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Maryland Offshore Wind Project

United States Army Corps of Engineers Section 404/10 Permit Application: NAB-2020-60863

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ACRONYM LIST

°	Degrees
°C	Degrees Celsius
°F	Degrees Fahrenheit
AC	Alternating Current
ACHP	Advisory Council on Historic Preservation
ACPARS	Atlantic Coast Port Access Route Study
ADCP	Acoustic Doppler Current Profiler
ADLS	Aircraft Detection Lighting System
ADIZ	Air Defense Identification Zone
AEPs	Auditory Evoked Potentials
AIS	Air Insulated Substations
ALARP	As Low As Reasonably Practicable
Alpine	Alpine Ocean Seismic Survey, Inc.
Apollo	Apollo Global Management
Barrier Beach Landfalls	3R's Beach or Tower Road
BGEPA	Bald and Golden Eagle Protection Act
BMPs	Best Management Practices
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CAA	Clean Air Act
CB&I	Coastal Planning & Engineering, Inc.
CBRAs	Cable Burial Risk Assessment
CBY	Chesapeake Bay Lowlands
C & D Canal	Chesapeake and Delaware Canal
CEJA	Clean Energy Jobs Act
CFR	Code of Federal Regulations
CH_4	Methane
Clearinghouse	Military Aviation and Installation Assurance Siting Clearinghouse
cm	Centimeter
CMEC	Coastal and Marine Ecological Classification System

CMP	Coastal Management Program
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COA	Corresponding Onshore Area
COMAR	Code of Maryland Regulation
COP	Construction and Operations Plan
CPS	Cable Protection Systems
C-PODs	Cetacean PODs
CTD	Conductivity, Temperature, And Depth
CTV	Crew Transfer Vessel
CVA	Certified Verification Agent
CWA	Clean Water Act
CWB	Colonial Nesting Waterbird
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program
dB	Decibels
dbh	Diameter at Breast Height
DE	Delaware
DE SHPO	Delaware's State Historic Preservation Office
DelDOT	Delaware Department of Transportation
DIBEP	Delaware Inland Bays Estuary Program Scientific and Technical Advisory Committee
DMAs	Dynamic Management Areas
DNREC	Department of Natural Resources and Environmental Control
DNV	DNV Energy USA, Inc.
DoD	Department of Defense
DOE	Department of Energy
DP	Dynamic Positioning
DP thrusters	Dynamic Positioning Thrusters
DPL	Delmarva Power and Light
DPSs	Distinct Population Segment
DSZ	Dynamic Speed Zones

E2EM1Pd	Estuarine Intertidal High Marsh
E	East
EC	Engineer Circular
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EMF	Electromagnetic Fields
EPA	Environmental Protection Agency
EPC	Engineering, Procurement, and Construction
EPI	EPI Group
EPR	Ethylene Propylene Rubber
ERES	Exceptional Recreational or Ecological Significance
ERL	Effects Range-Low
ESA	Endangered Species Act
ESP	Electric Service Platform
EEZ	Exclusive Economic Zone
FAA	Federal Aviation Administration
FACSFAC	U.S. Navy Fleet Area Control and Surveillance Facility
FFAECC	Fleet Forces Atlantic Exercise Coordination Center
Flotel	Floating Hotel
FMP	Fishery Management Plan
FNP	Federal Navigation Project
FPM	Flashes Per Minute
ft	Feet
ft^2	Square feet
FWCA	Fish and Wildlife Coordination Act
G&G	Geotechnical and Geophysical
gal	gallon
GIF	Gulf Island Fabrication, Inc.
GIS	Gas Insulated Substations
GARFO	Greater Atlantic Regional Fisheries Office
gm/cm3	Grams Per Cubic Centimeter
GW	Gigawatts

HAPC	Habitat Area of Particular Concern
HAPs	Hazardous Air Pollutants
HD	High Definition
HDD	Horizontal Directional Drilling
HSSE	Health, Safety, Security, and Environmental
Hz	Hertz
HRG	High Resolution Geophysical
HMS	Highly Migratory Species
HVDC	High Voltage Direct Current
ICA	Interconnection Agreement
ICPC	International Cable Protection Committee
IFR	Instrument Flight Rules
IHA	Incidental Harassment Authorization
IMO	International Maritime Organization
in	Inches
IPaC	Information for Planning and Consultation
IMPLAN	Impact Analysis for Planning
IOOS	Integrated Ocean Observation System
ITP	Inspection and Test Plan
IWC	International Whaling Commission
JPA	Joint Permit Application
Keystone	Keystone Engineering, Inc.
kg	Kilograms
kHz	Kilohertz
kJ	Kilojoules
km	Kilometers
km^2	Square Kilometers
KOXB	Ocean City Municipal Airport
kV	Kilovolt
Landmark	Landmark Science & Engineering
LF	Low Frequency
lbs	Pounds

lbs/ft^3	Pounds Per Cubic Feet
LMRCSC	Living Marine Resources Cooperative Science Center
LNTM	Local Notice to Mariners
LOA	Letter of Authorization
Lpk	Peak Sound Pressure
m	Meter
m^2	Square Meters
m^3	Cubic Meters
mm	Millimeters
MABS	Mid-Atlantic Baseline Studies
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MAPC	Maritime Applied Physics Corporation
MARCS	Marine Accident Risk Calculation System
MARUs	Marine Autonomous Recording Units
MBE	Minority Business Enterprise
MBTA	Migratory Bird Treaty Act
MCE	Mission Compatibility Evaluation
MD Project	Maryland Project
MDAT	Marine-Life Data and Analysis Team
MDE	Maryland Department of Environment
MDNR	Maryland Department of Natural Resources
MEA	Maryland Energy Administration
MEC	Munitions of Explosive Concern
Metocean Buoy	Monitoring Buoy
Met Tower	Meteorological Tower
mG	milligauss
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MGEL	Duke Marine Geospatial Ecology Laboratory
mi	Statute Miles
MLLW	Mean Lower Low Water

MOA	Military Operating Areas
MMPA	Marine Mammal Protection Act
MSF	Module Support Frame
MSL	Mean Sea Level
MTR	Military Training Routes
µm	Micrometers
µPa	MicroPascal
$\mu Pa^2 s$	MicroPascal squared-second
µPa RMS	MicroPascal (Root Mean Square)
MV	Medium Voltage
MW	Megawatt
N	North
NAAQS	National Ambient Air Quality Standards
NARW	North Atlantic Right Whales
NCCA	National Coastal Condition Assessment
NASA	National Aeronautics and Space Administration
NDAA	National Defense Authorization Act
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NLEB	Northern Long-Eared Bat
NAS	Naval Air Station
NGO	Non-Governmental Organizations
NHPA	National Historic Preservation Act
NM	Nautical Miles
NM^2	Square Nautical Miles
NMFS	National Marine Fisheries Service
NO_2	Nitrogen Dioxide
NOx	Nitrogen Oxide
NOAA	National Oceanic and Atmospheric Administration
NOEP	National Ocean Economics Program
NEFSC	Northeast Fisheries Science Center
NOI	Notice of Intent

NORAD	North American Aerospace Defense Command
NPDES	National Pollutant Discharge Elimination System
NSRA	Navigation Safety Risk Assessment
NTIA	National Telecommunications and Information Administration
NTL	Notices to Lessees
NWI	National Wetland Inventory
O_3	Ozone
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OE/AAA	Obstruction Evaluation/ Airport Airspace Analysis
OEM	Original Equipment Manufacturer
O&M	Operations and Maintenance
OPAREA	Navy Operations Area
OREC	Offshore Wind Renewable Energy Credit
OSRP	Oil Spill Response Plan
OSP	Optimum Sustainable Population
OSS	Offshore Substations
OTM	Offshore Transformer Module
PAHs	Polycyclic Aromatic Hydrocarbons
PAM	Passive Acoustic Monitoring
PARS	Port Access Route Study
PATON	Private Aids to Navigation
Pb	Lead
PDE	Project Design Envelope
PELs	Probable Effect Levels
PEM1E	Freshwater Marsh
PFO4/1Cd	Forested Wetland
PJM	PJM Grid Operator
$PM_{2.5}$	Particulate Matter with a Diameter Less Than or Equal to 2.5 Micrometers
PM_{10}	Particulate Matter with a Diameter Less Than or Equal to 10 Micrometers

POI	Point of Interconnection
PSO	Protected Species Observers
psu	Practical Salinity Units
PTS	Permanent Threshold Shift
RCG&A	R. Christopher Goodwin & Associates, Inc.
re 1 µPa	Relative to 1 microPascal
RNA	Rotor-Nacelle Assembly
ROD	Record of Decision
ROV	Remotely Operated Vehicle
ROW	Right-Of-Way
RV	Research Vessel
SADA	Shellfish Aquaculture Development Areas
SAP	Site Assessment Plan
SAV	Submerged Aquatic Vegetation
SCRP	Species Conservation and Research Program
SDM	Species Distribution Modeling
SEFSC	Southeast Fisheries Science Center
SELcum	Cumulative Sound Exposure
SELss	Sound Exposure Levels
SF_6	Sulfur hexafluoride
SFH	Harvestable Shellfish Waters
SHPO	State Historical Preservation Office
SHT	Spring High Tide
SMAs	Seasonal Management Areas
SMS	Safety Management System
SO_2	Sulfur Dioxide
SO_x	Sulfur Oxides
SPCC	Spill Prevention Control and Countermeasures
SPS	Sparrows Point Steel
sr	Solar Reflectivity
SSZ	Seasonal Speed Zones
SWAs	State Wildlife Areas

SWPPP	Stormwater Pollution Prevention Plan
the Lease	OCS-A 0490
the Project	Maryland Offshore Wind Project
TELs	Threshold Effect Levels
THPO	Tribal Historic Preservation Officers
TSHD	Trailing Suction Hopper Dredge
TOC	Total Organic Carbon
TOY	Time of Year
TMDL	Total Maximum Daily Loads
TNC	The Nature Conservancy
TRBM	Trawl Resistant Bottom Mount
TP	Transition Piece
TSS	Total Suspended Solids
UMCES	University of Maryland Center for Environmental Studies
UME	Unusual Mortality Event
U.S.	United States
USACE	United States Army Corps of Engineers
USCB	United States Census Bureau
USCG	United States Coast Guard
USDOI	United States Department of Interior
USFF	United States Fleet Forces
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
US Wind	US Wind, Inc.
UXO	Unexploded Ordnance
VACAPES	Virginia Capes Operating Area
VAQF	Virginia Aquarium & Marine Science Center Foundation
VHF	Very High Frequency
VOCs	Volatile Organic Compounds
VSA	Visual Study Area
W	West
WEA	Wind Energy Area

WFF	Wallops Flight Facility
WHOI	Woods Hole Oceanographic Institution
WOTUS	Waters of the United States
WTG	Wind Turbine Generators
XLPE	Cross-Linked Polyethylene
y^3	Cubic Yards

TERMINOLOGY

Term	Definition
Barrier Beach Landfalls	Locations on land where the Offshore Export Cables may come ashore, specifically 3R's Beach Parking Lot and Tower Road Parking Lot
Indian River Substation	Delmarva Power and Light (DPL) Substation adjacent to the NRG Indian River Power Plant
Inland Bays	Collection of Inland Bays in Delaware: Indian River Bay, Rehoboth Bay, Little Assawoman Bay
Inter-array Cables	Cables in the Lease area connecting WTGs in strings to OSSs
Interconnection Facilities	US Wind substations and substation expansion at Point of Interconnection
Lease	OCS-A 0490
Lease area	Area described in the Lease
Maryland WEA	The Wind Energy Area off Maryland that became US Wind's Lease area
Met Tower	Designed and fabricated structure proposed to be deployed in the Lease area, previously covered under an approved SAP
Metocean Buoy	Floating LiDAR buoy, including trawl-resistant bottom mount, deployed in Lease area under approved SAP
O&M Facility	Operations and maintenance facility (admin building and quayside) in the Ocean City, Maryland, region
Offshore Export Cable Corridors	Offshore Export Cable Routes labelled 1 and 2
Offshore Export Cables	Up to four cables to be located in the selected Offshore Export Cable Corridor(s)
Onshore Export Cable Corridor 1	"Onshore" cable corridor through Indian River Bay, proposed route from proposed landfall at 3R's Beach to proposed US Wind substations adjacent to Indian River Substation
Onshore Export Cable Corridors	Potential Onshore Cable Routes labelled 1, 1a, 1b, 1c, and 2

Term	Definition
Onshore Export Cables	Up to four cables to be located in the selected Onshore Export Cable Corridor(s)
Point of Interconnection	Where the Project interconnects to the regional electric grid (PJM)
The Project	Maryland Offshore Wind Project; encompasses all project facilities onshore and offshore
Submarine Cables	All cables in water, proposed to be buried beneath the seabed or bay bottom (Indian River Bay)
US Wind Substations	The substation or substations that US Wind will build to connect to the Point of Interconnection

1.0 Introduction

US Wind, Inc. (US Wind) is developing the Maryland Offshore Wind Project (the Project), an offshore wind energy project of up to approximately 2 gigawatts (GW) of nameplate capacity within OCS-A 0490 (the Lease), a Lease area of approximately 80,000 acres located approximately 18.5 kilometers (km) (11.5 miles [mi]) off the coast of Maryland on the Outer Continental Shelf (OCS) (Figure 1.0-1).

The Project includes:

- MarWin, a wind farm of approximately 300 megawatts (MW) for which the State of Maryland awarded to US Wind Offshore Renewable Energy Credits (ORECs) in 2017;
- Momentum Wind, consisting of approximately 808 MW for which the State of Maryland awarded additional ORECs in 2021; and
- Any subsequent developments authorized within the Lease area with an anticipated connection to the existing Indian River Substation near Millsboro, Delaware.

The Project will produce utility-scale power to the regional electric grid, help reduce greenhouse gas emissions, diversify the nation's energy portfolio, and create new economic development opportunities, including employment creation, in the region.

US Wind seeks authorization from the United States Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act through a Section 404(b)(1) guidelines evaluation for the construction and operation of a commercial-scale, offshore wind energy facility. The attached Engineering Form 4345 (see Appendix A) provides the information that the USACE would need when evaluating this application (the Application).

1.1 Purpose and Need

The purpose of the Project is to develop offshore wind energy under the Lease and to transmit this energy to the Delmarva Peninsula in fulfilment of state and federal clean energy standards and targets. The Project includes MarWin, a wind farm of approximately 300 MWs for which US Wind was awarded ORECs issued in 2017 by the State of Maryland; Momentum Wind, consisting of approximately 808 MWs for which the State of Maryland awarded additional ORECs issued in 2021; and will build out of the remainder of the Lease area to fulfill ongoing, government sanctioned demands for offshore wind energy. Once developed, the Project will play a critical role in advancing the offshore wind targets set forth by the federal government and the State of Maryland, reduce greenhouse gas emissions, increase grid reliability, and support economic development growth in the region, including thousands of union jobs. The Project may also provide renewable energy to other states and private enterprises in the region.

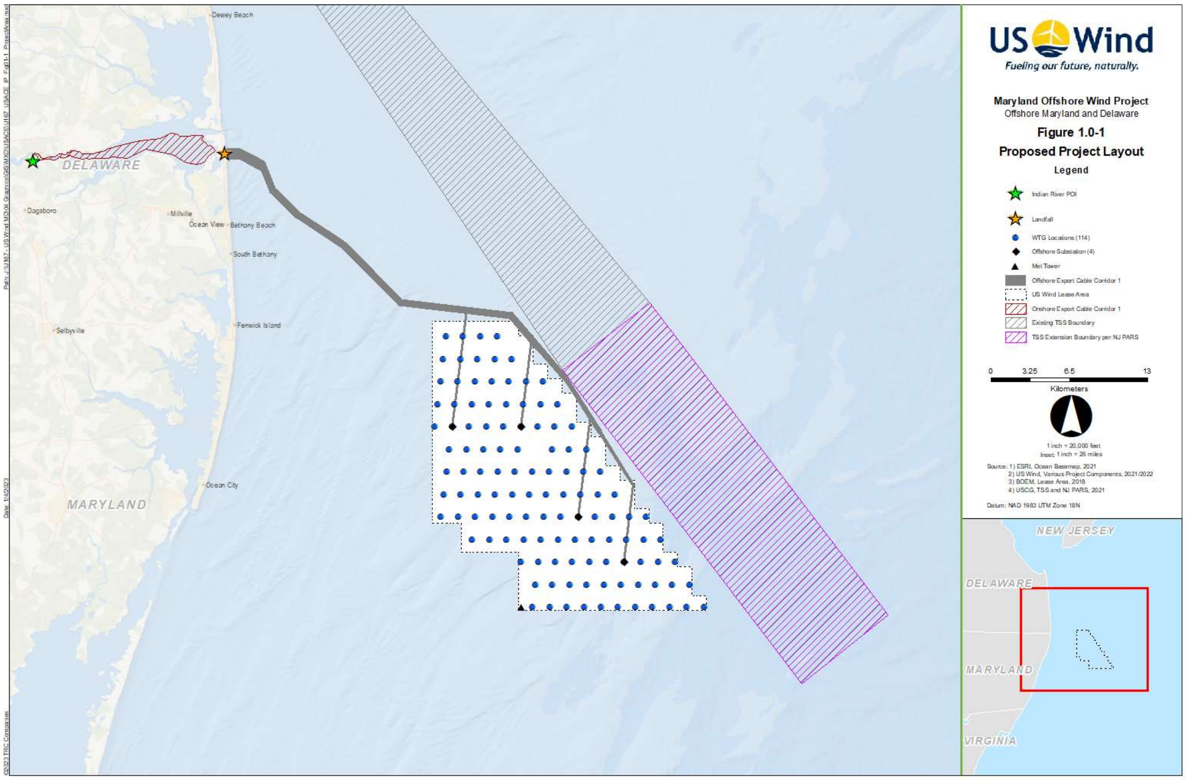


Figure 1.0-1. Proposed Project Layout

As a follow up to Executive Order 14008, "Tackling the Climate Crisis at Home and Abroad," which set forth a renewed commitment to United States offshore wind development, the Biden Administration in March 2021 announced a new federal effort to facilitate the deployment of 30 GW of offshore wind energy by 2030 (The White House, 2021). Given that there are currently 17 active commercial leases in various stages of development, including US Wind's Lease area within the Mid-Atlantic region. The Bureau of Ocean Energy Management's (BOEM) award of leases and timely review and authorization of project proposals comports with Congress' intent expressed in the Outer Continental Shelf Lands Act (OSCLA) to make the Outer Continental Shelf available for the "expeditious and orderly development," including for renewable projects (43 U.S.C. §§ 1332 & 1337(p)).

The Project is essential to achieving the state's renewable energy goals. As a result of two successful bids to secure ORECs from the PSC, US Wind currently has more than a gigawatt of offshore wind energy under contract with the state. While this advances the state's renewable energy goals of 50 percent by 2030, the full buildout of US Wind's Lease area would go further in achieving those targets and boost President Biden's offshore wind goals.

Offshore wind is Maryland's largest clean energy resource; as such, the state is unlikely to meet its goals without the full capacity of offshore wind energy US Wind intends to develop in the Lease area.Thus, the sizeable contribution available from development of US Wind's Lease on approximately 80,000 acres will be vital in fulfilling the state's clean energy goals, satisfy

Maryland's current offshore wind procurement goals, would power more than 500,000 homes in the region with clean, renewable energy, support thousands of union jobs, and may also provide renewable energy to other states and private enterprises in the mid-Atlantic.

With regard to USACE authorizations, the Project's purpose, as determined by USACE for Section 404(b)(1) guidelines evaluation, is offshore wind energy generation. The overall Project's purpose for Section 404(b)(1) guidelines evaluation, as determined by USACE, is the construction and operation of commercial-scale, offshore wind energy. The purpose of the USACE Section 408 action, as determined by Engineer Circular (EC) 1165-2-220, is to evaluate the applicant's request and determine whether the proposed alterations are injurious to the public interest or impair the usefulness of the USACE project. The USACE Section 408 permission is needed to ensure that congressionally authorized projects continue to provide their intended benefits to the public (Provided under separate cover).

1.2 Project Design Envelope Approach

Offshore wind technology is advancing rapidly, while the development and approvals process spans multiple years. Therefore, the Project development plans must maintain a level of flexibility so that the most advanced and appropriate technologies can be efficiently deployed. BOEM recognized the need for such flexibility and issued *Draft Guidance Regarding the Use of a Project Design Envelope in a Construction and Operations Plan* (BOEM 2018). Accordingly, US Wind uses a PDE approach in development of the Project and presents a reasonable range of design parameters that will allow for evaluation of a maximum design scenario.

Under this PDE approach, the Project has an upward limit of 121 WTGs, up to four OSSs, and one Met Tower located in the Lease area (Figure 1.2-1). The Project will be interconnected to the onshore electric grid by up to four new 230-275 kV export cables into a substation in Delaware. In the Application, at times US Wind has identified preferred site configurations or component designs based on the current understanding of site conditions and evaluation of potential impacts, which will be further refined during design as well as the fabrication and installation phases of the Project in a manner consistent with BOEM regulations. Additional design detail information will be provided to BOEM and the Bureau of Safety and Environmental Enforcement (BSEE) in the Facility Design Report/Facility Installation Report (FDR/FIR). The PDE represents maximum extents of Project elements.

Project elements include offshore structures, inter-array and export cables, and onshore infrastructure. A summary of the PDE parameters is provided in Table 1.2-1.

Table 1.2-1. Summary of PDE Parameters

Parameter	Description
Project Layout	
Total Structures	Up to 126, including WTGs, OSSs, and Met Tower
Project Capacity	Up to 2.2 GW
Spacing	0.77 NM E-W (1.43 km, 0.89 mi) 1.02 NM N-S (1.89 km, 1.17 mi)
Water Depths	Approximately 14 – 41 m (46 – 135 ft)
WTG	
Total WTGs	Up to 121
WTG Size	Up to 18 MW
Foundation Type	Monopiles
Rotor Diameter	Up to 250 m (-820 ft)
Hub Height	Up to 161 m (-528 ft)
Height Tip of Blade	Up to 286 m (-938 ft)
OSS	
Total OSS	Up to 4
Foundation Type	Monopiles, or jackets on piles or suction buckets
Met Tower	
Total Met Towers	1
Foundation Type	Braced Caisson
Cables	
Offshore Export Cables	4 – 230-275 kV AC submarine
Maximum Length of Offshore Export Cables (4 Total)	229.3 km (124 NM)
Inter-Array Cables	66 kV AC submarine
Maximum Length of Inter-Array Cable	202.2 km (127 mi)
Onshore Export Cables	Up to four – 3-phase 230-275 kV or 12 single phases
Maximum Length of Onshore Export Cables (4 Total)	68.1 km (42 mi)

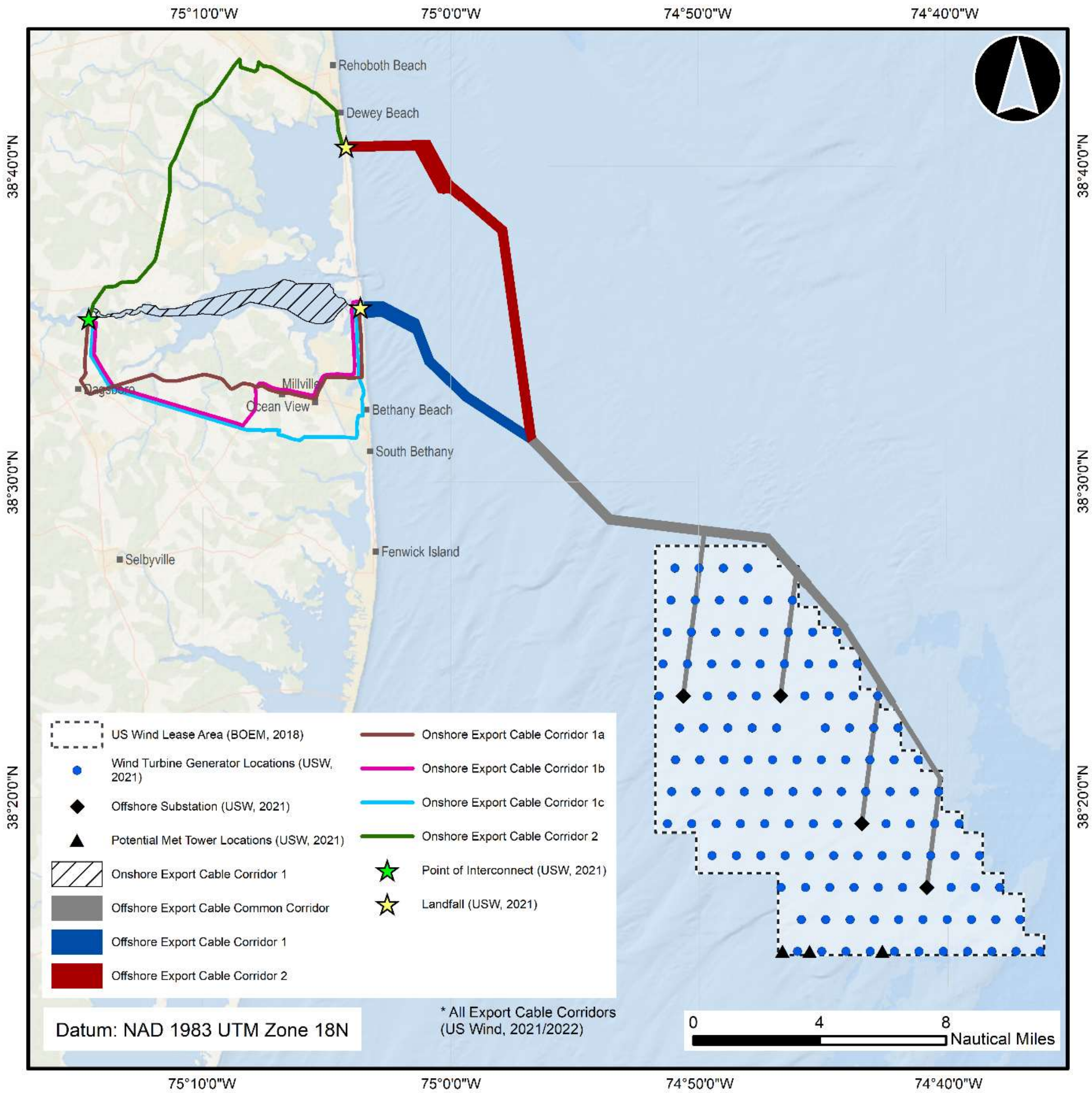


Figure 1.2-1. Project Design Envelope Layout

1.3 Previous Permitting History

The following Table 1.3-1 includes a list of USACE permits received.

Table 1.3-1. Previous USACE Permits and Approvals

Project Number	USACE District	Permit and Approval Dates	Project Area Surveyed
CENAP-OP-R-2016-0197-39	Philadelphia	**Nationwide Permit 6** July 7, 2016 September 8, 2016 July 19, 2021 August 2, 2021 October 20, 2021 March 23, 2022	Formerly planned offshore and onshore export cable route. Lease area. Nearshore Atlantic HDD locations. Onshore Export Cable Corridor 1.
CENAB-OPR-M 2016-00320	Baltimore	**Nationwide Permit 5** July 19, 2016 September 7, 2016	Lease area (specific to the construction of the Met Tower).
NAB-2020-60863 [1]	Baltimore	**Nationwide Permit 5** November 5, 2020 **Nationwide Permit 6** July 21, 2021 October 25, 2021	To deploy and maintain a meteorological buoy for data collection. Lease area.

[1] This permit modified the pre-existing NWP-6 (NAB-2016-00320).

1.4 Other Related Permits

The following Table 1.4-1 includes a list of permits, certifications, or approvals for which US Wind has applied or will apply for related to USACE Section 404 and Section 10 individual permits for the Project, including state water quality certifications and Federal Coastal Zone Consistency Determinations. Pre-application meetings or communications that have been conducted with several agencies related to these applications are noted in appropriate sections below.

