APPENDIX E –

ENDANGERED SPECIES ACT

CONSULTATION

Americans with Disabilities Act (ADA) Compliance Disclaimer:

The National Aeronautics and Space Administration is committed to ensuring its electronic documents are accessible to all users. There may be some third-party images and maps within this document that are not ADA compliant at this time. Please contact Shari Miller at Shari.A.Miller@nasa.gov for further assistance.

USFWS Consultation

Kisak, Natalie

From: Miller, Shari (WFF-2500) <shari.a.miller@nasa.gov>
Sent: Thursday, March 2, 2023 7:40 PM
To: Brittingham, Alan L. (WFF-013.0)[Virginia Commercial Space Flight Authority]; Warf, Jen; Busam, Michael
Subject: Fwd: Service Response: Project Review Request, Wallops Island Northern Development

Begin Forwarded Message:

From: "Argo, Emily E" <emily_argo@fws.gov>
Subject: [EXTERNAL] Service Response: Project Review Request, Wallops Island Northern Development
Date: 02 March 2023 16:39
To: "Miller, Shari (WFF-2500)" <shari.a.miller@nasa.gov>
Cc: "Andersen, Troy M" <troy_andersen@fws.gov>, "Schulz, Cindy" <cindy_schulz@fws.gov>, "Levine, Lori (GSFC-2500)" <lori.m.levine@nasa.gov>

Shari,

We have reviewed the project package received on December 13, 2022 for the referenced project. The following comments are provided under provisions of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended.

Following a discussion on January 24, 2023, NASA agreed to accept the March 15-August 31 time of year restriction for both dredging and sand placement activities (S. Miller, NASA, to E. Argo, USFWS, January 25, 2023) and the April 1-November 14 time of year restriction for tree clearing (S. Miller, NASA, to E. Argo, USFWS, January 30, 2023).

Based on the information provided in the BA and the additional discussion and email exchange summarized above, we concur with the determinations provided in the Determination Table dated December 13, 2022 (Table 5 in the BA). Should project plans change or if additional information on the distribution of listed species or critical habitat becomes available, this determination may be reconsidered. If you have any questions, please contact me at 804-824-2405 or emily_argo@fws.gov.

Sincerely,

Emily Argo

Emily E. Argo (she/her)
Fish and Wildlife Biologist
Virginia Field Office
U.S. Fish and Wildlife Service
6669 Short Lane
Gloucester, VA 23061
(804) 824-2405
https://www.fws.gov/northeast/virginiafield

Kisak, Natalie

From: Miller, Shari (WFF-2500) <shari.a.miller@nasa.gov>
Sent: Tuesday, December 13, 2022 4:22 PM
To: 'cindy_schulz@fws.gov'
Cc: Argo, Emily; Finio, Alan (MARAD); Bahnson, Sara E CIV USARMY CENAO (USA); Meyer, T J (WFF-2500); Finch, Kimberly (GSFC-2500); Levine, Lori (GSFC-2500); Brittingham, Alan L. (WFF-013.0) [Virginia Commercial Space Flight Authority]
Subject: RE: Project Review Request, Wallops Island Northern Development, NASA WFF
Attachments: NASA WFF WIND - USFWS_TE Consult Ltr_121322.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Ms. Schulz:

Based upon public comments received on the draft Wallops Island Northern Development Environmental Assessment (WIND EA) and your agency's comments on the Section 7 consultation letter, NASA Wallops Flight Facility and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) are resubmitting the attached consultation. NASA and VA Space propose to construct of a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

Based on the attached assessment, NASA requests your agency's concurrence with our determination of effects for each of the federally listed species under USFWS jurisdiction potentially occurring in the action area, as summarized in Table 5 of the attached.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Shari A. Miller
Center NEPA Manager and
Natural Resources Lead
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337
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https://code200-external.gsfc.nasa.gov/250-wff/

"The smallest act of kindness is worth more than the grandest intention." – Oscar Wilde

From: Miller, Shari A. (WFF-2500)
Sent: Wednesday, November 10, 2021 12:15 PM

To: 'cindy_schulz@fws.gov' <cindy_schulz@fws.gov>
Cc: Argo, Emily <emily_argo@fws.gov>; Finio, Alan (MARAD) <alan.finio@dot.gov>; brian.c.denson@usace.army.mil; Nate Overby <nathan.overby@vaspace.org>; TJ Meyer <theodore.j.meyer@nasa.gov>; Kimberly Finch (GSFC-2500) (kimberly.s.finch@nasa.gov) <kimberly.s.finch@nasa.gov>; Levine, Lori M. (GSFC-2500) <lori.m.levine@nasa.gov>
Subject: Project Review Request, Wallops Island Northern Development, NASA WFF

Dear Ms. Schulz:

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) propose to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

Based on the attached assessment, NASA requests your agency's concurrence with our determination of effects for each of the federally listed species under USFWS jurisdiction potentially occurring in the action area, as summarized in Table 5 of the attached.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Thank you.

Shari A. Miller
Center NEPA Manager &
Natural Resources Manager
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"Remember there's no such thing as a small act of kindness. Every act creates a ripple with no logical end." —Scott Adams

National Aeronautics and Space Administration

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

Reply to Attn of: 250.W

December 13, 2022

Ms. Cindy Schulz
Virginia Field Office
U.S. Fish and Wildlife Service
6669 Short Lane
Gloucester, Virginia 23061

Re: Project Review Request, Wallops Island Northern Development, NASA Wallops Flight Facility, Accomack County, Virginia

Dear Ms. Schulz:

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) propose to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel (**Figures 1 and 2**). NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfill their requirements.

NASA is preparing an Environmental Assessment (EA) in compliance with NEPA to analyze the potential effects of the proposed action on the environment. The EA will be tiered from the May 2019 *NASA WFF Site-Wide Programmatic Environmental Impact Statement* (PEIS), in which NASA evaluated the environmental consequences of constructing and operating new facilities and infrastructure at WFF.

The purpose of this letter is to provide information about the proposed project and to request your concurrence with our determinations regarding potential effects on federally listed threatened and endangered species under United States Fish and Wildlife Service (USFWS) jurisdiction in the action area. Additionally, NASA and VCSFA, along with MARAD and USACE, are concurrently consulting with the National Oceanic and Atmospheric Administration (NOAA) Fisheries on in-water species under their jurisdiction in the action area.

Background

The goal of the MARAD Marine Highway Program is to expand the use of America's navigable waterways; to develop and increase marine highway service options; and to facilitate their further integration into the current U.S. surface transportation system, especially where water-based

transport is the most efficient, effective, and sustainable option (MARAD 2019a). The M-95 Marine Highway Corridor includes the Atlantic Ocean coastal waters; Atlantic Intracoastal Waterway; and connecting commercial navigation channels, ports, and harbors spanning 15 states including Virginia. The proposed Wallops Island M-95 Intermodal Barge Service project has the potential to support the growth of existing operations at WFF, enhance Science, Technology, Engineering, and Math (STEM) research opportunities, and spur high-tech/high-paying jobs in a predominantly rural area (MARAD 2019b).

VCSFA was created in 1995 by the General Assembly of the Commonwealth of Virginia to promote the development of the commercial space flight industry, economic development, aerospace research, and STEM education throughout the Commonwealth. In 1997, the VCSFA entered into a Reimbursable Space Act Agreement with NASA, which permitted the use of land on Wallops Island for launch pads. VCSFA also applied for and was granted a Federal Aviation Administration (FAA) license for launches to orbital trajectories. This led to the establishment of the Mid-Atlantic Regional Spaceport (MARS) which is owned and operated by VCSFA.

Development of a port and operations area to support the activities of NASA, WFF tenants, and MARS at the north end of Wallops Island was evaluated at a programmatic level of detail in the 2019 *Final Site-wide PEIS* (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.

Description of the Proposed Action

Under the Proposed Action, the MARS Port, including a 398-meters (m) (1,305-feet [ft]) fixed pier and turning basin, would be constructed adjacent to the unmanned aerial system (UAS) Airstrip located at the north end of Wallops Island (**Figures 1 and 2**). The MARS Port would provide a port and operations area along with associated capabilities for VCSFA, NASA WFF, and other customers. The MARS Port would also serve as a new intermodal facility as part of the MARAD M-95 Marine Highway Corridor. Infrastructure (new upland facilities and improvements to the existing access road, airstrip, and utilities) would likewise be constructed or installed as part of the Proposed Action. Access road improvements would include widening of an existing culvert.

The Proposed Action would also include the dredging of a new and existing channel for enhanced vessel approach purposes (**Figure 3**). The vessel approach channel, which interfaces with two Federal waterways, the Chincoteague Inlet Channel and the Chincoteague Inlet to Bogues Bay connecting waters, would initially be used by a variety of shallow-draft, manned and unmanned vessels. Ultimately, the proposed channel would have a length of approximately 3,900-m (12,800-ft), a width of 30 m (100 ft), and a final depth of 3.7 m (12 ft) below mean lower low water (MLLW). Components of the Proposed Action are further described below.

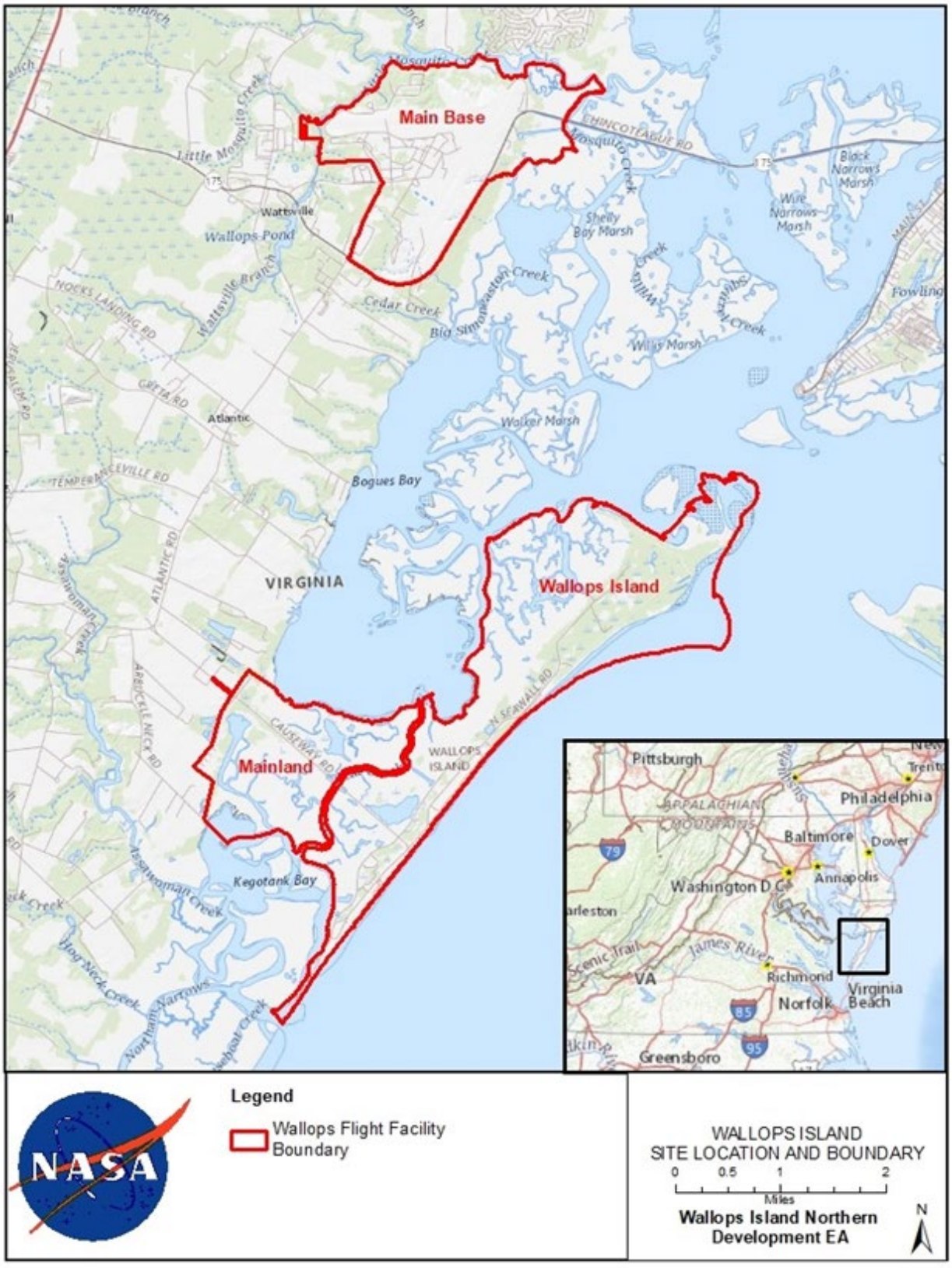

Figure 1: NASA WFF Location

Figure 2: Proposed MARS Port and Infrastructure Components

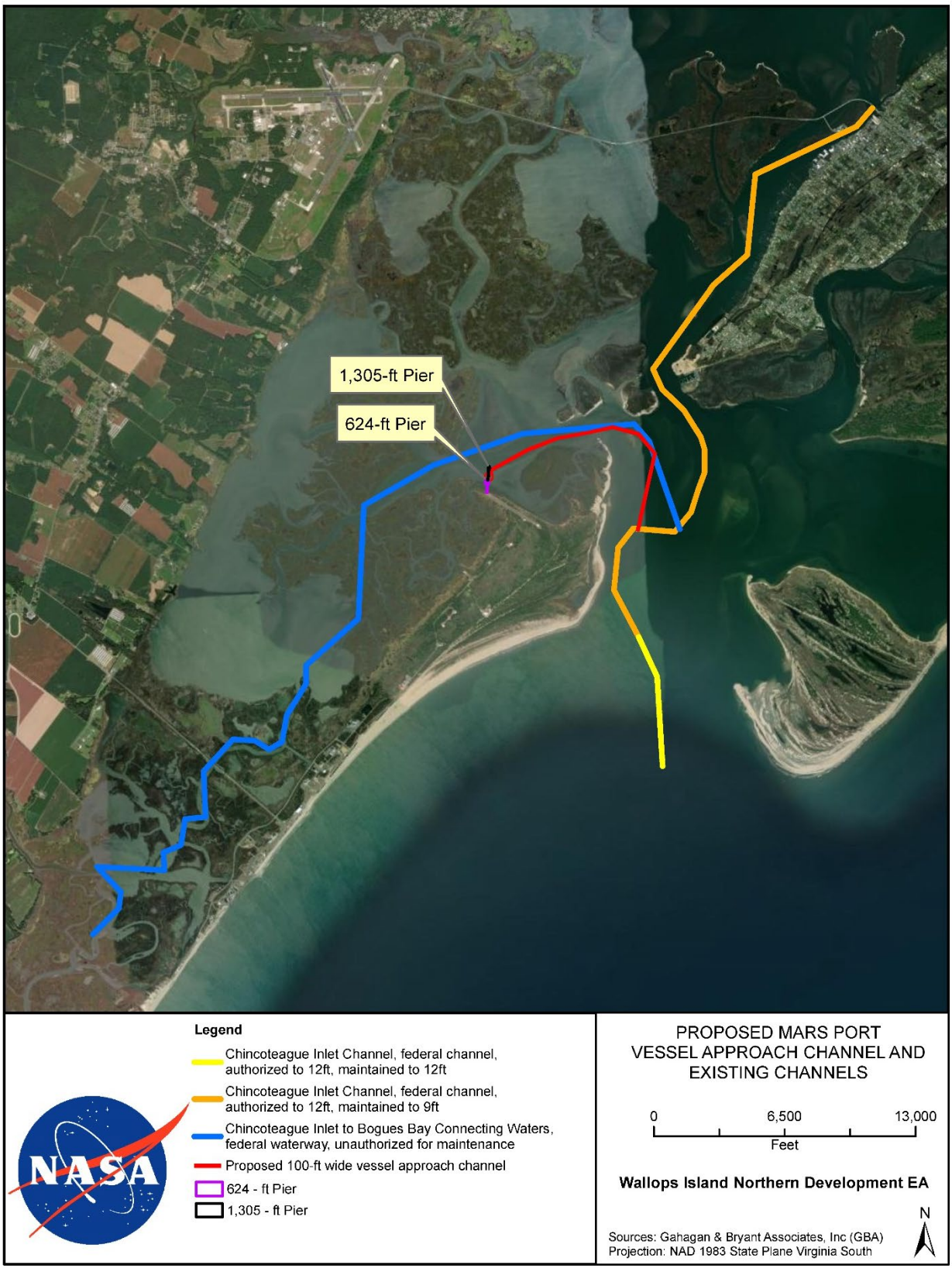

Figure 3: Proposed MARS Port Vessel Approach Channel and Existing Channels

Proposed Action In-Water Components

The MARS Port, including a 398-m (1,305-ft) fixed pier and turning basin would be constructed on (and within the vicinity of) the UAS Airstrip located at the north end of Wallops Island. The in-water portion of the Proposed Action would also include the dredging of an existing channel for enhanced vessel approach purposes. The vessel approach channel would be approximately 3,900 m (12,800 ft) long, 30 m (100 ft) wide, and would have a final depth of 3.7 m (12 ft) below MLLW. The MARS Port would provide a port and operations area along with associated capabilities for MARS, NASA WFF, and other customers. The MARS Port would also serve as a new part of the MARAD M-95 Marine Highway Corridor.

Construction of the Proposed Action would be carried out in three phases:

- **Phase 1** would be construction of a 190-m (624-ft) fixed pier, a 61-m (200-ft) radius turning basin 2.7 m (9 ft) deep below MLLW and dredging of the vessel approach channel to a final depth of 1.5-m to 2.7-m (5-ft to 9-ft) below MLLW (red outline in **Figure 4**). Additionally, improvements would be made to the existing paved UAS Airstrip access road and a temporary wastewater holding tank would be installed adjacent to a new onshore hangar. A 40-m (130-ft) long segment of the access road would be widened from 4.5 m to 9 m (15 ft to 30 ft) in conjunction with the widening of the culvert over which the road crosses a headwater drainage channel to Cow Gut.
- **Phase 2** would be construction of a 206-m (676-ft) extension of the fixed pier to a total length of 398 m (1,305 ft) and dredging of a 61-m (200-ft)-radius turning basin (located at the end of the pier extension; shaded pink on **Figure 4**) to a final depth of 2.7 m (9 ft) below MLLW. Phase 2 would begin approximately 1 to 2 years after Phase 1 is complete.
- **Phase 3** of construction would be additional dredging of the turning basin and vessel approach channel to a final depth of 3.7 m (12 ft) below MLLW, specifically the approximately 3,600-m (11,800-ft)-long portion of the channel from the Phase 2 turning basin to where it meets the Chincoteague Inlet Channel (shaded blue on **Figure 4**). Phase 3 would begin approximately 1 to 2 years after Phase 2 is complete.

Phases for the Proposed Action would be driven by customer need, which would increase operational tempo, and ultimately be tied to available funding. Each phase would help to expand the operational capability provided by the MARS Port to support the anticipated increase in WFF launch frequency and meet the need of commercial launch service providers to barge rocket components, payloads, and hardware directly to Wallops Island.

The portion of the channel shown in pink on **Figure 4**, which connects the vessel approach channel to the Phase 2 turning basin, is naturally deeper than 2.7 m (9 ft) below MLLW and, therefore, would not require any dredging during Phase 2. The estimated timeline for construction of the Proposed Action would have Phase 1 beginning in 2022 and being completed by 2024, with subsequent phases occurring approximately 1 to 2 years after the completion of the prior phase. Thus, construction of the Proposed Action would take a total of between 22.5 months and

24 months of active work to complete (not including the lag time between phases), depending on whether pier construction and dredging activities would occur concurrently or consecutively. Additional information about the proposed pier and other port components is provided in Chapter 2 of the Draft EA.

A variety of shallow-draft (0.6- to 1.2-m [2- to 4-ft]), manned and unmanned vessels would be serviced by the Port. The major navigational service would be a tug and barge configuration of an approximately 45-m by 12-m (150-ft by 40-ft) deck barge propelled by a tugboat requiring approximately 2.4 m (8 ft) of draft. Vessels originating from overseas or from the Ports of New York/New Jersey, Norfolk (Virginia), Baltimore (Maryland), Philadelphia (Pennsylvania), or Wilmington (Delaware) would enter the Chincoteague Inlet Channel and the Bogues Bay connecting waterways to the proposed approach channel and turning basin for the pier (**Figure 3**). The proposed width of the approach channel, approximately 30 m (100 ft), is consistent with the dimensions of the Federal Channel. Estimated dredging volumes for the vessel approach channel and turning basin are provided in **Table 1**.

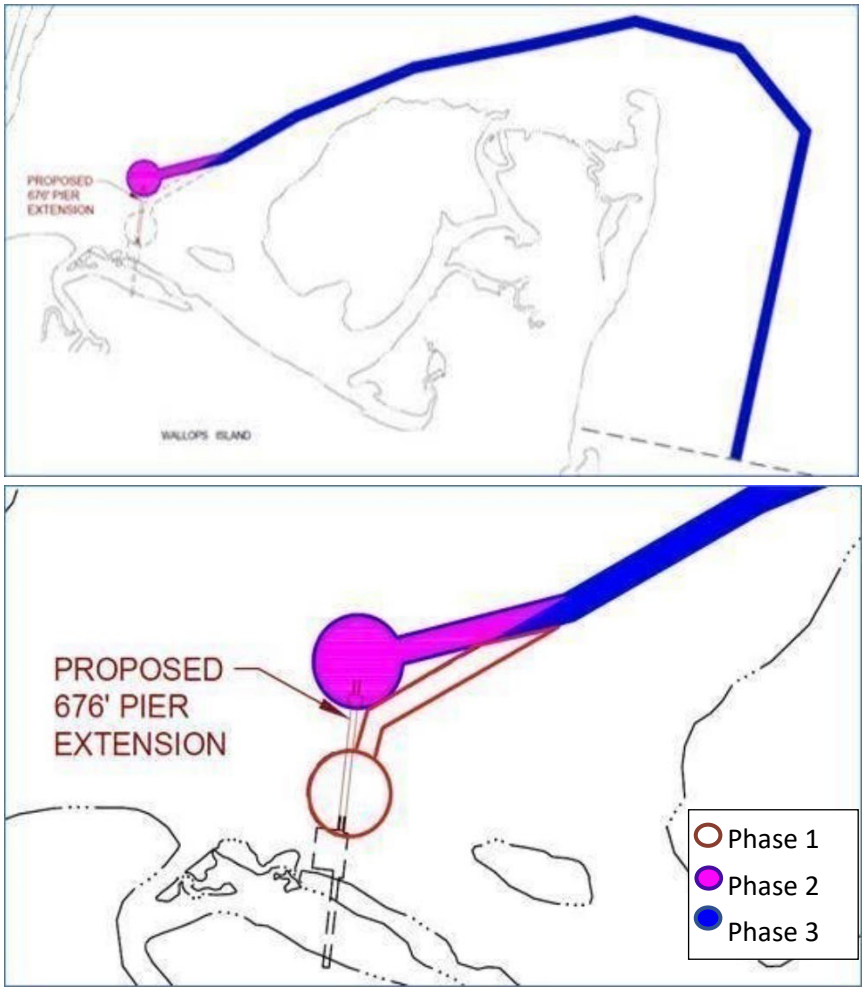

Figure 4: Diagram of Proposed Phased Construction

Table 1. Channel Dimensions and Estimated Dredging Volumes			
	Phase 1	**Phase 2**	**Phase 3**
Channel depth (depth below MLLW)	2.7 m (9 ft)	2.7 m (9 ft)	3.7 m (12 ft)
Channel length	3,900 m (12,800 ft)	3,600 m (11,800 ft)	3,600 m (11,800 ft)
Channel dredging volume	11,500 m^3 (15,100 yd^3)	0	26,500 m^3 (34,600 yd^3)
Turning basin dredging volume	31,000 m^3 (40,500 yd^3)	600 m^3 (800 yd^3)	2,500 m^3 (3,200 yd^3)
Total volume per phase	42,500 m^3 (55,600 yd^3)	600 m^3 (800 yd^3)	29,000 m^3 (37,800 yd^3)
Total Volume (Phases 1–3):			**72,100 m^3 (94,200 yd^3)**

m^3 = cubic meters, yd^3 = cubic yards

Dredged Material Placement Decision

The five potential sites considered for the placement of dredged material are summarized in **Table 2** and shown on **Figure 5**. The Proposed Action (Phases 1, 2, and 3) would result in a total volume of 72,100 m^3 (94,200 yd^3) of dredged material requiring placement. VCSFA intends to utilize Option 4, the Wallops Island Shoreline Protection Placement, as the preferred dredged material placement option. While Option 1 is the most economical solution (as it offers the lowest estimated mobilization costs, as well as the lowest unit costs for dredging, transport, and placement) Option 4 is the most beneficial reuse of the material. The dredged material placed on Wallops Island is required to have the same physical characteristics (90%+ sand) as the natural beach, and anything with a higher fine-grained content would not be suitable. Based on the geotechnical borings for the proposed project, the material is composed of approximately 95% sand and, therefore, would be suitable for shoreline renourishment.

The material dredged during Phase 1 (between 42,000 m^3 and 43,000 m^3 [56,000 y^3 and 57,000 y^3]) would be placed into the North Wallops Island beach borrow area to speed the recovery of this area for shoreline habitat. This borrow area was used as the source of sand to renourish the beach along the shoreline infrastructure protection area that was analyzed in the Final EA for the NASA WFF Shoreline Enhancement and Restoration Project (SERP) (NASA 2019c). For the Phase 2 and Phase 3 dredging and future maintenance dredging, NASA and MARS may work with the schedule for dredging events so that they coincide with ongoing shoreline renourishment actions as part of the SRIPP, and the material would be placed somewhere within the SERP Area. The SERP area includes the Wallops Island shoreline infrastructure protection area and the North Wallops Island beach borrow area.

Maintenance dredging of the basin and channel would be repeated periodically as necessary to maintain the required depth and is expected to be infrequent and of short duration. Estimates of future maintenance dredging requirements have been made using historic dredge records made available by the Norfolk District of the USACE. It was assumed that the proposed channel could

be maintained at a navigable depth of 2.7 m (9 ft) or 3.6 m (12 ft), MLLW, and that different regions of the proposed channel would have different dredging requirements because of location and wave influence. The estimated dredging volume and interval is highly variable because federal navigation channel dredging records indicate that channel migration has occurred historically. Further, 2019 and 2021 survey data show large naturally occurring changes in the bathymetry that can require dredging to maintain the proposed channel alignment. Therefore, future dredging events could range from every 3 to 6 years with annualized dredge volumes ranging from 1,100 to 9,200 cubic meters per year (m^3/yr) (1,400 to 12,000 cubic yards per year [yd^3/yr]), depending on the depth and location(s) that need to be dredged.

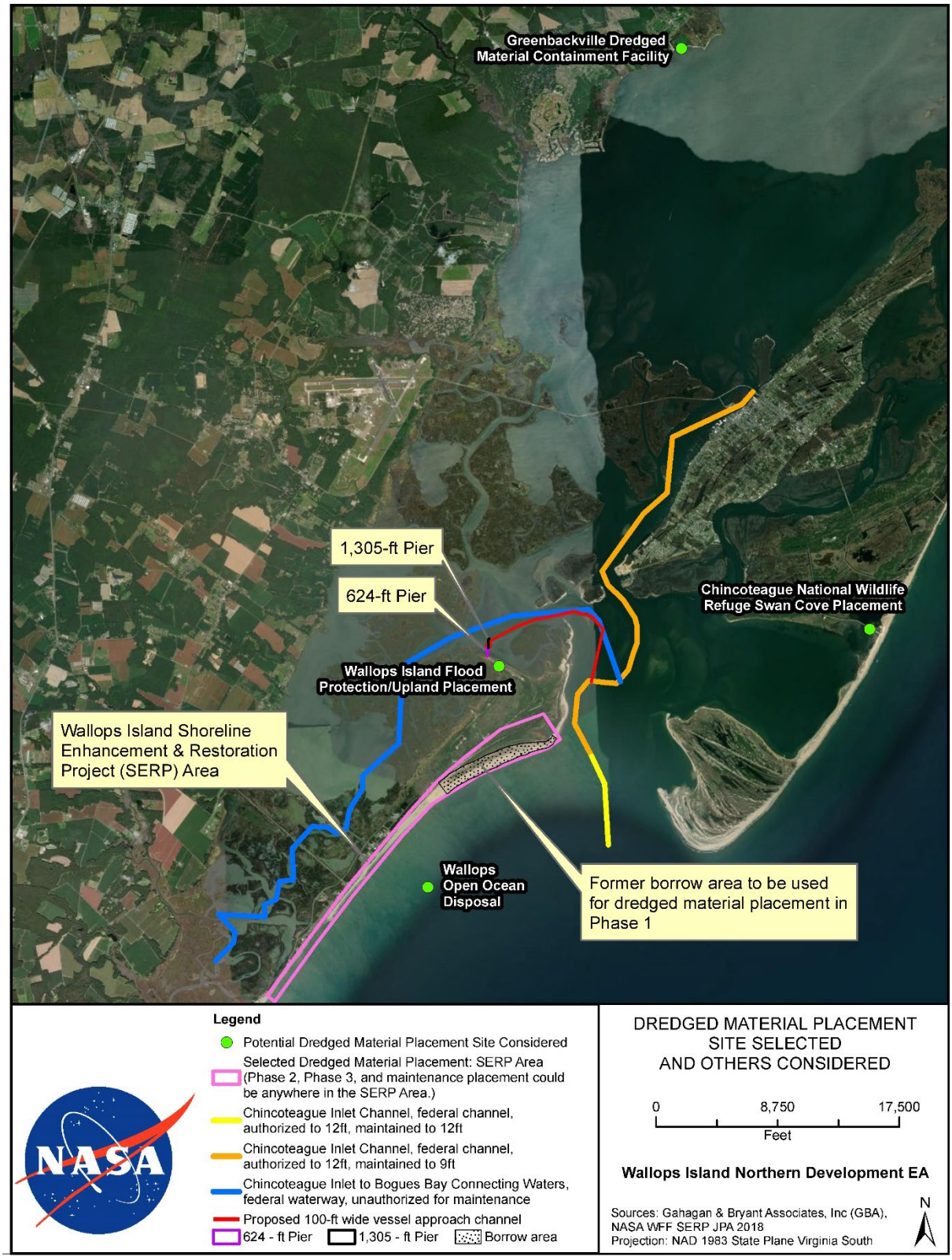

Figure 5. Dredged Material Placement Site Selected and Others Considered

Table 2. Potential Dredged Material Placement Sites							
Option	**Site**	**Description**	**Sail Distance from Basin[1]**	**Pipe Distance from Basin[2]**	**Sail Distance from Channel**	**Pipeline Distance from Channel**	**Description**
1	Wallops Open Ocean Dredge Material Placement Area	Open water placement site, closer than Lewis Creek or Norfolk Ocean disposal sites	9.8 km (6.1 mi)	--	7.1 km (4.4 mi)	--	This area is located just offshore of Wallops Island with a transportation distance of the dredged material of approximately 7.4 km (4 nautical mi). Open water placement options typically present the lowest cost dredging option and allows for the widest array of dredging equipment ranging from clamshell dredges to barge mounted excavators, supplying dump barges, or specially modified deck barges that are towed by tugboats to the dredged material placement site. Open water placement locations are controlled by the USACE and a CWA Section 404 permit would be required for the use of this site.
2	Wallops Island Flood Protection/ Upland Placement	Reuse of material for flood mitigation through upland placement at site identified by NASA	--	850 m (2,800 ft)	--	3,700 m (12,040 ft)	This option involves the beneficial reuse of material for flood mitigation through upland placement in low lying areas on Wallops Island. For example, there are low lying areas in the vicinity of the culvert crossing the main access road to the UAS Airstrip. This option was evaluated based on having a cutter suction dredge pump the material into this area. This option would also require development of containment measures for the dredged material in the form of containment dikes and the channeling of the effluent and its return into Bogues Bay. This effluent is the water that is used in the dredging process to transport the dredged material in slurry form to the placement location. Other alternatives could include thin layer placement for marsh enhancement in marsh areas a similar distance to the dredging location, or the use of geotubes, or synthetic membranes, for containing the dredged material.

Table 2. Potential Dredged Material Placement Sites							
Option	**Site**	**Description**	**Sail Distance from Basin[1]**	**Pipe Distance from Basin[2]**	**Sail Distance from Channel**	**Pipeline Distance from Channel**	**Description**
3	Greenbackville, VA, Dredged Material Containment Facility (DMCF)	Upland DMCF run by USACE, requires both navigation of Chincoteague Channel and pumping on location	18.2 km (11.3 mi)	--	15.3 km (9.5 mi)	200 m (650 ft)	The third dredged material placement option identified is the use of the upland Dredged Material Containment Facility (DMCF) owned and managed by the USACE. The USACE places material dredged from the upper reaches of the Chincoteague Channel into this DMCF. This option would require using a mechanical dredge to load the dredged material removed from the approach channel into barges. These barges would then be towed approximately 18.5 km (10 nautical mi) to the DMCF. A specialized hydraulic unloader would be required to discharge the dredged material from the transport barges and pump the material into the DMCF.

4	Wallops Island Shoreline Protection Placement	Reuse of material for shoreline protection and beach repair	12.1 km (7.5 mi)	--	9.7 km (6 mi)	--	This option would involve the beneficial reuse of clean, compatible sand from the dredged material to repair and protect areas of the shoreline on Wallops Island. Based on the March 2021 geotechnical borings for the proposed project, the material is anticipated to be composed of approximately 95 percent sand and, therefore, would be suitable for shoreline renourishment. The material would be placed into the North Wallops Island beach borrow area to speed the recovery of this area for shoreline habitat. This borrow area was used as the source of sand to renourish the beach along the shoreline infrastructure protection area that was analyzed in the Final EA for the NASA WFF Shoreline Enhancement and Restoration Project (SERP) (NASA 2019c). This action was part of the WFF Shoreline Restoration and Infrastructure Protection Program (SRIPP) (NASA 2010b) which involves the beneficial reuse of clean, compatible sand to repair and protect areas of the shoreline within the Launch Range area on Wallops Island. For the Phase 2 and Phase 3 dredging and future maintenance dredging, NASA and MARS may work with the schedule for dredging events so that they coincide with ongoing shoreline renourishment actions as part of the SRIPP, and the material would be placed somewhere within the SERP Area. The SERP area includes the Wallops Island shoreline infrastructure protection area and the North Wallops Island beach borrow area (**Figure 5**). Option 4 would require using a mechanical dredge to load the dredged material removed from the approach channel into barges. These barges would then be towed approximately 11 km (6 nautical mi) to the shoreline. A specialized hydraulic unloader would be required to discharge the dredged material from the transport barges and pump the material onto the placement areas.

Table 2. Potential Dredged Material Placement Sites							
Option	**Site**	**Description**	**Sail Distance from Basin[1]**	**Pipe Distance from Basin[2]**	**Sail Distance from Channel**	**Pipeline Distance from Channel**	**Description**
5	Chincoteague National Wildlife Refuge Swan Cove Placement	Reuse of material for habitat restoration	-	9 km (5.6 mi)	-	6.9 km (4.3 mi)	This option would involve the beneficial reuse of the dredged material for the Swan Cove Pool Restoration Project located in the Chincoteague National Wildlife Refuge (NWR). If dredged material is determined to be compatible with the Swan Cove Restoration Project design criteria, it would be used by USFWS to create berms and enhance and/or restore currently degraded areas of the estuarine salt marsh habitat that have been negatively impacted by an under sized culvert restricting sediment deposition and tidal flow. Although USFWS would prefer material with a high proportion of sand, they would also accept dredge material containing high organic matter content. This option was evaluated based on having a cutter suction dredge pump the material to this area. Once pumped, USFWS would assume responsibility for sediment placement and securing appropriate permits.

[1] Sail distance = the length of the path via water required to reach the placement site from the centroid of dredging in the proposed turning basin or approach channel (statute miles)
[2] Pipe distance = the length of pipe required to reach the placement site from the centroid of dredging or from the anchorage for a vessel loaded with dredged material

Proposed Action Onshore Components

Onshore facilities and infrastructure that would be constructed or upgraded under the Proposed Action are summarized in **Table 3**. Their proposed locations are shown on **Figure 2**. Improvements only apply to existing roads and utilities. No expansion beyond the proposed MARS Port and onshore facilities are anticipated at this time. Any future proposed changes would be addressed in additional NEPA documentation.

Table 3. Onshore Proposed Action Components

Facility or Element	Description
Project support building	A new, approximately 740-square meters (m^2) (8,000-square foot [ft^2]) building may be constructed on at the site of the former Wallops Employee Morale Association Recreational Facility (V-065) (Old Wallops Beach Lifeboat Station) on the southwest end of the access road to the UAS Airstrip. Once the existing facility is removed or demolished the new facility may be constructed and would serve as a new North Island Operations Center. The new building would have a maximum height of 12 m (40 ft) to avoid interference with a nearby air surveillance radar.
Second hangar	A new, approximately 660 m^2 (7,125-ft^2) hangar would be constructed adjacent to the runway, east of the existing UAS airstrip hangar. The new hangar would be a secure facility to support operations, store vehicles and equipment when not in use, accommodate vehicle maintenance as required, and provide a small meeting area for client usage. The new hangar would have a maximum height of 12 m (40 ft) to avoid interference with a nearby air surveillance radar. This proposed second, secure hangar would provide an additional area for MARS clients without hindering usage of the existing hangar for UAS Airfield operations.
Utility infrastructure	Electricity, potable water, wastewater, and communications utilities would be extended to the Project Support Building from existing nearby infrastructure. Potable water would be supplied from the elevated north end tank (V-090), which has a 190,000-liter (50,000-gallon) capacity. Potable water supply piping would be placed in existing conduit that runs along North Seawall Road and extends from Building V-067 to the existing hangar at the UAS Airstrip. New conduit for electrical and communication utilities would be extended from the existing hangar to the proposed hangar at the UAS Airstrip. New utility conduit would also be installed along the new port access road to provide electrical and communication utilities to the pier. Wastewater from the hangars would be conveyed to a proposed temporary holding tank where it would be periodically collected and pumped into the NASA wastewater system for treatment. In accordance with the WFF Integrated Contingency Plan, precautions would be taken prior to and during collection from the temporary tank and pumping into the wastewater collection system.
Airstrip lighting	New airstrip lighting meeting applicable FAA airfield standards would be installed at the UAS airstrip. The lights would be located along the edge of the runway (one white light every 61-m [200-ft]). Lights would only be turned on when required by an airfield operation (i.e., night-time aircraft takeoffs or landings) and turned off when the operation is completed.

Table 3. Onshore Proposed Action Components	
Facility or Element	**Description**
Airstrip access road improvements (culvert widening)	The existing access road at the culvert crossing is not wide enough for two-way traffic or to accept trailered loads from the proposed MARS Port. This creates a constriction and safety and operational hazards. A 40-m (130-ft) segment of the existing paved access road would be widened from 4.6 m (15 ft) to approximately 9.1 m (30 ft), and the culvert over which the road crosses a drainage channel to Cow Gut would also be widened.
Vehicle parking lot	A new asphalt parking area with spaces for up to 30 vehicles would be constructed near the northwest intersection of the UAS Airstrip access road and runway.
Runway hardening for port access	A 30.5-m (100-ft)-wide section of runway would be reinforced to accommodate heavy equipment and vehicles traversing the airfield between the proposed pier and the equipment parking/storage areas.
Access road to port	A new asphalt access road would be constructed along the north side of the existing UAS Airstrip (inside the drainage infiltration trench) from the intersection with the access road to the new MARS Port pier area.

Summary of Proposed Action Construction Activities

The Proposed Action would involve: (1) construction of the onshore and pier components that would make up the MARS Port, (2) mechanical dredging of the vessel approach channel and turning basin, (3) placement of dredged material, and (4) construction or improvement of the onshore facilities and infrastructure.

The estimated timeframe for construction of the Proposed Action would have Phase 1 beginning in 2022 and being completed by 2024, with subsequent phases occurring approximately 1 to 2 years after completion of the prior phase. It is assumed that construction of all proposed onshore project components and infrastructure would be completed during Phase 1 (although the North Island Operations Center may be constructed later). With two crews (10 persons each), working 5 days per week (10-hour days), construction of the 190-m (624-ft) long pier under Phase 1 would take approximately 12 months to complete, and construction of the 206-m (676-ft) long pier extension under Phase 2 (for a total pier length 398 m [1,305 ft]) would take approximately 9.5 months to complete.

Phase 1 dredging activities (turning basin and channel) would take approximately 30 days to complete, Phase 2 dredging (turning basin) would take approximately 7 days, and Phase 3 dredging (turning basin and channel) would take 30 days. Work would be performed 24 hours a day, seven days a week with two crews each working 12-hour shifts.

Typical equipment used during construction would include crane barges, material barges, tugboat, vibratory pile hammer, diesel impact hammer, concrete truck, concrete pump truck, concrete vibrator, generator, welding machines, cutting torches, and various small tools.

Summary of Proposed Action Operational Activities

VCSFA/MARS currently has a facilities team that mows grass once per week, monitors for eagles twice per week during nesting season, periodically removes tree and weed growth, and inspects the infiltration trench and fencing. During summer months, a mosquito fogging service truck sprays the airfield once every two weeks. Additionally, the pier structure would require quarterly structural inspections.

Potential facility usage associated with the MARS Port is provided in **Table 4**.

Table 4. Potential MARS Port Operations/Facility Usage

Potential Facility Usage	Vessel Type	Quantity Assumptions	Total Barge / Vessel Trips	Phase Associated with Usage
Medium Class ELV 1st stage (core) and 2nd stage	Shallow-draft deck barge & inland push boat	3 launches per year; each comes w/ ~4-6 truckloads of parts and equipment plus 2 heavy haulers	3	1
Venture Class ELV	Shallow-draft deck barge & inland push boat	Potential for 12 launches per year; 3 trucks per launch	12	1
Venture Class 2 ELV	Shallow-draft deck barge & inland push boat	9 launches per year; 1 truck per stage, 3-5 trucks for equipment	9	1
Venture Class Heavy ELV	Deck barge & 1000-1200 HP tugboat	3 launches per year, 3 first stage cores per launch w/ 1 truck each plus 3-5 trucks for equipment	3	2
Minotaur Class	Deck barge & 1000-1200 HP tugboat	4 launches per year, 3 stage/cores per launch w/ 1 truck each; 3-5 additional trucks for equipment	4	2
Recovery effort	Shallow-draft deck barge & inland push boat	1 per Venture Class ELV launch	12	1
Autonomous Surface Vehicle (ASV)	Trailered vessel	1 deployment per month; each deployment has 5-10 vehicles included	12	1
Autonomous Underwater Vehicle (AUV)	Trailered vessel	1 deployment every other month; each deployment has 5-10 vehicles included	6	1

Table 4. Potential MARS Port Operations/Facility Usage				
Potential Facility Usage	**Vessel Type**	**Quantity Assumptions**	**Total Barge / Vessel Trips**	**Phase Associated with Usage**
Miscellaneous usage	Shallow-draft vessel	1 deployment every other month	6	2
Research usage	Small research vessel	1 deployment every 4 months; each deployment has 5-10 vehicles included	3	2
Other government research & testing	Trailered vessel	1 deployment every other month	12	2
Other Site-wide PEIS construction/expansion	Deck barge & ocean tug	2 large/oversized deliveries per year	1	2
Commodity delivery	Deck barge & ocean tug	16 total barges	16	3
		Total Barge / Vessel Trips	**99**	

Description of the Action Area

The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402.02). For this project, the action area includes the north end of Wallops Island surrounding the UAS Airstrip – the onshore areas potentially affected by the construction of onshore facilities and their operation. It also includes the surrounding waters from Chincoteague Inlet to the east and north to Bogues Bay to the west, i.e., the offshore areas potentially affected by pier construction, channel and turning basin dredging, placement of dredged sediment, and vessels transiting between the proposed pier and the existing Chincoteague Inlet Federal Channel. As described above, the option selected for the placement of dredged material from construction dredging and long-term maintenance dredging is the pumping of the material from transport barges onto the Wallops Island beach in the SERP area (**Figure 5**). The elements of the ongoing SERP activities to protect Wallops Island shoreline infrastructure through beach renourishment are described in detail in the *2019 SERP EA* (NASA 2019c).

The onshore habitats within the action area on the north end of Wallops Island consist of forested uplands, maritime grasslands, non-tidal wetlands (emergent and scrub-shrub), tidal wetlands, and beaches within the SERP area where dredged sand material would be placed in conjunction with ongoing beach renourishment activities. The dominant habitat within the area is tidal marsh that transitions into upland grass and maritime forest areas adjacent to the UAS airstrip. Vegetated areas adjacent to the UAS airstrip are periodically mowed to maintain an obstruction-free zone to facilitate the safe operation of aircraft using the runway.

The offshore habitats within the action area include tidal marsh communities and the estuarine surface waters of Chincoteague Inlet, Bogues Bay, Ballast Narrows, and other waterways. The nearest beds of submerged aquatic vegetation are approximately 4.8 km (3 miles) north of the action area. Waters in the action area contain public and private harvesting areas for shellfish (oysters and clams).

USFWS Listed Species in the Action Area and Effects Determination

The federally listed species under USFWS jurisdiction that were identified by USFWS as potentially occurring in the action area are described in the species conclusion table (**Table 5**). **Attachment 1** includes the USFWS consultation letter from its Information for Planning and Consultation (IPaC) system that identified the species potentially occurring in the action area.

In 2019, USFWS issued a combined Biological Opinion (BO) for the 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. This plan outlines procedures for monitoring protected species that are likely to occur at Wallops Island, including the northern long-eared bat, red knot, piping plover, and sea turtles. Monitoring reports for these species are prepared annually by WFF and submitted to the USFWS.

The species conclusion table (**Table 5**) provides the ESA Section 7 effects determination for each species (based on the analysis presented in the EA for the Wallops Island Northern Development). The determination of effects on these listed species is further discussed below.

Table 5. Species Conclusions: Determination of Effects on Federally Listed Species under USFWS Jurisdiction

Common Name	Scientific Name	Status[1]	Habitat	Notes	ESA Section 7 Determination of Effect
Mammals					
Northern long-eared bat	*Myotis septentrionalis*	FE	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. Additionally, no maternity roost trees or winter hibernacula suitable for the species have been documented on or near Wallops Island (VDWR 2022). In accordance with the 2019 Biological Opinion, NASA and VCSFA would not remove identified maternity roost trees.	May affect, not likely to adversely affect

Table 5. Species Conclusions: Determination of Effects on Federally Listed Species under USFWS Jurisdiction

Common Name	Scientific Name	Status[1]	Habitat	Notes	ESA Section 7 Determination of Effect
Birds					
Red knot	*Calidris canutus rufa*	FT	Wallops Island beaches	Present May through July during spring migration. Regularly forages on Wallops, Assateague, and Assawoman Island beaches during northerly spring migration (NASA 2019a). In May 2019, over 2,000 birds were counted on the north end of Wallops Island (NASA 2019b). Numbers observed on the north end of Wallops Island were 117 in 2020 and 0 in 2021 (NASA 2021). Dredged material placement would occur on beaches and potentially would increase beach habitat.	May affect, not likely to adversely affect
Piping plover	*Charadrius melodus*	FT	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 2019a). Three nests were observed on Wallops Island in 2021 (NASA 2021). Dredged material placement would occur on beaches near piping plover habitat and potentially would increase beach habitat (NASA 2019b).	May affect, not likely to adversely affect
Roseate tern	*Sterna dougallii dougallii*	FE	Offshore ocean waters	Rarely observed along the U.S. coast south of New Jersey; may transit over oceanic waters off WFF during seasonal migration (NASA 2019a).	No effect
Eastern black rail	*Laterallus jamaicensis jamaicensis*	FT	Salt and brackish marshes with dense cover and upland areas of such marshes	Species has recently been documented at WFF and potentially suitable habitat is present at and near WFF. However, acoustic surveys conducted in June 2021 and during the 2022 breeding season (three survey rounds between May 1 and June 6), did not detect the species in the action area. Through informal conference with USFWS conducted on 8/16/2019 and subsequent informal consultation, avoidance and minimization measures to be implemented by NASA, VCSFA, and their contractors during construction were identified.	May affect, not likely to adversely affect

Table 5. Species Conclusions: Determination of Effects on Federally Listed Species under USFWS Jurisdiction

Common Name	Scientific Name	Status[1]	Habitat	Notes	ESA Section 7 Determination of Effect
Reptiles					
Loggerhead sea turtle	*Caretta caretta*	FT	Coastal and offshore ocean waters; nests on beaches	Most prevalent sea turtle species around WFF; has nested on Wallops and regularly nests on Assateague Island beaches (NASA 2019a; USFWS 2016). Loggerhead nests have been observed on Wallops Island beaches as recently as 2013. Greatest in-water concentrations over continental shelf; however, species is also found in deeper waters (NASA 2019). Proposed Action unlikely to affect species; construction activity not located in nesting habitat, and dredged material placement on beaches would avoid turtle nests and potentially increase beach area for nesting. Due to the transient presence of the species, dredging operations are unlikely to affect the loggerhead sea turtle. Potential occurrence in action area: adults and juveniles migrating and foraging May–November (NOAA Fisheries 2020). Turtles may stay through early winter (December - January) if water temperatures remain warm (VDWR 2016, Martin 2022).	Nesting: may affect, not likely to adversely affect
Leatherback sea turtle	*Dermochelys coriacea*	FE	Coastal and offshore ocean waters; nests on beaches	Typically nests on tropical or subtropical beaches. Nesting in the action area is unlikely; only one individual demonstrating nesting behavior documented on Assateague Island in 1996. Generally considered oceanic; however, will forage in coastal areas if prey species are available in high densities (NASA 2019). Potential occurrence in action area: adults and juveniles migrating and foraging May–November (NOAA Fisheries 2020). Turtles may stay through early winter (December - January) if water temperatures remain warm (VDWR 2016, Martin 2022).	No effect on nesting turtles
Hawksbill sea turtle	*Eretmochelys imbricata*	FE	Coastal ocean waters; nests on beaches	Unlikely to occur in or near the action area; only two observations in Virginia since 1979 (NASA 2019). Nest in tropics.	No effect on nesting turtles

Table 5. Species Conclusions: Determination of Effects on Federally Listed Species under USFWS Jurisdiction

Common Name	Scientific Name	Status[1]	Habitat	Notes	ESA Section 7 Determination of Effect
Kemp's ridley sea turtle	*Lepidochelys kempii*	FE	Coastal ocean waters; nests on beaches	Traditionally nests in Mexico; however, first Virginia nest discovered in 2012 at Virginia Beach (Virginia Army National Guard 2019), with a second nest at False Cape in summer 2014 (VDWR 2016). A Kemp's ridley nest also occurred in 2021 at an undisclosed location in Virginia (Argo 2021). Generally occurs in more sheltered, shallower water habitats than other sea turtle species (NASA 2019). Potential occurrence in action area: adults and juveniles migrating and foraging May–November (NOAA Fisheries 2020).	Nesting: may affect, not likely to adversely affect
Green sea turtle	*Chelonia mydas*	FT	Coastal ocean waters; nests on beaches	Green sea turtles have begun nesting regularly in Virginia; one nested in Virginia in 2021 at an undisclosed location (Argo 2021). Potential occurrence in action area: adults and juveniles migrating and foraging from May–November (NOAA Fisheries 2020).	Nesting: may affect, not likely to adversely affect
Flowering Plants					
Seabeach amaranth	*Amaranthus pumilus*	FT	Area seaward of primary dunes	Species has not been documented at WFF since monitoring began in 2010 (NASA 2019b); nearest documented occurrence is on Assateague Island (NASA 2019a). No primary dunes or beaches in the project limits; therefore, no suitable habitat present.	No effect

[1] FE = federally listed as endangered; FT = federally listed as threatened
Sources: Species and status -- USFWS (2020); habitat and notes -- NASA (2019) unless otherwise noted

Mammals

Northern long-eared bat

On November 29, 2022, the USFWS reclassified the northern long-eared bat to an endangered species status under the ESA and removed the 4(d) rule. Previously, the 4(d) rule defined "takes" and "incidental takes," and allowed the USFWS the ability to provide more specific rules or measures to protect the northern long-eared bat. The USFWS is in the process of developing new guidance to replace the 4(d) rule and associated determination key.

There is no winter hibernacula on or near Wallops Island and this species has not been documented at NASA WFF; it is therefore unlikely to be present in the Project Area. The removal of mature trees would be minimized to the extent possible and limited to those necessary to complete the proposed facilities. NASA and VCSFA would follow the procedures outlined in the letter to USFWS dated August 18, 2015, and in accordance with the 2019 Biological Opinion, would not

remove maternity roost trees, should any be identified. Thus, the Proposed Action may affect but is not likely to adversely affect the northern long-eared bat.

Tricolored bat

On September 14, 2022, the USFWS proposed to list the tricolored bat (*Perimyotis subflavus*) as an endangered species under the ESA, throughout its range. According to the USFWS, the primary factor influencing its viability is white nose syndrome with other factors influencing the tricolored bat's viability including habitat loss and effects from climate change (87 FR 177). The U.S. Geological Survey, Virginia Cooperative Fish and Wildlife Research Unit and the Virginia Tech Department of Fisheries and Wildlife Conservation conducted year-round acoustic surveys for bats throughout WFF from October 2016 through April 2018. Though localized both during the summer and dormant-season sampling, the survey determined that activity of the tricolored bat was relatively high at WFF (Barr 2018). As stated above for northern long-eared bats, the removal of mature trees would be minimized to the extent possible and limited to those necessary to complete the proposed facilities. NASA and VCSFA would follow the procedures established for northern long-eared bats and would not remove identified tricolor bat maternity roost trees. Therefore, potential for impacts from the Proposed Action on the tricolored bat are anticipated to negligible

Birds

Status of the Species in the Action Area

Red knot

The red knot is federally listed in Virginia as threatened. They do not breed in the vicinity of NASA WFF or Accomack County, but appear regularly on Wallops Island beaches, including those on the northern end of the island, to forage and roost during their annual spring migration, mostly during the second half of May (NASA 2015a). In 2019, over 2,000 red knots were observed on the north end of Wallops Island (NASA 2019b) which decreased to 117 individuals in 2020, most likely due to construction activities of the WFF SERP (NASA 2020a). There are no beaches on the northwestern side of Wallops Island where onshore components of the Proposed Action would be implemented; however, narrow beaches do exist along the eastern side of the island adjacent to offshore areas where dredging for portions of the proposed vessel approach channel would occur. Additionally, dredged material from construction of the turning basins and channels and future maintenance dredging would be placed on Wallops Island beaches for renourishment to increase shoreline resiliency and shorebird habitat in conjunction with the ongoing SERP.

Piping plover

The piping plover is federally listed as threatened. Nesting habitat generally occurs in areas with little or no vegetation, including coastal beaches above the high tide line, sandflats at the end of spits and barrier islands, gently sloping foredunes, blowout areas behind dunes, and overwash areas between dunes. Nests have also occasionally been found under beach grass and other vegetation (NASA 2015a). Piping plovers are a transient and summer resident of the upper Virginia barrier islands and are known to inhabit the coastal habitats of the nearby Chincoteague National

Wildlife Refuge. Piping plover nests have been documented on coastal beaches along the northeastern side of Wallops Island (**Figure 6**). Suitable habitat for the species is not present in areas where onshore components of the Proposed Action would be implemented. Additionally, dredged material from construction of the turning basins and channels and future maintenance dredging would be placed on Wallops Island beaches for renourishment to increase shoreline resiliency and shorebird habitat in conjunction with the ongoing SERP.

Eastern black rail

The eastern black rail is federally listed as threatened. In the northeastern U.S., the eastern black rail typically occurs 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 un-impounded salt and brackish marshes. The eastern black rail was documented at NASA WFF in May 2019. Suitable marsh nesting and foraging habitat for the species is present on and around areas of the northern end of Wallops Island and Ballast Narrows where components of the Proposed Action would be implemented. Through informal conference with USFWS conducted on August 16, 2019, and subsequent informal conference with USFWS during May and July 2020, a habitat survey was requested by USFWS to identify whether an eastern black rail survey would be needed.

A habitat assessment was conducted in July-August 2020 (NASA 2020b), and a follow-up species presence survey was performed in June 2021 (NASA 2021). The survey was performed in accordance with the Maryland Protocol (Wilson 2015; Gibbs and Melvin 1993), and in any situations where the Maryland Protocol did not specify a condition, the Standardized North American Marsh Bird Monitoring Protocol (SNAMBMP; Conway 2011). The methodology used for these surveys consisted of three broadcast playback field survey efforts between May 1 and July 15, conducted at the two survey stations. Surveys were not conducted in rain, fog, or when wind speeds exceeded 19 kilometers per hour (km/hr) (12 miles per hour [mi/hr]). These surveys were conducted as close to a half hour after sunset as possible to maintain consistency with the Maryland Protocol. Tidal conditions are not defined in the Maryland Protocol, but the SNAMBMP recommends similar tidal levels for all survey events. To maintain consistency with tidal conditions, all surveys were conducted at tide levels within approximately 0.3 m (1 ft) of each other; the tide level at approximately 21:00 on the three dates was approximately 0.6 m (2 ft) high and rising on June 15, 2021 and June 29, 2021 and approximately 0.9 m (3 ft) high and receding on June 22, 2021. Eastern black rails were not detected at either survey station within (or outside) the 400-m (1,300-ft) radii on any of the three survey nights.

An identical acoustic survey for eastern black rail was performed during the 2022 breeding season (three survey rounds between May 1 and June 6) at locations throughout high marsh habitat on Wallops Island, including survey points in the area of the Proposed Action. Similar to the results of the 2021 survey, no visual or auditory observations of eastern black rails were recorded during the 2022 survey (Stein, Bartok, and Ritzert 2022).

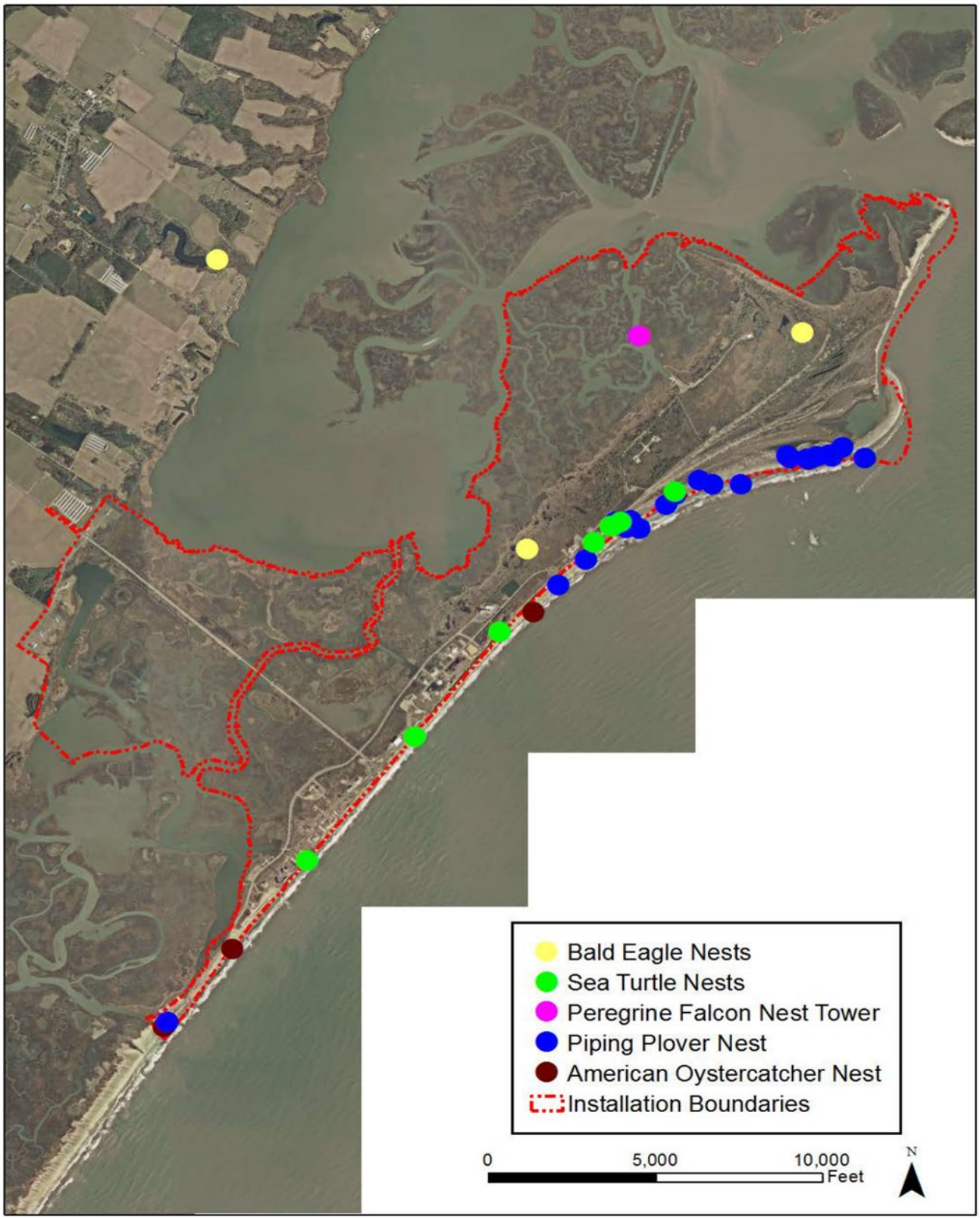

Figure 6. Historic Nesting Sites for Federally Listed and Other Special-Status Species at WFF Wallops Island and Mainland

Effects Determination

The roseate tern occurs offshore and is rarely observed along the U.S. coast south of New Jersey; therefore, the Proposed Action would have no effect on the roseate tern.

Piping plover and Red knot

Onshore construction of the Proposed Action would have the potential to disturb the red knot and piping plover if present in or near the action area due to stressors such as noise, increased human presence, and removal of vegetation potentially providing habitat. Airborne noise can be roughly estimated by assuming the construction equipment required and providing a distance to a noise sensitive receptor. For the replacement of the causeway bridge at the south end of Wallops Island, the noise from piling driving was estimated at 101 decibels A-weighted (dBA) at 15 m (50 ft) (NASA 2019a). In its Programmatic BO on the WFF Shoreline Restoration and Infrastructure Protection Program (NASA 2010), USFWS set protected species monitoring requirements at the 100 dB contours from a rocket launch (NASA 2019a). The nearest recorded piping plover nesting location would be greater than 1,800 m (6,000 ft) from pile-driving activities under the Proposed Action; thus, no airborne noise impacts are anticipated to the red knot or piping plover.

Open-water construction activities (i.e., dredging of channels and turning basins and construction of the outer portion of the pier) would have no or minimal direct impacts on piping plover or red knots because onshore habitat for these species near the areas where these activities would occur is absent or minimal. Also, these birds are highly mobile and could avoid these areas during project activities. Therefore, onshore and open-water construction activities of the Proposed Action may affect, but are not likely to adversely affect, the red knot or piping plover because these species occur on beaches, and project construction activities would not occur in beach areas potentially providing suitable habitat for these species.

As described above, the option selected for the placement of dredged material from construction dredging and long-term maintenance dredging is the pumping of the material from transport barges onto the beach in the SERP area (**Figure 5**). The elements of the ongoing project to protect Wallops Island shoreline infrastructure through beach renourishment are described in detail in the *2019 SERP EA* (NASA 2019c). The dredged material placement activities of the Proposed Action would be coordinated with, and incorporated into, the ongoing SERP activities. The associated effects from the placement of sand material on the beaches were evaluated in detail in the *2019 SERP EA*. Piping plover and red knot potentially would be affected by dredged material placement on beaches in the SERP area. In its 2019 BO (USFWS 2019), USFWS determined that the renourishment activities proposed as part of the SERP are likely to adversely affect the piping plover and red knot. (USFWS determined that the SERP is not likely to adversely affect the roseate tern). The 2019 BO included an Incidental Take Statement and required the implementation of measures, terms, and conditions to minimize impacts to the piping plover and red knot. These measures are listed in the *2019 SERP EA* (NASA 2019c). In addition, the VMRC permit for the SERP also prescribes six terms and conditions to reduce impacts to special status species, and these terms are listed in the

2019 SERP EA (NASA 2019c). NASA and VCSFA would follow both USFWS and VMRC permit terms during placement of dredged material into the SERP area.

The dredged material from construction and maintenance of turning basins and channels under the Proposed Action would be used by the SERP in conjunction with material from other sources for beach renourishment in the SERP area. Potential adverse effects from this activity on federally listed species have been evaluated by USFWS and NMFS in BOs for the SERP (USFWS 2019, NMFS 2012) and would be minimized by implementing any measures, terms, and conditions previously stipulated by the Services that may apply to the beach renourishment activity. Additionally, beneficially using the dredged material on the Wallops Island beach would speed recovery of the borrow area and increase habitat for red knots and piping plover.

Eastern black rail

The eastern black rail potentially could utilize as habitat the salt marsh where the proposed pier would be installed. During the informal conference process with USFWS to determine the area to survey for the presence of eastern black rail, a primary buffer within 15 m (50 ft) around onshore and nearshore construction activities of the pier was established. Beyond the 15-m (50-ft) buffer, a conservative estimate for a preliminary secondary buffer was established to account for potential effects from light, noise, and hydrology changes from the Proposed Action. Noise from construction equipment would likely to be intermittent and temporary. Based on the typical noise from roadway construction equipment, attenuation results in a drop-off rate of 7.5 dBA per doubling of distance for a point source. The noise emission levels at 15 m (50 feet) from the point source for pile driving, scraping, paving, and concrete mixing typically range from 80 to 95 dBA. Assuming the maximum noise from construction of 95 dBA, a nuisance level of 73 dBA and above, combined with the estimated 7.5 dBA attenuation, a conservative potential APE is noted with a 120-m (400-ft) buffer from the Project Area or noise source (California Department of Transportation 2016).

Noise minimization strategies implemented to the extent practicable during construction may include: temporary noise barriers or sound walls, noise pads or dampers, movable task noise barriers, queuing trucks to distribute idling noise, locating vehicle access points and loading and shipping facilities away from habitat areas, reducing the number of noisy activities that occur simultaneously, relocating stationary equipment away from habitat areas, and use of vibration reducing modifications to construction equipment. Implementing these practices would minimize potential effects on the eastern black rail. Additionally, based on the 2021 and 2022 breeding season surveys, it is unlikely that eastern black rail nest in the action area. Therefore, NASA has determined that the construction of the Proposed Action may affect, but is not likely to adversely affect, the eastern black rail.

Summary

Activities associated with the operation of the proposed port would be like other commercial boating activities occurring with relative frequency in and around the action area. Such activities

would not be particularly unusual or disruptive to listed birds. Birds may leave the immediate area during these operational activities but would be expected to return upon completion of project activities. Overall, the areas of potential habitat that would be temporarily disturbed by the Proposed Action would be small relative to the available, surrounding habitat.

For these reasons, effects of the Proposed Action on the red knot, piping plover, and eastern black rail would be insignificant or discountable. Accordingly, the Proposed Action may affect, but is not likely to be adversely affect, these bird species. It would have no effect on the roseate tern.

Sea Turtles

Status of the Species

For management purposes, the loggerhead sea turtle population is organized into nine distinct population segments (DPS), four that are listed as threatened and five that are listed as endangered. Loggerheads occurring at or near WFF belong to the Northwest Atlantic DPS, which is federally listed as threatened. The species nests on coastal beaches and occasionally on estuarine shorelines generally between late April and early September, with hatching occurring at night between late June and mid-November. Major nesting concentrations in the U.S. occur from North Carolina to southwest Florida. Successful loggerhead nests were observed on coastal beaches along Wallops Island as recently as 2013 (NASA 2021b). The closest nest to the Project Area was approximately 2.1 km (1.3 mi) south of the UAS Airstrip (**Figure 6**). Suitable loggerhead nesting habitat is not present in onshore areas where components of the Proposed Action would be implemented.

The leatherback sea turtle is federally listed as endangered. It is the largest sea turtle and largest reptile species, reaching up to 2 m (6.5 ft) in length and weighing up to 900 kilograms (kg) (2,000 pounds [lbs]). Leatherbacks are commonly known as oceanic creatures, but they also forage in coastal waters. They are the most migratory and wide-ranging of all sea turtle species. Nesting typically occurs in tropical waters. Leatherbacks have never been sighted at WFF, but are known to occur in the waters offshore of Accomack County (NASA 2017).

The hawksbill sea turtle is federally listed as endangered. It can reach up to 0.9 m (3 ft) in length and weigh up to 80 kg (180 lbs). Hawksbills typically nest high up on tropical beaches under beach and dune vegetation. Females return to natal beaches to lay their eggs every 2 to 3 years. In the continental U.S., hawksbills are found primarily in Florida and Texas, but have been observed as far north as Massachusetts. Hawksbills have never been directly observed at WFF (NASA 2017). They may occur in offshore waters, but their preferred tropical habitat is not present at or near WFF.

The Kemp's ridley sea turtle is federally listed as endangered. It is the smallest of all sea turtles, growing to 0.7 m (28 inches) long and weighing up to 45 kg (100 lbs). The species' range includes the Atlantic coastline from Maine to Florida, and the Gulf of Mexico. It is commonly present in areas that have muddy or sandy bottoms. Most Kemp's ridley sea turtle nesting occurs between May and July in the Mexican state of Tamaulipas along the Gulf of Mexico's western shoreline. Occasional nests have also been documented in North Carolina, South Carolina, and Florida. A

successful nest was documented in Virginia Beach in 2012 and at an undisclosed location in Virginia in 2021 (Argo 2021). The Kemp's ridley sea turtle has never been directly observed at WFF, but may occur offshore in shallow waters with depths less than 50 m (160 ft) (NOAA Fisheries 2016).

The green sea turtle is federally listed as threatened. This species is the largest of all the hard-shelled marine turtles, growing to a length of 0.9 m (3 ft) and weighing up to 159 kg (350 lbs). Nesting generally occurs between June and July along Florida's central and southern coasts. The species is globally distributed and generally occurs in tropical and subtropical waters along continental coasts and islands (NOAA Fisheries 2016). Green sea turtles have been observed in waters off WFF and are likely to inhabit the waters off WFF during the warmer months when sea grasses and algae are plentiful (NASA 2017). Green sea turtles have begun nesting regularly in Virginia with the most recent nesting occurring in 2021 at an undisclosed location (Argo 2021).

Effects Determination

Onshore Components

Loggerhead sea turtles are often seen in the channels and inlets of Virginia's barrier islands. Between 2008 and 2013, loggerhead sea turtle nests were periodically found on mid and south Wallops Island beaches, approximately 2.6 km (1.6 mi) southwest of the Proposed Action. Nighttime UAS airstrip lighting could disorient nesting females and emerging hatchlings; however, this type of indirect impact would not be anticipated. UAS would operate infrequently at night; lights would only be turned on when required by an airfield operation (i.e., night-time aircraft takeoffs or landings) and turned off when the operation is completed. Given that measures would be implemented to minimize lighting effects, implementation of the onshore components of the Proposed Action would not adversely impact loggerhead sea turtles.

Dredging Material Placement

Terrestrial impacts from construction activities are unlikely to adversely affect sea turtle nests due to the lack of nesting sites within the action area. Loggerhead sea turtle nesting sites have been found on Wallops Island beaches outside of the action area (**Figure 6**) but were last observed in 2013 (NASA 2021b). One leatherback sea turtle was observed demonstrating nesting behavior on Assateague Island in 1996. The hawksbill sea turtle has been observed in Virginia only twice since 1979 (Mansfield 2006). Kemp's ridley and green sea turtles have been found to nest at Virginia Beach and other undisclosed locations in Virginia (Argo 2021), but none have been found nesting near the action area. Due to the lack of nesting habitat in the action area where construction activities would occur, the Proposed Action would have no effect on nesting sea turtles.

However, as described above, the option selected for the placement of dredged material from construction dredging and long-term maintenance dredging is the pumping of the material from transport barges onto the beach in the SERP area (**Figure 5**). The elements of the ongoing project to protect Wallops Island shoreline infrastructure through beach renourishment are described in detail in the *2019 SERP EA* (NASA 2019c). The dredged material placement activities of the Proposed Action would be coordinated with, and incorporated into, the ongoing SERP activities,

and the associated effects from the placement of sand material on the beaches were evaluated in detail in the *2019 SERP EA*.

In its 2019 BO (USFWS 2019), USFWS determined that the renourishment activities proposed as part of the SERP are likely to adversely affect the loggerhead sea turtle, but are not likely to adversely affect the hawksbill sea turtle, leatherback sea turtle, Kemp's ridley sea turtle, or green sea turtle. The 2019 BO included an Incidental Take Statement and required the implementation of measures, terms, and conditions to minimize impacts to the loggerhead sea turtle. These measures are listed in the *2019 SERP EA* (NASA 2019c). In addition, the VMRC permit for the SERP also prescribes six terms and conditions to reduce impacts to special status species, and these terms are listed in the *2019 SERP EA* (NASA 2019c). NASA and VCSFA would follow both USFWS and VMRC permit terms during placement of dredged material into the SERP area.

The dredged material from construction and maintenance of turning basins and channels under the Proposed Action would be used by the SERP in conjunction with material from other sources for beach renourishment in the SERP area. Potential adverse effects from this activity on federally listed species have been evaluated by USFWS and NMFS in BOs for the SERP (USFWS 2019, NMFS 2012) and would be minimized by implementing any measures, terms, and conditions previously stipulated by the Services that may apply to the beach renourishment activity.

For these reasons, the effects of the Proposed Action on nesting sea turtles would be insignificant or discountable and not likely to adversely affect loggerhead, Kemp's ridley, or green sea turtles. The Proposed Action would have no effect on leatherback and hawksbill sea turtles, which do not nest in the region of the action area.

Flowering Plants

Seabeach amaranth has not been documented at WFF. Its habitat is the area seaward of primary dunes, but there are no primary dunes or beaches in the action area. Therefore, suitable habitat is not present in the construction area, and construction and operation of the Proposed Action would have no effect on seabeach amaranth. In a 2019 BO (USFWS 2019), USFWS determined that the renourishment activities proposed as part of the SERP are not likely to adversely affect the seabeach amaranth. The placement of dredged material from the Proposed Action would be incorporated as a component of the SERP.

Insects

The monarch butterfly was designated by the USFWS in December 2020 as a candidate species for listing as threatened or endangered under the ESA; its status will be reviewed each year. The monarch is dependent on milkweeds for breeding habitat because they are the only food source for monarch caterpillars. The action area is unlikely to provide habitat for milkweeds. During migration, monarchs may occur in vegetated areas anywhere and may utilize a wide variety of nectar-producing flowers for food. Thus, they could transit through the action area during migration. Approximately 0.4 hectare (ha) (1.1 acre [ac]) of upland vegetation would be lost due to the Proposed Action. Extensive vegetation would remain around the airstrip and in other areas

of NASA WFF as well as nearby National Wildlife Refuges maintained by USFWS. Vegetation impacts would be distributed over the Proposed Action's multi-year implementation period, further minimizing impacts because not all vegetation would be cleared simultaneously by the project. For these reasons, long-term impacts from the Proposed Action on common species of upland vegetation potentially providing habitat for the monarch butterfly would be minor, and the potential for impacts on the monarch butterfly would be negligible.

Best Management Practices Summary

To further reduce impacts on listed species, construction Best Management Practices (BMPs) may be implemented. The construction contractor would use erosion and sediment control measures in upland areas to minimize or prevent the erosion of exposed soils by wind and water and corresponding sedimentation of receiving water bodies. Accidental spills of fuel or other hazardous substances would be prevented or minimized through the contractor's adherence to the spill prevention and control measures as specified in the WFF's *Integrated Contingency Plan* and the project-specific Spill Prevention, Control, and Countermeasure Plan. Vegetation removed in areas impacted for construction access would be replaced in accordance with the NASA WFF vegetation management policies. BMPs could include, but would not be limited to, erosion control measures, noise and vibration reduction measures (including construction techniques such as vibratory dampening), minimization of lighting frequency and/or duration in work areas to the extent practicable while maintaining safe working conditions, and the incorporation of downward pointing and/or low-glare lighting, to minimize any long-term effects on protected species.

The intensity and duration of construction activity and the areas disturbed would vary throughout the Proposed Action's construction phases, resulting in corresponding variations in the intensity and duration of short-term impacts. The phased implementation of the Proposed Action would distribute potential impacts on listed species over multiple years, thereby minimizing impacts by ensuring that not all impacts occur simultaneously. Contractors would implement and adhere to BMPs to the extent practicable to further minimize adverse effects on listed species.

Conclusions

NASA requests your agency's concurrence with our determination of effects for each of the federally listed species under USFWS jurisdiction potentially occurring in the action area, as summarized in **Table 5**.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Sincerely,

Shari A. Miller
Center NEPA Manager and
Environmental Planning Lead

Enclosures
Attachment 1, USFWS Consultation Letter/Species List

cc:
250/Ms. K. Finch
250/Mr. T. Meyer
MARAD/Mr. A. Finio
USACE/Mr. S. Bahnson
VCSFA/Mr. A. Brittingham

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ATTACHMENT 1: USFWS SPECIES LIST

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032

In Reply Refer To: December 13, 2022
Project Code: 2023-0024496
Project Name: Wallops Island Northern Development w/ dredge placement

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Project Code in the header of this

letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Coastal Barriers

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
(804) 693-6694

Project Summary

Project Code: 2023-0024496
Project Name: Wallops Island Northern Development w/ dredge placement
Project Type: New Constr - Above Ground
Project Description: Construction and operation of a pier/port, with construction of associated buildings near the NASA unmanned aerial systems (UAS) airstrip and offshore dredging of channels and turning basins.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@37.91841735,-75.4305919317938,14z

Counties: Accomack County, Virginia

Endangered Species Act Species

There is a total of 12 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered

Birds

NAME	STATUS
Eastern Black Rail *Laterallus jamaicensis ssp. jamaicensis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10477	Threatened
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* There is **proposed** critical habitat for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Roseate Tern *Sterna dougallii dougallii* Population: Northeast U.S. nesting population No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2083	Endangered

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

Flowering Plants

NAME	STATUS
Seabeach Amaranth *Amaranthus pumilus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8549	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

The following FWS National Wildlife Refuge Lands and Fish Hatcheries lie fully or partially within your project area:

FACILITY NAME	ACRES
CHINCOTEAGUE NATIONAL WILDLIFE REFUGE https://www.fws.gov/refuges/profiles/index.cfm?id=51570	9,821.891

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Oystercatcher *Haematopus palliatus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8935	Breeds Apr 15 to Aug 31
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Oct 15 to Aug 31

NAME	BREEDING SEASON
Black Scoter *Melanitta nigra* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Black Skimmer *Rynchops niger* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5234	Breeds May 20 to Sep 15
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Blue-winged Warbler *Vermivora pinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 1 to Jun 30
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Brown Pelican *Pelecanus occidentalis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Jan 15 to Sep 30
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 10
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 25
Common Eider *Somateria mollissima* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Jun 1 to Sep 30
Common Loon *gavia immer* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/4464	Breeds Apr 15 to Oct 31

NAME	BREEDING SEASON
Double-crested Cormorant *phalacrocorax auritus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/3478	Breeds Apr 20 to Aug 31
Dovekie *Alle alle* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/6041	Breeds elsewhere
Great Shearwater *Puffinus gravis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Gull-billed Tern *Gelochelidon nilotica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9501	Breeds May 1 to Jul 31
Hudsonian Godwit *Limosa haemastica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Kentucky Warbler *Oporornis formosus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20
King Rail *Rallus elegans* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8936	Breeds May 1 to Sep 5
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Long-tailed Duck *Clangula hyemalis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/7238	Breeds elsewhere
Pomarine Jaeger *Stercorarius pomarinus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere

NAME	BREEDING SEASON
Prairie Warbler *Dendroica discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Purple Sandpiper *Calidris maritima* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Razorbill *Alca torda* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Jun 15 to Sep 10
Red Phalarope *Phalaropus fulicarius* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Red-breasted Merganser *Mergus serrator* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Red-necked Phalarope *Phalaropus lobatus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Red-throated Loon *Gavia stellata* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Ring-billed Gull *Larus delawarensis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Roseate Tern *Sterna dougallii* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds May 10 to Aug 31

NAME	BREEDING SEASON
Royal Tern *Thalasseus maximus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Apr 15 to Aug 31
Ruddy Turnstone *Arenaria interpres morinella* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Short-billed Dowitcher *Limnodromus griseus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Surf Scoter *Melanitta perspicillata* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
White-winged Scoter *Melanitta fusca* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Willet *Tringa semipalmata* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 5
Wilson's Storm-petrel *Oceanites oceanicus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

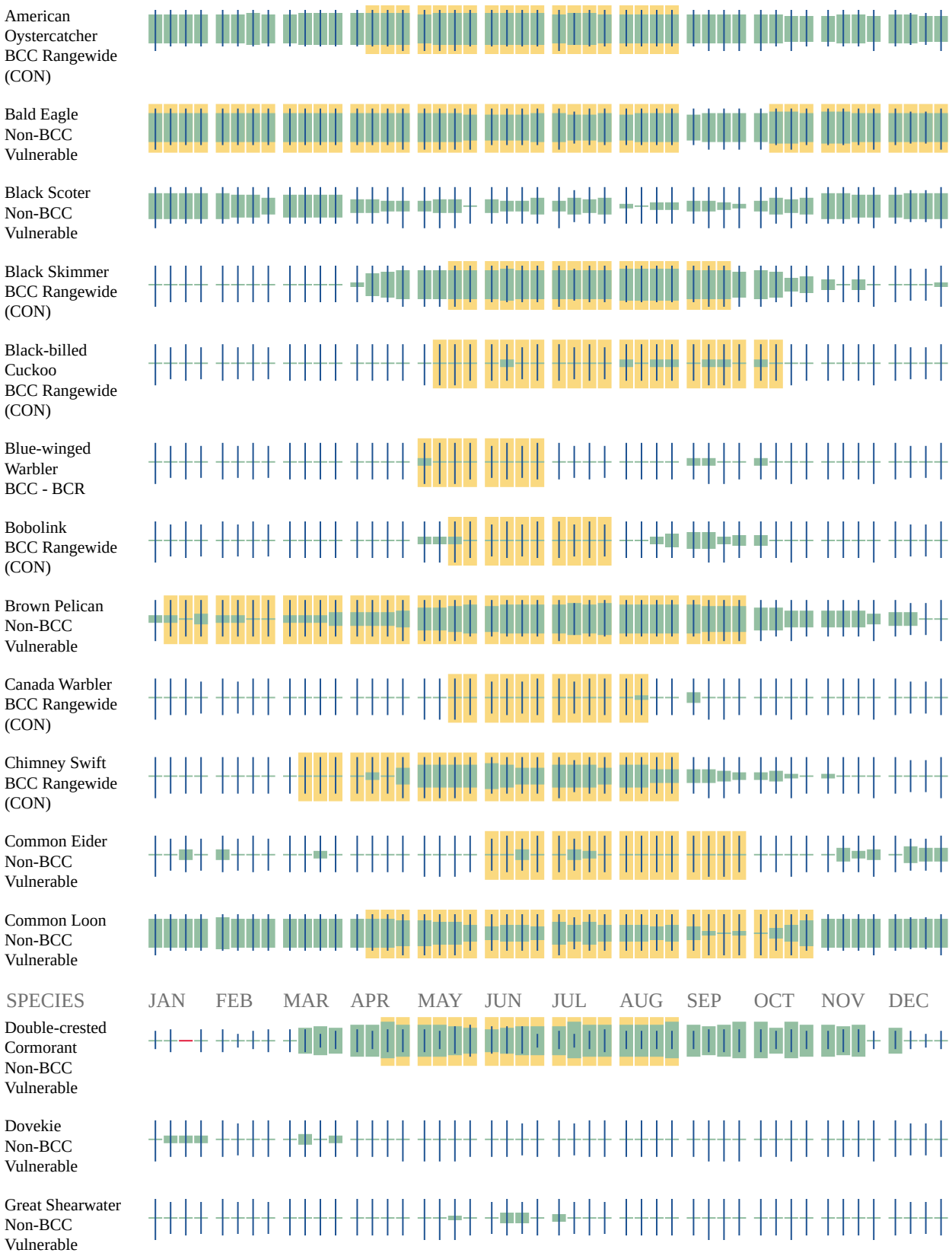
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

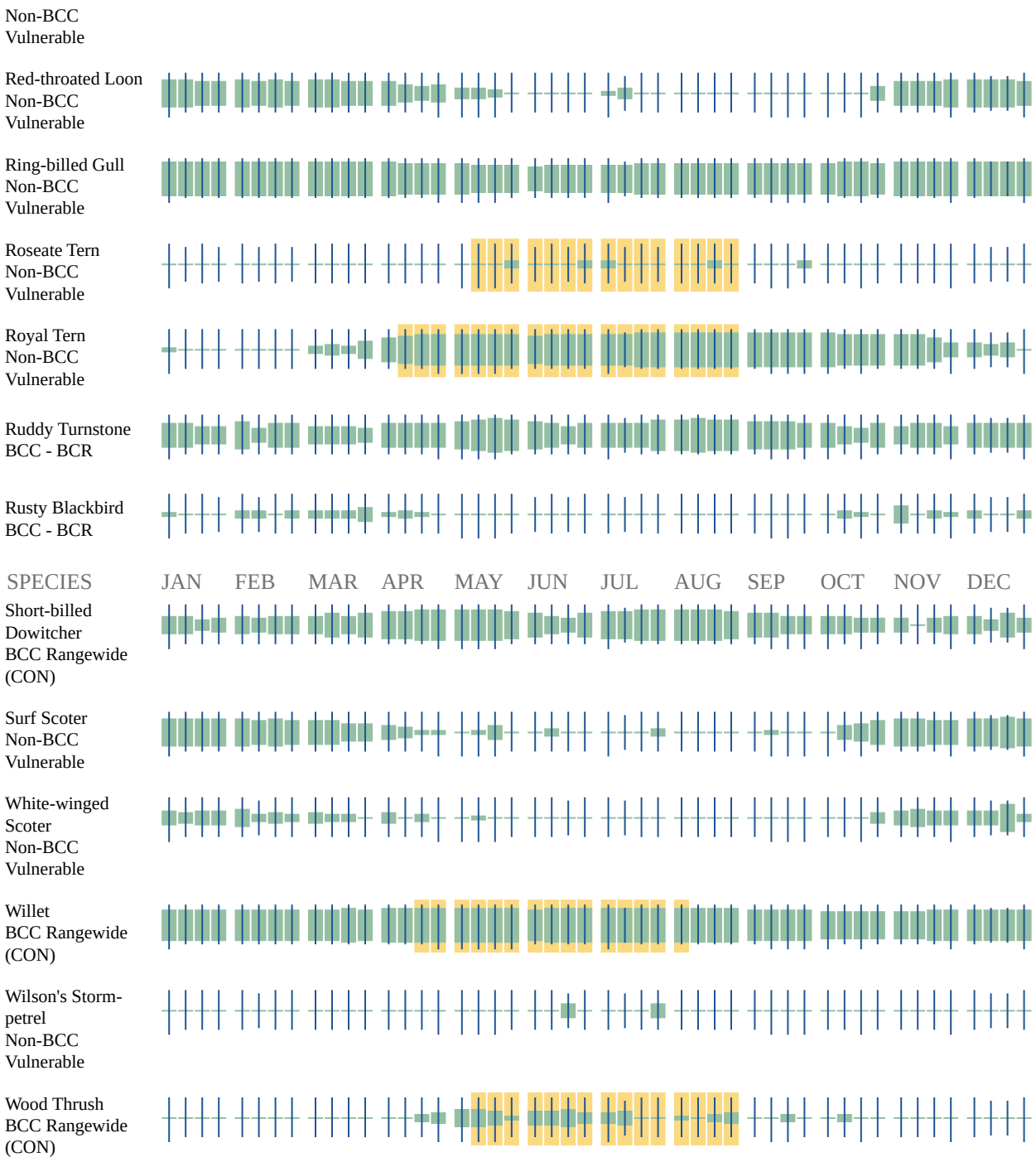
Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

▪ probability of presence ▪ breeding season | survey effort – no data

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC


American Oystercatcher BCC Rangewide (CON)
Bald Eagle Non-BCC Vulnerable
Black Scoter Non-BCC Vulnerable
Black Skimmer BCC Rangewide (CON)
Black-billed Cuckoo BCC Rangewide (CON)
Blue-winged Warbler BCC - BCR
Bobolink BCC Rangewide (CON)
Brown Pelican Non-BCC Vulnerable
Canada Warbler BCC Rangewide (CON)
Chimney Swift BCC Rangewide (CON)
Common Eider Non-BCC Vulnerable
Common Loon Non-BCC Vulnerable
SPECIES
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
Double-crested Cormorant Non-BCC Vulnerable
Dovekie Non-BCC Vulnerable
Great Shearwater Non-BCC Vulnerable

Gull-billed Tern BCC Rangewide (CON)
Hudsonian Godwit BCC Rangewide (CON)
Kentucky Warbler BCC Rangewide (CON)
King Rail BCC Rangewide (CON)
Lesser Yellowlegs BCC Rangewide (CON)
Long-tailed Duck Non-BCC Vulnerable
Pomarine Jaeger Non-BCC Vulnerable
Prairie Warbler BCC Rangewide (CON)
Prothonotary Warbler BCC Rangewide (CON)
SPECIES
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
Purple Sandpiper BCC Rangewide (CON)
Razorbill Non-BCC Vulnerable
Red Phalarope Non-BCC Vulnerable
Red-breasted Merganser Non-BCC Vulnerable
Red-headed Woodpecker BCC Rangewide (CON)
Red-necked Phalarope



Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds

- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look

at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be

aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Coastal Barriers

Projects within the John H. Chafee Coastal Barrier Resources System (CBRS) may be subject to the restrictions on Federal expenditures and financial assistance and the consultation requirements of the Coastal Barrier Resources Act (CBRA) (16 U.S.C. 3501 et seq.). For more information, please contact the local Ecological Services Field Office or visit the CBRA Consultations website. The CBRA website provides tools such as a flow chart to help determine whether consultation is required and a template to facilitate the consultation process.

Otherwise Protected Area (OPA)

OPAs are denoted with a "P" at the end of the unit number. The only prohibition within OPAs is on Federal flood insurance. ***CBRA consultation is not required for projects within OPAs.*** *However, agencies providing disaster assistance that is contingent upon a requirement to purchase flood insurance after the fact are advised to disclose the OPA designation and information on the restrictions on Federal flood insurance to the recipient prior to the commitments of funds.*

UNIT	NAME	TYPE	SYSTEM UNIT ESTABLISHMENT DATE	FLOOD INSURANCE PROHIBITION DATE
VA-01P	Assateague Island	OPA	N/A	11/16/1991

IPaC User Contact Information

Agency: AECOM
Name: Natalie Kisak
Address: 12420 Milestone Center Drive
City: Germantown
State: MD
Zip: 20876
Email natalie.kisak@aecom.com
Phone: 3018203255

From:	Miller, Shari A. (WFF-2500) <shari.a.miller@nasa.gov>
Sent:	Wednesday, November 10, 2021 12:15 PM
To:	'cindy_schulz@fws.gov'
Cc:	Argo, Emily; Finio, Alan (MARAD); brian.c.denson@usace.army.mil; Nate Overby; Meyer, T J (WFF-2500); Finch, Kimberly (GSFC-2500); Levine, Lori M. (GSFC-2500)
Subject:	Project Review Request, Wallops Island Northern Development, NASA WFF
Attachments:	NASA WIND - USFWS_T&E Consult Ltr_111021.pdf

Dear Ms. Schulz:

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) propose to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

Based on the attached assessment, NASA requests your agency's concurrence with our determination of effects for each of the federally listed species under USFWS jurisdiction potentially occurring in the action area, as summarized in Table 5 of the attached.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Thank you.

Shari A. Miller

Center NEPA Manager &
Natural Resources Manager
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/

"Remember there's no such thing as a small act of kindness. Every act creates a ripple with no logical end." —Scott Adams

National Aeronautics and Space Administration

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

Reply to Attn of: 250.W

November 10, 2021

Ms. Cindy Schulz
Virginia Field Office
U.S. Fish and Wildlife Service
6669 Short Lane
Gloucester, Virginia 23061

Re: Project Review Request, Wallops Island Northern Development, NASA Wallops Flight Facility, Accomack County, Virginia

Dear Ms. Schulz:

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) propose to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel (**Figures 1 and 2**). NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

NASA is preparing an Environmental Assessment (EA) in compliance with NEPA to analyze the potential effects of the proposed action on the environment. The EA will be tiered from the May 2019 *NASA WFF Site-Wide Programmatic Environmental Impact Statement* (PEIS), in which NASA evaluated the environmental consequences of constructing and operating new facilities and infrastructure at WFF.

The purpose of this letter is to provide information about the proposed project and to request your concurrence with our determinations regarding potential effects on federally listed threatened and endangered species under United States Fish and Wildlife Service (USFWS) jurisdiction in the action area. Additionally, NASA and VCSFA, along with MARAD and USACE, are concurrently consulting with the National Oceanic and Atmospheric Administration's Marine Fisheries Service on in-water species under their jurisdiction in the action area.

Background

The goal of the MARAD Marine Highway Program is to expand the use of America's navigable waterways; to develop and increase marine highway service options; and to facilitate their further integration into the current U.S. surface transportation system, especially where water-based transport is the most efficient, effective, and sustainable option (MARAD 2019a). The M-95 Marine Highway Corridor includes the Atlantic Ocean coastal waters; Atlantic Intracoastal Waterway; and connecting commercial navigation channels, ports, and harbors spanning 15 states including Virginia. The proposed Wallops Island M-95 Intermodal Barge Service project has the potential to support the growth of existing operations at WFF, enhance Science, Technology, Engineering, and Math (STEM) research opportunities, and spur high-tech/high-paying jobs in a predominantly rural area (MARAD 2019b).

VCSFA was created in 1995 by the General Assembly of the Commonwealth of Virginia to promote the development of the commercial space flight industry, economic development, aerospace research, and STEM education throughout the Commonwealth. In 1997, the VCSFA entered into a Reimbursable Space Act Agreement with NASA, which permitted the use of land on Wallops Island for launch pads. VCSFA also applied for and was granted a Federal Aviation Administration (FAA) license for launches to orbital trajectories. This led to the establishment of the Mid-Atlantic Regional Spaceport (MARS) which is owned and operated by VCSFA.

Development of a port and operations area to support the activities of NASA, WFF tenants, and MARS at the north end of Wallops Island was evaluated at a programmatic level of detail in the 2019 *Final Site-wide PEIS* (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.

Description of the Proposed Action

Under the Proposed Action, the MARS Port, including a 1,305-ft fixed pier and turning basin, would be constructed adjacent to the unmanned aerial system (UAS) Airstrip located at the north end of Wallops Island (**Figures 1 and 2**). The MARS Port would provide a port and operations area along with associated capabilities for VCSFA, NASA WFF, and other customers. The MARS Port would also serve as a new intermodal facility as part of the MARAD M-95 Marine Highway Corridor. Infrastructure (new upland facilities and improvements to the existing access road, airstrip, and utilities) would likewise be constructed or installed as part of the Proposed Action. Access road improvements would include widening of an existing culvert.

The Proposed Action would also include the dredging of a new and existing channel for enhanced vessel approach purposes (**Figure 3**). The vessel approach channel, which interfaces with two Federal waterways, the Chincoteague Inlet Channel and the Chincoteague Inlet to Bogues Bay connecting waters, would initially be used by a variety of shallow-draft, manned and unmanned vessels. Ultimately, the proposed channel would have a length of approximately 12,800 ft, a width of 100 ft, and a final depth of 12 ft below mean lower low water (MLLW). Components of the Proposed Action are further described below.

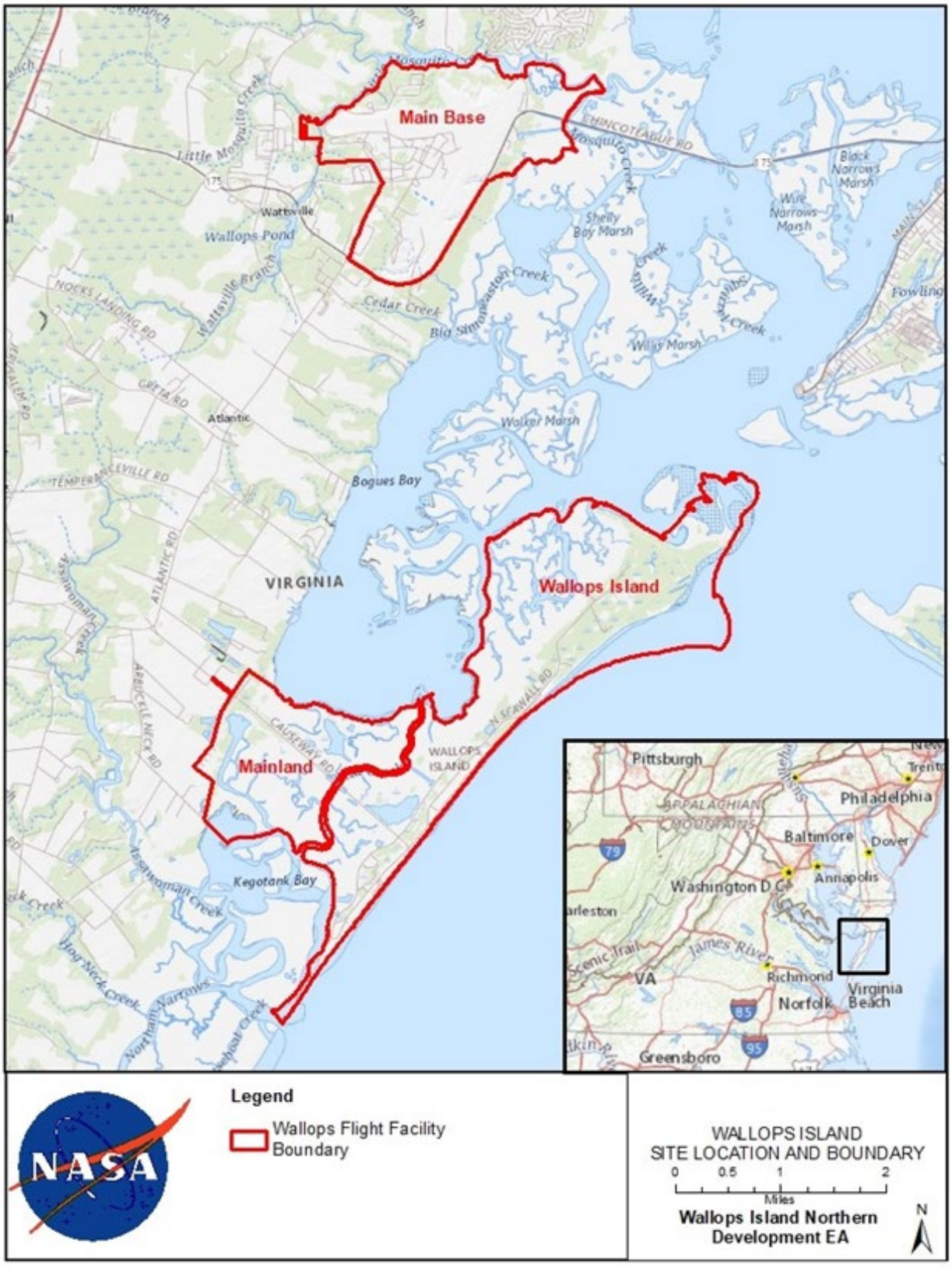


Figure 1: NASA WFF Location

Figure 2: Proposed MARS Port and Infrastructure Components

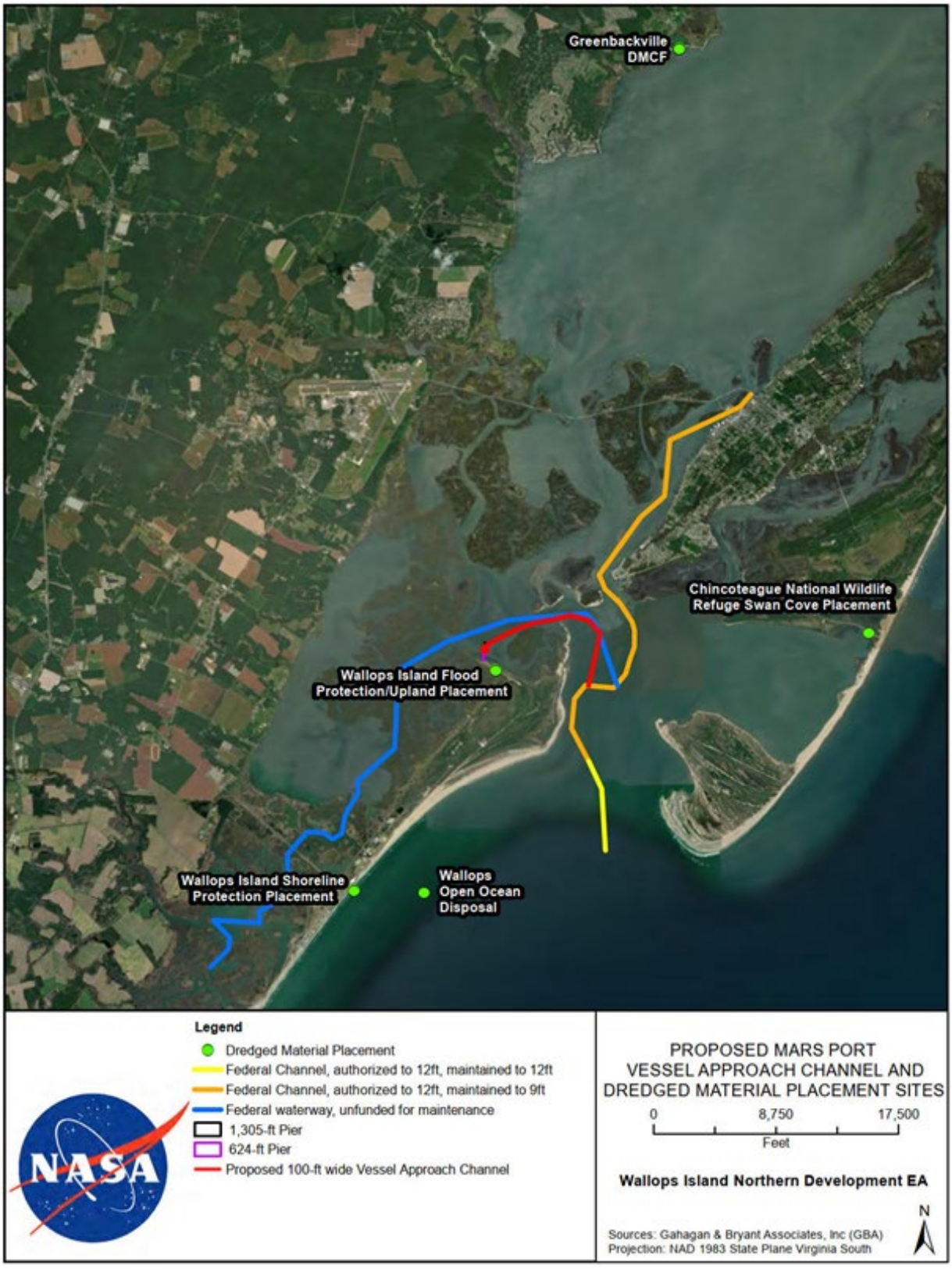


Figure 3: Proposed MARS Port Vessel Approach Channel and Dredged Material Placement Sites

Proposed Action In-Water Components

The MARS Port, including a 1,305-ft fixed pier and turning basin would be constructed on (and within the vicinity of) the UAS Airstrip located at the north end of Wallops Island. The in-water portion of the Proposed Action would also include the dredging of an existing channel for enhanced vessel approach purposes. The vessel approach channel would be approximately 12,800 ft long, 100 ft wide, and would have a final depth of 12 ft below MLLW. The MARS Port would provide a port and operations area along with associated capabilities for MARS, NASA WFF, and other customers. The MARS Port would also serve as a new part of the MARAD M-95 Marine Highway Corridor.

Construction of the Proposed Action would be carried out in three phases:

- **Phase 1** would be construction of a 624-ft fixed pier, a 200-ft-radius turning basin 9 ft deep below MLLW and dredging of the vessel approach channel to a final depth of 5 ft to 9 ft below MLLW (red outline in **Figure 4**). Additionally, a 130-ft long segment of the existing paved UAS Airstrip access road would be widened from 15 ft to 30 ft in conjunction with the widening of the culvert over which the road crosses a headwater drainage channel to Cow Gut.
- **Phase 2** would be construction of a 676-ft extension of the fixed pier to a total length of 1,305 ft and dredging of a 200-ft-radius turning basin (located at the end of the pier extension; shaded pink on **Figure 4**) to a final depth of 9 ft below MLLW.
- **Phase 3** of construction would be additional dredging of the turning basin and vessel approach channel to a final depth of 12 ft below MLLW, specifically the portion of the channel from the Phase 2 turning basin to where it meets the Chincoteague Inlet Federal Channel (shaded blue on **Figure 4**).

The portion of the channel shown in pink on **Figure 4**, which connects the vessel approach channel to the Phase 2 turning basin, is naturally deeper than 9 feet below MLLW and, therefore, would not require any dredging during Phase 2. The estimated timeline for construction of the Proposed Action would have Phase 1 beginning in 2022 and being completed by 2024, with subsequent phases occurring approximately 1 to 2 years after the completion of the prior phase. Additional information about the proposed pier and other port components is provided in Chapter 2 of the Draft EA.

A variety of shallow-draft (2- to 4-ft), manned and unmanned vessels would be serviced by the Port. The major navigational service would be a tug and barge configuration of an approximately 150-ft by 40-ft deck barge propelled by a tugboat requiring approximately 8 ft of draft. The vessel approach channel would intersect with the Chincoteague Inlet Federal Channel and the Bogues Bay connecting waters (**Figure 3**). The proposed width of the approach channel, approximately 100 ft, is consistent with the dimensions of the Federal Channel. Estimated dredging volumes for the vessel approach channel and turning basin are provided in **Table 1**.

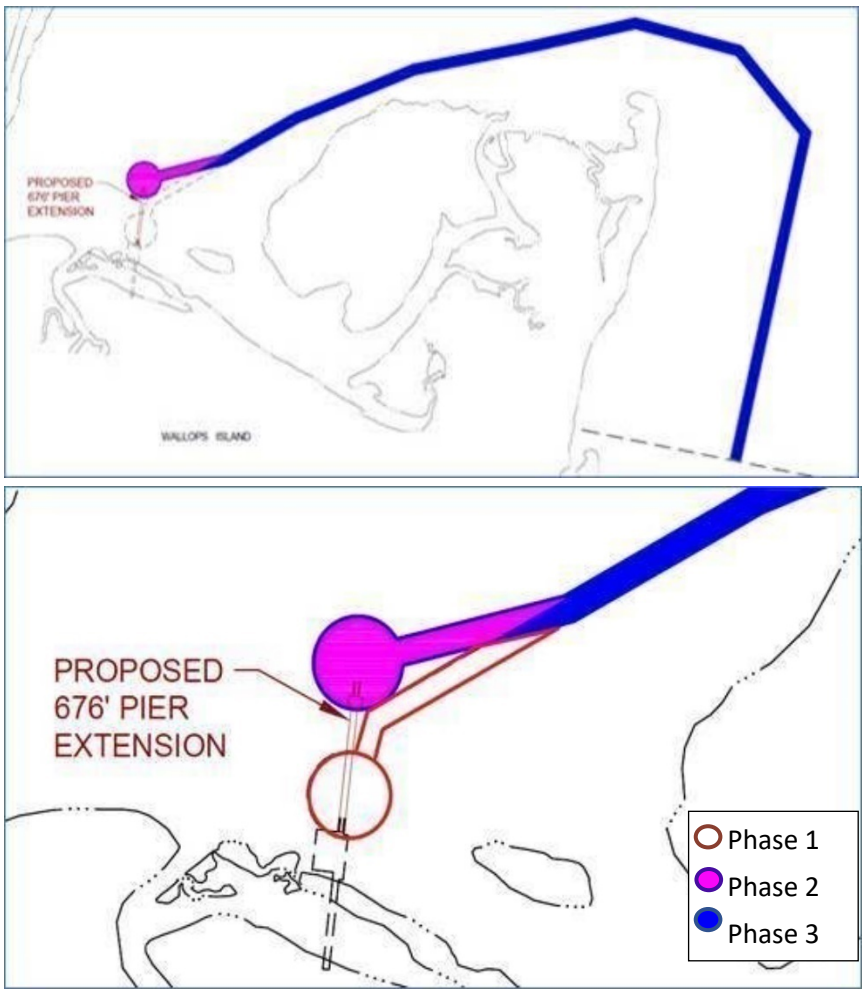


Figure 4: Diagram of Proposed Phased Construction

Table 1. Channel Dimensions and Estimated Dredging Volumes			
	Phase 1	**Phase 2**	**Phase 3**
Channel depth	9 ft deep below MLLW	9 ft deep below MLLW	12 ft deep below MLLW
Channel length	12,800 ft	11,800 ft	11,800 ft
Channel dredging volume	15,100 yd^3	0	34,600 yd^3
Turning basin dredging volume	40,500 yd^3	800 yd^3	3,200 yd^3
Total volume per phase	55,600 yd^3	800 yd^3	37,800 yd^3
Total Volume (Phases 1–3):			**94,200 yd^3**

yd^3 = cubic yards

Five potential sites for the placement of dredged material are summarized in **Table 2** and shown on **Figure 3**. Currently, it is estimated that between 56,000 CY and 57,000 CY of material would be dredged during the initial dredging event. VCSFA intends to utilize Option 1, the Wallops Open Ocean Dredge Material Placement Area, as the initial dredge material placement site. When compared to Options 2 through 5, Option 1 is the most economical solution as it offers the lowest estimated mobilization costs, as well as the lowest unit costs for dredging, transport, and placement. The Open Ocean site is also the fastest path towards construction as it is already permitted by the USACE and has capacity for the proposed initial dredge material. While the Greenbackville DMCF (Option 3) is also already permitted by the USACE, it is not anticipated to have available capacity to handle the initial projected volume of material due to its expected use by USACE. Lastly, the dredged material is expected to be of similar physical and chemical characteristics as the material currently dredged from the Chincoteague Channel by the USACE. Dredged material placed within the Wallops Island nearshore zone is required to have the same physical characteristics (90%+ sand) as the natural bottom and anything with a higher fine-grained content would not be suitable. Based on the geotechnical borings for the proposed project, the material is anticipated to be compromised of approximately 95% sand and, therefore, would be suitable for the Open Ocean site.

For future maintenance dredging events, the Project may use Option 2, Wallops Island Flood Protection/Upland Placement. Keeping this as an option allows for future beneficial re-use of the dredge material on Wallops Island to provide resiliency to the MARS UAS Airfield. The cost of this option is higher as it would require additional studies, design, and construction to contain and shape the pumped discharge. Option 2 may also have impacts to the wetlands north of the UAS Airfield. Further analysis would be required for this impact and depending on the results, thin layer deposition or the use of geotubes could be required to hold the material. Lastly, the UAS Airfield is currently not permitted for material placement; the permitting process would require a longer timeframe than Option 1. If selected for placement during future maintenance dredging events, designs, impact analysis, and permitting would be required and would be performed at that time.

Table 2. Potential Dredged Material Placement Sites							
Option	**Site**	**Description**	**Sail Distance from Basin[1]**	**Pipe Distance from Basin[2]**	**Sail Distance from Channel**	**Pipeline Distance from Channel**	**Description**
1	Wallops Open Ocean Dredge Material Placement Area	Open water placement site, closer than Lewis Creek or Norfolk Ocean disposal sites	6.1 mi	--	4.4 mi	--	This area is located just offshore of Wallops Island with a transportation distance of the dredged material of approximately 4 nautical mi. Open water placement options typically present the lowest cost dredging option and allows for the widest array of dredging equipment ranging from clamshell dredges to barge mounted excavators, supplying dump barges, or specially modified deck barges that are towed by tugboats to the dredged material placement site. Open water placement locations are controlled by the USACE and a CWA Section 404 permit would be required for the use of this site.
2	Wallops Island Flood Protection/ Upland Placement	Reuse of material for flood mitigation through upland placement at site identified by NASA	--	2,800 ft	--	12,040 ft	This option involves the beneficial reuse of material for flood mitigation through upland placement in low lying areas on Wallops Island. For example, there are low lying areas in the vicinity of the culvert crossing the main access road to the UAS Airstrip. This option was evaluated based on having a cutter suction dredge pump the material into this area. This option would also require development of containment measures for the dredged material in the form of containment dikes and the channeling of the effluent and its return into Bogues Bay. This effluent is the water that is used in the dredging process to transport the dredged material in slurry form to the placement location. Other alternatives could include thin layer placement for marsh enhancement in marsh areas a similar distance to the dredging location, or the use of geotubes, or synthetic membranes, for containing the dredged material.

Table 2. Potential Dredged Material Placement Sites

Option	Site	Description	Sail Distance from Basin[1]	Pipe Distance from Basin[2]	Sail Distance from Channel	Pipeline Distance from Channel	Description
3	Greenbackville Dredged Material Containment Facility (DMCF)	Upland DMCF run by USACE, requires both navigation of Chincoteague Channel and pumping on location	11.3 mi	--	9.5 mi	650 ft	The third dredged material placement option identified is the use of the upland Dredged Material Containment Facility (DMCF) owned and managed by the USACE. The USACE places material dredged from the upper reaches of the Chincoteague Channel into this DMCF. This option, which would require the USACE to first verify capacity and permit use of this site, would utilize a mechanical dredge to load the dredged material removed from the approach channel into barges. These barges would then be towed approximately 10 nautical mi to the DMCF. A specialized hydraulic unloader would be required to discharge the dredged material from the transport barges and pump the material into the DMCF. However, according to USACE, this site has limited capacity for material and may not be suitable.
4	Wallops Island Shoreline Protection Placement	Reuse of material for shoreline protection and beach repair	7.5 mi	--	6 mi	--	This option would involve the beneficial reuse of clean, compatible sand from the dredged material to repair and protect areas of the shoreline within the Launch Range area on Wallops Island. If dredged material is determined to be compatible with the current shoreline sand, the material would be placed along the seawall to protect the beach from tidal impacts or ocean overwash from coastal storms such as hurricanes and Nor'easters. This option would require using a mechanical dredge to load the dredged material removed from the approach channel into barges. These barges would then be towed approximately 6 nautical mi to the shoreline. A specialized hydraulic unloader would be required to discharge the dredged material from the transport barges and pump the material onto the placement areas.

Table 2. Potential Dredged Material Placement Sites

Option	Site	Description	Sail Distance from Basin[1]	Pipe Distance from Basin[2]	Sail Distance from Channel	Pipeline Distance from Channel	Description
5	Chincoteague National Wildlife Refuge Swan Cove Placement	Reuse of material for habitat restoration	-	9 km (5.6 mi)	-	6.9 km (4.3 mi)	This option would involve the beneficial reuse of the dredged material for the Swan Cove Pool Restoration Project located in the Chincoteague National Wildlife Refuge (NWR). If dredged material is determined to be compatible, it would be used by USFWS to create berms and enhance and/or restore currently degraded areas of the estuarine-salt marsh habitat that have been negatively impacted by an under sized culvert restricting sediment deposition and tidal flow. Although USFWS would prefer material with a high proportion of sand, they will also accept dredge material containing high organic matter content. This option was evaluated based on having a cutter suction dredge pump the material to this area. Once pumped, USFWS will assume responsibility for sediment placement and is in the process of securing appropriate permits.

[1] Sail distance = the length of the path via water required to reach the placement site from the centroid of dredging in the proposed turning basin or approach channel (statute miles)
[2] Pipe distance = the length of pipe required to reach the placement site from the centroid of dredging or from the anchorage for a vessel loaded with dredged material
DMCF = Dredged Material Containment Facility

Proposed Action Onshore Components

Onshore facilities and infrastructure that would be constructed or upgraded under the Proposed Action are summarized in **Table 3**. Their proposed locations are shown on **Figure 2**. Improvements only apply to existing roads and utilities. No expansion beyond the proposed MARS Port and onshore facilities are anticipated at this time. Any future proposed changes would be addressed in additional NEPA documentation.

Table 3. Onshore Proposed Action Components

Facility or Element	Description
Project support building	A new, approximately 8,000-square foot (ft^2) building may be constructed on at the site of the former Wallops Employee Morale Association Recreational Facility (V-065) (Old Wallops Beach Lifeboat Station) on the southwest end of the access road to the UAS Airstrip. Once the existing facility is removed or demolished the new facility may be constructed and would serve as a new North Island Operations Center. The new building would have a maximum height of 40 ft to avoid interference with a nearby air surveillance radar.
Second hangar	A new, approximately 7,125-ft^2 hangar would be constructed adjacent to the runway, east of the existing UAS airstrip hangar. The new hangar would be a secure facility to support operations, store vehicles and equipment when not in use, accommodate vehicle maintenance as required and provide a small meeting area for client usage. The new hangar would have a maximum height of 40 ft to avoid interference with a nearby air surveillance radar. This proposed second, secure hangar would provide an additional area for MARS clients without hindering usage of the existing hangar for UAS Airfield operations.
Utility infrastructure	Electricity, potable water, wastewater, and communications utilities would be extended to the Project Support Building from existing nearby infrastructure. Potable water would be supplied from the elevated north end tank (V-090), which has a 50,000-gallon capacity. Potable water supply piping would be placed in existing conduit that runs along North Seawall Road and extends from Building V-067 to the existing hangar at the UAS Airstrip. New conduit for electrical and communication utilities would be extended from the existing hangar to the proposed hangar at the UAS Airstrip. New utility conduit would also be installed along the new port access road to provide electrical and communication utilities to the pier. Wastewater from the hangars would be conveyed to a proposed temporary holding tank where it would be periodically collected and pumped into the NASA wastewater system for treatment.

Table 3. Onshore Proposed Action Components	
Facility or Element	**Description**
Airstrip lighting	New airstrip lighting meeting applicable FAA airfield standards would be installed at the UAS airstrip. The lights would be located along the edge of the runway (one white light every 200 ft). Lights would only be turned on when required by an airfield operation (i.e., night-time aircraft takeoffs or landings) and turned off when the operation is completed.
Airstrip access road Improvements (culvert widening)	The existing access road at the culvert crossing is not wide enough for two-way traffic or to accept trailered loads from the proposed MARS Port. This creates a constriction and safety and operational hazards. A 130-ft segment of the existing paved access road would be widened from 15 ft to approximately 30 ft, and the culvert over which the road crosses a drainage channel to Cow Gut would also be widened.
Vehicle parking lot	A new asphalt parking area with spaces for up to 30 vehicles would be constructed near the northwest intersection of the UAS Airstrip access road and runway.
Runway hardening for port access	A 100-ft-wide section of runway would be reinforced to accommodate heavy equipment and vehicles traversing the airfield between the proposed pier and the equipment parking/storage areas.
Access road to port	A new asphalt access road would be constructed along the north side of the existing UAS Airstrip (inside the drainage infiltration trench) from the intersection with the access road to the new MARS Port pier area.

Summary of Proposed Action Construction Activities

The Proposed Action would involve: (1) construction of the pier components that would make up the MARS Port; (2) dredging of the vessel approach channel, turning basin, and placement of dredged material; and (3) construction or improvement of the onshore facilities and infrastructure.

The estimated timeframe for construction of the Proposed Action would have Phase 1 beginning in 2022 and being completed by 2024, with subsequent phases occurring approximately 1 to 2 years after completion of the prior phase. It is assumed that construction of all proposed onshore project components and infrastructure would be completed during Phase 1 (although the North Island Operations Center may be constructed later). With two crews (10 persons each), working 5 days per week (10-hour days), construction of the 624-ft long pier under Phase 1 would take approximately 12 months to complete and construction of the 676-ft long pier extension under Phase 2 (for a total pier length 1,305 ft) would take approximately 9.5 months to complete.

Phase 1 dredging activities (turning basin and channel) would take approximately 30 days to complete; Phase 2 dredging (turning basin) would take approximately 7 days, and Phase 3 dredging (turning basin and channel) would take 30 days. Work would be performed 24 hours a day, seven days a week with two crews each working 12-hour shifts.

Typical equipment used during construction would include crane barges, material barges, tugboat, vibratory pile hammer, diesel impact hammer, concrete truck, concrete pump truck, concrete vibrator, generator, welding machines, cutting torches, and various small tools.

Summary of Proposed Action Operational Activities

VCSFA/MARS currently has a facilities team that mows grass once per week, monitors for eagles twice per week during nesting season, periodically removes tree and weed growth, and inspects the infiltration trench and fencing around the Revolutionary War Earthworks. During summer months, a mosquito fogging service truck sprays the airfield once every 2 weeks. The pier structure would also require quarterly structural inspections.

Potential facility usage associated with the MARS Port is provided in **Table 4**.

Table 4. Potential MARS Port Operations/Facility Usage

Potential Facility Usage	Vessel Type	Quantity Assumptions	Total Barge / Vessel Trips	Phase Associated with Usage
Medium Class ELV 1st stage (core) and 2nd stage	Shallow-draft deck barge & inland push boat	3 launches per year; Each comes w/ ~4-6 truckloads of parts and equipment plus 2 heavy haulers	3	1
Venture Class ELV	Shallow-draft deck barge & inland push boat	Potential for 12 launches per year; 3 trucks per launch	12	1
Venture Class 2 ELV	Shallow-draft deck barge & inland push boat	9 launches per year; 1 truck per stage, 3-5 trucks for equipment	9	1
Venture Class Heavy ELV	Deck barge & 1000-1200 HP tugboat	3 launches per year, 3 first stage cores per launch w/ 1 truck each plus 3-5 trucks for equipment	3	2
Minotaur Class	Deck barge & 1000-1200 HP tugboat	4 launches per year, 3 stage/cores per launch w/ 1 truck each; 3-5 additional trucks for equipment	4	2
Recovery effort	Shallow-draft deck barge & inland push boat	1 per Venture Class ELV launch	12	1

Table 4. Potential MARS Port Operations/Facility Usage				
Potential Facility Usage	**Vessel Type**	**Quantity Assumptions**	**Total Barge / Vessel Trips**	**Phase Associated with Usage**
Autonomous Surface Vehicle (ASV)	Trailered vessel	1 deployment per month; each deployment has 5-10 vehicles included	12	1
Autonomous Underwater Vehicle (AUV)	Trailered vessel	1 deployment every other month; each deployment has 5-10 vehicles included	6	1
Miscellaneous usage	Shallow-draft vessel	1 deployment every other month	6	2
Research usage	Small research vessel	1 deployment every 4 months; each deployment has 5-10 vehicles included	3	2
Other government research & testing	Trailered vessel	1 deployment every other month	12	2
Other Site-wide PEIS construction/expansion	Deck barge & ocean tug	2 large/oversized deliveries per year	1	2
Commodity delivery	Deck barge & ocean tug	16 total barges	16	3
		Total Barge / Vessel Trips	**99**	

Description of the Action Area

The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402.02). For this project, the action area includes the north end of Wallops Island surrounding the UAS Airstrip – the onshore areas potentially affected by the construction of onshore facilities and their operation. It also includes the surrounding waters from Chincoteague Inlet to the east and north to Bogues Bay to the west – the offshore areas potentially affected by pier construction, channel and turning basin dredging, placement of dredged sediment, and vessels transiting between the proposed pier and the existing Chincoteague Inlet Federal Channel.

The onshore habitats within the action area on the north end of Wallops Island consist of forested uplands, maritime grasslands, non-tidal wetlands (emergent and scrub-shrub), and tidal wetlands. The dominant habitat within the area is tidal marsh that transitions into upland grass and maritime forest areas adjacent to the UAS airstrip. Vegetated areas adjacent to the UAS airstrip are

periodically mowed to maintain an obstruction-free zone to facilitate the safe operation of aircraft using the runway.

The offshore habitats within the action area include tidal marsh communities and the estuarine surface waters of Chincoteague Inlet, Bogues Bay, Ballast Narrows, and other waterways. The nearest beds of submerged aquatic vegetation are approximately 3 miles north of the project area. Waters in the project area contain public and private harvesting areas for shellfish (oysters and clams).

USFWS Listed Species in the Action Area and Effects Determination

The federally listed species under USFWS jurisdiction that were identified by USFWS as potentially occurring in the action area are described in the species conclusion table (**Table 5**). **Attachment 1** includes the USFWS consultation letter from the IPaC system that identified the species potentially occurring in the action area.

In 2019, USFWS issued a combined Biological Opinion (BO) for the Proposed and Ongoing Operations and Shoreline Restoration/Infrastructure Protection Program at WFF. 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. This plan outlines procedures for monitoring protected species that are likely to occur at Wallops Island including the northern long-eared bat, red knot, piping plover, and sea turtles. Monitoring reports for these species are prepared annually by WFF and submitted to the USFWS.

The species conclusion table (**Table 5**) provides the ESA Section 7 effects determination for each species (based on the analysis presented in the EA for the Wallops Island Northern Development). The determination of effects on these listed species is further discussed below.

Mammals

The northern long-eared bat is currently listed as threatened by the USFWS. In February 2016, the USFWS published a final 4(d) rule further defining “takes” and “incidental takes.” ESA 4(d) rules allow the USFWS the ability to provide more specific rules or measures to protect a species that is threatened (not endangered). The ESA 4(d) rule was passed due to the mortality faced by this species from white-nose syndrome, a fungal disease that is poorly understood at this time. Based on the final 4(d) rule and the absence of maternity roost trees or winter hibernacula on or near Wallops Island, the Proposed Action would have no effect on the northern long-eared bat.

Birds

Status of the Species in the Action Area

The red knot is federally and state-listed in Virginia as threatened. They do not breed in the vicinity of NASA WFF or Accomack County, but appear regularly on Wallops Island beaches, including those on the northern end of the island, to forage and roost during their annual spring migration, mostly during the second half of May (NASA 2015a).

Table 5. Species Conclusions: Determination of Effects on Federally Listed Species under USFWS Jurisdiction

Common Name	Scientific Name	Status[1]	Habitat	Notes	ESA Section 7 Determination of Effect
Mammals					
Northern long-eared bat	*Myotis septentrionalis*	FT	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. Relying upon the findings of the 01/05/2016 Programmatic Biological Opinion for Final 4(d) Rule of the Northern Long-eared Bat and activities excepted from take prohibitions to fulfill project-specific Section 7 responsibilities. No maternity roost trees or winter hibernacula suitable for the species have been documented on or near Wallops Island (VDGIF 2020).	No effect
Birds					
Red knot	*Calidris canutus rufa*	FT	Wallops Island beaches	Present May through July during spring migration. Regularly forages on Wallops, Assateague, and Assawoman Island beaches during northerly spring migration (NASA 2019a). In May 2019, over 2000 birds were counted on the north end of Wallops Island (NASA 2019b). The Proposed Action would not occur on beaches or near red knot habitat.	May affect, not likely to adversely affect
Piping plover	*Charadrius melodus*	FT	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 2019a). The Proposed Action would not occur on beaches or near piping plover habitat (NASA 2019b).	May affect, not likely to adversely affect
Roseate tern	*Sterna dougallii dougallii*	FE	Offshore ocean waters	Rarely observed along the U.S. coast south of New Jersey; may transit over oceanic waters off WFF during seasonal migration (NASA 2019a).	No effect

Table 5. Species Conclusions: Determination of Effects on Federally Listed Species under USFWS Jurisdiction

Common Name	Scientific Name	Status[1]	Habitat	Notes	ESA Section 7 Determination of Effect
Eastern black rail	*Laterallus jamaicensis jamaicensis*	FT	Salt and brackish marshes with dense cover and upland areas of such marshes	Species has recently been documented at WFF and potentially suitable habitat is present at and near WFF. However, species surveys conducted in June 2021, did not detect a call response in the action area. Through informal conference with USFWS conducted on 8/16/2019 and subsequent informal consultation, avoidance and minimization measures to be implemented by NASA, VCSFA, and their contractors during construction were identified.	May affect, not likely to adversely affect
Reptiles					
Loggerhead sea turtle	*Caretta caretta*	FT	Coastal and offshore ocean waters; nests on beaches	Most prevalent sea turtle species around WFF; has nested on Wallops and regularly nests on Assateague Island beaches (NASA 2019a; USFWS 2016). Loggerhead nests have been observed on Wallops Island beaches as recently as 2013. Greatest in-water concentrations over continental shelf; however, species is also found in deeper waters (NASA 2019). Proposed Action unlikely to affect species; construction activity not located in nesting habitat. Due to the transient presence of the species, dredging operations are unlikely to affect the loggerhead sea turtle. Potential occurrence in action area: adults and juveniles migrating and foraging May–November (NOAA Fisheries 2020).	No effect on nesting turtles
Leatherback sea turtle	*Dermochelys coriacea*	FE	Coastal and offshore ocean waters; nests on beaches	Nesting in the action area is unlikely; only one individual demonstrating nesting behavior documented on Assateague Island in 1996. Generally considered oceanic; however, will forage in coastal areas if prey species are available in high densities (NASA 2019). Potential occurrence in action area: adults and juveniles migrating and foraging May–November (NOAA Fisheries 2020).	No effect on nesting turtles
Hawksbill sea turtle	*Eretmochelys imbricata*	FE	Coastal ocean waters; nests on beaches	Unlikely to occur in or near the action area; only two observations in Virginia since 1979 (NASA 2019).	No effect on nesting turtles

Table 5. Species Conclusions: Determination of Effects on Federally Listed Species under USFWS Jurisdiction

Common Name	Scientific Name	Status[1]	Habitat	Notes	ESA Section 7 Determination of Effect
Kemp's ridley sea turtle	*Lepidochelys kempii*	FE	Coastal ocean waters; nests on beaches	Traditionally nests in Mexico; however, first Virginia nest discovered in 2012 at Virginia Beach (Virginia Army National Guard 2019), with a second nest at False Cape in summer 2014 (VDWR 2016). Generally occurs in more sheltered, shallower water habitats than other sea turtle species (NASA 2019). Potential occurrence in action area: adults and juveniles migrating and foraging May–November (NOAA Fisheries 2020).	No effect on nesting turtles
Green sea turtle	*Chelonia mydas*	FT	Coastal ocean waters; nests on beaches	Nesting unlikely; only one documented nest in Virginia -- at Virginia Beach in 2005 (NASA 2019a). Potential occurrence in action area: adults and juveniles migrating and foraging from May–November (NOAA Fisheries 2020).	No effect on nesting turtles
Flowering Plants					
Seabeach amaranth	*Amaranthus pumilus*	FT	Area seaward of primary dunes	Species has not been documented at WFF since monitoring began in 2010 (NASA 2019b); nearest documented occurrence is on Assateague Island (NASA 2019a). No primary dunes or beaches in the project limits; therefore, no suitable habitat present.	No effect
Insects					
Monarch butterfly	*Danaus plexippus*	C	Breeding – meadows and weedy fields with milkweed; migration – vegetation anywhere	Breeds throughout eastern North America where milkweed species occur. Winters in Mexico. Migrates between these areas annually (USFWS 2020). Minimal potential for milkweed in action area. May transit the area during migration.	No effect

[1] FE = federally listed as endangered; FT = federally listed as threatened; C = candidate for listing
Sources: Species and status -- USFWS (2020); habitat and notes -- NASA (2019) unless otherwise noted

In 2019, over 2,000 red knots were observed on the north end of Wallops Island (NASA 2019b) which most likely due to construction activities of the WFF Shoreline Restoration Project decreased to 117 individuals in 2020 (NASA 2020a). There are no beaches on the northwestern side of Wallops Island where onshore components of the Proposed Action would be implemented; however, narrow beaches do exist along the eastern side of the island adjacent to offshore areas where dredging for portions of the proposed vessel approach channel would occur.

The piping plover is federally and state-listed as threatened. Nesting habitat generally occurs in areas with little or no vegetation, including coastal beaches above the high tide line, sandflats at the end of spits and barrier islands, gently sloping foredunes, blowout areas behind dunes, and overwash areas between dunes. Nests have also occasionally been found under beach grass and other vegetation (NASA 2015a). Piping plovers are a transient and summer resident of the upper Virginia barrier islands and are known to inhabit the coastal habitats of the nearby Chincoteague National Wildlife Refuge. Piping plover nests have been documented on coastal beaches along the northeastern side of Wallops Island (**Figure 5**). Suitable habitat for the species is not present in areas where onshore components of the Proposed Action would be implemented.

The eastern black rail is federally listed as threatened and state listed as endangered. In the northeastern U.S., the eastern black rail typically occurs 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 un-impounded salt and brackish marshes. The eastern black rail was documented at NASA WFF in May 2019. Suitable marsh nesting and foraging habitat for the species is present on and around areas of the northern end of Wallops Island and Ballast Narrows where components of the Proposed Action would be implemented. Through informal conference with USFWS conducted on August 16, 2019, and subsequent informal conference with USFWS during May and July 2020, a habitat survey was requested by USFWS to identify whether an eastern black rail survey would be needed.

A habitat assessment was conducted in July-August 2020 (NASA 2020b), and a follow-up species presence survey was performed in June 2021 (NASA 2021). The survey was performed in accordance with the Maryland Protocol (Wilson 2015; Gibbs and Melvin 1993), and in any situations where the Maryland Protocol did not specify a condition, the Standardized North American Marsh Bird Monitoring Protocol (SNAMBMP; Conway 2011). The methodology used for these surveys consisted of three broadcast playback field survey efforts between May 1 and July 15, conducted at the two survey stations. Surveys were not conducted in rain, fog, or when wind speeds exceeded 12 mph. These surveys were conducted as close to a half hour after sunset as possible to maintain consistency with the Maryland Protocol. Tidal conditions are not defined in the Maryland Protocol, but the SNAMBMP recommends similar tidal levels for all survey events. To maintain consistency with tidal conditions, all surveys were conducted at tide levels within approximately 1 foot of each other; the tide level at approximately 21:00 on the three dates was approximately 2 feet high and rising on June 15, 2021 and June 29, 2021 and approximately 3 feet high and receding on June 22, 2021. Eastern black rails were not detected at either survey station within (or outside) the 400-meter radii on any of the three survey nights; however, clapper rails were present and vocal for most of the surveys.

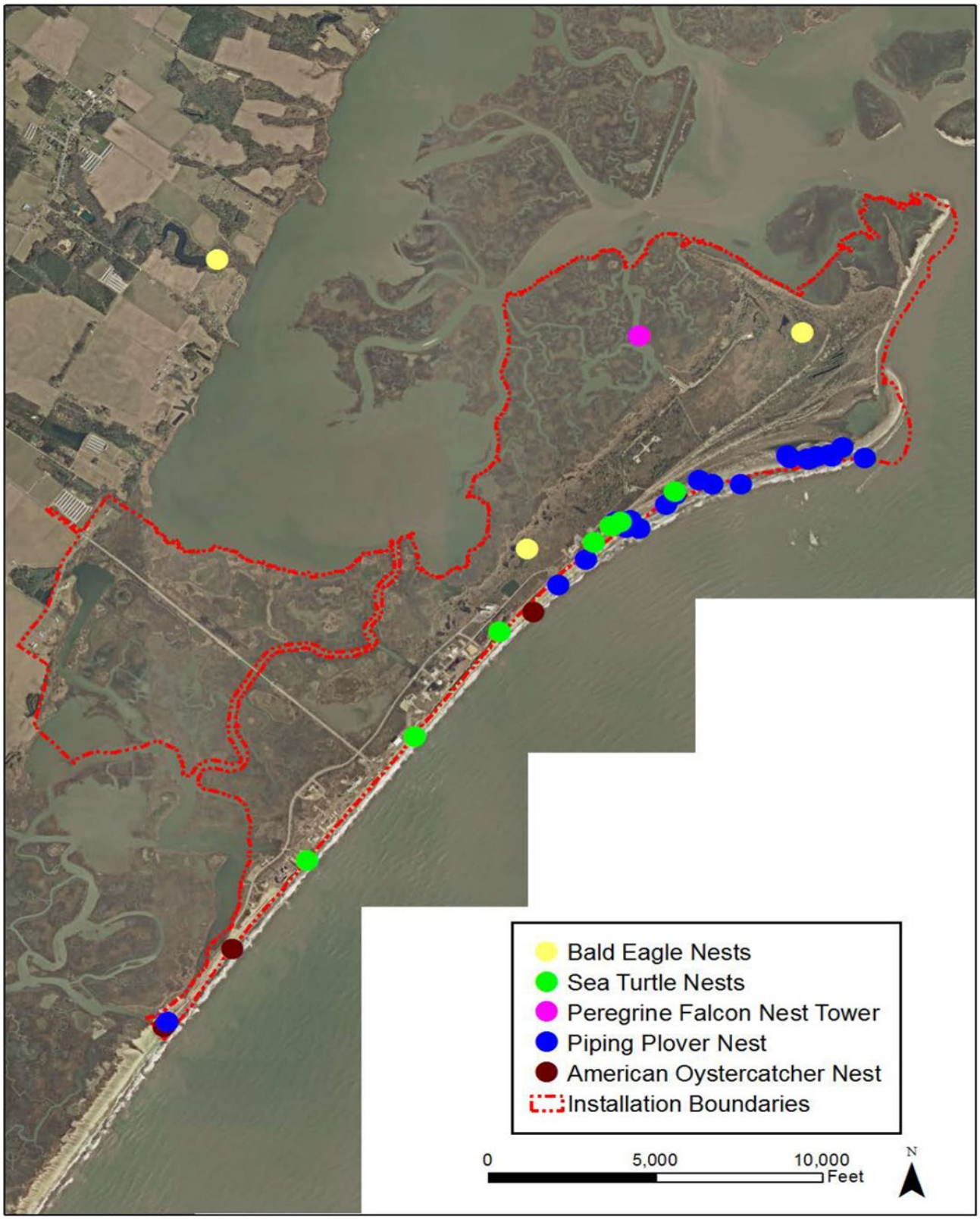


Figure 5. Historic Nesting Sites for Federally Listed and Other Special-Status Species at WFF Wallops Island and Mainland

Effects Determination

The roseate tern occurs offshore and is rarely observed along the U.S. coast south of New Jersey; therefore, the Proposed Action would have no effect on the roseate tern.

Construction of the Proposed Action would have the potential to disturb the red knot, piping plover, and eastern black rail if present in or near the action area due to stressors such as noise, increased human presence, and removal of vegetation potentially providing habitat. Airborne noise can be roughly estimated by assuming the construction equipment required and providing a distance to a noise sensitive receptor. For the replacement of the causeway bridge at the south end of Wallops Island, the noise from piling driving was estimated at 101 dBA at 50 ft (NASA 2019a). In its Programmatic Biological Opinion on the WFF Shoreline Restoration and Infrastructure Protection Program (NASA 2010), USFWS set protected species monitoring requirements at the 100 dB contours from a rocket launch (NASA 2019a). The nearest recorded nesting location for a federally listed avian species (i.e., piping plover) would be greater than 6,000 ft from pile-driving activities under the Proposed Action; thus, no airborne noise impacts are anticipated to the red knot or piping plover.

Open-water construction activities (i.e., dredging of channels and turning basins and construction of the outer portion of the pier) would have no or minimal direct impacts on listed birds because onshore habitat for these species near the areas where these activities would occur is absent or minimal. Also, birds are highly mobile and could avoid these areas during project activities.

Construction activities of the Proposed Action may affect but are not likely to adversely affect the red knot or piping plover because these species occur on beaches, and project activities would not occur in beach areas potentially providing suitable habitat for these species.

The eastern black rail potentially could utilize as habitat the salt marsh where the proposed pier would be installed. The area of habitat that would be affected would be very small compared to the extensive marsh habitat in adjacent areas. NASA anticipates a primary Area of Potential Effect (APE) within a 50-ft buffer around onshore and nearshore construction activities of the pier. Beyond the 50-ft buffer (or Primary APE), and through the informal conference process with USFWS, a conservative estimate for a preliminary secondary APE has been established to account for potential effects from light, noise, and hydrology changes from the Proposed Action. Noise from construction equipment would likely to be intermittent and temporary. Based on the typical noise from roadway construction equipment, attenuation results in a drop-off rate of 7.5 decibels A-weighted (dBA) per doubling of distance for a point source. The noise emission levels at 50 feet from the point source for pile driving, scraping, paving, and concrete mixing typically range from 80 to 95 dBA. Assuming the maximum noise from construction of 95 dBA, a nuisance level of 73 dBA and above, combined with the estimated 7.5 dBA attenuation, a conservative potential APE is noted with a 400-ft buffer from the Project Area or noise source (California Department of Transportation 2016).

Noise minimization strategies implemented to the extent practicable during construction may include: temporary noise barriers or sound walls, noise pads or dampers, movable task noise

barriers, queuing trucks to distribute idling noise, locating vehicle access points and loading and shipping facilities away from habitat areas, reducing the number of noisy activities that occur simultaneously, relocating stationary equipment away from habitat areas, and use of vibration reducing modifications to construction equipment. Implementing these practices would minimize potential effects on the eastern black rail. Therefore, NASA has determined that the construction of the Proposed Action may affect but is not likely to adversely affect the eastern black rail.

Activities associated with the operation of the proposed port would be like other commercial boating activities occurring with relative frequency in and around the action area. Such activities would not be particularly unusual or disruptive to listed birds. Birds may leave the immediate area during these operational activities but would be expected to return upon completion of project activities. Overall, the areas of potential habitat that would be temporarily disturbed by the Proposed Action would be small relative to the available, surrounding habitat.

For these reasons, effects of the Proposed Action on the red knot, piping plover, and eastern black rail would be insignificant or discountable. Accordingly, the Proposed Action may affect but is not likely to be adversely affect these bird species. It would have no effect on the roseate tern.

Sea Turtles

Status of the Species

For management purposes, the loggerhead sea turtle population is organized into nine distinct population segments (DPS), four that are listed as threatened and five that are listed as endangered. Loggerheads occurring at or near WFF belong to the Northwest Atlantic DPS, which is federally and state listed as threatened. The species nests on coastal beaches and occasionally on estuarine shorelines generally between late April and early September, with hatching occurring at night between late June and mid-November. Major nesting concentrations in the U.S. occur from North Carolina to southwest Florida. Successful loggerhead nests were observed on coastal beaches along Wallops Island as recently as 2013 (NASA 2017). The closest nest to the Project Area was approximately 1.3 mi south of the UAS Airstrip (**Figure 5**). Suitable loggerhead nesting habitat is not present in onshore areas where components of the Proposed Action would be implemented.

The leatherback sea turtle is federally and state listed as endangered. It is the largest sea turtle and largest reptile species, reaching up to 6.5 ft in length and weighing up to 2,000 lbs. Leatherbacks are commonly known as oceanic creatures but they also forage in coastal waters. They are the most migratory and wide-ranging of all sea turtle species. Nesting typically occurs in tropical waters. Leatherbacks have never been sighted at WFF but are known to occur in the waters offshore of Accomack County (NASA 2017).

The hawksbill sea turtle is federally and state listed as endangered. It can reach up to 3 ft in length and weigh up to 180 lbs. Hawksbills typically nest high up on beaches under beach and dune vegetation. Females return to natal beaches to lay their eggs every 2 to 3 years. In the continental U.S., hawksbills are found primarily in Florida and Texas, but have been observed as far north as

Massachusetts. Hawksbills have never been directly observed at WFF (NASA 2017). They may occur in offshore waters, but their preferred tropical habitat is not present at or near WFF.

The Kemp's ridley sea turtle is federally and state listed as endangered. It is the smallest of all sea turtles, growing to 28 inches long and weighing up to 100 lbs. The species' range includes the Atlantic coastline from Maine to Florida, and the Gulf of Mexico. It is commonly present in areas that have muddy or sandy bottoms. Most Kemp's ridley sea turtle nesting occurs between May and July in the Mexican state of Tamaulipas along the Gulf of Mexico's western shoreline. Occasional nests have also been documented in North Carolina, South Carolina, and Florida. A successful nest was documented in Virginia Beach in 2012. The Kemp's ridley sea turtle has never been directly observed at WFF but may occur offshore in shallow waters with depths less than 160 ft (NOAA Fisheries 2016).

The green sea turtle is federally and state listed as threatened. This species is the largest of all the hard-shelled marine turtles, growing to a length of 3 ft and weighing up to 350 lbs. Nesting generally occurs between June and July along Florida's central and southern coasts. The species is globally distributed and generally occurs in tropical and subtropical waters along continental coasts and islands (NOAA Fisheries 2016). Green sea turtles have been observed in waters off WFF and are likely to inhabit the waters off WFF during the warmer months when sea grasses and algae are plentiful (NASA 2017).

Effects Determination

Terrestrial impacts from construction activities are unlikely to adversely affect sea turtle nests due to the lack of nesting sites within the action area. Loggerhead sea turtle nesting sites have been found on Wallops Island beaches outside of the action area (**Figure 5**) but were last observed in 2013. One leatherback sea turtle was observed demonstrating nesting behavior on Assateague Island in 1996. The hawksbill sea turtle has been observed in Virginia only twice since 1979 (Mansfield 2006). Kemp's ridley and green sea turtles have been found to nest at Virginia Beach, but none have been found nesting near the action area. Due to the lack of nesting habitat in the action area, the proposed action would have no effect on nesting sea turtles.

Flowering Plants

Seabeach amaranth has not been documented at WFF. Its habitat is the area seaward of primary dunes, but there are no primary dunes or beaches in the action area. Therefore, suitable habitat is not present, and the Proposed Action would have no effect on seabeach amaranth.

Insects

The monarch butterfly was designated by the USFWS in December 2020 as a candidate species for listing as threatened or endangered; its status will be reviewed each year. The monarch is dependent on milkweeds for breeding habitat because they are the only food source for monarch caterpillars. The action area is unlikely to provide habitat for milkweeds. During migration, monarchs may occur in vegetated areas anywhere and may utilize a wide variety of nectar-producing flowers for food. Thus, they could transit through the action area during migration.

Approximately 1.1 ac of upland vegetation would be lost due to the Proposed Action. Extensive vegetation would remain around the airstrip and in other areas of NASA WFF as well as nearby National Wildlife Refuges maintained by USFWS. Vegetation impacts would be distributed over the Proposed Action's multi-year implementation period, further minimizing impacts because not all vegetation would be cleared simultaneously by the project. For these reasons, long-term impacts from the Proposed Action on common species of upland vegetation potentially providing habitat for the monarch butterfly would be minor, and the potential for impacts on the monarch butterfly would be negligible.

Best Management Practices Summary

The construction contractor would use erosion and sediment control measures in upland areas to minimize or prevent the erosion of exposed soils by wind and water and corresponding sedimentation of receiving water bodies. Accidental spills of fuel or other hazardous substances would be prevented or minimized through the contractor's adherence to the spill prevention and control measures as specified in the WFF's *Integrated Contingency Plan.* Vegetation removed in areas impacted for construction access would be replaced in accordance with the NASA WFF vegetation management policies. Construction techniques such as vibratory dampening would be used to reduce equipment vibration, and adherence to lighting best practices would be used to minimize the duration and intensity of lighting.

The intensity and duration of construction activity and the areas disturbed would vary throughout the Proposed Action's construction phases, resulting in corresponding variations in the intensity and duration of short-term impacts. The phased implementation of the Proposed Action would distribute potential impacts on listed species over multiple years, thereby minimizing impacts by ensuring that not all impacts occur simultaneously. Contractors would implement and adhere to BMPs to the extent practicable to further minimize adverse effects on listed species. BMPs could include but would not be limited to erosion control measures, noise and vibration reduction measures, and minimization of lighting frequency and/or duration in work areas to the extent practicable while maintaining safe working conditions.

Conclusions

NASA requests your agency's concurrence with our determination of effects for each of the federally listed species under USFWS jurisdiction potentially occurring in the action area, as summarized in **Table 5**.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Sincerely,

Shari A. Miller

Shari A. Miller
Center NEPA Manager and
Environmental Planning Lead

Enclosures
Attachment 1, USFWS Consultation Letter/Species List

cc:
250/Ms. K. Finch
250/Mr. T. Meyer
MARAD/Mr. A. Finio
USACE/Mr. B. Denson
VCSFA/Mr. N. Overby

Literature Cited

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ATTACHMENT 1: Information for Planning and Consultation (IPAC)
Consultation Code: 05E2VA00-2021-SLI-1294
Event Code: 05E2VA00-2021-E-03713

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032
http://www.fws.gov/northeast/virginiafield/

In Reply Refer To: December 28, 2020
Consultation Code: 05E2VA00-2021-SLI-1294
Event Code: 05E2VA00-2021-E-03713
Project Name: Wallops Island Northern Development

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered

species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
(804) 693-6694

Project Summary

Consultation Code: 05E2VA00-2021-SLI-1294

Event Code: 05E2VA00-2021-E-03713

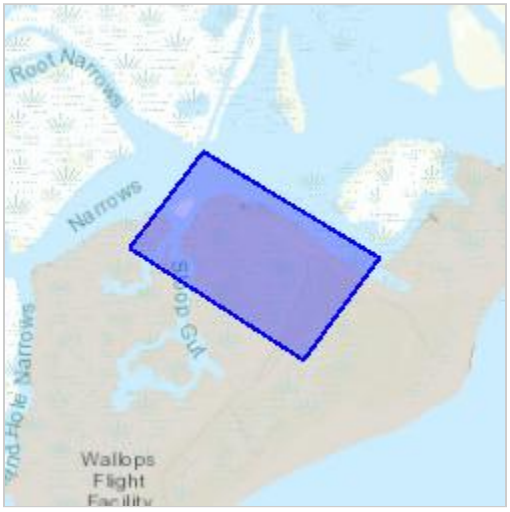
Project Name: Wallops Island Northern Development

Project Type: DEVELOPMENT

Project Description: Construction and operation of a pier/port, with construction of associated buildings near the NASA unmanned aerial systems (UAS) airstrip and offshore dredging of channels and turning basins.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/37.88564155082318N75.4428012803902W



Counties: Accomack, VA

Endangered Species Act Species

There is a total of 11 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Birds

NAME	STATUS
Eastern Black Rail *Laterallus jamaicensis ssp. jamaicensis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10477	Threatened
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Roseate Tern *Sterna dougallii dougallii* Population: Northeast U.S. nesting population No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2083	Endangered

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Hawksbill Sea Turtle *Eretmochelys imbricata* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3656	Endangered
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Flowering Plants

NAME	STATUS
Seabeach Amaranth *Amaranthus pumilus*	Threatened

No critical habitat has been designated for this species.

Species profile: https://ecos.fws.gov/ecp/species/8549

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

REFUGE INFORMATION WAS NOT AVAILABLE WHEN THIS SPECIES LIST WAS GENERATED. PLEASE CONTACT THE FIELD OFFICE FOR FURTHER INFORMATION.