Table 1.4-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
FEDERAL			
Bureau of Ocean Energy Management (BOEM)	Construction and Operations Plan (COP)	Outer Continental Shelf Lands Act (OCSLA) 43 U.S.C. 1337(p) and BOEM Regulations at 30 CFR Part 585	Under these federal regulations, the Lessee must submit a detailed plan for the construction, operation, and conceptual decommissioning of a wind energy project in the commercial lease area, including any easement. BOEM reviews and approves, disapproves, or approves with modifications the Lessee's COP.
	National Environmental Policy Act (NEPA) – Environmental Impact Statement (EIS)	NEPA 42 U.S.C. § 4321 *et seq.* and 40 CFR Part 1502	In accordance with NEPA review procedures, BOEM must prepare an EIS to consider the environmental impacts of its actions in decision making, providing full and fair discussion of significant environmental impacts and reasonable alternatives that would avoid or minimize adverse impacts or enhance the quality of the human environment. After completion of the NEPA EIS, BOEM will issue a Record of Decision (RoD) to adopt its final decision on the Lessee's COP.
	Facility Design Report and Fabrication and Installation Report	30 CFR 585, Subpart G	Under these federal regulations, the Lessee must submit a Facility Design Report and a Fabrication and Installation Report to BOEM before installing facilities described in the approved COP.
USACE	Individual Permit Section 10 Permit (navigable waters) Section 404 Permit	Rivers and Harbors Act of 1899 33 U.S.C 401 et seq., 33 U.S.C 403 (Section 10)	Section 10 of the Rivers and Harbors Act of 1899 requires that parties seek authorization from USACE for any civil works projects that include the construction of structures in or over any navigable water of the United States.

Table 1.4-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
		Clean Water Act (CWA) 33 U.S.C. 1251 et seq., 33 U.S.C. 1344 (Section 404)	Section 404 of the CWA requires that parties seek authorization from the USACE for the discharge of dredged or fill material into any navigable waters of the United States. Under both the Rivers and Harbors Act and the CWA, the USACE may issue an Individual Permit or Standard Permit. USACE may not issue its permit until it has received a CWA Section 401 Water Quality Certificate from any applicable state (or Environmental Protection Agency [EPA]) unless certification is waived. In addition, EPA or states with delegated authority (Maryland; Delaware) under Section 402 of the CWA may require National Pollutant Discharge Elimination System (NPDES) permits if there is a regulated discharge of pollutants into WOTUS (includes oceans out to 200 mi). Although the construction and operation of an offshore wind energy project would not likely create an ongoing source of water pollution, specific activities during construction may be considered a regulated discharge. US Wind submitted the permit application materials in August 2023. At the end of the Project, a separate permit to decommission Project infrastructure will be required.

Table 1.4-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
	Section 408 Permit Permission – Civil Works Projects	Rivers and Harbors Act of 1899 33 U.S.C 408 (Section 408)	USACE may grant Section 408 permission for another party to alter a Civil Works project upon a determination that the alteration proposed will not be injurious to the public interest and will not impair the usefulness of the Civil Works project. For example, USACE may grant permission to parties for the use or temporary occupation of designated USACE offshore sand borrow areas, provided such work is not injurious to the public interest of this project to achieves and mining for beach renourishment and highway projects. *US submitted initial draft review request materials in February 2023.* *US Wind submitted the 408 Review Request in August 2023.*
National Marine Fisheries Service (NMFS) – National Oceanic and Atmospheric Administration (NOAA) Fisheries	Incidental Harassment Authorization or Letter of Authorization	Marine Mammal Protection Act (MMPA), 16 U.S.C. 1361 et. seq.	The MMPA generally prohibits the "take" of marine mammals (includes harassment) but allows for the issuance of incidental "take" permits for negligible impact within a specified geographic region. The "take" largely arises due to activities incidental to planned marine construction activities and vessel transits, such as underwater sound, and may include avoidance of animal harassment or vessel interaction or strikes. *US Wind's MMPA Incidental Take Request deemed complete April 3, 2023.* *Notice of Receipt of Application published in the Federal Register on May 2, 2023.*
	Magnuson-Stevens Fishery Conservation and	Magnuson-Stevens Fishery Conservation and	Section 305 of the Magnuson-Stevens Fishery Conservation and Management Act requires that BOEM conducts

Table 1.4-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
NMFS – NOAA Fisheries	Management Act Consultation	Management Act, 16 U.S.C. 1801 - 1891	consultation with NMFS regarding an action that may adversely affect Essential Fish Habitat (EFH). *See also* Fish and Wildlife Coordination Act (FWCA), 16 U.S.C. 661-667e.
	Section 7 Endangered Species Act (ESA) Consultation	ESA, 16 U.S.C. 1531-1544	Section 7 of the ESA requires that the lead Federal agency (BOEM and USACE) consult with NMFS to determine whether or not any proposed action or marine construction activities in the Project's specified coastal or ocean area of effect is not likely to jeopardize the continued existence of any endangered/threatened species within NMFS jurisdiction or result in the destruction or adverse modification of critical habitat.
United States Fish and Wildlife Service (USFWS)	Migratory Bird Treaty Act (MBTA) and Bald and Golden Eagle Protection Act (BGEPA) conservation plans	MBTA of 1918, 16 U.S.C. 703 – 712 BGEPA of 1940, 16 U.S.C. 668 – 668d	Under the Interior Department's current legal position, the MBTA prohibits the incidental take of migratory birds, which could include take from offshore wind structures. While there is no MBTA permitting regime for offshore wind projects, the USFWS weighs heavily the existence of conservation plans in its administration of the statute. The BGEPA prohibits a person from "knowingly, or with wanton disregard" taking bald and golden eagles without permission. Unlike the MBTA, BGEPA has a take permit program.
	Section 7 ESA Consultation	ESA 16 U.S.C. 1531-1541	Section 7 of the ESA requires that the lead federal agency (BOEM and USACE) consult with the USFWS to determine if the proposed action in terrestrial, coastal, or offshore areas is not likely to jeopardize the continued existence of any endangered/threatened species or result in the destruction or adverse modification of critical habitat.

Table 1.4-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
			USFWS may issue an incidental take statement with its Biological Opinion where an action is reasonably certain to result in the incidental take of the species, but it is not likely to jeopardize its continued existence.
United States Coast Guard (USCG) – District 5	Local Notice to Mariners (LNTM)	14 U.S.C. 81	USCG requires notification of work within United States waters in order to avoid or mitigate potential marine traffic issues or conflicts that may arise from the operation of privately-owned vessels in order to notify local mariners. LNTM's are frequently issued by the USCG associated with various phases of construction and operations and maintenance vessel activities.
USCG – District 5	Private Aids to Navigation (PATON)		USCG will review and issue PATON Permits for Wind Turbine Generators (WTGs), Offshore Substations (OSSs), and the Meteorological Tower (Met Tower). They will specify and oversee the placement of structure lighting, lighting patterns and intensities, and flash/color characteristics.
Federal Aviation Administration (FAA)	Obstruction Evaluation/ Airport Airspace Analysis (OE/AAA) "Determination of No Hazard"	14 CFR Part 77	FAA jurisdiction extends 12 nautical miles (NM) from shore and applies to new construction or alteration of structures more than 200 feet above ground level. The FAA study will only assess WTG and OSS locations within their jurisdiction. It is anticipated BOEM will adopt the same obstruction lighting recommendations in their COP and NEPA reviews for the balance of any structure locations outside FAA jurisdiction, thereby encompassing the entire Project. *US Wind received a Determination of No Hazard from the FAA on May 22, 2023, effective July 1, 2023.*

Table 1.4-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
Advisory Council on Historic Preservation, Tribes, and the State Historic Preservation Office (ACHP, THPO, SHPO)	National Historic Preservation Act (NHPA) Section 106 Consultation	54 U.S.C. § 306108; 36 CFR Part 800	Section 106 consultation requires federal agencies to consider the effects of projects they carry out, approve, or fund on historic properties or properties eligible for listing. Section 106 applies to federal “undertakings” that may adversely affect historic property within the Area of Potential Effect. Consulting parties may include the state or tribal historic officer, local government, and other members of a community. The ACHP must be given an opportunity to participate. The parties may enter into an agreement to avoid, minimize, or mitigate the adverse effects of the Project.
Department of Defense (DoD)	Consultation	Public Law 111-383, National Defense Authorization Act (NDAA) DoD Instruction 4180.02	The DoD is authorized to ensure robust development of renewable energy sources. Per 4180.02, the DoD will review all anticipated renewable energy projects on the OCS to address any stipulations on the lease sale agreement. The Military Aviation and Installation Assurance Siting Clearinghouse (Clearinghouse) works with industry to overcome risks to national security. The DoD engages in a Mission Compatibility Evaluation (MCE) to study any adverse impacts on military operations and readiness and then proposes mitigation strategies to lessen those impacts. US Wind most recently filed an updated informal review request with the Clearinghouse in January 2022. Based on the FAA Determination of No Hazard, US Wind understands that the DoD will not be requiring a mitigation agreement for radar or aviation impacts at this time.
STATE OF MARYLAND			

Table 1.4-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
Maryland Department of Environment (MDE) (delegated authority from EPA)	OCS Clean Air Act Permit	COMAR 26.11 Clean Air Act; 42 U.S.C. 7627 40 CFR Part 55	The Clean Air Act (Section 328(a)) requires that OCS sources located within 25 mi (40 km) of States' seaward boundaries (inner sources) submit a Notice of Intent (NOI) and apply for an OCS Air Permit to construct and operate the OCS source in accordance with the requirements of the Corresponding Onshore Area (COA). In addition, Section 328 creates a more comprehensive program for inner sources, stating: "Such requirements shall be the same as would be applicable if the source were located in the COA, and shall include, but not be limited to, state and local requirements for emission controls, emission limitations, offsets, permitting, monitoring, testing, and reporting." *US Wind filed a Notice of Intent to apply for an OCS Air Permit on August 5, 2022.* *Air Dispersion Modeling Protocol submitted to MDE September 16, 2022.* *A Revised Air Dispersion Modeling Protocol and Alternative Model Request submitted to MDE March 10, 2023.* *An OCS Air Permit Application was submitted for the Project to MDE on August 17, 2023.*
Maryland Department of Natural Resources (MDNR)	Maryland Coastal Zone Management Consistency (per Federal Coastal Zone Management Act [CZMA])	Section 307 of the CZMA, 16 U.S.C. 1456	CZMA authorizes states to manage the development and use of coastal waters and adjacent lands. The Act authorizes the state to conduct a consistency review of federal actions that may affect Maryland's coastal uses and/or resources. Given that the State of Maryland has not designated a geographic location description outside its coastal zone area, US Wind will

Table 1.4-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
			proceed voluntarily to engage in the consistency review with the State, per 15 CFR 930.53 & 930.54.) *MDNR and US Wind executed a stay of review on July 8, 2022, which was amended on August 1, 2023. The amendment to the stay ends on February 9, 2024. Maryland's CZMP consistency decision is due July 8, 2024.*
MDE	Tidal Wetlands License	Environment Article Title 16; Code of Maryland Regulation (COMAR) 26.24	Any work performed in a tidal wetland or floodplain 5,000 square feet (ft^2)or more of impacts to tidal wetlands requires a Joint Federal/State Permit Application (JPA). For the Alteration of any tidal wetland in Maryland, the determination between minor and major projects depends on the impacts to tidal wetlands, not total project area. The type of authorization issued will depend on the amount of impacts and the type of tidal wetland to be impacted (i.e., state or private). US Wind anticipates a Tidal Wetlands License will be necessary for work related to the Operations & Maintenance (O&M) Facility.
	Water Quality Certification	Section 401 of the CWA, and COMAR Title 26, Part 2, Subtitle 08	Applicable to Discharge to navigable waters of the State, in this case stormwater from the O&M Facility. Must be a separate filing from the Joint Permit Application. The request may be submitted to the USACE concurrently.
STATE OF DELAWARE			
Delaware Department of Natural Resources and Environmental Control	Wetlands and Subaqueous Lands Permit Section 401 Water Quality Certification	Delaware Title 7 Natural Resources and Environmental Control:	Authorization from the Wetlands and Subaqueous Lands Section is required for construction activities in tidal wetlands or in tidal and non-tidal waters in Delaware. This CWA Section

Table 1.4-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
(DNREC) - Division of Water		7500 Wetlands and Subaqueous Lands CWA Section 401	401 Water Quality Certification will be necessary before USACE can issue its permits.
	Subaqueous Lands Lease (renewable on 10-year term)	Delaware Title 7 Natural Resources and Environmental Control: 7500 Wetlands and Subaqueous Lands	A subaqueous lands lease is issued from the Wetlands and Subaqueous Lands Section in conjunction with a permit and conveys a legal interest in public subaqueous lands for a terminate period for the use of the structure. The wetlands and subaqueous lands permit application serves as the instrument through which to obtain a lease. *Pre-application submitted to DNREC on June 16, 2023.* *US Wind intends to submit application materials in September 2023.*
Delaware Coastal Management Program (CZMP)	DE Coastal Zone Management (CZM) Consistency Certification (per federal CZMA)	Section 307 of the CZMA 16 U.S.C. 1456	The CZMA authorizes states to manage the development and use of coastal waters and adjacent lands. The Act authorizes the state to conduct a consistency review of federal actions that may affect Delaware's coastal uses and/or resources. The CZMP is delegated to DNREC for administration and given that US Wind will engage in a consistency review as set forth under 15 CFR 930.53. *DNREC and US Wind executed a stay of review on July 8, 2022, which was amended on August 1, 2023. The second stay of the DCMP CZMA six-month review period began on August 9, 2023, and will end on February 9, 2024. DNREC DCMP will issue its decision on or before July 9, 2024.*
Delaware DNREC - Division of Fish and Wildlife	Environmental Review for Species of Special Concern	Delaware Title 7 Natural Resources and Environmental Control:	Under Title 7, the Division of Fish and Wildlife may designate certain species of fish and wildlife as threatened or endangered. The Species Conservation and Research

Table 1.4-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
		3900 Wildlife Section 17.0 Species of Special Concern	Program (SCRP) is responsible for the information on listed species. Parties must submit formal requests to the SCRP for information on these species. It is expected that DNREC will administer and coordinate its sister Division's respective input into the Project's overall Joint Permit Application review process which is also coordinated with the USACE under their Individual Permit review process. *US Wind intends to conduct a review with DNREC in September 2023.*
Delaware DNREC - Division of Watershed Stewardship	Sediment and Stormwater Management Plan	7 Del. Code, Chapter 40, 7 DE Admin. Code 5101, CWA, 33 §§ 1251 et. seq.	Under these state regulations, DNREC has the authority to determine if a project may be granted approval for a standardized Sediment and Stormwater Management Plan if located on a site that has previously been managed for stormwater quantity and quality and will disturb less than 1.0 acre of land. For projects under 1.0 acre of land disturbance and minimal impact on stormwater a standard plan can be used. For all other projects, a detailed sediment and stormwater plan is required. The detailed plans consider stormwater impacts on regional drainage, water quantity and quality. Erosion and sediment control during construction is also more complex under detailed plan (see below). Construction review by DNREC may be required. DNREC may approve plans for disturbance on State Lands; otherwise, to delegated agencies (Sussex Conservation District).
Delaware DNREC - Division of Parks and Recreation	Special Use Permit/Land Use Agreement	7 Del.Code Chapter 47 Public Lands, Parks, and Memorials – State Parks	This law authorizes DNREC to grant easements for the purposes of transmission lines and other utilities and charge a fee. This Agreement is required to use and establish underground utility easements and install Project -associated

Table 1.4-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
			underground utilities through the State Parkland shoreline and barrier beach areas.
Delaware Department of Natural Resources and Environmental Control	Permit or Letter of Approval	Beach Preservation Act – 7 Del. Code Chapter 68; Title 7 Del. Admin. Code Chapter 5000	This law and regulation require permits for construction activities impacting beaches, dunes and vegetation along the Atlantic and Delaware Bay coastline and regulates activities seaward of the state-established building line.
Delaware State Fire Marshall's Office	Site Plan Approval	Title 1: 700 Delaware State Fire Prevention Regulations Chapter 4 Submittal of Plans	Site plans and building plans must be submitted for review.
Delaware Department of Transportation	Entrance Permit	17 Del.C Chapter 1, Section 146(c): Title 2 Del. Admin Code § 2309-7.2	An entrance permit is required to construct a new entrance or modify an existing entrance based on estimated traffic impacts resulting from site improvements. Modification of the entrances would be temporary. Approval from DelDOT is a condition of Conditional Use approval by Sussex County.

Table 1.4-1. Permits and Approvals

Agency	Permit or Approval	Statutory Basis	Project Applicability
LOCAL			
Sussex Conservation District	Erosion/Sediment Control and Stormwater Management Plan Approvals	7 Del. Code, Chapter 40, 7 DE Admin. Code 5101: Sussex County Code, Chapter 90	The Sussex Conservation District reviews and approves sediment and stormwater plans as a DNREC delegated agency for DNREC projects located in Sussex County.
Sussex County Planning and Zoning Commission/ County Council	Conditional Use and Site Plan	Sussex County, DE Code Chapter 115 9 Del. Code Chapter 68	Sussex County has the authority to regulate the use of land. This jurisdiction relates specifically to the Horizontal Directional Drilling (HDD) Landfall installations, installation of underground utilities, and construction of the Project Substation interconnecting with nearby Delmarva public grid facilities at Pine Neck.
Sussex County Building Code Office	Building Permit	Sussex County Code Chapter 52	County conducts plan reviews, building permit issuance and inspections for commercial, residential projects. Requires site plan and other regulatory approvals.
Worcester County Department of Development, Review and Permitting	Building Permit	Town of Ocean City, Maryland Code of Ordinances, Chapter 10	Under Ocean City, Maryland Town Code, the Town has the authority to uphold the International Building Code and the Building Code of the Town of Ocean City through issuance of Building Permits for the planned Operations and Maintenance (O&M) Facility to be located on the Ocean City waterfront.
Worcester County Department of the Environment	Shoreline Construction Permit	Worcester County Code NR 2-102	Major construction: any work executed 8-ft channel ward of mean high-water line or digging/excavation involving an alteration of the shoreline, in this case construction or upgrades related to the O&M Facility. Minor construction: any other construction along the shoreline not considered to be major construction.

2.0 PROJECT DESCRIPTION

US Wind is developing an offshore wind energy project of up to approximately 2 GW of nameplate capacity within OCS-A 0490 (the Lease), a Lease area of approximately 80,000 acres located approximately 18.5 km (11.5 mi) off the coast of Maryland on the OCS. US Wind obtained the Lease in 2014 when the company won an auction for two leases from BOEM which in 2018 were combined into the Lease.

The Lease granted US Wind, subject to BOEM's approval of the Construction and Operations Plan (COP) (US Wind 2023), the exclusive rights and privileges to conduct authorized activity to develop renewable energy in the Lease area, as set forth in Addendum A of the Lease. The Project includes MarWin, a wind farm of approximately 300 MW for which the State of Maryland awarded to US Wind ORECs in 2017; Momentum Wind, consisting of approximately 808 MW for which the State of Maryland awarded additional ORECs in 2021; and any subsequent developments authorized within the Lease area. On March 29, 2023, Governor Wes Moore announced that Maryland would work to quadruple energy from offshore wind, from about 2 gigawatts to 8.5 gigawatts, as well as improving the offshore wind supply chain and continuing to build partnerships between the offshore wind industry and Maryland businesses and communities (State of Maryland 2023). This plan was codified in the Promoting Offshore Wind Energy Resources Act of 2023, which was passed by the Maryland General Assembly on April 10, 2023, and signed by Governor Moore into law on April 21, 2023.

Under a Project Design Envelope (PDE) approach, the Project could include as many as 121 wind turbine generators (WTG), up to four offshore substations (OSS), and one meteorological tower (Met Tower) in the Lease area. The Project will be interconnected to the onshore electric grid by up to four new 230-275 kilovolt (kV) export cables to new US Wind substations, with an anticipated connection to the existing Indian River Substation near Millsboro, Delaware. For a full description of the PDE Approach and summary table of PDE Parameters, see Section 1.2.

The purpose of the Project is to provide offshore wind renewable energy generation within the Lease area to fulfil renewable energy standards and targets set by the State of Maryland and the United States. The Project will produce utility-scale power to the regional electric grid, help reduce greenhouse gas emissions, diversify the nation's energy portfolio, and create new economic development opportunities, including employment creation, in the region.

2.1 Overview of the Project

The Project consists of the construction, operation and maintenance, and decommissioning of the offshore wind electric generating facility located in the Lease area, easements, export cables, and onshore transmission and substation connections. US Wind adopted the PDE approach to present the Project in the COP and includes a reasonable range of design scenarios to encompass the maximum potential effects of development.

Use of the PDE allows for the reasonable evaluation of maximum effects and retains the flexibility needed to plan the Project during the rapid evolution of technology in the offshore wind sector. Under this PDE approach, the Project has an upward limit of 121 WTGs, up to four (4) OSS, and one (1) Met Tower located in the roughly 80,000-acre Lease area. The Project will be interconnected to the onshore electric grid by up to four (4) new 230-275 kV export cables into a new, an expanded or an existing substation in Delaware. In the COP, US Wind identifies preferred site configurations or component designs based on the current understanding of site conditions and evaluation of potential impacts; however, such site configurations and component designs will be further refined during the fabrication and installation phases of the Project in a manner consistent with BOEM regulations. As a result, the impacts of the final, approved Project may be less than the various scenarios considered in the COP.

2.2 Summary of Project Components and Activities

The proposed and alternative activities include the construction, operation and maintenance, and decommissioning of an offshore wind electric generating facility located in the Lease area, Export Cable Routes to onshore, onshore transmission and substation connections, and an O&M Facility (Appendices B-F).

Project elements include offshore structures, inter-array and export cables, and onshore infrastructure as described in more detail below:

- **WTGs**
  - Up to a maximum of 121 WTGs are proposed in the Lease area under the PDE, spaced 0.77 nautical miles (NM) east to west and 1.02 NM north to south.
  - The PDE maximum size is a WTG with 18 MW nameplate capacity.
  - Foundations for the wind turbines will be monopiles: large diameter coated steel tubes driven into the seabed. Layers of rock will be used for scour protection around the foundations.
  - Use of a staging facility at Sparrows Point in the Greater Baltimore area to receive WTGs and other components. Sparrows Point could also supply monopile foundations and fabricate and assemble other Project elements, as well as support the equipment needs of other offshore wind projects.
  - Use of the best commercially available technology suitable for the site to minimize the number of WTGs and site impacts and maximize efficiency of the Project.
- **OSSs**
  - Up to four OSSs are included in the PDE.
  - US Wind proposes jackets on piles (“piled jackets”) foundations for the OSSs. Alternative foundations considered include monopiles and jackets on suction buckets. Rocks for scour protection will be placed around the monopile and piled jacket foundations. Jackets on suction buckets include scour protection built in.

  - Fabrication of the OSSs may be completed at Sparrows Point or other suitable locations.
- **Met Tower**
  - Consists of a 100 m mast on a 279 sq. m deck atop a Braced Caisson foundation.
  - Includes measurement devices to record weather conditions such as winds and waves.
- **Inter-Array Cables**
  - Submarine inter-array cables designed for 66 kV will connect the WTGs in strings of four to six to the OSSs.
  - Inter-array cables will be buried in the seabed. The cable ends will be installed in cable protection systems (CPS) close to the WTG foundations where burial may not be possible. Scour protection rocks will later stabilize these CPS systems.
- **Offshore Export Cables**
  - Up to four offshore export cables are included in the PDE. Export cables consist of an offshore portion, the Offshore Export Cables, from the Lease area to the landing location, through a transition vault to the onshore portion, and the Onshore Export Cables that connect to the Point of Interconnection (POI).
  - Offshore Export Cables are planned as 230-275 kV 3/C submarine cable. Offshore Export Cables would run from the OSS to a planned landfall in the vicinity of the Indian River Inlet.
  - The proposed landfall location is at 3R’s Beach, with an alternative landing location at Tower Road. Both landing locations are in Delaware Seashore State Park parking lots at 3R’s Beach and Tower Road.
  - Proposed cable route, Offshore Export Cable Corridor 1, would land at the 3R’s Beach landfall. Other offshore route alternatives are included in the PDE.
  - Cable corridors offshore have been sited to avoid conflicts with existing uses, such as active sand borrow areas used for beach nourishment and storm resiliency projects along the Delmarva Peninsula.
- **Onshore Export Cables**
  - Onshore Export Cables are the portion of the export cables from the landfall location to the POI located onshore.
  - Up to four Onshore Export Cables are included in the PDE, as well as multiple routes to the associated POI.
  - The proposed Onshore Export Cable Corridor 1 traverses Indian River Bay after landfall at 3R’s Beach and connects to onshore substations next to the POI at Indian River Substation. Transition from water to land, and land to water, would be accomplished by horizontal directional drilling (HDD). HDD will minimize impacts

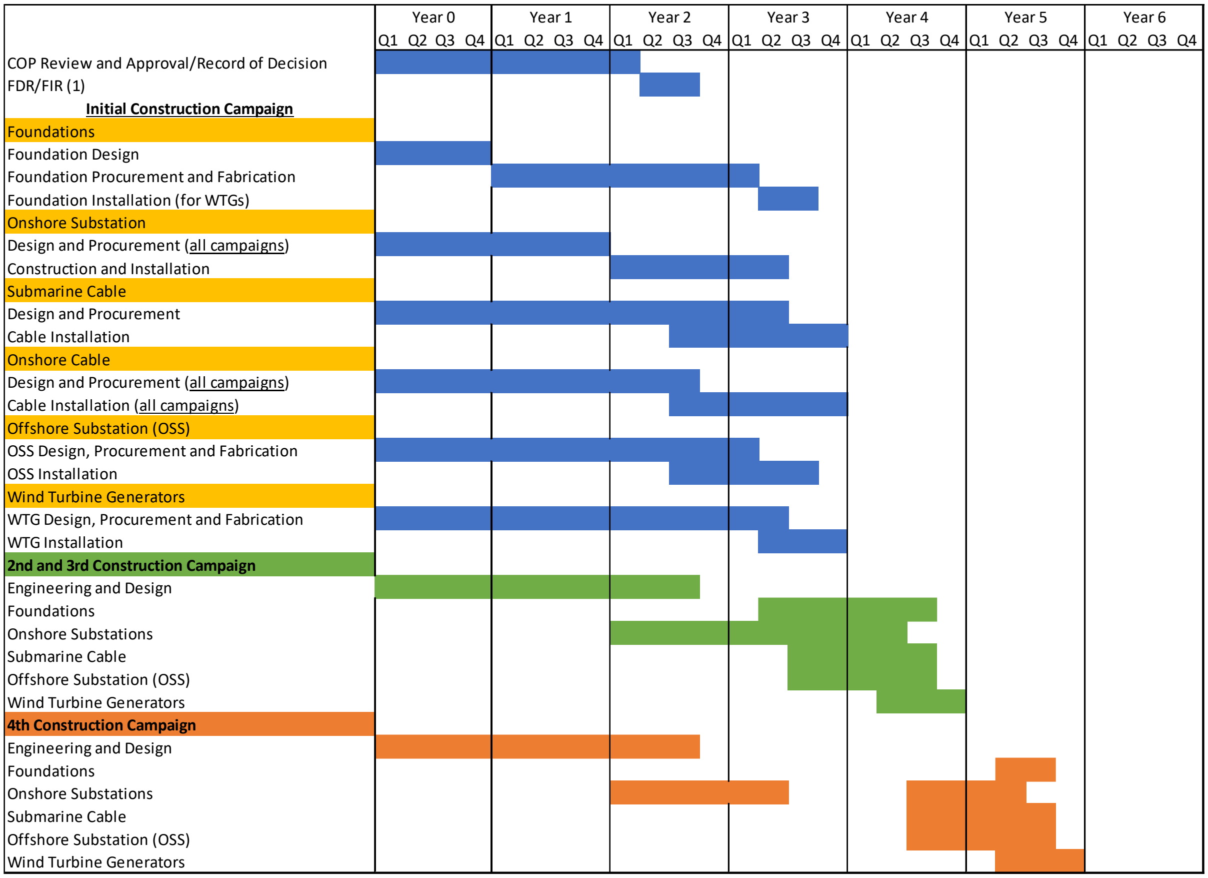
to sensitive shore areas. Alternative land-based cable corridors are included in the PDE.