From:	Miller, Shari A. (WFF-2500) <shari.a.miller@nasa.gov>
Sent:	Wednesday, November 10, 2021 1:38 PM
To:	Martin, Amy; Argo, Emily; Ruth Boettcher
Cc:	Levine, Lori M. (GSFC-2500); Nate Overby; Finio, Alan (MARAD); brian.c.denson@usace.army.mil; Meyer, T J (WFF-2500); Finch, Kimberly (GSFC-2500)
Subject:	Eastern Black Rail Survey for Wallops Island Northern Development, NASA WFF
Attachments:	313-382_NASA Wallops Island BLRA_Survey_Letter_Final.pdf
Follow Up Flag:	Follow up
Flag Status:	Flagged

Emily, Ruth, Amy,

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) propose to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

NASA contracted AECOM to conduct a breeding survey for eastern black rails (*Laterallus jamaicensis jamaicensis*). Three iterations of marsh bird surveys were conducted on the evenings of June 15, 2021, June 22, 2021, and June 29, 2021. The surveys occurred at two (2) survey stations in the vicinity of an existing unmanned aerial systems airstrip. Eastern black rails were not detected at either survey station within (or outside) the 400-meter (0.25-mile) radii on any of the 3 survey nights; however, clapper rails (CLRA) were present and
vocal for most of the surveys.

The report of the survey is attached for your review and comment. If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Thank you.

Shari A. Miller

Center NEPA Manager &
Natural Resources Manager
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/

“Remember there’s no such thing as a small act of kindness. Every act creates a ripple with no logical end.” —Scott Adams

August 5, 2021

Ms. Shari Miller
Center NEPA Manager and Natural Resource Manager
NASA GSFC Wallops Flight Facility
Wallops Island, VA 23337

Dear Ms. Miller:

Subject: NASA Wallops Island Eastern Black Rail Survey
Wallops Island, Accomack County, Virginia
CEC Project 313-382

1.0 INTRODUCTION

Tommy Goodwin, PE (CEC) and Christian Knatt (AECOM) conducted three iterations of marsh bird surveys on the evenings of June 15, 2021, June 22, 2021, and June 29, 2021 for the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center's Wallops Flight Facility (WFF) Wallops Island Northern Development Project in Wallops Island, Accomack County, Virginia. The purpose of the study was to conduct a breeding survey for eastern black rails (*Laterallus jamaicensis jamaicensis).* The surveys occurred at two (2) survey stations in the vicinity of an existing unmanned aerial systems airstrip (Figure 1). The survey stations were designated by AECOM in their habitat assessment for this project (AECOM 2020). The approximate center of the project area is located at 37.885818 °N, -75.436997 °W.

2.0 BACKGROUND

Black rails are a very small species of rail described by a slate gray/black body with a chestnut colored nape and thin white spotting on the rump and flanks; the bill is blueish gray and the eyes are bright red. Black rails are the smallest rail species in North America, measuring 10 to 15 centimeters (4 to 6 inches) in length and have a mean mass of approximately 35 grams (1.2 ounces), approximately the size of a deer mouse (Eddleman 2020). Eastern black rails, the subspecies found along the Atlantic coast and the largest subspecies of black rail, do not have a substantially different habitat or behavior from the other subspecies of black rail. Due to the size of black rails, their habitat tolerance is very narrow; they rely on high marshes which only flood in severe weather, but are consistently at least moist. Black rails need wet soils, but cannot tolerate more than 3 centimeters (1.2 inches) of water depth (Flores 1995). Black rails are typically found

in high marsh areas abundant in species including cordgrasses (ie. *Spartina patens, S. alterniflora, S. cynosuroides,* and *S. bakeri*), pickleweeds (*Salicornia spp.*), saltgrass (*Distichlis spicata*), black rush (*Juncus gerardi*), needlerush (*Juncus roemerianus*), or Olney bulrush (*Scirpus olneyi*). This habitat is more saturated than that which common reed (*Phragmites australis*) begins to dominate (Flores 1995; D. Brinkler, Maryland Department of Natural Resources (MDDNR) June 29, 2021, personal communication).

Prior to the mid 1990's, eastern black rails were one of the most abundant species/subspecies of rail in the Delmarva Peninsula, only outnumbered by Virginia rail and clapper rail (D. Brinkler, MDDNR June 29, 2021, personal communication). Due to rising sea levels, the high marshes along the Atlantic coast flood more frequently and have been transitioning to low marsh while upland habitats are unable to transition to high marsh habitat at a similar rate either due to geographical/geological restrictions or established flora that will take time to change (Watts 2016).

Like most rail species, black rails are primarily nocturnal callers and typically only fly when in distress, preferring to walk between the stems of flora in their environment; this makes observing this secretive species a challenging endeavor. No observations of eastern black rail have occurred during federal or state agency surveys in Maryland or Virginia since prior to 2019 (D. Brinkler, MDDNR June 29, 2021, personal communication). Every state along the Atlantic coast has also seen drastic reductions to eastern black rail populations leading to the eastern black rails obtaining federal protection on November 9, 2020 (USFWS 2020).

3.0 SURVEY STATIONS

Locations of the two (2) survey stations were determined by AECOM based on the findings in their Habitat Assessment for the WFF (AECOM 2020). These stations were located such that all high marsh habitat within 122 meters (400 feet) of the proposed buildings and runway expansion was included within a 400-meter (0.25-mile) radius survey area from the survey stations (Figure 1). According to AECOM (2020), a total of 8.9 hectares (22 acres) of high marsh habitat consisting primarily of saltmeadow hay (cordgrass; *Spartina patens)* and other high marsh flora exists within the survey station 400-meter (0.25-mile) radii. The two survey stations were positioned such that double counting of any rails would not be likely to occur.

4.0 METHODS

The survey was performed in accordance with the Maryland Protocol (Wilson 2015; Gibbs and Melvin 1993), and, in any situations where the Maryland Protocol did not specify a condition, the Standardized North American Marsh Bird Monitoring Protocol (SNAMBMP; Conway 2011) was followed.

The methodology used for these surveys consisted of 3 broadcast playback field survey efforts, between the first of May (May 1) and the fifteenth of July (July 15), conducted at the 2 survey stations. Surveys were not conducted in rain, fog, or when wind speeds exceeded 19.3 kilometers per hour (12 miles per hour). These surveys were conducted as close to 0.5-hour after sunset as possible to maintain consistency with the Maryland Protocol. Tidal conditions are not defined in the Maryland Protocol, but the SNAMBMP recommends similar tidal levels for all survey events.

Due to the nature of the secretive marsh birds, auditory surveys are the most effective method for identifying eastern black rails. In accordance with the Maryland Protocol, broadcast playback surveys were conducted at each survey station for 10 minutes with a call sequence as follows:

- 2 minutes of silence;
- 4 minutes of eastern black rail calls (ki-ki-ker, growls, ki-ki doo);
- 1 minute of silence;
- 2 minutes Virginia rail calls; and
- 1 minute of silence.

5.0 RESULTS

Eastern black rails were not detected at either survey station within (or outside) the 400-meter (0.25-mile) radii on any of the 3 survey nights; however, clapper rails (CLRA) were present and vocal for most of the surveys. Delays, of approximately 0.5 hour, were experienced due to runway access and excessive wind speed on the second and third surveys. To maintain consistency with tidal conditions, all surveys were conducted at tide levels within approximately 0.3 meter (1 foot) of each other; the tide level at approximately 21:00 on the 3 dates was approximately 0.6 meter (2 feet) high and rising on June 15, 2021 and June 29, 2021 and approximately 0.9 meter (3 feet) high and receding on June 22, 2021. A summary of the results of the surveys can be found in Table 1.

Table 1: Summary of Wallops Island Marsh Bird Surveys

Date	Time	Survey Station	Species	Individuals
June 15, 2021	21:00	1	CLRA	1
	21:20	2	None	0
June 22, 2021	21:30	1	CLRA	4
	21:45	2	CLRA	1
June 29, 2021	21:25	1	CLRA	1
	21:50	2	None	0

Data collection included survey station, date, time, weather conditions, ambient noise levels, any marsh bird vocalizations, and approximate distance/direction of detected birds from observers. Field forms were adapted from the SNAMBMP and are included as Attachment 1.

Sincerely,
CIVIL & ENVIRONMENTAL CONSULTANTS, INC.

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Enclosures: References
Figure 1: Eastern Black Rail Survey Map
Attachment 1: Scanned Field Forms

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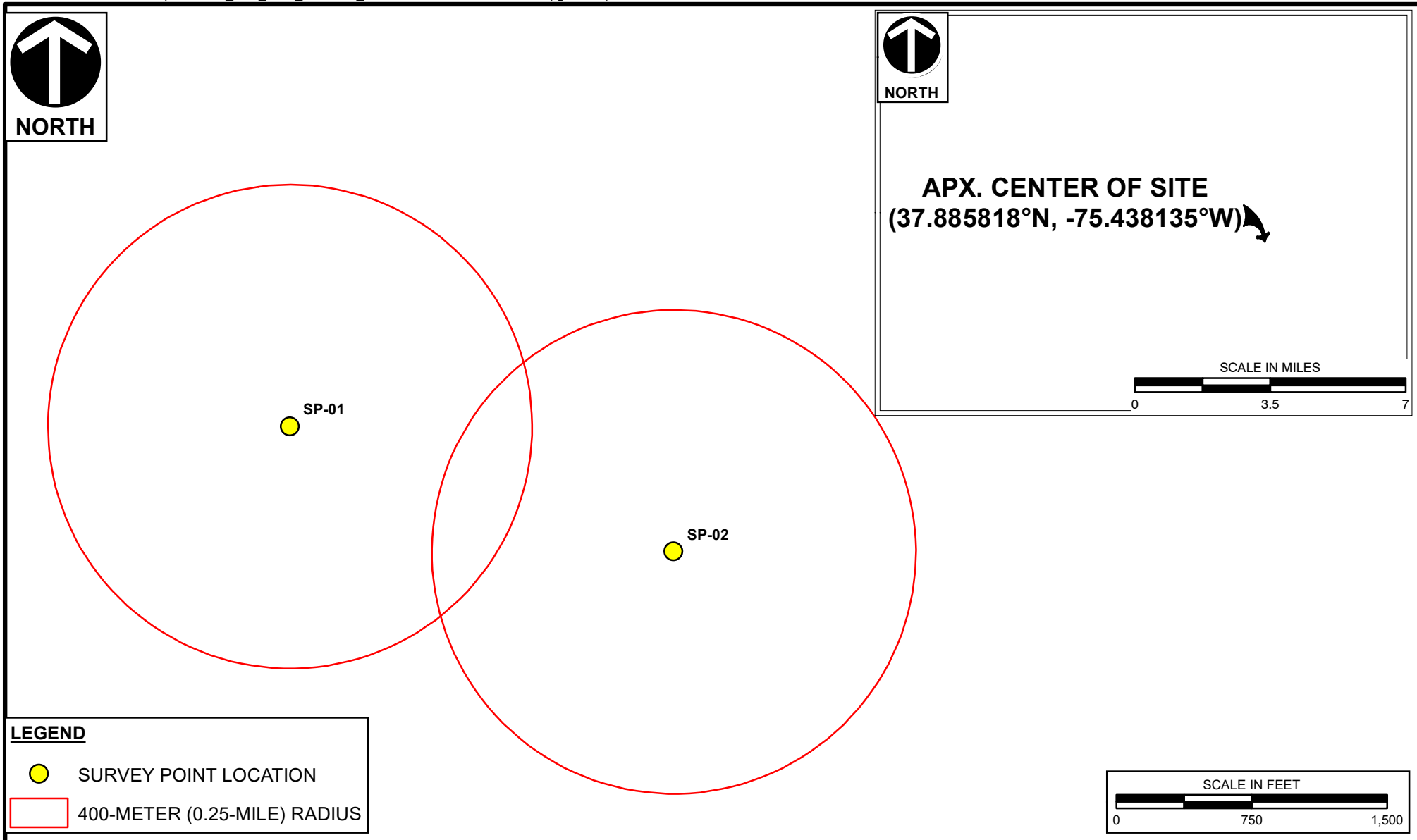

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HTTP://GOTO.ARCGISONLINE.COM/MAPS/
WORLD_IMAGERY, ACCESSED 8/4/2021,

USGS TOPOGRAPHIC MAP/ ARCGIS MAP SERVICE:
HTTP://GOTO.ARCGISONLINE.COM/MAPS/
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NATIONAL AERONAUTICS AND SPACE AGENCY
WALLOPS ISLAND FACILITY
WALLOPS ISLAND, ACCOMACK COUNTY, VIRGINIA

EASTERN BLACK RAIL SURVEY MAP

DRAWN BY:	TJG	CHECKED BY:	SRD	APPROVED BY:	RAS	FIGURE NO:	1
DATE:	8/4/2021	SCALE:	1 " = 750 '	PROJECT NO:	313-382.0001	* Hand signature on file	

National Marsh Bird Monitoring Program Survey Data Sheet

Date: 6/15/2021 **Location:** Wallops Island

Route: ~~Walsh~~ Wallops Island, VA **Temperature** (°F): 75 | 73

Observer(s): T Godwin / C Kneff **Wind speed** (mph): 1-3 | 1-3

Instructor _____ **Cloud cover** (%): 1 | 1

Survey replicate #: 1 **Precipitation** (see below): none | none

Before/After

Total # during survey			
PBGR		VIRA	
LEBI		CLRA	
AMBI		COGA	
BLRA		SORA	
AMCO		CLRA	1

**list all observers in order of their contribution to the data collected*

put an "S" in the appropriate column if the bird was seen, a "1" if the bird was heard, and "1S" if both heard and seen

Station#	Start Time (military)	Background noise	Species	Responded During: Before	Pass 0-1	Pass 1-2	BLRA 2-3	BLRA 3-4	BLRA 4-5	BLRA 5-6	Pass 6-7	VIRA 7-9	Pass 9-10	After	Call Type(s)	Direction	Distance (meters)	Detected at a Previous Point	Comments
1	~~2100~~ 2057	0	CLRA									1			Kek	Q	200		
2	2120	1	—													X			No Birds

Call Types: BLRA: *kicky-doo, grr, churt* RIRA: cltr, kburr, kek, khurrah LEBI: *coo, kak, ert* VIRA: *grunt, ticket, kicker*
SORA: whinny, perweep, keep PBGR: owhoop, hyena COGA: wpt, beep AMCO: burup, honk, hicup AMBI: pump-er-lunk

If the call type is not one of the above listed types, describe the call in the comments column

Precipitation: light rain, rain, heavy rain, light snow, snow, heavy snow, fog, none

Background noise: 0 *no noise* 1 *faint noise* 2 *moderate noise (probably can't hear some birds beyond 100m)*
3 *loud noise (probably can't hear some birds beyond 50m)* 4 *intense noise (probably can't hear some birds beyond 25m)*

National Marsh Bird Monitoring Program Survey Data Sheet

Date: 6/22/21 **Location:** WALLOPS ISLAND **Before/After**

Route: Wallops Island, VA **Temperature** *(°F)*: 68 / 68

Observer(s): TGoodwin / CKnott **Wind speed** *(mph)*: 5 / 5

Instructor _____ **Cloud cover** *(%)*: 90 / 90

Survey replicate #: 2 **Precipitation** *(see below)*: none / none

Total # during survey			
PBGR	___	VIRA	___
LEBI	___	CLRA	___
AMBI	___	COGA	___
BLRA	___	SORA	___
AMCO	___	CLRA	5

**list all observers in order of their contribution to the data collected*

put an "S" in the appropriate column if the bird was seen, a "1" if the bird was heard, and "1S" if both heard and seen

Station#	Start Time (military)	Background noise	Species	Responded During: Before	Pass 0-1	Pass 1-2	BLRA 2-3	BLRA 3-4	BLRA 4-5	BLRA 5-6	Pass 6-7	VIRA 7-9	Pass 9-10	After	Call Type(s)	Direction	Distance (meters)	Detected at a Previous Point	Comments
1	2130	1	CLRA	1		1	1	1	1	1					Kek	◯	300		
			CLRA			1						1				◯	300		
			CLRA									1				◯	350		
			CLRA										1			◯	50		
2	2145	1	CLRA										1	1(2)		◯	150		
																◯			
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Call Types: BLRA: *kicky-doo, grr, churt* RIRA: cltr, kburr, kek, khurrah LEBI: *coo, kak, ert* VIRA: *grunt, ticket, kicker*
SORA: whinny, perweep, keep PBGR: owhoop, hyena COGA: wpt, beep AMCO: burup, honk, hicup AMBI: pump-er-lunk

If the call type is not one of the above listed types, describe the call in the comments column

Precipitation: light rain, rain, heavy rain, light snow, snow, heavy snow, fog, none

Background noise: 0 *no noise* 1 *faint noise* 2 *moderate noise (probably can't hear some birds beyond 100m)*
3 *loud noise (probably can't hear some birds beyond 50m)* 4 *intense noise (probably can't hear some birds beyond 25m)*

National Marsh Bird Monitoring Program Survey Data Sheet

Date: 6/29/2021 **Location:** Wallops Island

Route: ~~WASA~~ Wallops Island, VA

Observer(s): TBourdon/C Kratt

Instructor

Survey replicate #: 3

	Before/After
Temperature *(°F)*:	80 / 80
Wind speed *(mph)*:	10 / 10
Cloud cover *(%)*:	0 / 0
Precipitation *(see below)*:	None / None

Total # during survey			
PBGR		VIRA	
LEBI		CLRA	
AMBI		COGA	
BLRA		SORA	
AMCO		CLRA	1

**list all observers in order of their contribution to the data collected*

put an "S" in the appropriate column if the bird was seen, a "1" if the bird was heard, and "1S" if both heard and seen

Station#	Start Time (military)	Background noise	Species	Responded During: Before	Pass 0-1	Pass 1-2	BLRA 2-3	BLRA 3-4	BLRA 4-5	BLRA 5-6	Pass 6-7	VIRA 7-9	Pass 9-10	After	Call Type(s)	Direction	Distance (meters)	Detected at a Previous Point	Comments
1	2125	0	CLRA										1		~~KEK~~ CLACK	←	300		
																○			
2	2150	1	—													○			No birds
																○			
																○			
																○			
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Call Types: BLRA: *kicky-doo, grr, churt* RIRA: cltr, kburr, kek, khurrah LEBI: *coo, kak, ert* VIRA: *grunt, ticket, kicker*
SORA: whinny, perweep, keep PBGR: owhoop, hyena COGA: wpt, beep AMCO: burup, honk, hicup AMBI: pump-er-lunk

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Precipitation: light rain, rain, heavy rain, light snow, snow, heavy snow, fog, none

Background noise: 0 *no noise* 1 *faint noise* 2 *moderate noise (probably can't hear some birds beyond 100m)*
3 *loud noise (probably can't hear some birds beyond 50m)* 4 *intense noise (probably can't hear some birds beyond 25m)*

Eastern Black Rail (*Laterallus jamaicensis jamaicensis*) Habitat Assessment

Prepared for the

NASA WFF Wallops Island Northern Development Environmental Assessment

Accomack County, Virginia

NASA Wallops Flight Facility
32400 Fulton Street
Wallops Island, VA 23337

Prepared by

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4840 Cox Road
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December 23, 2020

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1.0 INTRODUCTION

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) is proposing; developments would constitute a new Intermodal Facility at Wallops Island located in proximity to the existing Mid-Atlantic Regional Spaceport (MARS) Unmanned Aerial Systems (UAS) airstrip (**Appendix A, Figure 1**). Proposed developments could include construction and operation of a Wallops Island Pier Area, a second hangar at the UAS airstrip, potable and wastewater lines to the hangars, airstrip lighting, doubling of the existing access road culvert, a 25-30 vehicle parking lot, and a project support building at the entrance of the access road to the airstrip (Project Area). According to the U.S. Maritime Administration (MARAD), this project has the potential to grow existing site capabilities at Wallops Island; enhance science, technology, engineering, and mathematics (STEM) research opportunities; and spur high-tech/high-paying jobs in a predominately rural area. The Eastern Black Rail (*Laterallus jamaicensis jamaicensis*) was identified as a species with potential to be impacted by Project activities. The Eastern Black Rail was upgraded under the Endangered Species Act (ESA) from proposed to threatened status with 4D rule in the Federal Register (October 8, 2020) effective November 9, 2020 (85 FR 63764). The Virginia Department of Wildlife Resources (VDWR) also lists the species as endangered. To address the Project's potential for impacts to this species, an Eastern Black Rail Habitat Assessment was conducted by AECOM. The results of desktop analysis and field efforts are presented in this document.

2.0 PURPOSE

As part of the National Environmental Policy Act (NEPA) review process Wallops Island Northern Development (WIND) Environmental Assessment (EA), NASA identified the (then candidate species,) the Eastern Black Rail (*Laterallus jamaicensis jamaicensis*) for review. The Eastern Black Rail was documented on WFF Wallops Island in May 2019 (WFF Marsh Fiber Project Draft Environmental Assessment [NASA 2020]). Through subsequent informal conference with U.S. Fish and Wildlife Service (USFWS) during May and July of 2020, a habitat survey was requested by USFWS to identify whether an Eastern Black Rail species survey was needed (USFWS 2020a). The purpose of this document is to satisfy the request of USFWS and document the findings of a habitat assessment to identify whether suitable Eastern Black Rail habitat is present within or near the Project Area. It is anticipated that the habitat assessment results will support the development of further actions addressing the Project's potential for impacts to the Eastern Black Rail including the identification of future survey area and effort, potential impacts associated with design and engineering, and avoidance and minimization measures, as applicable.

3.0 PROJECT AREA

The Project Area is located on Wallops Island in Accomack County, Virginia, east of Atlantic Road (Route 679), north of Causeway Road (Route 803), and south of Chincoteague Island, and can be accessed from North Seawall Road (**Appendix A, Figure 1**). The United States Geological Survey (USGS) Quadrangle map (Quad) for Chincoteague West, VA (USGS 2019) depicts a mix of generally flat non-vegetated land cover and vegetated submerged swamps (including Cow Gut Flat) with Cow Gut bordering the southwest edge of the Project Area. Upland elevations depicted on the Chincoteague Quad range from 5 feet above mean sea level (amsl) to 0 feet amsl. ESRI™ (2019) aerial imagery depicts similar landcover as the USGS Quadrangle (Quad) map, but also shows paved roads, maintained shoulders, and a runway (**Appendix A, Figure 2**). The project figures in **Appendix A** depict the study area, which combines both the potential primary and secondary area of potential effect (APE). The active runway hosts air launches, a variety of

personnel, as well as air and vehicular traffic for training events. Resident wildlife would be assumed to have acclimated or moved away from the existing level of noise.

3.1 Primary APE

The proposed project is in the alternative planning stages and final engineering plans or site arrangements were not available at the time of the habitat assessment. Therefore, the anticipated primary APE is based on preliminary site plans or project area with a 50 foot (ft) buffer to account for site-specific adjustments (**Figure 2**).

3.2 Secondary APE

Beyond the 50 ft buffer (or Primary APE), the habitat assessment area was be expanded to include a conservative estimate for a preliminary secondary APE to account for potential effects from light, noise, and hydrology changes from the proposed activities, at the request of the USFWS through the informal conference process. The secondary APE used for the Eastern Black Rail habitat assessment may be further reduced as site-specific construction techniques are coordinated, once a contractor has been selected.

Noise from construction equipment would likely to be intermittent and temporary. Based on the typical equipment roadway construction equipment, attenuation results in a drop-off rate of 7.5 decibel, A-weighted (dBA) per doubling of distance for a point source (**Table 1**). **Table 2** below includes typical construction equipment and their max dBA. The noise emission levels at 50 feet from the point source for pile driving, scraping, paving, and concrete mixing typically range from 80 to 95 dBA. Assuming the maximum noise from construction of 95 dBA, a nuisance level of 73 dBA and above, combined with the estimated the 7.5 dBA attenuation, a conservative potential APE is noted with a 400 ft buffer from the Project Area or noise source (California Department of Transportation 2016).

Noise minimization strategies implemented to the extent practicable during construction may include: temporary noise barriers or sound walls, noise pads or dampers, movable task noise barriers, queuing trucks to distribute idling noise, locating vehicle access points and loading and shipping facilities away from habitat areas, reducing the number of noisy activities that occur simultaneously, relocating stationary equipment away from habitat areas, and use vibration reducing modifications to construction equipment.

Table 1: Anticipated Noise Attenuation based on Federal Highway Administration (FHWA 2006)

Noise level (dBA)	Distance from source ft (m)
95	50 (15)
88	100 (30)
80	200 (61)
73	400 (122)
65	800 (244)

Table 2: Construction Equipment Noise Emission Levels (greatest-to-least)

Equipment	Typical Lmax at 50 feet (15.2 m) from Source (dBA, Slow)
Pile Driver (Impact)	95
Vibratory Pile Driver	95
Rock Drill	85
Paver	85
Scraper	85
Crane	85
Concrete Mixer Truck	85
Dozer	85
Grader	85
Jackhammer	85
Pneumatic Tool	85
Crane	85
Chain w	85
Roller	85
Tractor	84
Concrete Pump Truck	82
Generator	82
Compactor (ground)	80
Compressor (Air)	80
Backhoe	80
Vibratory Concrete Mixer	80
Pumps	77

Lighting for construction is anticipated to be temporary and consistent with best practices which may include: turning off unnecessary lights; facing lights away from the habitat; shielding light sources; and/or using recessed lighting versus exposed light source, directional lighting versus scattered light sources, low-profile low-level lamps on light poles, low pressure sodium vapor lighting, yellow "bug" lights of 25 watts or less versus white incandescent bulbs, and/or motion detector lights with short time settings.

Hydrology impacts are anticipated to be limited to the primary APE depicted in **Figure 2** due to anticipated fill prisms for the proposed grading and structures. Due to the dynamic nature of a tidal-driven saltmarsh, secondary hydrology impacts are not anticipated.

As requested by USFWS, the anticipated, conservative limits of primary and secondary APE were evaluated for noise, light, and hydrology. Of these, it appears that construction noise has the potential to disturb the Eastern Black Rail the furthest distance from the construction activities. Therefore, the potential secondary APE is conservatively defined by a 400 ft buffer (distance to noise attenuation to 73 dBA) from the anticipated sources of construction noise and clipped to certain unsuitable habitat factors such as open water.

4.0 EASTERN BLACK RAIL DESCRIPTION

The Eastern Black Rail is a small, secretive, marsh-dwelling bird that is broadly distributed through portions of the United States, Central America, and South America. The Eastern Black Rail is one of four subspecies of Black Rail and, effective October 9, 2020, is listed as federally threatened by the USFWS under the ESA. The species is additionally protected by VDWR and the Migratory Bird Treaty Act of 1918. Adult Eastern Black Rails vary in size from four to six inches in length, have a wingspan of nine to 11 inches, and weigh less than 0.1 pound. Males and females are similar in size and adults are generally pale to blackish-gray, with a small blackish bill and bright red eyes. Feeding behavior for the Eastern Black Rail is generally unknown but it is believed that they are opportunistic foragers. The shape of their bill suggests adaptations for gleaning or pecking at items. The diet of the Eastern Black Rail consists of small aquatic and terrestrial invertebrates, as well as small seeds (USFWS 2019).

The marsh-dependent 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 (USFWS 2019). The preferred habitat of Eastern Black Rails in Virginia is the salt marsh zone known as high marsh (USFWS 2020a).

There are inherent challenges to studying or surveying for marsh birds. The Standardized North American Marsh Bird Monitoring Protocol (2011) describes marsh birds as "inconspicuous" or "secretive." Moreover, the Eastern Black Rail has been described as the "most secretive of the secret marsh birds" and lacking basic information on population status and trends in most areas (Watts 2016). It follows that, Eastern Black Rail nesting behavior has not been thoroughly studied but the species is known to tolerate a narrow range of water levels and variation within those water levels (Watts 2016, USFWS 2020b). Nesting sites have been found in the upper reaches of marshes, a few inches above ground or shallow water in clumps of vegetation (Audubon n.d.). Other Black Rail studies specify that nesting habitat requires inundation less than one inch (three cm) in depth (Conway 2011, USFWS 2020b).

The Virginia Institute of Marine Science (VIMS) located in Gloucester, Virginia describes the high marsh habitat zone as only flooded during extreme high tides and storm events. Common vegetation found in Eastern Black Rail habitat includes saltmeadow hay (*Spartina patens)*, chairmaker's bulrush (*Schoenoplectus americanus*), saltgrass (*Distichlis spicata*), and various needlerush (*Juncus*) species (Cornell, 2020). The VIMS salt marsh field guide (VIMS n.d.) distinguishes low marsh that is flooded daily during high tides and exposed during low tides (typified by saltmarsh cordgrass, (*Spartina alterniflora*), black needlerush (*Juncus roemerianus*), and saltmarsh bulrush (*Bolboshoenus robustus*)) from high marsh, which has a higher plant species diversity and includes saltmeadow hay, salt grass, sea lavender (*Limonium carolinanum*), big cordgrass (*Spartina cynosuroides*), marsh elder (*Iva frutescens*), among others. This is consistent with the NatureServe Explorer Floristic Summary for the Atlantic & Gulf Coastal High Salt Marsh which describes vegetation in the upper herbaceous or herb-shrub zones that develops between mean daily high tide and spring tides that still receive tidal influence from spring tides, wind tides, or other events (NatureServe n.d.).

5.0 METHODS

AECOM biologists completed a field reconnaissance following a desktop suitability estimate to determine the extent or presence of suitable high marsh Eastern Black Rail nesting habitat within 400 ft from potential construction noise sources. The desktop suitability estimate was qualitative and designed to

guide the field reconnaissance effort which documented vegetation density, composition, and qualitative water level class.

5.1 Desktop Suitability Estimate

AECOM biologists assessed the primary and secondary APE (study area) through analysis of desktop resources prior to field assessment (Figure 3). Historic aerials were also reviewed to estimate where anticipated uplands, high marsh, low marsh, or open water may be located and to guide the planned transect density. Areas anticipated to be open water were noted for spot check during the field survey to determine if a belt transect was required within the 400 ft buffer.

5.2 Field Reconnaissance

Vegetated wetlands and uplands (i.e. not open water) within the study area were evaluated for the presence/absence of suitable Eastern Black Rail high marsh nesting habitat by pedestrian transects spaced approximately 100 ft apart. This spacing was based on the approximate maximum distance that sightlines allowed for visualization of the prior transect line (and not obscured by taller vegetation). During a wetland delineation site visit on July 29, 2020, AECOM biologists noted the extensive monoculture of low marsh west of North Seawall Road. The proposed transect length was reduced and density displayed to 500 ft apart due to the increased sight lines and lack of apparent hummocks or upland islands.

Vegetation zones and transitions among marsh types were located with a hand-held sub-meter accuracy global positioning system (GPS) device to ground truth contour-derived estimates of suitable and unsuitable habitat. Representative photographs of marsh habitat and ecotones were recorded along with semi-quantitative water level class, and vegetation cover type and density. Previously disturbed areas unlikely to encourage bird activities were also recorded with georeferenced photographs.

Alternating colors of photo-degradable flagging tape were used to designate and record the start of each transect lines. Surveyors ran three concurrent transects to use each other as distance cues, ensuring consistent distance to neighboring surveyor. Surveyors used GPS devices to maintain transect lines generally perpendicular to the shoreline and the runway. Uplands and open water areas were spot-checked. In addition to the belt transects, meandering surveys were performed in high marsh habitat with dense stands of reed grass (*Phragmites australis*) due to poor visibility between transects.

Along select points of the transects, representative vegetative cover estimates were recorded for at least three meter-squared quadrats within each upland, high marsh, and low marsh zones within the study area. Vegetation were identified to species where possible according to the *Field Guide to Coastal Wetland Plants of the Southeastern United States* (Tiner, 1987) and cover classes according to Daubenmire (1959, **Table 3**).

Table 3: Vegetation Cover Classes (Daubenmire 1959)

Cover Class	Range of Coverage (%)	Midpoint of Range (%)
1	0-5	2.5
2	5-25	15.0
3	25-50	37.5
4	50-75	62.5
5	75-95	85.0
6	95-100	97.5

Qualitative water level class observations were made along transects to note inundation where:

- 0 = no inundation;
- 1 = surface water at ground level to below the ankle (or top of the toe of a boot);
- 2 = between ankle and knee height;
- 3 = between knee and hip; and
- 4 was deeper than the observer's hip.

As the Eastern Black Rail nesting habitat requires inundation less than one inch (three cm) in depth, water level classes of two or more were considered unsuitable. Desktop delineation of marsh zones were corrected based on georeferenced vegetative field observations. Water depth observations and vegetation density notes were included to remove areas of inundation and unsuitable vegetation composition or density from suitable habitat mapping. Photographs were taken at each vegetation sampling quadrat and along representative vegetation zones and ecotones. It should be noted that the purpose of this habitat survey is not to provide a detailed floral or faunal inventory but to assess the extent and location of suitable high marsh habitat for the Eastern Black Rail and provide a brief characterization of the various salt marsh zonation to provide a thorough review of site conditions in order to verify or adjust the initial desktop findings.

6.0 HABITAT ASSESSMENT RESULTS

The Eastern Black Rail habitat assessment was conducted from August 31 through September 2, 2020 by AECOM biologists. Approximately 40 man-hours were used to survey the approximately 77-acre study area. National Oceanic and Atmospheric Administration (NOAA) tidal water levels during the survey ranged from 0.03 ft to 3.27 ft (**Table 4**). Georeferenced representative photographs taken along transects and spot-checks can be found in **Appendix B.** For general ease of site walking, surveys were completed during lower tides. Therefore, water level classes should be considered conservative with higher inundation levels assumed during higher tides.

A total of 938,590 square feet (22 acres) of high marsh was identified within the study area (**Figure 4**). Most was at or above 2 ft amsl, and typical inundation during the survey ranged between no inundation to inundation up to the observers' knee (i.e., water level class zero to two, **Table 5**). Microtopographic variations in elevation (e.g., hummocks) were not observed. Some upland islands corresponding to higher elevation contours were observed. Vegetative cover and inundation levels were recorded to document areas of high marsh that were unsuitable habitat. High marsh vegetation primarily consisted of saltmeadow hay and reed grass (**Table 6**). Other vegetation species such as sea oxeye (*Borrichia frutescens*), American germander (*Teucrium canadense*), and some scrub-shrub species (wax myrtle [*Myrica cerifera*] and groundsel tree [*Baccharis halimifolia*]) were occasionally found in high marsh. One small area of marginally suitable habitat with black needlerush (*Juncus romarianus*) was mapped on the western portion of the study area (**Photograph 43**). High marsh with inundation category 2 (above the ankle) or more were excluded from suitable habitat (e.g., **Photograph 22**) as were areas of dense reed grass monoculture

(e.g., **Photograph 22**). Areas of high marsh are noted as potentially suitable habitat on **Figure 4,** and representative **Photograph 51**.

Only small tracts of maritime forest were observed in the study area—on the western tip and east of the North Seawall Road along the north and south perimeter of the island. Maritime forest habitat was typically located above four feet amsl. Maritime forest canopy coverage greater than 30 percent was considered forested and unsuitable habitat, if not located within 15 feet of high marsh. Woody species observed within maritime forests consist of a high canopy story of loblolly pine (*Pinus taeda*) and a lower understory or scrub-shrub community including black cherry (*Prunus serotine*), red cedar (*Juniperus virginiana*), American holly (*Ilex opaca*), and wax myrtle. The herbaceous vegetation diversity observed within the understory and groundcover was variable. In some areas herbaceous vegetative cover was less than five percent and dominated by greenbrier species (roundleaf greenbrier [*Smilax rotundifoliaa*], saw greenbrier [*S. bona-nox*], cat greenbrier [*S. glauca*]), or poison ivy (*Toxicodendron radicans*), especially along the edge of disturbed plots along the runway and aviation hangar; and along the transition to the high marsh ecotone (**Table 6**). **Photograph 28** depicts typical areas of minimal herbaceous cover under maritime forest. The coverage is sparse and not suitable for black rail habitat. Some areas had greater than 75 percent absolute coverage of greenbrier which does not provide suitable habitat either (**Table 5**).

Uplands were differentiated from maritime forests as areas with historic runway fill that were considerably disturbed or consistently maintained. They were treated similarly to maritime forest where only the upland edge with high marsh was evaluated for potential habitat. Some upland areas meet the high marsh with an ecotonal edge dominated with dense monoculture stands of reed grass, which is categorized as unsuitable habitat (e.g., **Photograph 24**). The uplands located along the southern boundary of the primary APE east of the North Seawall Road transitioned directly into low marsh/salt meadow habitat. The uplands along the airstrip showed evidence of historic alteration, disturbance, and fill. This area was dominated with maintained turfgrass and is included in the unsuitable habitat category on **Figure 4**.

Open water was typically mapped below elevation 1 ft amsl. Areas of open water were still present within the low marsh/salt meadow during the minimum tide interval as encapsulated shallow pools. The ground cover and soils within these pools contained gleyed soils, no vegetation, and had a inundation between the observers' ankle and hip (i.e., water level class between 2 and 3). During the field survey no submerged aquatic vegetation (SAV) was observed. Open water is included in the unsuitable habitat category on **Figure 4** (e.g., **Photograph 3**).

Low marsh was found at elevations between open water and high marsh (generally 1 to 2 ft amsl). Vegetation primarily included smooth cordgrass (*Spartina alterniflora*, **Table 5**). Other species present to a lesser extent, included Carolina sea lavender (*Limonium carolinianum*), glassworts and saltworts (*Salicoria spp.*), salt grass (*Districhlis spicata*), and salt marsh bulrush (*Scripus robustus*) (e.g., **Photograph 42**). Typical inundation during the survey ranged between no inundation and the observers' hip (water level class 0 to 3, **Table 4**). Low marsh was still evaluated in transects to ensure hummocks of high marsh were not overlooked. Low marsh is noted as unsuitable habitat in **Figure 4**. Maritime forest had no inundation (water level class 0) while inundation in the open water habitat was consistently above the observers' ankle (water level class 2 to 4, **Table 5**). High marsh and low marsh inundation varied from no inundation to between the observers' knee and hip (water level class 0 to 3). Potentially suitable habitat was identified along transects CI-003, MB-006, CI-004, MB-008, KN-004, CI-006, CI-007, and MB-001 as well as nearby transects KN-002 and MB-009 (**Table 7**).

Table 4: Tide summary during habitat assessment

Date	Survey start and end time	Min tide[1] during survey (ft)	Max tide[1] during survey (ft)	Min tide[2] level during survey (ft)	Max tide[2] level during survey (ft)	NOAA daily min tide times[2]	NOAA daily max tide time[2]	Tide station mean tidal range[1] (ft)
8/31/2020	1000-1600	-1.72	-0.02	0.03	2.11	0106 1254	06:4 1924	-1.12
9/01/2020	1000-1600	-1.54	0.66	0.03	2.15	0145 1338	0737 2004	-0.80
9/02/2020	0900-1200	0.12	1.59	1.44	3.27	0220 1420	0818 2043	0.98

[1]USGS Water Data for the USA https://nwis.waterdata.usgs.gov/nwis? for Tide Station USGS 01484746 Chincoteague Bay Inlet at Chincoteague, VA.
[2] NOAA iPhone App Tide Alert v2.1 for Wallops Island, VA (NOAA 2019).

Table 5: Qualitative water level class observations according to habitat zone

Date	Survey time start and end	Maritime Forest	High marsh	Low marsh	Open water
8/31/2020	1000-1600	0	0	1	2-4
9/01/2020	1000-1600	0	0-2	0-1	2-4
9/02/2020	0900-1200	0	1	1-3	2-4

Note: [1]0 = no inundation; 1 = surface water at ground level to below the ankle (or top of the toe of a boot);
2 = between ankle and knee height; 3 = between knee and hip; 4 =is deeper than the observer's hip.

Table 6: Vegetative Plot Summary

		High Marsh Plot ID						Low Marsh Plot ID					Maritime Forest Plot ID			
Herbaceous Plot ID		1	2	3	4	5	6	1	2	3	4	5	1	2	3	4
Alternate Plot Name		HMZ01	HMZ-02	MB HM-012	KN-HMW-004	MB-HMW-005	KN-UP2HM-001	LMZ-01	LMZ-02	CJI-LM-veg	KN-LMW-001	KN-LMW-004	KN-UPZ-006	MB UPZ-013	CJI-Veg-001	KN-WA
Water Level Class		0	0		0	1	0	0	0	0	1	1	0	0	0	0
Plant Name (Tiner, 1987)	**Plant Name (BONAP 2018)**															
Spartina patens	*Spartina patens*	5		6	6	6	6									
Scirpus robustus	*Schoenoplectus robustus*					3										
Spartina alterniflora	*Spartina alterniflora*						1	6		5	6	6				
Phragmites australis	*Phragmites australis*	2	6													2
Smilax rotundifolia	*Smilax rotundifolia*	1											1	2	2	5
Distichlis spicata	*Distichlis spicata*							P	6							
Andropogon virginicus	*Andropogon virginicus*													3		
Toxicodendron radicans	*Toxicodendron radicans*													1		
Teucrium canadense	*Teucrium canadense*	2					2									
Limonium carolinianum	*Limonium carolinianum*								2	1						
Pinus taeda	*Pinus taeda*														2	
Myrica cerifera	*Morella cerifera*														2	
Salicornia depressa	*Salicornia depressa*									1						
Iva frutescens	*Iva frutescens*										P					

Daubenmire Cover Class definition: 1 = 0-5%, 2 = 5-25%, 3 = 25-50%, 4 = 50-75%, 5 = 75-95%, 6 = 95-100%; P = presence noted but not quantified; Maritime Forest herbaceous cover does not include saplings and trees. Water level class 0 = no inundation; 1 = surface water at ground level to below the ankle; 2 = between ankle and knee height; 3 = between knee and hip; 4 =is deeper than the observer's hip.

Table 7: Eastern Black Rail Habitat Summary by Transect

Transect ID	Habitat Identified Along Transect	Vegetation Plot ID	Photo ID
MB-003	None		
MB-001	None	High Marsh Plot 1, Low Marsh Plot 1	1, 2, 3
KN-001	None	Low Marsh Plot 4, High Marsh Plot 6	
CI-001	None		
MB-004	None		4, 5
KN-002	Habitat mapped west of transect		6, 7
CI-002	None		
MB-005	None	High Marsh Plot 5	8
CI-003	Habitat mapped along transect	Maritime Forest Plot 3	9, 46
MB-006	Habitat mapped along transect		10, 47
CI-004	Habitat mapped along transect		48
MB-007	None		
KN-003	None		
CI-005	None		11
MB-008	Habitat mapped along transect		12, 49
KN-004	Habitat mapped along transect	Low Marsh Plot 5, High Marsh Plot 3	50
CI-006	Habitat mapped along transect		
MB-009	Habitat mapped near both sides of transect		
CI-007	Habitat mapped along transect		
MB-010	None		13, 14
KN-005	None		15, 16, 17, 18
MB-011	None		19, 20, 21
MB-012	None		22, 23, 24, 25
KN-006	None		28, 29
MB-013	None	Maritime Forest Plot 2	30, 31, 32, 33
MB-014	None		34, 35
CI-010A	None	Low Marsh Plot 3	36
CI-010	None		
MB-015	None		
CI-011	None		
CI-012	None		
KN0007	None		37
CI-013	None		
MB-016	None		38, 39, 40, 41
MB-001	Habitat mapped along transect	Low Marsh Plot 2	42, 43, 44
Unnamed Meander	None	Maritime Forest Plot 4	45
Unnamed Meander	None	High Marsh Plot 2	

7.0 CONCLUSIONS AND RECOMMENDATIONS

According to the USFWS, the Eastern Black Rail requires high marsh habitats with fine-stemmed emergent vegetation with high stem density and dense canopy cover (USFWS 2020c). Ideal vegetation height is generally less than or equal to one meter. Additionally, high marsh habitat with higher shrub density is not considered ideal habitat. They also require, on average, surface water depths less than one inch (three cm) to prevent eggs in the nest from becoming submerged and chicks' down feathers from becoming waterlogged during brood rearing. Based on these habitat requirements, some areas of high marsh habitat in **Figure 4** were not considered potential habitat due to shrub density being too high (e.g.,

Photo 10), vegetation density being too low, vegetation height being too high (e.g., **Photo 14**), or surface water depths greater than one inch (e.g,. **Photo 23**). Areas field identified as potential Eastern Black Rail marsh suitable nesting habitat are anticipated for species survey in Spring of 2021, during the USFWS and VDWR survey window with an approved methodology and using surveyors with *a priori* credential verification.

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Appendix A: Figures

AECOM

National Aeronautic Space Administration
Wallops Island Flight Facility
2020

Wallops Pier
Accomack County, VA

Last Date Edited: 9/10/2020
Project Number: 60632314

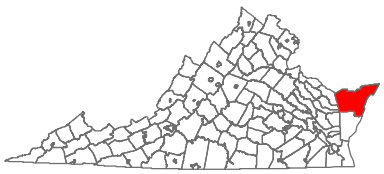
0 2,500 5,000 Feet

Legend

Study Area

Note: This map is for reference only
NAD83 State Plane Virginia North;
Topographic map source: ESRI, 2019

Figure 1
Project Vicinity



Accomack County

AECOM

National Aeronautics and Space Administration
Wallops Flight Facility
2020
Wallops Pier
Accomack County, VA

Last Date Edited: 9/10/2020
Project Number: 60632314

0 500 1,000 Feet

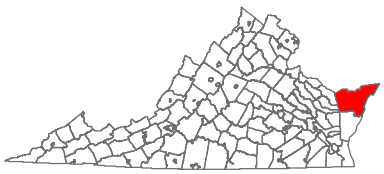
Legend

Study Area

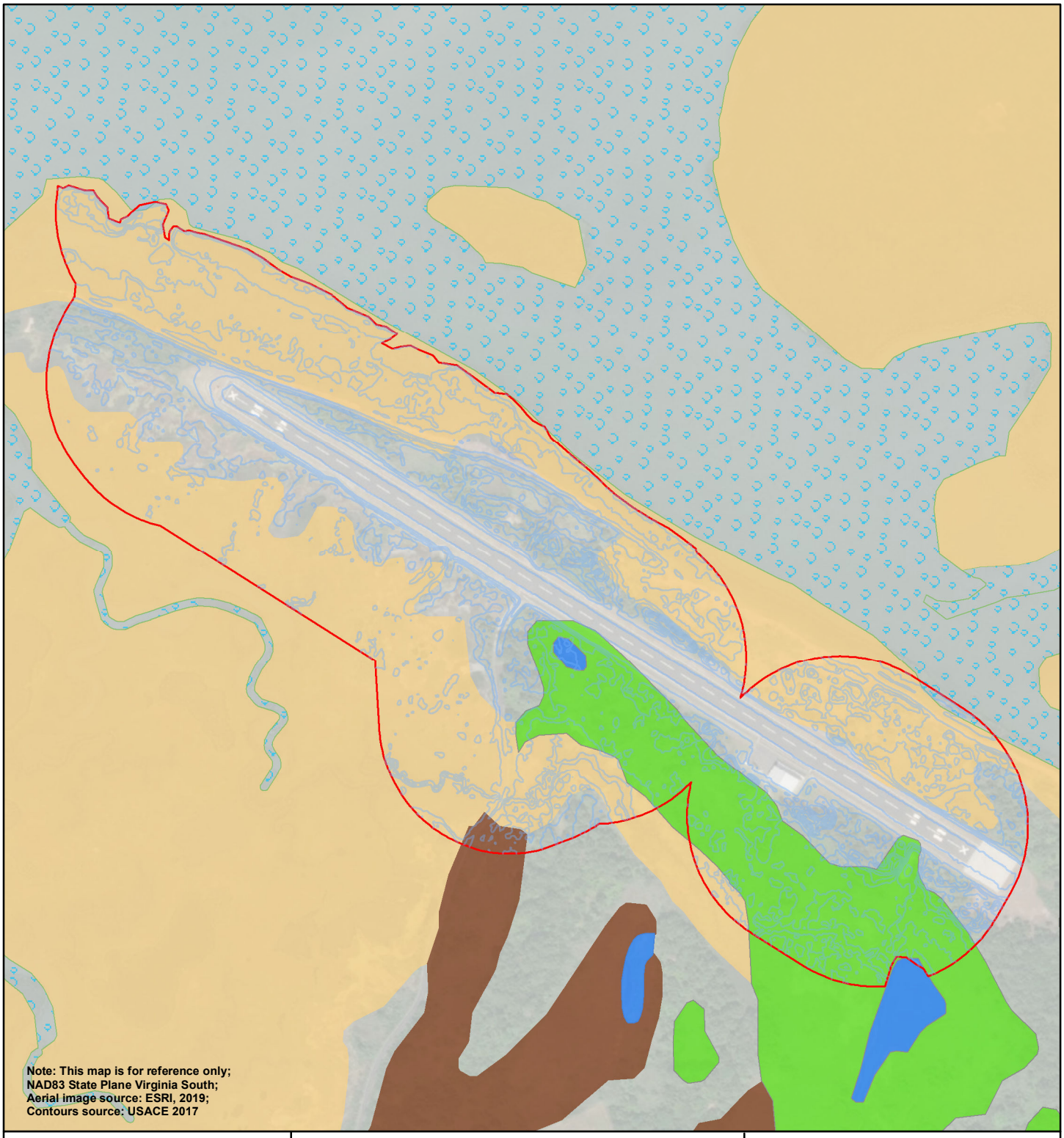
N
W E
S

Notes: This map is for reference only.
NAD83 State Plane Virginia North; Aerial Image Source: ESRI, 2019

Figure 2
Project Location



Accomack County



AECOM

National Aeronautics and Space Administration
Wallops Flight Facility
2020

Wallops Pier
Accomack County, VA

Last Date Edited: 10/19/2020
Project Number: 60617789

Legend

0 250 500 Feet

Study Area

Contours, 1ft. (USACE, 2017)

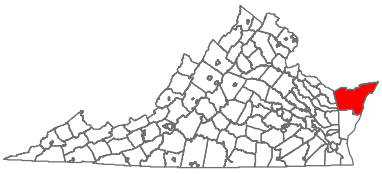
Waters of the US (NWI, 2020)

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

N W E S

Figure 3

Background Resources Map



Accomack County

Figure 4

Laterallus jamaicensis jamaicenses (Eastern Black Rail) Habitat Map

Legend

- Study Area
- Upland and Maritime Forest
- High Marsh
- Low Marsh
- Surface Water
- Potential Eastern Black Rail Habitat
- Dense Phragmites australis
- Transect (MB-001)
- Contours, 1ft (USACE, 2017)

Data Points

- Photo Location (36)
- Vegetation Plot (Low Marsh Plot 1)
- Photo Location and Vegetation Plot

Water Level Class

- 0 (no inundation)
- 1 (ground level to below ankle)
- 2 (ankle to knee)
- 3 (knee to hip)

N

0 200 400

Feet

AECOM

National Aeronautics and Space Agency
Wallops Flight Facility
Accomack Co., Virginia

Date: 11/12/2020

Page 1

Note: This map is for reference only; NAD83 State Plane Virginia South; Aerial Image Source: ESRI, 2019; Habitat assessment dates: 08/31 - 09/02/2020; Contours provided from USACE (2017)

Figure 4

Laterallus jamaicensis jamaicenses (Eastern Black Rail) Habitat Map

Page 2

Legend

- Study Area
- Upland and Maritime Forest
- High Marsh
- Low Marsh
- Surface Water
- Potential Eastern Black Rail Habitat
- Dense Phragmites australis
- Transect (MB-001)
- Contours, 1ft (USACE, 2017)

Data Points

- Photo Location (36)
- Vegetation Plot (Low Marsh Plot 1)
- Photo Location and Vegetation Plot

Water Level Class

- 0 (no inundation)
- 1 (ground level to below ankle)
- 2 (ankle to knee)
- 3 (knee to hip)

N

0 200 400

Feet

Note: This map is for reference only; NAD83 State Plane Virginia South; Aerial Image Source: ESRI, 2019; Habitat assessment dates: 08/31 - 09/02/2020; Contours provided from USACE (2017)

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

AECOM

National Aeronautics and Space Agency
Wallops Flight Facility
Accomack Co., Virginia

Date: 11/12/2020

Appendix B:
Representative Photographs

Photo Type: Typical Vegetation	
Photo ID: 1	**Photo Date:** 8/31/2020
Water Level Class: 0	**Transect:** MB-001
Vegetation Plot: High Marsh Plot 1	
Lat/Long: 37.888191,-75.442321	
Description: Another view of the narrow vegetation coverage with an increase of high scrub (*B. halimifolia, I. frutescens*) densities. The vegetation continues to the western tip of the island and changes to a mono-culture of high density Phragmites.	

Photo Type: Typical Vegetation	
Photo ID: 2	**Photo Date:** 8/31/2020
Water Level Class: 0	**Transect:** MB-001
Vegetation Plot: High Marsh Plot 1	
Lat/Long: 37.888202,-75.442308	
Description: A narrow strip of high marsh vegetation in transect MB-001 between low marsh and maritime forest or scrub-shrub communi-ties.	

Photo Type: Vegetation Plot	
Photo ID: 3	**Photo Date:** 8/31/2020
Water Level Class: 0	**Transect:** MB-001
Vegetation Plot: Low Marsh Plot 1	
Lat/Long: 37.888422,-75.442121	
Description: Monoculture of *Spartina alterniflora* in the low marsh along the northwestern tip of the island. Not suitable habitat due to increase of water levels above 6 cm deep and lack of high stem densities and dense canopy cover.	

Photo Type: Typical Water Level	
Photo ID: 4	**Photo Date:** 9/1/2020
Water Level Class: 0	**Transect:** MB-004
Vegetation Plot: N/A	
Lat/Long: 37.887351,-75.439841	
Description: The high tide rack line was prevalent along the southern edge of the island indicating that area experiences large tidal influences.	

Photo Type: Typical Water Level	
Photo ID: 5	**Photo Date:** 9/1/2020
Water Level Class: 1	**Transect:** MB-004
Vegetation Plot: N/A	
Lat/Long: 37.887556,-75.439770	
Description: During low tide the low marsh along the northern shore line had a water level below 3 cm.	

Photo Type: Typical Vegetation	
Photo ID: 6	**Photo Date:** 9/1/2020
Water Level Class: 0	**Transect:** KN-002
Vegetation Plot: N/A	
Lat/Long: 37.886786,-75.439027	
Description: This high marsh habitat in transect KN-002 exhibits dense vegetation with water levels at or above 3 cm during low tide. This would potentially be suitable habitat if water levels were below 3 cm during high tide for successful nesting habitat.	

Photo Type: Ecotone	
Photo ID: 7	**Photo Date:** 9/1/2020
Water Level Class: 0	**Transect:** KN-002
Vegetation Plot: N/A	
Lat/Long: 37.887569,-75.438536	
Description: Open water on the northern boundary of the study area in transect KN-002.	

Photo Type: Typical Vegetation	
Photo ID: 8	**Photo Date:** 9/1/2020
Water Level Class: 1	**Transect:** MB-005
Vegetation Plot: N/A	
Lat/Long: 37.886893,-75.437950	
Description: The low marsh in transect MB-005 was typified with *Spartina alterniflora* at the density shown.	

Photo Type: Typical Vegetation	
Photo ID: 9	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** CI-003
Vegetation Plot: Maritime Forest Plot 3	
Lat/Long: 37.886150,-75.438130	
Description: Upland vegetation in the maritime forest lack groundcover vegetation density. The vegetation coverage does not provide enough protection from predators and provide shelter from the elements.	

Photo Type: Ecotone	
Photo ID: 10	**Photo Date:** 9/1/2020
Water Level Class: 0	**Transect:** MB-006
Vegetation Plot: N/A	
Lat/Long: 37.886150,-75.437529	
Description: This maritime forest to high marsh ecotone provides unsuitable habitat due to dense woody vine vegetation coverage. This does not provide adequate escape route and mobility from ground dwelling predators.	

Photo Type: Typical Water Level	
Photo ID: 11	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** CI-005
Vegetation Plot: N/A	
Lat/Long: 37.885174,-75.435838	
Description: This unsuitable high marsh habitat displayed water level above 6 cm during low tide. It was surrounded with a dense shrub ecotone to the low marsh.	

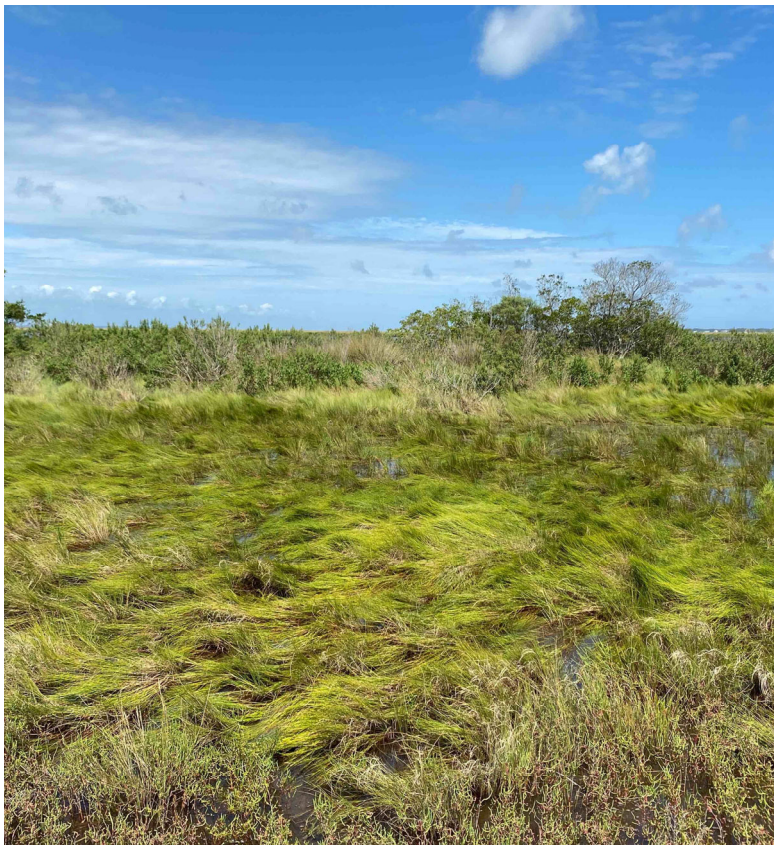


Photo Type: Typical Water Level	
Photo ID: 12	**Photo Date:** 9/1/2020
Water Level Class: 1	**Transect:** MB-008
Vegetation Plot: N/A	
Lat/Long: 37.885046,-75.435175	
Description: This high tide rack line was observed on the northern bank of the island across from the existing hanger. This high tide rack was observed transecting into the high marsh and depositing into pockets in various locations. The topographic change that allows high tidal influences along this portion of the island contributes to the dense phragmites pockets with high water levels. Resulting in poor and unsuitable habitat for nesting. This also indicates that this side of the island experiences high tide surges during storm events.	

Photo Type: Typical Vegetation	
Photo ID: 13	**Photo Date:** 9/1/2020
Water Level Class: 0	**Transect:** MB-010
Vegetation Plot: N/A	
Lat/Long: 37.883676,-75.433623	
Description: This high marsh area displayed unsuitable habitat due to the dense monoculture of *P. australis* with plenty of canopy coverage. In addition, this low-lying pocket had a water level between 10 –38 cm during low tide.	

Photo Type: Typical Water Level	
Photo ID: 14	**Photo Date:** 9/1/2020
Water Level Class: 2	**Transect:** MB-010
Vegetation Plot: N/A	
Lat/Long: 37.883782,-75.433554	
Description: This area of high marsh had unsuitable habitat due to the thick vegetation of *P. australis* and undulated with water levels above 6 cm during low tide. This would not allow adequate mobility and successful nesting conditions.	

Photo Type: Typical Vegetation	
Photo ID: 15	**Photo Date:** 9/1/2020
Water Level Class: 0	**Transect:** KN-005
Vegetation Plot: N/A	
Lat/Long: 37.883402,-75.433041	
Description: This high marsh habitat exhibits dense vegetation with water levels at or above 3 cm during low tide. This would potentially be suitable habitat if water levels were below 3 cm during high tide for successful nesting habitat.	

Photo Type: Dense Phragmites Sites	
Photo ID: 16	**Photo Date:** 9/1/2020
Water Level Class: 0	**Transect:** KN-005
Vegetation Plot: N/A	
Lat/Long: 37.883391,-75.433099	
Description: High density areas of *P. australis* on the edge of the runway in transect KN-005.	

Photo Type: Ecotone	
Photo ID: 17	**Photo Date:** 9/1/2020
Water Level Class: 0	**Transect:** KN-005
Vegetation Plot: N/A	
Lat/Long: 37.883683,-75.432611	
Description: This high tide rack line was observed on the northern bank of the island across from the existing hanger. This high tide rack was observed transecting into the high marsh and depositing into pockets in various locations. The topographic change that allows high tidal influences along this portion of the island contributes to the dense phragmites pockets with high water levels. Resulting in poor and unsuitable habitat for nesting. This also indicates that this side of the island experiences high tide surges during storm events.	

Photo Type: Dense Phragmites Site	
Photo ID: 18	**Photo Date:** 9/1/2020
Water Level Class: 0	**Transect:** KN-005
Vegetation Plot: N/A	
Lat/Long: 37.883969,-75.432347	
Description: High density area of *P. australis* in transect KN-005. Area not suitable for Eastern Black Rail habitat due to area not being adequate for escape routes from predators.	

Photo Type: Ecotone	
Photo ID: 19	**Photo Date:** 9/1/2020
Water Level Class: 0	**Transect:** MB-011
Vegetation Plot: N/A	
Lat/Long: 37.882935,-75.433777	
Description: This maritime forest to high marsh ecotone provides unsuitable habitat due to dense woody vine vegetation coverage. This does not provide adequate escape route and mobility from ground dwelling predators.	

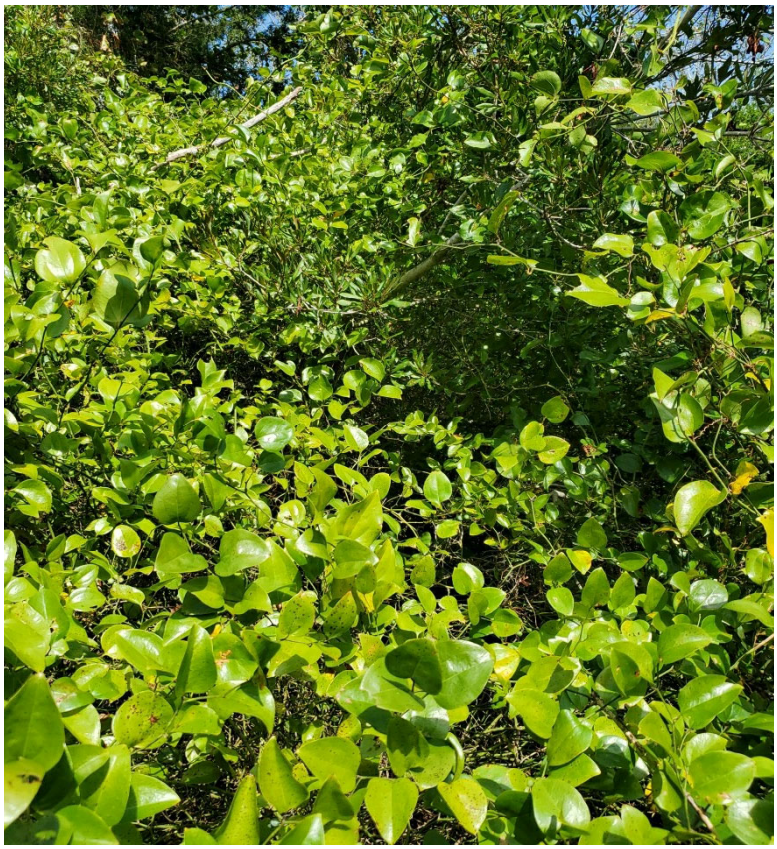


Photo Type: Typical Water Level	
Photo ID: 20	**Photo Date:** 9/1/2020
Water Level Class: 1	**Transect:** MB-011
Vegetation Plot: N/A	
Lat/Long: 37.882888,-75.434057	
Description: Another high marsh area that displayed high water levels above 6 cm during low tide times, which is unsuitable for nesting habitat. This area is located behind the proposed parking area.	

Photo Type: Typical Vegetation	
Photo ID: 21	**Photo Date:** 9/1/2020
Water Level Class: 1	**Transect:** MB-011
Vegetation Plot: N/A	
Lat/Long: 37.882309,-75.435140	
Description: High marsh habitat in transect MB-011 that is not Eastern Black Rail habitat due to the vegetation coverage not being fine-stemmed emergent vegetation.	

Photo Type: Typical Water Level	
Photo ID: 22	**Photo Date:** 9/1/2020
Water Level Class: 1	**Transect:** MB-012
Vegetation Plot: N/A	
Lat/Long: 37.883647,-75.435818	
Description: High marsh habitat with dense *P. australis* and a surface water level too high for Eastern Black Rail habitat in transect MB-012.	

Photo Type: Vegetation Plot	
Photo ID: 23	**Photo Date:** 9/1/2020
Water Level Class: 1	**Transect:** MB-012
Vegetation Plot: High Marsh Plot 3	
Lat/Long: 37.883078,-75.436150	
Description: This is a view of the southern portion of the study area in High Marsh Plot 3 looking toward North Seawall Road. This area was not suitable habitat due to the high water level greater than 6cm. This photo was taken at low tide where water levels reach above 76 cm.	

Photo Type: Vegetation Plot	
Photo ID: 24	**Photo Date:** 9/1/2020
Water Level Class: 1	**Transect:** MB-012
Vegetation Plot: High Marsh Plot 3	
Lat/Long: 37.883080,-75.436163	
Description: View of High Marsh Plot 3 inundated with open wa-ter and densely vegetated with *P. austra-lis* along the southeastern side of the study area behind the existing hangar.	

Photo Type: Vegetation Plot	
Photo ID: 25	**Photo Date:** 9/1/2020
Water Level Class: 1	**Transect:** MB-012
Vegetation Plot: High Marsh Plot 3	
Lat/Long: 37.883135,-75.436250	
Description: High Marsh Plot 3 was densely covered with salt marsh hay; however, only small sporadic vegetation mounds amongst the open water impoundments were available for nesting. This was unsuitable habitat due to minimum areas of low water levels below 3 cm to allow chicks to forage without becoming waterlogged during swim attempts.	

Photo Type: Typical Vegetation	
Photo ID: 26	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** KN-006
Vegetation Plot: N/A	
Lat/Long: 37.884572,-75.436441	
Description: The transition area from high marsh to low marsh with vegetation density being too high for Eastern Black Rail to maneuver in transect KN-005.	

Photo Type: Vegetation Plot	
Photo ID: 27	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** KN-006
Vegetation Plot: Maritime Forest Plot 1	
Lat/Long: 37.884377,-75.436552	
Description: Upland maritime forested area in Maritime Forest Plot 1 located adjacent to the hanger showing lack of ground level vegetation coverage.	

Photo Type: Vegetation Plot	
Photo ID: 28	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** KN-006
Vegetation Plot: Maritime Forest Plot 1	
Lat/Long: 37.884369,-75.436497	
Description: A photo of the Maritime Forest Plot 1 depicted in Photo 27.	

Photo Type: Typical Vegetation	
Photo ID: 29	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** KN-006
Vegetation Plot: N/A	
Lat/Long: 37.883941,-75.436786	
Description: An upland to high marsh transition in transect KN-006 with a high density of *P. australis* excluding this area as potential habitat for Eastern Black Rail.	

Photo Type: Typical Vegetation	
Photo ID: 30	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** MB-013
Vegetation Plot: N/A	
Lat/Long: 37.884458,-75.436980	
Description: High marsh habitat that consisted of *P. australis* cover too dense for Eastern Black Rail habitat in the south central portion of the study area in transect MB-013.	

Photo Type: Typical Water Level	
Photo ID: 31	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** MB-013
Vegetation Plot: N/A	
Lat/Long: 37.884096,-75.437165	
Description: An example of low marsh habitat with water levels too high for Eastern Black Rail habitat in the south central portion of the study area in transect MB-013.	

Photo Type: Vegetation Plots	
Photo ID: 32	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** MB-013
Vegetation Plot: Maritime Forest Plot 2	
Lat/Long: 37.883677,-75.437560	
Description: A photo of typical vegetation in Maritime Forest Plot 2.	

Photo Type: Vegetation Plot	
Photo ID: 33	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** MB-013
Vegetation Plot: Maritime Forest Plot 2	
Lat/Long: 37.883687,-75.437565	
Description: Upland maritime forest vegetation coverage conditions at Maritime Forest Plot 2.	

Photo Type: Typical Water Level	
Photo ID: 34	**Photo Date:** 9/2/2020
Water Level Class: 1	**Transect:** MB-014
Vegetation Plot: N/A	
Lat/Long: 37.884465,-75.437545	
Description: High marsh habitat during low tide in transect MB-014. Water level not ideal for Eastern Black Rail habitat.	

Photo Type: Typical Water Level	
Photo ID: 35	**Photo Date:** 9/2/2020
Water Level Class: 1	**Transect:** MB-014
Vegetation Plot: N/A	
Lat/Long: 37.884352,-75.437526	
Description: Low marsh with water levels too high for Eastern Black Rail habitat in the south-west section of the study area in transect MB-014.	

Photo Type: Vegetation Plot	
Photo ID: 36	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** N/A
Vegetation Plot: Low Marsh Plot 3	
Lat/Long: 37.884336,-75.438655	
Description: This area at Low Marsh Plot 3 showed areas of impounded water during low tide. In addition, the lack of canopy coverage with little to no high marsh habitat along its border along North Seawall Road.	

Photo Type: Ecotone	
Photo ID: 37	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** KN-007
Vegetation Plot: N/A	
Lat/Long: 37.886772,-75.440436	
Description: Open water within the low marsh of transect KN-007 in the southwestern portion of the study area.	

Photo Type: Typical Vegetation	
Photo ID: 38	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** MB-016
Vegetation Plot: N/A	
Lat/Long: 37.887524,-75.441717	
Description: Maintained uplands on the northwestern edge of the runway at transect MB-013.	

Photo Type: Typical Water Level	
Photo ID: 39	**Photo Date:** 9/2/2020
Water Level Class: 1	**Transect:** MB-016
Vegetation Plot: N/A	
Lat/Long: 37.887482,-75.441750	
Description: High marsh habitat in transect MB-016 with stem density too low and water level too high for Eastern Black Rail habitat.	

Photo Type: Ecotone	
Photo ID: 40	**Photo Date:** 9/2/2020
Water Level Class: 0	**Transect:** MB-016
Vegetation Plot: N/A	
Lat/Long: 37.887368,-75.441808	
Description: The transition from high marsh to low marsh in transect MB-016 of the south-west portion of the study area.	

Photo Type: Typical Water Level	
Photo ID: 41	**Photo Date:** 9/2/2020
Water Level Class: 1	**Transect:** MB-016
Vegetation Plot: N/A	
Lat/Long: 37.88725,-75.441945	
Description: Low marsh habitat in transect MB-016 with sparse vegetation density and water levels too high for Eastern Black Rail habitat.	

Photo Type: Vegetation Plot	
Photo ID: 42	**Photo Date:** 8/31/2020
Water Level Class: 1	**Transect:** MB-001
Vegetation Plot: Low Marsh Plot 2	
Lat/Long: 37.887813,-75.442925	
Description: The low marsh water level on the southwestern side of the island during low tide was 1 to 7 cm. There were areas of open water that remain impounded at low tide in Low Marsh Plot 2.	

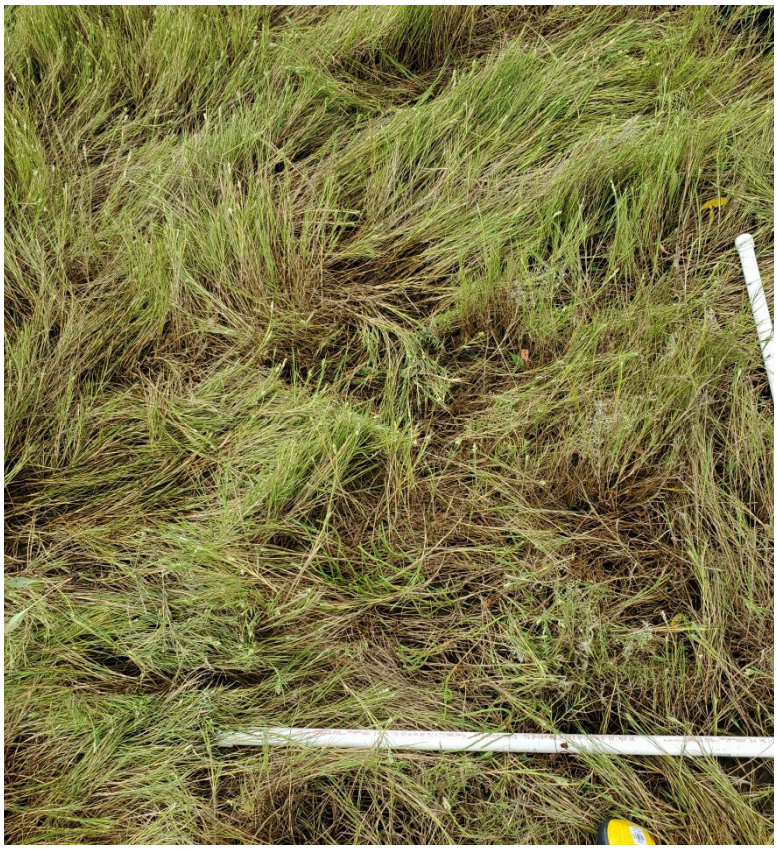


Photo Type: Vegetation Plot	
Photo ID: 43	**Photo Date:** 8/31/2020
Water Level Class: 1	**Transect:** MB-001
Vegetation Plot: Low Marsh Plot 2	
Lat/Long: 37.887819,-75.442935	
Description: There was a small area, approximately 0.10 acre, that had a patch of *Juncus roemerianus* that appeared to be suitable habitat. This was the only location of this species found on the island. Due to the lack in acreage and low canopy coverage, it should be considered only marginal habitat.	

Photo Type: Vegetation Plot	
Photo ID: 44	**Photo Date:** 8/31/2020
Water Level Class: 1	**Transect:** MB-001
Vegetation Plot: Low Marsh Plot 2	
Lat/Long: 37.887819,-75.442935	
Description: View of the southeastern portion of the *J. roemerianus* vegetation in Low Marsh Plot 2, looking along the southern edge of the runway toward North Seawall Road.	

Photo Type: Vegetation Plot	
Photo ID: 45	**Photo Date:** 8/31/2020
Water Level Class: 0	**Transect:** N/A
Vegetation Plot: High Marsh Plot 2	
Lat/Long: 37.885155,-75.437932	
Description: High density areas of *P. australis* on the edge of the runway in High Marsh Plot 2.	

Photo Type: Typical Vegetation	
Photo ID: 46	**Photo Date:** 9/1/2020
Water Level Class: 2	**Transect:** CI-003
Vegetation Plot: N/A	
Lat/Long: 37.886244,-75.437688	
Description: An example of potential Eastern Black Rail Habitat in transect CI-003 on the northern portion of the study area. Dense fine-stemmed herbaceous vegetation with some canopy coverage is present.	

Photo Type: Typical Vegetation	
Photo ID: 47	**Photo Date:** 9/1/2020
Water Level Class: 1	**Transect:** MB-006
Vegetation Plot: N/A	
Lat/Long: 37.886159,-75.437505	
Description: An example of potential Eastern Black Rail Habitat in transect MB-006 on the northern portion of the study area. Dense fine-stemmed herbaceous vegetation with some canopy coverage is present.	

Photo Type: Typical Vegetation	
Photo ID: 48	**Photo Date:** 9/1/2020
Water Level Class: 1	**Transect:** CI-004
Vegetation Plot: N/A	
Lat/Long: 37.885766,-75.436977	
Description: An example of potential Eastern Black Rail Habitat in transect CI-004 on the northern portion of the study area. Dense fine-stemmed herbaceous vegetation with some canopy coverage is present.	

Photo Type: Typical Vegetation	
Photo ID: 49	**Photo Date:** 9/1/2020
Water Level Class: 1	**Transect:** MB-008
Vegetation Plot: N/A	
Lat/Long: 37.884875,-75.435379	
Description: An example of potential Eastern Black Rail Habitat in transect MB-008 on the northern portion of the study area. Dense fine-stemmed herbaceous vegetation with some canopy coverage is present.	

Photo Type: Vegetation Plot	
Photo ID: 50	**Photo Date:** 9/1/2020
Water Level Class: 0	**Transect:** KN-004
Vegetation Plot: High Marsh Plot 4	
Lat/Long: 37.884436,-75.434794	
Description: An example of potential Eastern Black Rail Habitat in transect KN-004 on the northern portion of the study area. Dense fine-stemmed herbaceous vegetation with some canopy coverage is present.	

Photo Type: Typical Vegetation

Photo ID:	**Photo Date:**
51	9/1/2020
Water Level Class:	**Transect:**
0	CI-006

Vegetation Plot: N/A

Lat/Long: 37.884908,-75.434516

Description:

An example of potential Eastern Black Rail Habitat in transect CI-006 on the northern portion of the study area. Dense fine-stemmed herbaceous vegetation with some canopy coverage is present.

NOAA Fisheries Consultation

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

February 28, 2023

Shari A. Miller
NEPA Manager and Environmental Planning Lead
National Aeronautics and Space Administration
Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337-5099

Re: Wallops Island Northern Development, NASA Wallops Flight Facility, Accomack County, Virginia

Dear Ms. Miller:

We have completed our consultation under section 7 of the Endangered Species Act (ESA) in response to your letter dated December 13, 2022, regarding the above-referenced proposed project. We reviewed your consultation request document and related materials. Based on our knowledge, expertise, and your materials, we concur with your conclusion that the proposed action is not likely to adversely affect the NMFS ESA-listed species. Therefore, no further consultation pursuant to section 7 of the ESA is required.

We would like to offer the following information and clarifications to complement your incoming request for consultation. In your description of the proposed action, you state that work on Phase 1 is scheduled to commence in 2022 with completion in 2024. We would like to clarify that, based on the anticipated upper estimate of 24 months to complete Phase 1, construction would occur between 2023 and 2025. For this consultation, we considered a 15-year maintenance dredging cycle. In your description of the action area, you identified "offshore areas potentially affected by pier construction, dredging of channels and turning basins…" We agree that these locations are part of the action area, but would like to clarify that they are part of the action area because they include the maximum extent of the ESA-listed species acoustic behavioral threshold as well as the extent of any turbidity created during in-water construction. In addition, the action area includes all routes traveled by the project vessels, such as from the homeport of the project vessels to the project site, which may be unknown at this time.

In your section identifying ESA-listed species that may occur in the action area, we would like to clarify that ESA-listed large whales (North Atlantic right whales and fin whales) were not considered because of the shallow waters within the action area. We would also like to clarify that, for the same reason, we believe giant manta rays will not occur within the action area.

With respect to the effects of the action, in your analysis of pile driving noise, we would like to clarify that because the noise from pile driving will not exceed the injury or behavioral thresholds for sea turtles, you should conclude that the effects should not be considered further instead of making an insignificant determination. In your analysis of the effects of bottom disturbance during construction, we would like to clarify that because the habitat disturbance

would affect a relatively small amount of the available habitat within the action area and because of the temporary nature of the disturbance, the project is expected to result in negligible reductions in benthic shellfish and infaunal organisms that serve as prey for ESA-listed species. Therefore, the effects of habitat modification are too small to be meaningfully measured or detected and are insignificant. We would also like to provide some clarification regarding effects of bottom disturbance during maintenance dredging. Given that there will be only approximately one (1) dredging event approximately every 3-6 years, this will allow benthic habitat to recover enough to provide forage in between dredge events. Additionally, habitat surrounding the action area provides foraging for listed species, and thus individuals are not limited to only opportunistically foraging within the Action Area. As such, aggregate effects of repeated habitat disturbance on listed species will not accumulate over time and effects are expected to be too small to be meaningfully detected and are therefore insignificant. Protection measures and Best Management Practices (BMPs) will also be implemented during maintenance dredging events.

The offshore borrow area and the effects of dredge disposal at the site were previously considered in a Biological Opinion we issued on August 3, 2012 (Biological Opinion on the Wallops Flight Facility Shoreline Restoration and Infrastructure Protection Program (as amended, September 26, 2014)). Because dredge material may be also used for beach renourishment, we would like to provide clarification regarding water quality impacts. Wilber et al. (2006) reported that elevated total suspended sediment (TSS) concentrations associated with an active beach nourishment site were limited to within 1,312 feet (400 meters) of the discharge pipe in the swash zone (defined as the area of the nearshore that is intermittently covered and uncovered by waves). Another study, conducted five years later, found that the turbidity plume and elevated TSS levels were expected to be limited to a narrow area of the swash zone up to 1,640 feet (500 meters) down-current from the discharge pipe (Burlas et al. 2001). Considering beach nourishment materials consist primarily of coarse sands, plumes from the discharge should settle rapidly and not affect large areas. Based on this and the best available information, TSS concentrations created by beach nourishment operations along an open coastline are expected to be between 34.0-64.0 mg/L; limited to an area approximately 1,640 feet (500 meters) down-current from the discharge pipe; and, settle within several hours after discharge cessation. The TSS levels expected for beach nourishment (up to 64.0 mg/L) are below those shown to have adverse effect on fish (typically up to 1,000.0 mg/L; see summary of scientific literature in Burton 1993; Wilber and Clarke 2001) and benthic communities (390.0 mg/L (EPA 1986)). Therefore, the effects of water quality from beach renourishment are too small to be meaningfully measured or detected, and are insignificant.

In the section discussing potential effects associated with construction of the pier, we would like to clarify that the proposed pier will result in the shading of approximately 40,000 square feet of habitat. Benthic habitats can be impacted indirectly by shading by overwater structures. Shading has been found to adversely affect tidal marshes, submerged aquatic vegetation, and benthic invertebrate communities (Struck et al. 2004). Since no shellfish beds or submerged aquatic vegetation occur in this area, impacts to habitat from shading are expected to be insignificant.

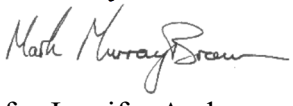
In your discussion of impacts from vessel interactions, we would like to clarify that adding vessels to the existing baseline will not increase the risk that any vessel in the area will strike an individual or will increase it to such a small extent that the effect of the action (i.e., any increase in risk of a strike caused by the project) cannot be meaningfully measured or detected. Therefore, because any increase in risk of a vessel interaction with listed species is too small to be meaningfully measured or detected, the analysis supports a determination that effects are insignificant. These clarifications do not alter your analysis or conclusion and thus no further consultation pursuant to section 7 of the ESA is required.

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 CFR part 402 in 2019 ("2019 Regulations," see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court's July 5 order. On November 14, 2022, the Northern District of California issued an order granting the government's request for voluntary remand without vacating the 2019 regulations. The District Court issued a slightly amended order two days later on November 16, 2022. As a result, the 2019 regulations remain in effect, and we are applying the 2019 regulations here. For purposes of this consultation and in an abundance of caution, we considered whether the substantive analysis and conclusions articulated in the letter of concurrence would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different.

Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in the consultation; (b) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this consultation; or (c) If a new species is listed or critical habitat designated that may be affected by the identified action. No take is anticipated or exempted. If there is any incidental take of a listed species, reinitiation would be required.

Should you have any questions about this correspondence please contact Brian Hopper at 240-628-5420 or by email (brian.d.hopper@noaa.gov). For questions related to Essential Fish Habitat please contact Mr. David O'Brien, with our Habitat and Ecosystem Services Division at 804-684-7828 or david.l.obrien@noaa.gov.

Sincerely,



for Jennifer Anderson
Assistant Regional Administrator
for Protected Resources

ECC: O'Brien, NMFS HESD
ECO: GARFO-2022-03514
File Code: H:\Section 7 Team\Section 7\Non-Fisheries\NASA\2023\Wallops Island Northern Development

Kisak, Natalie

From: Miller, Shari (WFF-2500) <shari.a.miller@nasa.gov>
Sent: Tuesday, December 13, 2022 4:28 PM
To: jennifer.anderson@noaa.gov
Cc: David O'Brien (david.l.obrien@noaa.gov); Brian Hopper (Brian.D.Hopper@noaa.gov); Bahnson, Sara E CIV USARMY CENAO (USA); Finio, Alan (MARAD); Meyer, T J (WFF-2500); Finch, Kimberly (GSFC-2500); Levine, Lori (GSFC-2500); Brittingham, Alan L. (WFF-013.0)[Virginia Commercial Space Flight Authority]
Subject: RE: Project Review Request, Wallops Island Northern Development, NASA WFF
Attachments: NASA WFF WIND - NOAA_TE Consult Ltr_121322.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Ms. Anderson:

Based upon public comments received on the draft Wallops Island Northern Development Environmental Assessment (WIND EA) and your agency's comments on the Section 7 consultation letter, NASA Wallops Flight Facility and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) are resubmitting the attached consultation. NASA and VA Space propose to construct of a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

Based on the analysis in the attached assessment, all effects of the Proposed Action would be insignificant and/or discountable, we have determined that the Wallops Island Northern Development Project may affect but is not likely to adversely affect any listed species or critical habitat under NOAA Fisheries' jurisdiction. We certify that we have used the best scientific and commercial data available to complete this analysis. We request your concurrence with this determination.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Thank you.

Shari A. Miller
Center NEPA Manager and
Natural Resources 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/

"The smallest act of kindness is worth more than the grandest intention." – Oscar Wilde

---

From: Miller, Shari A. (WFF-2500)
Sent: Wednesday, November 10, 2021 12:11 PM
To: jennifer.anderson@noaa.gov
Cc: Nate Overby <nathan.overby@vaspace.org>; David O'Brien (david.l.obrien@noaa.gov) <david.l.obrien@noaa.gov>; Brian Hopper (Brian.D.Hopper@noaa.gov) <Brian.D.Hopper@noaa.gov>; brian.c.denson@usace.army.mil; Finio, Alan (MARAD) <alan.finio@dot.gov>; TJ Meyer <theodore.j.meyer@nasa.gov>; Kimberly Finch (GSFC-2500) (kimberly.s.finch@nasa.gov) <kimberly.s.finch@nasa.gov>; Levine, Lori M. (GSFC-2500) <lori.m.levine@nasa.gov>
Subject: Project Review Request, Wallops Island Northern Development, NASA WFF

Dear Ms. Anderson:

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) proposes to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

Based on the analysis in the attached assessment, all effects of the Proposed Action would be insignificant and/or discountable, we have determined that the Wallops Island Northern Development Project may affect but is not likely to adversely affect any listed species or critical habitat under NOAA Fisheries' jurisdiction. We certify that we have used the best scientific and commercial data available to complete this analysis. We request your concurrence with this determination.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Thank you.

Shari A. Miller
Center NEPA Manager &
Natural Resources Manager
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/

"Remember there's no such thing as a small act of kindness. Every act creates a ripple with no logical end." —Scott Adams

National Aeronautics and Space Administration

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

Reply to Attn of: 250.W

December 13, 2022

Ms. Jennifer Anderson
Protected Resources Division
Greater Atlantic Regional Fisheries Office
NOAA Fisheries Service
55 Great Republic Drive
Gloucester, Massachusetts 01930

Re: Project Review Request, Wallops Island Northern Development, NASA Wallops Flight Facility, Accomack County, Virginia

Dear Ms. Anderson:

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) proposes to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel (**Figures 1 and 2**). NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfill their requirements.

NASA is preparing an Environmental Assessment (EA) in compliance with NEPA to analyze the potential effects of the proposed action on the environment. The EA will be tiered from the May 2019 *NASA WFF Site-Wide Programmatic Environmental Impact Statement* (PEIS), in which NASA evaluated the environmental consequences of constructing and operating new facilities and infrastructure at WFF.

The purpose of this letter is to provide information about the proposed project and to request your concurrence with our determinations regarding potential effects on federally listed threatened and endangered species under National Oceanic and Atmospheric Administration (NOAA) Fisheries jurisdiction in the action area. Additionally, NASA and VCSFA, along with MARAD and USACE, are concurrently consulting with the U.S. Fish and Wildlife Service (USFWS) on terrestrial species under their jurisdiction in the action area.

Background

The goal of the MARAD Marine Highway Program is to expand the use of America's navigable waterways; to develop and increase marine highway service options; and to facilitate their further integration into the current U.S. surface transportation system, especially where water-based transport is the most efficient, effective, and sustainable option (MARAD 2019a). The M-95

Marine Highway Corridor includes the Atlantic Ocean coastal waters; Atlantic Intracoastal Waterway; and connecting commercial navigation channels, ports, and harbors spanning 15 states including Virginia. The proposed Wallops Island M-95 Intermodal Barge Service project has the potential to support the growth of existing operations at WFF, enhance science, technology, engineering, and math (STEM) research opportunities, and spur high-tech/high-paying jobs in a predominantly rural area (MARAD 2019b).

VCSFA was created in 1995 by the General Assembly of the Commonwealth of Virginia to promote the development of the commercial space flight industry, economic development, aerospace research, and STEM education throughout the Commonwealth. In 1997, the VCSFA entered into a Reimbursable Space Act Agreement with NASA, which permitted the use of land on Wallops Island for launch pads. VCSFA also applied for and was granted a Federal Aviation Administration (FAA) license for launches to orbital trajectories. This led to the establishment of the Mid-Atlantic Regional Spaceport (MARS) which is owned and operated by VCSFA.

Development of a port and operations area to support the activities of NASA, WFF tenants, and MARS at the north end of Wallops Island was evaluated at a programmatic level of detail in the 2019 *Final Site-wide PEIS* (NASA 2019). NASA has several long-term tenants and customers that use the WFF research airport and Wallops Island launch range, its facilities, and airspace.

Description of the Proposed Action

Under the Proposed Action, the MARS Port, including a 398-meters (m) (1,305-feet [ft]) fixed pier and turning basin, would be constructed adjacent to the unmanned aerial system (UAS) airstrip located at the north end of Wallops Island (**Figures 1 and 2**). The MARS Port would provide a port and operations area along with associated capabilities for VCSFA, NASA WFF, and other customers. The MARS Port would also serve as a new intermodal facility as part of the MARAD M-95 Marine Highway Corridor. Upland infrastructure (new facilities and improvements to the existing access road, airstrip, and utilities) would likewise be constructed/installed as part of the Proposed Action. Access road improvements would include widening of an existing culvert. Although shown for completeness in **Figure 2**, upland activities that would not affect species under NOAA Fisheries jurisdiction are not discussed further.

The Proposed Action would also include the dredging of a new and existing channel to enhance the vessel approach to the pier (**Figure 3**). Mechanical dredging (i.e., clamshell bucket dredge) would be utilized for all dredging activities associated with the Proposed Action. The dredging process consists of lowering the bucket to the channel or basin floor, closing the bucket and raising it back to the water surface, and depositing the dredged material into a scow. The vessel approach channel, which interfaces with two Federal waterways, the Chincoteague Inlet Channel and the Chincoteague Inlet to Bogues Bay connecting waters, would initially be used by a variety of shallow-draft, manned and unmanned vessels. Ultimately, the proposed channel would have a length of approximately 3,900 m (12,800 ft), a width of 30 m (100 ft), and a final depth of 3.7 m (12 ft) below mean lower low water (MLLW). Components of the Proposed Action are further described below.

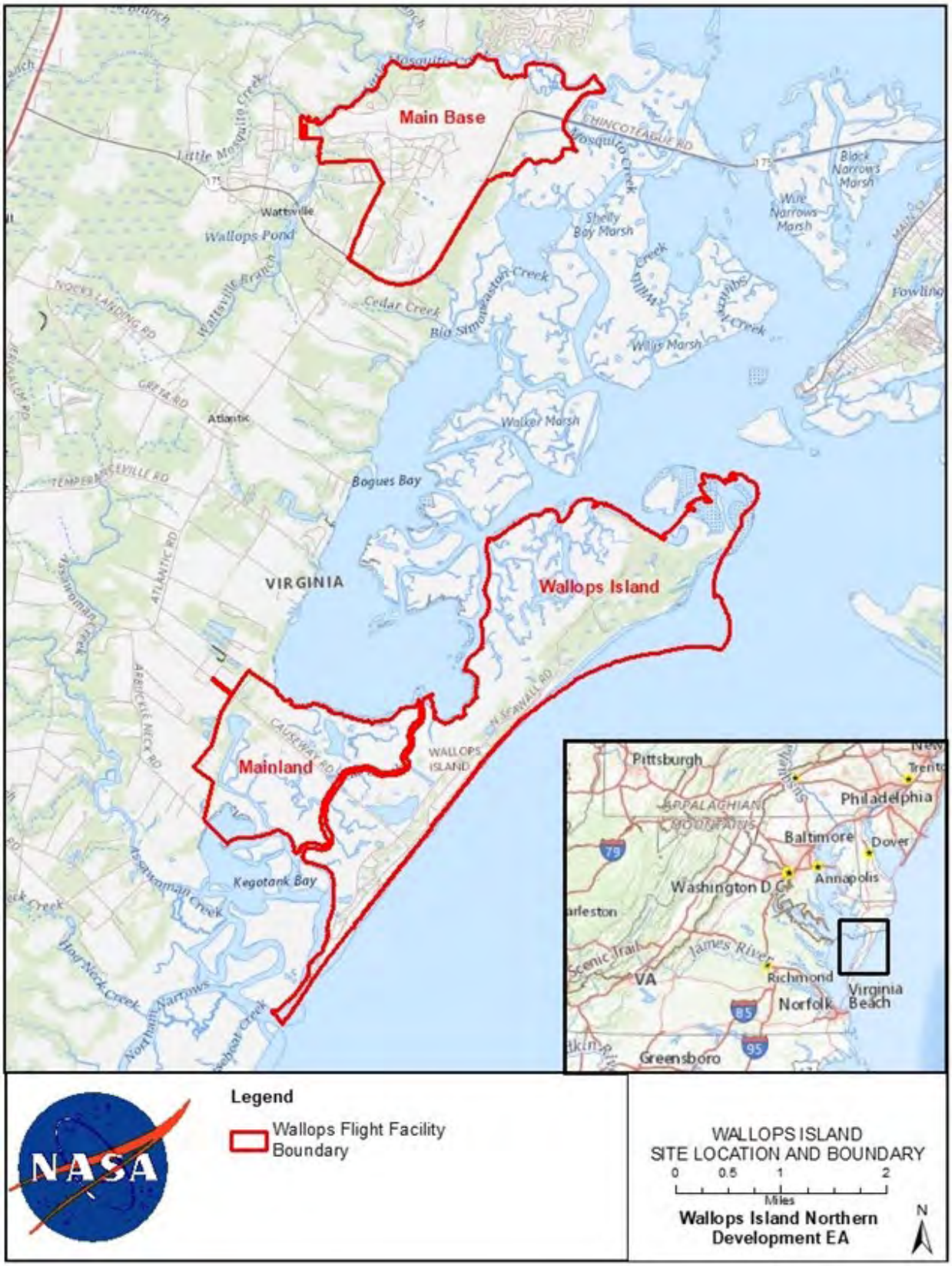


Figure 1. NASA WFF Location

Figure 2. Proposed MARS Port and Infrastructure Components

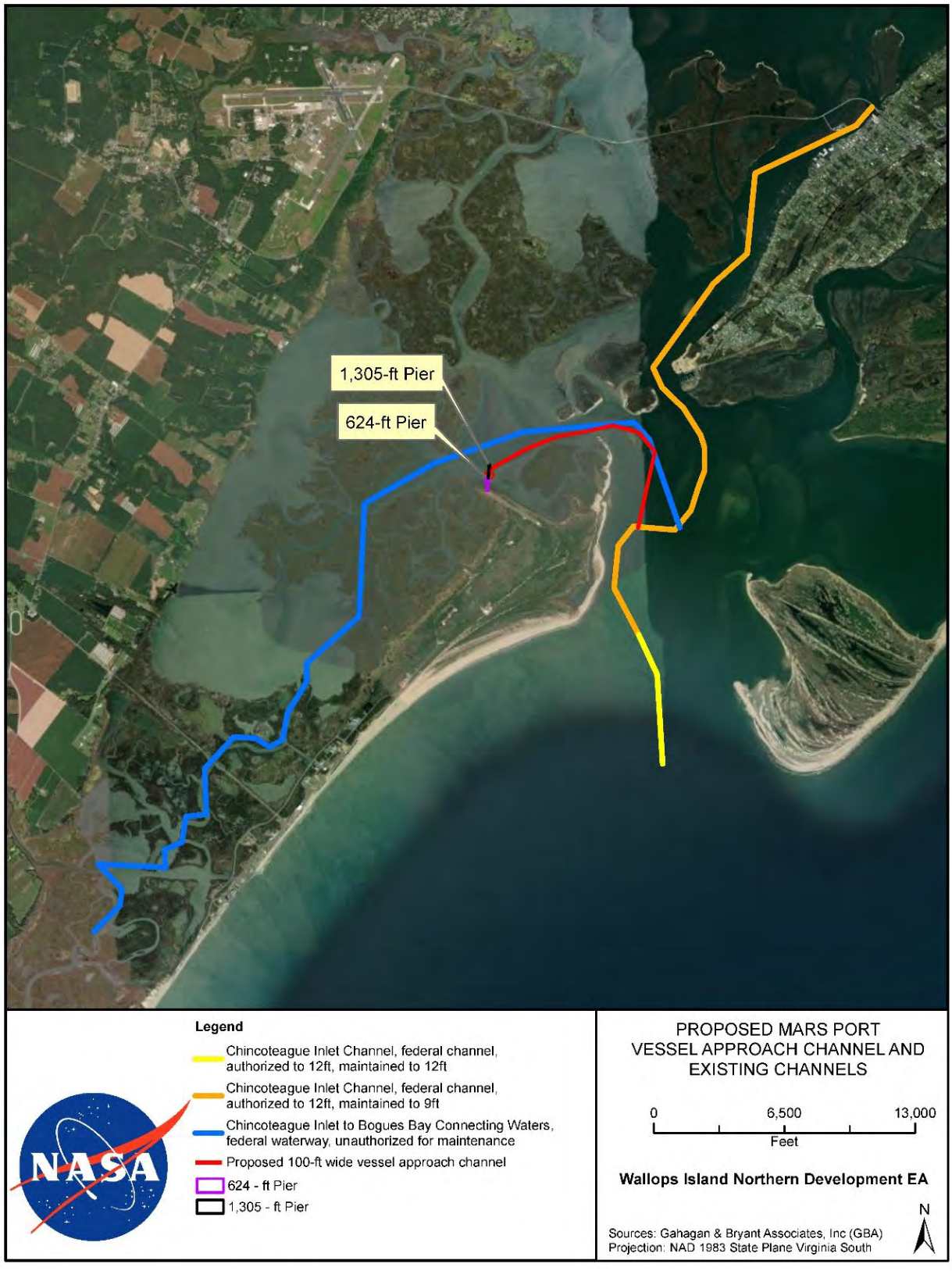


Figure 3. Proposed MARS Port Vessel Approach Channel and Existing Channels

Proposed Action In-Water Components

The MARS Port, including a 398-m (1,305-ft) fixed pier and turning basin would be constructed on (and within the vicinity of) the UAS Airstrip located at the north end of Wallops Island. The MARS Port would provide a port and operations area along with associated capabilities for MARS, NASA WFF, and other customers. The MARS Port would also serve as a new part of the MARAD M-95 Marine Highway Corridor.

The Proposed Action would also include the dredging of an existing channel for enhanced vessel approach purposes. The vessel approach channel, which would interface with both the Chincoteague Inlet Federal Channel and the Bogues Bay connecting waterways, would be used by a variety of manned and unmanned vessels. It would be approximately 3,900 m (12,800 ft) long, 30 m (100 ft) wide, and would have a final depth of 3.7 m (12 ft) below MLLW.

Construction of the Proposed Action would be carried out in three phases:

- **Phase 1** would be construction of a 190-m (624-ft) fixed pier, a 61-m (200-ft) radius turning basin 2.7 m (9 ft) deep below MLLW and dredging of the vessel approach channel to a final depth of 1.5 m to 2.7 m (5 ft to 9 ft) below MLLW (red outline in **Figure 4**). Additionally, improvements would be made to the existing paved UAS Airstrip access road and a temporary wastewater holding tank would be installed adjacent to a new onshore hangar. A 40-m (130-ft) long segment of the access road would be widened from 4.5 m to 9 m (15 ft to 30 ft) in conjunction with the widening of the culvert over which the road crosses a headwater drainage channel to Cow Gut.
- **Phase 2** would be construction of a 206-m (676-ft) extension of the fixed pier to a total length of 398 m (1,305 ft) and dredging of a 61-m (200-ft)-radius turning basin (located at the end of the pier extension; shaded pink on **Figure 4**) to a final depth of 2.7 m (9 ft) below MLLW. Phase 2 would begin approximately 1 to 2 years after Phase 1 is complete.
- **Phase 3** of construction would be additional dredging of the turning basin and vessel approach channel to a final depth of 3.7 m (12 ft) below MLLW, specifically the portion of the channel from the Phase 2 turning basin to where it meets the Chincoteague Inlet Federal Channel (shaded blue on **Figure 4**). The previously dredged area that would be dredged again to increase its depth would total approximately 13.4 hectare (ha) (33 acre [ac]). Phase 3 would begin approximately 1 to 2 years after Phase 2 is complete.

Phases for the Proposed Action would be driven by customer need, which would increase operational tempo, and ultimately be tied to available funding. Each phase would help to expand the operational capability provided by the MARS Port to support the anticipated increase in WFF launch frequency and meet the need of commercial launch service providers to barge rocket components, payloads, and hardware directly to Wallops Island.

The portion of the channel shown in pink on **Figure 4**, which connects the vessel approach channel to the Phase 2 turning basin, is naturally deeper than 2.7 m (9 ft) below MLLW and, therefore,

would not require any dredging during Phase 2. The estimated timeline for construction of the Proposed Action would have Phase 1 beginning in 2022 and being completed by 2024, with subsequent phases occurring approximately 1 to 2 years after completion of the prior phase. Thus, construction of the Proposed Action would take a total of between 22.5 months and 24 months of active work to complete (not including the lag time between phases), depending on whether pier construction and dredging activities would occur concurrently or consecutively Additional information about the proposed piers and other port components is provided in Chapter 2 of the Draft EA.

Typical equipment used during pier construction would include crane barges, material barges, dredging vessels, tugboat, vibratory pile hammer, diesel impact hammer, concrete truck, concrete pump truck, concrete vibrator, generator, welding machines, cutting torches, and various small tools. Concrete pilings would be installed using a soft-start procedure. The soft-start method involves initially driving the pile with a low hammer energy that is gradually increased to allow marine mammals that may be in the action area to detect the presence of noise-producing activities and to depart the area before full-power pile-driving begins. The soft-start procedure would not begin until the exclusion zone surrounding the project location is monitored/cleared for the presence of marine mammals and sea turtles.

A variety of shallow-draft (0.6- to 1.2-m [2- to 4-ft]), manned and unmanned vessels would be serviced by the port. The major navigational service would be a tug and barge configuration of an approximately 45-m by 12-m (150-ft by 40-ft) deck barge propelled by a tugboat requiring approximately 2.4 m (8 ft) of draft. Vessels originating from overseas or from the Ports of New York/New Jersey, Norfolk (Virginia), Baltimore (Maryland), Philadelphia (Pennsylvania), or Wilmington (Delaware) would enter the Chincoteague Inlet Federal Channel and the Bogues Bay connecting waterways to the proposed approach channel and turning basin for the pier (**Figure 3**). The proposed width of the approach channel, approximately 30 m (100 ft), is consistent with the dimensions of the Federal Channel. Estimated dredging volumes for the vessel approach channel and turning basin are provided in **Table 1**.

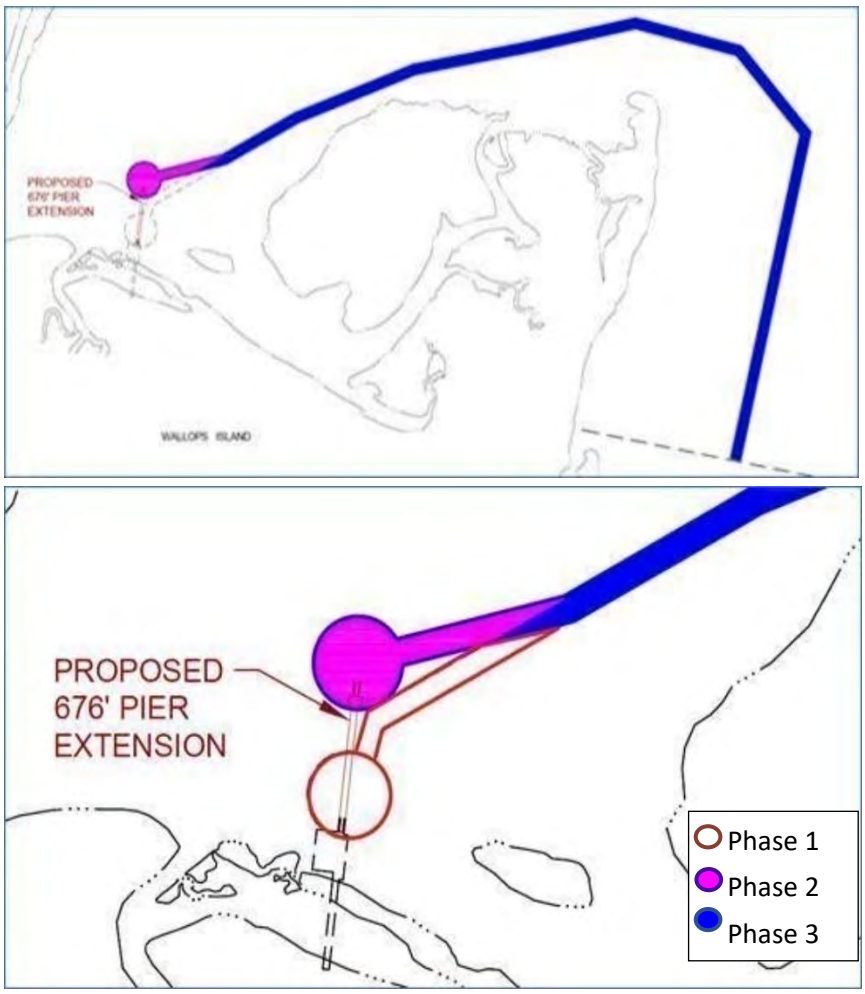


Figure 4. Diagram of Proposed Phased Construction

Table 1. Channel Dimensions and Estimated Dredging Volumes			
	Phase 1	**Phase 2**	**Phase 3**
Channel depth (depth below MLLW)	2.7 m (9 ft)	2.7 m (9 ft)	3.7 m (12 ft)
Channel length	3,900 m (12,800 ft)	3,600 m (11,800 ft)	3,600 m (11,800 ft)
Channel dredging volume	11,500 m^3 (15,100 yd^3)	0	26,500 m^3 (34,600 yd^3)
Turning basin dredging volume	31,000 m^3 (40,500 yd^3)	600 m^3 (800 yd^3)	2,500 m^3 (3,200 yd^3)
Total volume per phase	42,500 m^3 (55,600 yd^3)	600 m^3 (800 yd^3)	29,000 m^3 (37,800 yd^3)
		Total Volume (Phases 1–3):	**72,100 m^3 (94,200 yd^3)**

m^3 = cubic meters, yd^3 = cubic yards

Dredged Material Placement Decision

The five potential sites considered for the placement of dredged material are summarized in **Table 2** and shown on **Figure 5**. The Proposed Action (Phases 1, 2, and 3) would result in a total volume of 72,100 m^3 (94,200 yd^3) of dredged material requiring placement. VCSFA intends to utilize Option 4, the Wallops Island Shoreline Protection Placement, as the preferred dredged material placement option. While Option 1 is the most economical solution, as it offers the lowest estimated mobilization costs as well as the lowest unit costs for dredging, transport, and placement, Option 4 is the most beneficial reuse of the material. The dredged material placed on Wallops Island is required to have the same physical characteristics (90%+ sand) as the natural beach, and anything with a higher fine-grained content would not be suitable. Based on the geotechnical borings for the proposed project, the material is composed of approximately 95% sand and, therefore, would be suitable for shoreline renourishment. The geotechnical report for the MARS Port is provided as Attachment 1.

The material dredged during Phase 1 (between 42,000 m^3 and 43,000 m^3 [56,000 y^3 and 57,000 y^3]) would be placed into the North Wallops Island beach borrow area to speed the recovery of this area for shoreline habitat. This borrow area was used as the source of sand to renourish the beach along the shoreline infrastructure protection area that was analyzed in the Final EA for the NASA WFF Shoreline Enhancement and Restoration Project (SERP) (NASA 2019c). For the Phase 2 and Phase 3 dredging and future maintenance dredging, NASA and MARS may work with the schedule for dredging events so that they coincide with ongoing shoreline renourishment actions as part of the SRIPP, and the material would be placed somewhere within the SERP Area. The SERP area includes the Wallops Island shoreline infrastructure protection area and the North Wallops Island beach borrow area.

Maintenance dredging of the basin and channel would be repeated periodically as necessary to maintain the required depth and is expected to be infrequent and of short duration. Estimates of future maintenance dredging requirements have been made using historic dredge records made available by the Norfolk District of the USACE. It was assumed that the proposed channel could be maintained at a navigable depth of 2.7 m (9 ft) or 3.6 m (12 ft) MLLW, and that different regions of the proposed channel would have different dredging requirements because of location and wave influence. The estimated dredging volume and interval is highly variable because federal navigation channel dredging records indicate that channel migration has occurred historically. Further, 2019 and 2021 survey data show large naturally occurring changes in the bathymetry that can require dredging to maintain the proposed channel alignment. Therefore, future dredging events could range from every 3 to 6 years with annualized dredge volumes ranging from 1,100 to 9,200 cubic meters per year (m^3/yr) (1,400 to 12,000 cubic yards per year [yd^3/yr]), depending on the depth and location(s) that need to be dredged.

Table 2. Potential Dredged Material Placement Sites							
Option	**Site**	**Description**	**Sail Distance from Basin[1]**	**Pipe Distance from Basin[2]**	**Sail Distance from Channel**	**Pipeline Distance from Channel**	**Description**
1	Wallops Open Ocean Dredge Material Placement Area	Open water placement site, closer than Lewis Creek or Norfolk Ocean disposal sites	9.8 km (6.1 mi)	--	7.1 km (4.4 mi)	--	This area is located just offshore of Wallops Island with a transportation distance of the dredged material of approximately 7.4 km (4 nautical mi). Open water placement options typically present the lowest cost dredging option and allows for the widest array of dredging equipment ranging from clamshell dredges to barge mounted excavators supplying dump barges or specially modified deck barges that are towed by tugboats to the dredged material placement site. Open water placement locations are controlled by the USACE and a CWA Section 404 permit would be required for the use of this site
2	Wallops Island Flood Protection/ Upland Placement	Reuse of material for flood mitigation through upland placement at site identified by NASA	--	850 m (2,800 ft)	--	3,700 m (12,040 ft)	This option involves the beneficial reuse of material for flood mitigation through upland placement in low lying areas on Wallops Island. For example, there are low lying areas in the vicinity of the culvert crossing the main access road to the UAS airstrip. This option was evaluated based on having a cutter suction dredge pump the material into this area. This option would also require development of containment measures for the dredged material in the form of containment dikes and the channeling of the effluent and its return into Bogues Bay. This effluent is the water that is used in the dredging process to transport the dredged material in slurry form to the placement location. Other alternatives could include thin layer placement for marsh enhancement in marsh areas a similar distance to the dredging location, or the use of geotubes, or synthetic membranes, for containing the dredged material.

Table 2. Potential Dredged Material Placement Sites							
Option	**Site**	**Description**	**Sail Distance from Basin[1]**	**Pipe Distance from Basin[2]**	**Sail Distance from Channel**	**Pipeline Distance from Channel**	**Description**
3	Greenbackville, VA, Dredged Material Containment Facility (DMCF)	Upland DMCF run by USACE, requires both navigation of Chincoteague Channel and pumping on location	18.2 km (11.3 mi)	--	15.3 km (9.5 mi)	200 m (650 ft)	The third dredged material placement option identified is the use of the upland Dredged Material Containment Facility (DMCF) owned and managed by the USACE. The USACE places material dredged from the upper reaches of the Chincoteague Channel into this DMCF. This option would require using a mechanical dredge to load the dredged material removed from the approach channel into barges. These barges would then be towed approximately 18.5 km (10 nautical mi) to the DMCF. A specialized hydraulic unloader would be required to discharge the dredged material from the transport barges and pump the material into the DMCF.

Table 2. Potential Dredged Material Placement Sites							
Option	**Site**	**Description**	**Sail Distance from Basin[1]**	**Pipe Distance from Basin[2]**	**Sail Distance from Channel**	**Pipeline Distance from Channel**	**Description**
4	Wallops Island Shoreline Protection Placement	Reuse of material for shoreline protection and beach repair	12.1 km (7.5 mi)	--	9.7 km (6 mi)	--	This option would involve the beneficial reuse of clean, compatible sand from the dredged material to repair and protect areas of the shoreline on Wallops Island. Based on the March 2021 geotechnical borings for the proposed project, the material is anticipated to be composed of approximately 95 percent sand and, therefore, would be suitable for shoreline renourishment. The material would be placed into the North Wallops Island beach borrow area to speed the recovery of this area for shoreline habitat. This borrow area was used as the source of sand to renourish the beach along the shoreline infrastructure protection area that was analyzed in the Final EA for the NASA WFF Shoreline Enhancement and Restoration Project (SERP) (NASA 2019c). This action was part of the WFF Shoreline Restoration and Infrastructure Protection Program (SRIPP) (NASA 2010b) which involves the beneficial reuse of clean, compatible sand to repair and protect areas of the shoreline within the Launch Range area on Wallops Island. For the Phase 2 and Phase 3 dredging and future maintenance dredging, NASA and MARS may work with the schedule for dredging events so that they coincide with ongoing shoreline renourishment actions as part of the SRIPP, and the material would be placed somewhere within the SERP Area. The SERP area includes the Wallops Island shoreline infrastructure protection area and the North Wallops Island beach borrow area (Figure 5). Option 4 would require using a mechanical dredge to load the dredged material removed from the approach channel into barges. These barges would then be towed approximately 11 km (6 nautical mi) to the shoreline. A specialized hydraulic unloader would be required to discharge the dredged material from the transport barges and pump the material onto the placement areas.

Table 2. Potential Dredged Material Placement Sites							
Option	**Site**	**Description**	**Sail Distance from Basin[1]**	**Pipe Distance from Basin[2]**	**Sail Distance from Channel**	**Pipeline Distance from Channel**	**Description**
5	Chincoteague National Wildlife Refuge Swan Cove Placement	Reuse of material for habitat restoration	-	9 km (5.6 mi)	-	6.9 km (4.3 mi)	This option would involve the beneficial reuse of the dredged material for the Swan Cove Pool Restoration Project located in the Chincoteague National Wildlife Refuge (NWR). If dredged material is determined to be compatible with the Swan Cove Pool Restoration Project design criteria, it would be used by USFWS to create berms and enhance and/or restore currently degraded areas of the estuarine-salt marsh habitat that have been negatively impacted by an under sized culvert restricting sediment deposition and tidal flow. Although USFWS would prefer material with a high proportion of sand, they would also accept dredge material containing high organic matter content. This option was evaluated based on having a cutter suction dredge pump the material to this area. Once pumped, USFWS would assume responsibility for sediment placement and securing appropriate permits.

[1] Sail distance = the length of the path via water required to reach the placement site from the centroid of dredging in the proposed turning basin or approach channel (statute miles)
[2] Pipe distance = the length of pipe required to reach the placement site from the centroid of dredging or from the anchorage for a vessel loaded with dredged material

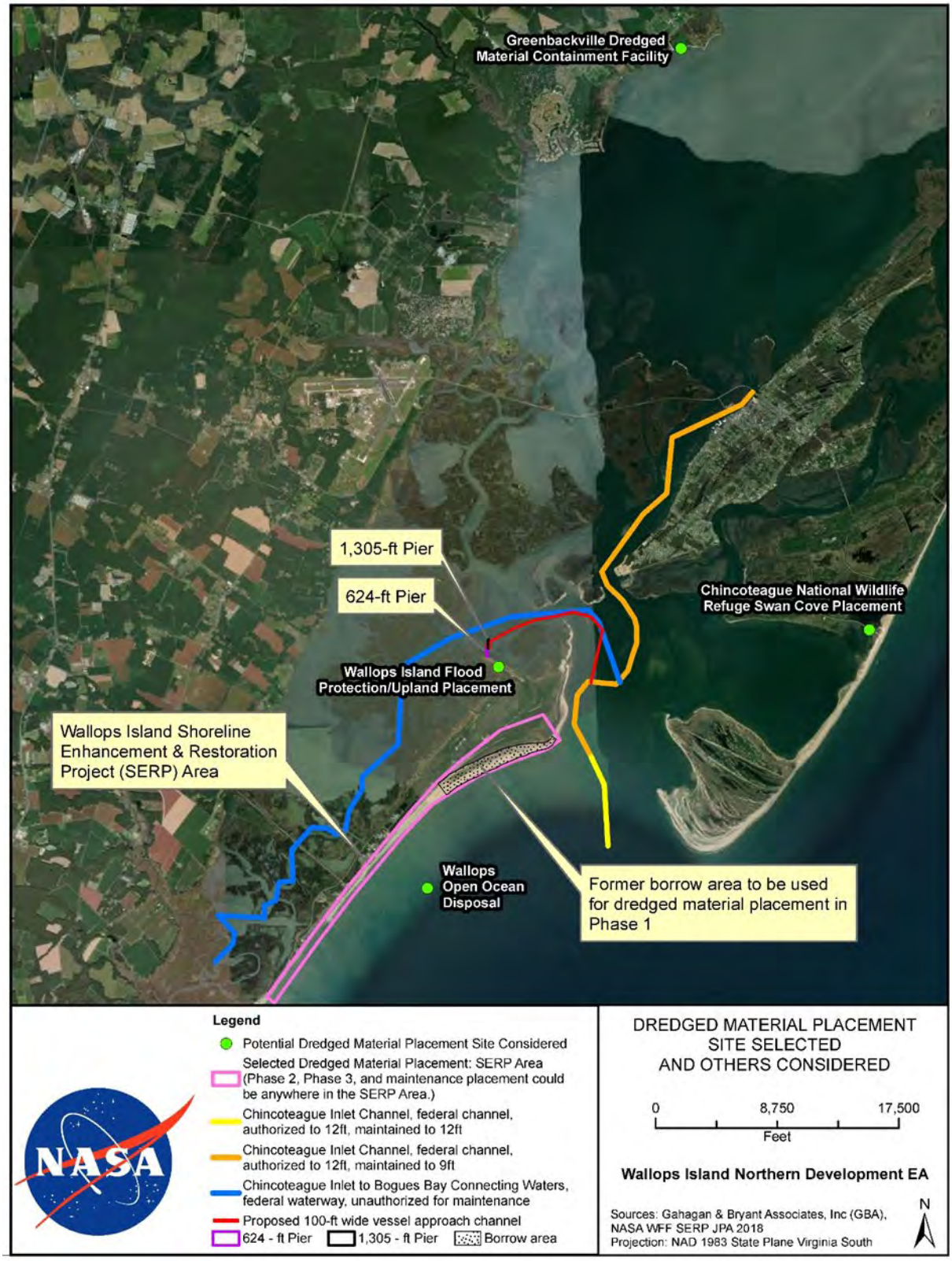


Figure 5. Dredged Material Placement Site Selected and Others Considered

Summary of Proposed Action Construction Activities

Construction of the Proposed Action would involve: (1) construction of onshore and pier components that would make up the MARS Port, (2) mechanical dredging of the vessel approach channel and turning basin, (3) placement of dredged material, and (4) construction or improvement of the proposed onshore facilities and infrastructure.

The estimated timeframe for construction of the Proposed Action would have Phase 1 beginning in 2022 and being completed by 2024, with subsequent phases occurring approximately 1 to 2 years after completion of the prior phase. With two crews (10 persons each), working 5 days per week (10-hour days), construction of the 190-m (624-ft) long pier under Phase 1 would take approximately 12 months to complete and construction of the 206-m (676-ft) long pier extension under Phase 2 (for a total pier length 398 m [1,305 ft]) would take approximately 9.5 months to complete.

Phase 1 dredging activities (turning basin and channel) would take approximately 30 days to complete, Phase 2 dredging (turning basin) would take approximately 7 days, and Phase 3 dredging (turning basin and channel) would take 30 days. Work would be performed 24 hours/day, 7 days a week, with two crews each working 12-hour shifts.

In addition to in-water components of the Proposed Action, onshore facilities and infrastructure would be constructed or upgraded, including installation of a temporary wastewater holding tank from which wastewater would be periodically collected and pumped into the NASA wastewater system for treatment. In accordance with the WFF Integrated Contingency Plan, precautions would be taken prior to and during collection from the temporary tank and while pumping into the wastewater collection system. It is assumed that construction of all proposed onshore project components and infrastructure would be completed during Phase 1.

Typical equipment used during construction would include crane barges, material barges, tugboat, vibratory pile hammer, diesel impact hammer, concrete truck, concrete pump truck, concrete vibrator, generator, welding machines, cutting torches, and various small tools.

Summary of Proposed Action Operational Activities

VCFSA/MARS currently has a facilities team that mows grass once per week, monitors for eagles twice per week during nesting season, periodically removes tree and weed growth, and inspects the infiltration trench and fencing. During summer months, a mosquito fogging service truck sprays the airfield once every two weeks. Additionally, the pier structure would require quarterly structural inspections.

Potential usage of the MARS Port facility during its operation is provided in **Table 3**.

Table 3. Potential MARS Port Operations/Facility Usage				
Potential Facility Usage	**Vessel Type**	**Quantity Assumptions**	**Total Barge / Vessel Trips**	**Phase Associated with Usage**
Medium Class ELV 1st stage (core) and 2nd stage	Shallow Draft Deck Barge & Inland Pushboat	3 launches per year; each comes w/ ~4-6 truckloads of parts and equipment plus 2 heavy haulers	3	1
Venture Class ELV	Shallow Draft Deck Barge & Inland Pushboat	Potential for 12 launches per year; 3 trucks per launch	12	1
Venture Class 2 ELV	Shallow Draft Deck Barge & Inland Pushboat	9 launches per year; 1 truck per stage, 3-5 trucks for equipment	9	1
Venture Class Heavy ELV	Deck Barge & 1000-1200 HP Tugboat	3 launches per year, 3 first stage cores per launch w/ 1 truck each plus 3-5 trucks for equipment	3	2
Minotaur Class	Deck barge & 1000-1200 HP tugboat	4 launches per year, 3 stage/cores per launch w/ 1 truck each; 3-5 additional trucks for equipment	4	2
Recovery effort	Shallow-draft deck barge & inland push boat	1 per launch	12	1
Autonomous Surface Vehicle (ASV)	Trailered vessel	1 deployment per month; each deployment has 5-10 vehicles included	12	1
Autonomous Underwater Vehicle (AUV)	Trailered vessel	1 deployment every other month; each deployment has 5-10 vehicles included	6	1
Miscellaneous usage	Shallow-draft vessel	1 deployment every other month	6	2
Research usage	Small research vessel	1 deployment every 4 months; each deployment has 5-10 vehicles included	3	2
Other government research & testing	Trailered vessel	1 deployment every other month	12	2
Other Site-wide PEIS construction/expansion	Deck barge & ocean tug	2 large/oversized deliveries per year	1	2

Table 3. Potential MARS Port Operations/Facility Usage				
Potential Facility Usage	**Vessel Type**	**Quantity Assumptions**	**Total Barge / Vessel Trips**	**Phase Associated with Usage**
Commodity delivery	Deck barge & ocean tug	16 total barges	16	3
Total Barge / Vessel Trips			**99**	

Description of the Action Area

The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402.02). For this project, the action area includes the north end of Wallops Island surrounding the UAS Airstrip including the surrounding waters from Chincoteague Inlet to the east and north and to Bogues Bay to the west, i.e., the offshore areas potentially affected by pier construction, dredging of channels and turning basins, and vessels transiting between the proposed pier and the existing Chincoteague Inlet Federal Channel. As described above, the option selected for the placement of dredged material from construction dredging and long-term maintenance dredging is the pumping of the material from transport barges onto the Wallops Island beach in the SERP area (**Figure 5**). The elements of the ongoing SERP activities to protect Wallops Island shoreline infrastructure through beach renourishment are described in detail in the *2019 SERP EA* (NASA 2019c).

The offshore habitats within the action area include tidal marsh communities and the estuarine surface waters of Chincoteague Inlet, Bogues Bay, Ballast Narrows, and other waterways. The nearest beds of submerged aquatic vegetation are approximately 4.8 km (3 miles) north of the action area. Waters in the action area contain public and private harvesting areas for shellfish (oysters and clams).

These areas are expected to encompass all of the effects of the proposed project. NASA is concurrently consulting with USFWS under Section 7 of the ESA and any upland or out-of-water work will not be considered further in this consultation.

NMFS Listed Species (and Critical Habitat) in the Action Area

The federally listed species and life stages with the potential to occur in the action area were identified through a query of the NOAA Fisheries Section 7 online mapping application (the ESA Section 7 Mapper) as having the potential to occur in the action area. The information from the ESA Section 7 Mapper is included in Attachment 2. **Table 4** summarizes the information for each species regarding the life stages that could be present, the time of year when they may be present, and the types of behaviors they are expected to be engaged in when present in the waters of the action area.

Table 4. Federally Listed Species Under NOAA Fisheries Jurisdiction Potentially Occurring in the Action Area

Common Name	Scientific Name	Listing Status	DPS	Life Stage	Behavior	Time of Year	Recovery Plan
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	Threatened/ Endangered	All	Adult and subadult	Migrating and foraging	1 Jan – 31 Dec	N/A
Giant manta ray	*Manta birostris*	Threatened	N/A	Adult	Migrating and foraging	1 Jan – 31 Dec	N/A
Leatherback sea turtle	*Dermochelys coriacea*	Endangered	N/A	Adult and juveniles	Migrating and foraging	1 May – 30 Nov	NMFS & USFWS 1992
Loggerhead sea turtle	*Caretta caretta*	Threatened	Northwest Atlantic	Adult and juveniles	Migrating and foraging	1 May – 30 Nov	NMFS & USFWS 2008
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered	N/A	Adult and juveniles	Migrating and foraging	1 May – 30 Nov	NMFS et al. 2011
Green sea turtle	*Chelonia mydas*	Threatened	North Atlantic	Adult and juveniles	Migrating and foraging	1 May – 30 Nov	NMFS & USFWS 1991

Notes:
DPS = Distinct population segment
N/A = Not applicable
Source: NOAA Fisheries (2020)

One listed fish species (Atlantic sturgeon) and four listed sea turtle species (leatherback, loggerhead, Kemp's ridley, and green) were identified by the ESA Section 7 Mapper as potentially occurring in the action area. No critical habitat for these species has been designated in the area. Information regarding the potential for occurrence of each species in the action area or the vicinity of WFF is provided below. Although not identified by the ESA Section 7 Mapper as a species potentially occurring in the action area, the giant manta ray has been observed off the coast of Assateague Island (Swann 2018) and has been observed in estuarine waters, oceanic inlets, and bays.

Fish

Atlantic Sturgeon

There are five Distinct Population Segments (DPSs) of Atlantic sturgeon listed as threatened or endangered. The marine range of all five DPSs extends along the Atlantic coast from Canada to Cape Canaveral, Florida. The New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs of Atlantic sturgeon are endangered; the Gulf of Maine DPS is threatened. Transient adult and subadult Atlantic sturgeon originating from any of these DPSs could occur in the action area to opportunistically forage. The Atlantic sturgeon is anadromous and estuarine-dependent. Adults migrate to natal rivers and spawn in flowing fresh waters between the salt front and fall line in spring and early summer, then migrate to estuarine and marine waters where they spend the majority of their lives. Atlantic sturgeon typically forage on the bottom for benthic invertebrates (e.g., crustaceans, worms, mollusks). Atlantic sturgeon are known to occur and have been documented in the deeper waters off WFF (NASA 2019). There are no known spawning areas (freshwater rivers) or congregation areas (e.g., mouths of Chesapeake and Delaware Bays) within

the vicinity of the action area, so it is expected that any individuals present would be opportunistically foraging during migration. Although the Atlantic sturgeon could occur at any time of the year, its likelihood of being present is greatest during fall and early spring during peak migration periods. The shallow estuary where the proposed action would occur provides minimal habitat for the Atlantic sturgeon, and its potential to occur there is likely limited to occasional transient subadults or adults. Spawning adults, eggs, and larvae are not expected to be present.

Giant Manta Ray

The giant manta ray is federally listed as threatened. It is the world's largest ray with a wingspan of up to 8.8 m (29 ft). The giant manta ray is found worldwide in tropical, subtropical, and temperate bodies of water and is typically found offshore in oceanic waters and near productive coastlines. The species has also been observed in estuarine waters, oceanic inlets, and bays. Off the East Coast of the U.S., giant manta rays occur in water with temperatures ranging from 19 to 22 degrees Celsius (66 to 72 degrees Fahrenheit). The giant manta ray is migratory and solitary, with small, highly fragmented populations that are sparsely distributed around the world. Information on global distribution and population sizes is lacking, but regional populations are small, ranging from 100 to 1,500 individuals. The giant manta ray feeds primarily on planktonic invertebrates but may also consume small fish (NOAA Fisheries 2021).

Although, the ESA Section 7 Mapper did not identify the giant manta ray as potentially occurring in the action area (NOAA Fisheries 2020e), this species has been observed off the coast of Assateague Island (Swann 2018), and it potentially could occur in the action area. However, given its rarity, its solitary and migratory behavior, and the lack of optimal habitat or food sources in the action area, the giant manta ray is extremely unlikely to occur in this area. It is unknown which life stages other than adult may be in the action area.

Sea Turtles

Leatherback Sea Turtle

The leatherback sea turtle mainly forages in the ocean but also in coastal waters in search of its soft-bodied prey, predominantly jellyfish. It is the most migratory and wide-ranging of all sea turtles. Although the leatherback is known to occur in the waters offshore of Accomack County, it has never been sighted swimming or nesting on the beaches at WFF (NASA 2019). Given the minimal habitat for the leatherback or its jellyfish prey in the action area, its potential to be present is likely to be limited to occasional transient adults or juveniles passing through the area from May through November.

Loggerhead Sea Turtle

The loggerhead sea turtle spends the majority of its life in the open ocean or nearshore coastal areas, foraging for mainly invertebrate prey such as crabs, whelks, and conch. It nests on beaches and occasionally on estuarine shorelines. NOAA Fisheries has divided the loggerhead population into nine DPSs, four that are threatened and five that are endangered. The population near WFF belongs to the federally threatened Northwest Atlantic DPS. NOAA Fisheries has designated 38

critical habitat areas within marine areas occupied by the northwest Atlantic DPS, and USFWS has identified 88 beaches from North Carolina to Mississippi as critical nesting habitat. None of these areas are in the vicinity of WFF. However, loggerhead nests have been observed on Wallops Island beaches as recently as 2013 (NASA 2021). The proposed action would not occur on or affect beaches potentially providing nesting habitat for the loggerhead sea turtle. Its potential to be present in the action area is likely to be limited to occasional transient adults or juveniles foraging in or migrating through the area from May through November.

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle ranges as far north as Maine. It is found in oceanic and estuarine areas that typically contain muddy or sandy bottoms, where it feeds on crabs as well as mollusks, fish, and jellyfish. The Kemp's ridley nests on beaches from May to July, with 95% of the worldwide nesting of the Kemp's ridley occurring in the Mexican state of Tamaulipas. Occasional nests have been documented on the east coast of the United States, including the southeast coast of Virginia. The Kemp's ridley has never been directly observed at WFF. The species may occur offshore in relatively shallow waters (less than 50 m [160 ft]) in areas where habitat exists for prey species (NASA 2019). Given the lack of documented occurrences at WFF, its potential to occur in the action area is likely to be limited to occasional transient adults or juveniles foraging in or migrating through the area from May through November.

Green Sea Turtle

The green sea turtle is unique among marine turtles in that it feeds exclusively on plants, primarily sea grasses and algae. In the U.S., the green sea turtle primarily nests in June and July along the east coast of Florida, with lower occurrences of nesting northward to North Carolina. Green sea turtles use open ocean convergence zones and coastal areas for benthic feeding on sea grasses and algae. The green sea turtle has been directly observed in waters off WFF (NASA 2019). They are likely to inhabit the waters off WFF during the warmer months when sea grasses and algae are plentiful; however, nesting habitat occurs farther south. Given the minimal habitat for the green sea turtle in the action area, including the lack of seagrass beds, its potential to be present is likely to be limited to occasional transient adults or juveniles foraging in or migrating through the area from May through November.

Effects Determination

As shown in **Table 4**, each of the five federally listed marine species potentially occurring in the action area would be expected, if present, to be engaged in foraging and/or migrating through the area. However, as indicated by their life history characteristics and records for the WFF area, the potential for occurrence of any of these species in the action area is minimal and is expected to be limited to the occasional transient passage of individuals through the area during migration or while foraging. Only the Atlantic sturgeon is potentially present in the action area throughout the full year. Sea turtles are potentially present in the area only within a 7-month period (May through November), further limiting their potential for exposure and effects. The potential for effects on these species is discussed below.

Atlantic Sturgeon

It is possible, though unlikely, that Atlantic sturgeon could be affected by the Proposed Action. Recent studies have suggested that the shallow waters off the Atlantic coast could be an important migratory corridor to and from spawning, foraging, and overwintering grounds. As there are no known spawning areas (freshwater rivers) or congregation areas (e.g., mouths of Chesapeake and Delaware Bays) within the project vicinity, it is expected that any individuals encountered would be opportunistically foraging during migration. The potential impact of construction and dredging activities on Atlantic sturgeon would depend on the time of year these activities were conducted, with the likelihood of encountering a sturgeon greatest during fall and early spring, which are times of peak migration (NASA 2019). Construction and operations activities under the Proposed Action potentially could affect Atlantic sturgeon if present in the action area as a result of pile-driving noise, vessel noise (including dredging noise), and turbidity due to sediment disturbance during construction and dredging.

Construction activities would not be anticipated to substantively affect migration or foraging behaviors of the Atlantic sturgeon. The inadvertent destruction or displacement of benthic species would be localized and would not substantially affect the quantity of benthic prey available in waters near the action area. The area of marsh and open water bottom beneath the pier would be approximately 0.4 hectare (ha) (1 acre [ac]) in Phase 1 and 0.6 ha (1.5 ac) in Phase 3. The areas to be dredged, including turning basins and channels, would be approximately 13.8 ha (34 ac) in Phase 1, 1.6 ha (4 ac) in Phase 2, and 13.4 ha (33 ac) in Phase 3. Thus, the maximum area to be dredged through all phases of the Proposed Action would be approximately 28.7 ha (71 ac). Maintenance dredging of the basin and channel would be repeated periodically as necessary to maintain the required depth and is expected to be infrequent and of short duration.

Pile-Driving Noise

Sturgeon and other special status marine species occurring in the inshore waters of the action area potentially could be affected by underwater noise caused by pier construction. The principal source of construction noise would be pile installation. Construction of the 190-m (624-ft) pier under Phase 1 would take approximately 12 months to complete, and construction of the 206-m (676-ft) pier extension under Phase 2 (for a total pier length of 398 m [1,305 ft]) would take approximately 9.5 months, with about 1 to 2 years between phases. Pier construction would require the installation of 260 piles over a period of 80 days in Phase 1 and 140 piles over a period of 45 days in Phase 2. The piles would be made of prestressed concrete, 24 inches square, and driven by a diesel impact hammer.

The NOAA Fisheries Greater Atlantic Regional Fisheries Office (GARFO) developed a spreadsheet Acoustics Tool (GARFO 2020) for analyzing the effects of pile-driving in inshore waters on ESA-listed species of the Greater Atlantic Region. GARFO developed a Simplified Attenuation Formula (SAF) for use in estimating the ensonification area of pile-driving projects in shallow, inshore environments, such as the bays and waterways of the action area. Based on the characteristics of the proposed pile-driving, information for a proxy project from the GARFO SAF spreadsheet is shown in **Table 5**. The estimated noise levels at the source associated with pile-

driving for the Proposed Action, based on measurements for a proxy project (at a distance of 10 m [33 ft]), are presented in **Table 6** (GARFO 2020).

Table 5. Proxy Project for Estimating Underwater Noise

Project location	Water depth (m)	Pile size (in)	Pile type	Hammer type	Attenuation rate (dB/10 m)
Not available	5	24	concrete	impact	5

m = meters; in = inches; dB = decibels
Source: GARFO (2020)

Table 6. Proxy-Based Estimates for Underwater Noise Level at the Source

Pile type	Hammer type	Estimated SPL_{peak} (dB re 1 Pa)	Estimated SEL_{cum} (dB re 1 μPa^2s)	Estimated SPL_{rms} (dB re 1 µPa)
24-in concrete	impact	185	170	160

dB re 1 µPa = sound exposure level in decibels relative to 1 microPascal; dB re 1 μPa^2s = sound exposure level in decibels relative to 1 microPascal squared second; rms = root mean square; SEL_{cum} = cumulative sound exposure level; SPL = sound pressure level
Source: GARFO (2020)

The GARFO SAF model was used to estimate the distances from pile-driving activities at which thresholds for noise-related effects would be exceeded. Effects can range from behavioral changes/disturbance to physical injury. Because sound (noise) consists of variations in pressure, the unit for measuring sound is referenced to a unit of pressure, the Pascal (Pa). A decibel (dB) is defined as the ratio between the measured sound pressure level (SPL) in microPascals (µPa) and a reference pressure. In water, the reference level is decibels relative to 1 microPascal (dB re 1 µPa). SPL units can be expressed in several ways depending on the measurement properties. Acoustic source levels and sound exposure levels (SELs) also are expressed in decibels.

The thresholds for effects vary among types of organisms. Effect thresholds have been identified by NOAA Fisheries for fish (including sturgeon), sea turtles, and marine mammals. For sturgeon, the estimated distances at which pile-driving noise would equal or exceed injury or behavioral threshold levels are shown in **Table 7**.

Table 7. Estimated Distances to Sturgeon Injury and Behavioral Thresholds

Pile type	Hammer type	Distance to injury threshold (SPL_{peak} = 206 dB re 1 µPa)	Distance to injury threshold (SEL_{cum} = 187 dB re 1 μPa^2s)	Distance to behavioral threshold (SPL_{rms} = 150 dB re 1 µPa)
24-in concrete	impact	NA	30 m	50 m

m = meters; in = inches; dB re 1 µPa = sound exposure level in decibels relative to 1 microPascal; dB re 1 μPa^2s = sound exposure level in decibels relative to 1 microPascal squared second; rms = root mean square; SEL_{cum} = cumulative sound exposure level; SPL = sound pressure level; NA = not applicable because source level is less than or equal to threshold level
Source: GARFO (2020)

The peak exposure criterion (SPL_{peak} = 206 dB re 1 Pa) for sturgeon is related to the energy received from a single pile strike. The potential for injury also exists from multiple exposures to noise over a period of time, which is accounted for by the SEL_{cum} threshold (SEL_{cum} = 187 dB re

1 µPa^{2}s). The SEL_{cum} is not an instantaneous maximum noise level but is a measure of the accumulated energy over a specific period of time (e.g., the period of time it takes to install a pile). The farther away a fish is from the pile being driven, the more strikes it must be exposed to for enough energy to accumulate to result in injury. For behavioral effects, the exposure criterion for sturgeon is expressed as a root-mean-square sound pressure level (SPL_{rms}= 150 dB re 1 µPa).

Exposure to impulsive underwater noise levels of 206 dB re 1 µPa (SPL_{peak}) or 187 dB re 1 µPa^{2}s (SEL_{cum}) can result in injury to sturgeon.

As shown in **Table 7**, exposure to an SPL_{peak} that may result in injury to sturgeon is not anticipated to occur during pile-driving for the Proposed Action because the SPL_{peak} at the source (185 dB re 1 Pa) would be less than the effects threshold (206 dB re 1 Pa). However, based on the SEL_{cum} exposure criterion, injury to a sturgeon potentially could occur if the fish remained within 30 m (98 ft) while the pile was being driven. In order to be exposed to potentially injurious levels of noise during installation of the piles, a sturgeon would need to remain within 30 m (98 ft) of the pile during the time it is being driven in order to be exposed to this SEL_{cum} threshold. This is extremely unlikely to occur because sturgeon would be expected to modify their behavior and move away from the source upon exposure to underwater noise levels greater than the behavioral effects threshold (SPL_{rms} = 150 dB re 1 µPa). Sturgeon would be exposed to levels of noise that cause behavioral modification at 50 m (165 ft) according to the model estimate and would be expected to move away from the sound source before cumulative exposure could result in injury. If a sturgeon were within 30 m (100 ft) of the pile at the time pile-driving begins, it likely would leave the area quickly. Additionally, the use of a soft-start technique should also give any sturgeon in the area time to move out of the range of any potential injury from noise. Therefore, noise injury to sturgeon is not anticipated.

Behavioral effects, such as avoidance of the area or disruption of foraging activities, may occur in sturgeon exposed to noise above the behavioral threshold (SPL_{rms} = 150 dB re 1 µPa). Underwater noise levels are predicted to be below this threshold at distances beyond approximately 50 m (165 ft) from the pile being installed. As discussed above, it is reasonable to assume that a sturgeon within the action area that detects underwater noise levels of 150 dB re 1 µPa would modify its behavior and redirect its course of movement away from the ensonified area. The waterway at the location where the pier would be constructed is approximately 1.6 kilometer (km; 1 mile) wide, providing extensive habitat in which a sturgeon could avoid the ensonified area. It is extremely unlikely that these movements will affect essential sturgeon behaviors such as spawning, foraging, resting, or migration. The action area is not sturgeon spawning habitat, and the bays and waterways of the area are sufficiently extensive to allow sturgeon to avoid the ensonified area while continuing to forage and migrate. Given the small distance that a sturgeon would need to move to avoid disturbing levels of noise, any effects would not be measurable or detectable and, therefore, would be insignificant.

Mitigation Measures for Underwater Noise from Pile-Driving

A soft-start procedure would be used for pile-driving to allow sturgeon that may be in the action area to detect the presence of noise-producing activities and to depart the area before full-power

pile-driving begins. A bubble curtain around each pile being driven could be used for noise attenuation. Bubble curtain effectiveness can be highly variable depending on local conditions and the type of system used. Given the uncertainty associated with the potential use of bubble curtains for noise attenuation, this evaluation was conservative, and the estimated effects of using a bubble curtain were not included in the calculation of threshold distances using the GARFO SAF spreadsheet model. The model results indicated a lack of significant effects without a bubble curtain.

Vessel Noise

Noise generated by vessels during project construction or vessels calling on the pier during its operation potentially could affect sturgeon in the action area. The area is already affected by anthropogenic noise from vessels and other sources. Construction and use of the pier would cause additional noise in the area. The noise produced by vessels during project construction would vary depending on the vessel size, speed, and whether it uses dynamic positioning thrusters. Large ships tend to be noisier than small ones, and ships with a full load (including towing or pushing a load) tend to be noisier than unloaded vessels. Vessel noise is a combination of narrow-band (tonal) sound and broadband sound. The intensity of noise produced is approximately related to the size and speed of the vessel. Individual vessels may generate very different sound levels and have different frequency characteristics depending on factors such as the propulsion system and whether there is propeller cavitation or singing (Spiga et al. 2012).

Noise from vessels traveling to and from the pier potentially would cause behavioral disturbance to sturgeon but would not result in injury. Smaller ships such as tugs or trawlers produce broadband noise with a source level (SPL) of typically 168 to 170 dB re 1µ Pa at 1 m (3.3 ft), while larger ships such as supertankers produce underwater broadband noise at source levels of up to 190 dB re 1 µPa at 1 m (3.3 ft) (Spiga et al. 2012). These SPLs at 1 m (3.3 ft) are less than the sturgeon noise response criteria for injury and greater than the sturgeon noise response criterion for non-impulsive behavioral effects (**Table 7**). However, a sturgeon would need to be in relatively close proximity to the vessel to experience sound levels that exceed the 150 dB re 1µ Pa behavioral effect threshold.

Impacts from vessel noise would not cause physical injury to sturgeon. When vessels are underway in open waters, sturgeon in adjacent areas could be disturbed. However, construction vessels and vessels visiting the pier during operation would be shallow-draft, slow-moving, and likely would produce noise levels less than the behavioral effects level for sturgeon. Noise from project vessels during construction and operation would not be expected to potentially cause more than local and temporary behavioral responses in sturgeon if present nearby. The waterway in the channel varies, with the most narrow spot approximately 0.5 km (0.35 mile) wide and, similar to noise avoidance from pile-driving, there is sufficient habitat to allow a sturgeon to avoid the ensonified area.

Noise from dredging vessels and associated equipment and operations was evaluated by NMFS in a 2012 Biological Opinion, which concluded that the effects of dredge noise on whales are discountable (NASA 2018). Similarly, the numbers of sturgeon in the action area are very low, and it is extremely unlikely for a sturgeon to occur close enough to the dredge to be disturbed by

noise. Thus, the overall likelihood of a sturgeon being adversely affected by vessel noise from construction or operation of the Proposed Action also would be discountable, and any potential effects would be insignificant.

Vessel Strikes

Where there is overlap between vessel traffic and Atlantic sturgeon habitat, there is the possibility of vessel strikes, which potentially can result in injury or mortality. The dredging of the new channel and turning basin during the construction phases of the Proposed Action would increase vessel traffic in the action area during dredging operations. The use of the navigation channel and turning basin during operation of the proposed port would result in additional vessels transiting through the action area in the future. Any increases in vessel traffic may not directly correlate to more vessels in the action area, as active vessels in the area may move elsewhere or be retired from use. During dredging and placement of dredged material, only one or two project vessels would likely be utilized. The use of dredging vessels would be intermittent, temporary, and restricted to a small portion of the overall action area on any day that dredging occurs.

It would be extremely unlikely for a vessel related to the Proposed Action to strike and injure or kill a sturgeon given the nature of the habitat in the action area; the low baseline risk of vessel strikes in the area; and the extremely small, intermittent increase in vessel traffic that would be added to existing traffic in the area as a result of the Proposed Action. Given that the number of sturgeon in the action area is small, the risk of vessel strike is extremely low. Additionally, vessels entering the inlet would slow down, further reducing the probability of vessels strikes. It is estimated that, although there may be a slight increase in risk from the minimal number of additional vessels added to baseline activity in the action area during construction and operations, any associated increase in risk of vessel strikes would be extremely small and, therefore, discountable.

Turbidity

Pile-driving for pier construction, dredging of the channel and turning basin, and placement of dredged sediment, would cause temporary increases in suspended sediment, thereby increasing local turbidity. During pier construction, the installation of piles would disturb bottom sediments, which may temporarily increase suspended sediment in the action area. Information collected from a project in the Hudson River indicates that pile-driving activities may produce total suspended sediment (TSS) concentrations of approximately 5 to 10 mg/L above background levels within approximately 91 m (300 ft) of the pile being driven (NOAA Fisheries 2022). The resulting sediment plume is expected to be small and to settle out of the water column within a few hours. Studies of the effects of turbid water on fish suggest that toxic effects would not be expected before TSS concentrations reach thousands of milligrams per liter. The TSS levels expected for pile-driving (5 to 10 mg/L) are below those shown to have adverse effects on fish (typically up to 1,000 mg/L) and benthic communities (390 mg/L) (NOAA Fisheries 2020).

During dredging operations, sediment disturbance and TSS concentrations typically vary depending on factors such as the equipment used, currents, and tides. For the Proposed Action, mechanical dredges (e.g., clamshell) would be used during channel and turning basin dredging. TSS concentrations associated with clamshell bucket dredging operations have been found to range from 105 mg/L in the middle of the water column to 445 mg/L near the bottom (210 mg/L, depth-averaged). A study that measured TSS concentrations at distances of 152, 305, 610, and 1,006 m (500, 1,000, 2,000, and 3,300 ft) from dredge sites in the Delaware River detected concentrations between 15 mg/L and 191 mg/L up to 610 m (2,000 ft) from the dredge site. In support of the New York/New Jersey Harbor Deepening Project, USACE conducted extensive monitoring of mechanical dredge plumes and found that plumes dissipated to background levels within approximately 180 m (600 ft) of the source in the upper water column and 730 m (2,400 ft) in the lower water column regardless of bucket type (NOAA Fisheries 2022). Based on these studies, elevated TSS concentrations (several hundred mg/L above background) may be present in the immediate vicinity of the bucket but would settle rapidly within a 730-m (2,400-ft) radius of the dredge location. The TSS levels found to be associated with mechanical dredging (up to 445 mg/L) are below those shown to have adverse effects on fish (typically up to 1,000 mg/L) (NOAA Fisheries 2020).

High TSS levels can cause a reduction in dissolved oxygen levels. Sturgeon may become stressed when dissolved oxygen falls below certain levels. A study in shortnose sturgeon found that high rates of mortality can occur in younger sturgeon when dissolved oxygen levels are low, while older individuals can tolerate those reduced oxygen levels for short periods. However, chronic exposure to low levels of dissolved oxygen may result in reduced tolerance. Exposure of sturgeon to TSS levels of 1,000 mg/L above ambient for longer than 14 days at a time may result in behavioral and physiological effects (NOAA Fisheries 2022). NOAA Fisheries recommends that sturgeon early life stages not be exposed to more than 50 mg/L of TSS. While the increase in TSS from pile-driving or dredging in the action area may cause Atlantic sturgeon to alter their normal movements, these minor changes in movements would be too small to be meaningfully measured or detected. TSS is most likely to affect sturgeon if a plume causes a barrier to normal behaviors. However, sturgeon would be expected to swim through the plume to avoid the area with no adverse effects (NOAA Fisheries 2020).

Increased turbidity from construction activities would likely be short-lived, and with proper, required controls, such as turbidity curtains (sediment curtains), turbidity impacts would be reduced. If the use of turbidity curtains is not possible during dredging due to current velocities, dredging would be conducted during slack tides (i.e., on the western portion of the channel during flood tides and the eastern portion of the channel during ebb tides). Sediment plumes from construction would likely settle out in a few hours, limiting effects from increased turbidity to the short-term. Increased turbidity has the potential to temporarily impact foraging habitat for the Atlantic sturgeon, and sturgeon may avoid the locally affected area entirely if the sediment load is extremely high. A relatively limited area potentially would be affected temporarily, and extensive areas of unaffected foraging habitat would remain available in the waterways of the action area. Thus, the overall likelihood of the Atlantic sturgeon being adversely affected by turbidity from

construction or operation of the Proposed Action would be discountable, and any potential effects would be insignificant.

Capture/Entrapment During Dredging

Aquatic species can be captured in dredge buckets and may be injured or killed from entrapment in the bucket or burial in sediment during dredging and deposition of sediment into the dredge scow. Fish captured and emptied out of the bucket could suffer severe stress or injury, which could also lead to mortality (Hopper 2021).