- All onshore cable infrastructure will be buried.

- **Onshore Substations**
  - Proposed POI to the regional electric grid is the existing Indian River Substation owned by Delmarva Power and Light (DPL) in Dagsboro, Delaware.
  - It is anticipated that the Indian River Substation will be upgraded and expanded by DPL as required as the contracted generating capacity of the Project is increased.
- **US Wind Onshore Substations**
  - Proposed construction of new onshore substations in the vicinity of the existing Indian River Substation. These substations would provide for a transition for the Onshore Export Cables to connect to the Indian River Substation.
- **Operations and Maintenance Facility**
  - An Operations and Maintenance (O&M) Facility is proposed in West Ocean City, Maryland to allow for efficient access to the Project once operational.

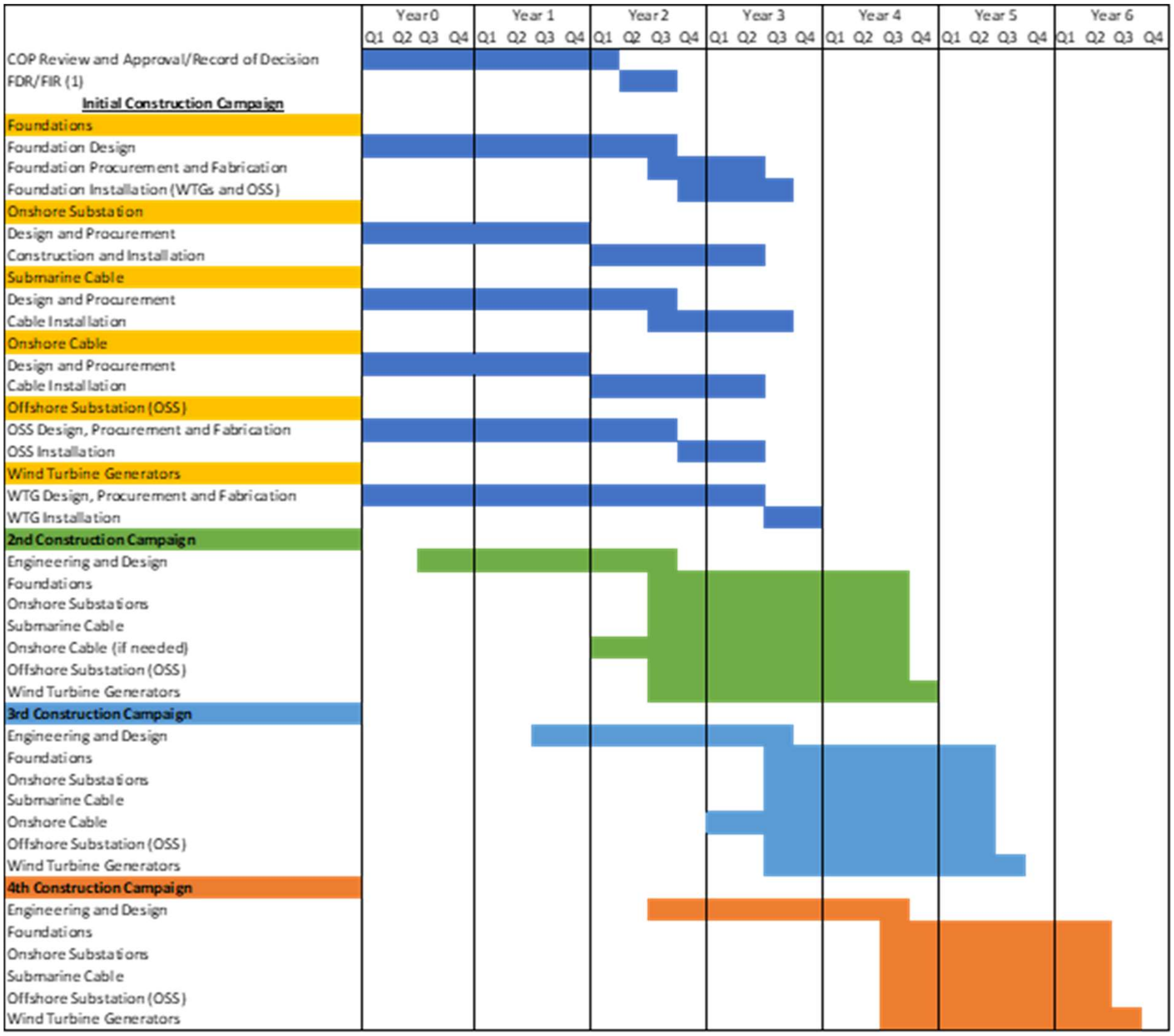
2.3 Proposed Project Schedule

US Wind's high-level schedule for permitting, site investigation, detailed design, fabrication, and installation phases of the Project is provided in Figure 2.3-1 below. An alternate Project schedule is provided in Figure 2.3-2.



NOTES
1) US Wind may seek separate, earlier FDR/FIR approvals pre-COP approval, as permitted under the departure regulatory approval process
2) Activity not constant during identified windows
3) No underwater impact hammering assumed December through March
4) Onshore construction of up to 4 cables occurs Years 2-3 to align with all construction campaigns

Figure 2.3-1. Summary Project Schedule



NOTES
1) US Wind may seek separate, earlier FDR/FIR approvals pre-COP approval, as permitted under the departure regulatory approval process
2) Activity not constant during identified windows
3) No underwater impact hammering assumed December through March

Figure 2.3-2. Alternate Project Schedule

3.0 PROJECT INFRASTRUCTURE, FABRICATION AND INSTALLATION

3.1 Project Infrastructure

3.1.1 Construction and Fabrication Facilities

The Project will be located in the Lease area and includes an offshore export cable corridor for connection to onshore infrastructure.

The Lease area covers 79,707 acres, with the western edge located approximately 16.2 km (10.1 miles) to the closest point on the Maryland coastline as shown in Figure 3.1-1. Figure 3.1-2 provides an overview of the proposed Project showing WTG and OSS positions, and offshore export cable corridors.

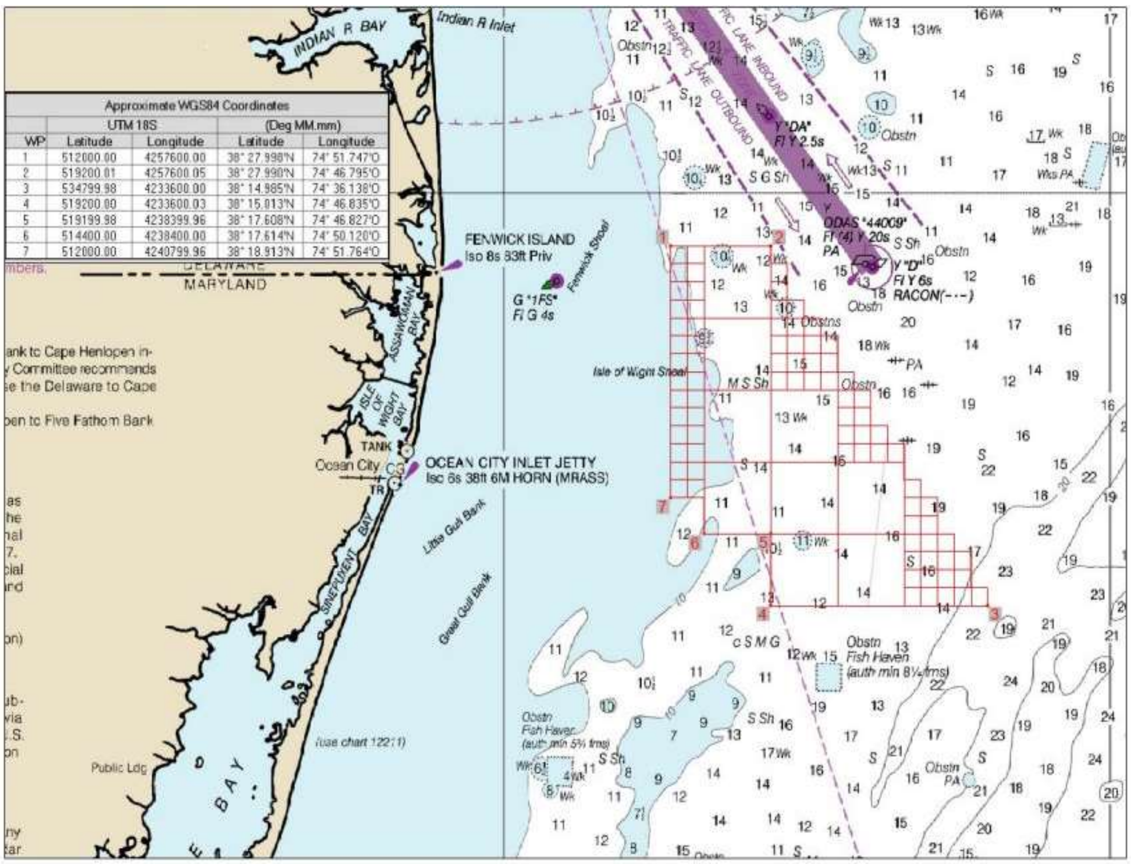

Approximate WGS84 Coordinates				
	UTM 18S		(Deg MM.mm)	
WP	Latitude	Longitude	Latitude	Longitude
1	512000.00	4257600.00	38° 27.998'N	74° 51.747'O
2	519200.01	4257600.05	38° 27.990'N	74° 46.795'O
3	534799.98	4233600.00	38° 14.985'N	74° 36.138'O
4	519200.00	4233600.03	38° 15.013'N	74° 46.835'O
5	519199.98	4238399.96	38° 17.608'N	74° 46.827'O
6	514400.00	4238400.00	38° 17.614'N	74° 50.120'O
7	512000.00	4240799.96	38° 18.913'N	74° 51.764'O

Figure 3.1-1. Project Lease area map depicting the different water depths according to NOAA

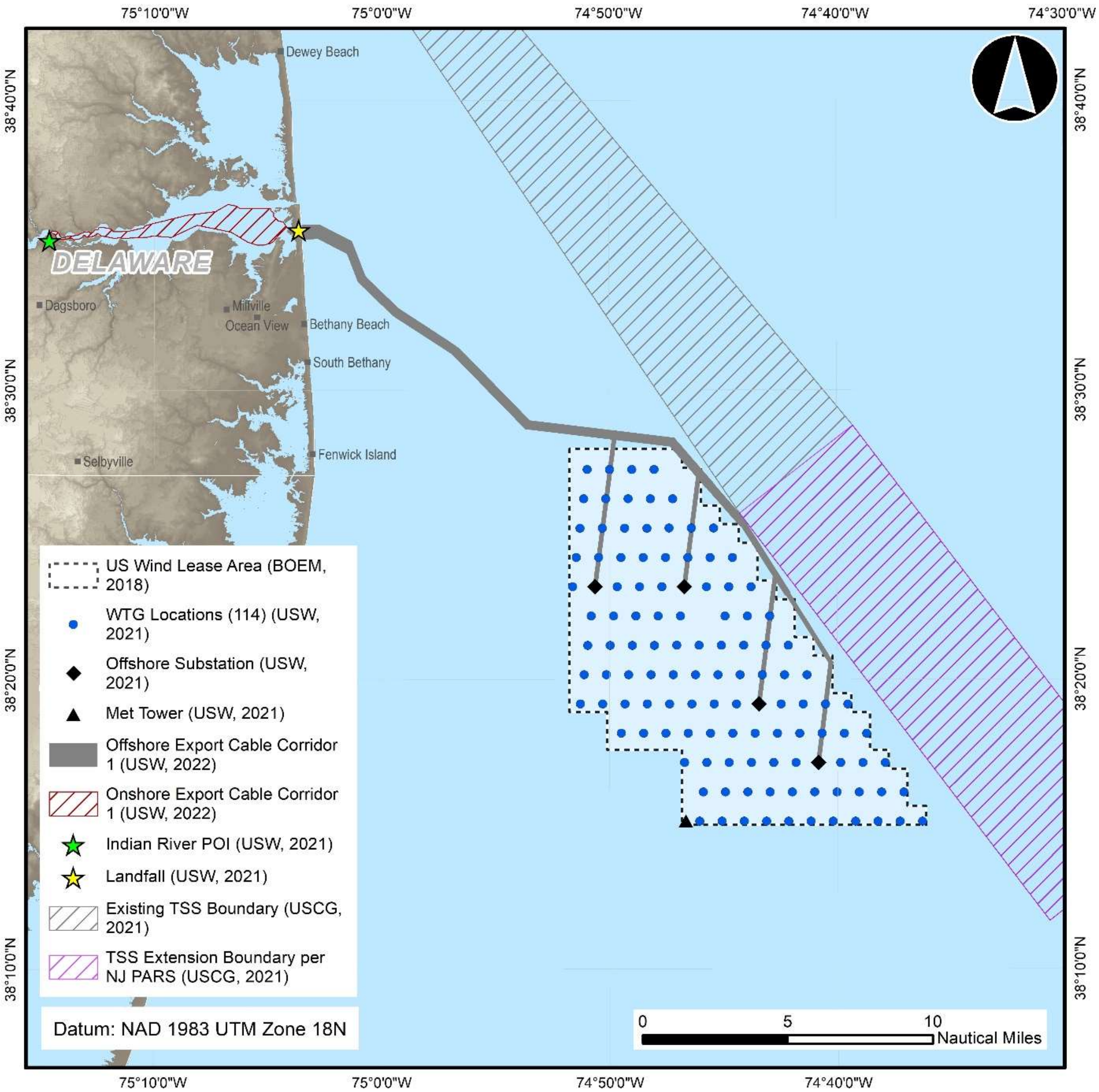


Figure 3.1-2. Proposed Project

Proposed WTG locations are evenly distributed across the Lease area at a distance of 0.77 NM (1.4 km, 0.89 miles) in the east-west direction and 1.02 NM (1.88 km, 1.17 miles) in the north-south direction. The proposed OSSs are located to service groups of WTGs. The coordinates of the WTGs and OSSs are listed in Appendix F of COP Volume I (US Wind 2023). Inter-array cables will run in a radial fashion from the WTGs toward the OSS locations.

The Met Tower is proposed in a location along the southern edge of the Lease area. The proposed location for the Met Tower is 38.252352° -74.777755° as shown in Figure 3.1-2.

The maximum design scenario in the PDE includes WTGs in 121 locations. US Wind's proposed layout would ensure no WTGs or OSSs are located within 1 NM of the outer boundary of the south-eastbound traffic lane of the current Traffic Separation Scheme for the southeastern approach to the Delaware Bay or its proposed extension[1] (see Section 5.16.1), and therefore includes up to 114 WTG as shown in Figure 3.1-3.

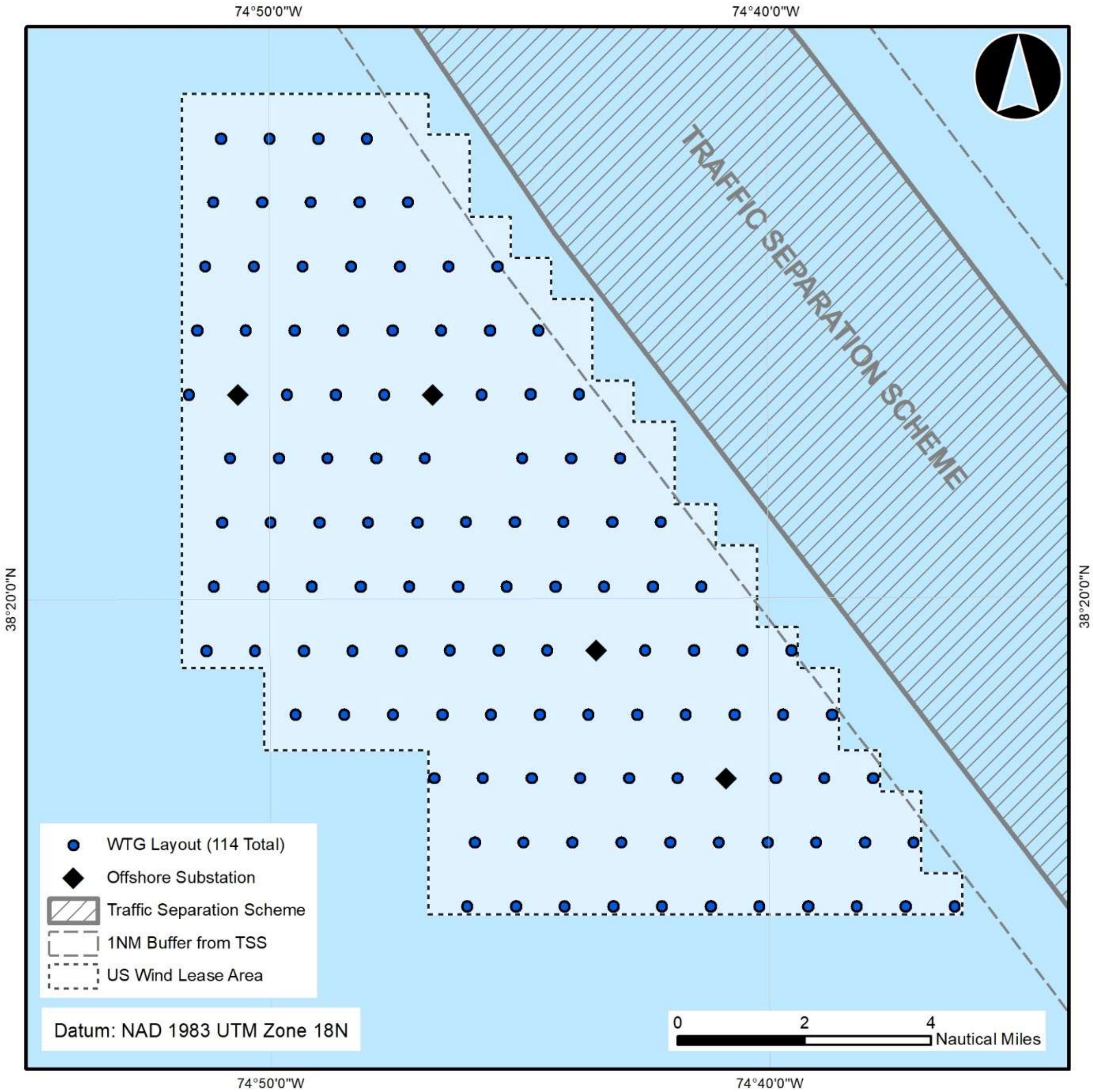


Figure 3.1-3. Proposed Layout with 1 NM Traffic Separation Scheme Setback

The proposed offshore export cables would exit the Lease area and traverse Offshore Export Cable Corridor 1, making landfall south of the Indian River Inlet at 3R's Beach. From there, the

[1] Traffic Separation Scheme boundary extension based on New Jersey PARS.

onshore export cables would extend through Indian River Bay to the US Wind substations and connect to the POI at the DPL Indian River Substation (Onshore Export Cable Corridor 1). A Project alternative would be the offshore export cables making landfall at the Tower Road parking lot, north of Indian River Inlet, and crossing over land to the Indian River Substation as described in Section 3.1.5.3.

3.1.2 Wind Turbine Generators

US Wind is considering contemporary and near-term offshore WTG models with individual nameplates of up to 18 MW. The WTGs under consideration have industry standard three-bladed, upwind, horizontal-axis configurations. The rotor-nacelle assembly (RNA) sits atop a multi-section tubular steel tower at a hub height of up to 161 m Mean Sea Level (MSL). One WTG US Wind is considering within the PDE is the GE Haliade X -14.7 wind turbine at a hub height of 139 m MSL. This Haliade X configuration employs the platform's 220 m rotor diameter and has a nameplate of 14.7 MW. An overview of the proposed scenario and maximum WTG characteristics evaluated for the project are outlined in Table 3.1-1.

Table 3.1-1. WTG Envelope

WTGs	PDE
Turbine Generation Capacity	18 MW[2]
Total Tip Height	286 m (938 ft)
Hub Height	161 m (528 ft)
Rotor Diameter	250 m (820 ft)
Air Gap[3]	36 m (118 ft)
WTG Locations	121

The range of WTG dimensions included in the PDE is further illustrated in Figure 3.1-4.

Obstruction aviation lights are planned on the nacelle and tower of each WTG. US Wind expects to install two medium-intensity obstruction aviation lights on top of each nacelle and four low intensity obstruction lights mid-way on each tower (approximately 70-80 m above MSL), as well as a helicopter hoist status light. Navigation aids are likely to differ based on location within the wind farm. See Section 5.16.2 for discussion and COP Appendix II-K2, Marking and Lighting Assessment for US Wind's preliminary aviation and navigation lighting and marking plan for the maximum design scenario and proposed layout (US Wind 2023).

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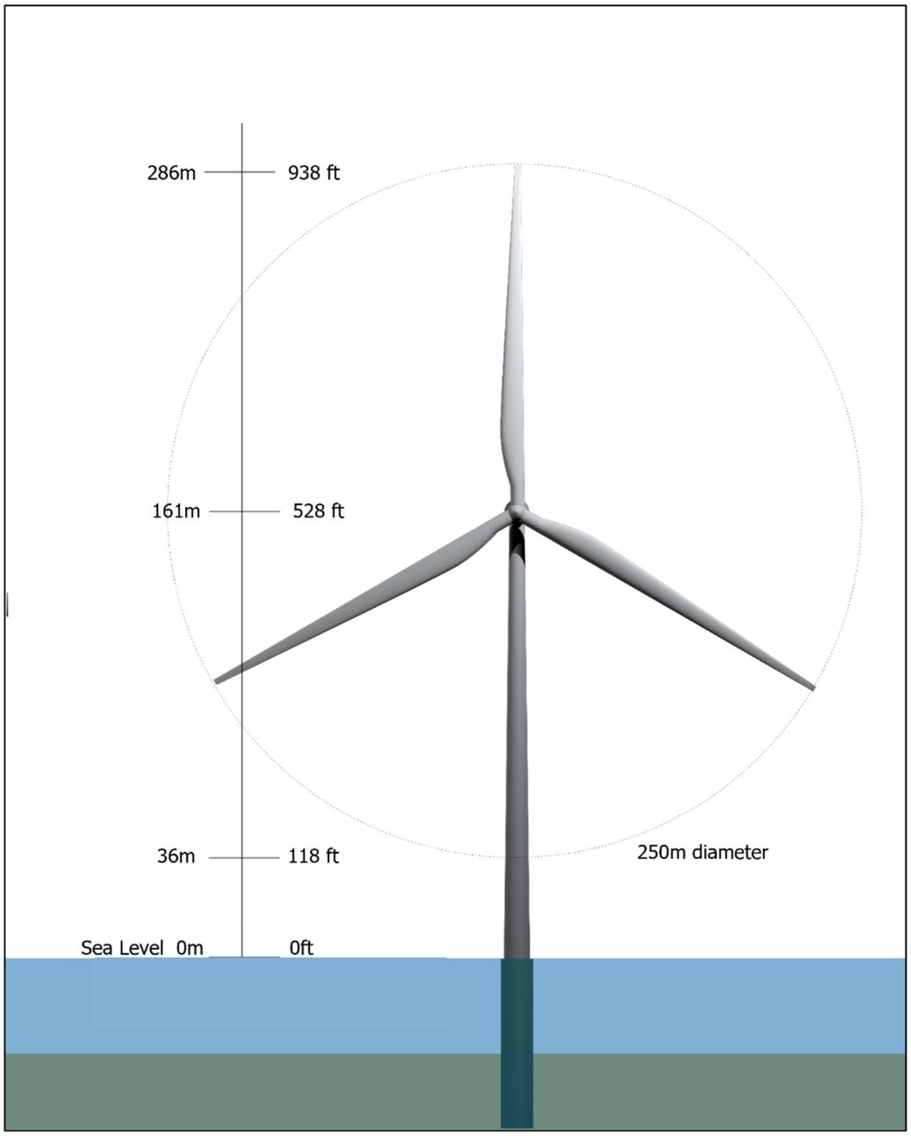
[2] The 18 MW WTG referred to here is a configuration of a 250-m rotor diameter platform, inclusive of nameplate capacities other than 18 MW.
[3] Lower tip height in relation to MSL.



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Fueling our future, naturally.

Reference Dimensions:
18MW: 250m Rotor Diameter, 161m Hub

Wind Turbine Generator

Figure 3.1-4. Dimensions for PDE Maximum 18 MW

3.1.2.1 Monopile WTG Foundations

The WTGs will be installed on monopile foundations which are large diameter coated steel tubes driven into the seabed. The diameter, weight, length, and wall thickness of the monopile vary based on water depth, geotechnical conditions, metocean conditions and WTG size. The selection of monopile foundations is discussed further below.

Approximate weights and dimensions of the monopile foundations within the Project Design Envelope are provided in Table 3.1-2.

Table 3.1-2. Monopile Design Ranges

Approximate Foundation Parameters	Units	Project Design Envelope
Water Depth[4]	m (ft)	14 – 41 (46 – 135)
Interface Height	m (ft)	22 (73)
Maximum Pile Penetration	m (ft)	50 (164)
Maximum Monopile + TP Total Length	m (ft)	110 (360) @ max depth
Maximum Monopile Mass, Primary Steel	tonnes (ton)	2,200 (2,424) @ max depth
Maximum TP Mass, Primary Steel	tonnes (ton)	364 (401)
Maximum Total Mass, Primary Steel[5]	tonnes (ton)	2,200 (2,425)
Monopile Diameter	m (ft)	8 – 11 (26 – 36)

The monopile foundations consist of a monopile with integrated or separate transition piece (TP) as shown in Figure 3.1-5. The top of the monopile typically consists of a flanged connection that allows for a bolted connection between the TP or turbine tower. The foundation TP acts as an interface between the monopile and WTG tower. The TP commonly incorporates space for switch gear, dehumidification equipment and control systems while also providing boat landing, access, and service platforms. If a monopile foundation without a separate TP is selected, the switch gear, dehumidification equipment and control systems would be installed in a suspended structure inside the monopile, with the boat landing, access, and service platform attached to the exterior of the foundation. US Wind intends to include scour protection in the form of rock around the base of the monopile foundation, an area of approximately three times the diameter of the foundation.

[4] The same reference datum is assumed for both depth and interface height.
[5] Mass based on current design, subject to modification pending final design and site conditions.