Nearly all of the recorded interactions between mechanical dredges and sturgeon have occurred during dredging in the Kennebec River at the Bath Iron Works facility in Maine. It is unknown if this is due to a unique situation in this river or the intense observer coverage during dredging operations in this river, which happen nearly every year. During ten dredging events at Bath Iron Works between 1997 and 2012, only three interactions of mechanical dredges with sturgeon were recorded: two (one lethal) with shortnose sturgeon (2003 and 2009) and one with an Atlantic sturgeon (2001). An Atlantic sturgeon was also reported killed in the Cape Fear River, North Carolina in a bucket and barge operation (Hopper 2021). Very few other mechanical dredge operations have employed observers to document interactions between sturgeon and the dredge; therefore, it is possible that interactions during other projects have occurred but have not been observed (Hopper 2021).

Based on the best available information, the mobility of the sturgeon, and the small size of the area to be dredged, the probability of a sturgeon being captured in a slow-moving dredge bucket in the action area is low. This conclusion is further supported by the small number of sturgeon captured during dredging operations at Bath Iron Works and elsewhere. Therefore, it can be concluded that the capture or entrapment of Atlantic sturgeon by a clamshell bucket during proposed dredging would be extremely unlikely and, therefore, discountable (Hopper 2021).

Effects Determination for Atlantic Sturgeon

The Proposed Action may affect but is not likely to adversely affect Atlantic sturgeon if present in the action area.

Giant Manta Ray

The giant manta ray is rare, solitary, and migratory, and the action area does not provide optimal habitat or food sources. Thus, the giant manta ray is extremely unlikely to occur in the area. Effects from the Proposed Action on the giant manta ray can be assumed to be similar to effects on the Atlantic sturgeon. Noise from pile-driving would not cause injury to a giant manta ray and, given the small distance that a giant manta ray would need to move to avoid disturbing levels of noise, any effects would not be measurable or detectable and, therefore, would be insignificant. The overall likelihood of a giant manta ray being adversely affected by noise or other effects from construction or operation of the Proposed Action would be discountable, and any potential effects would be less than significant.

Effects Determination for Giant Manta Ray

Thus, the Proposed Action may affect but is not likely to adversely affect the giant manta ray.

Sea Turtles

The time of year when activities occur under the Proposed Action affects the chances for impacts to sea turtles. As shown in **Table 4**, sea turtles potentially occur in the action area only during the seven months of the year when water temperatures are warmest (May through November). Activities occurring in the other five months would have no effect on sea turtles. Construction and operations activities under the Proposed Action potentially could affect sea turtles if present in the action area as a result of pile-driving noise, vessel noise (including dredging noise), vessel strikes, and turbidity due to sediment disturbance during construction and dredging.

Pile-Driving Noise

As discussed for sturgeon, the NOAA Fisheries GARFO Acoustics Tool (GARFO 2020) for analyzing the effects of pile-driving in inshore waters on ESA-listed species was used to evaluate potential underwater noise impacts on sea turtles from pile-driving during construction of the Proposed Action. The GARFO SAF spreadsheet model was used to estimate the ensonification area from pile-driving in the shallow, inshore bays and waterways of the action area. Based on the characteristics of the proposed pile-driving, information for a proxy project from the GARFO SAF spreadsheet is shown in **Table 5**. The estimated noise levels at the source associated with pile-driving for the Proposed Action, based on measurements for a proxy project (at a distance of 10 m [33 ft]), are presented in **Table 6** (GARFO 2020).

The thresholds for effects vary among types of organisms. Effect thresholds have been identified by NOAA Fisheries for fish, sea turtles, and marine mammals. For sea turtles, the estimated distances at which pile-driving noise would equal or exceed injury or behavioral threshold levels are shown in **Table 8**.

Table 8. Estimated Distances to Sea Turtle Injury and Behavioral Thresholds

Pile type	Hammer type	Distance to injury threshold (SPL_{peak} = 226 dB re 1 µPa for TTS, = 232 dB re 1 µPa for PTS)	Distance to injury threshold (SEL_{cum} = 189 dB re 1 µPa^{2}s for TTS, = 204 dB re 1 µPa^{2}s for PTS)	Distance to behavioral threshold (SPL_{rms} = 175 dB re 1 µPa)
24-in concrete	Impact	NA	NA	NA

m = meters; in = inches; dB re 1 µPa = sound exposure level in decibels relative to 1 microPascal; dB re 1 µPa^{2}s = sound exposure level in decibels relative to 1 microPascal squared second; rms = root mean square; SEL_{cum} = cumulative sound exposure level; SPL = sound pressure level; TTS = temporary threshold shift; PTS = permanent threshold shift; NA = not applicable because source level is less than or equal to threshold level
Source: GARFO (2020)

A loss of hearing sensitivity (i.e., an elevated hearing threshold) may result from exposure to sound of sufficient SPL and duration. Such a loss of hearing sensitivity is referred to as a noise-induced

threshold shift (TS). If the hearing threshold eventually returns to normal, the TS is referred to as a temporary threshold shift (TTS). If the threshold remains elevated after an extended period of time, the TS that remains is referred to as a permanent threshold shift (PTS). TTS and PTS criteria and thresholds are used to predict auditory effects in sea turtles exposed to underwater noise, which is similar to their use in the development of safe noise exposure guidelines for people in noisy environments. TTS is defined as a temporary, reversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level, and PTS is defined as a permanent, irreversible increase in this threshold (NOAA Fisheries 2018).

Exposure to impulsive underwater noise levels of 232 dB re 1 µPa (SPL_{peak}) or 204 dB re 1 μPa^2s (SEL_{cum}) can result in PTS injury to sea turtles, and exposure to lower levels can result in TTS. As shown in **Table 8**, exposure to an SPL_{peak} that may result in injury to sea turtles is not anticipated to occur during pile-driving for the Proposed Action because the SPL_{peak} and the SEL_{cum} at the source (i.e., within 10 m [33 ft] of the pile being driven) would be less than the effects thresholds. Therefore, no noise injury to sea turtles is anticipated. Behavioral effects, such as avoidance of the area or disruption of foraging activities, may occur in sea turtles exposed to noise above the behavioral threshold (SPL_{rms} = 175 dB re 1 µPa). Underwater noise levels are also predicted to be below this threshold at the source. Sea turtles are mobile, would avoid the activity and noise associated with pile-driving, and would not remain adjacent to a pile being driven. Thus, the effects of pile-driving noise on sea turtles during construction of the Proposed Action would be insignificant.

Mitigation Measures for Underwater Noise from Pile-Driving

A soft-start procedure would be used for pile-driving to allow sea turtles that may be in the action area to detect the presence of noise-producing activities and to depart the area before full-power pile-driving activity begins. Soft-start procedures would not begin until the exclusion zone, which would surround the project location and be monitored for the presence of sea turtles, has been cleared. A bubble curtain around each pile being driven could be used for noise attenuation. Bubble curtain effectiveness can be highly variable depending on local conditions and the type of system used. Given the uncertainty associated with the potential use of bubble curtains for noise attenuation, this evaluation was conservative, and the estimated effects of using a bubble curtain were not included in the calculation of threshold distances using the GARFO SAF spreadsheet model.

Vessel Noise

As described above for sturgeon, noise generated by vessels during project construction or vessels calling on the pier during its operation potentially could affect sea turtles in the action area. Smaller ships such as tugs or trawlers produce broadband noise with a source level (SPL) of typically 168 to 170 dB re 1µ Pa at 1 m (3.3 ft), while larger ships such as supertankers produce underwater broadband noise at source levels of up to 190 dB re 1 µPa at 1 m (3.3 ft) (Spiga et al. 2012). These

SPLs at 1 m (3.3 ft) are less than the sea turtle noise response criteria for injury (**Table 8**), and those for smaller ships are also less than the sea turtle noise response criterion for behavioral effects (175 dB re 1µ Pa). A sea turtle would need to be in close proximity to a large vessel such as a supertanker to experience sound levels that exceed the 175 dB re 1µ Pa behavioral effect threshold, and such large vessels would not be associated with the Proposed Action.

Noise from dredging vessels and associated equipment and operations was evaluated by NMFS in a 2012 Biological Opinion, which concluded that the effects of dredge noise on whales are discountable (NASA 2018). Whales are generally more sensitive to underwater noise than sea turtles, so effects on sea turtles would be even less likely. The numbers of sea turtles in the action area are very low, and it is extremely unlikely for a sea turtle to occur close enough to the dredge area to be disturbed by noise. In addition, mitigation measures would be employed through the use of protected species observers, which can halt dredging operations when a sea turtle is observed within a minimum defined distance (e.g., 1 km [0.5 nautical mile]) of the dredge (NASA 2018). Thus, the overall likelihood of a sea turtle being adversely affected by vessel noise from construction or operation of the Proposed Action would be discountable, and any potential effects would be insignificant.

Vessel Strikes

Where there is overlap between vessel traffic and sea turtle habitat, there is the possibility of vessel strikes to sea turtles, which potentially can result in injury or mortality. The dredging of new channels and turning basins as part of the Proposed Action would increase vessel traffic in the action area during dredging operations, and the use of the navigation channel during operation of the proposed pier would result in additional vessels transiting through the area in the future. Any increases in vessel traffic may not directly correlate to more vessels in the action area, as active vessels in the area may move elsewhere or be retired from use. During dredging and placement of dredged material, only one or two project vessels would likely be utilized, and the use of dredging vessels would be intermittent, temporary, and restricted to a small portion of the overall action area on any day that dredging occurs. Vessels involved in pile driving, construction, dredging, and spoil placement would use trained protected species observers to monitor for sea turtles and other protected species in the area of operations. Monitoring and exclusion zones would be established around the location of activities that could cause injury or disturbance to sea turtles, and operation of moving equipment would cease if a sea turtle is observed within 45 m (150 ft).

It would be extremely unlikely for a vessel related to the Proposed Action to strike and injure or kill a sea turtle given the nature of the habitat in the action area; the low baseline risk of vessel strikes in the area; and the extremely small, intermittent increase in vessel traffic that would be added to existing traffic in the area as a result of the project. Given that the presence of sea turtles in the action area is seasonal and the numbers potentially occurring in the warmer months are small, the risk of vessel strike is extremely low. Additionally, vessels entering the inlet would reduce speed, and would operate at idle/no wake speeds in project construction areas, further

reducing the probability of vessels strikes. At this time, we assume there would be only a slight increase in risk from the minimal number of additional vessels added to baseline activity in the action area during construction, and that any associated increase in vessel strikes on sea turtles would be extremely small and, therefore, discountable.

Turbidity

Pile-driving for pier construction, dredging of channels and turning basins, and placement of dredged sediment would cause temporary increases in suspended sediment, thereby increasing local turbidity. Increased turbidity from construction activities would likely be short-lived. Controls, such as turbidity curtains (sediment curtains), may reduce turbidity impacts. If the use of turbidity curtains is not possible due to current velocities, dredging would be conducted during slack tides (i.e., on the western portion of the channel during flood tides and the eastern portion of the channel during ebb tides) to lessen turbidity. Sediment plumes from construction would likely settle out in a few hours, limiting effects from increased turbidity to the short-term.

No information is available on the effects of TSS on juvenile and adult sea turtles. While the increase in suspended sediments may cause sea turtles to alter their normal movements, these minor alterations would be too small to be meaningfully measured or detected. Sea turtles breathe air at the water's surface and would be able to swim away from the turbidity plume and would not be adversely affected by passing through areas affected by the temporary increase in TSS. TSS is most likely to affect sea turtles if a plume causes a barrier to normal behaviors. However, sea turtles would be expected to swim through or around the plume to avoid the area with no adverse effects. For these reasons, physical and behavioral turbidity effects on sea turtles would be too small to be meaningfully measured or detected, and would be insignificant (NOAA Fisheries 2020).

Capture/Entrapment During Dredging

Sea turtles are not known to be vulnerable to entrainment in mechanical dredges, presumably because they are able to avoid the dredge bucket. Thus, if a sea turtle were to be present at the dredge site, it would be extremely unlikely to be injured or killed as a result of dredging operations carried out by a mechanical dredge. Based on this information, effects to sea turtles from the mechanical dredge are discountable (Hopper 2021).

Effects Determination for Sea Turtles

The Proposed Action may affect but is not likely to adversely affect sea turtles if present in the waters of the action area.

Conclusions

The effect determinations for each species discussed above are summarized in **Table 9**.

Table 9. Effects Determinations for Species Under NOAA Fisheries Jurisdiction Potentially Occurring in the Action Area			
Common Name	**Listing Status**	**DPS**	**Effect Determination**
Atlantic sturgeon	Threatened/ Endangered	All	May affect, not likely to adversely affect
Giant manta ray	Threatened	N/A	May affect, not likely to adversely affect
Leatherback sea turtle	Endangered	N/A	May affect, not likely to adversely affect
Loggerhead sea turtle	Threatened	Northwest Atlantic	May affect, not likely to adversely affect
Kemp's ridley sea turtle	Endangered	N/A	May affect, not likely to adversely affect
Green sea turtle	Threatened	North Atlantic	May affect, not likely to adversely affect

Notes:
DPS = Distinct population segment
N/A = Not applicable

Based on the analysis that all effects of the Proposed Action would be insignificant and/or discountable, we have determined that the Wallops Island Northern Development Project may affect but is not likely to adversely affect any listed species or critical habitat under NOAA Fisheries' jurisdiction. We certify that we have used the best scientific and commercial data available to complete this analysis. We request your concurrence with this determination.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Sincerely,

Shari A. Miller
Center NEPA Manager and
Environmental Planning Lead

Enclosures
Attachment 1, Geotechnical Report for MARS Port
Attachment 2, NOAA ESA Section 7 Mapper

cc:
250/Ms. K. Finch
250/Mr. T. Meyer
MARAD/Mr. A. Finio
NMFS/Mr. D. O'Brien
NMFS/Mr. B. Hopper
USACE/Mr. S. Bahnson
VCSFA/Mr. A. Brittingham

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ATTACHMENT 1: GEOTECHNICAL REPORT

JOHN D. HYNES & ASSOCIATES, INC.

Geotechnical and Environmental Consultants
Monitoring Well Installation
Construction Inspection and Materials Testing

March 31, 2021

William A. Murchison
Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland 21237

Re: Report of Subsurface Exploration and Geotechnical Consulting Services
Wallops Island M95 Intermodal Barge Service Project
Wallops Island, Virginia
Project No.: JDH-10/20/145

Dear Mr. Murchison:

John D. Hynes & Associates, Inc. has completed the authorized subsurface exploration and geotechnical engineering evaluations for the proposed Wallops Island M95 Intermodal Barge Service project located in Wallops Island, Virginia. Our services were performed, generally, in accordance with our contract dated September 12, 2019.

This report describes the exploration methods employed, exhibits the data obtained, and presents our evaluations and recommendations with regard to dock pile foundations. The report includes a discussion of the field work, the soil and groundwater conditions encountered during the exploration for the dredging and deepening of the proposed Wallops channel and turning basin and the construction of barge deck. The barge deck is to be supported on deck pier bents and pier bents are supported on pier bent pile foundations. We provide recommendations for vertical and battered piles for pier bent pile foundations for the proposed Wallops Island M95 Intermodal Barge Service project.

We appreciate the opportunity to be of service to you. If you have any questions regarding the contents of this report or if we may be of further assistance, please contact our office.

Respectfully,
JOHN D. HYNES & ASSOCIATES, INC.

Duowen Ding
Project Engineer

DD: JDH/jsl

John D. Hynes, P.E.
President

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HYNES

REPORT OF
SUBSURFACE EXPLORATION
AND
GEOTECHNICAL CONSULTING SERVICES

WALLOPS ISLAND M95 INTERMODAL BARGE SERVICE PROJECT
WALLOPS ISLAND, VIRGINIA

PREPARED FOR
GAHAGAN & BRYANT ASSOCIATES, INC.

MARCH 31, 2021
PROJECT NO.: JDH-10/20/145

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PURPOSE AND SCOPE

The subsurface exploration study was performed to evaluate the subsurface conditions with respect to the following:

1. Soil and groundwater conditions encountered at the site;
2. Channel deepening and dredging;
3. Pier bent pile foundation capacities and installation depths;
4. Pile foundation construction and inspection procedures;
5. Location of groundwater and Chincoteague Bay water; and
6. Other aspects of the design and construction for the proposed structures indicated by the exploration.

An evaluation of the site is included. The inspection is considered necessary both to confirm the subsurface conditions and to verify that the soils related construction phases are performed properly.

EXISTING SITE CONDITIONS

As shown on the Project Location Map (Drawing JDH-10/20/145-A) in the Appendix, the project site is located at the Wallops Island, Virginia. The site includes an on land side area, a marsh area and a water side (mud and overdredge) area. The on land side area is beyond the end of the pavement/runway at the edge of the marsh. The marsh area is generally surrounded by the runway and Chincoteague Bay water. The water side area is along the water channel and turning basin in the Chincoteague Bay. The site includes on land side, marsh, water side areas and is generally along the shoreline of Chincoteague Bay water and Wallops Island.

PROJECT CHARACTERISTICS

Proposed for development on the site is the construction of Wallops Island M95 Intermodal barge service waterfront facilities. Hynes & Associates evaluated the site for the deck foundations. The deck will be supported on bents which are, in turn, supported on pile foundations. Based on information provided by the WBCM, LLC, we understand that the maximum compression load of 140 tons and the maximum uplift load of 90 tons will be considered in the pile analyses. Piles considered for support are 24 inches square prestressed concrete piles and 20 inches square prestressed concrete piles. We understand that the Phase 1 mudline depth at Boring P-3 is -10.3 NAVD88. The Phase 3 mudline depth at Boring P-5 is -13.3 NAVD88. We have evaluated 24 inch and 20 inch square vertical and battered piles to support the pier bent deck. We will provide recommendations for alternative foundations, upon request.

FIELD EXPLORATION AND STUDY

In order to determine the nature of the subsurface conditions at the site, sixteen (16) test borings, designated as L-1, P-1 through P-5, D-2, D-4, D-6, D-9, D-11, D-13, D-15, E-2, E-4, and E-7, were drilled on November 13, 2020 to January 5, 2021, at the approximate locations shown on the Exploration Location Plan (Drawing JDH-10/20/145-B) in the Appendix. Land test boring L-1 was drilled to a depth of 90.5 feet below existing grade. Pier test borings P-1 through P-5 were drilled to depths of 90.5 to 120.5 feet below existing grade. Channel deepening test borings D-2, D-4, D-6, D-9, D-11, D-13, and D-15 were drilled to depths of 4 to 18 feet below existing grade. Dredging test borings E-2, E-4 and E-7 were drilled to depths of 8 feet below existing grade. The test borings were drilled using track-mounted Geoprobe 3230 and 7822 DT drill rigs, and a Mobile B-47 HD drill rig.

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Soil sampling and testing were carried out in accordance with ASTM Specification D-1586. A brief description of the field procedures is included in the Appendix. The results of all boring and sampling operations are shown on the boring log in the Appendix.

Samples of the subsurface soils were examined by our engineering staff and were visually classified in accordance with the Unified Soil Classification System (USCS) and ASTM Specification D-2488. The estimated USCS symbols appear on the boring log and a key to the system nomenclature is provided in the Appendix of this report. Also included are reference sheets which define the terms and symbols used on the boring log and explain the Standard Penetration Test procedures.

We note that the test boring records represent our interpretation of the field data based on visual examination and selected soil classification tests. Indicated interfaces between materials may be gradual.

The field exploration data was supplemented with laboratory testing data. The laboratory at John D. Hynes & Associates, Inc. performed six (6) moisture content tests, fourteen (14) particle size distribution tests including ten (10) hydrometer tests, and eleven (11) Atterberg limits test. The test results are presented in a table in the Appendix.

We collected two Shelby tubes in a soft cohesive soil layers. A third Shelby Tube was attempted at 32 to 34 feet in Boring P-4. The sampling retrieved in no recovery. Two tube samples was sent to EBA Engineering in Laurel, Maryland for unconfined compressive strength testing, unit weight determination, moisture content testing, and Atterberg Limits testing. The samples were taken at 22 to 24 in Boring L-1 and 42 to 44 in Boring P-5. The Shelby tube sample L-1 from Boring L-1 at depths 22 to 24 feet was very soft and could not stand properly to be tested. So, EBA could not perform UU-triaxial test on the Shelby tube sample L-1. EBA performed the other tests on the Shelby tube sample L-1 except the UU-triaxial test. Shelby tube test results and sample identifications, locations and depths are included in the Appendix. The EBA Engineering data sheets are included in the Appendix.

Six pressuremeter tests were performed by In-Situ Soil Testing, L.C. in the field at locations P-2 and P-2A. The test at 12.9 feet at B-2 was rerun at B-2A at 14 feet because the data was in question. The data was verified. The results of this testing are included in the Appendix of this report.

SUBSURFACE CONDITIONS

At the time of our field work, 6 inches of organic bearing soil was encountered at the ground surface at the boring location L-1. Sediments were encountered at the other boring locations. Varying thicknesses of organic bearing soils or other surficial materials in varying thicknesses may be encountered at other locations on site.

The soils encountered were visually classified in accordance with the USCS and consisted of interbedded layers of SAND (SP and SP-SM), Silty SAND (SM), Clayey SILT (ML and ML-MH), Clayey Elastic SILT (MH), Clayey Organic SILT (MH-OH), CLAY and SAND (CL-SC), CLAY (CL), Silty CLAY and Fat CLAY (CL-CH), and Silty Fat CLAY (CH) to the boring termination depths. Standard Penetration Test (SPT) values (N-values) in the sand layers ranged from 2 to 47 blows per foot, indicating in-place relative densities of very loose to dense. The SPT values in the cohesive soil layers ranged from 3 to more than 91 blows per foot, indicating in-place consistencies of very soft to hard.

Groundwater was encountered at depths of 3 feet below the ground surface during drilling operations at Boring L-1. Groundwater elevations may vary at other times during the year depending upon the amount of local precipitation, tidal fluctuations in the Chincoteague Bay at boring L-1. The water level in the Bay was at grade in boring P-1 at the

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time the boring was drilled. Water depths varied from 2.25 feet to 16 feet in the other test borings that were drilled from a barge.

RECOMMENDATIONS

The following recommendations and considerations are based on our understanding of the proposed construction, the data obtained from the exploration, and our previous experience with similar subsurface conditions and projects. If there are any significant changes to the project characteristics, such as structural loadings differing significantly from those noted above, structure geometry, structure location, foundation type, elevations, etc., we request that this office be advised so the recommendations of this report can be re-evaluated.

A. Turning Basin and Channel Deepening and Dredging

Deepening and dredging for the construction of the proposed channel and turning basin will be required. Based on boring information, it is anticipated that the depth of deepening and dredging in earth materials will likely be up to 8 to 18 feet deep. The materials that will be encountered in the deepening and dredging include SAND (SP and SP-SM), and CLAY and SAND (CL-SC) materials. Standard Penetration Test (SPT) values (N-values) in the sand layers ranged from 3 to 37 blows per foot, indicating in-place relative densities of very loose to dense. It is anticipated that earth deepening and dredging can generally be performed using conventional deepening and dredging equipment in proper working condition.

B. Driven Prestressed Concrete Piles

Based on the proposed loads and subsurface soil conditions at the site, we recommend supporting the deck pier bents on prestressed concrete pile foundations. Hynes & Associates' pile recommendations are based upon local site characteristics, the subsurface soil parameters determined from the field exploration, pressuremeter test results and the physical characteristics of the piles. We provide recommendations for 24 inch square and 20 inch square prestressed concrete piles. Assuming conformance to the embedment requirements, the assigned pile capacities may be used by the Structural Engineer for pile spacing according to the structure design and the loads to be applied. Total elastic settlement of the piles is anticipated to be less than ½ inch. Considering the subsurface soil characteristics and the parameters used in our assignment of pile embedments, long term settlement of the pile foundations is expected to be minimal if the recommendations of this report are followed. The pile properties are shown in the Appendix (Drawing JDH-10/20/145-D. We understand that the Phase 1 mudline depth at Boring P-3 is -10.3 NAVD88. The Phase 3 mudline depth at Boring P-5 is -13.3 NAVD88.

Based upon the above, we will provide pile embedments and allowable capacities of prestressed concrete piles with square sections, dimensions of 24 in. by 24 in. and 20 in. by 20 in. the land side area, marsh and water areas. The pile capacities will be presented in a supplement to this report.

The compression design capacity of each prestressed concrete pile production pile should be confirmed by the geotechnical engineer or an experienced pile inspector during the pile driving operations by using an acceptable pile driving formula such as the Engineering News Formula. In instances where the design capacity cannot be obtained within the production pile lengths, additional piles would be required.

The characteristics of the prestressed concrete pile groups should be designed for adequate structural requirements as specified by the Structural Engineer. These requirements should include the strengh of the piles under static, dynamic, uplift and lateral loads, where applicable.

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The installation of all piles should be in accordance with local code requirements. In addition, the installation of all piles should be inspected by a qualified Geotechnical Engineer or foundation inspector. The inspector should verify and record all aspects of the installation including pile sizes, pile length before driving, cut-off length, tip installation depth and the driving data.

We recommend that at least one pile load test be performed for each capacity of vertical pile at locations as decided by the Structural and Geotechnical Engineers. The pile load test should be in accordance with ASTM D-1143 Standard Test Method for Piles Under Static Axial Compressive Load. The piles should be loaded to 200 percent of the design load. The load tests should be required to verify the capacity of the piles at the selected embedment depth and capacity. As an alternative, Dynamic Pile Load testing may be performed.

ADDITIONAL SERVICES RECOMMENDED

Additional engineering, testing and consulting services recommended for this project are summarized below.

Driven Pile Inspections

The Geotechnical Engineer should verify all driven length embedments. The geotechnical engineer or experienced foundation inspector should verify and record all aspects of installation including pile dimensions, pile length, tip elevation, top elevation and the driving data. The inspecting engineer should verify that the driving data indicates that the design compression, uplift, and lateral capacity of each pile had been achieved.

REMARKS

This report has been prepared solely and exclusively for Gahagan & Bryant Associates, Inc. to provide guidance to design professionals in developing facilities plans for the proposed Wallops Island M95 Intermodal Barge Service Project located in Wallops Island, Virginia. It has not been developed to meet the needs of others, and application of this report for other than its intended purpose could result in substantial difficulties. The Consulting Engineer cannot be held accountable for any problems which occur due to the application of this report to other than its intended purpose.

These analyses and recommendations are, of necessity, based on the concepts made available to us at the time of the writing of this report, and on-site conditions, surface and subsurface that existed at the time the exploratory borings were drilled. Further assumption has been made that the limited exploratory borings, in relation both to the areal extent of the site and to depth, are representative of conditions across the site. It is also recommended that we be given the opportunity to review all plans for the project in order to comment on the interaction of soil conditions as described herein and the design requirements.

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted engineering principles and practices.

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APPENDIX

1. Investigative Procedures
2. Project Location Map
3. Boring Location Plan
4. Proposed Pier Plan and Elevation
5. Pile Properties Sketch
6. Boring Logs
7. Hynes & Associates: Grain Size Distribution Graphs
8. EBA: Soil Testing
9. Pressuremeter Test Results
10. Unified Soil Classification Sheet
11. Field Classification Sheet
12. Important Information Sheet

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INVESTIGATIVE PROCEDURES

SOIL TEST BORINGS

Soil drilling and sampling operations were performed in accordance with ASTM Specification D-1586. The borings were advanced by mechanically turning continuous hollow stem auger flights into the ground. At regular intervals, samples were obtained with a standard 1.4 inch I.D., 2.0 inch O.D. splitspoon sampler. The sampler was first seated 6 inches to penetrate any loose cuttings and then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot is the "Standard Penetration Resistance". The penetration resistance, when properly evaluated, is an index to the soil's strength, density and behavior under applied loads. The soil descriptions and penetration resistances for each boring are presented on the Test Boring Records in the Appendix.

SOIL CLASSIFICATION

Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply his past experience to current problems. In our investigation, jar samples obtained during drilling operations are examined in our laboratory and visually classified by the geotechnical engineer in accordance with ASTM Specification D-2488. The soils are classified according to the Unified Classification System (ASTM D-2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior.

SIEVE ANALYSIS

Gradational analysis tests were performed to determine the particle size and distribution of the samples tested. The grain size distribution of soils coarser than a No. 200 sieve is determined by passing the sample through a standard set of nested sieves. The percentage of materials passing the No. 200 sieve is determined by washing the material over a No. 200 sieve. These tests are in accordance with ASTM D-421, D-422 and D-1140. The results are presented in the Appendix to our report.

NATURAL MOISTURE

Portions from representative soil samples obtained during drilling operations were selected for Natural Moisture Content tests. The Natural Moisture Content Test determines the water content of soils by drying into an oven with a standard drying temperature of 110°C. The lost of mass drying the sample, determines the water content into the soil. The water content of the sample is calculated in percentage. The water content of soils (natural moisture) is determined in accordance with ASTM Specification D-2216.

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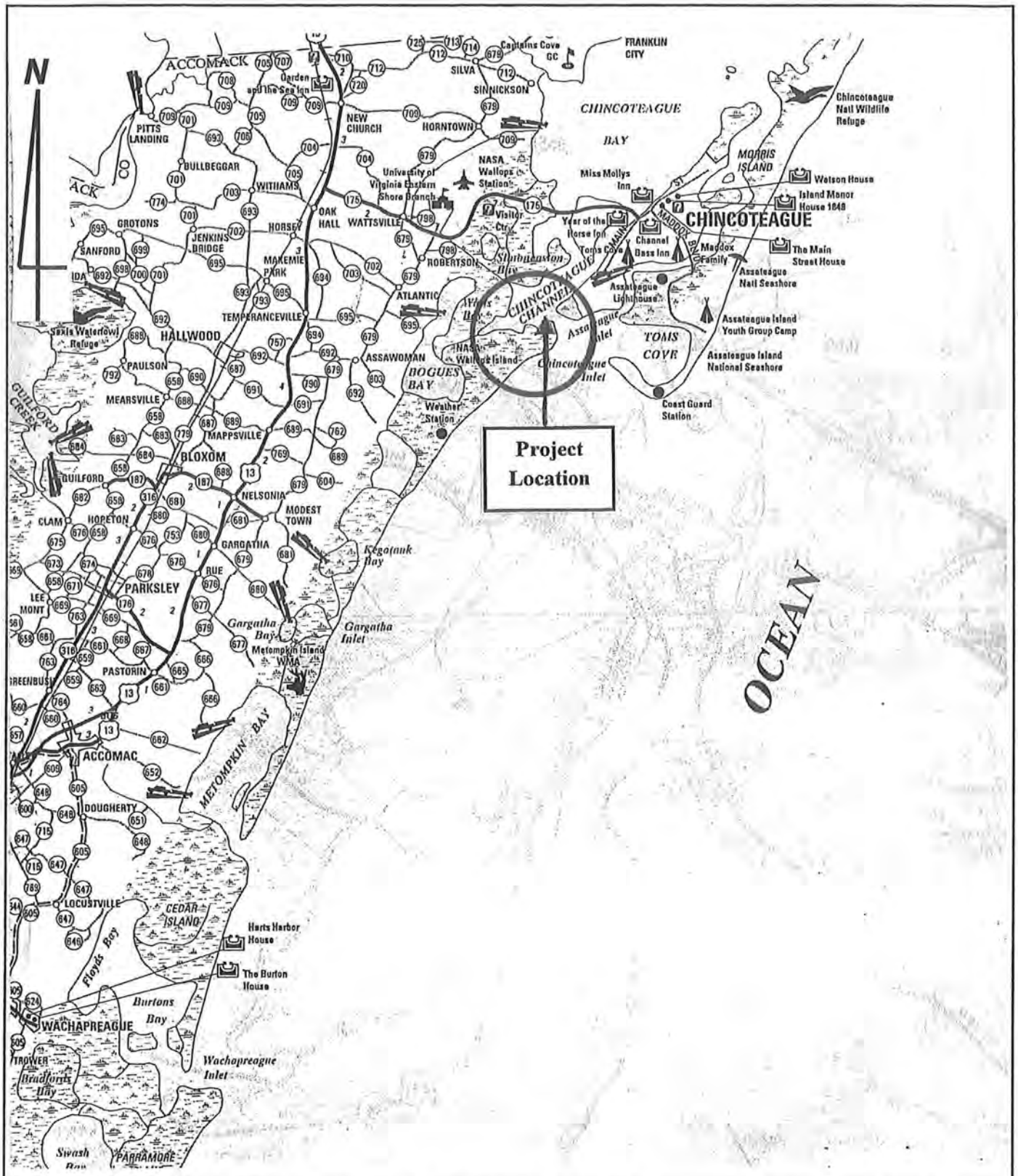

HYNES **JOHN D. HYNES & ASSOCIATES, INC.**

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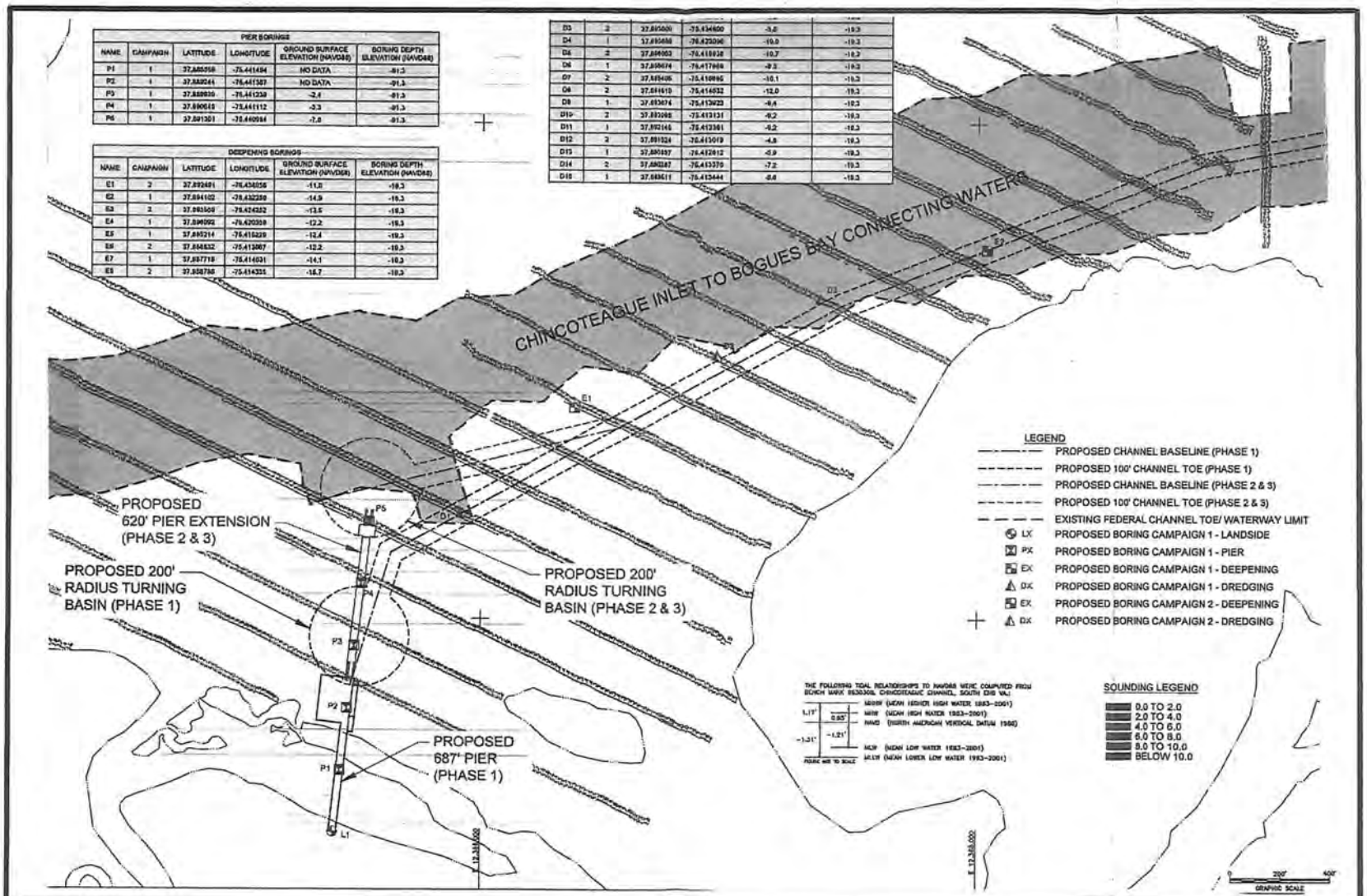
	Date: November 25, 2020
	Scale: 1 in. = 2,000 ft.
	Drawn: ADC Map
Project Location Map Wallops Island M95 Intermodal Barge Wallops Island, Virginia	**DWG. No.** **JDH-10/20/145-A**



PIER BORINGS

NAME	CAMPAIGN	LATITUDE	LONGITUDE	GROUND SURFACE ELEVATION (NAVD88)	BORING DEPTH ELEVATION (NAVD88)
P1	1	37.885058	-75.441494	NO DATA	-91.3
P2	1	37.888244	-75.441587	NO DATA	-91.3
P3	1	37.889939	-75.441259	-2.4	-91.3
P4	1	37.890618	-75.441112	-3.3	-91.3
P5	1	37.891301	-75.440984	-7.8	-91.3

DEEPENING BORINGS

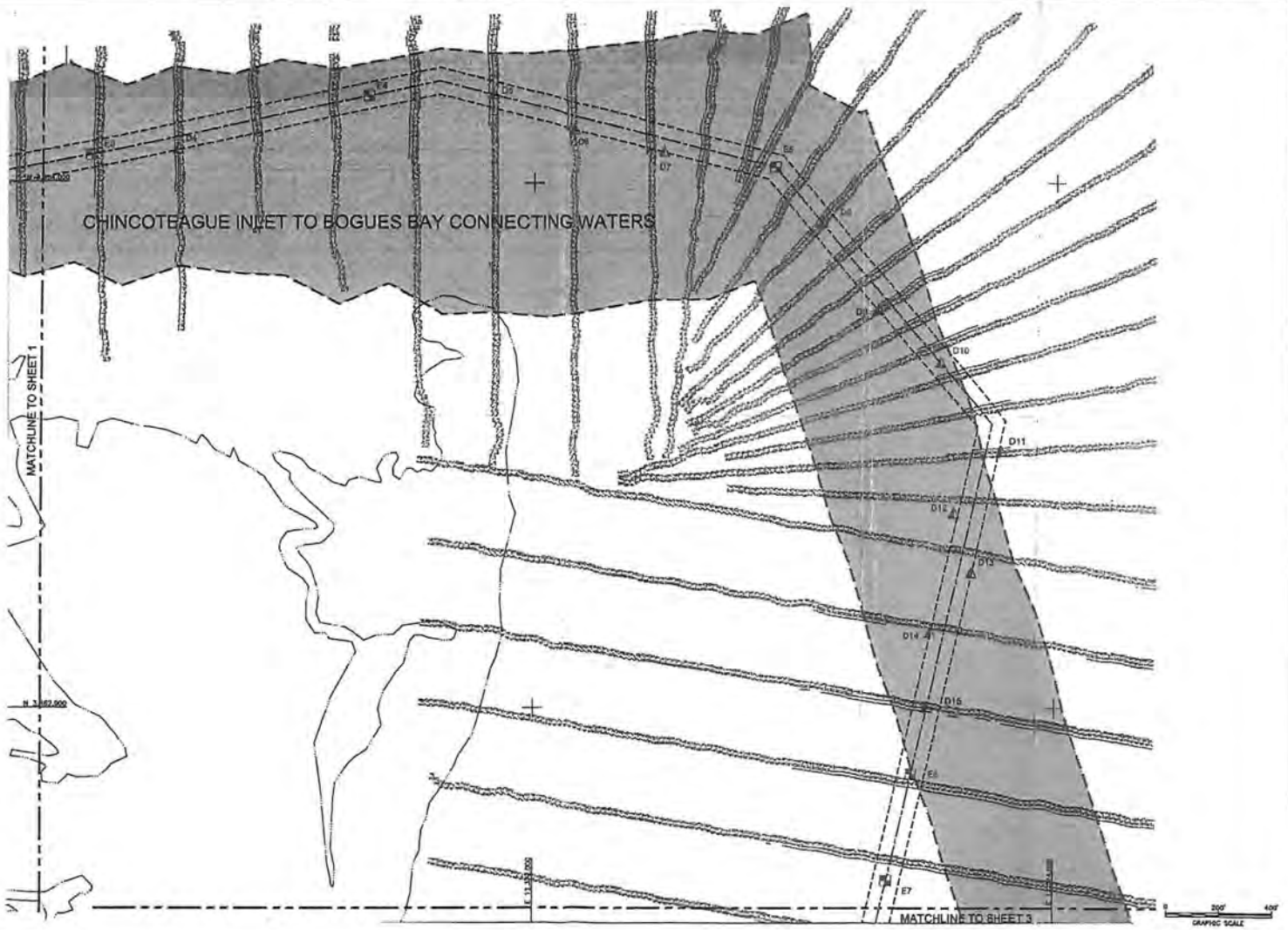
NAME	CAMPAIGN	LATITUDE	LONGITUDE	GROUND SURFACE ELEVATION (NAVD88)	BORING DEPTH ELEVATION (NAVD88)
E1	2	37.892491	-75.434056	-11.0	-19.3
E2	1	37.894102	-75.432259	-14.9	-19.3
E3	2	37.893509	-75.424252	-13.6	-19.3
E4	1	37.890092	-75.420358	-12.2	-19.3
E5	1	37.885214	-75.418229	-12.4	-19.3
E6	2	37.884632	-75.412067	-12.2	-19.3
E7	1	37.887718	-75.414031	-14.1	-19.3
E8	2	37.888786	-75.414335	-16.7	-19.3

D3	2	37.895091	-75.434600	-9.8	-19.3
D4	1	37.895858	-76.423096	-10.0	-19.3
D5	2	37.896053	-76.418938	-10.7	-19.3
D6	1	37.896474	-76.417966	-9.3	-19.3
D7	2	37.895406	-75.416986	-10.1	-19.3
D8	2	37.894610	-75.416632	-12.0	-19.3
D9	1	37.893674	-75.413923	-9.4	-19.3
D10	2	37.893068	-75.413131	-9.2	-19.3
D11	1	37.892146	-75.412361	-9.2	-19.3
D12	2	37.891024	-75.413019	-9.8	-19.3
D13	1	37.890697	-75.412612	-9.9	-19.3
D14	2	37.890287	-75.413370	-7.2	-19.3
D15	1	37.889511	-75.413444	-9.6	-19.3

THE FOLLOWING TIDAL RELATIONSHIPS TO NAVD88 WERE COMPUTED FROM BENCH MARK 8638308, CHINCOTEAGUE CHANNEL, SOUTH END VA.:
MHHW (MEAN HIGHER HIGH WATER, 1983–2001)
MHW (MEAN HIGH WATER 1983–2001)
NAVD (NORTH AMERICAN VERTICAL DATUM 1988)
MLW (MEAN LOW WATER 1983–2001)
MLLW (MEAN LOWER LOW WATER 1983–2001)
1.17'
0.93'
-1.21'
-1.31'
FIGURE NOT TO SCALE

E 12,333,000
E 12,333,500

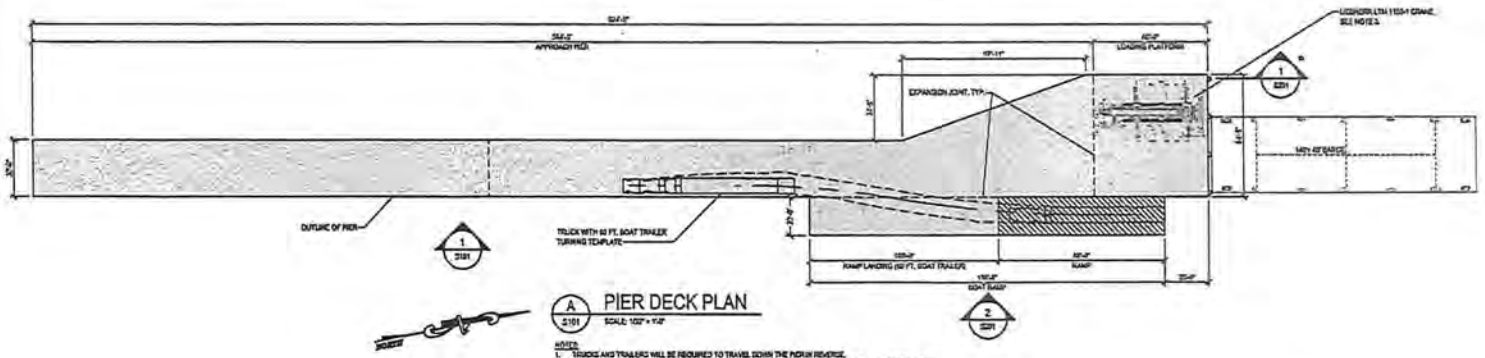
HYNES JOHN D. HYNES & ASSOCIATES, INC. 32185 Beaver Run Drive • Salisbury, Maryland 21804 410-546-6462 / Fax: 410-548-5346	Boring Location Plan Wallops Island M95 Intermodal Barge Wallops Island, Virginia
	Date: January 18, 2021 Scale: As Shown Drawn: GBA Engineering DWG. No. JDH-10/20/145-B-1



HYNES
JOHN D. HYNES & ASSOCIATES, INC.
32185 Beaver Run Drive • Salisbury, Maryland 21804
410-546-6462 / Fax: 410-548-5346

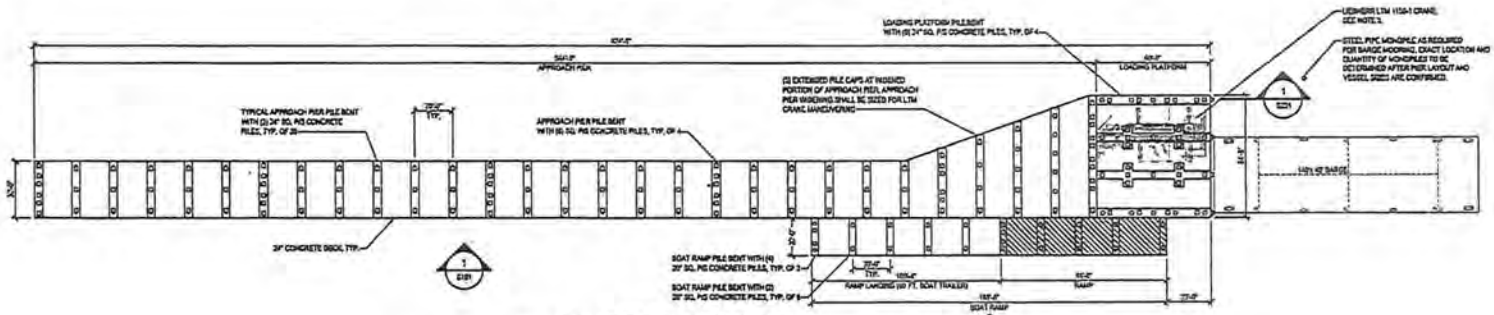
Boring Location Plan
Wallops Island M95 Intermodal Barge
Wallops Island, Virginia

Date: January 18, 2021
Scale: As Shown
Drawn: GBA Engineering
DWG. No. JDH-10/20/145-B-2

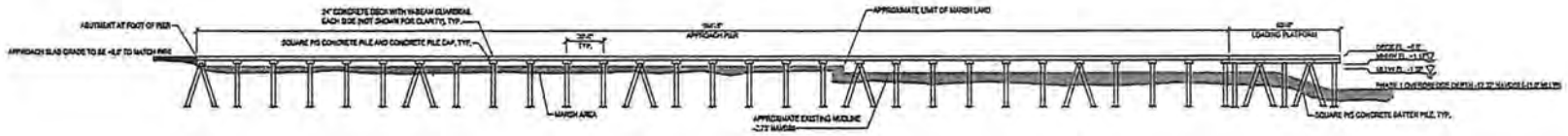


A 2101 PIER DECK PLAN
SCALE: 1/32" = 1'-0"

NOTES:
1. TRUCKS AND TRAILERS WILL BE REQUIRED TO TRAVEL DOWN THE PIER IN REVERSE.
2. THE RAMP LANDING SIZE IS CONTROLLED BY THE SIZE OF THE BOAT TRAILER. THE SIZE SHOWN IS FOR A 65 FT. BOAT TRAILER.
3. PIER OPERATIONS, INCLUDING LTM CRANE LOADING AND UNLOADING FROM THE BARGE AND USE OF THE BOAT RAMP CANNOT BE CARRIED OUT CONCURRENTLY.



B 2101 PIER FRAMING PLAN
SCALE: 1/32" = 1'-0"



1 2101 PIER ELEVATION
SCALE: 1/32" = 1'-0"

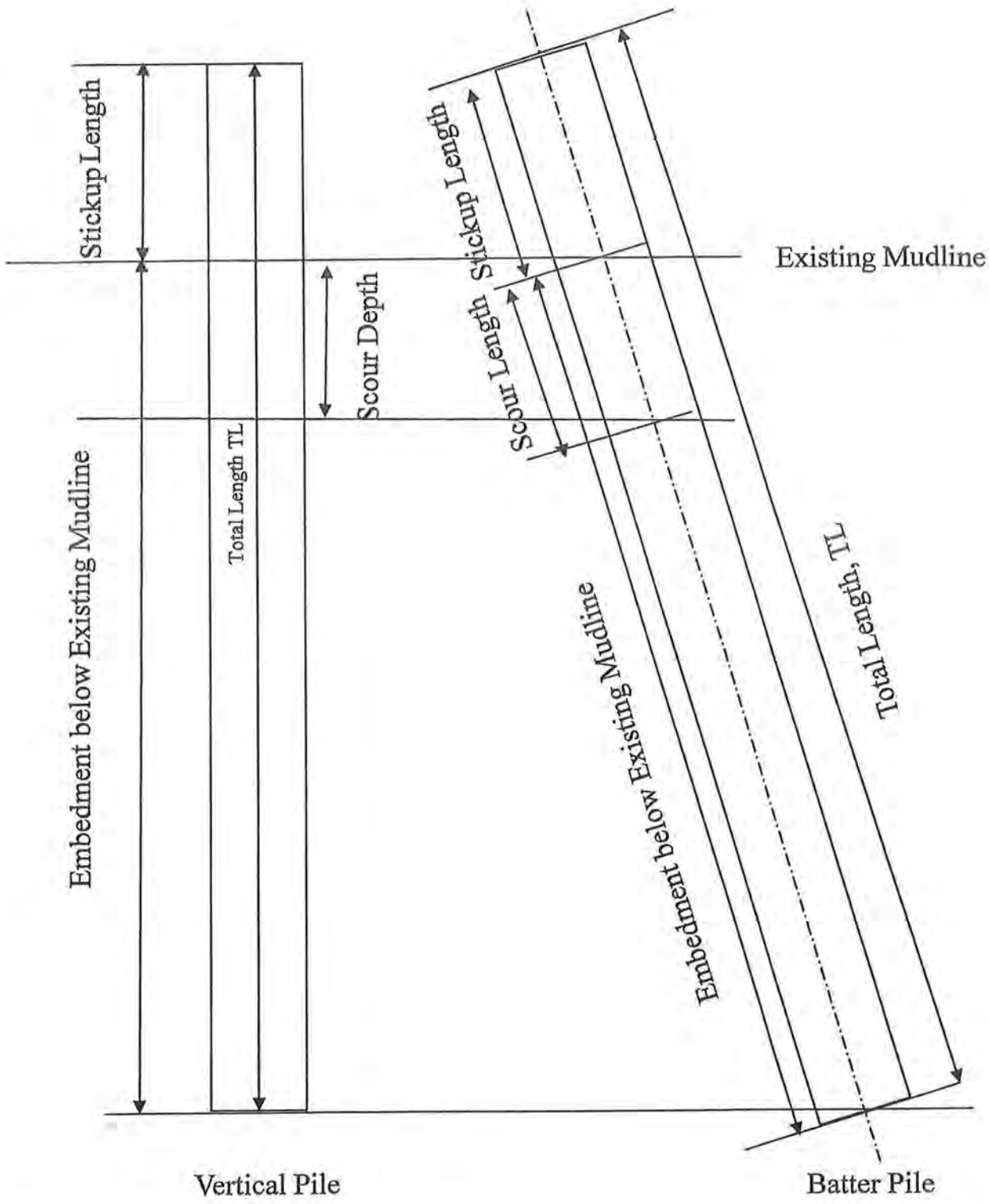
NOTES:
1. BOAT RAMP NOT SHOWN FOR CLARITY. SEE ELEVATION 2/2201.
2. ALL ELEVATIONS REFER TO NAVD88 DATUM UNLESS NOTED OTHERWISE.

HYNES

JOHN D. HYNES & ASSOCIATES, INC.
32185 Beaver Run Drive • Salisbury, Maryland 21804
410-546-6462 / Fax: 410-548-5346

Proposed Pier Plan and Elevation
Wallops Island M95 Intermodal Barge
Wallops Island, Virginia

Date: March 10, 2021
Scale: As Shown
Drawn: GBA Engineering
DWG. No. JDH-10/20/145-C



HYNES **JOHN D. HYNES & ASSOCIATES, INC.**
32185 Beaver Run Drive • Salisbury, Maryland 21804
410-546-6462 / Fax: 410-548-5346

Date: March 10, 2021
Scale: N/A
Drawn: DD

Pile Properties
Wallops Island M95 Intermodal Barge Service Project
Wallops Island, Virginia

DWG. No.
JDH-10/20/145-D

HYNES & ASSOCIATES

LOG OF BORING L-1

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : November 13, 2020
Logged By: : J. Lindsey
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 3230 DT)
Total Depth: : 90.5 feet

Depth in Feet	Surf. Elev. 4.40	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blows per 6 inches	Pocket Penetrometer Readings (tons/sq./ft.)	REMARKS
0	4.4	Brown, wet, very loose, fine to medium SAND, with trace silt		SP	1	1-1-2-2		Scale 1" ~ 7.4 feet
2	2.4							
4	.4	Dark brown, wet to saturated, very soft, clayey organic SILT, with trace fine sand		MH-OH	2	1-2-1	0.0	Approximately 6 inches of organic bearing soil was encountered at the ground surface.
6	-1.6				3	1-1-2		Shelby Tube sample was pushed from 22 to 24 feet.
8	-3.6							
10	-5.6	Gray, saturated, loose to very loose, fine to medium SAND, with trace silt		SP	4	2-4-2		Groundwater was encountered at 3 feet during drilling operations.
12	-7.6							
14	-9.6				5	1-1-1		Laboratory Test Results
16	-11.6							Sample No. 3 From 6 to 7.5 feet
18	-13.6	Gray, saturated, very loose, fine to medium SAND, with some silt, trace to little clay		SM				Natural Moisture = 36.3%
20	-15.6				6	1-2-1		Sample No. 6 From 19 to 20.5 feet
22	-17.6							Sieve Analysis
24	-19.6				7	1-2-2		Sieve Passing Size % 3/8" 100 No. 4 99.1 No. 10 98.5 No. 20 97.9 No. 40 97.4 No. 60 96.1 No. 100 63.8 No. 200 30.1 USCS: SM Natural Moisture = 25.1%
26	-21.6							
28	-23.6	Gray, saturated, very soft, clayey SILT, with trace fine sand, trace organic silt		CH	8	WOH/18"		
30	-25.6							
32	-27.6	Gray, saturated, medium stiff to stiff, silty CLAY		CH				
34	-29.6				9	4-5-5	2.0	
36	-31.6							
38	-33.6							Sample No. 8 From 29 to 30.5 feet
40	-35.6				10	3-6-6	2.0	Atterberg Limits
42	-37.6	Brown, saturated, soft, clayey SILT, with trace fine sand		ML				Liquid Limit = 57 Plasticity Index = 24 USCS: CH Natural Moisture = 51.3%
44	-39.6				11	1-2-2	1.5	
46	-41.6							NAD 83 VA State Plane South Easting: 12365404 Northing: 3861122
48	-43.6	Gray, saturated, very loose, fine to medium SAND, with little silt, trace clay, trace shell fragments		SM				
50					12	1-1-2		

HYNES & ASSOCIATES

LOG OF BORING L-1

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : November 13, 2020
Logged By: : J. Lindsey
Drilled By: : B. Hynes
Drilling Method: : HSA (Geoprobe 3230 DT)
Total Depth: : 90.5 feet

Depth in Feet	Surf. Elev. 4.40	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blows per 6 inches	Pocket Penetrometer Readings (tons/sq./ft.)	REMARKS
50	-45.6	Gray, saturated, very loose, fine to medium SAND, with little silt, trace clay, trace shell fragments		SM	12	1-1-2		The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
52	-47.6							
54	-49.6	Gray, saturated, medium stiff, clayey SILT, with little fine sand, trace shell fragments		ML	13	1-2-4		
56	-51.6							
58	-53.6							
60	-55.6				14	1-2-6		
62	-57.6	Gray, saturated, medium stiff to stiff, clayey SILT, with little fine sand, trace shell fragments		MH				
64	-59.6				15	1-2-4		
66	-61.6							
68	-63.6							
70	-65.6				16	2-4-4		
72	-67.6							
74	-69.6				17	2-4-7		
76	-71.6							
78	-73.6	Gray, saturated, medium dense, fine to medium SAND, with little silt, trace shell fragments		SM	18	6-9-12		
80	-75.6							
82	-77.6	Gray, saturated, dense, fine to medium SAND, with trace to little silt		SP-SM				
84	-79.6				19	8-18-23		
86	-81.6							
88	-83.6							
90	-85.6				20	9-16-24		
92	-87.6	Boring terminated at 90.5 feet.						
94	-89.6							
96	-91.6							
98	-93.6							
100								

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HYNES & ASSOCIATES

LOG OF BORING P-1

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : November 24, 2020
Logged By: : A. Kus
Drilled By: : M. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 90.5 feet

Depth in Feet	Surf. Elev. -0.40	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blows per 6 inches	REMARKS
0	-.4	Gray, saturated, organic SILT, with trace fine to medium sand, trace clay		OL	1	HA	Scale 1" ~ 7.4 feet
2	-2.4	Gray, saturated, medium dense, fine to medium SAND, with trace silt		SP	2	4-6-5	No organic bearing soil was encountered at the ground surface.
4	-4.4	Gray, saturated, medium dense, fine to medium SAND, with trace organic silt		SP	3	3-6-6	Groundwater was not encountered during drilling operations.
6	-6.4	Gray, saturated, loose, fine to medium SAND, with trace organic silt		SP	4	2-3-3	Laboratory Test Results Sample No. 2 From 3 to 4.5 feet
8	-8.4	Gray, saturated, very loose, fine to medium SAND, with little silt, trace organic silt		SM	5	1-2-1	Natural Moisture = 25.6% Sample No. 12 From 49 to 50.5 feet
10	-10.4	Gray, saturated, very soft, SILT, with little fine to medium sand, trace clay		ML	6	1-1-2	Sieve Analysis Sieve Size / Passing % No. 10 100 No. 20 99.9 No. 40 99.5 No. 60 93.6 No. 100 42.2 No. 200 12.6 USCS: SM
12	-12.4	Gray, saturated, medium dense, fine to medium SAND, with trace silt		SP	7	2-5-6	
14	-14.4				8	3-5-8	Natural Moisture = 23.7% Sample No. 17 From 74 to 75.5 feet
16	-16.4						
18	-18.4						
20	-20.4						
22	-22.4						
24	-24.4						
26	-26.4						
28	-28.4						
30	-30.4						
32	-32.4	Gray, saturated, loose to medium dense, fine to medium SAND, with trace silt		SP	9	3-4-4	Natural Moisture = 55.7% NAD 83 VA State Plane South Easting: 12365439 Northing: 3861379
34	-34.4						
36	-36.4						
38	-38.4				10	3-5-7	The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
40	-40.4						
42	-42.4						
44	-44.4				11	3-6-10	
46	-46.4						
48	-48.4	Gray, saturated, medium dense to dense, fine to medium SAND, with little to trace silt		SM	12	17-19-20	
50							

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HYNES & ASSOCIATES

LOG OF BORING P-1

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : November 24, 2020
Logged By: : A. Kus
Drilled By: : M. Hynes
Drilling Method: : HSA (Geoprobe 7822 DT)
Total Depth: : 90.5 feet

Depth in Feet	Surf. Elev. -0.40	DESCRIPTION	GRAPHIC	USCS	Sample No.	Blows per 6 inches	REMARKS
50	-50.4	Gray, saturated, medium dense to dense, fine to medium SAND, with little to trace silt		SP-SM	12	17-19-20	
52	-52.4						
54	-54.4				13	6-8-11	
56	-56.4						
58	-58.4						
60	-60.4				14	5-6-8	
62	-62.4						
64	-64.4				15	15-17-19	
66	-66.4						
68	-68.4						
70	-70.4				16	12-18-24	
72	-72.4	Gray, saturated, very dense, fine to medium SAND, with little to trace silt		SP-SM			
74	-74.4				17	20-24-27	
76	-76.4						
78	-78.4	Gray, saturated, dense, fine to medium SAND, with little to trace silt		SP-SM			
80	-80.4				18	7-15-19	
82	-82.4						
84	-84.4				19	7-15-18	
86	-86.4						
88	-88.4						
90	-90.4				20	8-16-19	
92	-92.4	Boring terminated at 90.5 feet.					
94	-94.4						
96	-96.4						
98	-98.4						
100							

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HYNES & ASSOCIATES

LOG OF BORING P-2

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 18, 2020
Logged By: : R. Rhoads
Drilled By: : M. Hynes
Drilling Method: : HSA/Rotary (Mobile B-47 HD)
Total Depth: : 90.5 feet

Depth in Feet	Surf. Elev. -2.80	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-2.8	Dark gray, saturated, medium dense, fine to medium SAND and SILT, with trace clay, trace organic silt		SM	1	1-6-6	Scale 1" ~ 7.4 feet No organic bearing soil was encountered at the ground surface. Water Depth: 3.7 ft. Laboratory Test Results Sample No. 11 From 49 to 50.5 feet Atterberg Limits Liquid Limit = 28 Plasticity Index = 7 USCS: CL-ML Natural Moisture = 31.4% NAD 83 VA State Plane South Easting: 12365462 Northing: 3861627 The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
2	-4.8						
4	-6.8	Gray, saturated, medium dense, fine to medium SAND, with little silt		SM	2	6-9-10	
6	-8.8						
8	-10.8	Dark gray, saturated, medium dense, fine to medium SAND and SILT, with trace clay, trace organic silt					
10	-12.8				3	3-4-8	
12	-14.8			SM			
14	-16.8				4	4-4-7	
16	-18.8						
18	-20.8	Dark gray, saturated, medium dense, fine to medium SAND and SILT, with trace clay					
20	-22.8				5	9-7-8	
22	-24.8						
24	-26.8				6	8-10-13	
26	-28.8			SM			
28	-30.8						
30	-32.8				7	5-8-11	
32	-34.8						
34	-36.8	Gray, saturated, medium dense, fine to medium SAND, with little silt, trace shell fragments			8	12-13-15	
36	-38.8						
38	-40.8			SM			
40	-42.8				9	12-12-10	
42	-44.8						
44	-46.8	Dark gray, saturated, medium dense, fine to medium SAND and SILT, with trace clay		SM	10	2-5-7	
46	-48.8						
48	-50.8	Gray, saturated, stiff, silty CLAY, with trace fine sand, trace shell fragments		CL-ML	11	4-5-7	
50							

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HYNES & ASSOCIATES

LOG OF BORING P-2

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 18, 2020
Logged By: : R. Rhoads
Drilled By: : M. Hynes
Drilling Method: : HSA/Rotary (Mobile B-47 HD)
Total Depth: : 90.5 feet

Depth in Feet	Surf. Elev. -2.80	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
50	-52.8	Gray, saturated, stiff, CLAY and SILT, with trace fine sand, trace shell fragments		CL-ML	11	4-5-7	
52	-54.8						
54	-56.8	Gray, saturated, very stiff, silty CLAY, with some to little fine sand, trace shell fragments		CL	12	4-8-9	
56	-58.8						
58	-60.8	Gray, saturated, stiff, silty CLAY, with little to trace fine sand		CL	13	4-6-8	
60	-62.8						
62	-64.8						
64	-66.8				14	6-7-8	
66	-68.8						
68	-70.8	Gray, saturated, very stiff, silty CLAY, with some fine to coarse sand, little shell fragments		CL	15	9-10-13	
70	-72.8						
72	-74.8						
74	-76.8	Gray, saturated, dense, fine to coarse SAND, with some silt, little shell fragments		SM	16	12-17-28	
76	-78.8						
78	-80.8	Gray, saturated, dense, fine to medium SAND, with some clay, some silt		SC	17	9-12-19	
80	-82.8						
82	-84.8						
84	-86.8	Gray, saturated, very dense, fine to coarse SAND, with some to little silt, trace clay, trace shell fragments		SM	18	20-50/5"	
86	-88.8						
88	-90.8	Gray, saturated, very dense, fine to coarse SAND, with some gravel, trace silt		SP	19	30-37-43	
90	-92.8						
92	-94.8	Boring terminated at 90.5 feet.					
94	-96.8						
96	-98.8						
98	-100.8						
100							

03-30-2021 J:\Mtech 2010\Wallops Island M95 Intermodal Barge Service Project-20145\P-2.bor

HYNES & ASSOCIATES

LOG OF BORING P-3

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 17, 2020
Logged By: : A. Kus
Drilled By: : M. Hynes
Drilling Method: : HSA/Rotary (Mobile B-47 HD)
Total Depth: : 90.5 feet

Depth in Feet	Surf. Elev. -2.70	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-2.7	Gray, saturated, loose, SILT, with little fine to medium sand, trace clay		ML	1	1-4-6	Scale 1" ~ 7.4 feet
2	-4.7						No organic bearing soil was encountered at the ground surface.
4	-6.7	Gray, saturated, medium dense, fine to medium SAND, with trace silt		SP	2	8-11-11	Water Depth: 4.5 ft. at 12:00 pm
6	-8.7						
8	-10.7						Laboratory Test Results
10	-12.7	Gray, saturated, loose, fine to medium SAND, with some to little silt, trace clay		SM	3	6-3-6	Sample No. 2 From 4 to 5.5 feet
12	-14.7						
14	-16.7	Gray, saturated, medium dense, fine to medium SAND, with little to trace silt		SP-SM	4	3-7-7	Sieve Analysis Sieve Size / Passing % No. 20 100 No. 40 99.5 No. 60 85.6 No. 100 86.1 No. 200 5.5 USCS: SP Natural Moisture = 23.1%
16	-18.7						
18	-20.7						
20	-22.7				5	8-8-12	
22	-24.7						
24	-26.7				6	9-13-18	Sample No. 8 From 34 to 35.5 feet
26	-28.7						Natural Moisture = 23.5%
28	-30.7	Gray, saturated, medium dense, fine to medium SAND, with little silt, trace clay		SM	7	10-10-11	Sample No. 12 From 54 to 55.5 feet
30	-32.7						Atterberg Limits
32	-34.7	Gray, saturated, medium dense, fine to medium SAND, with little to trace silt		SP-SM			Liquid Limit = 33 Plasticity Index = 20 USCS: CL Natural Moisture = 25.5%
34	-36.7				8	10-8-11	
36	-38.7						
38	-40.7						Sample No. 16 From 74 to 75.5 feet
40	-42.7				9	9-14-11	Atterberg Limits
42	-44.7	Gray, saturated, medium dense, fine to medium SAND, with some to little silt, trace clay		SM			Liquid Limit = 60 Plasticity Index = 28 USCS: CH Natural Moisture = 39.1%
44	-46.7				10	7-12-15	
46	-48.7						
48	-50.7	Gray, saturated, stiff, clayey SILT, with little fine to medium sand, trace shell fragments		ML			NAD 83 VA State Plane South Easting: 12365490 Northing: 3861891
50					11	4-6-6	

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HYNES & ASSOCIATES

LOG OF BORING P-3

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 17, 2020
Logged By: : A. Kus
Drilled By: : M. Hynes
Drilling Method: : HSA/Rotary (Mobile B-47 HD)
Total Depth: : 90.5 feet

Depth in Feet	Surf. Elev. -2.70	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
50	-52.7	Gray, saturated, stiff, clayey SILT, with little fine to medium sand, trace shell fragments		ML	11	4-6-6	The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
52	-54.7	Gray, saturated, very stiff, silty CLAY, with little fine to medium sand, little shell fragments		CL	12	6-8-10	
54	-56.7						
56	-58.7						
58	-60.7				13	8-8-10	
60	-62.7						
62	-64.7	Gray, saturated, very stiff, clayey SILT, with little fine to medium sand, trace shell fragments		ML	14	7-8-11	
64	-66.7						
66	-68.7						
68	-70.7	Gray, saturated, very stiff, silty CLAY, with little fine to medium sand, trace shell fragments		CL	15	10-11-10	
70	-72.7						
72	-74.7	Gray, saturated, very stiff, clayey SILT, with trace fine to medium sand		CH	16	8-12-14	
74	-76.7						
76	-78.7						
78	-80.7	Gray, saturated, very stiff, clayey SILT, with little fine to coarse sand, trace shell fragments		ML/MH	17	9-13-14	
80	-82.7						
82	-84.7	Gray, saturated, dense, fine to medium SAND, with little silt, trace clay		SM	18	14-24-30	
84	-86.7						
86	-88.7						
88	-90.7	Gray, saturated, very dense, fine to coarse SAND, with trace silt		SP	19	20-29-39	
90	-92.7						
92	-94.7	Boring terminated at 90.5 feet.					
94	-96.7						
96	-98.7						
98	-100.7						
100							

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HYNES & ASSOCIATES

LOG OF BORING P-4

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 23, 2020
Logged By: : D. Csanda
Drilled By: : B. Hynes
Drilling Method: : HSA/Rotary (Mobile B-47 HD)
Total Depth: : 120.5 feet

Depth in Feet	Surf. Elev. -2.70	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-2.7	Gray, saturated, loose, fine to medium SAND, with trace silt		SP	1	1-4-6	Scale 1" ~ 7.4 feet
2	-4.7	Gray, saturated, medium dense, fine to medium SAND, with trace silt		SP	2	8-8-10	No organic bearing soil was encountered at the ground surface.
4	-6.7						
6	-8.7						Water Depth: 2 ft. 3 in. at 8:30 am
8	-10.7	Gray, saturated, very loose, fine to medium SAND, with little silt		SM	3	1-1-2	Shelby Tube sample was pushed from 32 to 34 feet with no recovery.
10	-12.7						
12	-14.7	Gray, saturated, medium dense, fine to medium SAND, with little silt		SM	4	3-8-8	Laboratory Test Results Sample No. 11 From 49 to 50.5 feet
14	-16.7						
16	-18.7						Atterberg Limits
18	-20.7						Liquid Limit = 33 Plasticity Index = 14 USCS: CL Natural Moisture = 25.7%
20	-22.7				5	12-12-17	
22	-24.7	Gray, saturated, medium dense, fine to medium SAND, with little silt, trace shell fragments		SM	6	17-17-10	Sample No. 23 From 109 to 110.5 feet
24	-26.7						
26	-28.7						Atterberg Limits
28	-30.7	Gray to brown, saturated, very stiff, silty CLAY		CL	7	5-8-11	Liquid Limit = 49 Plasticity Index = 17 USCS: ML Natural Moisture = 34.9%
30	-32.7						
32	-34.7	Gray, saturated, very stiff, silty CLAY, with trace fine to medium sand		CL	8	7-10-13	NAD 83 VA State Plane South Easting: 12365519 Northing: 3862142
34	-36.7						
36	-38.7						The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
38	-40.7	Gray, saturated, soft, silty CLAY, with trace fine to medium sand, trace shell fragments		CL	9	3-2-2	
40	-42.7						
42	-44.7	Gray, saturated, very stiff, silty CLAY, with trace fine to meidum sand, trace shell fragments		CL	10	3-7-10	
44	-46.7						
46	-48.7						
48	-50.7	Gray, saturated, hard to stiff, silty CLAY, with some fine to medium sand, trace shell fragments		CL	11	7-14-18	
50							

HYNES & ASSOCIATES

LOG OF BORING P-4

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 23, 2020
Logged By: : D. Csanda
Drilled By: : B. Hynes
Drilling Method: : HSA/Rotary (Mobile B-47 HD)
Total Depth: : 120.5 feet

Depth in Feet	Surf. Elev. -2.70	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
50	-52.7	Gray, saturated, hard to stiff, silty CLAY, with some fine to medium sand, trace shell fragments		CL	11	7-14-18	
52	-54.7						
54	-56.7				12	14-18-20	
56	-58.7						
58	-60.7						
60	-62.7				13	12-6-6	
62	-64.7	Gray, saturated, stiff, silty CLAY, with trace shell fragments		CL			
64	-66.7				14	4-6-8	
66	-68.7						
68	-70.7						
70	-72.7				15	5-6-7	
72	-74.7	Gray, saturated, hard, silty CLAY, with trace fine to medium sand		CL			
74	-76.7				16	17-21-33	
76	-78.7						
78	-80.7	Gray, saturated, very stiff to hard, silty CLAY, with some fine to medium sand, little shell fragments		CL			
80	-82.7				17	10-17-25	
82	-84.7						
84	-86.7				18	10-13-18	
86	-88.7						
88	-90.7						
90	-92.7				19	10-14-15	
92	-94.7						
94	-96.7				20	17-24-34	
96	-98.7						
98	-100.7	Gray, saturated, hard, silty CLAY, with trace fine to medium sand		CL			
100					21	14-16-21	

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HYNES & ASSOCIATES

LOG OF BORING P-4

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 23, 2020
Logged By: : D. Csanda
Drilled By: : B. Hynes
Drilling Method: : HSA/Rotary (Mobile B-47 HD)
Total Depth: : 120.5 feet

Depth in Feet	Surf. Elev. -2.70	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
100	-102.7	Gray, saturated, hard, silty CLAY, with trace fine to medium sand		CL	21	14-16-21	
102	-104.7						
104	-106.7				22	10-21-30	
106	-108.7						
108	-110.7	Gray, saturated, hard, clayey SILT, with trace fine to medium sand		ML	23	22-40-50/4"	
110	-112.7						
112	-114.7	Gray, saturated, hard, silty CLAY, with trace fine to medium sand		CL			
114	-116.7				24	18-32-48	
116	-118.7						
118	-120.7						
120	-122.7				25	20-41-50/5"	
		Boring terminated at 120.5 feet.					
122	-124.7						
124	-126.7						
126	-128.7						
128	-130.7						
130	-132.7						
132	-134.7						
134	-136.7						
136	-138.7						
138	-140.7						
140	-142.7						
142	-144.7						
144	-146.7						
146	-148.7						
148	-150.7						
150							

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HYNES & ASSOCIATES

LOG OF BORING P-5

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 21, 2020
Logged By: : D. Csanda
Drilled By: : B. Hynes
Drilling Method: : HSA/Rotary (Mobile B-47 HD)
Total Depth: : 110.5 feet