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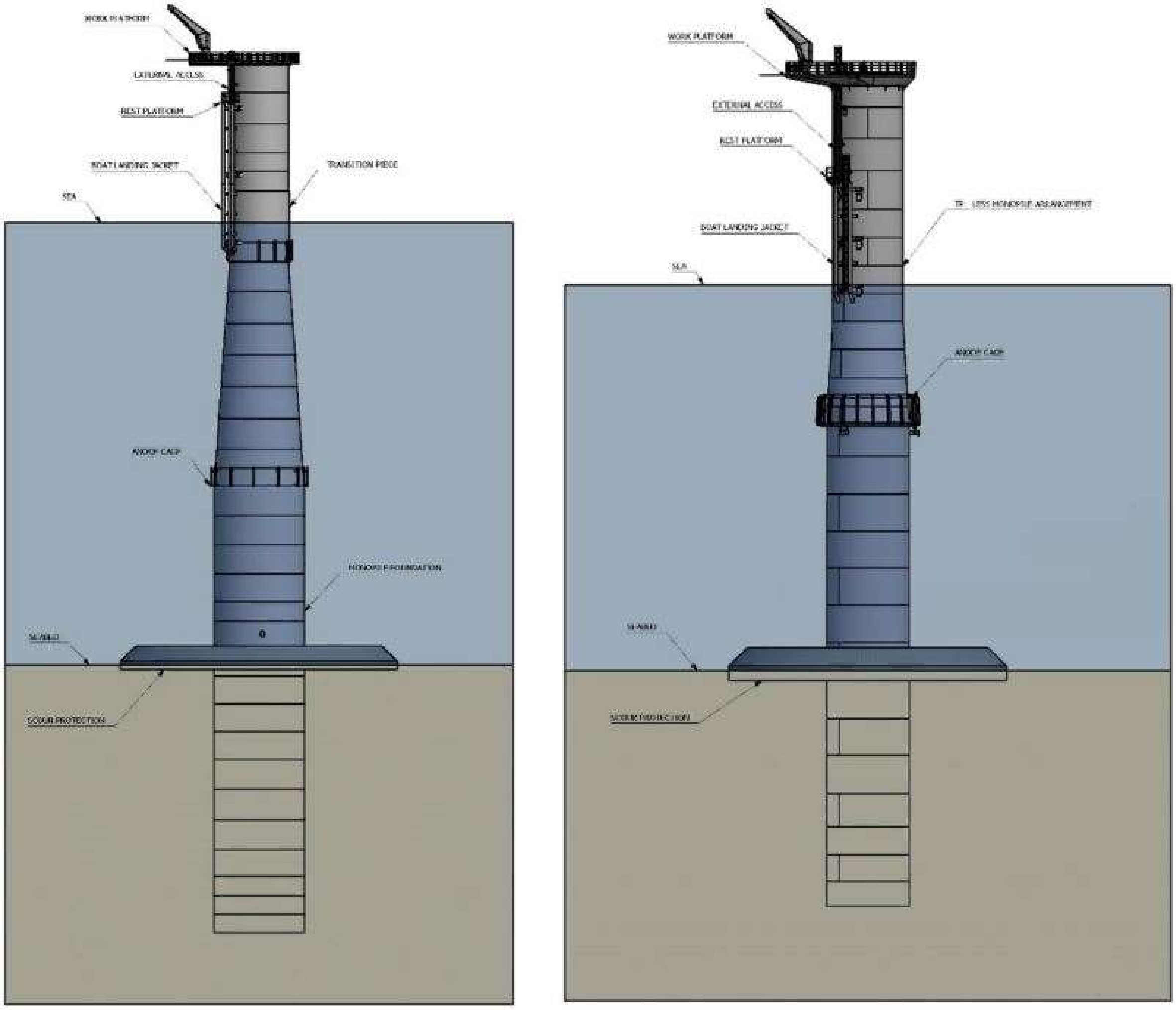

Figure 3.1-5. Monopile Foundations with and without Transition Pieces

WTG illustrative foundation drawings for both MarWin and Momentum Wind/Phase 3 can be found in Appendix B.

3.1.3 OSS

US Wind proposes to deploy up to four OSSs[6] for the Project, one for each grouping of approximately 300 to 400 MW of WTG capacity, deployed atop monopile or jacket foundations. US Wind is evaluating a modular configuration of the OSS topsides, each of which are anticipated to contain medium-voltage (MV) switch gear (66 kV), HV transformer (66 kV to 230 kV), Supervisory Control and Data Acquisition (SCADA) interface, control systems and a connection

[6] The term offshore substation (OSS) refers to the same structure and Project components referenced elsewhere in the industry as the electric service platform (ESP), offshore transformer module (OTM), and similar names.

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to the export cables, a generator, as well as the associated safety and ancillary equipment. The back-up generator is needed to power the SCADA and other communication and control systems in case of a grid connection outage. The modular topside configuration is intended to be standardized to the extent possible for cost reduction, ease of installation, and to facilitate review and approval.

OSS topside dimensions are anticipated to range from 30 m by 43 m and 50 m high (98 ft by 141 ft by 164 ft) for a single module OSS in multiple locations and up to 40 m by 80 m and 60 m high (131 ft by 262 ft by 197 ft) for an OSS topside if the modules are placed at a single location.

Figure 3.1-6. Design of Conceptual OSS atop a Monopile Foundation

3.1.3.1 OSS Foundations

Monopile or jacket foundations are being considered for the OSSs. A monopile foundation for an OSS would be similar to a monopile for a WTG as described in Section 3.1.2.1. A conceptual OSS platform on a monopile is depicted in Figure 3.1-6 A jacket is a multi-leg lattice structure that is connected to the seabed via piling or suction buckets. An OSS installed on a jacket foundation is shown Figure 3.1-7.

Figure 3.1-7. OSS on Jacket Foundation (Source: HSM Offshore)

The PDE includes a three, four or six-leg jacket structure for the OSSs, depending on its capacity. Piles driven into the seabed or suction buckets are used as foundation of the jacket and to support the topsides. In case of piles, these may be pre-installed using a temporary template on the seabed, or post-installed through jacket pile guides. For the jacket on suction bucket configuration, the buckets are integrated into the jacket legs and the structure is installed as one piece, with no piling as shown in Figure 3.1-8. Preliminary dimensions in the PDE for the pile and jacket features are provided in Table 3.1-3.

Table 3.1-3. OSS Foundation Design Envelope

	Monopiles	Jacket on Suction Buckets	Jacket on Piles
Diameter (each)	8 – 11 m (26 – 36 ft)	10 – 15 m (33 – 49 ft)	2 – 4 m (7 – 13 ft)
Pile Footprint (each)	50.3 – 95.1 m^2 (165.0 – 312.0 ft^2)	78.5 – 176.0 m^2 (257.5 – 577.4 ft^2))	3.1 – 7.1 m^2 (10.2 – 23.3 ft^2))
Pile Penetration Depth	30 – 40 m (98 – 131 ft)	10 – 15 m (33 – 49 ft)	30 – 80 m (98 – 262 ft)

US Wind intends to include scour protection in the form of rock around the base of the OSS foundation, an area of approximately three times the diameter of the piles or buckets. Suction buckets with scour protection mats incorporated into the buckets may be used if available and feasible.

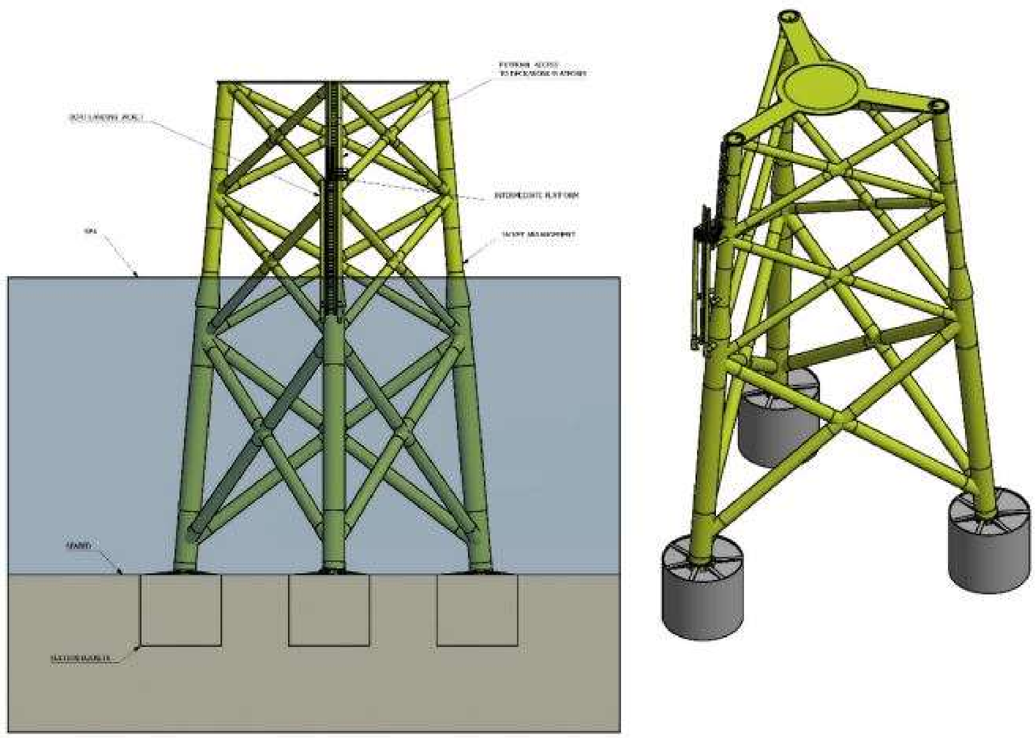

Figure 3.1-8. Jacket Foundation on Suction Buckets

OSS illustrative foundation drawings for a 400 MW OSS and larger 800 MW OSS can be found in Appendix B.

3.1.4 Met Tower

The Project includes a Met Tower which will serve as a permanent metocean monitoring station. The data collected by the Met Tower will be used to support project operations and long-term monitoring.

The Met Tower is a bottom-fixed structure consisting of a steel, lattice mast fixed to a steel deck supported by a steel Braced Caisson style foundation as shown in Figure 3.1-9. The primary structure has been fabricated and is currently in storage at the Modern American Recycling Services facility in Gibson, Louisiana. The Met Tower is planned to include a robust suite of monitoring, data logging, and remote communications equipment, as well as associated power supply, lighting, and marking equipment. Previously, BOEM granted approval to US Wind for the installation of the Met Tower in the Site Assessment Plan (SAP) process (see COP, Volume I, Section 1.1.1 [US Wind 2023]).

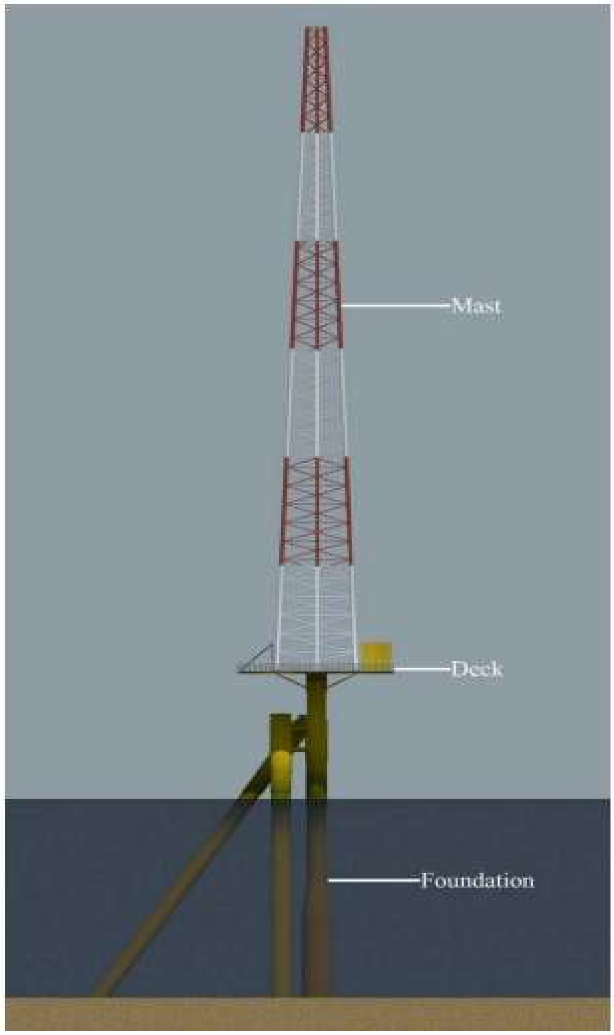

Figure 3.1-9. Simplified Met Tower Rendering

3.1.4.1 Met Tower Location

The proposed Met Tower location is at the western edge of the southernmost row of the array. The coordinates for this proposed location, along with two other alternate locations in the same row, are summarized in Table 3.1-4 below.

Table 3.1-4. Proposed Met Tower Coordinates

Location	Coordinates – NAD 83 [decimal degrees]		Approximate Water Depth [in MLLW]
	Latitude	Longitude	
Proposed	38.252352°	-74.777755°	24.4
Alternate 1	38.252253°	-74.759586°	28.3
Alternate 2	38.252195°	-74.710674°	31.3

The proposed location addresses a number of long-term monitoring priorities for the Project. Specifically, that location is expected to provide nearly unobstructed exposure to the prevailing southwest and northwest wind directions which improves the value of the wind data it collects. This is anticipated to help support operations planning (along with the associated metocean measurements) and Project performance audits. Additionally, the location is also within four rotor-diameters of the adjacent WTG, which is expected to potentially support power curve testing and overall energy production audits. The proposed location on the western edge of the row also has a clear line of sight to Ocean City, which facilitate high-speed remote data communications.

All locations under consideration would be the only structures considered outside of the Project's regular 1 NM by 0.77 NM array layout. The locations were selected to be in line with the east-west turbine row to limit any additional obstruction to fishing and other vessel traffic transiting across the Lease area.

3.1.4.2 Met Tower Design

The Met Tower structure was designed by Keystone Engineering, Inc. (Keystone), an experienced US engineering firm with extensive global experience with bottom-fixed offshore structures, including the Block Island Wind Farm WTG jacket foundations and the Hornsea meteorological mast in the United Kingdom. The Met Tower structure was engineered to employ standard design elements that have been successfully deployed in similar environments. US Wind retained Keystone as the Project Engineer for the Met Tower, and that team will support forthcoming engineering design and structural fabrication and modification.

Because the proposed location is different from the Met Tower location originally approved by BOEM in the now-withdrawn SAP, US Wind engaged Keystone to conduct a re-siting assessment. The scope of the assessment included a desktop review of site conditions between the original location and the proposed location. Based upon the data currently available, Keystone identified no significant risks to the proposed location utilizing the existing structure, pending site-specific geotechnical data review. Relatively minor structural changes were recommended to accommodate the slightly shallower water depth. The re-siting report is provided as COP, Volume I, Appendix I-K5 (US Wind 2023). A detailed redesign assessment is planned after updated site-specific metocean and geotechnical conditions.

The following subsections present the current Met Tower configuration and planned equipment suite. US Wind is also evaluating alternative foundation types and other design updates for the Met Tower. Material changes to the configuration summarized below, if any, may be presented in subsequent updates to the COP.

Met Tower Configuration

The Met Tower configuration employs standard, proven design elements that have extensive track records in the Unites States and globally. The foundation is a Braced Caisson design consisting of a main caisson steel pile and two bracing piles. The main caisson is a 1.8 m (72 in) diameter pile that tapers to 1.5 m (60 in) diameter above the mudline. The pile will be driven to an anticipated maximum depth of 53 m (175 ft). The two bracing piles are 1.5 m (60 in) diameter each. These piles will be driven to an anticipated maximum depth of 51 m (166 ft). Actual pile depths are anticipated to be shallower based upon water depths at the proposed location but will be confirmed upon Keystone's analysis of site-specific geotechnical data.

A steel grillage deck will be fixed onto the installed piles. A galvanized steel lattice mast will be erected onto the deck. Multiple measurement sensors will be placed on cross-arms at various levels on the mast. The height of the Met Tower including the mast and foundation will be approximately 100 m (328 ft) above the mean sea level, and no higher than maximum hub height as described in Table 3.1-1. The platform deck supporting the mast will be approximately 279 square m (m^2) (3,000 square ft (ft^2)).

Additional design details are provided in the following Appendices. The Met Tower Design Basis Report and Ancillary Reports are provided as Appendix I-K1 of COP Volume I (US Wind 2023). The Met Tower Design Summary is provided as Appendix I-K2 of COP Volume I (US Wind 2023). The preliminary engineering design is provided as Appendix I-K3 in COP Volume I (US Wind 2023) .

Met Tower Equipment Suite

The mast and the platform deck will be equipped with the necessary and proper safety lighting, markings, and signal equipment. See Section 5.16.2 for discussion and COP Volume I, Appendix II-K2 for US Wind's preliminary aviation and navigation lighting and marking plan, which includes the Met Tower (US Wind 2023).

The mast will be outfitted with scientific instruments, such as anemometers, vanes, barometers, temperature sensors, relative humidity sensors, pyranometer, and precipitation sensors, for recording empirical environmental and biological conditions in situ. The Met Tower is also planned to include a vertical profiling light detection and ranging (lidar) wind sensor, and a bottom-mounted and sub-surface instrumentation packages to gather oceanographic data and additional biological observations. At a minimum, the subsurface package will include an Acoustic Doppler Current Profiler (ADCP) system to measure currents, wave heights and other oceanographic data, and a conductivity, temperature, and depth (CTD) sensor.

In addition to the monitoring and safety equipment, the Met Tower is planned to have a robust suite of data logging, remote high-speed communications, and power supply equipment. A representative instrumentation package and data collection system planned for the Met Tower is attached at COP, Volume I, Appendix I-K4 (US Wind 2023).

3.1.5 Cables

The Project includes up to four offshore and onshore export cables and inter-array cables. The export cables will be comprised of an offshore component, the offshore export cables, located on the OCS and in state waters and an inshore component, the onshore export cables, located solely in state waters or on land. The proposed export cable corridor from the Lease area to US Wind's onshore substations will span between 65-97 km (40-60 miles) in length, dependent on the location of the OSS and the final routing through Indian River Bay or on land to the POI.

Inter-array cables (or inter-turbine) collect and transmit the power from the WTGs to the offshore substation. In US Wind's proposed design, WTGs are connected in strings of approximately five units. Inter-array cables connecting the WTG strings to an OSS will be 66 kV three-core, solid dielectric (Cross-linked Polyethylene (XLPE) or Ethylene Propylene Rubber (EPR)) construction. The sizes of the cables will vary depending on the distance of a WTG from the OSS and the number of WTGs on a given string. The strings converge at the OSS(s), where the voltage is stepped-up and delivered ashore via one or more high voltage alternating current (AC) submarine export cables. The OSS platforms may also be linked by additional 66 kV cables to provide a level of redundancy.

The proposed offshore export cables connecting each OSS to the landing location will be via a single 230-275 kV, 3/C cable, up to 300 millimeter (mm) (12 in) in diameter. Up to four offshore export cables are possible under the PDE approach planned.

The Project proposes use of two types of industry-standard 3i conductor submarine cables: inter-array cables connecting the WTGs and OSSs and the offshore export cables connecting the OSSs to the landing location. An overview of the construction of the submarine inter-array cable and offshore export cables is provided in Table 3.1-5. The components of an inter-array cable can be seen in Figure 3.1-10 and a typical cross section of a 230-275 kV cable, the TKRA 245 kV 3x1x1000 square mm (mm^2) AQ + FO produced by Nexans, is shown in Figure 3.1-11.

Table 3.1-5. Submarine Cable Construction

Component	Description
Conductor	The conductor is made of round stranded compacted wires filled with a longitudinal water blocking material. The water blocking material is used to prevent penetration of seawater into the conductor in case of damage to the cable. Conductor water blocking is regarded favorably with respect to aging of extruded insulation systems. Due to different thermal conditions at the landfalls HDD, different conductor material for the landfall section and different conductor material for the offshore part have been selected. Inter-array cables and offshore export cables will use copper or aluminum conductors and range in size from 200-300 mm overall diameter.

Table 3.1-5. Submarine Cable Construction

Component	Description
Insulation	The insulation system is made of XLPE, a material with good mechanical, thermal and electrical properties. The insulation system is designed as follows: • Extruded layer of semi-conducting compound; • Extruded insulation of crosslinked polyethylene; • Extruded layer of semi-conducting compound. XLPE is produced by cross-linking of thermoplastic polyethylene. The crosslinking of the molecules in polyethylene is a chemical process caused by peroxides when subjected to high temperature and pressure. XLPE has thermal properties which permit a continuous maximum conductor temperature of 90 °C (194 ° F) and a maximum short circuit temperature of 250 °C (482 ° F). The insulation material has a high dielectric strength, low dielectric constant, high insulation resistance, and the water absorption is very low.
Lead Alloy Sheath	A lead alloy sheath is applied as radial water barrier. Semi-conductive water swellable tapes are wrapped on the insulated core in the same process. The water swellable tapes will prevent longitudinal water penetration if the cable is damaged.
Core Sheath	An inner sheath of semiconducting extruded polyethylene is applied over the lead sheath. The core sheath acts as a mechanical reinforcement of the lead sheath and act as a corrosion protection.
Assembly	The three sheathed cores together with one fiber optic element are laid up with extruded PE fillers applied in the interstices to give a substantially round shape. The assembled cores are bound together with synthetic tapes.
Armor	The cable armor consists of one layer of round, galvanized steel wires. The armor wires are embedded in bitumen. The armor serves as a mechanical protection and a major tensile element during laying and installation.
Outer Serving	The outer serving is main corrosion protection of the armor. It consists of asphaltic compound with polypropylene reinforcement.

Figure 3.1-10. Inter-array Cable (Source: Nexans)

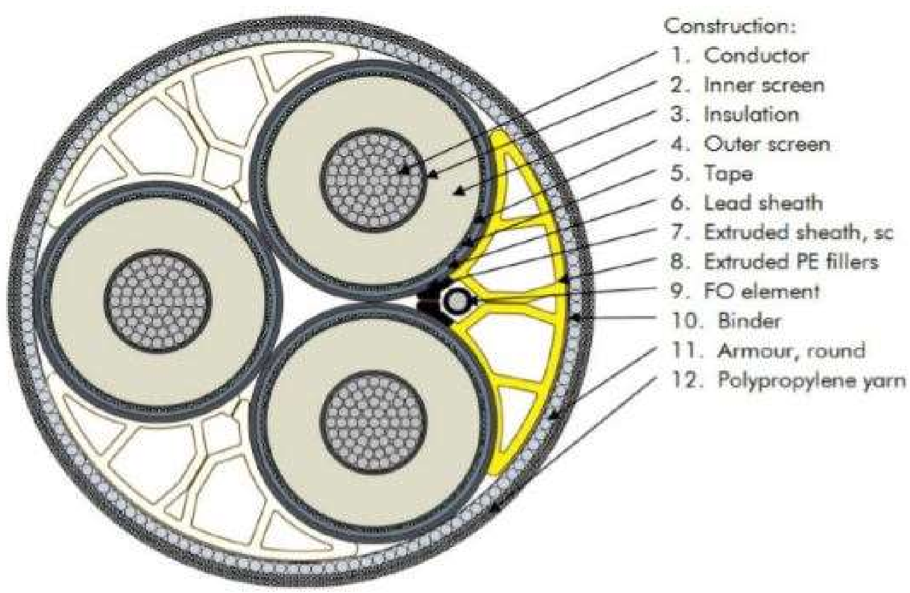

Figure 3.1-11. 230 kV Cable Cross Section (Source: Nexans)

The onshore export cables may be submarine via the Onshore Export Cable Corridor 1 through Indian River Bay, or land-based cables if an alternative terrestrial route is pursued, which would involve co-location in Delaware Department of Transportation (DelDOT) rights-of-way (ROW) excepting portions of Onshore Export Cable Corridors 1b and 1c that utilize a Sussex County

ROW under development. In the case of Onshore Export Cable Corridor 1 the cables would be of the same construction presented in Table 3.1-5. Cables for any alternative land-based routes would be (1/C) 230-275 kV single copper or aluminum core cables. Three single conductor (singe phase) cables would be installed in parallel, possibly sharing a cement bound sand block (see COP Volume I Appendix I-J [US Wind 2023]) in the ROW, to complete the circuit from the OSS to the POI.

3.1.5.1 Inter-Array Cables

The inter-array cables connect the WTGs to the OSS and will be run in a primarily north/south direction connecting up to four to six WTGs in a string. The cables will transition from their primary north/south direction to an east/west direction as required to connect the WTG strings to the OSSs. Based on the PDE layout, up to 245 km (152 mi) of inter-array cable will be used. Figure 3.1-12 illustrates the preliminary inter-array cabling for the proposed Project.

3.1.5.2 Offshore Export Cables

Up to four offshore export cables will be located among up to two 600-m (1,968-ft) corridors from the OSSs to the planned landfall at 3R's Beach or Tower Road (Barrier Beach Landfalls). Proposed Offshore Export Cable Corridor 1 connects to 3R's Beach while Offshore Export Cable Corridor 2 connects to Tower Road, as shown in Figure 3.1-13.

When the cables reach the landfall, they will be pulled into a cable duct that routes the cables under the existing beach to subterranean transition vaults. The transition vaults would be located in existing developed areas such as parking areas.

Spacing between parallel offshore export cables will be approximately three times the water depth, in line with the recommendations from the International Cable Protection Committee (ICPC), to provide ample space for cable repairs as needed.

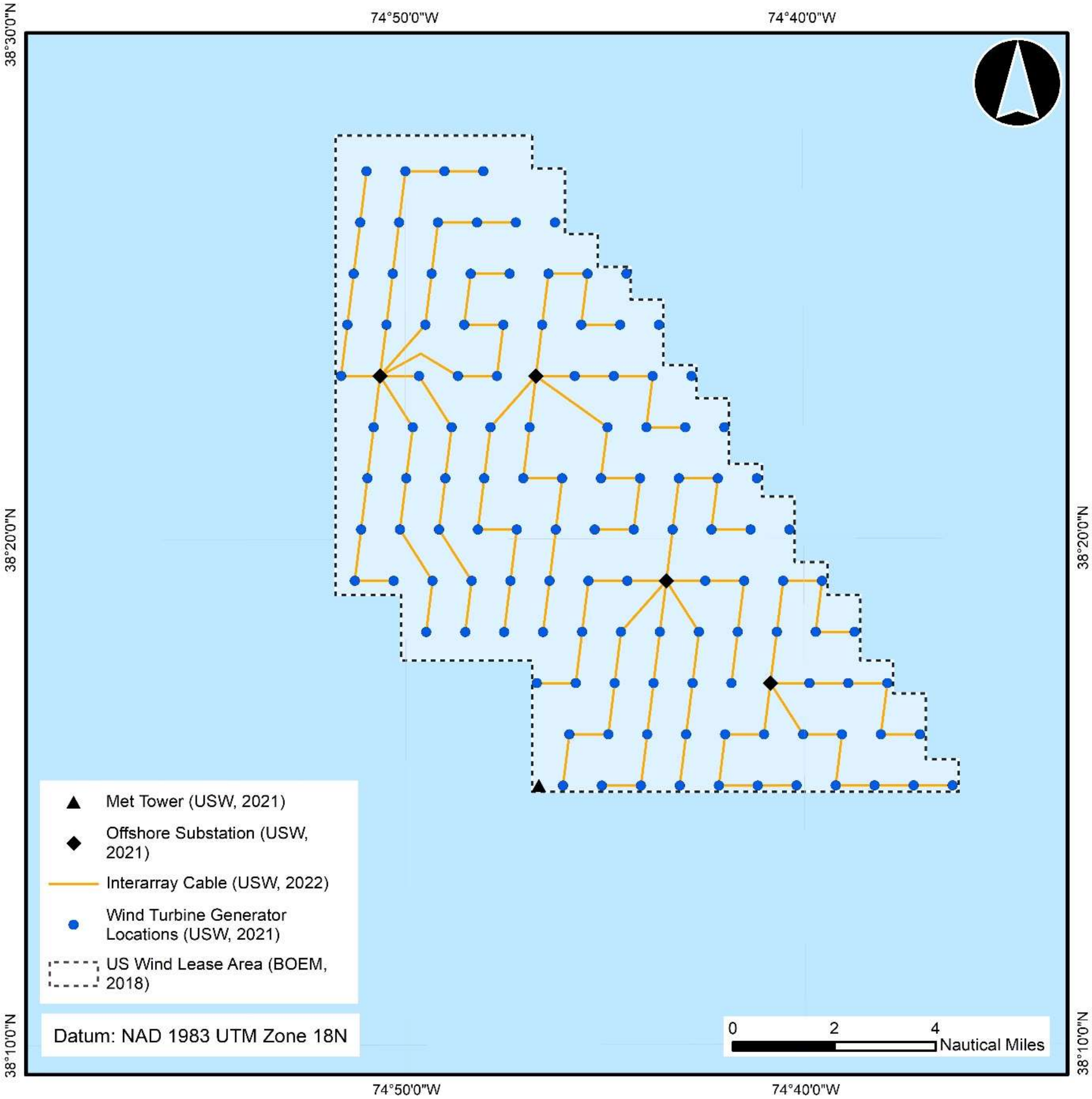

Figure 3.1-12. Indicative Inter-Array Cable Layout

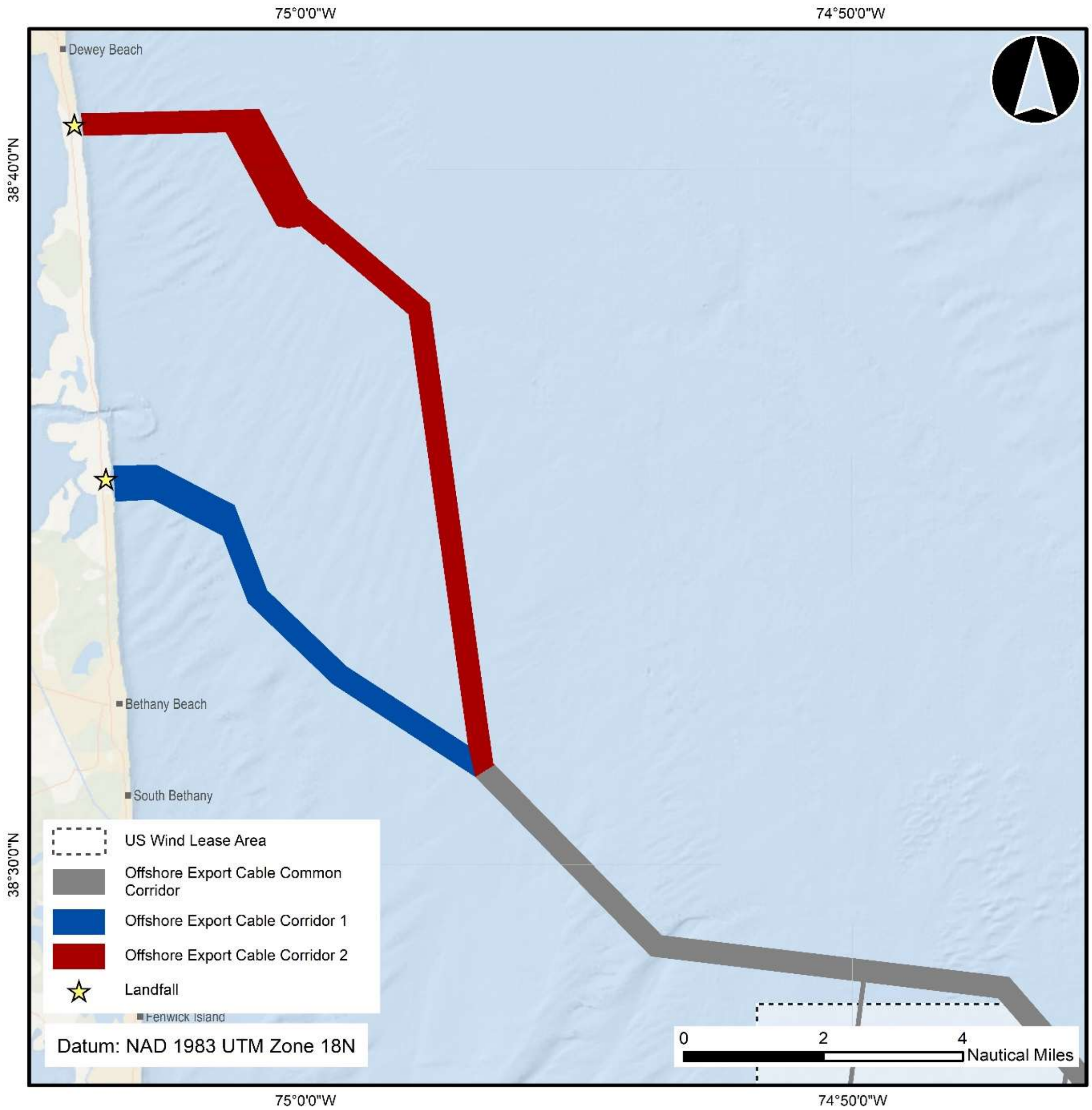

Figure 3.1-13. Offshore Export Cable Corridors

3.1.5.3 Onshore Export Cables

US Wind's PDE includes two landfall and transition vault locations. The proposed scenario is a landfall location in vicinity of the 3R's Beach parking lot located approximately 1.6 km (1 mi) south of the Indian River Inlet. A landfall alternative is at Tower Road approximately 7.7 km (5 mi) north of the Indian River Inlet.

An overview of the proposed and alternative landfall points is provided in Figure 3.1-14a and Figure 3.1-14b.

Figure 3.1-14a. Anticipated Landfall 3R's Beach Parking

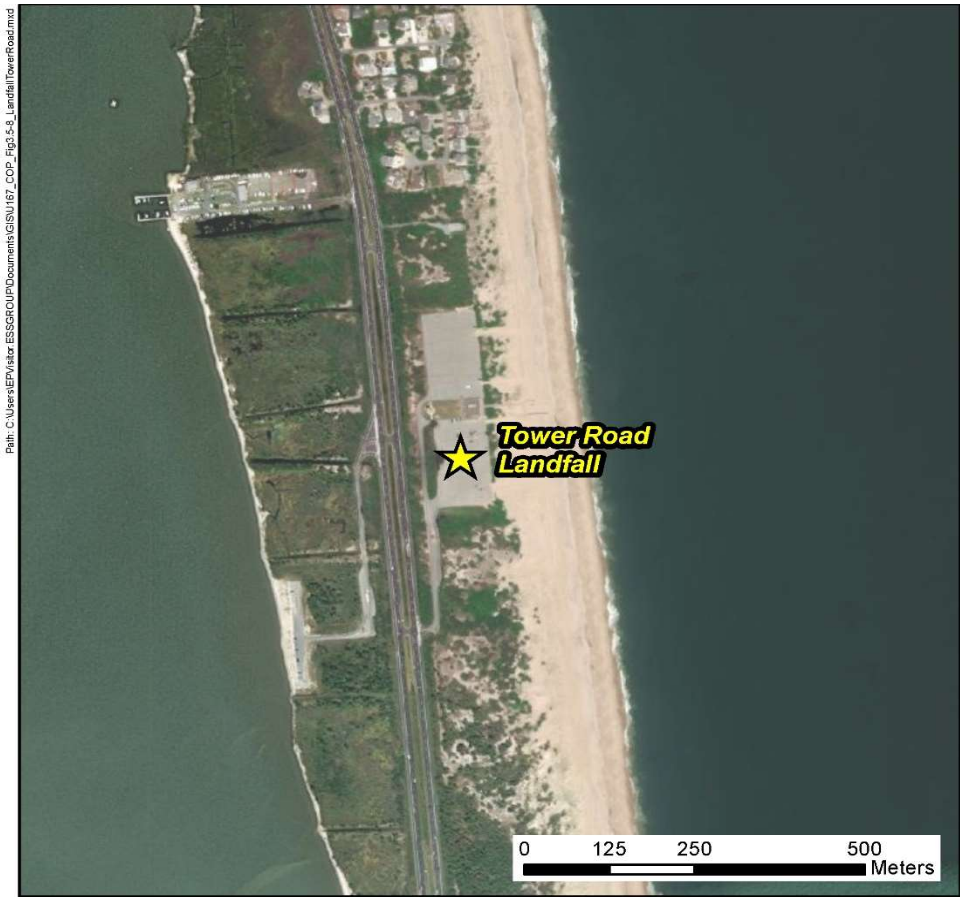

Figure 3.1-14b. Alternative Landfall Option - Tower Road

From the landfall location, up to four onshore export cables will run from the transition vaults via a cable corridor to the POI. Transition vaults for the Project will be installed below grade and are planned to be installed in existing parking areas, roadways, or similarly developed locations. An example of the access point for an operational transition vault can be seen in Figure 3.1-15.

Figure 3.1-15. Typical Vault within Parking Lot Post Construction

Onshore Export Cable Corridor 1 is proposed for the onshore export cables. Onshore Export Cable Corridor 1 and potential alternatives are shown in Figure 3.1-16 and described further in the following subsections.

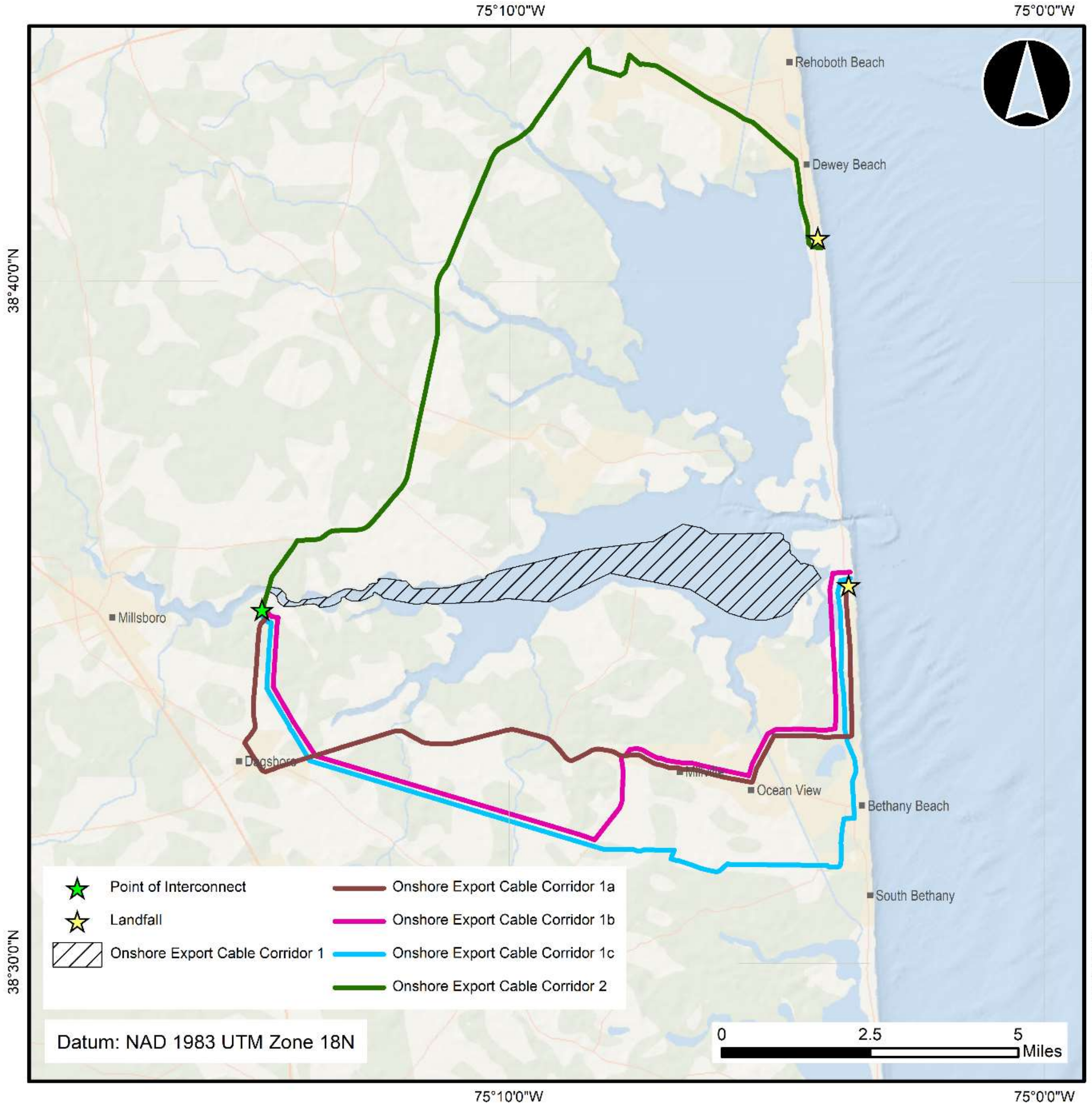

Figure 3.1-16. Onshore Export Cable Corridors

Onshore Export Cable Corridor 1

Onshore Export Cable Corridor 1 is the proposed cable route for the Project and is associated with landfall at 3R's Beach. Onshore Export Cable Corridor 1 would bring up to four onshore 230-275 kV export cables through cable ducts that route the cables under existing coastal wetlands into Indian River Bay. Onshore Export Cable Corridor 1 extends 17 km (10 mi) from the transition vaults within a corridor within Indian River Bay to Indian River at the landfall location to the US Wind substations. When the cables reach US Wind's substations' cable ducts, they will be pulled into the cable ducts and into the substations' transition bays. The landfall in Indian River for US Wind's proposed substations is adjacent to the existing DPL Indian River substation. An overview of Onshore Export Cable Corridor 1 is provided in Figure 3.1-17.

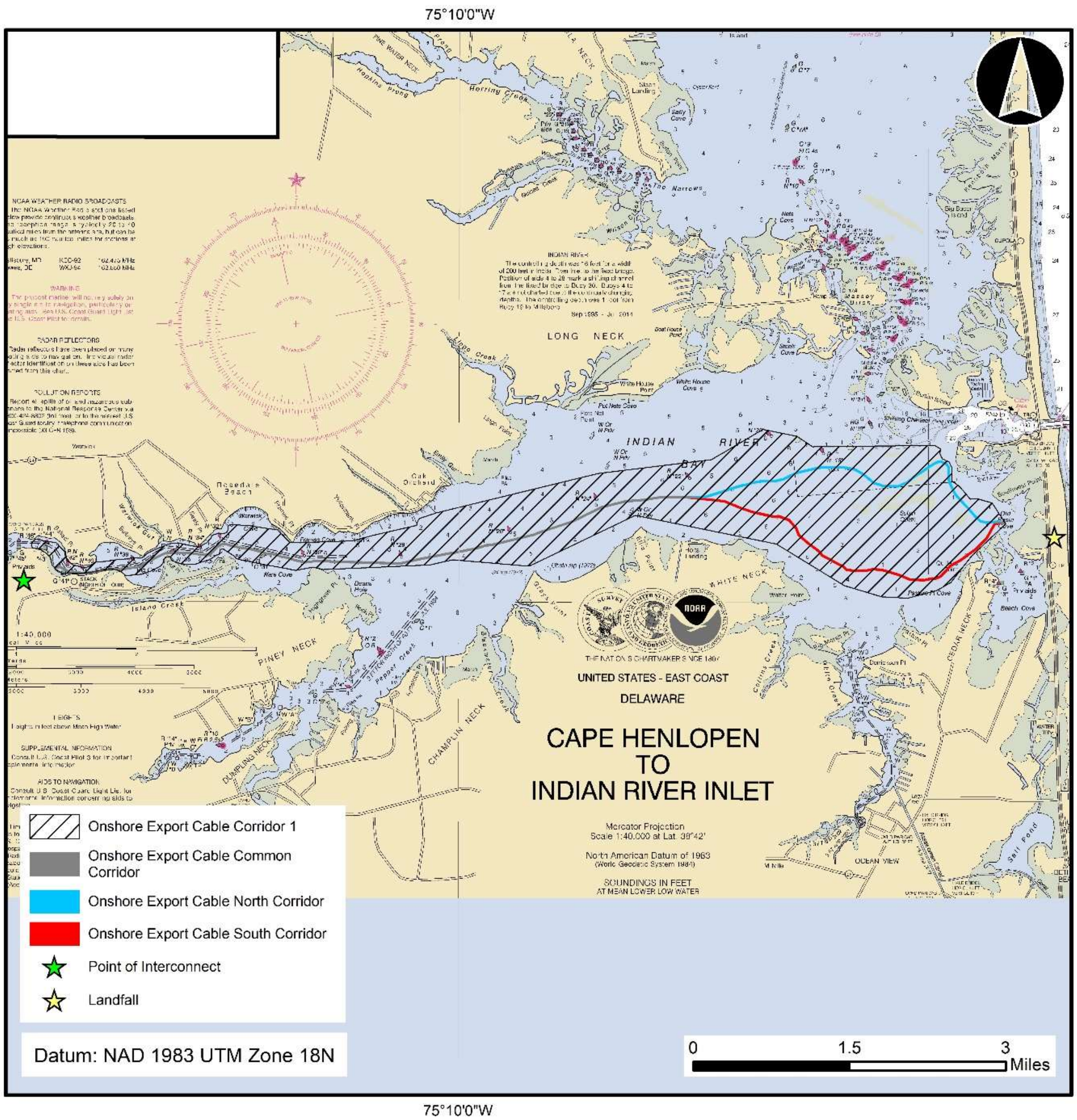

Figure 3.1-17. Onshore Export Cable Corridor 1

Onshore Export Cable Corridor 1 is anticipated for the cables due to the feasibility and constructability of the cable corridor. Two potential alignments for the cables, Onshore Export Cable North Corridor and Onshore Export Cable South Corridor, are identified in Figure 3.1-17. Both alignments begin in the eastern portion of Indian River Bay, which is predominantly sandy sediments, and pass to the west and the point of interconnect through muddy sediments. Onshore

Export North Corridor is closer to the tidally dynamic Indian River Inlet. The minimum width of the four-cable installation would be 40 m (131 ft) while the maximum width would be dependent on bay bottom conditions, considering the thermal properties of the soil and proper cable spacing. Determination of the final alignments for up to four cables would be made in consultation with BOEM, USACE, and the Delaware Department of Natural Resources and Environmental Control (DNREC). In Appendix B, Onshore Export Cable North Corridor is shown on Sheets 4-18 with Onshore Export Cable South Corridor on Sheets 19-23.

Alternatives – Terrestrial Onshore Export Cable Corridors

US Wind includes four optional terrestrial cable corridors in the PDE in addition to the proposed Onshore Export Cable Corridor 1 as shown in Figure 3.1-17. Cables would be buried along the terrestrial corridors, pending final design for any road or water crossings, along existing ROW, or ROW under development. Cables for any land-based routes would be (1/C) 230-275 kV single copper or aluminum core cables. Three single conductor (single phase) cables would be installed in parallel, possibly sharing a cement bound sand block (see COP, Volume I, Appendix I-J [US Wind 2023]) in the ROW, to complete the circuit from the OSS to the POI.

Below is a description of each alternative onshore cable corridor, the landfall associated with each, as well as the POI. These routes are discussed further in Section 4.0.

- <u>Onshore Export Cable Corridor 1a:</u> Approximately 26 km (16 mi) from the landfall at 3R's Beach along existing DelDOT ROWs to Indian River POI via a southern route around Indian River Bay.

- <u>Onshore Export Cable Corridor 1b</u>: Approximately 26 km (16 mi) along existing DelDOT ROWs and Sussex County ROWs under development from landfall at 3R's Beach to Indian River POI.

- <u>Onshore Export Cable Corridor 1c</u>: Approximately 27 km (17 mi) along existing DelDOT and Sussex County ROWs under development from landfall at 3R's Beach to Indian River POI.

- <u>Onshore Export Cable Corridor 2</u>: Approximately 28 km (17 mi) along existing DelDOT ROWs from landfall at Tower Road to Indian River POI via a northern route around Indian River Bay.

3.1.6 Substations

Connection of the Project to the electrical grid is anticipated through a combination of substations built by US Wind and expansion of an existing DPL 230 kV substation at the POI.

3.1.6.1 DPL Substation

US Wind proposes to interconnect to DPL's Indian River 230 kV substation (Indian River Substation), located near Millsboro, Delaware. An aerial view of the Indian River Substation can be seen in Figure 3.1-18. The Indian River Substation is located adjacent to the Indian River Power Station. An expansion of the substation of up to two acres is expected to accommodate the new capacity and required transformers, breakers, switch, and control gear. Appendix E contains the engineering plans for the US Wind substations.

US Wind has an established interconnection through ABI-056, and AFI-007, and AH1-634 for 323.1 MW to connect to an empty bay of the Indian River Substation requiring minor modifications. Interconnection of an additional 448.8 MW and 897.6 MW through queue positions AG2-347 and AG2-348, respectively, would require expansion of the Indian River Substation to accommodate the additional capacity.

Figure 3.1-18. Indian River Substation

3.1.6.2 US Wind Substations

US Wind proposes to construct new substations adjacent to an existing DPL substation at the POI. The anticipated location of US Wind's substations is adjacent to Indian River Substation.

US Wind's substations immediately adjacent to the proposed Indian River Substation and expansion are shown in Appendix C. The drawings demonstrate a preliminary general arrangement of the substations; however, the final design may vary. The US Wind substations would be constructed to the west and southwest of the Indian River Substation. The proposed arrangement of the US Wind substations allows for expansion of the Indian River Substation and allows for sequential construction of the US Wind substations. The onshore export cables would exit the HDD duct, into underground transition vaults approximately the same size as transition vaults at the Barrier Beach Landing locations, and traverse underground to be terminated at the respective US Wind substation block . Some or all of the underground cables connecting from the transition vaults to the new substations would be installed using HDD approximately 6 m (20 ft) below grade. The US Wind substations would connect to the Indian River Substation via overhead line. The transmission line between the new US Wind substations and the Indian River Substation POI is expected to be a short overhead transmission line, subject to any applicable DPL discretion. US Wind proposes that the two substations will be adjacent to one another such that any overhead transmission line will be less than 152 m (500 ft) long.

US Wind is evaluating gas-insulated and air-insulated substations for the Project which have different maximum footprints and tallest structures within the substation. Ground disturbance below the substation is estimated to extend 4 m (12 ft) below grade. Preliminary design drawings of both substations are included in Appendix E.

3.1.7 O&M Facility

The operations and maintenance facility (O&M Facility) provide a suitable location to plan and coordinate WTG and OSS maintenance and servicing operations for the Project from the Ocean City, Maryland region. The O&M Facility will be comprised of onshore office, crew support, and warehouse spaces with associated parking in the Ocean City commercial harbor and will include quayside and berthing areas for four or more crew transfer vessels (CTVs). The O&M Facility will also house a Marine Coordination Center, which will serve to monitor the status of the WTGs and OSSs via SCADA systems, plan maintenance operations and dispatch CTVs, monitor marine activity in the Project area, coordinate drills and exercises, and communicate with outside agencies. The facility will be located in a suitable commercial real estate location of up to three acres and in close proximity to the Ocean City harbor in order to limit maintenance crew travel times, ensure efficient operations, and reduce unnecessary handling of parts and equipment.

The proposed O&M facility location is likely to be located on two adjacent sites on the waterfront in West Ocean City, Maryland. The waterfront sites together are approximately 1.5 acres in size. Specifically, both potential parcels are waterfront properties with suitable water depth and mooring space in the commercial harbor to safely support four or more CTVs. Under the Worcester County zoning regulations, the sites are zoned Commercial Marine which is designated for the commercial fishing industry and "commercial, industrial and recreational uses which of necessity must be located in close proximity to waterfront areas".

The two waterfront properties currently under consideration are 12933 Harbor Road and 12929 Harbor Road.

US Wind would grade portions of the sites to prepare for construction of new buildings approximately three stories and no more than 13.7 m (45 ft) high, set back at least 7.6 m (25 ft) from the tidal waters. New buildings would include a crew support facility and a temporary warehouse, as well as a combined administrative building and warehouse to be completed later in the Project. Expansion or replacement of the existing waterfront access points would be undertaken in consultation with the Maryland Department of the Environment (MDE) and U.S. Army Corps of Engineers (USACE), including for the replacement or expansion of pavement to allow for vehicle parking and vehicular/forklift access to new cranes or davits that would load materials onto the CTVs stationed at the berth/quayside.

The facility's waterfront location in the Ocean City commercial harbor will allow technicians efficient access to the Project offshore via CTVs, ensure dedicated monitoring of WTG and OSS operations, support planning and coordination of maintenance activities, allow marine coordination with US Wind CTVs, other marine traffic, and emergency response agencies, and facilitate world-class support of the WTG and OSS maintenance technicians. The co-location of administration, operations, and warehousing will support efficient planning and coordination, limit maintenance crew travel times, house spare parts, tools, and equipment next to the CTVs on the waterfront, and reduce unnecessary handling of parts and equipment.

US Wind plans to acquire suitable properties that will be capable of berthing up to four or more CTVs. The waterfront property will support the onloading and offloading of parts, tools, and personnel needed for operations and maintenance on the WTGs and OSSs with ingress/egress to the Project area via the Ocean City Inlet. See Figure 3.1-19 and Figure 3.1-20 for the proposed quayside operations site and a rendering of a potential layout of the O&M Facility, respectively.

Site improvements would include the replacement of a timber pier and the existing bulkhead/quay wall. The pier is anticipated to be up to 625 ft (191 m) long and 28 ft wide (8.5 m). The existing bulkhead/quay wall would be replaced from the end of the pier to 175 ft (53 m) west. Equipment deployed on the pier deck would include jib cranes and mooring hardware to allow for CTVs to dock and receive the necessary crew and equipment. The 28-ft (8.5-m) pier would allow for a truck to assist in loading equipment on to vessels. Plans for the O&M Facility are provided in Appendix F.

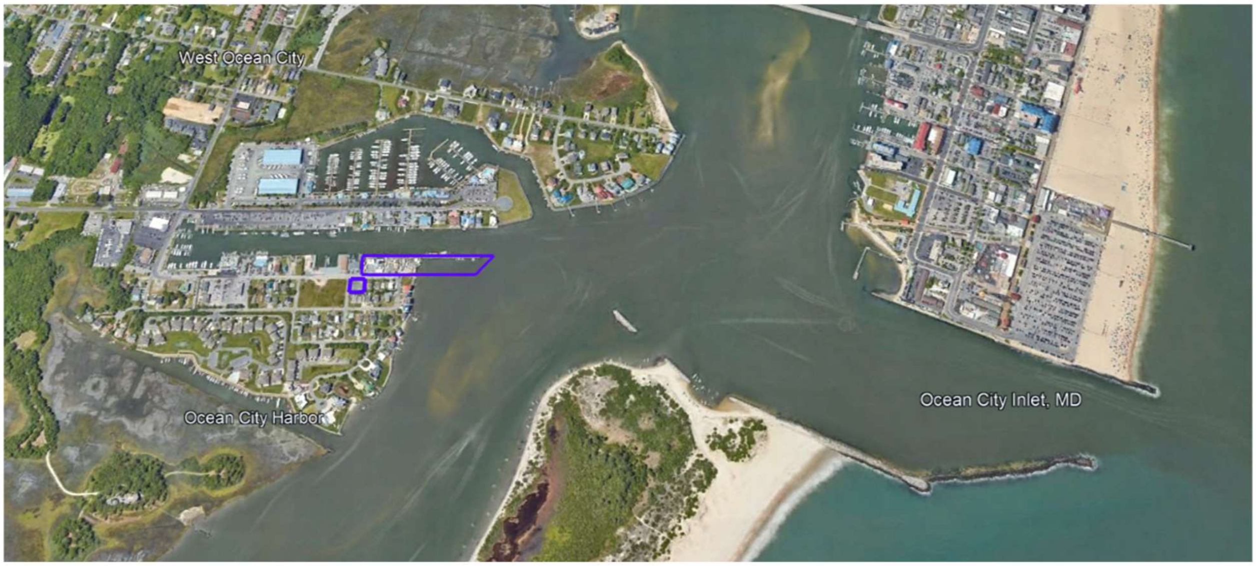

Figure 3.1-19. Potential Ocean City Harbor Quayside Operations Site

Figure 3.1-20. Notional rendering of O&M Facility in Ocean City, MD

Larger deep draft vessels needed to support routine or unplanned maintenance activities involving larger parts and equipment than cannot be transported via CTV, would likely mobilize from additional ports as presented in Table 3.1-6.

Table 3.1-6. Potential O&M Ports

Port	Potential O&M Activities
Ocean City, MD	Maintenance activities for WTGs, OSSs, and routine inspections
Lewes, DE	Maintenance activities for WTGs, OSSs, and routine inspections
Portsmouth, VA	Major maintenance activities requiring deep draft or jack-up vessels
Baltimore, MD	Major maintenance activities requiring deep draft vessels

3.2 Project Fabrication and Installation

Construction of the Project is proposed over up to four campaigns. Each construction campaign will follow this general sequence:

- Mobilization and upgrades of construction and staging facilities
- Fabrication and delivery of Project components
- Realize grid connection including onshore export cables and substations
- Vessel mobilization
- Installation of the OSS
- Offshore export cable installation (optionally before the OSS)
- WTG monopile foundation installation
- Inter-array cable installation
- WTG installation and commissioning

US Wind continues to evaluate and refine the Project design and works with suppliers to select the Project components, equipment fabrication, and assembly locations, as well as the transport and installation strategies for the Project. The final size of the Project and the development of the supply chain will govern the duration of component fabrication and Project construction activities. These aspects of construction and installation will be further solidified under BOEM's review and approval process of the COP.