Depth in Feet	Surf. Elev. -10.50	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-10.5	Gray, saturated, very loose, fine to medium SAND and SILT, with trace organic silt		SM	1	1-2-2	Scale 1" ~ 7.4 feet
2	-12.5	Gray, saturated, medium dense, fine to medium SAND, with trace silt, trace organic silt					No organic bearing soil was encountered at the ground surface.
4	-14.5				2	7-7-10	
6	-16.5			SP	3	8-9-9	Water Depth: 12 ft. at 10:30 am
8	-18.5						Shelby Tube sample was pushed from 42 to 44 feet.
10	-20.5				4	7-8-8	Laboratory Test Results
12	-22.5	Gray, saturated, medium dense, fine to medium SAND, with trace shell fragments					Sample No. 3 From 6 to 7.5 feet
14	-24.5			SP	5	10-8-10	Natural Moisture = 27.6%
16	-26.5						
18	-28.5	Gray, saturated, very soft, clayey SILT, with trace fine to medium sand					Sample No. 2 From 4 to 5.5 feet
20	-30.5			ML	6	1-2-2	Sieve Analysis
22	-32.5	Gray to brown, saturated, stiff, silty CLAY, with trace fine to medium sand					Sieve Size / Passing %
24	-34.5				7	1-4-8	No. 20 100 No. 40 99.7 No. 60 83.3 No. 100 32.9 No. 200 4.8 USCS: SP
26	-36.5			CL-CH			
28	-38.5						
30	-40.5				8	3-6-8	Natural Moisture = 25.3%
32	-42.5	Brown, saturated, stiff, silty CLAY, with trace fine to medium sand					Sample No. 8 From 29 to 30.5 feet
34	-44.5			CL	9	5-6-9	Atterberg Limits
36	-46.5						Liquid Limit = 50 Plasticity Index = 27 USCS: CL-CH Natural Moisture = 32.1%
38	-48.5	Gray, saturated, very stiff, silty CLAY, with trace fine to medium sand, trace shell fragments					
40	-50.5			CL	10	2-3-4	Sample No. 14 From 59 to 60.5 feet
42	-52.5	Gray, saturated, stiff to very stiff, silty CLAY, with some fine to medium sand, trace shell fragments					Atterberg Limits
44	-54.5				11	4-4-10	Liquid Limit = 67 Plasticity Index = 40 USCS: CH Natural Moisture = 43.2%
46	-56.5			CL			
48	-58.5						
50					12	4-10-11	

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LOG OF BORING P-5

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 21, 2020
Logged By: : D. Csanda
Drilled By: : B. Hynes
Drilling Method: : HSA/Rotary (Mobile B-47 HD)
Total Depth: : 110.5 feet

Depth in Feet	Surf. Elev. -10.50	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
50	-60.5	Gray, saturated, stiff to very stiff, silty CLAY, with some fine to medium sand, trace shell fragments		CL	12	4-10-11	Sample No. 23 From 104 to 105.5 feet Natural Moisture = 39.2% NAD 83 VA State Plane South Easting: 12365548 Northing: 3862392 The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
52	-62.5						
54	-64.5	Gray, saturated, very stiff, silty CLAY, with trace shell fragments		CL	13	5-10-12	
56	-66.5						
58	-68.5	Gray, saturated, very stiff, silty CLAY		CH	14	6-8-11	
60	-70.5						
62	-72.5	Gray, saturated, very stiff, silty CLAY, with some fine to medium sand, trace shell fragments		CL	15	8-8-10	
64	-74.5						
66	-76.5						
68	-78.5	Gray, saturated, dense, fine to medium SAND and SILT, with trace clay, trace shell fragments		SM	16	11-13-20	
70	-80.5						
72	-82.5						
74	-84.5				17	13-14-19	
76	-86.5						
78	-88.5	Gray, saturated, medium dense, fine to medium SAND, with some silt, trace shell fragments		SM	18	6-11-18	
80	-90.5						
82	-92.5	Gray, saturated, hard, silty CLAY		CL	19	9-13-21	
84	-94.5						
86	-96.5						
88	-98.5				20	16-21-30	
90	-100.5						
92	-102.5	Gray, saturated, hard, silty CLAY, with trace fine to medium sand		CL	21	17-24-38	
94	-104.5						
96	-106.5						
98	-108.5	Gray, saturated, hard, silty CLAY		CL	22	18-31-43	
100							

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LOG OF BORING P-5

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 21, 2020
Logged By: : D. Csanda
Drilled By: : B. Hynes
Drilling Method: : HSA/Rotary (Mobile B-47 HD)
Total Depth: : 110.5 feet

Depth in Feet	Surf. Elev. -10.50	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
100	-110.5	Gray, saturated, hard, silty CLAY		CL	22	18-31-43	
102	-112.5						
104	-114.5				23	19-36-47	
106	-116.5						
108	-118.5						
110	-120.5				24	20-34-47	
		Boring terminated at 110.5 feet.					
112	-122.5						
114	-124.5						
116	-126.5						
118	-128.5						
120	-130.5						
122	-132.5						
124	-134.5						
126	-136.5						
128	-138.5						
130	-140.5						
132	-142.5						
134	-144.5						
136	-146.5						
138	-148.5						
140	-150.5						
142	-152.5						
144	-154.5						
146	-156.5						
148	-158.5						
150							

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HYNES & ASSOCIATES

LOG OF BORING D-2

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 28, 2020
Logged By: : D. Csanda
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 14 feet

Depth in Feet	Surf. Elev. -10.30	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-10.3	Gray, saturated, medium dense, fine to medium SAND, with trace silt, trace clay		SP	1	7-6-6-7	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface. Water Depth: 13.0 ft. Laboratory Test Results Sample No. 5 From 8 to 10 feet Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 20.0% NAD 83 VA State Plane South Easting: 12366943 Northing: 3863058 The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
2	-12.3				2	7-7-7-8	
4	-14.3	Gray, saturated, loose, fine to medium SAND, with little to trace silt		SP-SM	3	11-4-4-5	
6	-16.3				4	6-4-4-3	
8	-18.3	Gray, saturated, loose, fine to medium SAND, with trace silt, trace clay		SP	5	8-2-4-5	
10	-20.3	Gray, saturated, medium dense, fine to medium SAND, with little to trace silt		SP-SM	6	5-6-6-8	
12	-22.3	Gray, saturated, medium dense, fine to medium SAND, with trace silt, trace shells		SP	7	12-6-5-8	
14	-24.3	Boring terminated at 14 feet.					
16	-26.3						
18	-28.3						
20							

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HYNES & ASSOCIATES

LOG OF BORING D-4

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 28, 2020
Logged By: : D. Csanda
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 10 feet

Depth in Feet	Surf. Elev. -11.40	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-11.4	Gray, saturated, very loose, fine to medium SAND, with trace shells		SP	1	4-2-2-3	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface.
2	-13.4	Gray, saturated, medium dense, fine to medium SAND, with trace shells		SP	2	7-3-7-5	Water Depth: 11.5 ft. Laboratory Test Results Sample No. 5 From 8 to 10 feet
4	-15.4				3	6-6-7-7	Hydrometer Analysis (See Graph) USCS: ML Natural Moisture = 31.0%
6	-17.4	Gray, saturated, very loose, fine to medium SAND, with little to trace silt, trace clay		SP-SM	4	1-1-2-3	NAD 83 VA State Plane South Easting: 12370656 Northing: 3864121
8	-19.4	Gray, saturated, soft, SILT, with some fine to medium sand, little clay		ML	5	1-1-2-3	The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
10	-21.4	Boring terminated at 10 feet.					
12	-23.4						
14	-25.4						
16	-27.4						
18	-29.4						
20							

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HYNES & ASSOCIATES

LOG OF BORING D-6

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 31, 2020
Logged By: : D. Csanda
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 10 feet

Depth in Feet	Surf. Elev. -10.10	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-10.1	Gray, saturated, medium dense, fine to medium SAND, with trace silt		SP	1	24-9-8-8	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface. Water Depth: 16.0 ft.
2	-12.1				2	18-20-27-15	Laboratory Test Results Sample No. 1 From 0 to 2 feet
4	-14.1	Gray, satuarated, dense, fine to medium SAND, with trace silt, trace shells		SP	3	16-15-18-18	Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 24.9% Sample No. 3 From 4 to 6 feet
6	-16.1				4	12-14-19-20	Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 17.0%
8	-18.1				5	17-15-22-24	NAD 83 VA State Plane South Easting: 12372163 Northing: 3864201
10	-20.1	Boring terminated at 10 feet.					The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
12	-22.1						
14	-24.1						
16	-26.1						
18	-28.1						
20							

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HYNES & ASSOCIATES

LOG OF BORING D-9

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : January 5, 2021
Logged By: : D. Csanda
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 18 feet

Depth in Feet	Surf. Elev. -3.10	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-3.1	Brown, saturated, loose, fine to medium SAND, with trace shells, trace silt		SP	1	13-5-5-4	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface. Water Depth: 4.3 ft. Laboratory Test Results Sample No. 7 From 12 to 14 feet Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 17.9% NAD 83 VA State Plane South Easting: 12373304 Northing: 3863541 The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
2	-5.1				2	15-6-5-5	
4	-7.1	Brown to gray, saturated, loose to medium dense, fine to medium SAND, with trace silt, trace shells		SP	3	8-2-5-4	
6	-9.1				4	6-7-5-5	
8	-11.1				5	7-4-5-7	
10	-13.1				6	15-5-6-7	
12	-15.1	Gray, saturated, dense, fine to medium SAND, with trace silt		SP	7	17-17-19-20	
14	-17.1	Gray, saturated, dense, fine to medium SAND, with trace silt, trace shells		SP	8	20-16-19-21	
16	-19.1				9	15-17-20-22	
18	-21.1	Boring terminated at 18 feet.					
20							

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HYNES & ASSOCIATES

LOG OF BORING D-11

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : January 5, 2021
Logged By: : D. Csanda
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 10 feet

Depth in Feet	Surf. Elev. -10.90	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-10.9	Brown, saturated, medium dense, fine to medium SAND, with trace silt		SP	1	12-11-6-7	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface.
2	-12.9	Brown, saturated, medium dense, fine to medium SAND, with trace silt, trace shells		SP	2	8-11-12-11	Water Depth: 15.7 ft. Laboratory Test Results Sample No. 5 From 8 to 10 feet Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 23.1% NAD 83 VA State Plane South Easting: 12373834 Northing: 3863013 The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
4	-14.9	Brown, satuarated, medium dense, fine to medium SAND, with trace silt		SP	3	6-7-7-4	
6	-16.9				4	8-9-11-13	
8	-18.9	Gray, saturated, loose, fine to medium SAND, with trace silt		SP	5	4-3-4-6	
10	-20.9	Boring terminated at 10 feet.					
12	-22.9						
14	-24.9						
16	-26.9						
18	-28.9						
20							

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HYNES & ASSOCIATES

LOG OF BORING D-13

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : January 4, 2021
Logged By: : D. Csanda
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 4 feet

Depth in Feet	Surf. Elev. -7.70	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-7.7	Brown, saturated, loose, fine to medium SAND, with trace silt		SP	1	5-4-4-4	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface.
2	-9.7	Brown, saturated, medium dense, fine to medium SAND, with trace silt, trace shells		SP	2	15-9-9-10	Water Depth: 10.0 ft. NAD 83 VA State Plane South Easting: 12373678 Northing: 3862510
4	-11.7	Boring terminated at 4 feet.					The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
6	-13.7						
8	-15.7						
10	-17.7						
12	-19.7						
14	-21.7						
16	-23.7						
18	-25.7						
20							

03-30-2021 J:\Mtech 2010\Wallops Island M95 Intermodal Barge Service Project-20145\D-13.bor

HYNES & ASSOCIATES

LOG OF BORING D-15

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : January 4, 2021
Logged By: : D. Csanda
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 10 feet

Depth in Feet	Surf. Elev. -10.40	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-10.4	Brown, saturated, medium dense, fine to medium SAND, with trace silt		SP	1	2-5-5-6	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface. Water Depth: 10.0 ft. Laboratory Test Results Sample No. 5 From 8 to 10 feet Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 17.0% NAD 83 VA State Plane South Easting: 12373512 Northing: 3862000 The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
2	-12.4	Gray, saturated, medium dense, fine to medium SAND, with trace silt		SP	2	6-4-4-7	
4	-14.4	Brown to gray, satuarated, dense, fine to medium SAND, with trace silt, trace shells		SP	3	9-11-17-20	
6	-16.4	Brown to gray, saturated, medium dense, fine to medium SAND, with trace silt, trace shells		SP	4	7-8-13-14	
8	-18.4				5	9-10-14-15	
10	-20.4	Boring terminated at 10 feet.					
12	-22.4						
14	-24.4						
16	-26.4						
18	-28.4						
20							

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HYNES & ASSOCIATES

LOG OF BORING E-2

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 28, 2020
Logged By: : D. Csanda
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 8 feet

Depth in Feet	Surf. Elev. -17.50	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-17.5	Gray, saturated, medium dense, fine to medium SAND, with trace shells		SP	1	8-7-6-5	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface. Water Depth: 16.0 ft.
2	-19.5	Gray, saturated, medium dense, fine to medium SAND, with trace shells		SP	2	10-5-5-8	Laboratory Test Results Sample No. 2 From 2 to 4 feet
4	-21.5			SP	3	19-5-7-7	Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 22.4%
6	-23.5			SP	4	11-6-6-8	NAD 83 VA State Plane South Easting: 12368034 Northing: 3863493
8	-25.5	Boring terminated at 8 feet.					The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
10	-27.5						
12	-29.5						
14	-31.5						
16	-33.5						
18	-35.5						
20							

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HYNES & ASSOCIATES

LOG OF BORING E-4

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : December 28, 2020
Logged By: : D. Csanda
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 8 feet

Depth in Feet	Surf. Elev. -12.00	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-12	Brown, saturated, loose, fine to medium SAND, with little to trace silt, trace clay		SP	1	4-3-3-3	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface.
2	-14	Gray, saturated, loose to medium dense, fine to medium SAND, with trace shells		SP	2	5-5-4-5	Water Depth: 11.0 ft. Laboratory Test Results Sample No. 4 From 6 to 8 feet
4	-16				3	6-8-3-5	Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 18.4%
6	-18				4	6-6-10-11	NAD 83 VA State Plane South Easting: 12371382 Northing: 3864328
8	-20	Boring terminated at 8 feet.					The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
10	-22						
12	-24						
14	-26						
16	-28						
18	-30						
20							

03-30-2021 J:\Mtech 2010\Wallops Island M95 Intermodal Barge Service Project-20145\E-4.bor

HYNES & ASSOCIATES

LOG OF BORING E-7

Gahagan & Bryant Associates, Inc.
9008 Yellow Brick Road, Unit O
Baltimore, Maryland

Wallops Island M95 Intermodal Barge Service

Project No.: JDH-10/20/145

Date Completed: : January 4, 2021
Logged By: : D. Csanda
Drilled By: : M. Hynes
Drilling Method: : HSA (Mobile B-47 HD)
Total Depth: : 6 feet

Depth in Feet	Surf. Elev. -16.00	DESCRIPTION	GRAPHIC	USCS	Sample	Blow Count	REMARKS
0	-16	Brown, saturated, medium dense, fine to medium SAND, with trace silt		SP	1	3-4-5-6	Scale 1" ~ 3 feet No organic bearing soil was encountered at the ground surface. Water Depth: 13.0 ft. Laboratory Test Results Sample No. 2 From 2 to 4 feet Hydrometer Analysis (See Graph) USCS: SP Natural Moisture = 23.1% NAD 83 VA State Plane South Easting: 12373364 Northing: 3861342 The tidal relationship MLLW = -1.31' NAVD88 was determined at NOAA Station 8630308, Chincoteague Channel, South End, VA for the 1983-2001 Epoch.
2	-18				2	7-5-6-8	
4	-20	Brown to gray, satuarated, dense, fine to medium SAND, with trace silt, trace shells		SP	3	11-14-17-19	
6	-22	Boring terminated at 6 feet.					
8	-24						
10	-26						
12	-28						
14	-30						
16	-32						
18	-34						
20							

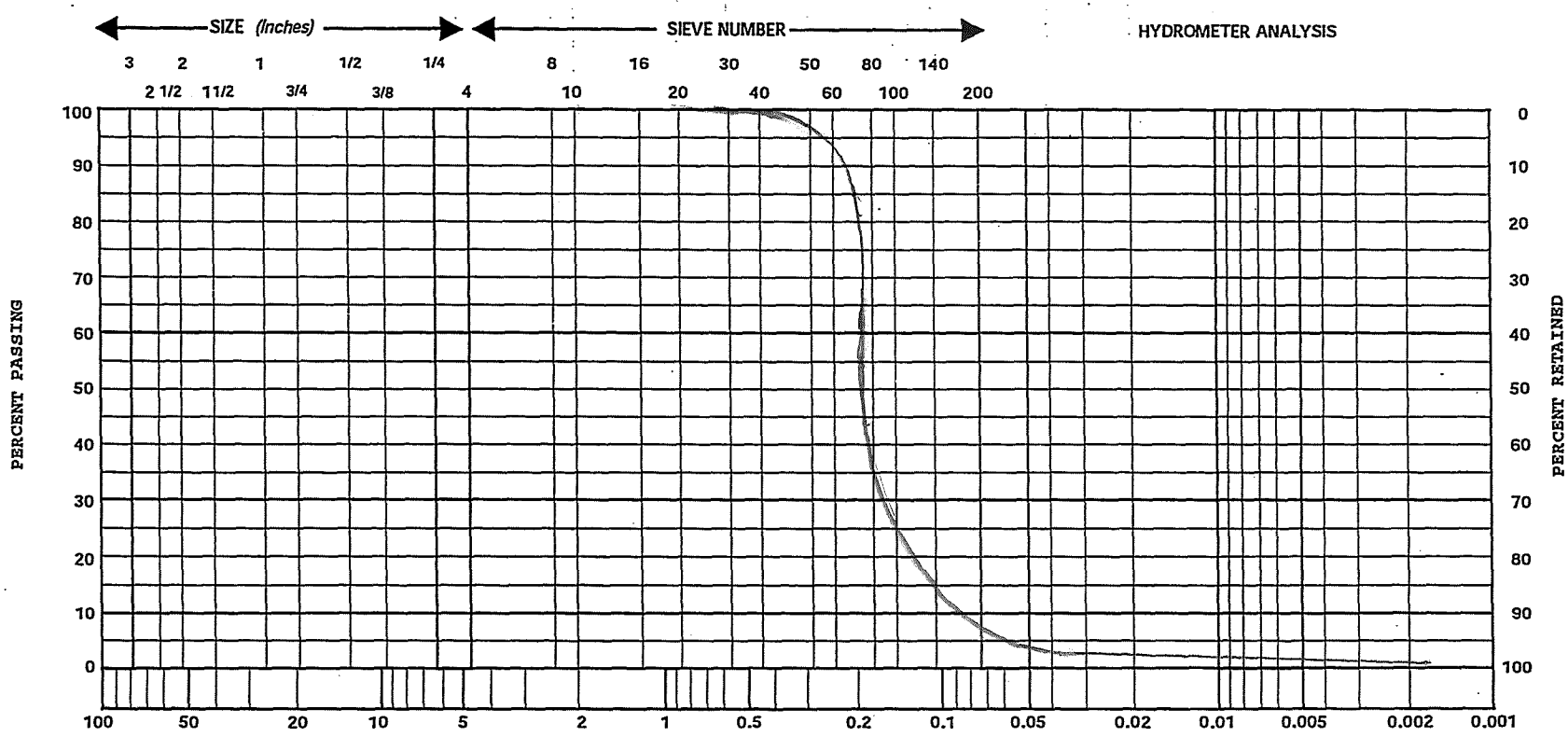
03-30-2021 J:\Mtech 2010\Wallops Island M95 Intermodal Barge Service Project-20145\E-7.bor

GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT: Wallops Island M95 Intermodal Barge Service

2. DATE: 1/25/21

SIEVE ANALYSIS - US STANDARD SIEVE SIZES



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc ($(D_{30})^2/(D_{60} \times D_{10})$)	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
E2	S2	NP	NP	NP				SP

3. TECHNICIAN *(Signature)*: Joe Lowe

4. PLOTTED BY *(Signature)*

5. CHECKED BY *(Signature)*

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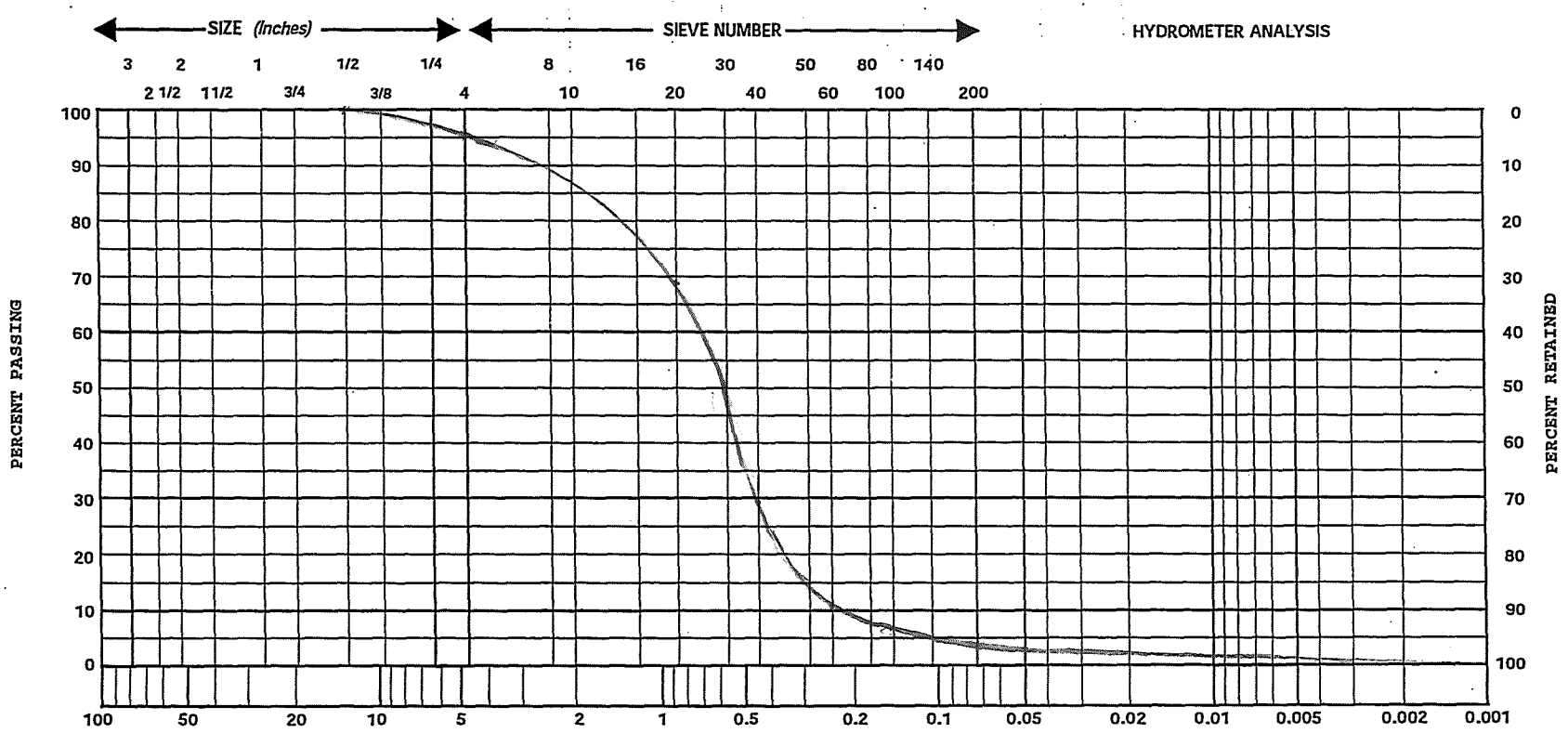
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT: Wallops Island M95 Intermodal Barge Service

2. DATE: 1/25/21

SIEVE ANALYSIS - US STANDARD SIEVE SIZES



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc ($(D_{30})^2/(D_{60} \times D_{10})$)	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
E4	S4	NP	NP	NP				SP

3. TECHNICIAN (Signature): Joe Long

4. PLOTTED BY (Signature):

5. CHECKED BY (Signature):

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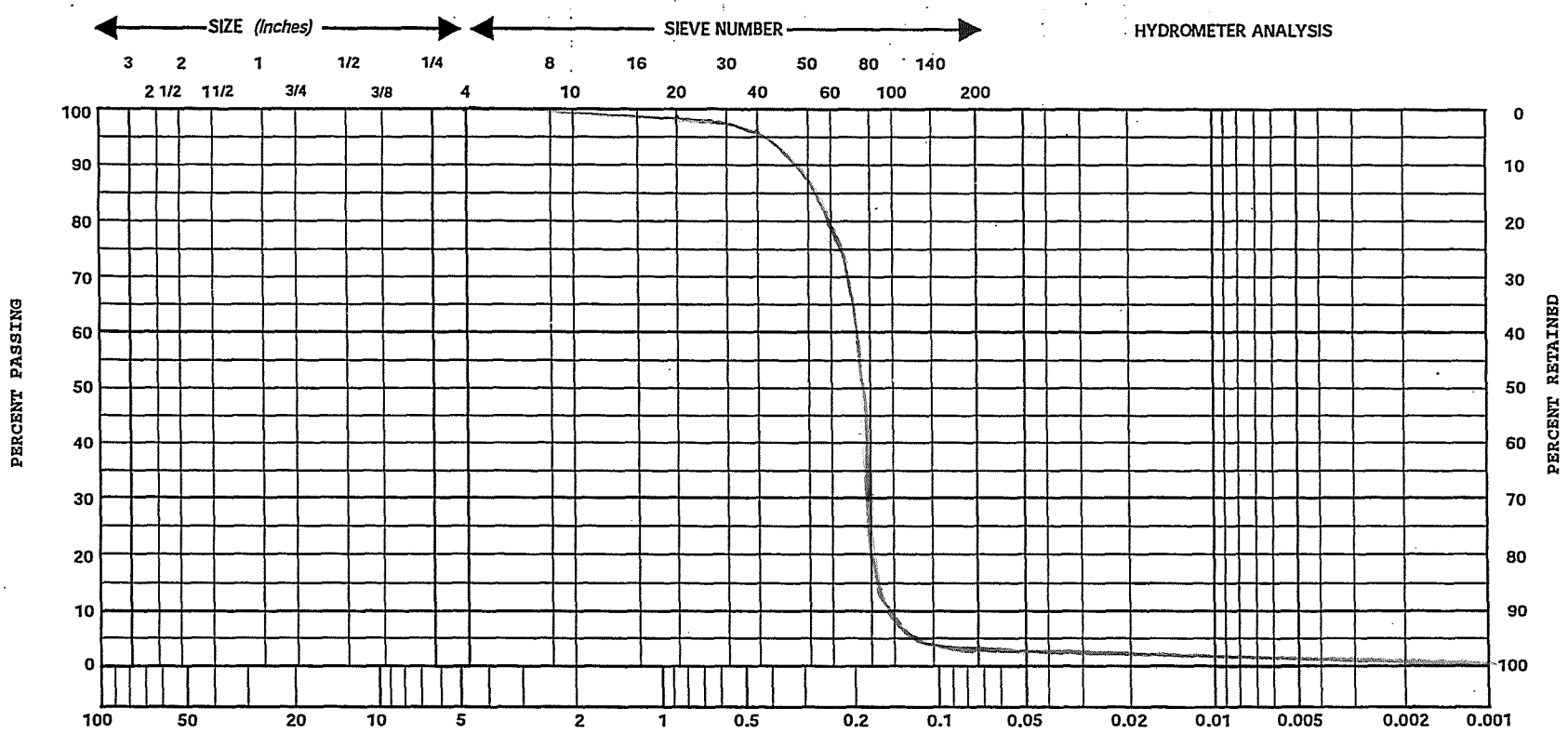
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT: Walkps Island M95 Intermodal Barge Service

2. DATE: 1/25/24

SIEVE ANALYSIS - US STANDARD SIEVE SIZES



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc ($(D_{30})^2/(D_{60} \times D_{10})$)	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
E7	S2	NP	NP	NP				SP

3. TECHNICIAN (Signature): JK Long

4. PLOTTED BY (Signature):

5. CHECKED BY (Signature):

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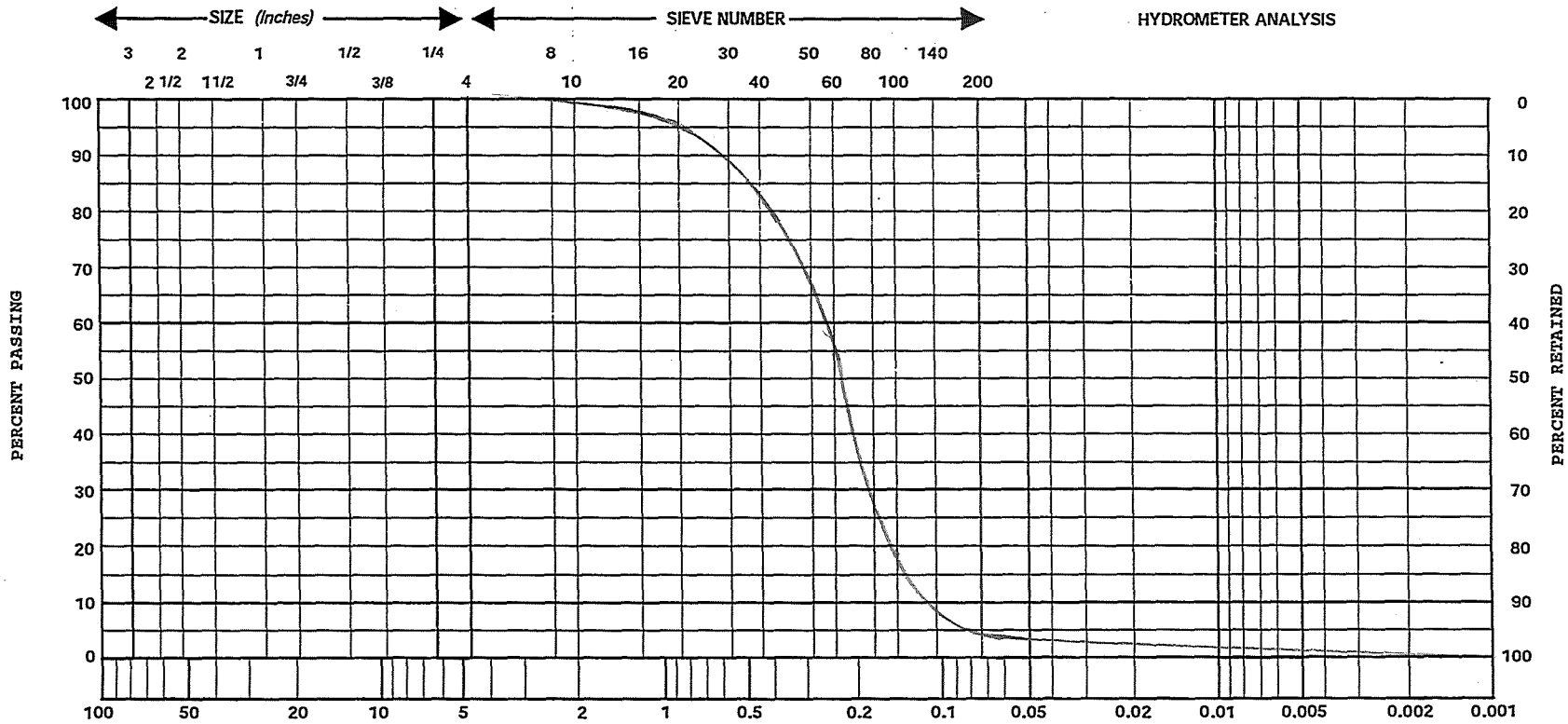
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT: Wallops Island Intermodal Barge Service

2. DATE: 1/25/21

SIEVE ANALYSIS - US STANDARD SIEVE SIZES



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc ($(D_{30})^2/(D_{60} \times D_{10})$)	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D2	S5	NP	NP	NP				SP

3. TECHNICIAN (Signature): Joe Long

4. PLOTTED BY (Signature): RL

5. CHECKED BY (Signature): JDP

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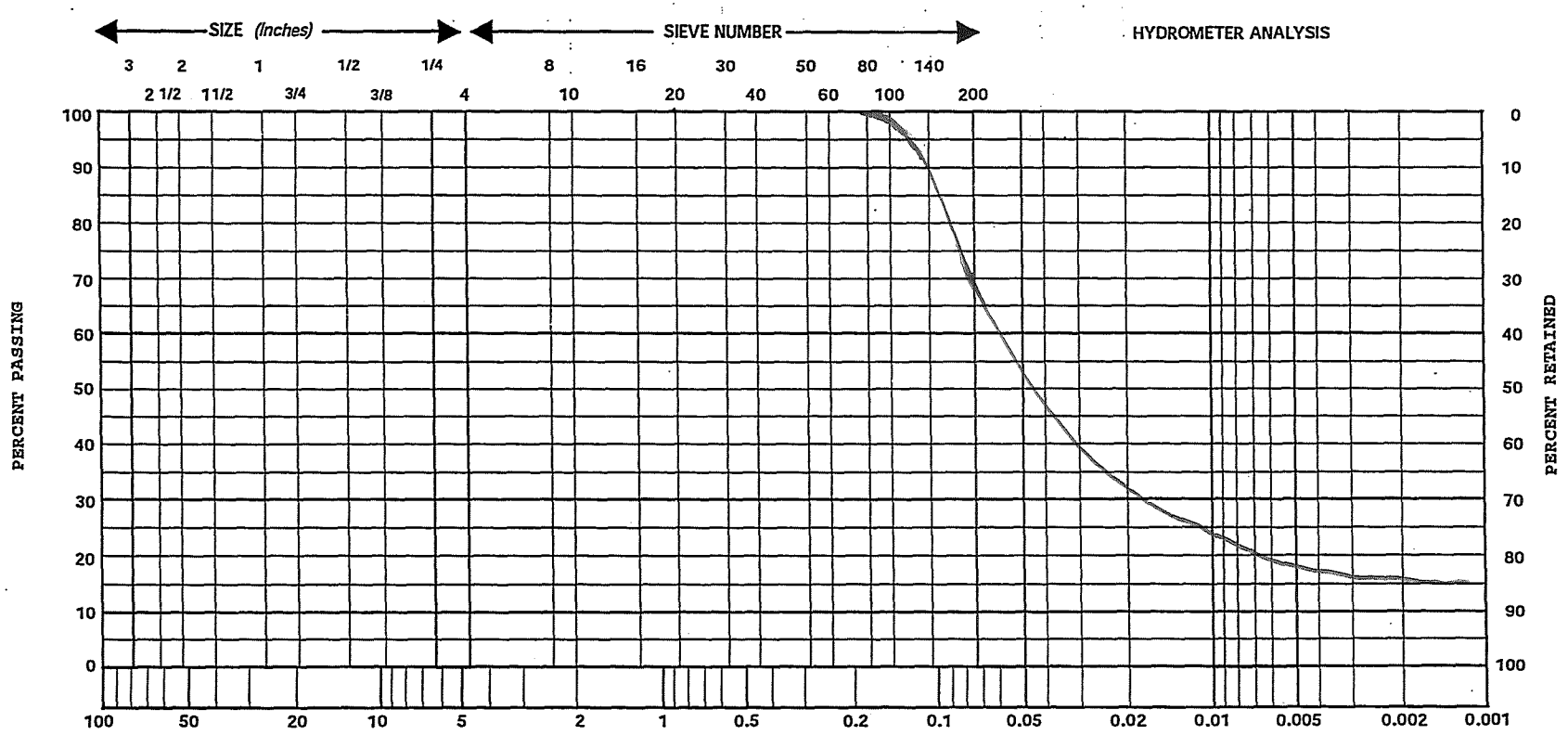
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT: Wallops Island M95 Intermodal Barge Service

2. DATE: 1/25/21

SIEVE ANALYSIS - US STANDARD SIEVE SIZES



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc ($(D_{30})^2/(D_{60} \times D_{10})$)	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D4	S5	—	—	—				ML

3. TECHNICIAN (Signature)

4. PLOTTED BY (Signature)

5. CHECKED BY (Signature)

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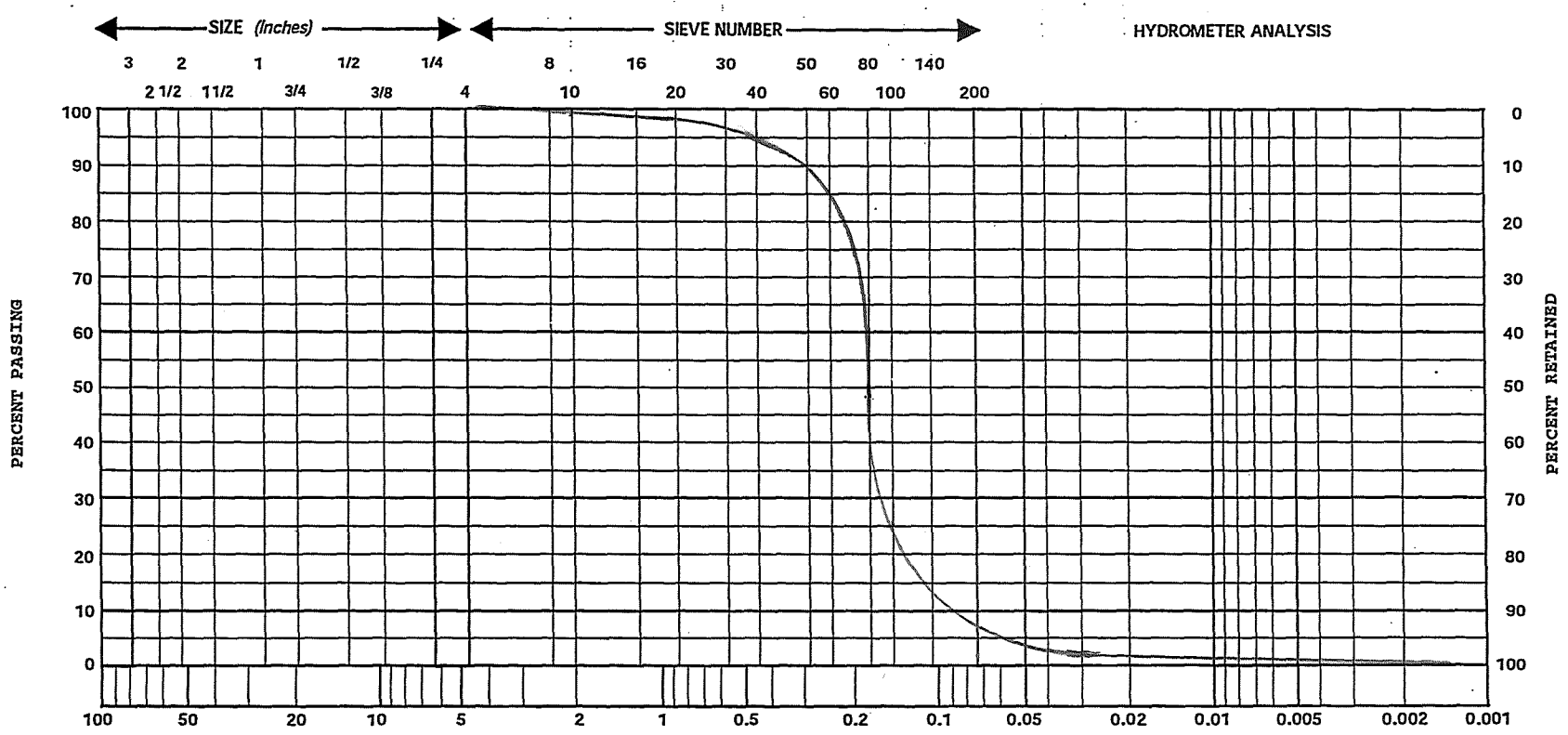
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT: Wallops Island M95 Intermodal Barge Service

2. DATE: 1/25/24

SIEVE ANALYSIS - US STANDARD SIEVE SIZES



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc ($(D_{30})^2/(D_{60} \times D_{10})$)	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D6	S1	NP	NP	NP				SP

3. TECHNICIAN *(Signature)*: JK Lowe

4. PLOTTED BY *(Signature)*: RCM

5. CHECKED BY *(Signature)*: [illegible]

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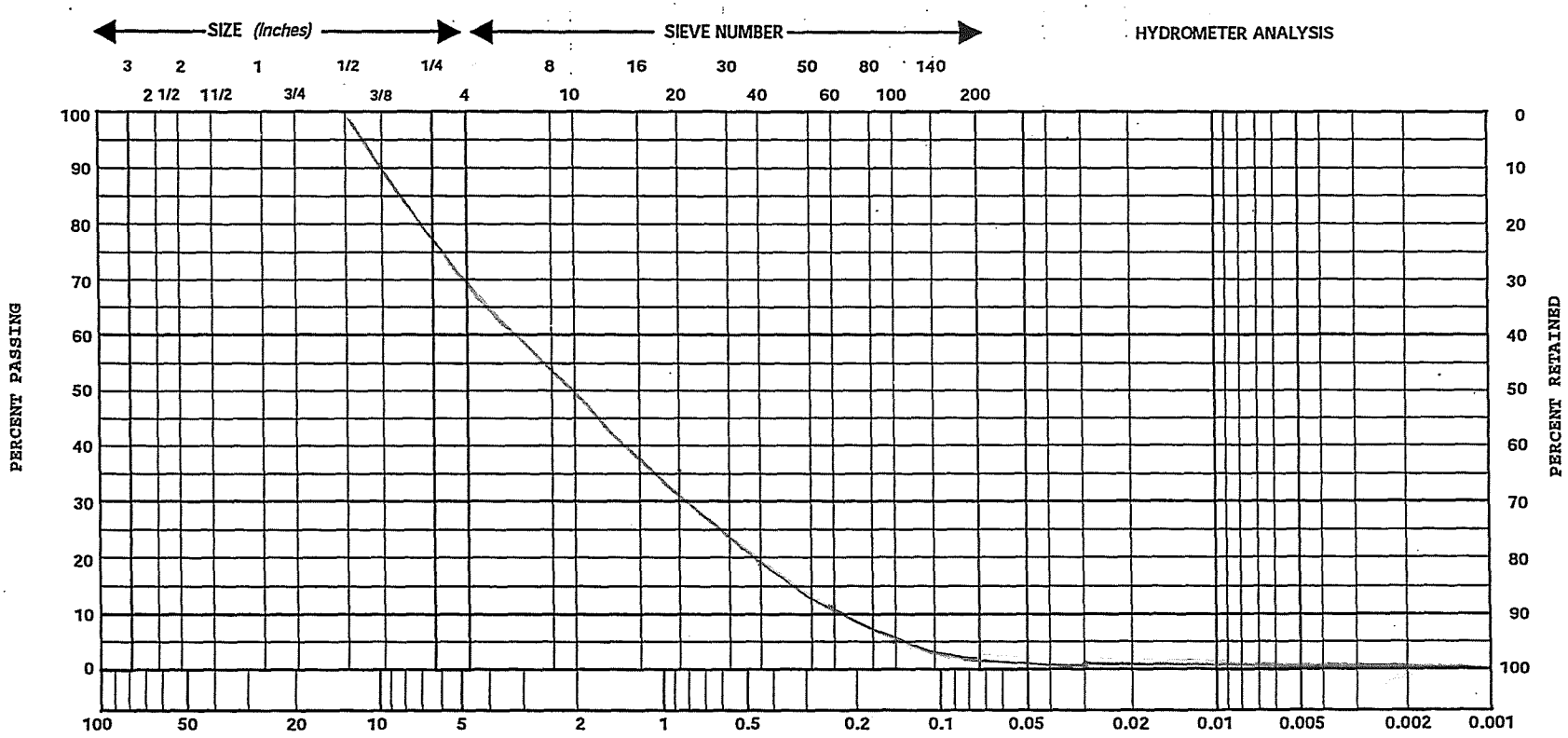
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT Wallops Island M95 Intermodal Barge Service

2. DATE 1/29/21

SIEVE ANALYSIS - US STANDARD SIEVE SIZES



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc ($(D_{30})^2/(D_{60} \times D_{10})$)	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D6	S3	NP	NP	NP				SP

3. TECHNICIAN *(Signature)* Jaz Lozy

4. PLOTTED BY *(Signature)*

5. CHECKED BY *(Signature)*

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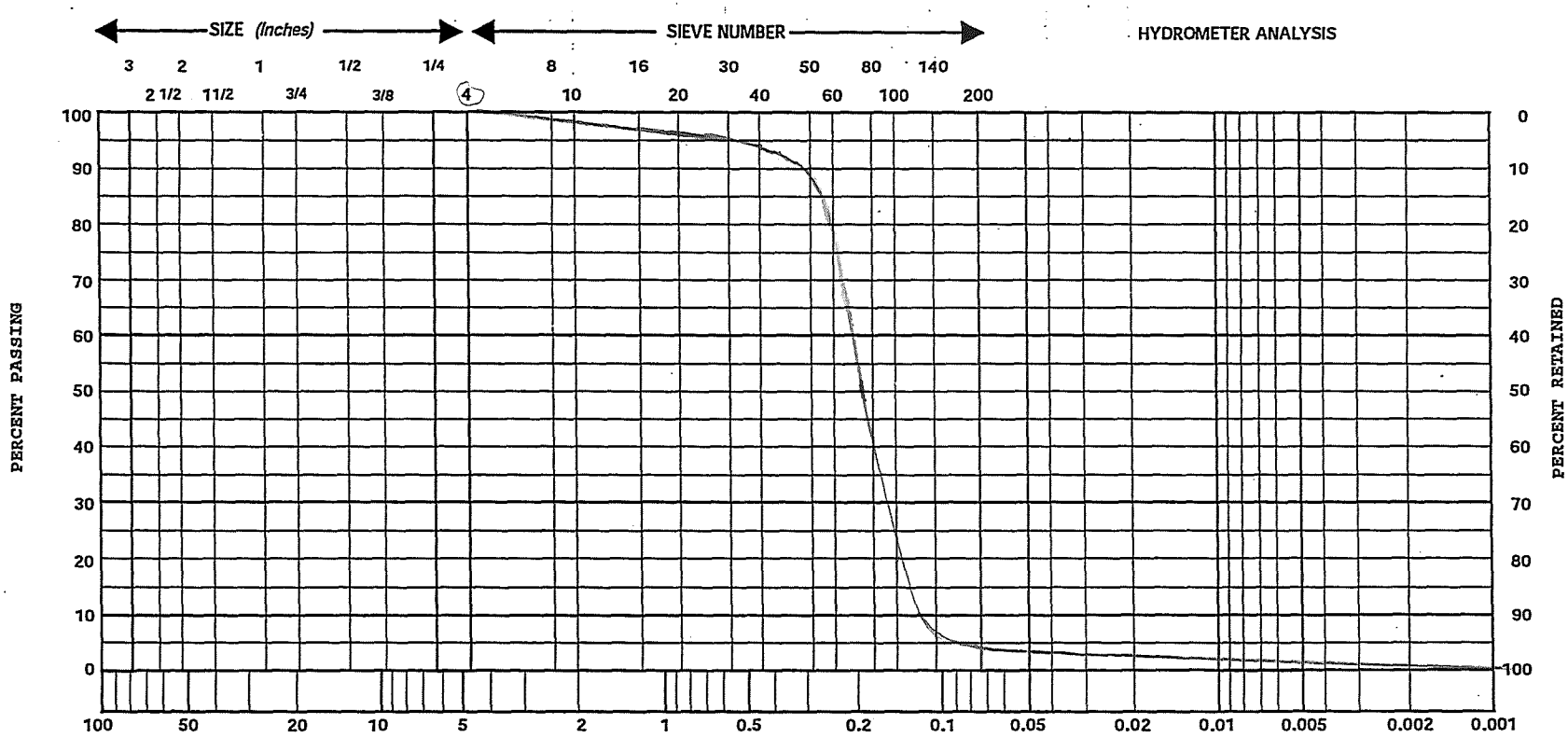
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT: Wallops Island M95 Intermodal Barge Services

2. DATE: 1/29/21

SIEVE ANALYSIS - US STANDARD SIEVE SIZES



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc ($(D_{30})^2/(D_{60} \times D_{10})$)	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D9	S7	NP	NP	NP				SP

3. TECHNICIAN (Signature): Jos Lowe

4. PLOTTED BY (Signature):

5. CHECKED BY (Signature):

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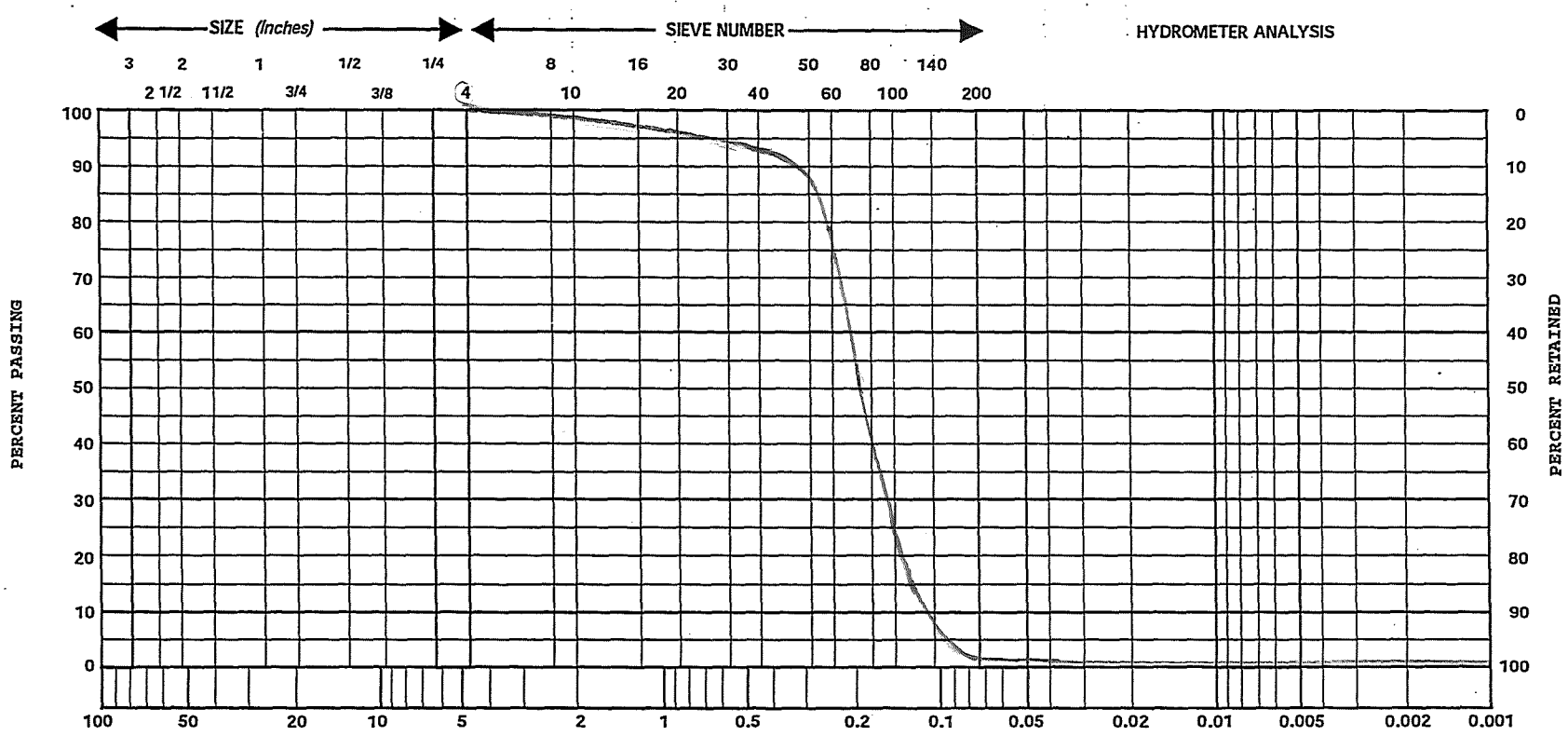
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT: Wallops Island M95 Intermodal Barge Service

2. DATE: 1/29/21

SIEVE ANALYSIS - US STANDARD SIEVE SIZES



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc ($(D_{30})^2/(D_{60} \times D_{10})$)	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D11	S5	NP	NP	NP				SP

3. TECHNICIAN *(Signature)*: Joe Long

4. PLOTTED BY *(Signature)*: TCD

5. CHECKED BY *(Signature)*:

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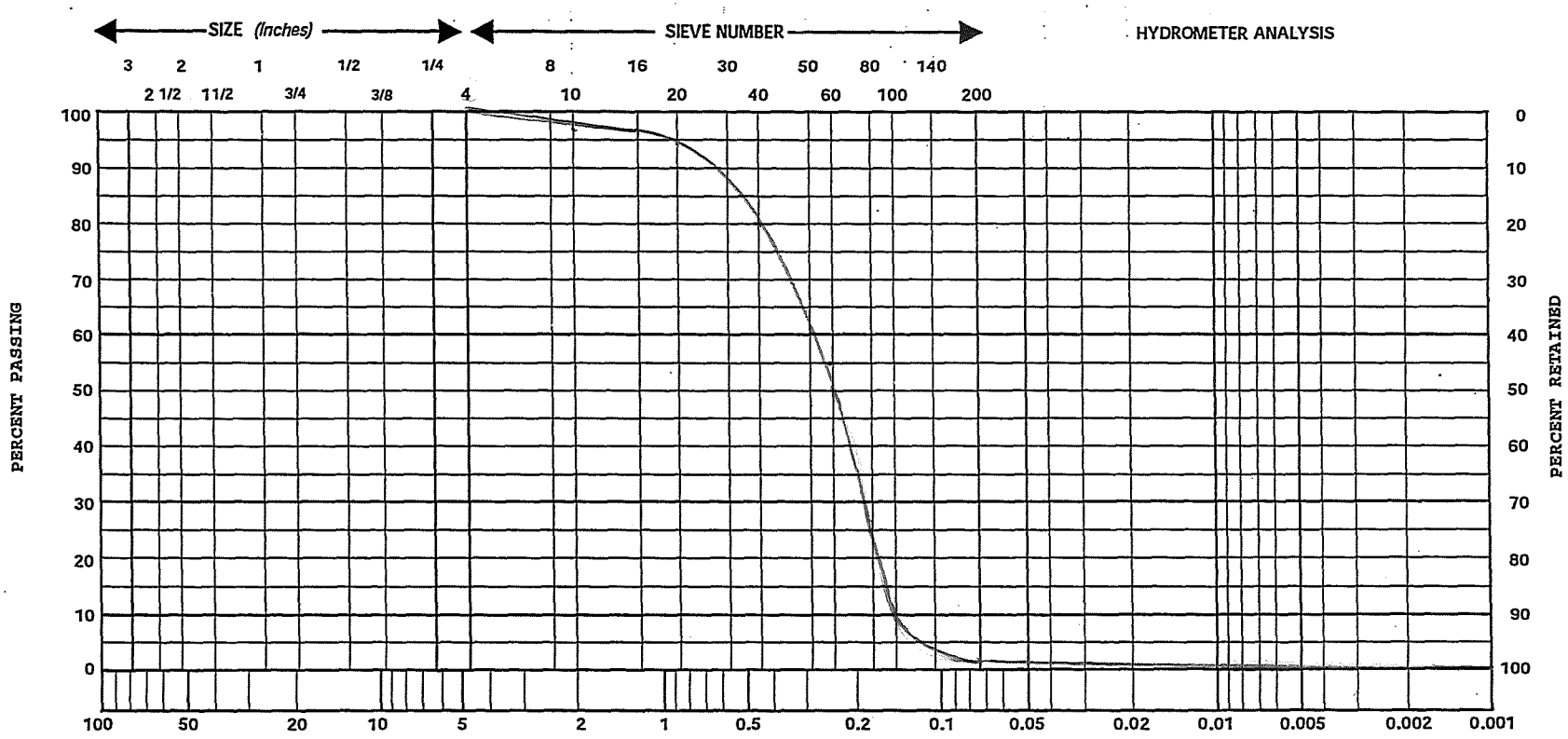
GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT: Wallops Island M95 Intermodal Barge Service

2. DATE: 1/25/21

SIEVE ANALYSIS - US STANDARD SIEVE SIZES



EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D_{60}/D_{10})	Cc ($(D_{30})^2/(D_{60} \times D_{10})$)	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
D15	S5	NP	NP	NP				SP

3. TECHNICIAN (Signature): Joe Lang

4. PLOTTED BY (Signature): [illegible]

5. CHECKED BY (Signature): [illegible]

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EBA ENGINEERING

Project: Wallops Island M-95 Intermodal

Client: John D Hynes & Associates, Inc. **Purchase Order #** 13363

EBA Project Number: 4629-00-035

SOIL TESTING SUMMARY

Boring No.	JDH Sample Date	Depth (ft)	Specific Gravity	Moisture Content	Atterberg Limits		Dry Unit Weight
			AASHTO T100	ASTM D2166	ASTM D4813		ASTM D7262
				%	LL	PL	pcf
L-1	11/13/2020	22'-24'	2.672	26.1	NP	NP	98.0

Submitted by: Rita Patel

EBA Laboratory Chief Technician

EBA ENGINEERING

Project: Wallops Island M-95 Intermodal

Client: John D Hynes & Associates, Inc. **Purchase Order #** 13398

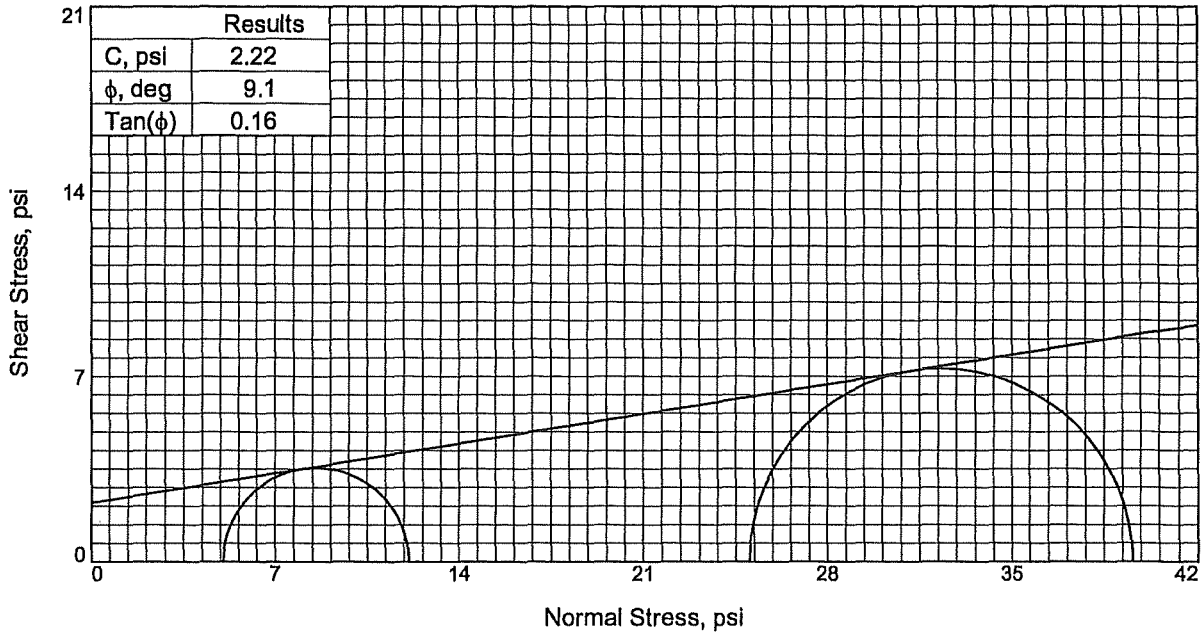
EBA Project Number: 4629-00-035

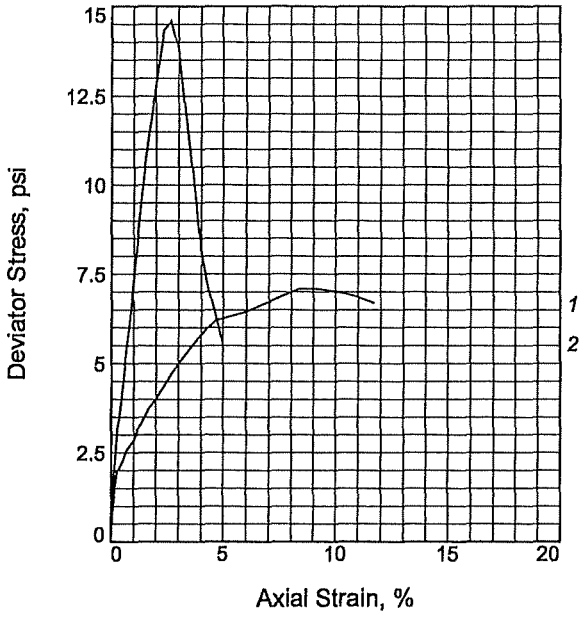
SOIL TESTING SUMMARY

Boring No.	JDH Sample Date	Depth (ft)	Specific Gravity	Moisture Content	Atterberg Limits		Dry Unit Weight
			AASHTO T100	ASTM D2166	ASTM D4813		ASTM D7262
				%	LL	PL	pcf
P-5	12/21/2020	42'-44'	2.714	42.6	36	17	78.6

Submitted by: Rita Patel

EBA Laboratory Chief Technician





Sample No.		1	2
Initial	Water Content, %	41.5	36.7
	Dry Density, pcf	78.6	83.8
	Saturation, %	97.5	97.6
	Void Ratio	1.1563	1.0211
	Diameter, in.	2.89	2.86
	Height, in.	6.00	6.02
At Test	Water Content, %	42.6	37.6
	Dry Density, pcf	78.6	83.8
	Saturation, %	100.0	100.0
	Void Ratio	1.1563	1.0211
	Diameter, in.	2.89	2.86
	Height, in.	6.00	6.02
Strain rate, in./min.		0.045	0.045
Back Pressure, psi		0.0	0.0
Cell Pressure, psi		5.0	25.0
Fail. Stress, psi		7.1	14.6
Ult. Stress, psi			
σ_1 Failure, psi		12.1	39.6
σ_3 Failure, psi		5.0	25.0

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed Shelby tube
Description: Visual classification: sandy lean clay

LL= 36 **PL=** 17 **PI=** 19
Specific Gravity= 2.714
Remarks: Date tested: 12/29/2020

Figure _____

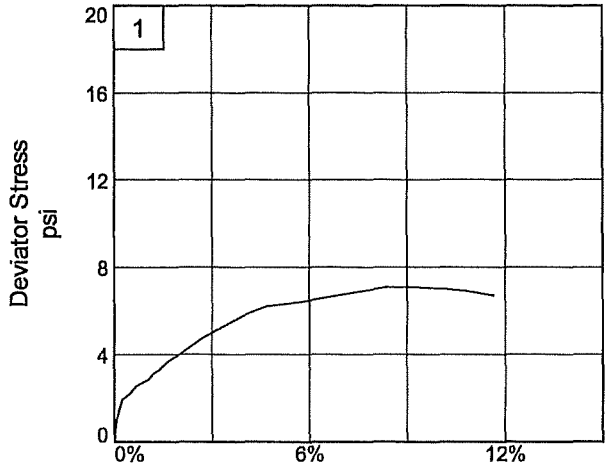
Client: JDH

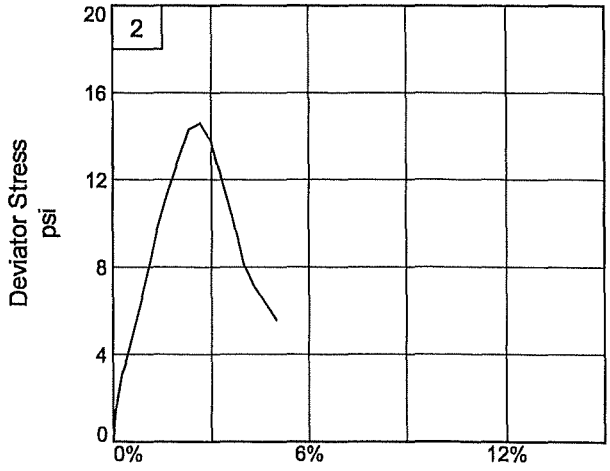
Project: Wallops Island M-95 Intermodal

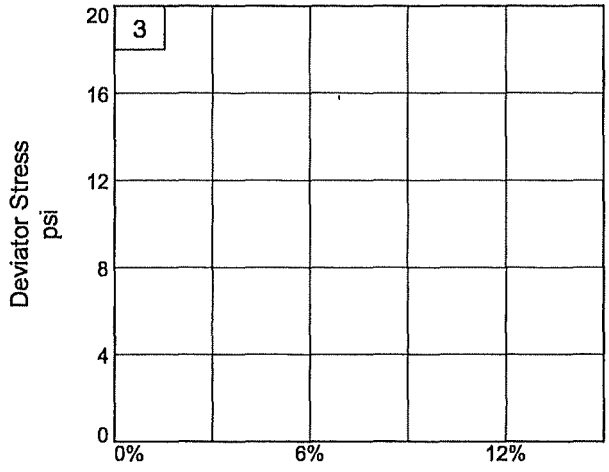
Source of Sample: P-5 **Depth:** 42'-44'
Sample Number: P-5
Proj. No.: 4629-00-035 **Date Sampled:** 12/21/2020

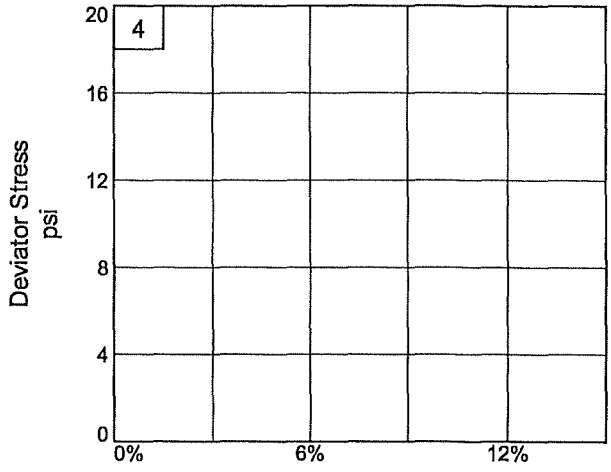
TRIAXIAL SHEAR TEST REPORT
EBA Engineering, Inc.
Laurel, MD

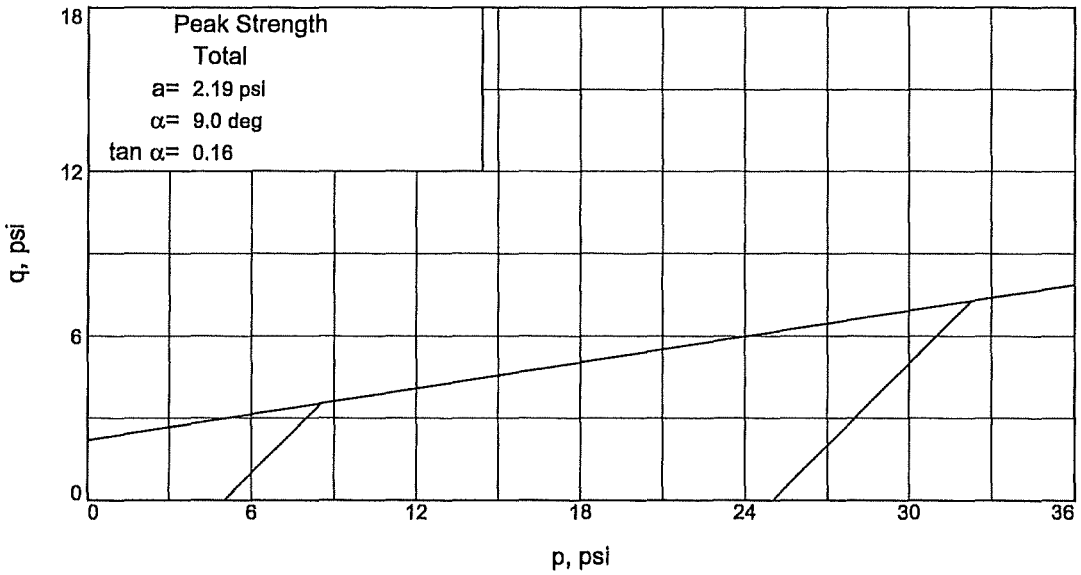
Tested By: RD **Checked By:** JK











Client: JDH
Project: Wallops Island M-95 Intermodal
Source of Sample: P-5 **Depth:** 42'-44' **Sample Number:** P-5
Project No.: 4629-00-035 **Figure** _____

EBA Engineering, Inc.

Tested By: RD **Checked By:** JK

PRESSUREMETER TEST REPORT

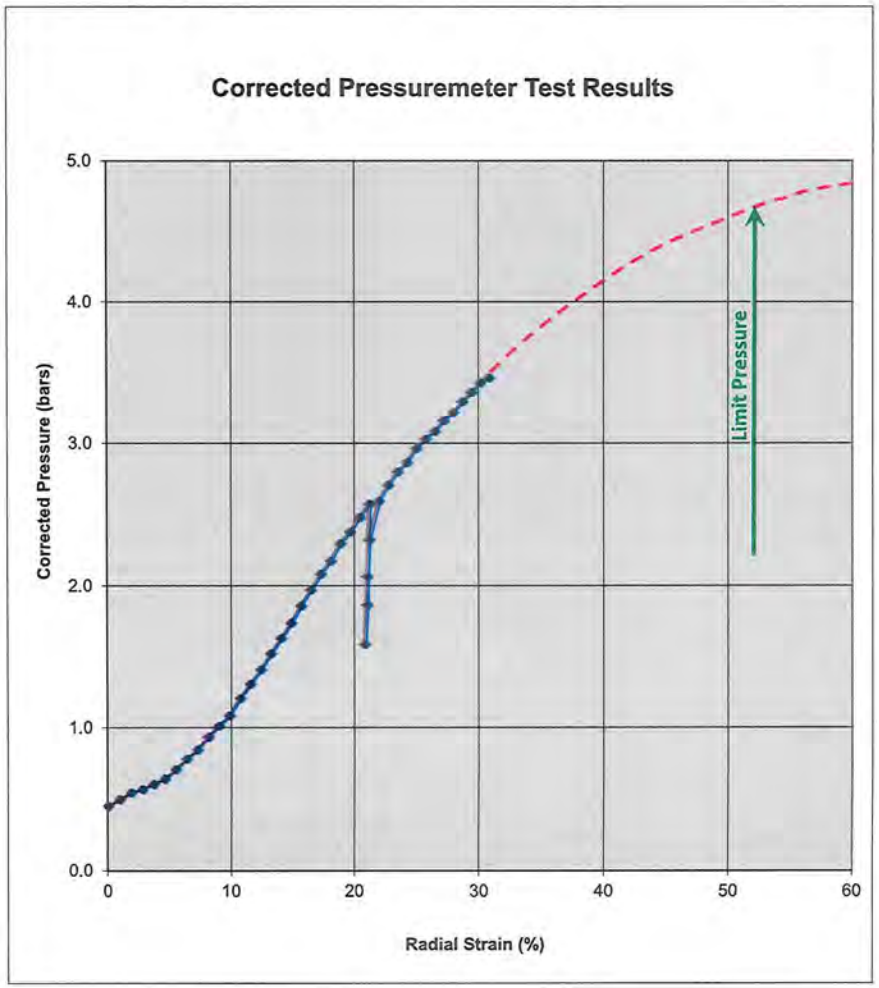
PROJECT:	Wallops Island Northern Development	BORING:	P-2
LOCATION:	Wallops Island, Virginia	TEST #:	1
IN-SITU SOIL TESTING, L.C.		DEPTH:	12.9 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	December 29, 2020

Note: ***Depth*** refers to the distance from the ground surface to center of NX Probe.

Pressure Bar	Volume cm^3	$\Delta R/R_0$ %	Selected
0.45	0	0.00	
0.50	40	0.93	
0.55	80	1.85	
0.57	120	2.76	
0.61	160	3.67	
0.64	200	4.56	
0.71	240	5.45	
0.78	280	6.33	
0.85	319	7.21	
0.93	359	8.08	
1.01	399	8.94	
1.08	439	9.79	
1.21	479	10.64	
1.31	519	11.48	
1.41	559	12.31	
1.52	599	13.14	
1.63	639	13.96	
1.74	679	14.78	E0a
1.86	719	15.59	
1.97	759	16.39	
2.08	799	17.19	
2.17	839	17.99	
2.30	878	18.77	E0b
2.38	918	19.56	
2.48	958	20.34	
2.57	998	21.11	E1a
1.86	989	20.92	
1.59	979	20.73	E1b
2.06	989	20.92	
2.32	998	21.11	E1c
2.59	1038	21.88	
2.71	1078	22.64	
2.80	1118	23.40	
2.87	1158	24.15	
2.96	1198	24.90	
3.03	1238	25.65	
3.08	1278	26.39	
3.16	1318	27.13	
3.22	1358	27.86	
3.29	1398	28.59	
3.36	1438	29.31	
3.42	1478	30.03	
3.46	1518	30.75	

Interpreted Pressuremeter Parameters		
P_o	0.8	bar
Limit Pressure Strain	52.0%	
P_L	4.7	bar
P_L^*	3.9	bar
E_o	22	bar
E_o/P_L^*	5.6	bar

Loop #	Unload Modulus	Reload Modulus	
1	422	313	bar
2	#DIV/0!	#DIV/0!	bar
3	#DIV/0!	#DIV/0!	bar



PRESSUREMETER TEST REPORT

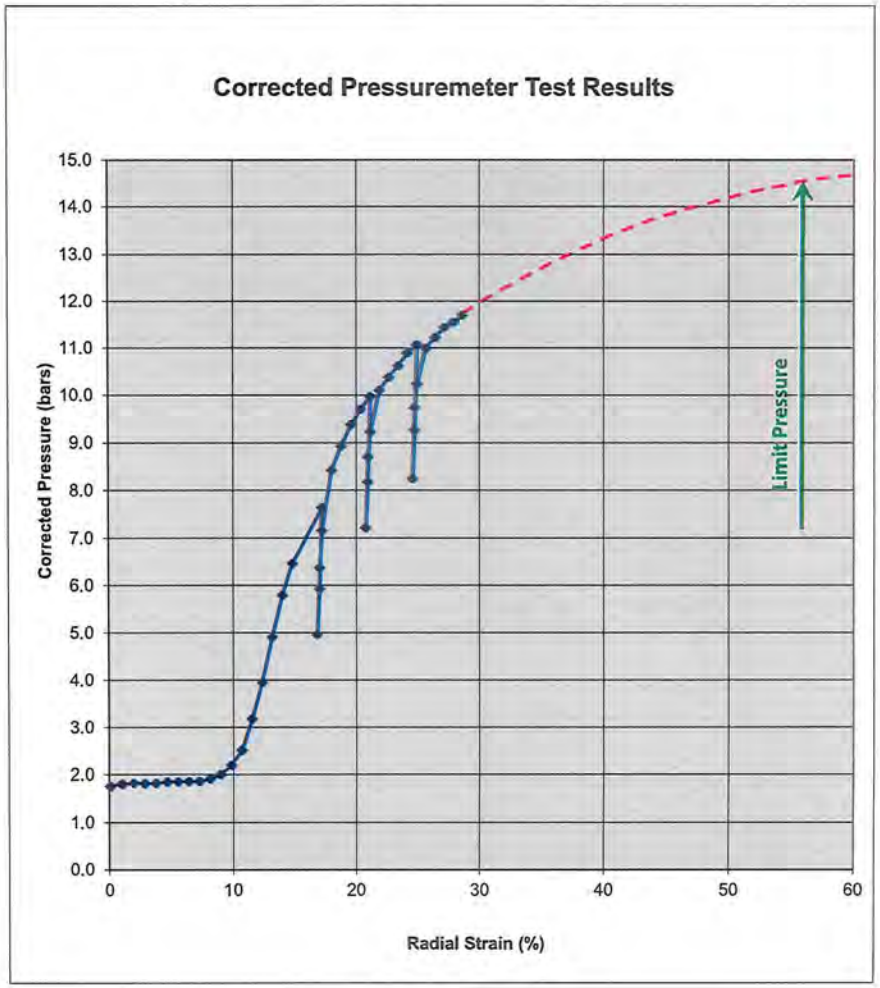
PROJECT:	Wallops Island Northern Development	BORING:	P-2
LOCATION:	Wallops Island, Virginia	TEST #:	1
IN-SITU SOIL TESTING, L.C.		DEPTH:	55.5 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	December 29, 2020

Note: ***Depth*** refers to the distance from the ground surface to center of NX Probe.