Additional details regarding the infrastructure of the Met Tower, WTG Foundations, OSS Foundations, Cables, the O&M Facility, and Substations can be found in Section 3.1

3.2.1 Construction and Fabrication Facilities

Due to the global nature of the offshore wind supply chain, it is likely that some Project elements will be manufactured and transported to a staging facility for final assembly and transport to the Project site. The construction and staging facilities for the Project will allow for the receipt and fabrication of Project components as well as the pre-assembly of components prior to installation offshore. A facility at Sparrows Point, in addition to other locations, as needed, is anticipated to be utilized to support multiple Project activities including:

- Fabrication or assembly of foundations
- Storage and pre-assembly for turbines
- Storage and trans-shipment of export and inter-array cables
- Fabrication or assembly of OSSs and/or support components
- Fabrication or assembly of feeder barges
- Loadout of project components for installation offshore
- Support for other offshore wind projects' fabrication needs

US Wind evaluated several potential locations for construction and staging of Project components and anticipates utilizing facilities in the Greater Baltimore area, including Sparrows Point. Other port facilities elsewhere on the United States east coast could be utilized to support the Project and will be considered by US Wind on an as-needed basis. It is assumed that development of some infrastructure at the potential port sites will be required. US Wind will engage with the facility operators and component suppliers to determine where upgrades are occurring to support the offshore wind industry. Table 3.2-1 below, provides a list of proposed construction activities and related port facilities.

To the extent that upgrades or modifications at an existing port facility may occur, those upgrades or modifications would serve to support the United States offshore wind industry in general. Given the numerous states that are procuring, facilitating, and funding offshore wind development, both existing and upgraded as well as new port facilities are expected to serve multiple offshore wind projects and, potentially, offshore wind-related and other maritime industries.

US Wind anticipates that a separate corporate entity will be established to conduct a significant portion of fabrication, assembly, and staging activities for this Project and other offshore wind projects at a location in the Greater Baltimore area, which is expected to be at Sparrows Point[7].

US Wind expects that component fabrication and facility preparation will commence two to three years prior to offshore construction and that Project construction activities will occur over a period of between two to five years.

[7] US Wind is aware other proposed offshore wind development projects identify Sparrows Point as a potential staging or assembly location.

Table 3.2-1. Proposed Construction Activities and Related Port Facilities

Port Facility	Project Element	Activity
Baltimore, MD	WTG – Primary	Delivery, storage, pre-assembly and load out to installation or feeder vessel
	Foundation – Primary	Fabrication, assembly of components, load out to feeder or installation vessel
	OSS – Primary	Fabrication, assembly of components, load out to feeder or installation vessel
	Cable – Primary	Storage, load out to installation vessel
	Onshore Cable - Primary	Storage, load out to installation vessel (Indian River Bay crossing)
Hampton Roads, VA	WTG – Alternate	Delivery, storage, pre-assembly and load out to installation or feeder vessel
	Foundation – Alternate	Fabrication, assembly of components, load out to feeder or installation vessel
	Support – Alternate	Large support vessels, assembly of components, load out of feeder vessel
Ocean City, MD	Support – Primary	Support services, crew transfer
Port Norris, NJ	Support – Alternate	Support services, crew transfer
Lewes, DE	Support – Alternate	Support services, crew transfer
Cape Charles, VA	Support – Alternate	Assembly of components, load out to feeder vessel

3.2.2 Construction Project Management

US Wind plans to execute the Project through the management of major Engineering Procurement and Construction (EPC) contractors that are responsible for their areas of expertise.

The major Project work packages are:

- WTG installation
- Foundation installation
- Submarine cable (supply and) installation
- OSS installation
- Onshore substations supply & installation

Individual packages may be split into smaller components or completed by a single contractor.

Health, safety, security, and environmental (HSSE) procedures from the selected contractors will be aligned with the overall Safety Management System (SMS) managed by US Wind through a bridging process described in COP Volume I, Appendix I-B (US Wind 2023). The EPC contractors and their subcontractors will be subject to audits by US Wind to ensure proper application of HSSE regulations and procedures. All personnel providing services for the Project will be fully qualified and trained according to applicable safety standards and training requirements. The Project fabrication and construction packages will include the relevant Certified Verification Agent (CVA) oversight and inspection requirements as provided in the CVA scope of work in COP Volume I, Appendix I-D (US Wind 2023). Work packages will be structured to provide the following information:

- Execution Plan: The Execution Plan defines how the contractor will manage all phases of the package.
- Quality Management Plan: The Quality Management Plan defines a set of planned, systematic actions required to ensure that the works comply with the requirements from the contract, the project quality plans, and any regulatory requirements.
- HSSE Plan: The HSSE Plan defines the overall HSSE management system applicable to the package, taking into account the specific scope of work and package-specific HSSE-related requirements (from US Wind's SMS).
- Transportation and Installation Plan: The Transportation and Installation Plan is a comprehensive, package-specific procedure detailing how the work will be performed during the installation phase and incorporate constraints such as weather and the work of other contractors or seasonal restrictions.
- Inspection and Test Plan (ITP): The ITP will be developed by US Wind and the relevant fabrication and installation contractor(s) for each package. The ITP will define inspections and tests required to confirm that the project meets design, performance, and regulatory requirements as detailed in project documents and contracts.

3.2.3 Foundations for Wind Turbine Generators

3.2.3.1 Monopile Foundation Fabrication

US Wind plans a portion of the foundation fabrication and assembly work will be conducted at a location in the Greater Baltimore area, which is anticipated to be at Sparrows Point. This work scope is expected to include the fabrication of secondary steel works which may include concrete access platforms. The major phases of foundation fabrication and installation are as follows:

- Receive foundation components
- Assembly and coating of foundations
- Fabrication of secondary steel components
- Load out to feeder vessel
- Site preparation as required (obstruction removal and leveling)
- Foundation installation

For the first construction campaign, US Wind assumes that subcomponents of the monopile foundations will be supplied from Europe and transported to Sparrows Point for final welding and finishing. For later stages of construction, monopiles are expected to be fabricated and finished at Sparrows Point.

Installation of secondary steel components, including internal platforms and equipment, boat landing and access platforms, and fendering systems, is expected to occur at the staging area prior to transporting the foundation component offshore. Alternatively, in case of extended monopiles, all secondary steel will be installed offshore, either by the main installation vessel or by a smaller crane vessel.

3.2.3.2 Monopile Foundation Installation

Monopile foundations will be transported offshore to the installation site by self-floating or by using feeder vessels or direct installation vessels. The transport methodology will be determined by the location of the fabrication facility and availability of Jones Act compliant vessels. The tug and barge feeder concept is depicted in Figure 3.2-1.

Figure 3.2-1. Tug and Barge Feeder System for Foundation Transportation (Source: Wagenborg.com)

The number of feeder vessels employed will be determined based on foundation size and installation rate. US Wind assumes that up to four feeder vessels could be employed to support monopile installation. The feeder vessels may be jack-up vessels or tug and barge units. The feeder vessels may employ anchors for positioning. If anchors are employed, US Wind will utilize mid-line anchor buoys.

The feeder vessels will sail from Baltimore to the Lease area either via the Chesapeake and Delaware Canal and the Delaware Bay, or via the Chesapeake Bay.

During installation of each monopile foundation US Wind plans to confine bottom disturbance, for example the contact from legs of a jack-up vessel, to an area within a 300-meter (m) radius from the installation location.

Installation of the monopile foundations offshore will be conducted using either a dynamically positioned crane vessel or a jack-up style installation vessel equipped with a hydraulic hammer to drive the monopiles into the seabed. Monopile installation from a jack-up foundation installation vessel is depicted in Figure 3.2-2. An anchored vessel may be used for monopile installation but is not anticipated. If anchors are employed, US Wind will utilize mid-line anchor buoys.

Figure 3.2-2. Monopile Installation
(Source: Globalenergyworld.com)

Prior to or following installation of a monopile into the seabed, the first layer of scour protection rocks will be deployed in a circle around the pile location. This layer of small rocks, the filter layer, will stabilize the sandy seabed, avoiding the development of scour holes. The rocks will be placed by a specialized rock dumping vessel with a layer thickness of up to 0.5 m (2 feet [ft]). Once the inter-array cables have been pulled into the monopile, a 1-2 m (2-7 ft) thick second layer of larger rocks, the armor layer, will be placed to stabilize the filter layer.

Typical monopile foundation installation procedures are as follows:

- Foundation location is verified, any obstructions are removed, and leveled, if required.
- Feeder or installation vessel transports foundation to site; alternatively, monopiles are self-floating and towed to site.
- Installation vessel positions itself at foundation location including jacking and preloading as required. The use of anchors may be required in some instances.

- Monopile delivered to installation vessel, lifted from feeder vessel, upended (if necessary) and installed in pile gripper frame.
- Monopile verticality verified and pile allowed to penetrate seabed under its own weight.
- Noise mitigation procedures implemented.
- Pile hammer placed on monopile and soft start process commenced.
- Pile driven to target penetration depth, using as low impact energy as possible and no more than 4400 kilojoules (kJ).
- In the unlikely event that pile meets refusal prior to the embedment depth, relief drilling of the pile may be required. "Relief drilling" would be conducted using a trailing suction hopper dredger which would suction soils from the area creating sound similar to dredging operations. Any soils removed during relief drilling will remain at the foundation location and will be placed in the general area where scour protection will be later installed.
- If a TP is included in the foundation design, the TP is lifted from installation vessel or feeder vessel and installed. If a TP-less monopile is used this step would be omitted from the installation procedure.
- For the TP-less monopile installation process, the internal and external platforms and boat landing would be lifted from feeder vessel and installed on monopile.
- If a jack-up vessel is used the installation vessel jacks down and moves to the next foundation position.
- Installation of scour protection as required.

Installation would extend up to two days, including approximately two to four hours of pile driving operations. Pile driving will occur during daylight hours with operations beginning after sunrise and ending before dusk, unless a situation occurs where prematurely ending pile driving may cause a safety hazard or compromise the feasibility of the foundation installation.

US Wind intends to employ both near-field and far-field underwater sound mitigation technologies while the monopile is driven into the seabed. Near-field sound abatement technologies could include AdBm Technologies Noise Mitigation System and using a damper between the hammer and sleeve to prolong the impact pulse. Far-field technologies could include a large double bubble curtain, deployed by a separate vessel mobilized to the installation location.

The installation procedures will be refined as the design process continues and installation equipment is selected.

3.2.4 Offshore Substation

The OSS consists of the foundation and topside. US Wind's modular approach to the design of the OSS topside, as described in Section 3.1.3, allows for components to be fabricated at various locations with final assembly and testing completed at a port facility. The OSS topsides are expected to be supplied from either the Gulf of Mexico or Baltimore, or potentially from Europe or Asia depending on availability.

US Wind is evaluating monopile, piled jacket, and jacket on suction bucket foundations. OSS foundation drawings can be found in Appendix B. If monopiles are used for OSS foundations, supply and fabrication would be the same as described in Section 3.1.3. Piled jacket or jacket on suction bucket foundations would likely be supplied from Europe or the Gulf of Mexico and transported to the installation site.

3.2.4.1 Offshore Substation Foundation Installation

Foundations under consideration for the OSSs would be installed using varied procedures and installation methods.

Installation of monopile foundations and scour protection for the OSS follows the same sequence as described Section 3.1.2.1. Monopile foundations for an OSS have a separate TP with a number of J-tubes for the installation of inter-array cables and the Offshore Export Cable.

Piled Jacket Installation

Jacket foundations are typically installed in two ways: pre-piled (pin piles preinstalled in the seabed using a template) or post-piled (piles driven through jacket skirts). An OSS on a piled jacket foundation is shown in Figure 3.2-3.

If seabed preparation is needed to provide a level surface for the post-piled jacket or jacket on suction buckets, dredging equipment from a vessel would remove disturbed soil to create a firm and level base in the footprint of the foundation.

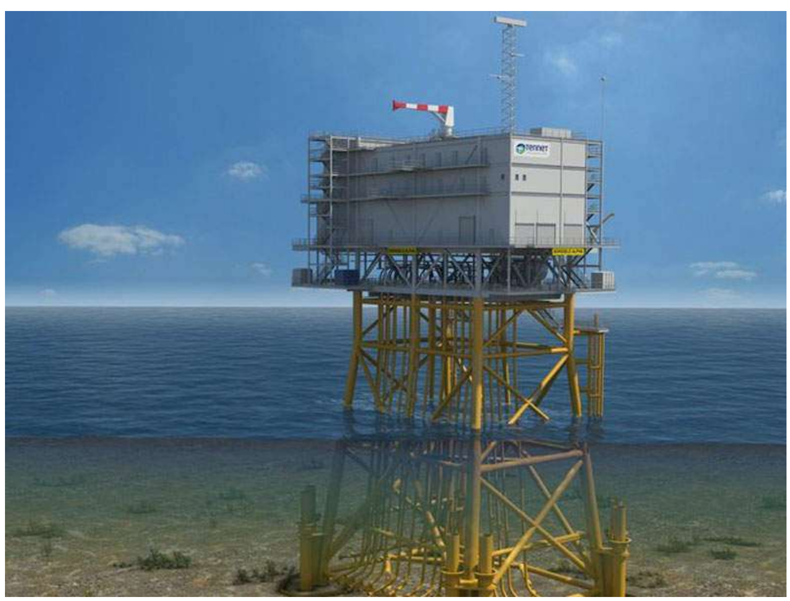

Figure 3.2-3. Example High-Capacity OSS with Jacket Foundation and Skirt Piles (Source: Tennet.eu, Borssele Alpha OSS)

Typical pre-piling installation procedures are as follows:

- Feeder or installation vessel transports foundation to site; if anchors are employed for positioning of vessels these may be installed ahead of vessel arrival.
- Piling template lifted from crane vessel deck and lowered to seabed. The piling template is adjusted using the hydraulically actuated template legs to provide a level frame for pile installation.
- Pile is lifted from the feeder vessel and lowered into the piling frame and pile allowed to penetrate seabed under its own weight.
- Noise mitigation procedures are implemented.
- Pile driven to initial embedment depth with impact pile hammer.
- Remaining piles lowered into piling frame and driven to initial depth.
- All piles driven to target embedment depth.
- In the unlikely event the pile meets refusal prior to the embedment depth, removal of the soil plug or relief drilling of the pile may be required. Any soils removed during relief drilling will remain at the foundation location and will be placed in the general area where scour protection will be later installed.
- Soil plugs removed from piles to ensure adequate depth for jacket stabbing mechanism.
- Pile heights above seabed are verified and piling template removed.

Typical jacket installation procedures are as follows:

- Feeder or installation vessel transports foundation to site, if anchors are employed for positioning of the vessels, these are installed ahead of vessel arrival.
- Pre-installed piles inspected by remotely operated vehicle (ROV) to ensure that sufficient soil is removed to allow engagement of jacket stabbing mechanism and cleaned to ensure appropriate bonding surface for grout adhesion.
- Jacket lifted from feeder vessel and lowered onto piling.
- Jacket gripper and leveling system engaged to level and secure jacket, if required.
- Grouting process commenced to permanently attach jacket to piling.

In case of a post-piled jacket, the jacket will be placed on the seabed and piles will be stabbed into the jacket pile guides (skirts). An underwater hammer will be used to drive the piles to target penetration. The jacket will then be leveled, if needed, and the top of the piles rigidly connected to the pile guides of the jacket.

Suction Bucket Installation

Typical jacket on suction bucket foundation installation procedures are as follows:

- Feeder or installation vessel transports foundation to site; if anchors are employed for positioning of the vessels, these are installed ahead of vessel arrival.
- Jacket on suction buckets delivered to installation vessel, lifted from feeder vessel, and lowered in the target area on the seabed (Figure 3.2-4).
- Verify correct orientation of the jacket.
- Activate and test the suction bucket dewatering pumps. Dewatering process commenced, drawing suction buckets to design embedment depth.
- Jacket verticality monitored during lowering, and suction pressure adjusted per bucket, if needed.
- Once the buckets have reached their target penetration, the suction pumps will be disconnected from the buckets by ROV and recovered to the vessel.
- Deploy scour protection, if applicable.

Figure 3.2-4. Jacket on Suction Bucket Transport (www.chpv.co.uk)

3.2.4.2 Offshore Substation Topside

Final assembly of the OSS topside will be completed at a port facility, potentially Sparrows Point, and loaded onto an appropriate feeder vessel for delivery to the installation location. The OSS topside installation is expected to be conducted in the following general sequence:

- Installation vessel positions itself at OSS foundation location. Anchors may be required in some instances for installation and feeder vessel positioning.
- Foundation is installed at the target location(s) depending on the type (Section 3.2.4.1). In case modular substations will be combined, a jacket foundation with pre-installed pin piles, post-installed skirt piles or suction buckets will be used. A module support frame (MSF) may be installed on the jacket to facilitate the installation of multiple topside modules for different phases of the Project.
- OSS topside is lifted from feeder vessel and lowered onto foundation or MSF.
- OSS topside is secured per design, which could include a bolted, grouted, or welded connection.

Following installation of the topside, inter-array cables and the Offshore Export Cable can be landed and terminated. Alternatively, the offshore export cables can be pulled in prior to topsides installation and temporarily stored on the cable deck of the jacket if jacket foundations are installed. It is expected that OSS commissioning activities will be supported from either a floating hotel (Flotel) or jack-up vessel.

3.2.5 Meteorological Tower Installation

The Met Tower structure was fabricated to the original design by Gulf Island Fabrication, Inc. (GIF) in Houma, Louisiana. A table of contents for the original GIF fabrication documentation provided as COP Volume I, Appendix I-K6 (US Wind 2023), with the specific sections available upon request.

Subsequent structural modifications and/or fabrication will be conducted under the supervision of Keystone at an appropriate facility. The candidate fabricators are expected to include, but are not necessarily limited to, GIF, Sparrows Point Steel (SPS), Maritime Applied Physics Corporation (MAPC), or another qualified manufacturer that has successfully fabricated similar structures in accordance with accepted engineering practices.

US Wind will use industry standard offshore construction techniques and equipment to install the Met Tower’s Braced Caisson foundation, deck, and mast. All installation work will be conducted under US Wind’s SMS.

A detailed installation plan will be developed based upon the originally planned installation procedures, which are summarized in part below, and updated based upon any design changes, the final approved Met Tower location, the available installation vessels and equipment, and anticipated installation schedule. US Wind will engage an installation contractor that has successfully installed similar facilities in similar offshore environments in conformance with accepted engineering practices. The Met Tower installation is anticipated to be overseen by the Project Engineer or CVA. The installation is planned to be documented in a Met Tower-specific Installation Report.

The following subsections summarize the planned sequence of construction and assembly activities and highlight some of the candidate United States-based installation and support vessels.

3.2.5.1 Meteorological Tower Installation Sequence

Offshore installation and construction of the Met Tower is planned to follow this general sequence of activities. The actual sequence of activities is planned to be updated based upon final design, timing of installation, and available vessels and equipment.

- Vessel mobilization at Baltimore or the Met Tower marshalling port
- Transportation of Met Tower foundation and met mast to the installation site
- Installation of Braced Caisson foundation and deck
- Installation of the met mast
- Installation of the sensors and ancillary equipment
- Commissioning of the sensor and communications equipment

Representative Met Tower installation activities are summarized below, based upon installation with a United States-flagged lift boat. Actual installation activities and sequencing will be updated based upon final design, timing of installation, and selected vessels and equipment.

- Prior to jacking into position at site, a brief bottom visual survey will be carried out to ensure the area is free of debris or any other impediments to the vessel legs.
- After ensuring the site is clear of debris, the lift-boat will jack up until it is in a secure and correct position to commence operations.
- The main 183-centimeter (cm) (72-inch [in]) diameter main caisson will be lifted into place from the materials barge to a driving template guide on the vessel ready for piling.
- Once the caisson is penetrated in the seabed, it will be driven to its design depth or refusal using either a hydraulic or diesel driven impact hammer rated at approximately 500 kJ.
- With the main caisson installed, the bracing pile guide will be lifted from the materials barge and set onto the caisson.
- The two bracing piles, each 152 (cm) (60 in) in diameter, will then be driven to design depth or refusal.
- The steel deck and boat landing appurtenances will then be installed onto the Braced Caisson configuration.
- Once the deck has been checked for level and is secure in place, the met mast and all ancillary equipment shall be installed.

The schedule duration of pile driving is anticipated to span approximately two days. Pile driving operations will occur only during daylight hours with a start of operations planned after sunrise. Piling operations will cease at dusk unless a situation occurs where ceasing the pile driving could cause a safety hazard or compromise the integrity of the Met Tower.

3.2.5.2 Candidate Meteorological Tower Installation Vessels

Installation of the Met Tower will be conducted by a qualified marine construction contractor. US Wind will select the contractor based upon final Met Tower design, installation timing, and vessel availability. Candidate installers include United States contractors based in Maryland and the Gulf of Mexico region, as well as US Wind's wind turbine and foundation installation contractor.

Candidate installation and support vessel that may be employed for Met Tower installation are summarized below in Table 3.2-2.

Table 3.2-2. Candidate Meteorological Tower Installation Vessels

Candidate Vessel	Representative Dimensions	Comments
WTG Installation Vessel	164 m x 60 m x 8 m (538 ft x 197 ft x 25 ft)	Jack-up vessel employed before or after WTG installation and supplied by barge
Self-Propelled Lift Boat	42 m x 30 m x 2m (137 ft x 100 ft x 7 ft)	Jack-up style construction vessel with accommodation
Materials Barge	122 m x 30 m x 4m (400 ft x 100 ft x 12 ft)	Flat top deck barge
Ocean Going Tug	43 m x 12 m x 4m (140 ft x 40 ft x 13 ft)	Ocean class tug with large horsepower (hp) and high bollard pull. Assists barge and other vessel repositioning as required.
Crew/Supply Boat	18 m x 5 m x 2 m (60 ft x 17 ft x 7 ft)	Crew boat designed for heavy weather. Transport crew to/from work site.
O&M Vessel	8 m x 2 m x 1 m (25 ft x 8 ft x 2 ft)	Fast utility vessel designed to carry 5 personnel and small parts

3.2.6 Cable Installation

3.2.6.1 Horizontal Directional Drilling

HDD operations will be employed for the Project to install cable ducts that allow for the installation of up to four export cables at the transition points between water and land. The Project as proposed includes HDD at up to three locations: between the Atlantic and landfall location at 3

R's Beach; from 3 R's Beach into Indian River Bay; and, from Indian River to the US Wind onshore substations. The HDD work may be conducted simultaneously or in stages depending on the final design of the Project.

The primary HDD drilling equipment will be located on land and will consist of a drilling rig, mud pumps, drilling fluid cleaning systems, pipe handling equipment, excavators, and support equipment such as generators and trucks. Land side operations will be in existing parking areas or other already developed areas such as access roads to avoid impacts to sensitive coastal habitats. The approximate footprint, required for HDD land side HDD operations, is 60 m by 46 m (200 ft by 150 ft). An overview of the landside HDD footprint for the offshore to onshore HDD point is shown in Appendix B, Sheets 36-38.

Water side HDD equipment will vary based on the installation location but will generally consist of a work platform (either a barge or small jack-up) and associated support vessels (such as tugs and small work boats). The work platform will be equipped with a crane, excavator, winches, and auxiliary equipment including generators and lights. The limited water depth in Indian River Bay is expected to require in-water operations to be based on a barge equipped with spuds for positioning. An anchor spread may be employed if required. The offshore (ocean based) HDD works may be supported by either a jack-up or barge depending on the final design and installation requirements.

The HDD process will follow industry practice and will utilize detailed operating procedure including fluids containment plans. Lubrication of the HDD drill bit and sealing of the HDD borehole will be provided through the use of a non-toxic bentonite water-based drilling mud. During the installation process, temporary excavation pits will be required at the onshore locations and gravity cells may be required at the in-water termination of the HDD bore.

An overview of the proposed HDDs for Onshore Export Cable Corridors associated with 3 R's Beach is shown in Appendix B, Sheet 38 between the Atlantic and landfall location at 3 R's Beach, Sheet 37 between 3 R's Beach and Old Basin Cove in Indian River Bay; and Sheet 36 at Deep Hole between the Indian River to the US Wind Substation connection in Millsboro, Delaware.

Final HDD lengths will depend on factors such as soil conductivity, cable design, and available installation methods to minimize disturbance in the shallow areas of the bay close to the landfall locations.

Onshore Horizontal Directional Drilling Preparation

Prior to the commencement of drilling operation, a pit, potentially lined with sheet pile if needed for support, will be excavated at the drilling site for each bore. Alternatively, a casing pipe may also be used and installed to help support the overlying soils. If sheet pile is required, it will be constructed of industry standard interlocking sheet piling driven to design depth using a vibratory hammer. The pit will be excavated to the depth required to allow for HDD boring, avoiding bentonite flowing into the water. It is expected that the excavation will be to a depth of approximately 3 m (9.8 ft). Any material from the excavation will be stockpiled in accordance with a storm water management plan and used for backfill or repurposed as required.

In Water Horizontal Directional Drilling Preparation

The offshore or in water end of the HDD duct may employ gravity cells, or a casing pipe in order to facilitate the installation of the cables, retain cuttings and drilling fluids, and to ensure that the HDD duct remains free of debris prior to installation of the export cable. The requirements for the gravity cells will be determined as the design and sequencing of the Project is finalized. It is expected that the gravity cells for in-water operations would be up to 60 m long and 10 m wide (197 ft long and 33 ft wide). The gravity cells will be designed to minimize the release of drilling cuttings and fluids and would be open on the seaward (outbound) side to facilitate the installation of the export cables.

Indian River Bay

Gravity cells, if employed in Indian River Bay, would remain in place until the Onshore Export Cable is installed in order to prevent silting in the HDD duct. Any structures installed in Indian River Bay will be marked and lighted as required in accordance with safety of navigation regulations. The gravity cell will be removed upon completion of the HDD duct installation. Any material excavated will be reused on site or disposed of at an appropriate offsite location based on the quality of the material. The excavation will be backfilled with the excavated material and/or the appropriate clean fill upon completion of the work.

Offshore

Materials removed from the gravity cell for the installation of the HDD duct will be reused on site or disposed of at an appropriate offsite location based on the quality of the material. The excavation will be backfilled with the excavated material and/or appropriate clean fill upon completion of the work. The gravity cell will be removed upon completion of the HDD duct installation.

Transition Vaults

Upon completion of HDD operations, the transition vaults will be installed. Up to four HDD ducts and subterranean transition vaults may be installed at the landfall location. When fully installed the shore end of the HDD ducts will terminate in a transition vault and the water end will be sealed and buried to the installation depth of the offshore export cables. The proposed vaults are each approximately 12 m long, 3 m wide, and 3 m deep (40 ft long, 10 ft wide, and 10 ft deep). The HDD ducts will be connected to the transition vaults and backfilled. The transition vaults when fully installed will be accessed from ground level access points.

Horizontal Directional Drilling Operations

HDD operations commence with a pilot hole that is progressively enlarged by using progressively larger reaming tools.

The HDD drill rig will be set up behind the shore gravity cell and the drill advanced to the offshore exit point. During drilling operations, the drilling mud will be injected to cool the drill bit, provide lubrication, and stabilize the borehole. The drilling fluid (mud) is an inert bentonite slurry and will carry the cuttings back to the shoreside excavation pit for collection/removal of the cuttings and reuse. The HDD operation will include monitoring of the downhole water/bentonite slurry to minimize the potential of drilling fluid breakout. A series of reamers will be added to the drill string as soil conditions allow to progressively increase the size of the borehole until it is large enough to accept the final export cable duct.

When the required borehole diameter is achieved, a pulling head is attached to the drill string at the in-water end of the bore. Prefabricated sections of duct are attached to the drilling head and pulled into the borehole. Figure 3.2-5 below, shows an underwater view of a near-shore cable pull into an HDD duct. The duct sections are expected to be fabricated on shore and floated to the barge or jack-up for installation. A duct of approximately 60 cm (24 in) in diameter is planned and final sizing of the duct will be confirmed based on cable sizing and thermal properties of the soils.

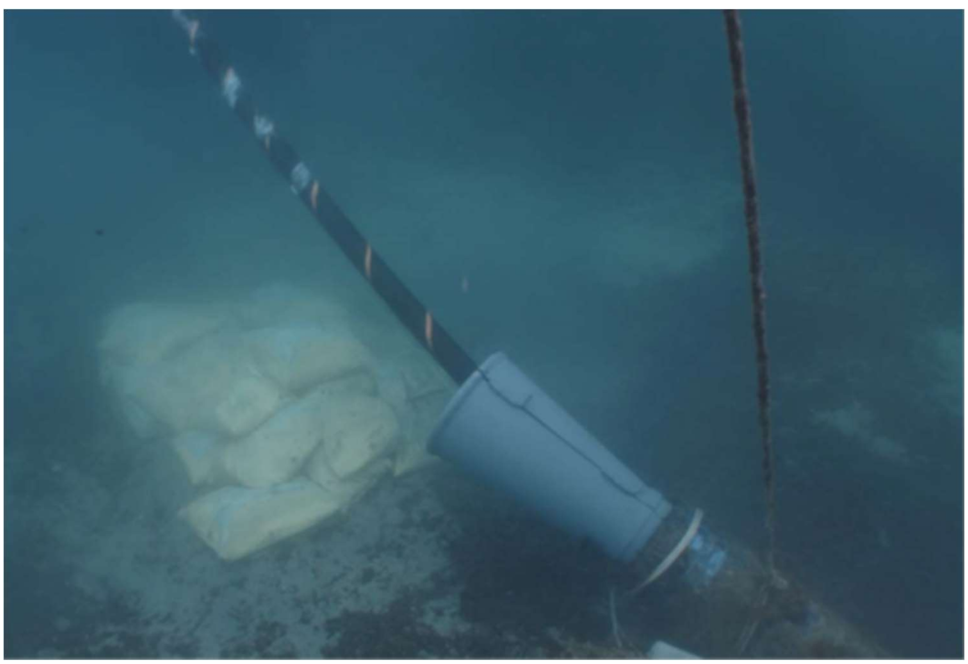

Figure 3.2-5. Underwater View of Near Shore Cable Pull into HDD Duct (Source: Nexans.com)

3.2.6.2 Offshore Export Cables

US Wind proposes up to four Offshore Export Cables will be employed on the Project. A single Offshore Export Cable will run from each OSS to the transition vault at the landing location where it would continue as an Onshore Export Cable along on Onshore Export Cable Corridor to the POI. Cables will be sourced from global suppliers, likely from the United States, Europe, and Asia.

US Wind proposes the Offshore Export Cables will be loaded at the manufacturing facility onto the cable installation vessel. The cable installation vessel will then transit to the installation location. The main elements of the Offshore Export Cable installation are:

- Insertion of gravity cells, if required, and installation of HDD ducts at landfall.
- Route clearance including a pre-installation survey and grapnel run.
- Jet plow installation trial.
- Installation and simultaneous jetting of cable.
- Pull-in of the cables through HDD ducts into jointing/transition vaults.
- Cable pull-in at the OSS.
- Post-lay burial and mattressing, if needed.

Route clearance activities will be conducted prior to Offshore Export Cable installation including a pre-installation survey and grapnel run. The pre-installation survey and grapnel run will be conducted along the Offshore Export Cable Corridor to remove debris such as lost fishing nets or other objects that could impact the cable lay and burial. Collected debris will be recovered and disposed of in appropriate shore side facilities. Pre-installation seabed preparation, such as levelling, pre-trenching, or boulder removal, is not currently expected.

A specialized cable lay vessel such as Nexans Skagerrak as seen Figure 3.2.6 is anticipated to be employed to install the Offshore Export Cable. The cable installation vessel will be supported by smaller vessels as required for activities such as guard duty, pre- and post-lay surveys, access to shallow waters, and support for pulling of the cable into HDD ducts.

The installation process will commence with the offshore cable pull in through the HDD duct (see Section 3.2.6.1 for HDD process) into the cable jointing/transition vault at the landfall location. Upon completion of this phase the cable installation vessel will commence the direct laying of the cable on the seabed along the prescribed route to the OSS. Based on the sandy seabed observed along the Offshore Export Cable Corridors, it is expected that a jet plow will be employed to bury the cable to target depths of approximately 1 to 3 m (3.3 – 9.8 ft), not more than 4 m (13.1 ft). The jet plow uses a combination of high-pressure water to temporarily fluidize the sediment and the cable subsequently settles into the area opened by the jets through a combination of its own weight and a depressor arm. The displaced sediment settles back over the cable effectively burying the cable. If needed, a trenching tool may be employed in areas with harder bottoms. At the offshore end in the Lease area, the cable will be pulled into the OSS, tested, and terminated.

Figure 3.2-6. Nexans Skagerrak
(Source: Nexans.com)

On the basis of an as-buried cable survey, concrete mattresses will be installed at areas with insufficient burial depth if needed. US Wind estimates a maximum of ten percent of the Offshore Export Cable would require additional protection and is likely to be significantly less. The unburied cable section close to the OSS will run through a cable protection system (CPS), covered by the armor layer of the scour protection as described in Section 3.1.2.1.

Cable Burial Risk Assessments (CBRAs) have been prepared based on geophysical and geotechnical (G&G) survey data for the Lease Area (COP Volume II, Appendix II-K5 [US Wind 2023]) and export cables (COP Volume II, Appendix II-K7 [US Wind 2023]).

The cable installation vessel will employ DP, although anchors may be used in shallow waters. If anchors are employed, US Wind will utilize mid-line anchor buoys.

3.2.6.3 Onshore Export Cable

Onshore export cables would be installed in one or more of the Onshore Export Cable Corridors described in Section 3.1.5.3, including proposed Onshore Export Cable Corridor 1 which would enter Indian River Bay via HDD and traverse the Bay to an HDD exit location near the US Wind substations. Alternative cable routes on land would exit the transition vaults and be buried in the previously disturbed ROWs along the designated corridor.

Onshore Export Cable Corridor 1

For the proposed Onshore Export Cable Corridor 1 the Onshore Export Cables will be installed between the 3 R’s Beach landfall and the US Wind substations adjacent to Indian River Substation. Prior to installation in Indian River Bay, route clearance activities will be conducted including pre-installation survey and debris removal and disposal, as needed. An overview of Onshore Export Cable Corridor 1 is provided in Figure 3.1-17 which includes a northern and southern cable alignment. Appendix B provides detailed descriptions of Project plans and profiles within Indian River Bay.

- Up to four Onshore Export Cables would span a minimum 40 m-wide route to allow for appropriate cable spacing, although in multiple areas cable spacing or site conditions may necessitate a route wide than 40 m.
- Where the cable alignment overlaps portions of the federal navigation channel, particularly within Indian River, cables would be buried below the lowest channel maintenance depth to avoid interference with future maintenance dredging and to protect the cables in such instances.
- Areas where the HDD punch-out locations may occur are subject to additional review of site conditions and micro-siting.

The cable installation spread will be arranged to maintain a limited draft and may be arranged on multiple barges. A cable storage barge will be equipped with a turntable, loading arm, and cable roller highway towards a cable installation barge. The barges would be suitable for positioning close to the HDD exit points due to the flat bottom and shallow draft. It is expected that the barge will be moved along the cable route using a six-point anchor system, assisted by an anchor handling tug, in combination with spud piles. An example of a barge-based installation can be seen in Figure 3.2-7.

The cable will be fed to the HDD ducts using small boats and floatation where it will subsequently be pulled through the ducts into the jointing/transition bays. If necessary, a temporary cable roller highway will be pre-installed in shallow water. An image of this process can be seen in Figure 3.2-8. The cable barge will lay and bury the cable between the two end points maneuvering along the cable route using its anchoring system and positioned using spuds as required. Based on the sediments observed along Onshore Export Cable Corridor 1, US Wind assumes that a barge mounted vertical injector, which fluidizes the soil, will be the primary burial tool for the cable. The use of a cable plough or barge mounted excavator may be required in some areas. In shallow water, a self-driving or towed post-lay cable burial tool may be used.

No cable or pipeline crossings have currently been identified based on currently available information. It is anticipated that the cable will be installed in a continuous length, however if operational needs warrant, the cable can be installed in smaller sections and spliced. US Wind will optimize the cable installation and construction methodologies.

With any of the cable burial methods within Onshore Export Cable Corridor 1, the trench in the bay bottom would be narrow, about one meter, and would collapse immediately after the cable has been depressed into the trench. The required burial depth will be based on the anticipated long-term bay bottom morphology and is expected to be 1-2 m (3-7 ft). Up to four export cables may be laid in Indian River Bay with spacing of 10-30 m (32-98 ft) between the parallel alignments to allow for construction and any future maintenance. Construction would be confined to a corridor within Indian River Bay.

Figure 3.2-7. Block Island Cable Installation
Source: www.oceannews.com

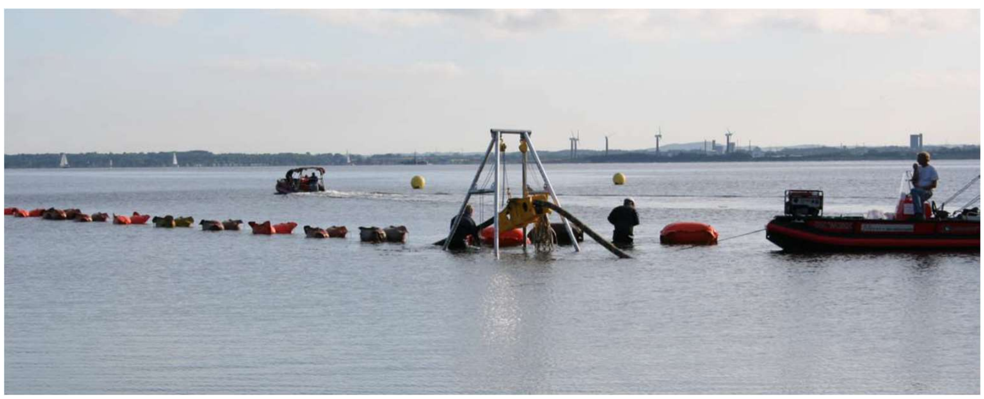

Figure 3.2-8 Example of Shallow Water Cable Installation

Dredging within Indian River Bay

To achieve the target burial depth US Wind and its contractors have determined dredging may precede cable installation in locations along the cable routes for barge access. Maximum dredging disturbance is assumed to be within 90 m (295 ft) wide along the route which is within a maximum 193-m (633 ft) area of temporary construction disturbance shown in Figure 3.2-9. Dredging would be conducted using mechanical, or most likely, hydraulic means. US Wind would conduct turbidity monitoring while performing dredging in Indian River Bay, in accordance with the requirements contained in the USACE and DNREC permits.

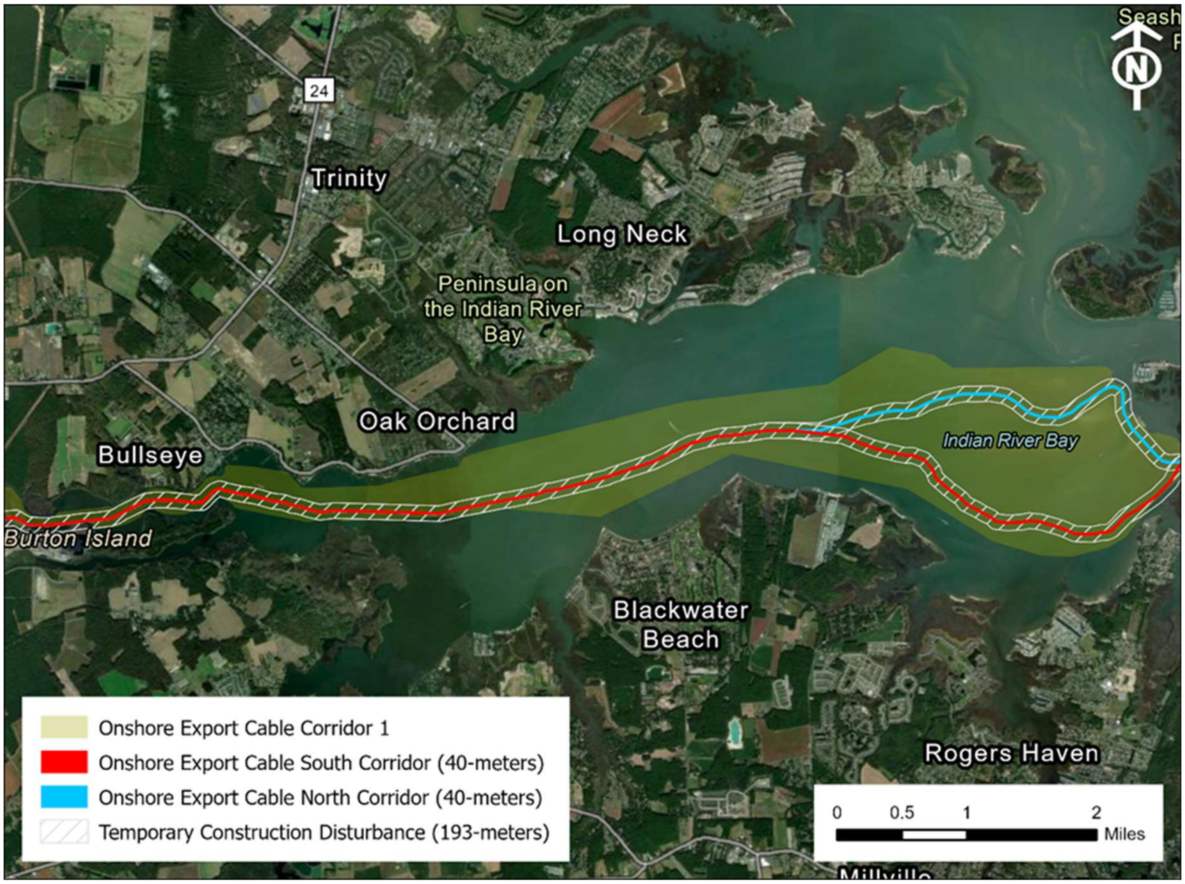

Figure 3.2-9. Onshore Export Cable Corridor 1 with Temporary Construction Disturbance Area

Dredging along the routes would be a maximum of 1.8 m (6 ft), varying from 1-6 ft (0.3-1.8 m) depending on location. Much of the route would be 1 m (3 ft) or less. Maximum volume of dredging, assuming all 4 cables installed in a single season, and across the entirety of the 295-ft width of the cable corridor, would be 916,000 cubic yards along the northern route and 1,368,000 cubic yards along the southern route, both inclusive of the common corridor.

The dredging material volumes are preliminary and worst-case. Small changes in the assumptions would result in the reduction of dredge material volumes by hundreds of thousands of cubic yards. Dredging volumes assume a uniform bay bottom depth of the shallowest point across the width of the 90-m (295-ft) temporary disturbance corridor for distances over 305 m (1,000 ft) in most analysis. The draft of the vessel is assumed to be 2.4 m (8 ft), which, if reduced, would result in significantly less dredging. US Wind continues to work with installation contractors to refine the assumptions based on bay bottom conditions and available vessels, and the expectation is that the dredge material volume would reduce appreciably. If construction stretches over two seasons, with the dredging window considered to be October-March based on prior dredging projects in Indian River Bay, the dredging volume would also be reduced due to a portion of the areas dredged the prior season.

The dredge volumes also assume all dredging is conducted by US Wind for cable installation and does not account for maintenance dredging projects DNREC may undertake for navigation purposes prior to US Wind's cable installation activities.

Dredging would be conducted using mechanical, or most likely, hydraulic means.

US Wind will conduct sediment testing to determine characteristics of the potential dredge material. Dependent on the outcome of this, multiple placement options for dredged material have been considered.

Dredge materials would be prioritized for beneficial reuse for beach renourishment north of Indian River Inlet, habitat reconstruction in Indian River and Indian River Bay, or other projects identified by USACE, DNREC, and other stakeholders. Clean material that meets human health screening criteria, primarily expected to be sourced in the eastern portion of Indian River Bay, would be appropriate for beach nourishment. Wetland and habitat restoration projects would use material of similar grain size and composition as the potential project areas, primarily located in the western portions of Indian River Bay and Indian River. Material not suitable for beneficial use projects would, if necessary, be placed in approved offshore or onshore disposal sites (see Figure 3.2-10).

US Wind would conduct turbidity monitoring while performing dredging in Indian River Bay, in accordance with the requirements contained in the USACE and DNREC permits. The permits would specify monitoring for analytes (e.g., TSS, turbidity, metals, PAHs, etc.), exceedance thresholds, monitoring distances, frequency/timing of the required sampling and depth at which samples will be taken. Turbidity monitoring in Indian River Bay would be constrained by the shallow depths in most locations in the proposed cable corridors. A boat-based and/or buoy-based turbidity monitoring procedure will be employed, depending on the specific permit requirements. US Wind would prepare a Turbidity Monitoring Plan for dredging operations for submittal to BOEM, DNREC, and USACE, as required, prior to conducting construction activity in Indian River Bay.

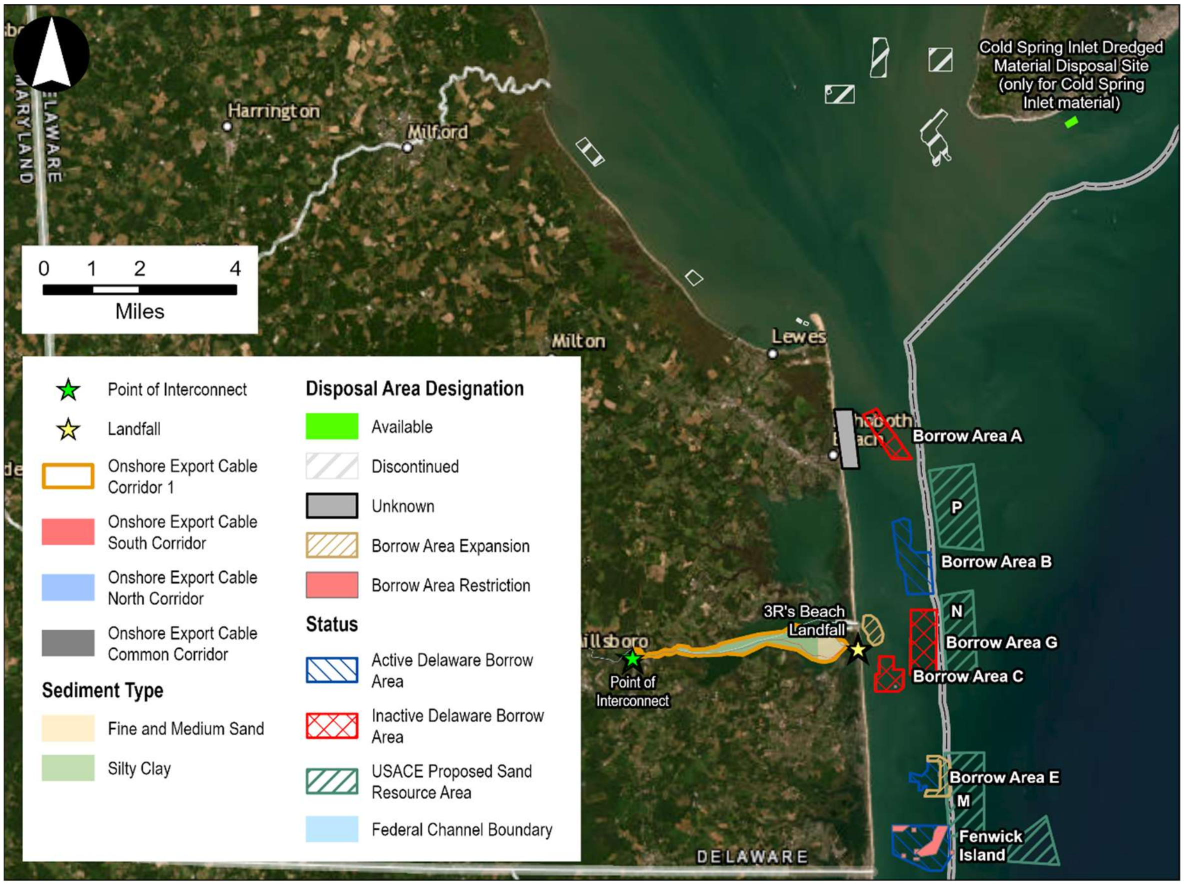

Figure 3.2-10. Indian River Bay Dredging Alternatives Breakdown

3.2.6.4 Inter-Array Cables

Inter-array cables for the Project are anticipated to be sourced in the United States, Europe or Asia and delivered to a staging area in Baltimore for load out to the installation vessel. The main elements of the inter-array cable installation are:

- Route clearance including a pre-installation survey and grapnel run.
- Installation trials as required.
- Cable lay and burial.
- Install cable protection systems.
- Perform pull-in and termination at OSS and WTGs.
- Installation of scour protection around the WTG foundations to avoid the development of cable free spans due to scouring, and to stabilize the CPS.

A pre-lay grapnel run will be conducted along the cable route to remove debris that could impact the cable lay and burial. Collected debris will be recovered and disposed of in appropriate shore side facilities. While the possibility exists that some seabed levelling, pre-trenching, or boulder removal may be required, it is not currently expected.

Prior to commencing inter-array cable installation activities, testing of the installation equipment is planned within the cable corridors to confirm that the equipment is working as expected. US Wind expects that cable equipment testing will be performed in several cable corridor locations on the site. The test locations will be determined based on the detailed seabed conditions identified during US Wind's geotechnical survey campaign.

The inter-array cable will be installed from a dynamically positioned cable installation vessel equipped with the required industry standard cable handling equipment as seen in Figure 3.2-11. US Wind assumes that the inter-array cable will be installed utilizing a towed or self-driving jet plow which allows for the direct installation and burial of the cable. The jet plow uses a combination of high-pressure water to temporarily fluidize the sediment and the cable subsequently settles into the area opened by the jets through a combination of its own weight and a depressor arm. The displaced sediment settles back over the cable effectively burying the cable. If soil conditions do not permit the use of the jet plow, a mechanical cutting/trenching tool or conventional cable plow may be employed. US Wind plans to bury inter-array cables between 1 to 2 m (3.3 – 6.6 ft), but no more than 4 m (13.1 ft).

The cable installation vessel will maneuver as close as possible to the WTGs or OSS as required, the cable will be cut and required cable protection and pulling mechanisms installed. The cable will then be pulled into the WTG to the hang-off platform, or into the OSS through a J-tube, secured, and terminated. Scour protection will be placed over the cable as required.

Post lay burial will be completed as needed. It is anticipated that this will be accomplished by employing a cable installation support vessel and an ROV system. Areas with cable crossings or hard bottoms may require additional protection means such as mattresses, rock placement, or cable protection systems.

Figure 3.2-11. Dynamically Positioned Cable Installation Vessel (Source: Deutsche Bucht and Van Oord)

3.2.7 Wind Turbines

US Wind anticipates receiving and preassembling WTG components at a staging area at Sparrows Point in the Greater Baltimore area. Delivery of the towers, blades, and nacelles from a European port would be accomplished using a mix of heavy lift and general cargo vessels, a representative vessel can be seen in Figure 3.2-12 WTG components will be stored and pre-assembled at the staging area and then moved offshore for installation.

Figure 3.2-12. Tower Sections Onboard the BBC Chartering and Logistic Ship M/V BBC Konan (Source: gcaptain.com)

The logistics and pre-assembly conducted at the staging area will depend in part on the WTG model that is selected. The general activities expected include:

- Receive WTG components, towers, nacelles, blades, turbine parts, site parts.
- Pre-assembly of the towers.
- Pre-assembly of nacelle as required.
- Load out to wind turbine installation vessel or feeder vessel.

The Greater Baltimore area has significant marine infrastructure and port facilities to support offshore wind projects. US Wind proposes to receive the WTG components at a staging facility at Sparrows Point. US Wind assumes feeder vessels will be employed to transport the WTG components to the installation location in the Lease area. Multiple feeder vessels are anticipated with the quantity and type to be finalized based on the WTG model selected and the construction schedule. The feeder vessel spread could be a tug and barge unit or jack-up vessel; a mix of commercial and technical factors will determine which vessels are ultimately selected. Tower sections may be pre-staged at a location seaward of any bridges between Greater Baltimore and the Lease area. The WTG installation vessel will likely sail to the installation site from Europe[8]. The feeder barges will sail to the Lease area either via the C&D Canal and Delaware Bay or via the Chesapeake Bay as shown in Figure 3.2-13. An installation vessel can be seen in Figure 3.2-14.

Regardless of the methodology employed to transport the WTG components to the site, the installation concept of the WTGs remains as follows:

- Positioning of the jack-up installation vessel, lowering and load testing of the legs, or if a floating installation vessel is used, position using DP.
- Positioning of the feeder vessel at the installation site.
- Lifting of the wind turbine components from the feeder vessel onto the deck of the installation vessel.
- Installation of tower sections either individually or as a pre-assembled unit onto the foundation.
- Installation of nacelle.
- Installation of individual blades.
- Commencement of commissioning.

Once the WTG is fully assembled, the commissioning of the WTG commences including the verification of structural and component fasteners and electrical and mechanical system field connections. Upon completion of the field assembly scope, the WTGs will be energized, and hot commissioning of systems will commence.

[8] US Wind expects that as the offshore wind market develops in the United States, United States flag installation vessels may become available as the market continues to mature. The availability and specification of a United States flag installation vessel would allow for the direct loading of WTG components onto the vessel. US Wind will comply with the Jones Act, as applicable.

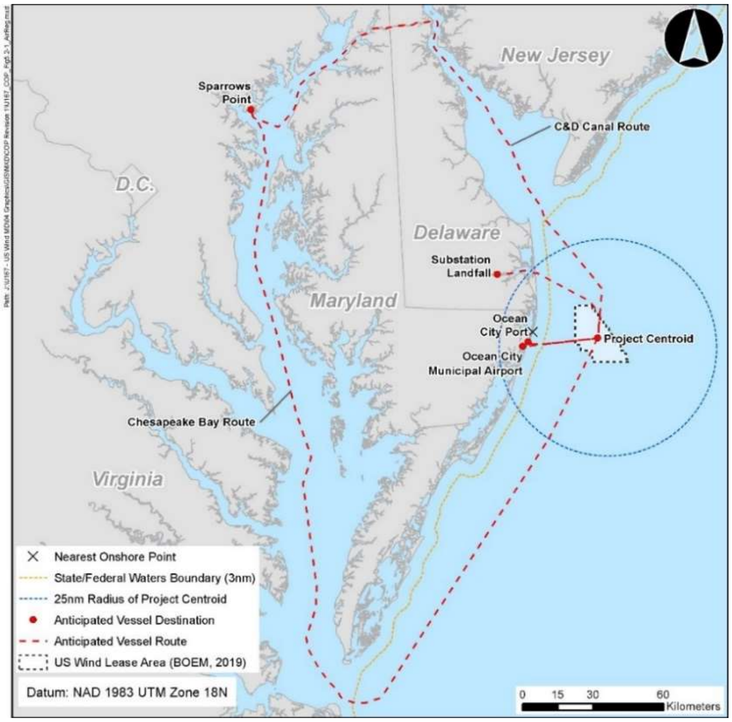

Figure 3.2-13. Vessel Routes to Installation Site from Sparrows Point Staging Area

Figure 3.2-14. Offshore WTG Installation Vessel (Source: blockisland.com)

3.2.8 Delmarva Power and Light Substation

The DPL Substation expansions at the POI will be governed by the final size of the Project and broader grid requirements. Delmarva Power and Light would construct the expansion of the substation. US Wind conducted preliminary design work to estimate the footprint of the Indian River Substation expansion required to support the Project. The maximum vertical extent above ground would be 18 m (60 ft) and below ground would be 4 m (12 ft). US Wind assumes that the DPL Substation would be expanded to accommodate the addition of up to four circuit breakers and the associated disconnect switches, metering, relay, and control panels.