Pressure Bar	Volume cm^3	$\Delta R/R_o$ %	Selected
1.76	0	0.00	
1.81	40	0.93	
1.83	80	1.85	
1.82	120	2.76	
1.83	160	3.67	
1.85	200	4.56	
1.86	240	5.46	
1.86	280	6.34	
1.87	320	7.21	
1.92	360	8.08	
2.00	400	8.94	
2.20	439	9.79	
2.52	479	10.64	
3.18	519	11.47	
3.96	558	12.30	E0a
4.91	598	13.11	
5.80	637	13.92	E0b
6.46	677	14.73	
7.63	796	17.14	E1a
5.94	787	16.95	
4.97	777	16.77	E1b
6.37	787	16.95	
7.15	796	17.14	E1c
8.43	835	17.92	
8.94	875	18.70	
9.38	915	19.48	
9.70	954	20.26	
9.97	994	21.03	E2a
8.18	985	20.86	
7.22	976	20.68	E2b
8.71	985	20.85	
9.23	995	21.04	E2c
10.11	1034	21.80	
10.38	1074	22.56	
10.62	1114	23.32	
10.89	1154	24.07	
11.06	1194	24.82	E3a
9.27	1184	24.65	
8.25	1175	24.48	E3b
9.74	1184	24.65	
10.23	1194	24.83	E3c
10.99	1234	25.57	
11.22	1273	26.31	
11.43	1313	27.04	
11.54	1353	27.78	
11.69	1393	28.50	

Interpreted Pressuremeter Parameters		
P_o	2.0	bar
Limit Pressure Strain	55.8%	
P_L	14.5	bar
P_L^*	12.5	bar
E_o	170	bar
E_o/P_L^*	13.6	bar

Loop #	Unload Modulus	Reload Modulus	
1	1123	906	bar
2	1244	887	bar
3	1355	929	bar

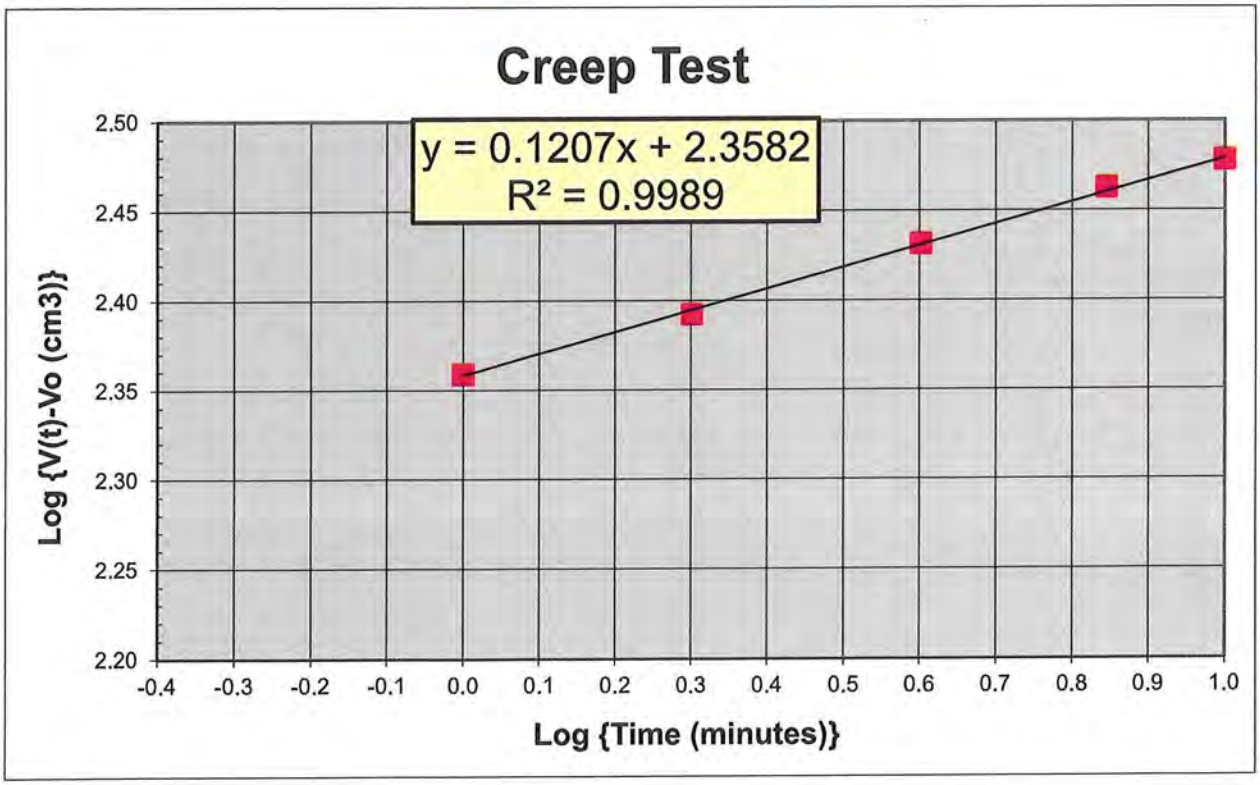


Pressuremeter Creep Test

Project: Wallops Island Northern Development
Sounding No.: P-2
Test Depth: 55.5 feet
Holding Gauge Pressure = 5.15 bars
Corrected Pressure = 6.42 bars
Initial Probe Radius = 3.69 cm
Initial Probe Length = 50 cm
Initial Volume of Probe = 2139 cm^3
Probe Radius Contacting Borehole = 4.08 cm
Initial Borehole Volume, Vo = 2612 cm^3

Time (minutes)	Log (Time) (minutes)	Volume Increase (cm^3)	Total Probe Volume (cm^3)	$V(t)-V_o$ (cm^3)	Log $[V(t)-V_o]$ (cm^3)
1	0.000	701.38	2840.19	228.65	2.359
2	0.301	719.65	2858.46	246.92	2.393
4	0.602	742.73	2881.54	270.00	2.431
7	0.845	762.58	2901.39	289.85	2.462
10	1.000	773.07	2911.88	300.34	2.478

$E_0(t)/E_0(t=1\ min) = \{t/1\}^{-n}$
n = 0.1207

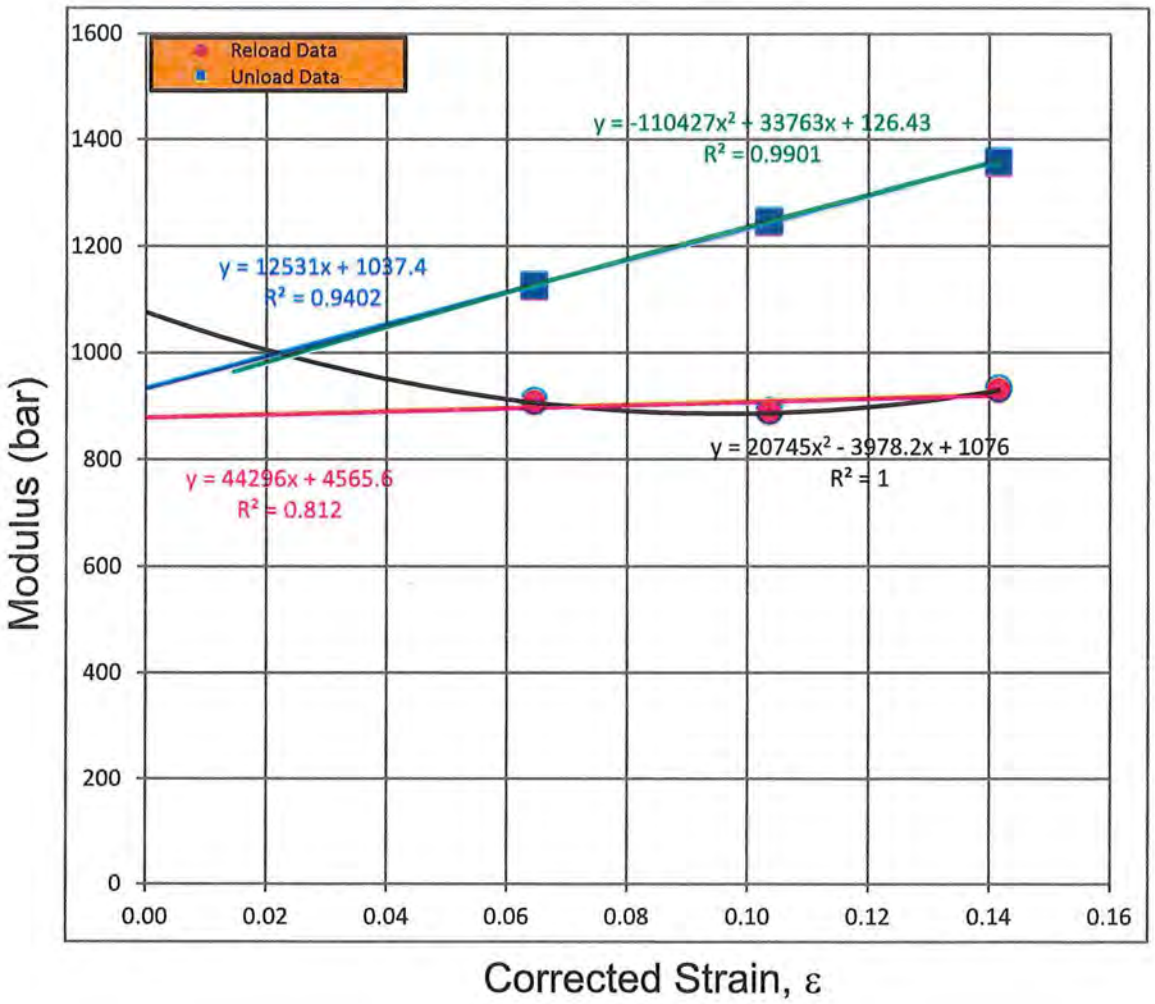


RELOAD/UNLOAD MODULUS ANALYSES

PROJECT:	Wallops Island Northern Development	BORING:	P-2
LOCATION:	Wallops Island, Virginia	TEST #:	1
IN-SITU SOIL TESTING, L.C.		DEPTH:	55.5 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	12/29/2020

Strain to contact borehole = 0.105

Average Strain	Corrected Strain	Reload Modulus	Average Strain	Corrected Strain	Unload Modulus
0.1695	0.0645	906	0.1695	0.0645	1123
0.2086	0.1036	887	0.2085	0.1035	1244
0.2465	0.1415	929	0.2465	0.1415	1355



PRESSUREMETER TEST REPORT

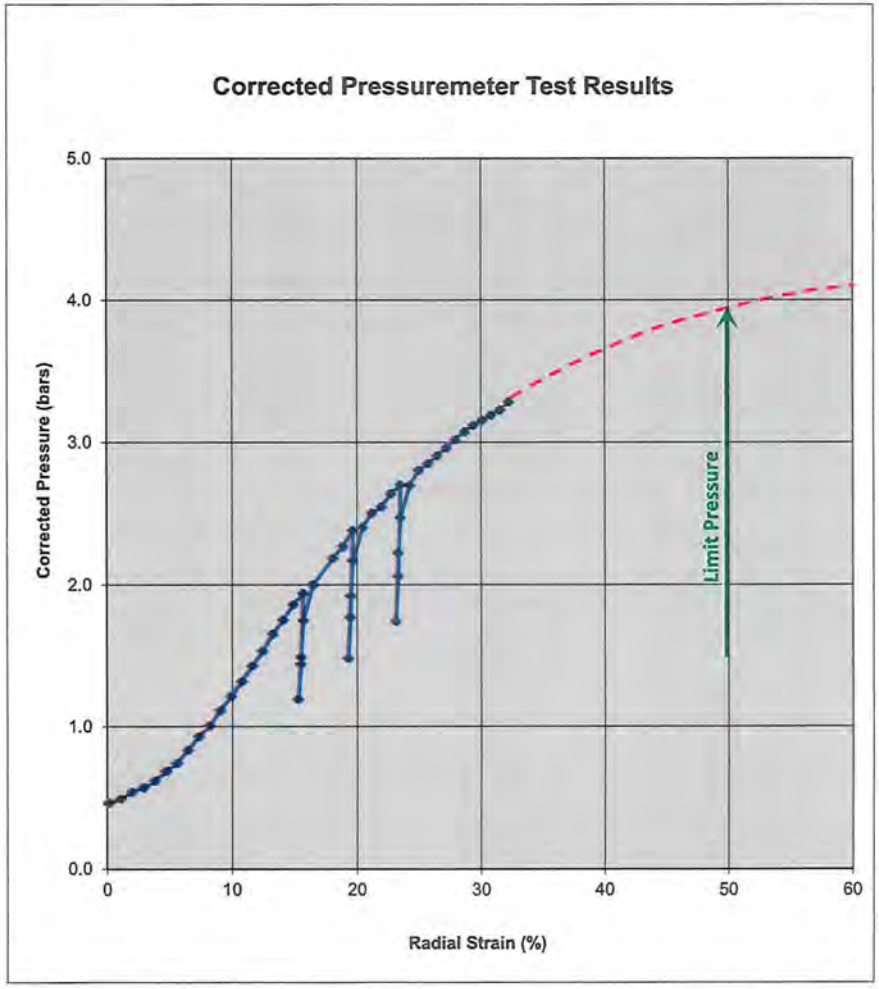
PROJECT:	Wallops Island Northern Development	BORING:	P-2A
LOCATION:	Wallops Island, Virginia	TEST #:	1
IN-SITU SOIL TESTING, L.C.		DEPTH:	14.0 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	December 30, 2020

Note: ***Depth*** refers to the distance from the ground surface to center of NX Probe.

Pressure Bar	Volume cm^3	$\Delta R/R_0$ %	Selected
0.46	0	0.00	
0.49	40	0.93	
0.54	80	1.85	
0.57	120	2.76	
0.62	160	3.67	
0.68	200	4.56	
0.74	240	5.45	
0.83	280	6.33	
0.93	319	7.21	
1.01	359	8.08	
1.11	399	8.94	
1.22	439	9.79	
1.32	479	10.64	
1.43	519	11.48	
1.53	559	12.31	E0a
1.65	599	13.14	
1.75	639	13.96	
1.86	679	14.78	E0b
1.94	719	15.59	E1a
1.44	709	15.39	
1.19	699	15.19	E1b
1.49	709	15.39	
1.75	719	15.59	E1c
2.00	759	16.39	
2.19	839	17.99	
2.27	879	18.78	
2.38	918	19.56	E2a
1.77	909	19.37	
1.48	899	19.18	E2b
1.92	909	19.37	
2.17	919	19.56	E2c
2.40	958	20.34	
2.50	998	21.11	
2.55	1038	21.88	
2.64	1078	22.64	
2.70	1118	23.40	E3a
2.06	1109	23.22	
1.74	1099	23.03	E3b
2.22	1109	23.22	
2.47	1118	23.41	E3c
2.70	1158	24.16	
2.80	1198	24.91	
2.85	1238	25.65	
2.91	1278	26.39	
2.96	1318	27.13	
3.02	1358	27.86	
3.07	1398	28.59	
3.12	1438	29.32	
3.16	1478	30.04	
3.19	1518	30.75	
3.23	1558	31.47	
3.28	1598	32.18	

Interpreted Pressuremeter Parameters		
P_o	0.8	bar
Limit Pressure Strain	49.7%	
P_L	3.9	bar
P_L^*	3.1	bar
E_o	20	bar
E_o/P_L^*	6.5	bar

Loop #	Unload Modulus	Reload Modulus	
1	289	214	bar
2	373	283	bar
3	426	321	bar

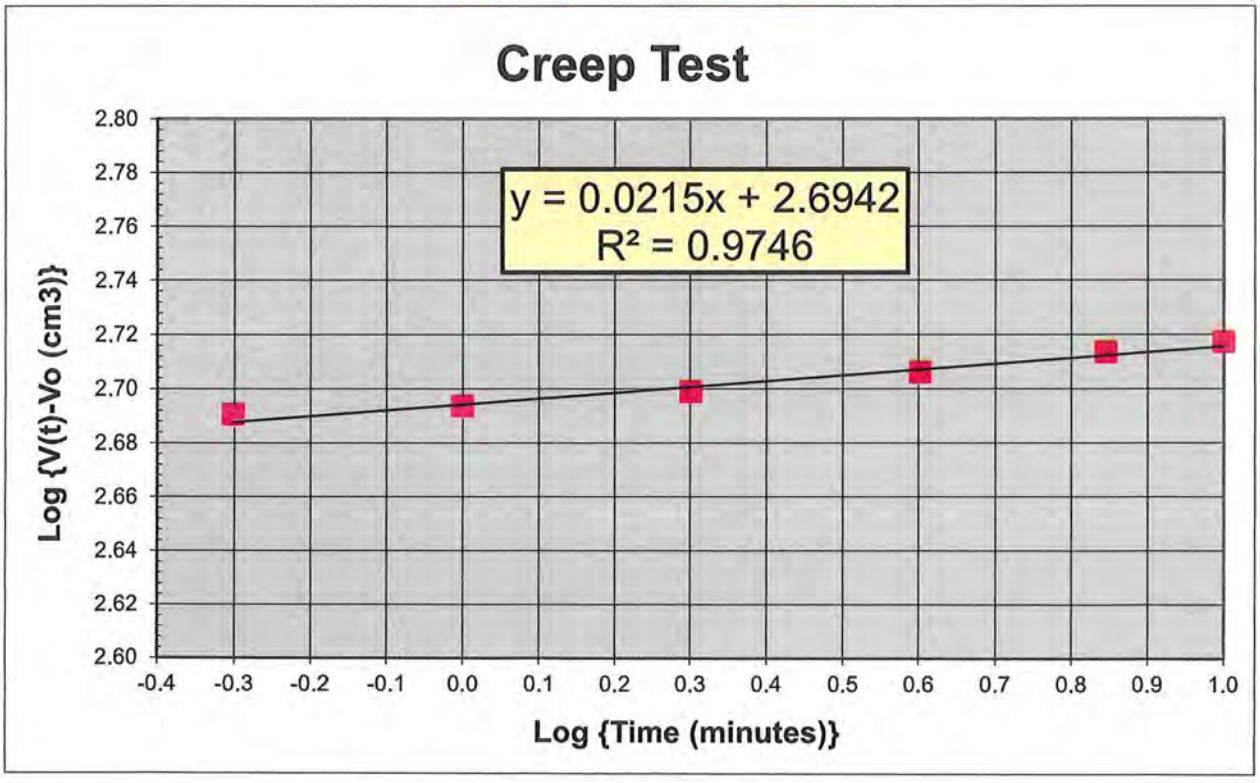


Pressuremeter Creep Test

Project: Wallops Island Northern Development
Sounding No.: P-2A
Test Depth: 14.0 feet
Holding Gauge Pressure = 1.95 bars
Corrected Pressure = 2.00 bars
Initial Probe Radius = 3.69 cm
Initial Probe Length = 50 cm
Initial Volume of Probe = 2139 cm^3
Probe Radius Contacting Borehole = 3.92 cm
Initial Borehole Volume, Vo = 2412 cm^3

Time (minutes)	Log (Time) (minutes)	Volume Increase (cm^3)	Total Probe Volume (cm^3)	$V(t)-V_0$ (cm^3)	Log $[V(t)-V_0]$ (cm^3)
0.5	-0.301	763.12	2901.93	489.69	2.690
1	0.000	766.85	2905.66	493.42	2.693
2	0.301	772.87	2911.68	499.44	2.698
4	0.602	781.23	2920.04	507.80	2.706
7	0.845	789.98	2928.79	516.55	2.713
10	1.000	794.72	2933.53	521.29	2.717

$E_0(t)/E_0(t=1\ min) = \{t/1\}^{-n}$
n = 0.0215

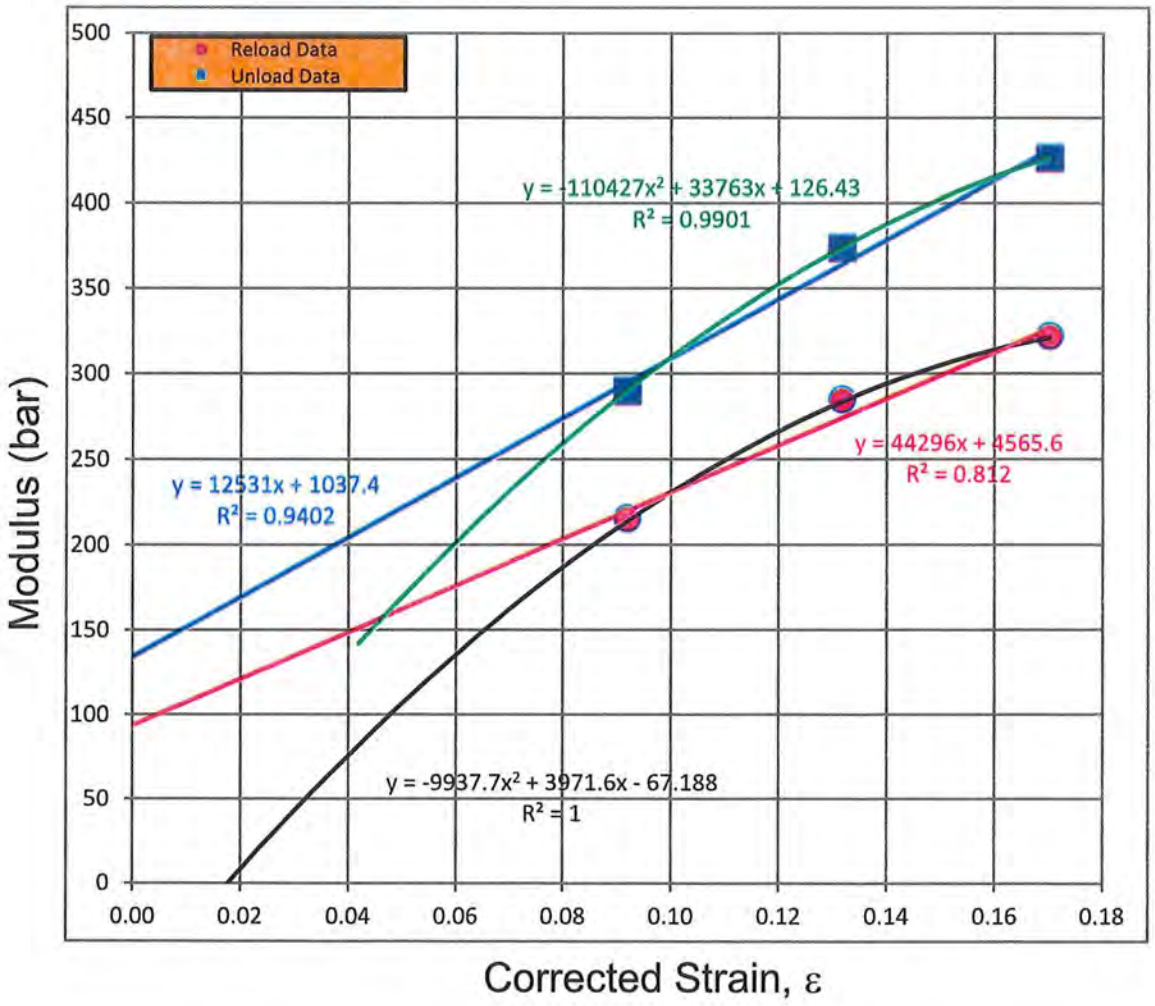


RELOAD/UNLOAD MODULUS ANALYSES

PROJECT:	Wallops Island Northern Development	BORING:	P-2A
LOCATION:	Wallops Island, Virginia	TEST #:	1
IN-SITU SOIL TESTING, L.C.		DEPTH:	14.0 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	12/30/2020

Strain to contact borehole = 0.062

Average Strain	Corrected Strain	Reload Modulus	Average Strain	Corrected Strain	Unload Modulus
0.1539	0.0919	214	0.1539	0.0919	289
0.1937	0.1317	283	0.1937	0.1317	373
0.2322	0.1702	321	0.2322	0.1702	426



PRESSUREMETER TEST REPORT

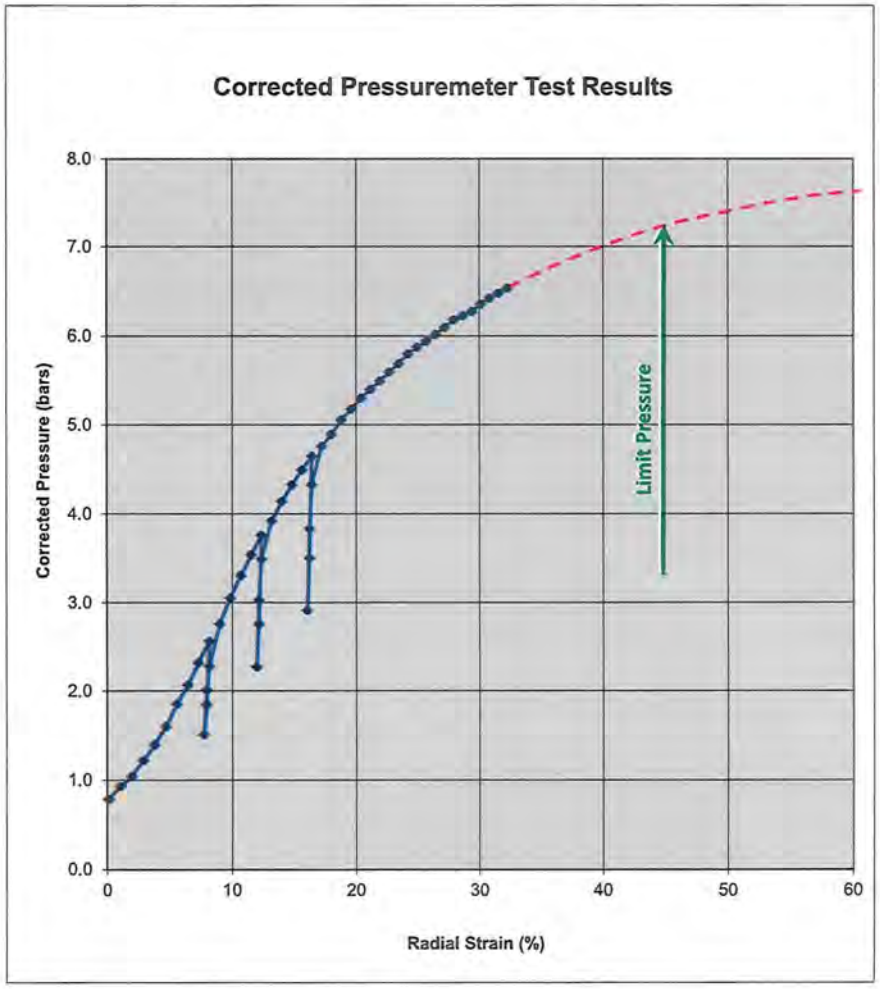
PROJECT:	Wallops Island Northern Development	BORING:	P-2A
LOCATION:	Wallops Island, Virginia	TEST #:	2
IN-SITU SOIL TESTING, L.C.		DEPTH:	24.0 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	December 30, 2020

Note: ***Depth*** refers to the distance from the ground surface to center of NX Probe.

Pressure Bar	Volume cm^3	$\Delta R/R_o$ %	Selected
0.78	0	0.00	
0.93	40	0.93	
1.04	80	1.85	
1.22	120	2.76	
1.40	159	3.66	
1.60	199	4.55	E0a
1.86	239	5.44	
2.07	279	6.32	
2.33	319	7.19	E0b
2.56	359	8.06	E1a
1.85	349	7.85	
1.51	339	7.64	E1b
2.02	349	7.85	
2.28	359	8.06	E1c
2.76	398	8.92	
3.05	438	9.77	
3.31	478	10.61	
3.54	518	11.45	
3.76	558	12.29	E2a
2.76	548	12.09	
2.27	539	11.89	E2b
3.03	548	12.09	
3.49	558	12.29	E2c
3.92	598	13.11	
4.14	638	13.93	
4.33	677	14.75	
4.50	717	15.56	
4.65	757	16.36	E3a
3.50	748	16.17	
2.91	738	15.98	E3b
3.83	748	16.17	
4.33	757	16.37	E3c
4.76	797	17.16	
4.89	837	17.95	
5.06	877	18.74	
5.18	917	19.53	
5.30	957	20.30	
5.40	997	21.08	
5.49	1037	21.85	
5.60	1077	22.61	
5.69	1116	23.37	
5.80	1156	24.12	
5.87	1196	24.87	
5.94	1236	25.62	
6.01	1276	26.36	
6.09	1316	27.10	
6.18	1356	27.83	
6.22	1396	28.56	
6.27	1436	29.28	
6.35	1476	30.00	
6.42	1516	30.72	
6.48	1556	31.43	
6.53	1596	32.14	

Interpreted Pressuremeter Parameters		
P_o	1.2	bar
Limit Pressure Strain	44.5%	
P_L	7.2	bar
P_L^*	6.0	bar
E_o	39	bar
E_o/P_L^*	6.4	bar

Loop #	Unload Modulus	Reload Modulus	
1	360	262	bar
2	555	450	bar
3	702	566	bar

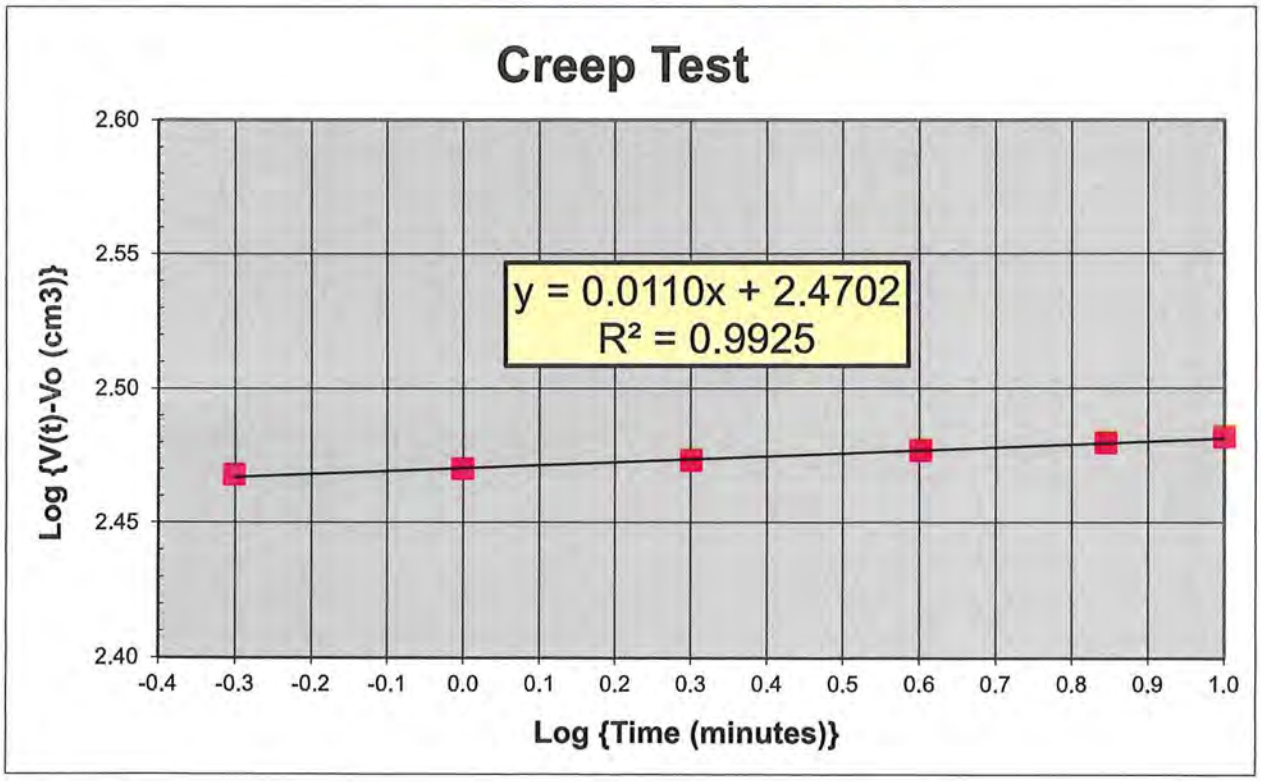


Pressuremeter Creep Test

Project: Wallops Island Northern Development
Sounding No.: P-2A
Test Depth: 24.0 feet
Holding Gauge Pressure = 2.33 bars
Corrected Pressure = 2.76 bars
Initial Probe Radius = 3.69 cm
Initial Probe Length = 50 cm
Initial Volume of Probe = 2139 cm^3
Probe Radius Contacting Borehole = 3.78 cm
Initial Borehole Volume, Vo = 2247 cm^3

Time (minutes)	Log (Time) (minutes)	Volume Increase (cm^3)	Total Probe Volume (cm^3)	$V(t)-V_0$ (cm^3)	Log $[V(t)-V_0]$ (cm^3)
0.5	-0.301	401.73	2540.54	293.45	2.468
1	0.000	403.28	2542.09	295.00	2.470
2	0.301	405.41	2544.22	297.13	2.473
4	0.602	407.93	2546.74	299.65	2.477
7	0.845	409.85	2548.66	301.57	2.479
10	1.000	411.44	2550.25	303.16	2.482

$E_0(t)/E_0(t=1\ min) = \{t/1\}^{-n}$
n = 0.0110

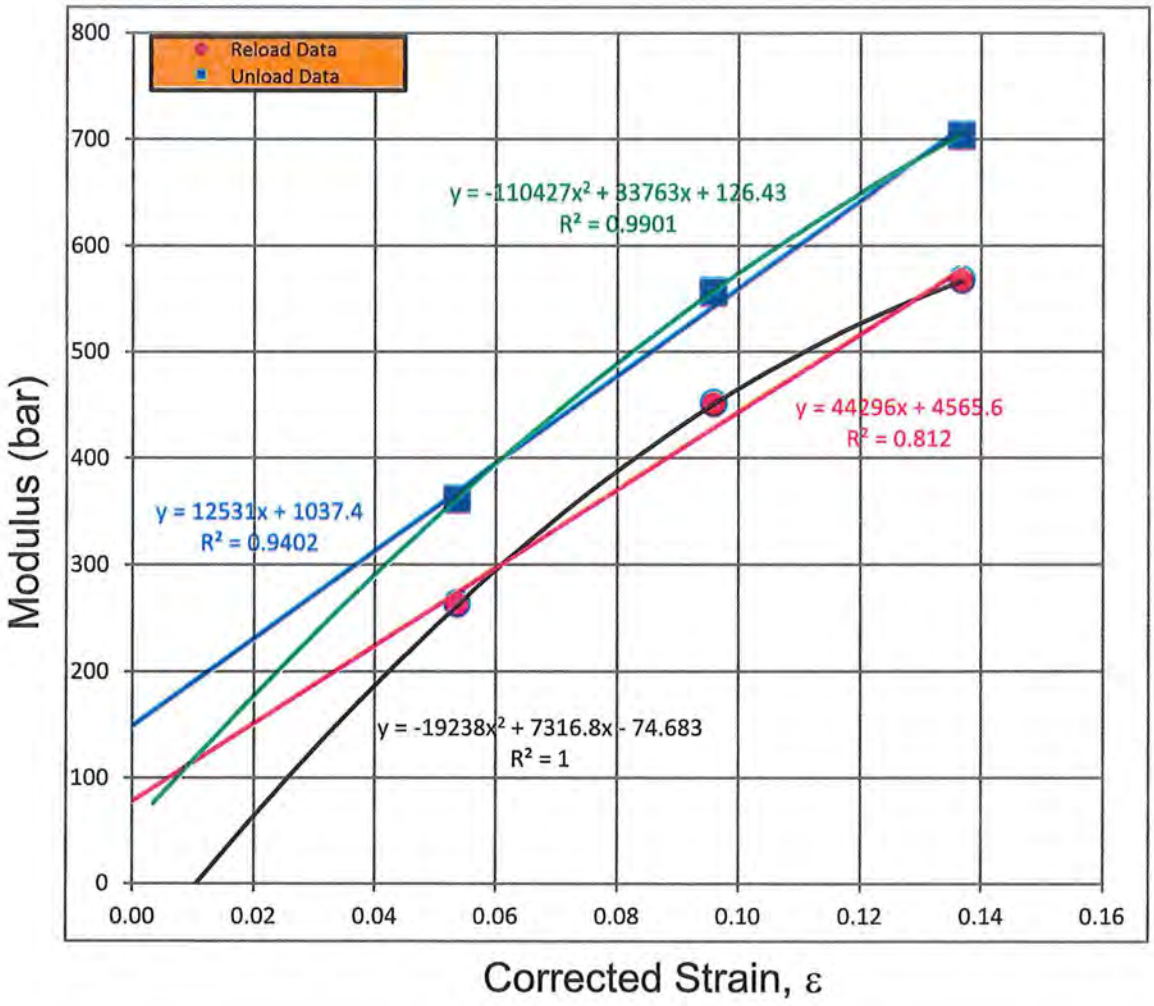


RELOAD/UNLOAD MODULUS ANALYSES

PROJECT:	Wallops Island Northern Development	BORING:	P-2A
LOCATION:	Wallops Island, Virginia	TEST #:	2
IN-SITU SOIL TESTING, L.C.		DEPTH:	24.0 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	12/30/2020

Strain to contact borehole = 0.025

Average Strain	Corrected Strain	Reload Modulus	Average Strain	Corrected Strain	Unload Modulus
0.0785	0.0535	262	0.0785	0.0535	360
0.1209	0.0959	450	0.1209	0.0959	555
0.1617	0.1367	566	0.1617	0.1367	702



PRESSUREMETER TEST REPORT

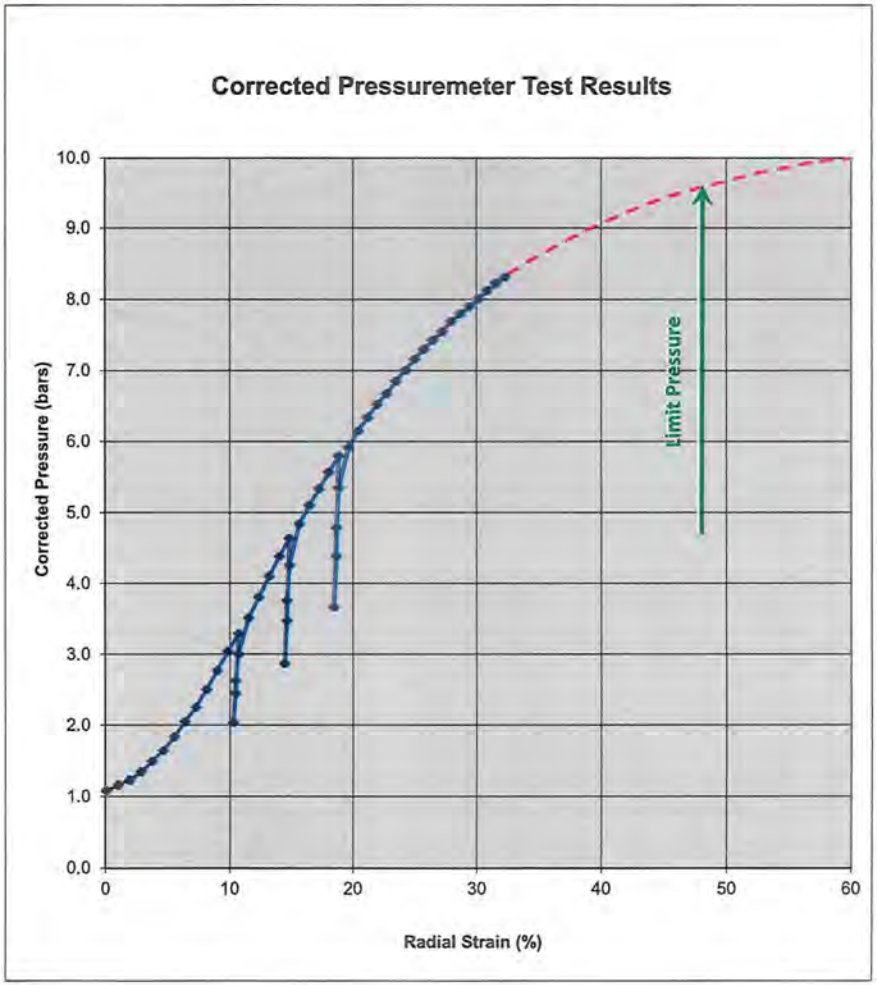
PROJECT:	Wallops Island Northern Development	BORING:	P-2A
LOCATION:	Wallops Island, Virginia	TEST #:	3
IN-SITU SOIL TESTING, L.C.		DEPTH:	35.0 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	December 30, 2020

Note: ***Depth*** refers to the distance from the ground surface to center of NX Probe.

Pressure Bar	Volume cm^3	$\Delta R/R_0$ %	Selected
1.08	0	0.00	
1.16	40	0.93	
1.23	80	1.85	
1.34	120	2.76	
1.49	160	3.66	
1.64	199	4.56	
1.84	239	5.45	
2.05	279	6.33	
2.26	319	7.20	E0a
2.50	359	8.06	
2.77	399	8.92	
3.04	438	9.77	E0b
3.30	478	10.62	E1a
2.45	469	10.42	
2.04	459	10.21	E1b
2.63	469	10.42	
3.01	479	10.62	E1c
3.52	518	11.46	
3.81	558	12.29	
4.10	598	13.11	
4.38	638	13.93	
4.64	677	14.75	E2a
3.48	668	14.56	
2.87	658	14.36	E2b
3.76	668	14.56	
4.26	678	14.75	E2c
4.84	717	15.56	
5.10	757	16.36	
5.33	797	17.16	
5.56	837	17.95	
5.80	877	18.74	E3a
4.39	867	18.55	
3.67	858	18.37	E3b
4.79	867	18.55	
5.35	877	18.74	E3c
5.92	917	19.52	
6.15	956	20.30	
6.34	996	21.07	
6.52	1036	21.84	
6.68	1076	22.60	
6.85	1116	23.36	
7.01	1156	24.11	
7.16	1196	24.86	
7.30	1236	25.61	
7.42	1276	26.35	
7.54	1315	27.08	
7.69	1355	27.82	
7.79	1395	28.54	
7.90	1435	29.27	
8.00	1475	29.99	
8.12	1515	30.70	
8.23	1555	31.42	
8.31	1595	32.12	

Interpreted Pressuremeter Parameters		
P_o	1.5	bar
Limit Pressure Strain	47.8%	
P_L	9.6	bar
P_L^*	8.1	bar
E_o	44	bar
E_o/P_L^*	5.5	bar

Loop #	Unload Modulus	Reload Modulus	
1	452	344	bar
2	694	537	bar
3	906	703	bar

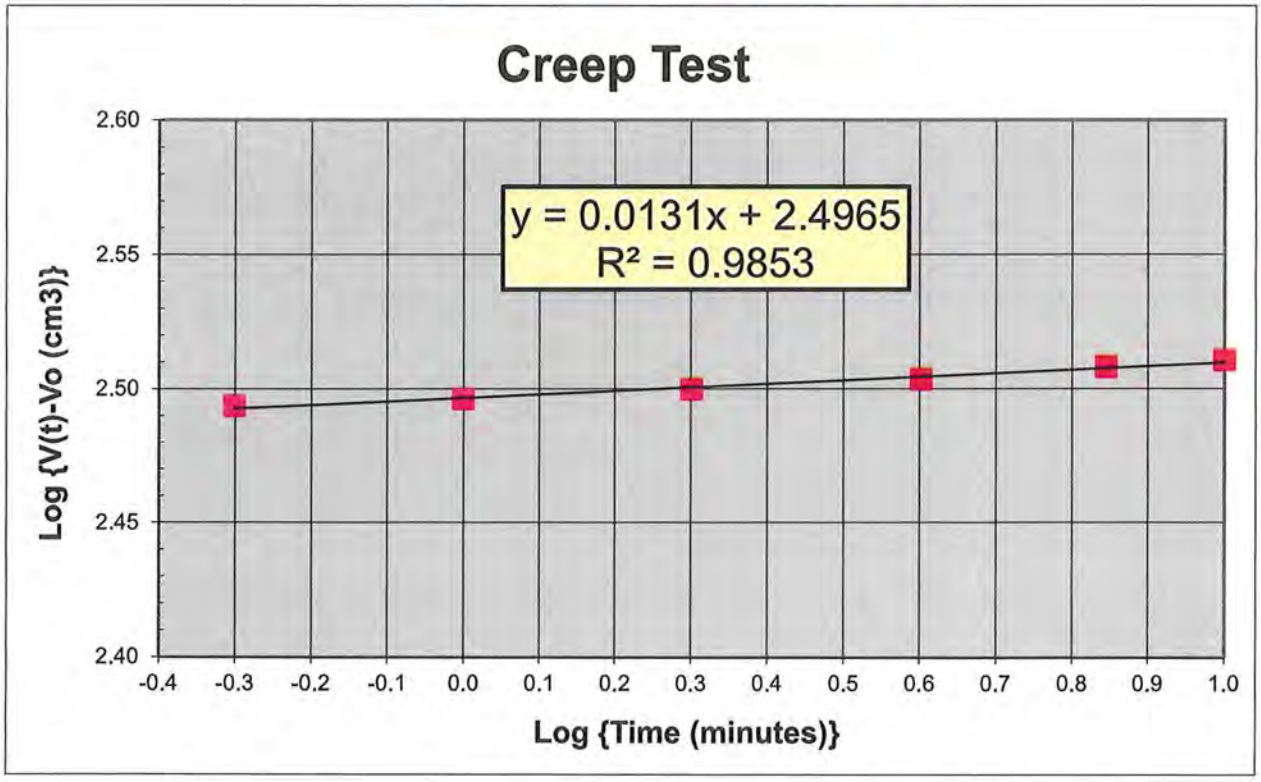


Pressuremeter Creep Test

Project: Wallops Island Northern Development
Sounding No.: P-2A
Test Depth: 35.0 feet
Holding Gauge Pressure = 2.78 bars
Corrected Pressure = 3.52 bars
Initial Probe Radius = 3.69 cm
Initial Probe Length = 50 cm
Initial Volume of Probe = 2139 cm^3
Probe Radius Contacting Borehole = 3.87 cm
Initial Borehole Volume, Vo = 2349 cm^3

Time (minutes)	Log (Time) (minutes)	Volume Increase (cm^3)	Total Probe Volume (cm^3)	$V(t)-V_0$ (cm^3)	Log $[V(t)-V_0]$ (cm^3)
0.5	-0.301	521.79	2660.60	311.54	2.494
1	0.000	523.73	2662.54	313.48	2.496
2	0.301	526.27	2665.08	316.02	2.500
4	0.602	529.04	2667.85	318.79	2.503
7	0.845	532.35	2671.16	322.10	2.508
10	1.000	534.21	2673.02	323.96	2.510

$E_0(t)/E_0(t=1\ min) = \{t/1\}^{-n}$
n = 0.0131

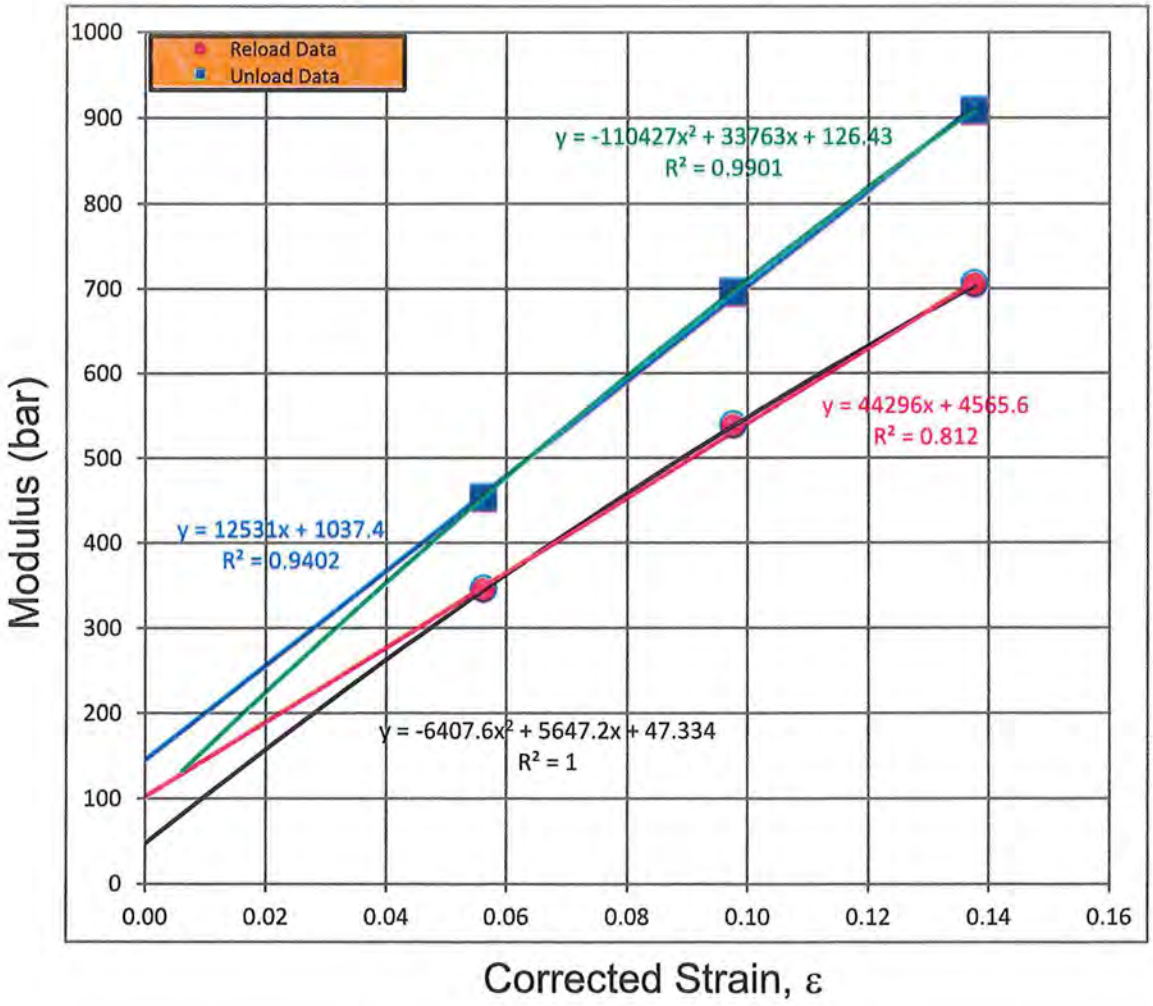


RELOAD/UNLOAD MODULUS ANALYSES

PROJECT:	Wallops Island Northern Development	BORING:	P-2A
LOCATION:	Wallops Island, Virginia	TEST #:	3
IN-SITU SOIL TESTING, L.C.		DEPTH:	35.0 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	12/30/2020

Strain to contact borehole = 0.048

Average Strain	Corrected Strain	Reload Modulus	Average Strain	Corrected Strain	Unload Modulus
0.1042	0.0562	344	0.1041	0.0561	452
0.1456	0.0976	537	0.1455	0.0975	694
0.1856	0.1376	703	0.1855	0.1375	906



PRESSUREMETER TEST REPORT

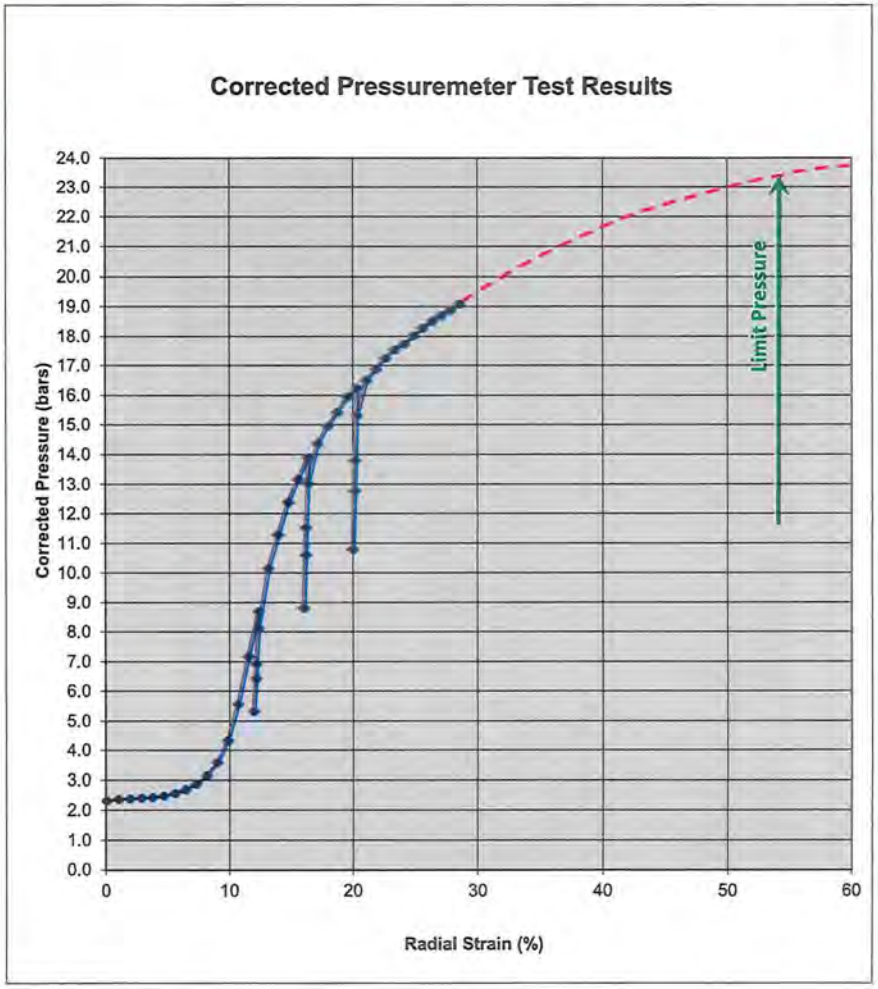
PROJECT:	Wallops Island Northern Development	BORING:	P-2A
LOCATION:	Wallops Island, Virginia	TEST #:	4
IN-SITU SOIL TESTING, L.C.		DEPTH:	76.0 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	December 30, 2020

Note: ***Depth*** refers to the distance from the ground surface to center of NX Probe.

Pressure Bar	Volume cm^3	$\Delta R/R_0$ %	Selected
2.32	0	0.00	
2.36	40	0.93	
2.38	80	1.85	
2.40	120	2.76	
2.43	160	3.67	
2.48	200	4.56	
2.56	240	5.45	
2.68	280	6.33	
2.87	319	7.21	
3.14	359	8.07	
3.58	399	8.93	E0a
4.32	438	9.77	
5.57	478	10.60	
7.17	517	11.42	E0b
8.69	556	12.24	E1a
6.43	547	12.05	
5.32	538	11.86	E1b
6.93	547	12.05	
8.13	556	12.25	E1c
10.14	595	13.05	
11.27	634	13.86	
12.36	673	14.66	
13.15	713	15.46	
13.89	752	16.26	E2a
10.61	744	16.09	
8.81	735	15.92	E2b
11.52	744	16.09	
13.01	753	16.27	E2c
14.36	792	17.06	
14.95	831	17.84	
15.42	871	18.63	
15.94	911	19.41	
16.23	951	20.18	E3a
12.77	942	20.02	
10.79	934	19.86	E3b
13.80	942	20.02	
15.31	951	20.20	E3c
16.50	990	20.96	
16.87	1030	21.72	
17.24	1070	22.48	
17.53	1110	23.24	
17.72	1150	23.99	
18.01	1189	24.74	
18.26	1229	25.49	
18.50	1269	26.23	
18.69	1309	26.96	
18.87	1349	27.70	
19.07	1389	28.42	

Interpreted Pressuremeter Parameters		
P_o	2.8	bar
Limit Pressure Strain	53.4%	
P_L	23.3	bar
P_L^*	20.5	bar
E_o	211	bar
E_o/P_L^*	10.3	bar

Loop #	Unload Modulus	Reload Modulus	
1	1336	1092	bar
2	2284	1827	bar
3	2645	2122	bar



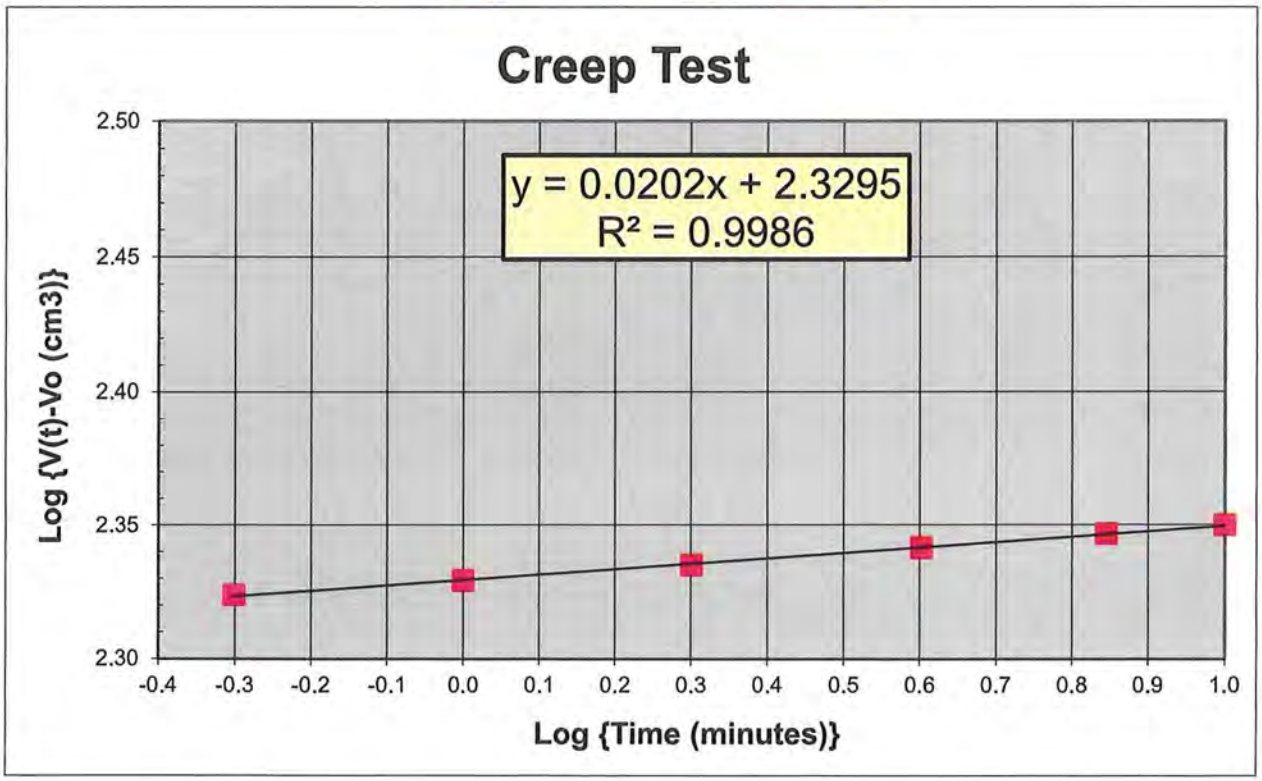
Pressuremeter Creep Test

Project: Wallops Island Northern Development
Sounding No.: P-2A
Test Depth: 76.0 feet

Holding Gauge Pressure =	8.19 bars
Corrected Pressure =	10.14 bars
Initial Probe Radius =	3.69 cm
Initial Probe Length =	50 cm
Initial Volume of Probe =	2139 cm^3
Probe Radius Contacting Borehole =	4.01 cm
Initial Borehole Volume, Vo =	2532 cm^3

Time (minutes)	Log (Time) (minutes)	Volume Increase (cm^3)	Total Probe Volume (cm^3)	$V(t)-V_0$ (cm^3)	Log $[V(t)-V_0]$ (cm^3)
0.5	-0.301	603.80	2742.61	210.81	2.324
1	0.000	606.46	2745.27	213.47	2.329
2	0.301	609.26	2748.07	216.27	2.335
4	0.602	612.51	2751.32	219.52	2.341
7	0.845	615.15	2753.96	222.16	2.347
10	1.000	616.85	2755.66	223.86	2.350

$$E_0(t)/E_0(t=1\ min) = \{t/1\}^{-n}$$
$$n = 0.0202$$

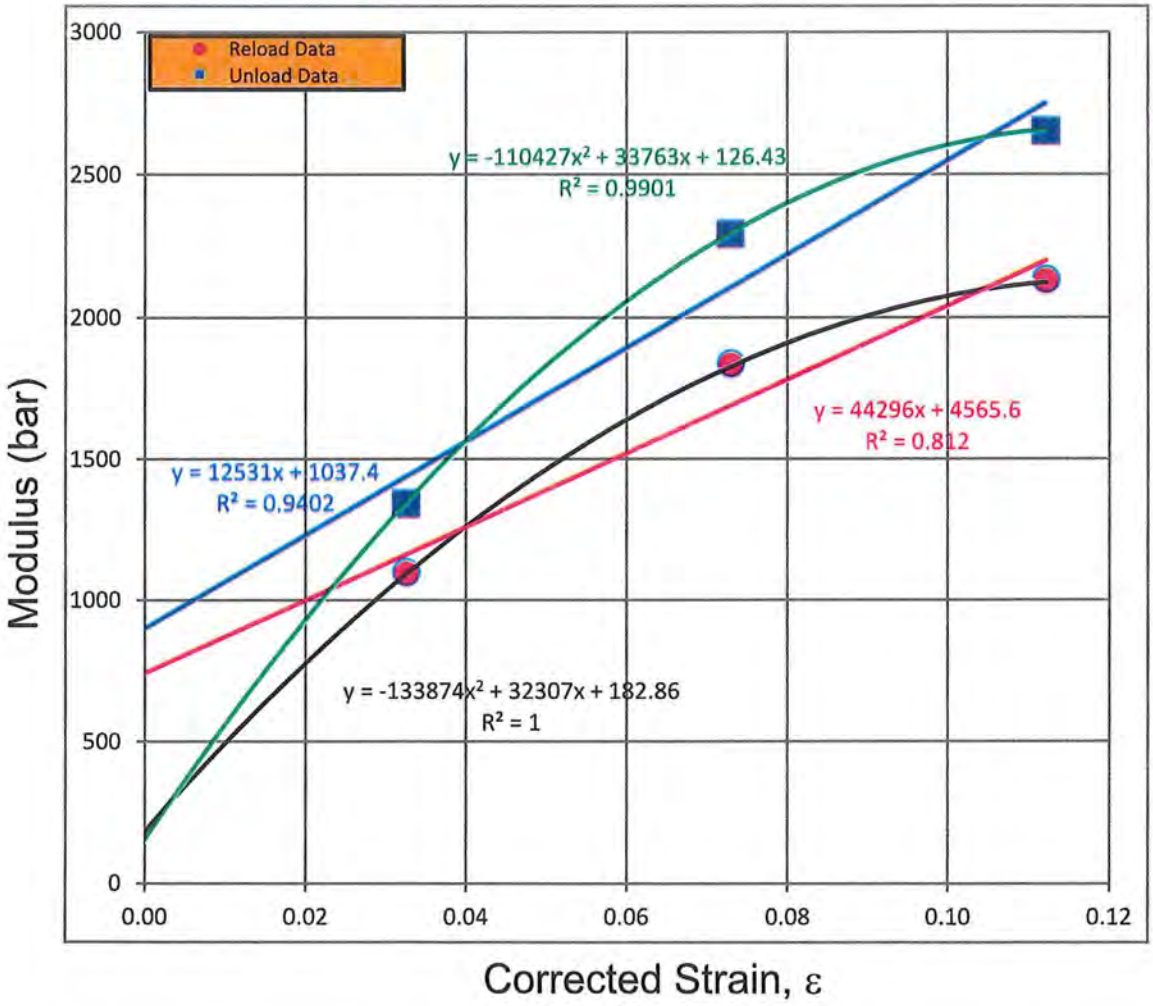


RELOAD/UNLOAD MODULUS ANALYSES

PROJECT:	Wallops Island Northern Development	BORING:	P-2A
LOCATION:	Wallops Island, Virginia	TEST #:	4
IN-SITU SOIL TESTING, L.C.		DEPTH:	76.0 ft
ENGINEER:	Roger A. Failmezger, P.E., F. ASCE, D GE	TEST DATE:	12/30/2020

Strain to contact borehole = 0.088

Average Strain	Corrected Strain	Reload Modulus	Average Strain	Corrected Strain	Unload Modulus
0.1205	0.0325	1092	0.1205	0.0325	1336
0.1609	0.0729	1827	0.1609	0.0729	2284
0.2003	0.1123	2122	0.2002	0.1122	2645



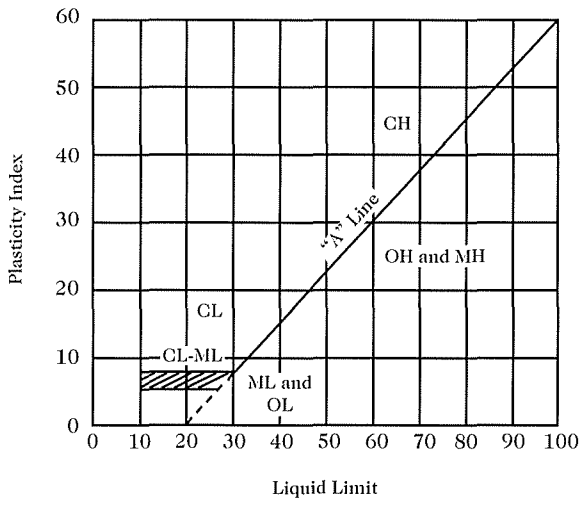
JOHN D. HYNES & ASSOCIATES, INC.

Geotechnical and Environmental Consultants
Monitoring Well Installation
Construction Inspection and Materials Testing

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions			*Group Symbols*	*Typical Names*	*Laboratory Classification Criteria*	
Coarse-grained soils (More than half of material is larger than No 200 sieve size)	Gravels (More than half of coarse fraction is larger than No 4 sieve size)	Clean gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No 200 sieve size), coarse grained soils are classified as follows: Less than 5 percent: GW, GP, SW, SP. More than 12 percent: GM, GC, SM, SC. 5 to 12 percent: *Borderline cases requiring dual symbols*[a]	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})_2}{D_{10} \times D_{60}}$ between 1 and 3
			GP	Poorly graded gravels, gravel sand mixtures, little or no fines		Not meeting all graduation requirements for GW
		Gravels with fines (Appreciable amount of fines)	GM[a] d / u	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits above "A" line with P.I. greater than 7	
	Sands (More than half of coarse fraction is smaller than No 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands,	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})_2}{D_{10} \times D_{60}}$ between 1 and 3	
			SP	Poorly graded sands, gravelly sands, little or no fines		Not meeting all graduation requirements for SW
		Sands with fines (Appreciable amount of fines)	SM[a] d / u	Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols.
			SC	Clayey sands, sand-clay mixtures	Atterberg limits above "A" line with P.I. greater than 7	
Fine-grained soils (More than half material is smaller than No 200 sieve)	Silts and clays (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity		
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
			OL	Organic silts and organic silty clays of low plasticity		
	Silts and clays (Liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
			CH	Inorganic clays of high plasticity, fat clays		
			OH	Organic clays of medium to high plasticity, organic silts		
	Highly organic soils		Pt	Peat and other highly organic soils		

Plasticity Chart



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E-mail - jdhynes@aol.com

HYNES

FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

NON-COHESIVE SOILS
(Silt, Sand, Gravel and Combinations)

DENSITY

Very Loose	- 5 blows/ft. or less
Loose	- 6 to 10 blows/ft.
Medium Dense	- 11 to 30 blows/ft.
Dense	- 31 to 50 blows/ft.
Very Dense	- 51 blows/ft. or more

RELATIVE PROPORTIONS

Descriptive Term	Percent
Trace	1 - 10
Little	11 - 20
Some	21 - 35
And	36 - 50

PARTICLE SIZE IDENTIFICATION

Boulders	- 8 inch diameter or more
Cobbles	- 3 to 8 inch diameter
Gravel	- Coarse - 1 to 3 inch
	- Medium - 1/2 to 1 inch
	- Fine - 4.75 mm to 1/2 inch
Sand	- Coarse - 2.0 mm to 4.75 mm
	- Medium - 0.425 mm to 2.0 mm
	- Fine - 0.075 mm to 0.425 mm
Silt	- 0.075 mm to 0.002 mm

COHESIVE SOILS
(Clay, Silt and Combinations)

CONSISTENCY

Very Soft	- 3 blows/ft. or less
Soft	- 4 to 5 blows/ft.
Medium Stiff	- 6 to 10 blows/ft.
Stiff	- 11 to 15 blows/ft.
Very Stiff	- 16 to 30 blows/ft.
Hard	- 31 blows/ft. or more

PLASTICITY

Degree of Plasticity	Plasticity Index
None to Slight	0 - 4
Slight	5 - 7
Medium	8 - 22
High to Very High	over 22

Classification on logs are made by visual inspection of samples unless a sample has been subjected to laboratory classification testing.

Standard Penetration Test - Driving a 2.0" O.D., 1-3/8" I.D., splitspoon sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. It is customary to drive the spoon 6 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the test are recorded for each 6 inches of penetration on the drill log (Example - 6/8/9). The standard penetration test value (N - value) can be obtained by adding the last two figures (i.e. 8 + 9 = 17 blows/ft.). (ASTM D-1586)

Strata Changes - In the column "Soil Descriptions," on the drill log, the horizontal lines represent strata changes. A solid line (—) represents an actually observed change, a dashed line (----) represents an estimated change.

Groundwater - Observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc. may cause changes in the water levels indicated on the logs.

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410-546-6462 • Fax 410-548-5346

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by:* the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GBC GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

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ATTACHMENT 2: NOAA FISHERIES ESA MAPPER

NOAA Fisheries Section 7 Mapper (Version 2, Nov 2019) **Accessed 12/2/2020**
Species Descriptions for the Vicinity of the Wallops WIND Action Area

Atlantic sturgeon
Adult
Migrating & Foraging
N/A

Acipenser oxyriynchus oxyriynchus
DPS: All DPSs
ESA Status: Threatened/Endangered

Time(s) of year:
01/01 to 12/31
N/A to N/A

Federal Register: 77 FR 5880 and 77 FR 5914
Recovery Plan: N/A

Notes: We expect adult Atlantic sturgeon to opportunistically forage year round as they migrate along the coast to and from their natal spawning grounds (Hilton et al. 2016, p. 8). They may aggregate in ocean and estuarine areas during certain times of year, and exhibit seasonal coastal movements in the spring and fall. We expect that they typically remain within the 50-meter depth contour (Erickson et al. 2011, p. 356, 360), but may be found out to the Exclusive Economic Zone (EEZ)(Stein et al. 2004, p. 174).

Sources: Hilton et al. 2016; Erickson et al. 2011; Stein et al. 2004

River Kilometers (if applicable):
to , (Hilton et al. 2016, p. 8)
to , (GARFO)

Feature ID: ANS_C50_ADU_MAF
Last Updated: 7/12/2017, 8:00 PM

Atlantic sturgeon
Subadult
Migrating & Foraging
N/A

Acipenser oxyriynchus oxyriynchus
DPS: All DPSs
ESA Status: Threatened/Endangered

Time(s) of year:
01/01 to 12/31
N/A to N/A

Federal Register: 77 FR 5880 and 77 FR 5914
Recovery Plan: N/A

Notes: We expect subadult Atlantic sturgeon to opportunistically forage year round as they migrate along the coast to and from their natal rivers (Hilton et al. 2016, p. 8). They may aggregate in ocean and estuarine areas during certain times of year, and exhibit seasonal coastal movements in the spring and fall. We expect that they typically remain within the 50-meter depth contour (Erickson et al. 2011, p. 356, 360), but may be found out to the Exclusive Economic Zone (EEZ)(Stein et al. 2004, p. 174).

Sources: Hilton et al. 2016; Erickson et al. 2011; Stein et al. 2004

River Kilometers (if applicable):
to , (Hilton et al. 2016, p. 8)
to , (GARFO)

Feature ID: ANS_C50_SUB_MAF
Last Updated: 7/12/2017, 8:00 PM

Green sea turtle
Adults and juveniles
Migrating & Foraging
Massachusetts (S of Cape Cod) through Virginia

Chelonia mydas
DPS: North Atlantic DPS
ESA Status: Threatened

Time(s) of year:
5/1 to 11/30
to

Federal Register: 81 FR 20057
Recovery Plan: NMFS & USFWS 1991

Notes: In general, juvenile and adult green sea turtles migrate north in the spring as water temperatures warm, arriving in mid-Atlantic waters in May. As the waters cool in the fall, the trend is reversed with most sea turtles leaving the area by the end of November. The waters south of Cape Cod were delineated based on Ecological Protection Units (EPUs), as defined by the Northeast Fisheries Science Center.

Sources: [Loggerhead] Shoop and Kenney 1992; [Green]USFWS 2015; [Kemp's ridley] NMFS and USFWS 2015

Feature ID: GRN_STS_AJV_MAF
Last Updated: 3/26/2017, 8:00 PM

Kemp's ridley sea turtle
Adults and juveniles
Migrating & Foraging
Massachusetts (S of Cape Cod) through Virginia

Lepidochelys kempii
DPS: N/A
ESA Status: Endangered

Time(s) of year:
5/1 to 11/30
to

Federal Register: 35 FR 18319
Recovery Plan: NMFS et al. 2011

Notes: In general, juvenile and adult Kemp’s ridley sea turtles migrate north in the spring as water temperatures warm, arriving in mid-Atlantic waters in May. As the waters cool in the fall, the trend is reversed with most sea turtles leaving the area by the end of November. The waters south of Cape Cod were delineated based on

Ecological Protection Units (EPUs), as defined by the Northeast Fisheries Science Center.

Sources: [Loggerhead] Shoop and Kenney 1992; [Green]USFWS 2015; [Kemp's ridley] NMFS and USFWS 2015

Feature ID: KMP_STS_AJV_MAF
Last Updated: 3/26/2017, 8:00 PM

Leatherback sea turtle
Adults and juveniles
Migrating & Foraging
Massachusetts (S of Cape Cod) through Virginia

Dermochelys coriacea
DPS: N/A
ESA Status: Endangered

Time(s) of year:
5/1 to 11/30
to

Federal Register: 35 FR 849
Recovery Plan: NMFS & USFWS 1992

Notes: In general, juvenile and adult leatherback sea turtles migrate north in the spring as water temperatures warm, arriving in mid-Atlantic waters in May. As the waters cool in the fall, the trend is reversed with most sea turtles leaving the area by the end of November. The waters south of Cape Cod were delineated based on Ecological Protection Units (EPUs), as defined by the Northeast Fisheries Science Center.

Sources: [Loggerhead] Shoop and Kenney 1992; [Green]USFWS 2015; [Kemp's ridley] NMFS and USFWS 2015

Feature ID: LTR_STS_AJV_MAF
Last Updated: 3/26/2017, 8:00 PM

Loggerhead sea turtle
Adults and juveniles
Migrating & Foraging
Massachusetts (S of Cape Cod) through Virginia

Caretta caretta
DPS: Northwest Atlantic DPS
ESA Status: Threatened

Time(s) of year:
5/1 to 11/30
to

Federal Register: 76 FR 58868
Recovery Plan: NMFS & USFWS 2008

Notes: In general, juvenile and adult loggerhead sea turtles migrate north in the spring as water temperatures warm, arriving in mid-Atlantic waters in May. As the waters cool in the fall, the trend is reversed with most sea turtles leaving the area by the end

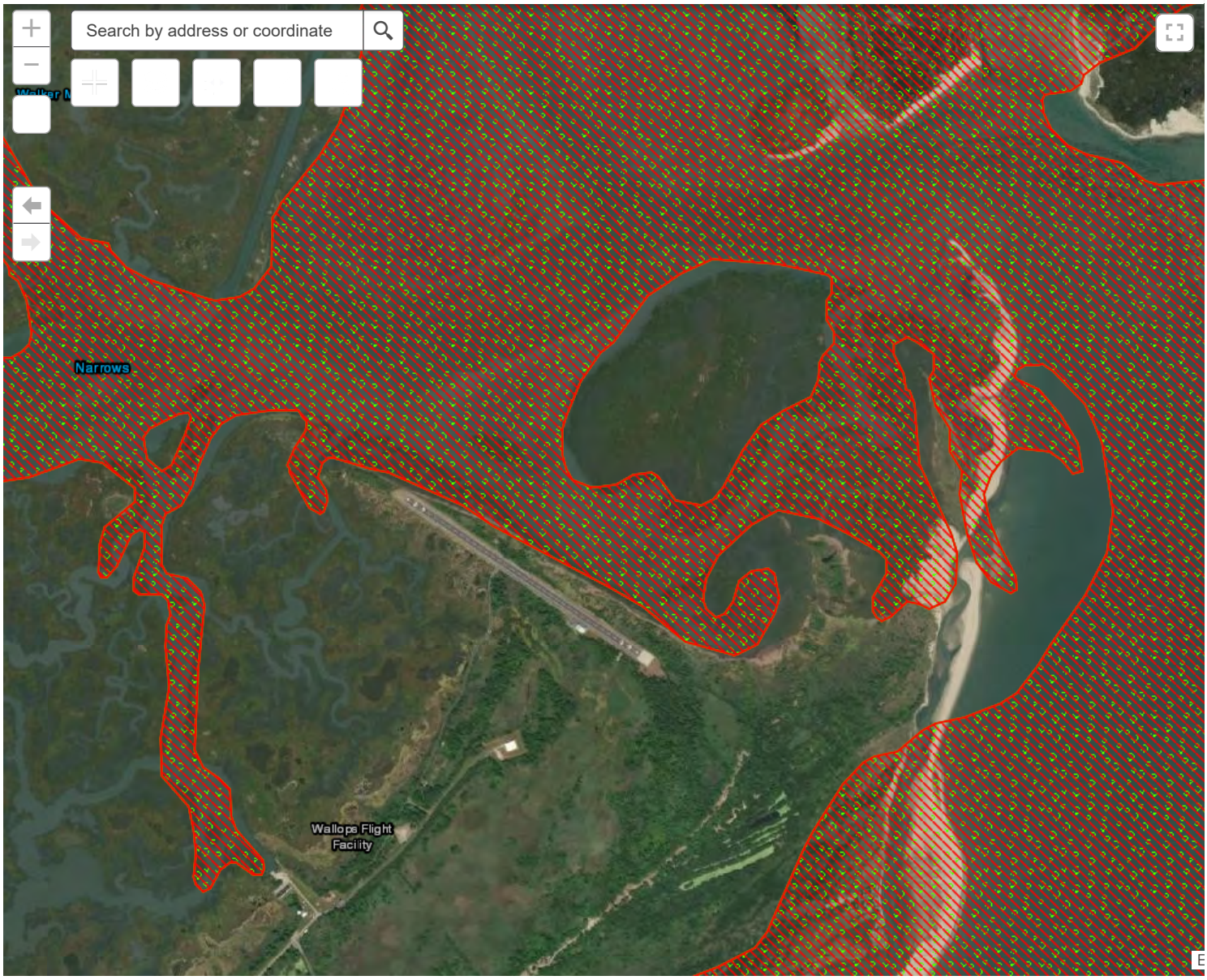
of November. The waters south of Cape Cod were delineated based on Ecological Protection Units (EPUs), as defined by the Northeast Fisheries Science Center.

Sources: [Loggerhead] Shoop and Kenney 1992; [Green]USFWS 2015; [Kemp's ridley] NMFS and USFWS 2015

Feature ID: LOG_STS_AJV_MAF
Last Updated: 3/26/2017, 8:00 PM

ESA Section 7 Mapper

NOAA Fisheries Greater Atlantic Region



From:	Miller, Shari A. (WFF-2500) <shari.a.miller@nasa.gov>
Sent:	Wednesday, November 10, 2021 12:11 PM
To:	jennifer.anderson@noaa.gov
Cc:	Nate Overby; David O'Brien (david.l.obrien@noaa.gov); Brian Hopper (Brian.D.Hopper@noaa.gov); brian.c.denson@usace.army.mil; Finio, Alan (MARAD); Meyer, T J (WFF-2500); Finch, Kimberly (GSFC-2500); Levine, Lori M. (GSFC-2500)
Subject:	Project Review Request, Wallops Island Northern Development, NASA WFF
Attachments:	NASA WFF_NorthDevelop - NOAA_T&E Consult Ltr_111021.pdf

Dear Ms. Anderson:

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) proposes to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel. NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

Based on the analysis in the attached assessment, all effects of the Proposed Action would be insignificant and/or discountable, we have determined that the Wallops Island Northern Development Project may affect but is not likely to adversely affect any listed species or critical habitat under NOAA Fisheries' jurisdiction. We certify that we have used the best scientific and commercial data available to complete this analysis. We request your concurrence with this determination.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Thank you.

Shari A. Miller

Center NEPA Manager &
Natural Resources Manager
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"Remember there's no such thing as a small act of kindness. Every act creates a ripple with no logical end." —Scott Adams

National Aeronautics and Space Administration

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA 23337

Reply to Attn of: 250.W

November 10, 2021

Ms. Jennifer Anderson
Protected Resources Division
Greater Atlantic Regional Fisheries Office
NOAA Fisheries Service
55 Great Republic Drive
Gloucester, Massachusetts 01930

Re: Project Review Request, Wallops Island Northern Development, NASA Wallops Flight Facility, Accomack County, Virginia

Dear Ms. Anderson:

The National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) and the Virginia Commercial Space Flight Authority (VCSFA, VA Space) proposes to construct a pier for barge access and berthing and to dredge a vessel approach area connecting to the Chincoteague Inlet Federal Channel (**Figures 1 and 2**). NASA is the lead agency for the National Environmental Policy Act (NEPA) process and for this Endangered Species Act (ESA) consultation. As the Department of Transportation's Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) are serving as Cooperating Agencies on this project, this consultation also serves to fulfil their requirements.

NASA is preparing an Environmental Assessment (EA) in compliance with NEPA to analyze the potential effects of the proposed action on the environment. The EA will be tiered from the May 2019 *NASA WFF Site-Wide Programmatic Environmental Impact Statement* (PEIS), in which NASA evaluated the environmental consequences of constructing and operating new facilities and infrastructure at WFF.

The purpose of this letter is to provide information about the proposed project and to request your concurrence with our determinations regarding potential effects on federally listed threatened and endangered species under National Oceanic and Atmospheric Administration (NOAA) Fisheries jurisdiction in the action area.

Background

The goal of the MARAD Marine Highway Program is to expand the use of America's navigable waterways; to develop and increase marine highway service options; and to facilitate their further integration into the current U.S. surface transportation system, especially where water-based transport is the most efficient, effective, and sustainable option (MARAD 2019a). The M-95 Marine Highway Corridor includes the Atlantic Ocean coastal waters; Atlantic Intracoastal

Waterway; and connecting commercial navigation channels, ports, and harbors spanning 15 states including Virginia. The proposed Wallops Island M-95 Intermodal Barge Service project has the potential to support the growth of existing operations at WFF, enhance science, technology, engineering, and math (STEM) research opportunities, and spur high-tech/high-paying jobs in a predominantly rural area (MARAD 2019b).

VCSFA was created in 1995 by the General Assembly of the Commonwealth of Virginia to promote the development of the commercial space flight industry, economic development, aerospace research, and STEM education throughout the Commonwealth. In 1997, the VCSFA entered into a Reimbursable Space Act Agreement with NASA, which permitted the use of land on Wallops Island for launch pads. VCSFA also applied for and was granted a Federal Aviation Administration (FAA) license for launches to orbital trajectories. This led to the establishment of the Mid-Atlantic Regional Spaceport (MARS) which is owned and operated by VCSFA.

Development of a port and operations area to support the activities of NASA, WFF tenants, and MARS at the north end of Wallops Island was evaluated at a programmatic level of detail in the 2019 *Final Site-wide PEIS* (NASA 2019). NASA has several long-term tenants and customers that use the WFF research airport and Wallops Island launch range, its facilities, and airspace.

Description of the Proposed Action

Under the Proposed Action, the MARS Port, including a 1,305-ft fixed pier and turning basin, would be constructed adjacent to the UAS airstrip located at the north end of Wallops Island (**Figures 1 and 2**). The MARS Port would provide a port and operations area along with associated capabilities for VCSFA, NASA WFF, and other customers. The MARS Port would also serve as a new intermodal facility as part of the MARAD M-95 Marine Highway Corridor. Upland infrastructure (new facilities and improvements to the existing access road, airstrip, and utilities) would likewise be constructed/installed as part of the Proposed Action. Access road improvements would include widening of an existing culvert. Although shown for completeness in **Figure 2**, upland activities that would not affect species under NOAA Fisheries jurisdiction are not discussed further.

The Proposed Action would also include the dredging of a new and existing channel to enhance the vessel approach to the pier (**Figure 3**). The vessel approach channel, which interfaces with two Federal waterways, the Chincoteague Inlet Channel and the Chincoteague Inlet to Bogues Bay connecting waters, would initially be used by a variety of shallow-draft, manned and unmanned vessels. Ultimately, the proposed channel would have a length of approximately 12,800 ft, a width of 100 ft, and a final depth of 12 ft below mean lower low water (MLLW). Components of the Proposed Action are further described below.

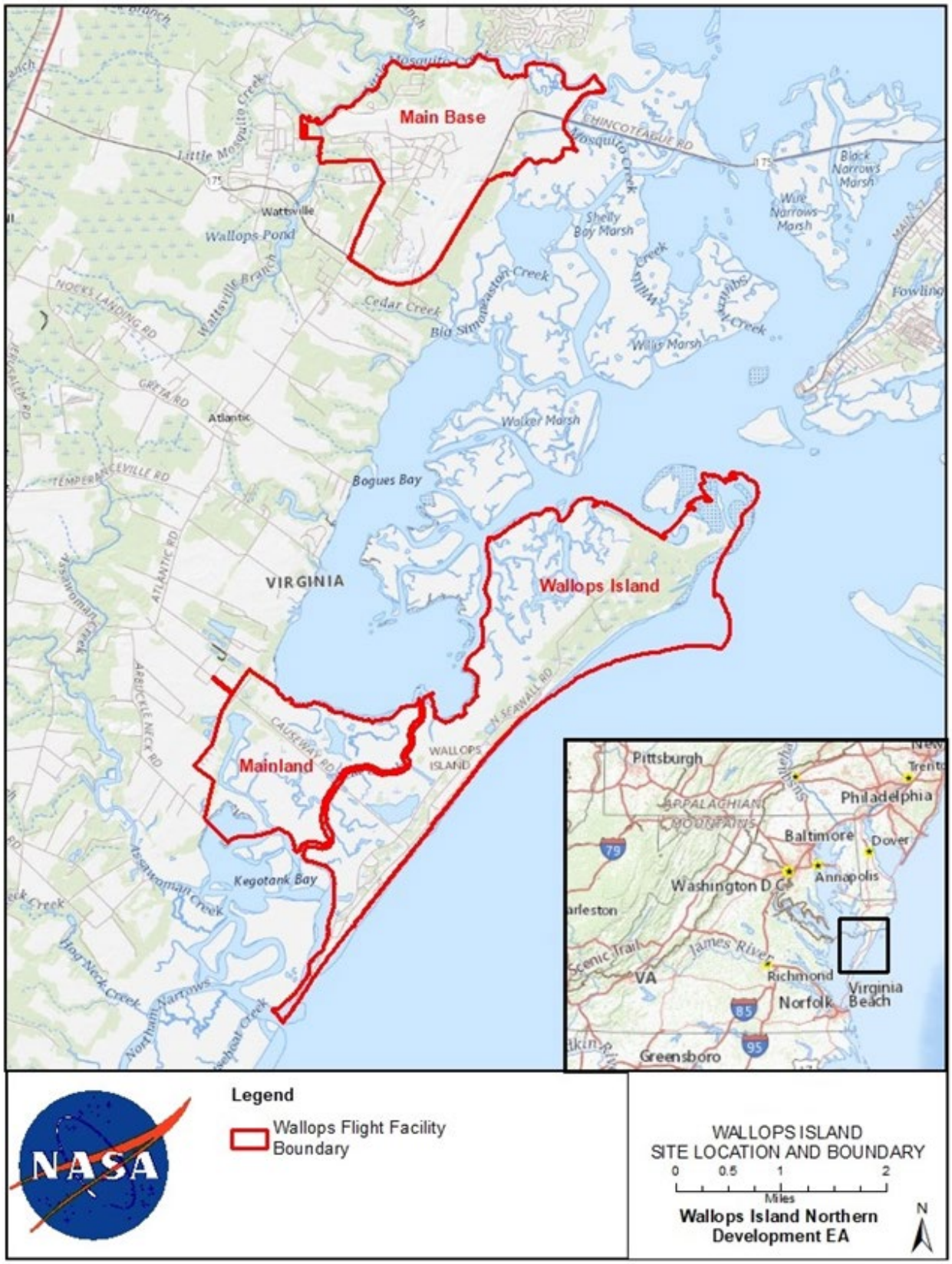

Figure 1. NASA WFF Location

Figure 2. Proposed MARS Port and Infrastructure Components

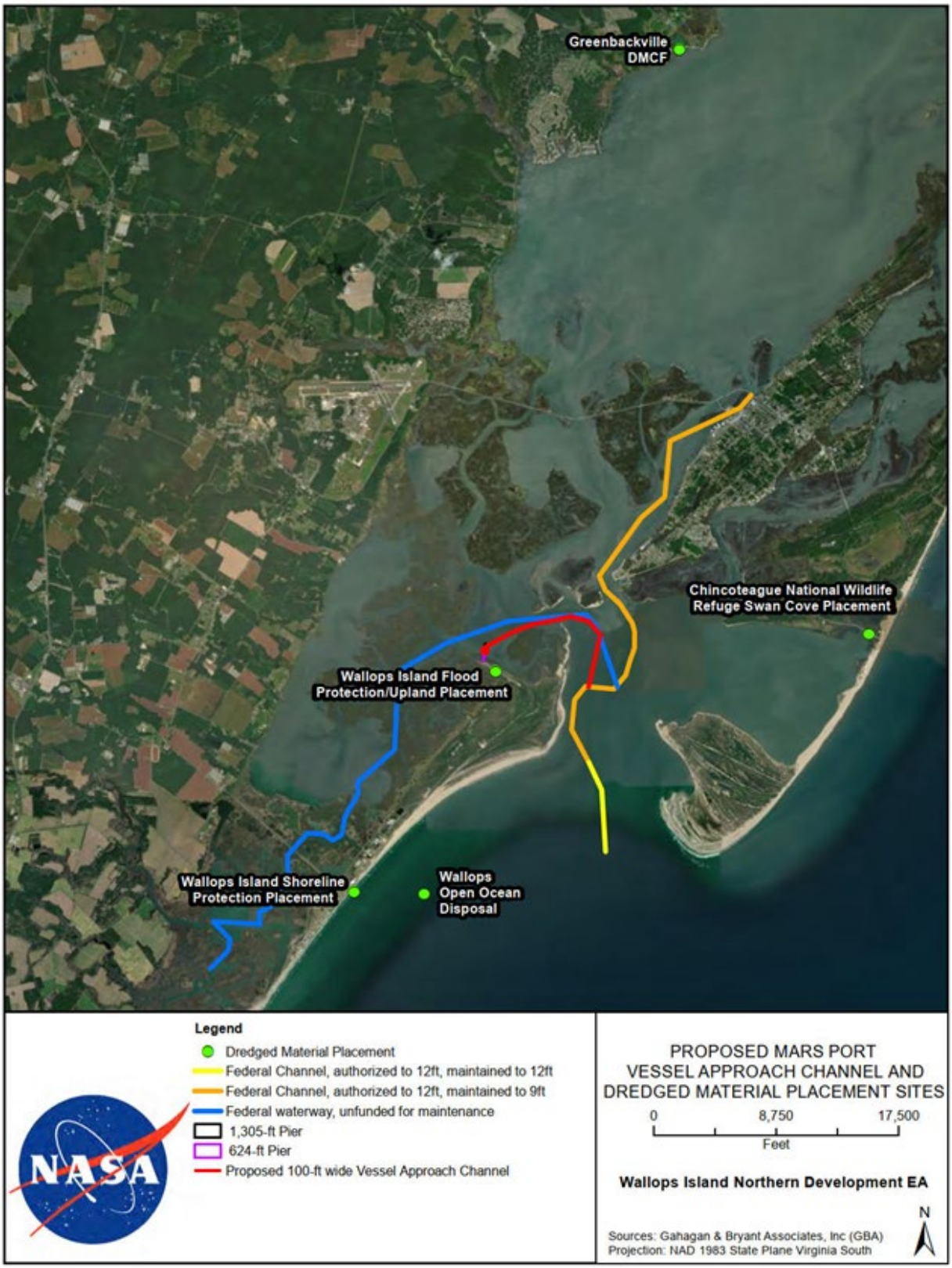

Figure 3. Proposed MARS Port Vessel Approach Channel and Dredged Material Placement Sites

Proposed Action In-Water Components

The MARS Port, including a 1,305-ft fixed pier and turning basin would be constructed on (and within the vicinity of) the UAS Airstrip located at the north end of Wallops Island. The MARS Port would provide a port and operations area along with associated capabilities for MARS, NASA WFF, and other customers. The MARS Port would also serve as a new part of the MARAD M-95 Marine Highway Corridor.

The Proposed Action would also include the dredging of an existing channel for enhanced vessel approach purposes. The vessel approach channel, which would interface with both the Chincoteague Inlet Federal Channel and the Bogues Bay connecting waterways, would be used by a variety of manned and unmanned vessels. It would be approximately 12,800 ft long, 100 ft wide, and would have a final depth of 12 ft below MLLW.

Construction of the Proposed Action would be carried out in three phases:

- **Phase 1** would be construction of a 624-ft fixed pier, a 200-ft-radius turning basin 9 ft deep below MLLW and dredging of the vessel approach channel to a final depth of 5 ft to 9 ft below MLLW (red outline in **Figure 4**). Additionally, a 130-ft long segment of the existing paved UAS Airstrip access road would be widened from 15 ft to 30 ft in conjunction with the widening of the culvert over which the road crosses a headwater drainage channel to Cow Gut.
- **Phase 2** would be construction of a 676-ft extension of the fixed pier to a total length of 1,305 ft and dredging of a 200-ft-radius turning basin (located at the end of the pier extension; shaded pink on **Figure 4**) to a final depth of 9 ft below MLLW.
- **Phase 3** of construction would be additional dredging of the turning basin and vessel approach channel to a final depth of 12 ft below MLLW, specifically the portion of the channel from the Phase 2 turning basin to where it meets the Chincoteague Inlet Federal Channel (shaded blue on **Figure 4**).

The portion of the channel shown in pink on **Figure 4**, which connects the vessel approach channel to the Phase 2 turning basin, is naturally deeper than 9 feet below MLLW and, therefore, would not require any dredging during Phase 2. The estimated timeline for construction of the Proposed Action would have Phase 1 beginning in 2022 and being completed by 2024, with subsequent phases occurring approximately 1 to 2 years after completion of the prior phase. Additional information about the proposed piers and other port components is provided in Chapter 2 of the Draft EA.

A variety of shallow-draft (2- to 4-ft), manned and unmanned vessels would be serviced by the port. The major navigational service would be a tug and barge configuration of an approximately 150-ft by 40-ft deck barge propelled by a tugboat requiring approximately 8 ft of draft. The vessel approach channel would intersect with the Chincoteague Inlet Federal Channel and the Bogues Bay connecting waterways (**Figure 3**). The proposed width of the approach channel,

approximately 100 ft, is consistent with the dimensions of the Federal Channel. Estimated dredging volumes for the vessel approach channel and turning basin are provided in **Table 1**.

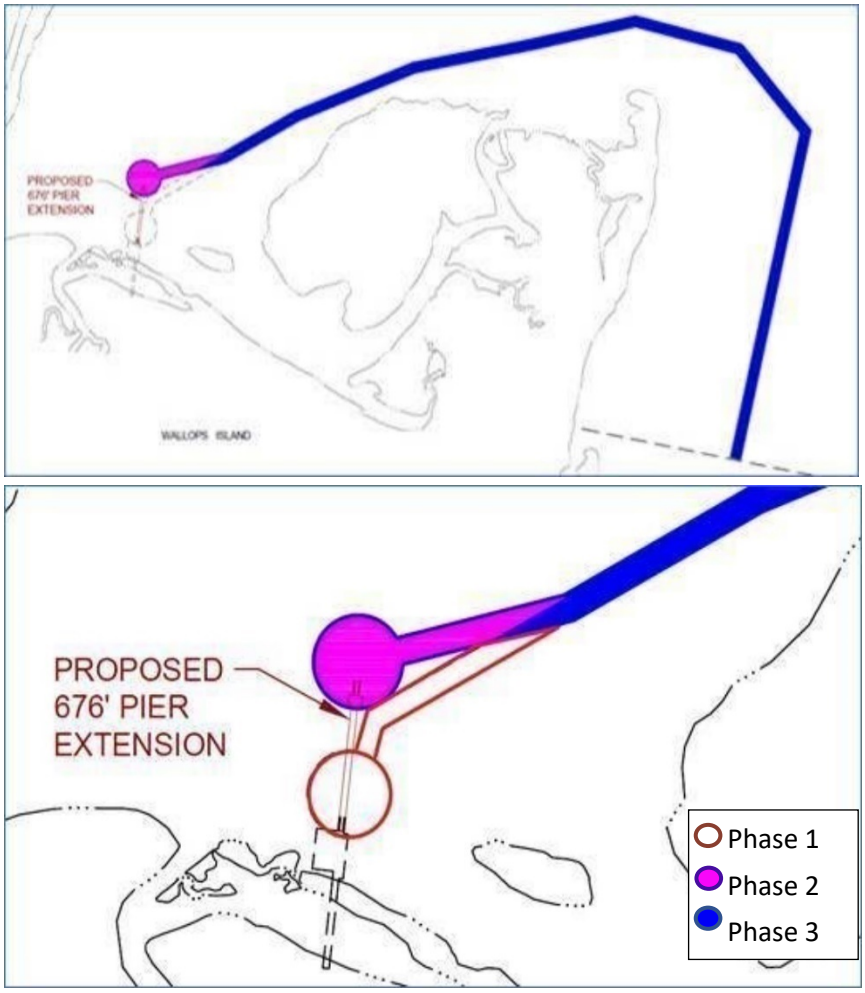

Figure 4. Diagram of Proposed Phased Construction

Table 1. Channel Dimensions and Estimated Dredging Volumes			
	Phase 1	**Phase 2**	**Phase 3**
Channel area	9 ft deep below MLLW	9 ft deep below MLLW	12 ft deep below MLLW
Channel length	12,800 ft	11,800 ft	11,800 ft
Channel dredging volume	15,100 yd^3	0	34,600 yd^3
Turning basin dredging volume	40,500 yd^3	800 yd^3	3,200 yd^3
Total volume per phase	55,600 yd^3	800 yd^3	37,800 yd^3
Total Volume (Phases 1–3):			**94,200 yd^3**

yd^3 = cubic yards

Five potential sites for the placement of dredged material are summarized in **Table 2** and shown on **Figure 3**. Currently, it is estimated that between 56,000 CY and 57,000 CY of material would be dredged during the initial dredging event. VCSFA intends to utilize Option 1, the Wallops Open Ocean Dredge Material Placement Area, as the initial dredge material placement site. When compared to Options 2 through 5, Option 1 is the most economical solution as it offers the lowest estimated mobilization costs, as well as the lowest unit costs for dredging, transport, and placement. The Open Ocean site is also the fastest path towards construction as it is already permitted by the USACE and has capacity for the proposed initial dredge material. While the Greenbackville DMCF (Option 3) is also already permitted by the USACE, it is not anticipated to have available capacity to handle the initial projected volume of material due to its expected use by USACE. Lastly, the dredged material is expected to be of similar physical and chemical characteristics as the material currently dredged from the Chincoteague Channel by the USACE. Dredged material placed within the Wallops Island nearshore zone is required to have the same physical characteristics (90%+ sand) as the natural bottom and anything with a higher fine-grained content would not be suitable. Based on the geotechnical borings for the proposed project, the material is anticipated to be compromised of approximately 95% sand and, therefore, would be suitable for the Open Ocean site.

For future maintenance dredging events, the Project may use Option 2, Wallops Island Flood Protection/Upland Placement. Keeping this as an option allows for future beneficial re-use of the dredge material on Wallops Island to provide resiliency to the MARS UAS Airfield. The cost of this option is higher as it would require additional studies, design, and construction to contain and shape the pumped discharge. Option 2 may also have impacts to the wetlands north of the UAS Airfield. Further analysis would be required for this impact and depending on the results, thin layer deposition or the use of geotubes could be required to hold the material. Lastly, the UAS Airfield is currently not permitted for material placement; the permitting process would require a longer timeframe than Option 1. If selected for placement during future maintenance dredging events, designs, impact analysis, and permitting would be required and would be performed at that time.

Table 2. Potential Dredged Material Placement Sites							
Option	**Site**	**Description**	**Sail Distance from Basin[1]**	**Pipe Distance from Basin[2]**	**Sail Distance from Channel**	**Pipeline Distance from Channel**	**Description**
1	Wallops Open Ocean Dredge Material Placement Area	Open water placement site, closer than Lewis Creek or Norfolk Ocean disposal sites	6.1 mi	--	4.4 mi	--	This area is located just offshore of Wallops Island with a transportation distance of the dredged material of approximately 4 nautical mi. Open water placement options typically present the lowest cost dredging option and allows for the widest array of dredging equipment ranging from clamshell dredges to barge mounted excavators supplying dump barges or specially modified deck barges that are towed by tugboats to the dredged material placement site. Open water placement locations are controlled by the USACE and a CWA Section 404 permit would be required for the use of this site
2	Wallops Island Flood Protection/ Upland Placement	Reuse of material for flood mitigation through upland placement at site identified by NASA	--	2,800 ft	--	12,040 ft	This option involves the beneficial reuse of material for flood mitigation through upland placement in low lying areas on Wallops Island. For example, there are low lying areas in the vicinity of the culvert crossing the main access road to the UAS airstrip. This option was evaluated based on having a cutter suction dredge pump the material into this area. This option would also require development of containment measures for the dredged material in the form of containment dikes and the channeling of the effluent and its return into Bogues Bay. This effluent is the water that is used in the dredging process to transport the dredged material in slurry form to the placement location. Other alternatives could include thin layer placement for marsh enhancement in marsh areas a similar distance to the dredging location, or the use of geotubes, or synthetic membranes, for containing the dredged material.

Table 2. Potential Dredged Material Placement Sites							
Option	**Site**	**Description**	**Sail Distance from Basin[1]**	**Pipe Distance from Basin[2]**	**Sail Distance from Channel**	**Pipeline Distance from Channel**	**Description**
3	Greenbackville Dredged Material Containment Facility (DMCF)	Upland DMCF run by USACE, requires both navigation of Chincoteague Channel and pumping on location	11.3 mi	--	9.5 mi	650 ft	The third dredged material placement option identified is the use of the upland Dredged Material Containment Facility (DMCF) owned and managed by the USACE. The USACE places material dredged from the upper reaches of the Chincoteague Channel into this DMCF. This option, which would require the USACE to first verify capacity and permit use of this site, would utilize a mechanical dredge to load the dredged material removed from the approach channel into barges. These barges would then be towed approximately 10 nautical mi to the DMCF. A specialized hydraulic unloader would be required to discharge the dredged material from the transport barges and pump the material into the DMCF. However, according to USACE, this site has limited capacity for material and may not be suitable.
4	Wallops Island Shoreline Protection Placement	Reuse of material for shoreline protection and beach repair	7.5 mi	--	6 mi	--	This option would involve the beneficial reuse of clean, compatible sand from the dredged material to repair and protect areas of the shoreline within the Launch Range area on Wallops Island. If dredged material is determined to be compatible with the current shoreline sand, the material would be placed along the seawall to protect the beach from tidal impacts or ocean overwash from coastal storms such as hurricanes and Nor'easters. This option would require using a mechanical dredge to load the dredged material removed from the approach channel into barges. These barges would then be towed approximately 6 nautical mi to the shoreline. A specialized hydraulic unloader would be required to discharge the dredged material from the transport barges and pump the material onto the placement areas.

Table 2. Potential Dredged Material Placement Sites							
Option	**Site**	**Description**	**Sail Distance from Basin[1]**	**Pipe Distance from Basin[2]**	**Sail Distance from Channel**	**Pipeline Distance from Channel**	**Description**
5	Chincoteague National Wildlife Refuge Swan Cove Placement	Reuse of material for habitat restoration	-	9 km (5.6 mi)	-	6.9 km (4.3 mi)	This option would involve the beneficial reuse of the dredged material for the Swan Cove Pool Restoration Project located in the Chincoteague National Wildlife Refuge (NWR). If dredged material is determined to be compatible, it would be used by USFWS to create berms and enhance and/or restore currently degraded areas of the estuarine-salt marsh habitat that have been negatively impacted by an under sized culvert restricting sediment deposition and tidal flow. Although USFWS would prefer material with a high proportion of sand, they will also accept dredge material containing high organic matter content. This option was evaluated based on having a cutter suction dredge pump the material to this area. Once pumped, USFWS will assume responsibility for sediment placement and is in the process of securing appropriate permits.

[1] Sail distance = the length of the path via water required to reach the placement site from the centroid of dredging in the proposed turning basin or approach channel (statute miles)
[2] Pipe distance = the length of pipe required to reach the placement site from the centroid of dredging or from the anchorage for a vessel loaded with dredged material
DMCF = Dredged Material Containment Facility

Summary of Proposed Action Construction Activities

Construction of the Proposed Action would involve: (1) construction of the pier components that would make up the MARS Port, (2) dredging of the vessel approach channel, turning basin, and placement of dredged material, and (3) construction or improvement of the proposed onshore facilities and infrastructure.

The estimated timeframe for construction of the Proposed Action would have Phase 1 beginning in 2022 and being completed by 2024, with subsequent phases occurring approximately 1 to 2 years after completion of the prior phase. It is assumed that construction of all proposed onshore project components and infrastructure would be completed during Phase 1 (although the North Island Operations Center may be constructed later). With two crews (10 persons each), working 5 days per week (10-hour days), construction of the 624-ft long pier under Phase 1 would take approximately 12 months to complete and construction of the 676-ft long pier extension under Phase 2 (for a total pier length 1,305 ft) would take approximately 9.5 months to complete.

Phase 1 dredging activities (turning basin and channel) would take approximately 30 days to complete; Phase 2 dredging (turning basin) would take approximately 7 days, and Phase 3 dredging (turning basin and channel) would take 30 days. Work would be performed 24 hours a day, seven days a week with two crews each working 12-hour shifts.

Typical equipment used during construction would include crane barges, material barges, tugboat, vibratory pile hammer, diesel impact hammer, concrete truck, concrete pump truck, concrete vibrator, generator, welding machines, cutting torches, and various small tools.

Summary of Proposed Action Operational Activities

VCFSA/MARS currently has a facilities team that mows grass once per week, monitors for eagles twice per week during nesting season, periodically removes tree and weed growth, and inspects the infiltration trench and fencing around the Revolutionary War Earthworks. During summer months, a mosquito fogging service truck sprays the airfield once every 2 weeks. The pier structure would also require quarterly structural inspections.

Potential usage of the MARS Port facility during its operation is provided in **Table 3**.

Table 3. Potential MARS Port Operations/Facility Usage

Potential Facility Usage	Vessel Type	Quantity Assumptions	Total Barge / Vessel Trips	Phase Associated with Usage
Medium Class ELV 1st stage (core) and 2nd stage	Shallow Draft Deck Barge & Inland Pushboat	3 launches per year; Each comes w/ ~4-6 truckloads of parts and equipment plus 2 heavy haulers	3	1
Venture Class ELV	Shallow Draft Deck Barge & Inland Pushboat	Potential for 12 launches per year; 3 trucks per launch	12	1

Table 3. Potential MARS Port Operations/Facility Usage				
Potential Facility Usage	**Vessel Type**	**Quantity Assumptions**	**Total Barge / Vessel Trips**	**Phase Associated with Usage**
Venture Class 2 ELV	Shallow Draft Deck Barge & Inland Pushboat	9 launches per year; 1 truck per stage, 3-5 trucks for equipment	9	1
Venture Class Heavy ELV	Deck Barge & 1000-1200 HP Tugboat	3 launches per year, 3 first stage cores per launch w/ 1 truck each plus 3-5 trucks for equipment	3	2
Minotaur Class	Deck barge & 1000-1200 HP tugboat	4 launches per year, 3 stage/cores per launch w/ 1 truck each; 3-5 additional trucks for equipment	4	2
Recovery effort	Shallow-draft deck barge & inland push boat	1 per launch	12	1
Autonomous Surface Vehicle (ASV)	Trailered vessel	1 deployment per month; each deployment has 5-10 vehicles included	12	1
Autonomous Underwater Vehicle (AUV)	Trailered vessel	1 deployment every other month; each deployment has 5-10 vehicles included	6	1
Miscellaneous usage	Shallow-draft vessel	1 deployment every other month	6	2
Research usage	Small research vessel	1 deployment every 4 months; each deployment has 5-10 vehicles included	3	2
Other government research & testing	Trailered vessel	1 deployment every other month	12	2
Other Site-wide PEIS construction/expansion	Deck barge & ocean tug	2 large/oversized deliveries per year	1	2
Commodity delivery	Deck barge & ocean tug	16 total barges	16	3
Total Barge / Vessel Trips			**99**	

Description of the Action Area

The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402.02). For this project, the action area includes the north end of Wallops Island surrounding the UAS Airstrip including the surrounding waters from Chincoteague Inlet to the east and north to Bogues Bay to the west – the offshore areas potentially affected by pier construction, dredging of channels and turning basins, placement of dredged sediment, and vessels transiting between the proposed pier and the existing Chincoteague Inlet Federal Channel.

The offshore habitats within the action area include tidal marsh communities and the estuarine surface waters of Chincoteague Inlet, Bogues Bay, Ballast Narrows, and other waterways. The nearest beds of submerged aquatic vegetation are approximately 3 miles north of the project area. Waters in the project area contain public and private harvesting areas for shellfish (oysters and clams).

NMFS Listed Species (and Critical Habitat) in the Action Area

The federally listed species and life stages with the potential to occur in the action area were identified through a query of the NOAA Fisheries Section 7 online mapping application (the ESA Section 7 Mapper) as having the potential to occur in the action area. The information from the ESA Section 7 Mapper is included in **Attachment 1**. **Table 4** summarizes the information for each species regarding the life stages that could be present in the area, the time of year when they may be present, and the types of behaviors they are expected to be engaged in when present.

Table 4. Federally Listed Species Under NOAA Fisheries Jurisdiction Potentially Occurring in the Action Area

Common Name	Scientific Name	Listing Status	DPS	Life Stage	Behavior	Time of Year	Recovery Plan
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	Threatened/ Endangered	All	Adult and subadult	Migrating and foraging	1 Jan – 31 Dec	N/A
Leatherback sea turtle	*Dermochelys coriacea*	Endangered	N/A	Adult and juveniles	Migrating and foraging	1 May – 30 Nov	NMFS & USFWS 1992
Loggerhead sea turtle	*Caretta caretta*	Threatened	Northwest Atlantic	Adult and juveniles	Migrating and foraging	1 May – 30 Nov	NMFS & USFWS 2008
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered	N/A	Adult and juveniles	Migrating and foraging	1 May – 30 Nov	NMFS et al. 2011
Green sea turtle	*Chelonia mydas*	Threatened	North Atlantic	Adult and juveniles	Migrating and foraging	1 May – 30 Nov	NMFS & USFWS 1991

Notes:
DPS = Distinct population segment
N/A = Not applicable
Source: NOAA Fisheries (2020)

One listed fish species (Atlantic sturgeon) and four listed sea turtle species (leatherback, loggerhead, Kemp's ridley, and green) were identified by the ESA Section 7 Mapper as potentially occurring in the action area. No critical habitat for these species has been designated in the area. Information regarding the potential for occurrence of each species in the action area or the vicinity of WFF is provided below. Although not identified by the Section 7 Mapper as a species potentially occurring in the action area, the giant manta ray has been observed off the coast of Assateague Island (Swann 2018) and has been observed in estuarine waters, oceanic inlets, and bays. However, it is rare, solitary, and migratory, and the action area does not provide optimal habitat or food sources. Therefore, the giant manta ray is extremely unlikely to occur in the area and is not discussed further.

Fish

Atlantic Sturgeon

The Atlantic sturgeon is anadromous and estuarine-dependent. Adults migrate to natal rivers and spawn in flowing fresh waters between the salt front and fall line in spring and early summer, then migrate to estuarine and marine waters where they spend the majority of their lives. Atlantic sturgeon typically forage on the bottom for benthic invertebrates (e.g., crustaceans, worms, mollusks). Atlantic sturgeon are known to occur and have been documented in the deeper waters off WFF (NASA 2019). There are no known spawning areas (freshwater rivers) or congregation areas (e.g., mouths of Chesapeake and Delaware Bays) within the vicinity of action area, so it is expected that any individuals present would be opportunistically foraging during migration. Although the Atlantic sturgeon could occur at any time of the year, its likelihood of being present is greatest during fall and early spring during peak migration periods. The shallow estuary where the proposed action would occur provides minimal habitat for the Atlantic sturgeon, and its potential to occur there is likely limited to occasional transient subadults or adults.

Sea Turtles

Leatherback Sea Turtle

The leatherback sea turtle mainly forages in the ocean but also in coastal waters in search of its soft-bodied prey, predominantly jellyfish. It is the most migratory and wide-ranging of all sea turtles. Although the leatherback is known to occur in the waters offshore of Accomack County, it has never been sighted swimming or nesting on the beaches at WFF (NASA 2019). Given the minimal habitat for the leatherback or its jellyfish prey in the action area, its potential to be present is likely to be limited to occasional transient adults or juveniles passing through the area from May through November.

Loggerhead Sea Turtle

The loggerhead sea turtle spends the majority of its life in the open ocean or nearshore coastal areas, foraging for mainly invertebrate prey such as crabs, whelks, and conch. It nests on beaches and occasionally on estuarine shorelines. NOAA Fisheries has divided the loggerhead population into nine DPSs, four that are threatened and five that are endangered. The population near WFF belongs to the federally threatened Northwest Atlantic DPS. NOAA Fisheries has designated 38

critical habitat areas within marine areas occupied by the northwest Atlantic DPS, and USFWS has identified 88 beaches from North Carolina to Mississippi as critical nesting habitat. None of these areas are in the vicinity of WFF. However, loggerhead nests have been observed on Wallops Island beaches as recently as 2016 (NASA 2019). The proposed action would not occur on or affect beaches potentially providing nesting habitat for the loggerhead sea turtle. Its potential to be present in the action area is likely to be limited to occasional transient adults or juveniles foraging in or migrating through the area from May through November.

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle ranges as far north as Maine. It is found in oceanic and estuarine areas that typically contain muddy or sandy bottoms, where it feeds on crabs as well as mollusks, fish, and jellyfish. The Kemp's ridley nests on beaches from May to July, with 95% of the worldwide nesting of the Kemp's ridley occurring in the Mexican state of Tamaulipas. Occasional nests have been documented on the east coast of the United States, including the southeast coast of Virginia. The Kemp's ridley has never been directly observed at WFF. The species may occur offshore in relatively shallow waters (less than 160 ft [50 m]) in areas where habitat exists for prey species (NASA 2019). Given the lack of documented occurrences at WFF, its potential to occur in the action area is likely to be limited to occasional transient adults or juveniles foraging in or migrating through the area from May through November.

Green Sea Turtle

The green sea turtle is unique among marine turtles in that it feeds exclusively on plants, primarily sea grasses and algae. In the U.S., the green sea turtle primarily nests in June and July along the east coast of Florida, with lower occurrences of nesting northward to North Carolina. Green sea turtles use open ocean convergence zones and coastal areas for benthic feeding on sea grasses and algae. The green sea turtle has been directly observed in waters off WFF (NASA 2019). They are likely to inhabit the waters off WFF during the warmer months when sea grasses and algae are plentiful; however, nesting habitat occurs farther south. Given the minimal habitat for the green sea turtle in the action area, including the lack of seagrass beds, its potential to be present is likely to be limited to occasional transient adults or juveniles foraging in or migrating through the area from May through November.

Effects Determination

As shown in **Table 4**, each of the five federally listed marine species potentially occurring in the action area would be expected, if present, to be engaged in foraging and/or migrating through the area. However, as indicated by their life history characteristics and records for the WFF area, the potential for occurrence of any of these species in the action area is minimal and is expected to be limited to the occasional transient passage of individuals through the area during migration or while foraging. Only the Atlantic sturgeon is potentially present in the action area throughout the full year. Sea turtles are potentially present in the area only within a 7-month period (May through November), further limiting their potential for exposure and effects. The potential for effects on these species is discussed below.

Atlantic Sturgeon

It is possible, though unlikely, that Atlantic sturgeon could be affected by the Proposed Action. Recent studies have suggested that the shallow waters off the Atlantic coast could be an important migratory corridor to and from spawning, foraging, and overwintering grounds. As there are no known spawning areas (freshwater rivers) or congregation areas (e.g., mouths of Chesapeake and Delaware Bays) within the project vicinity, it is expected that any individuals encountered would be opportunistically foraging during migration. The potential impact of construction and dredging activities on Atlantic sturgeon would depend on the time of year these activities were conducted, with the likelihood of encountering a sturgeon greatest during fall and early spring, which are times of peak migration (NASA 2019). Construction and operations activities under the Proposed Action potentially could affect Atlantic sturgeon if present in the action area as a result of pile-driving noise, vessel noise (including dredging noise), and turbidity due to sediment disturbance during construction and dredging.

Construction activities would not be anticipated to substantively affect migration or foraging behaviors of the Atlantic sturgeon. The inadvertent destruction or displacement of benthic species would be localized and would not substantially affect the quantity of benthic prey available in waters near the action area. The area of marsh and open water bottom beneath the pier would be approximately 1 acre (ac) in Phase 1 and 1.5 ac in Phase 3. The areas to be dredged, including turning basins and channels, would be approximately 34 ac in Phase 1, 4 ac in Phase 2, and 33 ac in Phase 3. Thus, the maximum area to be dredged through all phases of the Proposed Action would be approximately 71 ac. Maintenance dredging of the basin and channel would be repeated periodically as necessary to maintain the required depth and is expected to be infrequent and of short duration.

Pile-Driving Noise

Sturgeon and other special status marine species occurring in the inshore waters of the Proposed Action area potentially could be affected by underwater noise caused by pier construction. The principal source of construction noise would be pile installation. Construction of the 624-foot pier under Phase 1 would take approximately 12 months to complete, and construction of the 676-foot pier extension under Phase 2 (for a total pier length of 1,305 feet) would take approximately 9.5 months, with about 1 to 2 years between phases. Pier construction would require the installation of 260 piles over a period of 80 days in Phase 1 and 140 piles over a period of 45 days in Phase 2. The piles would be made of prestressed concrete, 24 inches square, and driven by a diesel impact hammer. A bubble curtain could be used for noise attenuation. A slow start technique would be used to allow mobile species to move away from the area.

The NOAA Fisheries Greater Atlantic Regional Fisheries Office (GARFO) developed a spreadsheet Acoustics Tool (GARFO 2020) for analyzing the effects of pile driving in inshore waters on ESA-listed species of the Greater Atlantic Region. GARFO developed a Simplified Attenuation Formula (SAF) for use in estimating the ensonification area of pile-driving projects in shallow, inshore environments, such as the bays and waterways of the action area. Based on the characteristics of the proposed pile driving, information for a proxy project from the GARFO SAF spreadsheet is shown in **Table 5**. The estimated noise levels at the source associated with

pile driving for the Proposed Action, based on measurements for a proxy project (at a distance of 10 meters), are presented in **Table 6** (GARFO 2020).

Table 5. Proxy Project for Estimating Underwater Noise

Project location	Water depth (m)	Pile size (in)	Pile type	Hammer type	Attenuation rate (dB/10 m)
Not available	5	24	concrete	impact	5

m = meters; in = inches; dB = decibels
Source: GARFO (2020)

Table 6. Proxy-Based Estimates for Underwater Noise Level at the Source

Pile type	Hammer type	Estimated SPL_{peak} (dB re 1 Pa)	Estimated SEL_{cum} (dB re 1 μPa^2s)	Estimated SPL_{rms} (dB re 1 µPa)
24-in concrete	impact	185	170	160

dB re 1 µPa = sound exposure level in decibels relative to 1 microPascal; dB re 1 μPa^2s = sound exposure level in decibels relative to 1 microPascal squared second; rms = root mean square; SEL_{cum} = cumulative sound exposure level; SPL = sound pressure level
Source: GARFO (2020)

The GARFO SAF model was used to estimate the distances from pile-driving activities at which thresholds for noise-related effects would be exceeded. Effects can range from behavioral changes/disturbance to physical injury. Because sound (noise) consists of variations in pressure, the unit for measuring sound is referenced to a unit of pressure, the Pascal (Pa). A decibel (dB) is defined as the ratio between the measured sound pressure level (SPL) in microPascals (µPa) and a reference pressure. In water, the reference level is decibels relative to 1 microPascal (dB re 1 µPa). SPL units can be expressed in several ways depending on the measurement properties. Acoustic source levels and sound exposure levels (SELs) also are expressed in decibels.

The thresholds for effects vary among types of organisms. Effect thresholds have been identified by NOAA Fisheries for fish (including sturgeon), sea turtles, and marine mammals. For sturgeon, the estimated distances at which pile-driving noise would equal or exceed injury or behavioral threshold levels are shown in **Table 7**.

Table 7. Estimated Distances to Sturgeon Injury and Behavioral Thresholds

Pile type	Hammer type	Distance to injury threshold (SPL_{peak} = 206 dB re 1 µPa)	Distance to injury threshold (SEL_{cum} = 187 dB re 1 μPa^2s)	Distance to behavioral threshold (SPL_{rms} = 150 dB re 1 µPa)
24-in concrete	impact	NA	30 m	50 m

m = meters; in = inches; dB re 1 µPa = sound exposure level in decibels relative to 1 microPascal; dB re 1 μPa^2s = sound exposure level in decibels relative to 1 microPascal squared second; rms = root mean square; SEL_{cum} = cumulative sound exposure level; SPL = sound pressure level; NA = not applicable because source level is less than or equal to threshold level
Source: GARFO (2020)

The peak exposure criterion (SPL_{peak} = 206 dB re 1 Pa) for sturgeon is related to the energy received from a single pile strike. The potential for injury also exists from multiple exposures to

noise over a period of time, which is accounted for by the SEL_{cum} threshold (SEL_{cum} = 187 dB re 1 μPa^2s). The SEL_{cum} is not an instantaneous maximum noise level but is a measure of the accumulated energy over a specific period of time (e.g., the period of time it takes to install a pile). The farther away a fish is from the pile being driven, the more strikes it must be exposed to for enough energy to accumulate to result in injury. For behavioral effects, the exposure criterion for sturgeon is expressed as a root-mean-square sound pressure level (SPL_{rms}= 150 dB re 1 µPa).

Exposure to impulsive underwater noise levels of 206 dB re 1 µPa (SPL_{peak}) or 187 dB re 1 μPa^2s (SEL_{cum}) can result in injury to sturgeon.

As shown in **Table 7**, exposure to an SPL_{peak} that may result in injury to sturgeon is not anticipated to occur during pile driving for the Proposed Action because the SPL_{peak} at the source (185 dB re 1 Pa) would be less than the effects threshold (206 dB re 1 Pa). However, based on the SEL_{cum} exposure criterion, injury to a sturgeon potentially could occur if the fish remained within 30 meters (98 feet) while the pile was being driven. In order to be exposed to potentially injurious levels of noise during installation of the piles, a sturgeon would need to remain within 30 meters of the pile during the time it is being driven in order to be exposed to this SEL_{cum} threshold. This is extremely unlikely to occur because sturgeon would be expected to modify their behavior and move away from the source upon exposure to underwater noise levels greater than the behavioral effects threshold (SPL_{rms} = 150 dB re 1 µPa). Sturgeon would be exposed to levels of noise that cause behavioral modification at 165 feet according to the model estimate and would be expected to move away from the sound source before cumulative exposure could result in injury. If a sturgeon were within 100 feet of the pile at the time pile driving begins, it likely would leave the area quickly. Additionally, the use of a soft start technique should also give any sturgeon in the area time to move out of the range of any potential injury from noise. Therefore, noise injury to sturgeon is not anticipated.

Behavioral effects, such as avoidance of the area or disruption of foraging activities, may occur in sturgeon exposed to noise above the behavioral threshold (SPL_{rms} = 150 dB re 1 µPa). Underwater noise levels are predicted to be below this threshold at distances beyond approximately 165 feet from the pile being installed. As discussed above, it is reasonable to assume that a sturgeon within the action area that detects underwater noise levels of 150 dB re 1 µPa would modify its behavior and redirect its course of movement away from the ensonified area. It is extremely unlikely that these movements will affect essential sturgeon behaviors such as spawning, foraging, resting, or migration. The Proposed Action area is not sturgeon spawning habitat, and the bays and waterways of the area are sufficiently extensive to allow sturgeon to avoid the ensonified area while continuing to forage and migrate. Given the small distance that a sturgeon would need to move to avoid disturbing levels of noise, any effects would not be measurable or detectable and, therefore, would be insignificant.

Mitigation Measures for Underwater Noise from Pile Driving

A soft-start procedure would be used for pile driving to allow sturgeon that may be in the project area to detect the presence of noise-producing activities and to depart the area before full-power pile driving begins. A bubble curtain around each pile being driven could be used for noise attenuation. The estimated effects of using a bubble curtain were not included in the calculation of threshold distances using the GARFO SAF spreadsheet model.

Vessel Noise

Noise generated by vessels during project construction or vessels calling on the pier during its operation potentially could affect sturgeon in the Proposed Action area. The area is already affected by anthropogenic noise from vessels and other sources. Construction and use of the pier would cause additional noise in the area. The noise produced by vessels during project construction would vary depending on the vessel size, speed, and whether it uses dynamic positioning thrusters. Large ships tend to be noisier than small ones, and ships with a full load (including towing or pushing a load) tend to be noisier than unloaded vessels. Vessel noise is a combination of narrow-band (tonal) sound and broadband sound. The intensity of noise produced is approximately related to the size and speed of the vessel. Individual vessels may generate very different sound levels and have different frequency characteristics depending on factors such as the propulsion system and whether there is propeller cavitation or singing (Spiga et al. 2012).

Noise from vessels traveling to and from the pier potentially would cause behavioral disturbance to sturgeon but would not result in injury. Smaller ships such as tugs or trawlers produce broadband noise with a source level (SPL) of typically 168 to 170 dB re 1µ Pa at 1 meter, while larger ships such as supertankers produce underwater broadband noise at source levels of up to 190 dB re 1 µPa at 1 meter (Spiga et al. 2012). These SPLs at 1 meter are less than the sturgeon noise response criteria for injury and greater than the sturgeon noise response criterion for non-impulsive behavioral effects (**Table 7**). However, a sturgeon would need to be in relatively close proximity to the vessel to experience sound levels that exceed the 150 dB re 1µ Pa behavioral effect threshold.

Impacts from vessel noise would not cause physical injury to sturgeon. When vessels are underway in open waters, sturgeon in adjacent areas could be disturbed. However, construction vessels and vessels visiting the pier during operation would be shallow-draft, slow-moving and likely would produce noise levels less than the behavioral effects level for sturgeon. Noise from project vessels during construction and operation would not be expected to potentially cause more than local and temporary behavioral responses in sturgeon if present nearby. The presence of a sturgeon foraging or migrating through the Proposed Action area at the time of a vessel visit is unlikely.

Noise from dredging vessels and associated equipment and operations was evaluated by NMFS in a 2012 Biological Opinion, which concluded that the effects of dredge noise on whales are discountable (NASA 2018). Similarly, the numbers of sturgeon in the Proposed Action area are very low, and it is extremely unlikely for a sturgeon to occur close enough to the dredge to be disturbed by noise. Thus, the overall likelihood of a sturgeon being adversely affected by vessel noise from construction or operation of the Proposed Action also would be discountable, and any potential effects would be insignificant.

Vessel Strikes

Where there is overlap between vessel traffic and Atlantic sturgeon habitat, there is the possibility of vessel strikes to sea turtles, which potentially can result in injury or mortality. The dredging of new channels and turning basins as part of the Proposed Action would increase vessel traffic in the action area during dredging operations, and the use of the navigation channel during operation of the proposed pier would result in additional vessels transiting through the area in the future. Any increases in vessel traffic may not directly correlate to more vessels in the Project Area, as active vessels in the area may move elsewhere or be retired from use. During dredging and placement of dredged material, only one or two project vessels would likely be utilized, and the use of dredging vessels would be intermittent, temporary, and restricted to a small portion of the overall Project Area on any day that dredging occurs.

Once dredging of the existing channel and new turning basin is completed, there would be an increase in the baseline number of vessels or changes in vessel traffic patterns due to vessels transiting to the MARS Port pier during the period of operation. However, it would be extremely unlikely for a vessel related to the Proposed Action to strike and injure or kill a sturgeon given the nature of the habitat in the Project Area; the low baseline risk of vessel strikes in the area; and the extremely small, intermittent, and temporary increase in vessel traffic that would be added to existing traffic in the area as a result of the project. Also, given that the numbers of sturgeon in the Project Area are small, the risk of vessel strike is extremely low. Additionally, vessels entering the inlet would reduce speed, further reducing the probability of vessels strikes. As a result, the effect of the Proposed Action on the risk of a vessel strike on Atlantic sturgeon in the Project Area is discountable.

Turbidity

Pile driving for pier construction, channel and turning basin dredging, and placement of dredged sediment would cause temporary increases in suspended sediment, thereby increasing local turbidity. Increased turbidity from construction activities would likely be short-lived and with proper, required controls, such as turbidity curtains (sediment curtains), turbidity impacts would be reduced. Sediment plumes from construction would likely settle out in a few hours, limiting effects from increased turbidity to the short-term. Increased turbidity has the potential to temporarily impact foraging habitat for the Atlantic sturgeon, and sturgeon may avoid the locally affected area entirely if the sediment load is extremely high. A relatively limited area potentially would be affected temporarily, and extensive areas of unaffected foraging habitat would remain available in the waterways of the action area. Thus, the overall likelihood of the Atlantic sturgeon being adversely affected by turbidity from construction or operation of the Proposed Action would be discountable, and any potential effects would be insignificant.

Effects Determination for Atlantic Sturgeon

The Proposed Action may affect but is not likely to adversely affect Atlantic sturgeon if present in the action area.

Sea Turtles

The time of year when activities occur under the Proposed Action affects the chances for impacts to sea turtles. As shown in **Table 4**, sea turtles potentially occur in the action area only during the seven months of the year when water temperatures are warmest (May through November). Activities occurring in the other five months would have no effect on sea turtles. Construction and operations activities under the Proposed Action potentially could affect sea turtles if present in the action area as a result of pile-driving noise, vessel noise (including dredging noise), vessel strikes, and turbidity due to sediment disturbance during construction and dredging.

Pile-Driving Noise

As discussed for sturgeon, the NOAA Fisheries GARFO Acoustics Tool (GARFO 2020) for analyzing the effects of pile driving in inshore waters on ESA-listed species was used to evaluate potential underwater noise impacts on sea turtles from pile driving during construction of the Proposed Action. The GARFO SAF spreadsheet model was used to estimate the ensonification area from pile-driving in the shallow, inshore bays and waterways of the action area. Based on the characteristics of the proposed pile driving, information for a proxy project from the GARFO SAF spreadsheet is shown in **Table 5**. The estimated noise levels at the source associated with pile driving for the Proposed Action, based on measurements for a proxy project (at a distance of 33 feet), are presented in **Table 6** (GARFO 2020).

The thresholds for effects vary among types of organisms. Effect thresholds have been identified by NOAA Fisheries for fish, sea turtles, and marine mammals. For sea turtles, the estimated distances at which pile-driving noise would equal or exceed injury or behavioral threshold levels are shown in **Table 8**.

Table 8. Estimated Distances to Sea Turtle Injury and Behavioral Thresholds

Pile type	Hammer type	Distance to injury threshold (SPL_{peak} = 226 dB re 1 µPa for TTS, = 232 dB re 1 µPa for PTS)	Distance to injury threshold (SEL_{cum} = 189 dB re 1 μPa^2s for TTS, = 204 dB re 1 μPa^2s for PTS)	Distance to behavioral threshold (SPL_{rms} = 175 dB re 1 µPa)
24-in concrete	Impact	NA	NA	NA

m = meters; in = inches; dB re 1 µPa = sound exposure level in decibels relative to 1 microPascal; dB re 1 μPa^2s = sound exposure level in decibels relative to 1 microPascal squared second; rms = root mean square; SEL_{cum} = cumulative sound exposure level; SPL = sound pressure level; TTS = temporary threshold shift; PTS = permanent threshold shift; NA = not applicable because source level is less than or equal to threshold level
Source: GARFO (2020)

A loss of hearing sensitivity (i.e., an elevated hearing threshold) may result from exposure to sound of sufficient SPL and duration. Such a loss of hearing sensitivity is referred to as a noise-induced threshold shift (TS). If the hearing threshold eventually returns to normal, the TS is referred to as a temporary threshold shift (TTS). If the threshold remains elevated after an extended period of

time, the TS that remains is referred to as a permanent threshold shift (PTS). TTS and PTS criteria and thresholds are used to predict auditory effects in sea turtles exposed to underwater noise, which is similar to their use in the development of safe noise exposure guidelines for people in noisy environments. TTS is defined as a temporary, reversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level, and PTS is defined as a permanent, irreversible increase in this threshold (NOAA Fisheries 2018).

Exposure to impulsive underwater noise levels of 232 dB re 1 µPa (SPL_{peak}) or 204 dB re 1 μPa^2s (SEL_{cum}) can result in PTS injury to sea turtles, and exposure to lower levels can result in TTS. As shown in **Table 8**, exposure to an SPL_{peak} that may result in injury to sea turtles is not anticipated to occur during pile driving for the Proposed Action because the SPL_{peak} and the SEL_{cum} at the source (i.e., within 33 feet of the pile being driven) would be less than the effects thresholds. Therefore, no noise injury to sea turtles is anticipated. Behavioral effects, such as avoidance of the area or disruption of foraging activities, may occur in sea turtles exposed to noise above the behavioral threshold (SPL_{rms} = 175 dB re 1 µPa). Underwater noise levels are also predicted to be below this threshold at the source. Sea turtles are mobile, would avoid the activity and noise associated with pile driving, and would not remain adjacent to a pile being driven. Thus, the effects of pile-driving noise on sea turtles during construction of the Proposed Action would be insignificant.

Mitigation Measures for Underwater Noise from Pile Driving

A soft-start procedure would be used for pile driving to allow sea turtles that may be in the project area to detect the presence of noise-producing activities and to depart the area before full-power, pile-driving activity begins. Soft-start procedures would not begin until the exclusion zone, which would surround the project location and be monitored for the presence of sea turtles, has been cleared. A bubble curtain around each pile being driven could be used for noise attenuation. The estimated effects of using a bubble curtain were not included in the calculation of threshold distances using the GARFO SAF spreadsheet model.

Vessel Noise

As described above for sturgeon, noise generated by vessels during project construction or vessels calling on the pier during its operation potentially could affect sea turtles in the action area. Smaller ships such as tugs or trawlers produce broadband noise with a source level (SPL) of typically 168 to 170 dB re 1µ Pa at 1 meter, while larger ships such as supertankers produce underwater broadband noise at source levels of up to 190 dB re 1 µPa at 1 meter (Spiga et al. 2012). These SPLs at 1 meter (3.3 feet) are less than the sea turtle noise response criteria for injury (**Table 8**), and those for smaller ships are also less than the sea turtle noise response criterion for behavioral effects (175 dB re 1µ Pa). A sea turtle would need to be in close proximity to a large vessel such

as a supertanker to experience sound levels that exceed the 175 dB re 1µ Pa behavioral effect threshold, and such large vessels would not be associated with the Proposed Action.

Noise from dredging vessels and associated equipment and operations was evaluated by NMFS in a 2012 Biological Opinion, which concluded that the effects of dredge noise on whales are discountable (NASA 2018). Whales are generally more sensitive to underwater noise than sea turtles, so effects on sea turtles would be even less likely. The numbers of sea turtles in the Proposed Action area are very low, and it is extremely unlikely for a sea turtle to occur close enough to the dredge to be disturbed by noise. In addition, mitigation measures would be employed through the use of protected species observers, which can halt dredging operations when a sea turtle is observed within a minimum defined distance (e.g., 1 kilometer) of the dredge (NASA 2018). Thus, the overall likelihood of a sea turtle being adversely affected by vessel noise from construction or operation of the Proposed Action would be discountable, and any potential effects would be insignificant.

Vessel Strikes

Where there is overlap between vessel traffic and sea turtle habitat, there is the possibility of vessel strikes to sea turtles, which potentially can result in injury or mortality. The dredging of new channels and turning basins as part of the Proposed Action would increase vessel traffic in the action area during dredging operations, and the use of the navigation channel during operation of the proposed pier would result in additional vessels transiting through the area in the future. Any increases in vessel traffic may not directly correlate to more vessels in the Project Area, as active vessels in the area may move elsewhere or be retired from use. During dredging and placement of dredged material, only one or two project vessels would likely be utilized, and the use of dredging vessels would be intermittent, temporary, and restricted to a small portion of the overall Project Area on any day that dredging occurs.

Once dredging of the existing channel and new turning basin is completed, there would be an increase in the baseline number of vessels or changes in vessel traffic patterns due to vessels transiting to the MARS Port pier during the period of operation. However, it would be extremely unlikely for a vessel related to the Proposed Action to strike and injure or kill a sea turtle given the nature of the habitat in the Project Area; the low baseline risk of vessel strikes in the area; and the extremely small, intermittent, and temporary increase in vessel traffic that would be added to existing traffic in the area as a result of the project. Also, given that the presence of sea turtles in the Project Area is seasonal and the numbers potentially occurring in the warmer months are small, the risk of vessel strike is extremely low. Additionally, vessels entering the inlet would reduce speed, further reducing the probability of vessels strikes. As a result, the effect of the Proposed Action on the risk of a vessel strike on sea turtles in the Project Area is discountable.

Turbidity

Pile driving for pier construction, dredging of channels and turning basins, and placement of dredged sediment would cause temporary increases in suspended sediment, thereby increasing local turbidity. Increased turbidity from construction activities would likely be short-lived and with proper, required controls, such as turbidity curtains (sediment curtains), turbidity impacts would be reduced. Sediment plumes from construction would likely settle out in a few hours, limiting effects from increased turbidity to the short-term. Increased turbidity has the potential to temporarily impact foraging habitat for sea turtles and decrease visibility, and sea turtles may avoid the locally affected area entirely if the sediment load is extremely high. A relatively limited area potentially would be affected temporarily, and extensive areas of unaffected foraging habitat would remain available in the waterways of the action area. Thus, the overall likelihood of sea turtles being adversely affected by turbidity from construction or operation of the Proposed Action would be discountable, and any potential effects would be insignificant.

Effects Determination for Sea Turtles

The Proposed Action may affect but is not likely to adversely affect sea turtles if present in the action area.

Conclusions

The effect determinations for each species discussed above are summarized in **Table 9**.

Table 9. Effects Determinations for Species Under NOAA Fisheries Jurisdiction Potentially Occurring in the Action Area

Common Name	Listing Status	DPS	Effect Determination
Atlantic sturgeon	Threatened/ Endangered	All	May affect, not likely to adversely affect
Leatherback sea turtle	Endangered	N/A	May affect, not likely to adversely affect
Loggerhead sea turtle	Threatened	Northwest Atlantic	May affect, not likely to adversely affect
Kemp's ridley sea turtle	Endangered	N/A	May affect, not likely to adversely affect
Green sea turtle	Threatened	North Atlantic	May affect, not likely to adversely affect

Notes:
DPS = Distinct population segment
N/A = Not applicable

Based on the analysis that all effects of the Proposed Action would be insignificant and/or discountable, we have determined that the Wallops Island Northern Development Project may affect but is not likely to adversely affect any listed species or critical habitat under NOAA Fisheries' jurisdiction. We certify that we have used the best scientific and commercial data available to complete this analysis. We request your concurrence with this determination.

If you have any questions or require additional information, please contact me at Shari.A.Miller@nasa.gov or (757) 824-2327.

Sincerely,

Shari A. Miller

Shari A. Miller
Center NEPA Manager and
Environmental Planning Lead

Enclosures
Attachment 1, NOAA ESA Section 7 Mapper

cc:
250/Ms. K. Finch
250/Mr. T. Meyer
NMFS/Mr. D. O'Brien
NMFS/Mr. B. Hopper
USACE/Mr. B. Denson
VCSFA/Mr. N. Overby

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ATTACHMENT 1: NOAA FISHERIES ESA MAPPER

NOAA Fisheries Section 7 Mapper (Version 2, Nov 2019) **Accessed 12/2/2020**
Species Descriptions for the Vicinity of the Wallops WIND Action Area

Atlantic sturgeon
Adult
Migrating & Foraging
N/A

Acipenser oxyriynchus oxyriynchus
DPS: All DPSs
ESA Status: Threatened/Endangered

Time(s) of year:
01/01 to 12/31
N/A to N/A

Federal Register: 77 FR 5880 and 77 FR 5914
Recovery Plan: N/A

Notes: We expect adult Atlantic sturgeon to opportunistically forage year round as they migrate along the coast to and from their natal spawning grounds (Hilton et al. 2016, p. 8). They may aggregate in ocean and estuarine areas during certain times of year, and exhibit seasonal coastal movements in the spring and fall. We expect that they typically remain within the 50-meter depth contour (Erickson et al. 2011, p. 356, 360), but may be found out to the Exclusive Economic Zone (EEZ)(Stein et al. 2004, p. 174).

Sources: Hilton et al. 2016; Erickson et al. 2011; Stein et al. 2004

River Kilometers (if applicable):
to , (Hilton et al. 2016, p. 8)
to , (GARFO)

Feature ID: ANS_C50_ADU_MAF
Last Updated: 7/12/2017, 8:00 PM

Atlantic sturgeon
Subadult
Migrating & Foraging
N/A

Acipenser oxyriynchus oxyriynchus
DPS: All DPSs
ESA Status: Threatened/Endangered

Time(s) of year:
01/01 to 12/31
N/A to N/A

Federal Register: 77 FR 5880 and 77 FR 5914
Recovery Plan: N/A

Notes: We expect subadult Atlantic sturgeon to opportunistically forage year round as they migrate along the coast to and from their natal rivers (Hilton et al. 2016, p. 8). They may aggregate in ocean and estuarine areas during certain times of year, and exhibit seasonal coastal movements in the spring and fall. We expect that they typically remain within the 50-meter depth contour (Erickson et al. 2011, p. 356, 360), but may be found out to the Exclusive Economic Zone (EEZ)(Stein et al. 2004, p. 174).

Sources: Hilton et al. 2016; Erickson et al. 2011; Stein et al. 2004

River Kilometers (if applicable):
to , (Hilton et al. 2016, p. 8)
to , (GARFO)

Feature ID: ANS_C50_SUB_MAF
Last Updated: 7/12/2017, 8:00 PM

Green sea turtle
Adults and juveniles
Migrating & Foraging
Massachusetts (S of Cape Cod) through Virginia

Chelonia mydas
DPS: North Atlantic DPS
ESA Status: Threatened

Time(s) of year:
5/1 to 11/30
to

Federal Register: 81 FR 20057
Recovery Plan: NMFS & USFWS 1991

Notes: In general, juvenile and adult green sea turtles migrate north in the spring as water temperatures warm, arriving in mid-Atlantic waters in May. As the waters cool in the fall, the trend is reversed with most sea turtles leaving the area by the end of November. The waters south of Cape Cod were delineated based on Ecological Protection Units (EPUs), as defined by the Northeast Fisheries Science Center.

Sources: [Loggerhead] Shoop and Kenney 1992; [Green]USFWS 2015; [Kemp's ridley] NMFS and USFWS 2015

Feature ID: GRN_STS_AJV_MAF
Last Updated: 3/26/2017, 8:00 PM

Kemp's ridley sea turtle
Adults and juveniles
Migrating & Foraging
Massachusetts (S of Cape Cod) through Virginia

Lepidochelys kempii
DPS: N/A
ESA Status: Endangered

Time(s) of year:
5/1 to 11/30
to

Federal Register: 35 FR 18319
Recovery Plan: NMFS et al. 2011

Notes: In general, juvenile and adult Kemp’s ridley sea turtles migrate north in the spring as water temperatures warm, arriving in mid-Atlantic waters in May. As the waters cool in the fall, the trend is reversed with most sea turtles leaving the area by the end of November. The waters south of Cape Cod were delineated based on

Ecological Protection Units (EPUs), as defined by the Northeast Fisheries Science Center.

Sources: [Loggerhead] Shoop and Kenney 1992; [Green]USFWS 2015; [Kemp's ridley] NMFS and USFWS 2015

Feature ID: KMP_STS_AJV_MAF
Last Updated: 3/26/2017, 8:00 PM

Leatherback sea turtle
Adults and juveniles
Migrating & Foraging
Massachusetts (S of Cape Cod) through Virginia

Dermochelys coriacea
DPS: N/A
ESA Status: Endangered

Time(s) of year:
5/1 to 11/30
to

Federal Register: 35 FR 849
Recovery Plan: NMFS & USFWS 1992

Notes: In general, juvenile and adult leatherback sea turtles migrate north in the spring as water temperatures warm, arriving in mid-Atlantic waters in May. As the waters cool in the fall, the trend is reversed with most sea turtles leaving the area by the end of November. The waters south of Cape Cod were delineated based on Ecological Protection Units (EPUs), as defined by the Northeast Fisheries Science Center.

Sources: [Loggerhead] Shoop and Kenney 1992; [Green]USFWS 2015; [Kemp's ridley] NMFS and USFWS 2015

Feature ID: LTR_STS_AJV_MAF
Last Updated: 3/26/2017, 8:00 PM

Loggerhead sea turtle
Adults and juveniles
Migrating & Foraging
Massachusetts (S of Cape Cod) through Virginia

Caretta caretta
DPS: Northwest Atlantic DPS
ESA Status: Threatened

Time(s) of year:
5/1 to 11/30
to

Federal Register: 76 FR 58868
Recovery Plan: NMFS & USFWS 2008

Notes: In general, juvenile and adult loggerhead sea turtles migrate north in the spring as water temperatures warm, arriving in mid-Atlantic waters in May. As the waters cool in the fall, the trend is reversed with most sea turtles leaving the area by the end

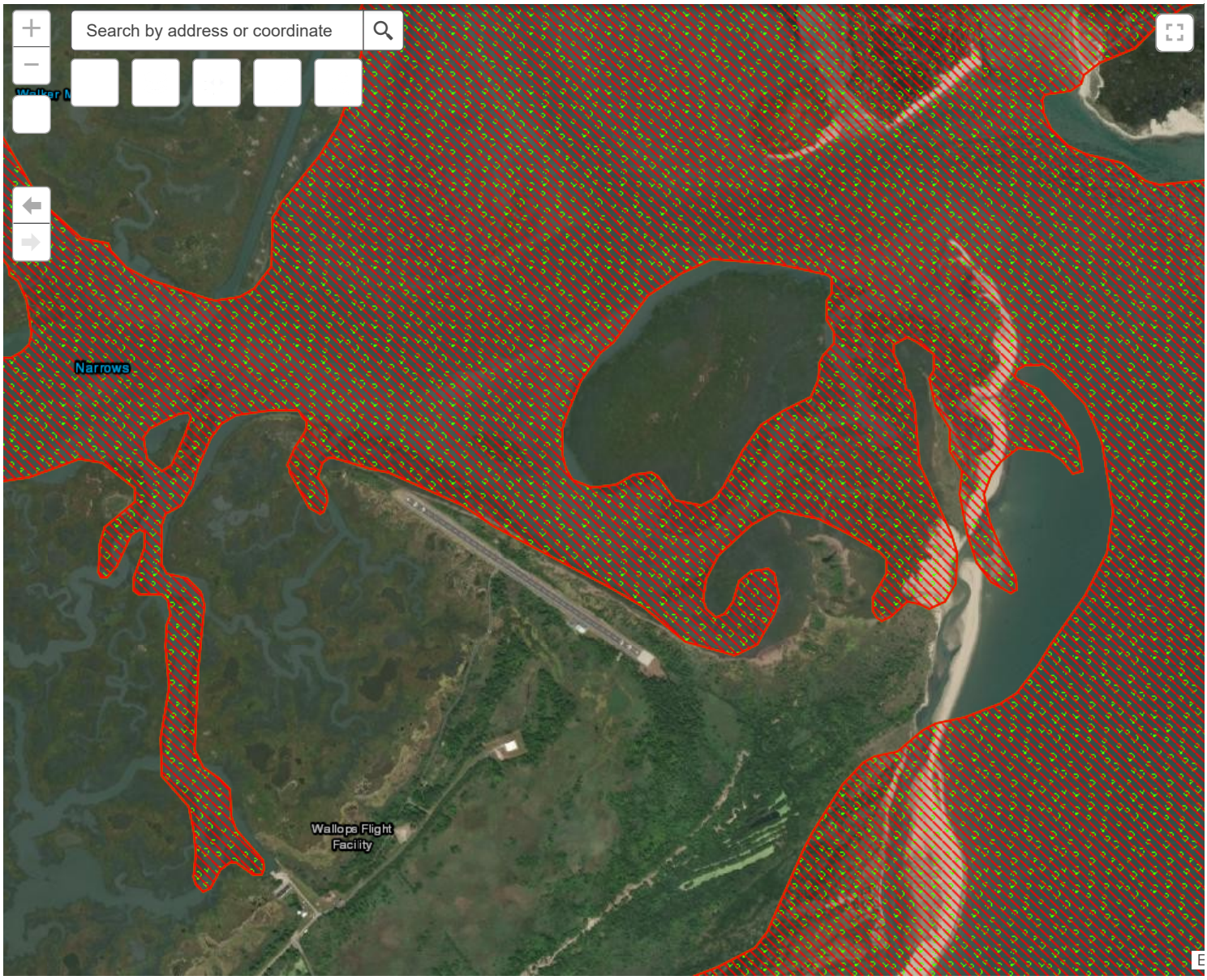
of November. The waters south of Cape Cod were delineated based on Ecological Protection Units (EPUs), as defined by the Northeast Fisheries Science Center.

Sources: [Loggerhead] Shoop and Kenney 1992; [Green]USFWS 2015; [Kemp's ridley] NMFS and USFWS 2015

Feature ID: LOG_STS_AJV_MAF
Last Updated: 3/26/2017, 8:00 PM

ESA Section 7 Mapper

NOAA Fisheries Greater Atlantic Region



Atlantic Sturgeon

Sea Turtles

0.2mi

-75.416 37.901 Degrees