3.2.9 US Wind Substations

The proposed US Wind substations would be constructed adjacent to the Indian River Substation. Typical onshore construction equipment, including cranes and earth moving equipment, will be employed to install the onshore substations. Tree clearing and ground disturbance associated with construction would be limited to the footprint of the substation. Ground disturbance is estimated to extend 4 m (12 ft) below grade. The new substations and access road could disturb up to 10.3 acres based on the initial design information. If feasible, US Wind will use an area already disturbed for construction laydown activities.

US Wind anticipates the substations would be constructed in phases aligned with the respective offshore campaigns, with up to four substations built out in approximately 400 MW blocks.

3.2.10 Project Commissioning

The Project will be commissioned in a sequential approach dictated by the construction activities, regulatory requirements, DPL, and PJM Grid Operator (PJM) Clearances.

Commissioning activities of the DPL Substation and US Wind substations will be similar to those of any land based electrical asset. The substations are expected to be the first components of the Project to be commissioned.

Sequential commissioning of the Project will then move to the OSSs, and Onshore and Offshore Export Cables, followed by the inter-array cables and WTGs. WTG and inter-array cable commissioning will occur on a per string basis. WTG pre-commissioning activities will commence prior to energization of a WTG string.

In order to conduct offshore commissioning activities in the most efficient manner, US Wind plans to employ a mix of accommodation vessels and service vessels. These vessels are intended to remain at the Project site during commissioning to reduce the time commissioning crews spend transiting from the shore to the site. CTVs will also be used to support movement of personnel to and from shore as needed.

3.2.10.1 Project Decommissioning

In general, structures and project elements will be decommissioned in the opposite order as they are installed and with the same or similar equipment. The first wind farms in Europe are just now reaching their design lives and are starting to enter the decommissioning process. As such, it is expected that means and methods will continue to evolve as more projects are decommissioned. US Wind will submit a Decommissioning Application to BSEE for approval per § 585.902(b) followed by required notifications per § 585.908. US Wind would also submit an application for decommissioning activities to USACE, therefore, decommissioning activities and impacts are outside the scope of the Application and are not discussed further.

3.2.11 Project Operations and Maintenance

As the owner and operator of the Project, US Wind will be responsible for daily operations, which includes planned and unplanned maintenance. US Wind's maintenance strategy assumes an integrated maintenance approach that incorporates the maintenance activities of all Project components in order to minimize the time technicians spend offshore and to minimize downtime.

US Wind's planned O&M Facility is intended to serve as the primary access point for Project maintenance activities. The 24/7 monitoring of the Project will be conducted at both the O&M Facility and at the original equipment manufacturers (OEM) remote operations center, which will monitor the WTGs and electrical systems and coordinate with the grid operator, PJM.

The O&M Facility will have access to an adjacent quayside area that allows for the loading of maintenance crews, replacement components, and consumables onto CTVs (Figure 3.2-14). The CTVs will transport the maintenance crews to the offshore site on an as needed basis dependent on weather conditions.

Figure 3.2-14 Quayside at O&M Facility ***Source: Marine Industry News***

The local operations and maintenance team will have the appropriate training to execute the maintenance scope of the Project including required safety training for marine, WTG, and electrical systems. Personnel will be trained and deemed competent for performance of maintenance operations on the WTGs, OSS, and supporting equipment.

The O&M strategy for the Project will be refined in conjunction with OEMs, EPC contractors, and regulatory agencies as design development, selection of project components, and installation data progresses.

3.2.11.1 Routine Operating Procedures

Project maintenance activities are divided into planned and corrective maintenance. Planned maintenance includes proactive repairs or replacements based on the outcome of routine inspections and information collected from the remote monitoring system. Corrective maintenance includes reactive repairs or replacements of failed or damaged components.

Planned maintenance is considered a component of the routine operating procedure. Corrective or unscheduled maintenance is part of the non-routine operating procedures and is discussed in Non-Routine Operating Procedures (see Section 3.2.12).

3.2.11.2 Routine Operating Procedures for WTGs

WTGs are designed to be operated remotely and only accessed by technicians for routine maintenance and inspections, or in the event of a fault that requires local reset or intervention. The monitoring of the operations will be performed remotely from the O&M Facility and from the remote OEM's operations center. All operational decisions are managed between the local O&M Facility and the remote operations center, including coordination on marine and aviation safety with United States Coast Guard (USCG) and Federal Aviation Administration (FAA), relevant local authorities, and the grid operator.

3.2.11.3 Routine Operating Procedures for OSS

The scheduled maintenance of the OSS components will take place at predefined intervals in accordance with the manufacturer's recommendations. Planned maintenance outage will be scheduled with PJM to avoid peak load periods. Scheduled maintenance will include high voltage protection functional testing, switchgear tests, and detailed transformer inspections. The OSS will be serviced by technicians trained in high voltage equipment.

In addition to the electrical focused scope of work, routine maintenance, and inspection of the OSS structure and support systems will also be conducted, such as structural integrity, corrosion protection, seabed scouring and maintenance of safety systems.

3.2.11.4 Routine Operating Procedures for Onshore Substations

Maintenance of the onshore substation primarily consists of non-intrusive inspections of switchgear, transformers, control systems, conductors, and support structures. Similar to the OSS, the scheduled maintenance of the onshore substation components will take place at predefined intervals, in accordance with the manufacturer's recommendations and in coordination with PJM.

3.2.11.5 Routine Operating Procedures for Power Cables

US Wind will monitor and survey the offshore export cables and inter-array cables and repairing as needed.

The routine procedures will include cable surveys, typically required to check the cable burial depths. Cable surveys are anticipated in year one, year three, and then every five years after. The frequency of the surveys may be adjusted based on the results of the first survey.

In case of insufficient burial or cable exposure, appropriate remedial measures will be taken including reburial or placement of additional protective measures.

3.2.11.6 Routine Operating Procedures for Foundations

Planned maintenance operations for foundations include visual inspections of the topside portions of the foundations and ROV supported inspection of the underwater portions of the foundation, including cable protection and cable entry, cathodic protection, and scour systems. During the initial operational period of approximately two years, foundations will be inspected visually above and below the waterline at least once. The findings of the initial inspections will inform the frequency of inspections to be completed later in the project life cycle, which is expected to be every 4 four or 5 five years.

3.2.11.7 Routine Operating Procedures for Met Tower

The Met Tower is designed for high reliability, redundancy, and remote operations. US Wind's operations team and a third-party contractor will jointly monitor Met Tower operations remotely via the high-speed remote data link and anticipated near real-time data transmission capabilities. Data issues, alarms, and/or other operational anomalies are anticipated to be flagged promptly remote operations and monitoring.

Operational protocols and scheduled maintenance plans for the Met Tower will be built on the final equipment configuration and the associated manufacturers and engineers' recommendations. Met Tower operational decisions are planned to be managed between the O&M facility and the contractor's remote facility.

3.2.12 Non-Routine Operating Procedures

Non-routine procedures include major repairs and emergencies. Major unscheduled or reactive maintenance is a significant repair or replacement activity that results in an extended shut down or the mobilization of a specialty vessel such as a jack-up or cable installation vessel. While these activities are not routine, plans will be developed in advance to mitigate their impact. Plans for managing non-routine events will include contracts with vessel service providers, strategic spares inventory or supply agreements, combined with procedures and plans to execute.

Non-routine emergency procedures will be governed by established plans such as the SMS. Specific emergency procedures to curtail or stop Project operations will be developed in conjunction with equipment manufacturer recommendations under the larger SMS.

3.2.13 Summary of Construction and Operations Vessels

A number of vessels will be required to support activities carried out during the development, construction, and operation phases of the Project. Specific vessels are required for surveying activities, foundation installation, OSS installation, cable installation, WTG installation, and support activities.

The vessels will vary in size and complexity based on their function on the Project. The vessels employed on the Project will be required to comply with applicable USCG and Jones Act regulations for conducting operations in United States waters. All foreign flag vessels employed on the Project will, in addition to USCG and Jones Act requirements, be required to meet International Maritime Organization (IMO) and International Marine Contractors Association (IMCA) requirements.

The majority of the vessels are expected to have conventional propeller- or thruster-based propulsion systems. Smaller vessels designed primarily for crew transfer applications are expected to employ water jet-drive based systems.

An overview of the vessels anticipated to be required and their characteristics is provided in Table 3.2-3[9].

The specific vessels selected to perform the required tasks during development and construction will be dependent upon availability at the commencement of each activity. US Wind will secure vessel supply in advance to prevent any delays to the construction schedule.

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[9] At this point in time, US Wind does not anticipate the use of aircraft during the construction phase of the Project.

Table 3.2-3. Vessel Summary

Vessel Class	Vessel Role	Foundation	Cables	OSS	WTG	Support	Operations	Approx. Length	Approx. Displacement	Approx. Crew Size	Est. # of Fuel Tanks	Estimated Max Fuel Storage Capacity
Utility boat, Fishing Vessel	• Marine Mammal Observers • Environmental Monitors • Guard Vessels • Acoustic Monitoring	X		X		X		15-25m (45-80ft)	20-250 t	2-10	2-6	8,000 L (2,110 gal)
Fall Pipe	Installation of scour protection	X		X				120-170 m (400-550 ft)	15,000-25,000 t	20-60	10-20	260,000-1,8M L (68,680-475,510 gal)
Heavy Lift and General Cargo	Delivery of project components from manufacturing location to staging/assembly port	X	X	X	X			120-223 m (394-735 ft)	15,000-200,000 t	15-25	10-20	260,000-1,800,000 L (68,680-475,510 gal)
Jack-up Crane or Floating Crane	• Installation of project components • Foundation • WTGs	X		X	X			120-225 m (400-740ft)	20,000-80,000 t	25-220	10-20	260,000-1,800,000 L (68,680-475,510 gal)

Table 3.2-3. Vessel Summary

Vessel Class	Vessel Role	Foundation	Cables	OSS	WTG	Support	Operations	Approx. Length	Approx. Displacement	Approx. Crew Size	Est. # of Fuel Tanks	Estimated Max Fuel Storage Capacity
	• OSS											
Multipurpose Offshore Supply	Supply of materials and consumables Pre lay grapnel run boulder clearance Noise Mitigation Foundation Grouting Refueling Cable Burial	X	X	X	X	X		65-90 m (210-295 ft)	500-3,000 t	8-25	10-20	378,000 L (100,000 gal)
Anchor Handling	Anchor positioning for installation vessels	X		X				20-80 m (65-262ft)	50-2,500 t	5-20	5-15	284,000 L (75,000 gal)
Crew Transfer Vessel	Crew Transfer	X	X	X	X	X	X	10-30m (30-100ft)	50-1,500 t	2-5	3-8	8,000 (2,110 gal)
Cargo Barge	Feeder Vessel: Delivering components from staging port to Project site	X		X	X			75-120m (250-400ft)	9,600 -17,000 t	N/A		N/A

Table 3.2-3. Vessel Summary

Vessel Class	Vessel Role	Foundation	Cables	OSS	WTG	Support	Operations	Approx. Length	Approx. Displacement	Approx. Crew Size	Est. # of Fuel Tanks	Estimated Max Fuel Storage Capacity
Tugs	Feeder Barge: Movement and general support	X		X	X	X		16-35 m (75-115ft)	250-2000 t	5-10	3-8	215,000 L (56,800 gal)
Jack-up or Accommodation vessel	Housing for offshore workers during construction			X	X			55-100 m (180-328 ft)	750-5,000 t	50-200	8-12	215,000 L (56,800 gal)
Survey	Pre-Installation and Verification Surveys G&G	X	X	X	X			13-112 m (45-350 ft)	400-3,000 t	5-70	5-12	8,000–52,000 L (2,110–13,800 gal)
Cable Laying	Cable Installation		X					80-150 m (262-492 ft)	1,200-15,000 t	15-45	10-20	120,000 L (31,700 gal)
Rock/ Mattress Placement	Placement of Scour Protection, Concrete Mattresses		X					130-170 m (427-558 ft)	25,000 t	20-60	10-20	260,000-1,800,000 L (68,680-475,510 gal)
Dredging	Seabed preparation/ leveling		X	X				75-120 m (250-400ft)	2,000-7,000 t	15-25	10-20	284,000 L (75,000 gal)

Table 3.2-3. Vessel Summary

Vessel Class	Vessel Role	Foundation	Cables	OSS	WTG	Support	Operations	Approx. Length	Approx. Displacement	Approx. Crew Size	Est. # of Fuel Tanks	Estimated Max Fuel Storage Capacity
Service Operation	Commissioning Activities			X	X			80 m (262 ft)	5500 t	20-50	8-12	284,000 L (75,000 gal)
Cable barge	In shore cable installation		X					30.5 m (100 ft)		2-4	1	3,785 L (1,000 gal)
Anchor handling tug	In shore cable installation		X					7.6–15 m (25–50 ft)		1-4	1-2	3,785 L (1,000 gal)
	*gal = gallon											

4.0 ALTERNATIVES ANALYSIS

US Wind evaluated use of the Lease area to maximize the production of clean, renewable wind-generated electricity and deliver the power to shore in a manner that avoids, minimizes, and mitigates impacts, where impacts are unavoidable. Some of the most significant impact-producing factors relate to the selection of foundation structures and the associated available construction measures for foundation installation, selection of viable export cable routes and landfall locations to available points of interconnection for connection to the regional electric grid, and the methods used to install the export cables. The alternatives analysis describes US Wind's evaluation and selection process, alternatives discarded and the reasoning why, and the alternatives to the proposed action carried forward in the analysis in Section 5.0.

4.1 Wind Turbine Locations

US Wind began data collection and evaluation about conditions in the Lease area upon securing the Lease. Site data collection was integrated with a detailed review of available project technology and installation methods. This resulted in a high degree of confidence that both the siting of the Project and proposed WTG spacing are appropriate and feasible. US Wind reviewed available marine mapping sources, such as the Mid-Atlantic Ocean Data Portal, for information about charted wrecks, fishing locations, potentially sensitive habitats, and existing maritime uses in and around the Lease area. The Project layout is based upon the extensive technical, environmental, and existing-use data library developed by US Wind.

US Wind established a gridded array for the WTG and OSS locations. Placement was governed primarily by soil conditions, relative distance to neighboring WTGs, known objects in the ocean floor, the boundaries of the Lease area, and optimal turbine layout to maximize energy production. Based upon estimated long-term wind conditions across the site and a review of commercially available and planned WTG models, US Wind developed an optimized layout that balances energy production, long-term operations, and navigation safety. The optimized layout has all proposed structures on a regular gridded array with a spacing of 0.77 NM (1.4 km, 0.89 miles) in the East-West direction and 1.02 NM (1.88 km, 1.17 miles) in the North-South direction. This layout accounts for wake effects and other traditional users of the Lease area from Ocean City, Maryland, which generally traverse the Lease area in an east-west direction. One location near the center of the Lease area was excluded due to a charted wreck in the Lease area that is also a recreational fishing location.

Review of existing and collected data informed the development of a 125-position layout that is used as the maximum design envelope for permitting. US Wind established a high-resolution geophysical (HRG) survey plan (Figure 4.1-1) based on the proposed layout to gather site specific data at each proposed location as well as for connecting inter-array cables and export cables. The muti-vessel HRG survey campaign spanned April 2021 through May 2022 and the data was used in multiple analyses such as site characterization, benthic resources and fish habitat, marine cultural resources, cable burial risk assessment, and sediment transport modeling. Results of the surveys and related analyses have not found any conflicts at the WTG and OSS locations requiring locations to be abandoned. Micro-siting to avoid potential paleo landforms may be necessary although the distances from the original planned positions do not exceed 50 m (164 ft).

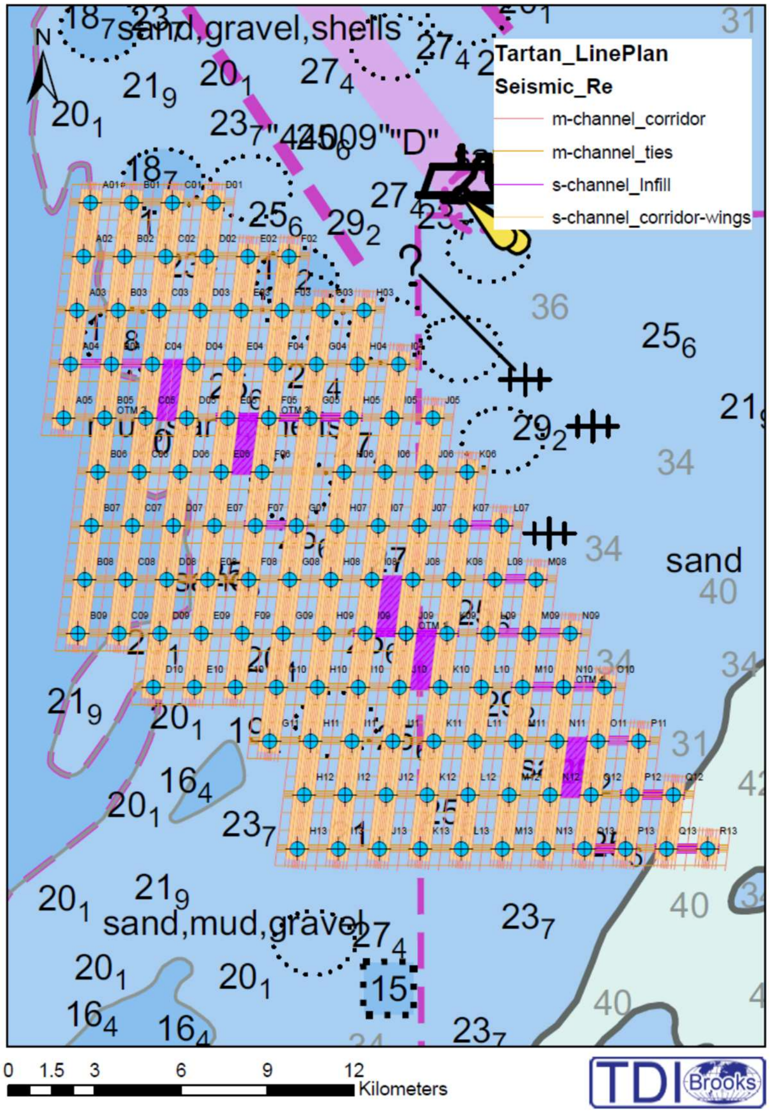

Figure 4.1-1. 2021 High Resolution Geophysical Survey Plan

US Wind’s array in the PDE includes 7 WTG locations along the eastern edge of the Lease area within 1 NM of the existing, and proposed extension of, the Traffic Separation Scheme from Delaware Bay. US Wind proposes to remove 7 WTG locations and maintain at least a 1 NM distance from the Traffic Separation Scheme as a navigation mitigation measure.

4.1.1 Alternatives Carried Forward

The PDE includes 121 WTG locations as an alternative to US Wind’s proposed development of 114 WTGs, removing 7 WTGs to maintain a 1 NM separation of the Traffic Separation Scheme. As described in Section 5.17, US Wind’s Navigation Safety Risk Assessment supports a 1 NM setback from the Traffic Separation Scheme as lower risk relative to the full 125-postion array. For example, removal of the 7 WTG positions within 1 NM lowered a key risk metric -- total Cargo / Carrier / Tanker allision risk -- from 1 allision in 92 years for the full array to 1 allision in over 100 years for the proposed array. US Wind supports the 1 NM setback as a mitigation measure.

4.2 Wind Turbine Generators

WTGs and their foundations are the most numerous and the most prominent components of the Project. Collectively, they also represent the largest portion of the installed Project's capital expenditures. Consequently, the WTGs and their foundations (as well as their installation methodologies, as described below) were given significant consideration in the development of the PDE. The following sections describe the options that US Wind considered for each of these Project components and the alternatives carried forward.

4.2.1 Wind Turbine Generator Configuration

US Wind is proposing to employ contemporary offshore WTGs in the Project, namely three-bladed, horizontal-axis, up-wind generators mounted atop tubular steel towers. Within this family of systems, the various WTG original equipment manufacturers have multiple models available and in advanced stages of development. Given the rapid pace of WTG technology advancement, these available and planned models represent a large range of component dimensions and nameplate generating capacities.

4.2.2 Wind Turbine Generator Foundations

US Wind considered alternate foundations for the WTGs; however, these were not carried forward in the design process. Monopiles are the proposed foundation due to favorable site conditions, market availability, and obligations in offtake agreements, and the potential to source monopiles in Maryland from Sparrows Point.

Jacket foundations for the WTGs are not typically employed at the water depths present across the Lease area. For commercial-scale projects, jacket foundations are more typically used in deeper locations where monopiles become less viable. Additionally, jackets would not likely be available or cost-effective for the Project. Suction caisson foundations have not been successfully used for WTGs and remain unproven for commercial projects. Gravity-base structures are not widely used in conditions such as those found within the Lease area and can have greater bottom disturbance than monopiles due to required site leveling and preparation. Additionally, each of these foundation types would be exceedingly difficult to manufacture at commercial scales in Maryland and would also significantly limit the number of vessels available to deploy them. These issues further reinforce the removal of jackets, suction caissons, and gravity bases from consideration for WTG foundations.

Installation of monopiles would be achieved by impact pile driving offshore. Impact pile driving generates significant underwater sound. US Wind considered the potential addition of a vibratory hammer for some or all of the monopile installation process, however, the seafloor and subsurface conditions are appropriate for impact pile driving. Layered far-field and near-field sound attenuation methods, standard among offshore wind projects, would be used to lessen the sound while construction monitoring by Protected Species Observers, empowered to shut down pile driving activity when protected species are in defined shutdown zones, will mitigate impacts (see Section 5.8.3).

4.2.3 Alternatives Carried Forward

Monopile foundations are the most appropriate foundations for WTGs in the site conditions, are commercially proven, and can be manufactured in the U.S. at scale.

4.3 Offshore Substations

US Wind is proposing up to four OSSs to support the collection and evacuation of power from WTGs within the Lease area. OSSs are complex, bespoke systems that can be most expensive single component within an offshore wind project. US Wind evaluated multiple candidate OSS configurations and foundations in the context of technical, commercial, and environmental parameters, carrying the most feasible options forward.

4.3.1 Offshore Substation Configuration

US Wind evaluated multiple OSS configuration options to support power collection and export from offshore wind projects, ranging from the deployment of no offshore substation – where power is sent ashore at the collection system voltage directly from multiple WTG strings – to high voltage direct current (HVDC) OSSs.

Starting with the general arrangement, US Wind evaluated the traditional stand-alone OSS configuration and a novel design that is collocated with a wind turbine, sharing one foundation. The novel design concept employs a compact main power transformer, compact switchgear, and other size-optimized components mounted around the base of a WTG, sharing a foundation with the turbine. This configuration theoretically eliminates the need for an individual OSS foundation. However, the complexity and cost of the foundations supporting OSS gear and a WTG increase significantly over a standard WTG monopile and over a traditional, stand-alone OSS jacket. Additionally, the collocation of the OSS equipment and a WTG complicates the deployment of mitigation equipment that would typically be housed on a stand-alone OSS. High priority equipment such as metocean and biological monitoring systems, cellular antennas, aircraft detection lighting systems (ADLS), etc., would have to be removed or significantly redesigned, if possible. US Wind abandoned the approach of collocating OSS equipment with a WTG on a single foundation and opted for a traditional OSS design on a dedicated foundation.

Multiple OSS location options within the Lease area were also evaluated. US Wind evaluated locating the OSSs at dedicated positions off the gridded WTG array to ensure maximum production from the site. However, this approach presented increased navigation complexity and risk by putting the largest structures in the farm off of the regular gridded array. The proposed OSSs locations on the gridded array ensure adequate site condition input data derived from the survey tartan (Figure 4.1-1 above) and lowers navigation risk through the Lease area. Navigation risk was further reduced by locating the OSSs centrally within the layout, such that they were less likely to be impacted by vessels adrift or without steering. The proposed central OSS locations within the layout also help minimize inter-array cable lengths and their respective bottom impacts.

Finally, US Wind evaluated OSS size options based upon anticipated WTG nameplates, site conditions, export cable capacity, interconnection capacity, ancillary systems, and other Project parameters. Concept studies for the Lease area indicated that two OSS size configurations were likely to be viable for the Lease. They are generally described as such:

- A nominal 400 MW nameplate capacity, collecting power from up to 30 WTGs and evacuating the power via one export cable with a voltage of up to 275 kV AC, and with a topside footprint of approximately 30 m by 42.5 m (98 ft by 140 ft).
- A nominal 800 MW nameplate capacity, collecting power from up to 60 WTGs and evacuating the power via two export cables, each with a voltage of up to 275 kV AC, and with a topside footprint of approximately 40 m by 80 m (131 ft by 263 ft).

Illustrative diagrams of both smaller (nominally 400 MW) and larger (nominally 800 MW) OSS are included in Appendix B.

4.3.2 Offshore Substation Foundations

US Wind evaluated multiple options for OSS foundations, in part because the relatively few OSS foundations -- up to four in the PDE -- can be individually built for a particular construction campaign. The loads on OSS foundations are also different than for WTGs, allowing for different configurations. The favorable soil conditions across the site offered a few additional feasible options, including a jacket with skirt piles, jacket with suction piles, and a monopile.

US Wind proposes to use jacket foundations with skirt piles for the OSSs. Monopiles and jackets on suction buckets are also included in the PDE. Jacket foundations in general are the most likely to be used based on industry practice, available installation vessels, and domestic manufacturing capabilities.

4.4 Point of Interconnect

The selected point of interconnect needed to be located along the coast and be able to handle the power capacity from the Project. Interconnection of the Project, including the individual construction campaigns, necessitates an existing POI of 230 kV or greater, as lower voltages would require significantly more cables and infrastructure to deliver the total capacity of the Project, resulting in significantly more impact to the community and environment. The Indian River point of interconnection (POI) proposed is the southernmost existing 230 kV interconnection point on the Delmarva Peninsula. South of the Indian River POI the grid only offers 138 kV, and therefore, all three of the feasible POIs are in Delaware, which correspondingly results in the lowest cumulative impact to the environment.

Because the electric grid south of Indian River POI is of insufficient size to accommodate injection of the power from the Project, or any of the three components thereof (MarWin, Momentum Wind and future development), a POI in Maryland would not be technically or economically feasible.

The POIs south of Indian River, Bishop, Worcester and Oak Hall, are 138 kV and geographically constrained, and are therefore insufficient to inject power from the Project without economically infeasible upgrades. Transmission upgrades to the existing 230 kV POIs on the Delmarva Peninsula are estimated to be hundreds of millions of dollars. Upgrade of the 138 kV system would certainly exceed the upgrade costs of 230 kV systems significantly and could be multiples of the 230 kV cost. Interconnection into the lower voltage substation, resulting in significantly greater impacts on the electrical infrastructure around the lower voltage substations, which would require significant expansion of real estate, replacement of entire substations, transmission lines, and equipment.

Indian River is also the site of a 1950's-era coal-fired power plant slated to retire. Using the existing infrastructure adjacent to a retiring fossil fuel power plant is an environmentally attractive alternative to building new, expensive, and disruptive transmission upgrades. It should be noted that PJM has notified Indian River Power Station that the plant cannot retire yet due to the need for power generation in the region to provide regional grid stability - another example of the fragile electric infrastructure and lack of alternative power generation on the Delmarva Peninsula.

230 kV POIs north of Indian River, specifically Milford and Cool Spring, were evaluated and initially proposed in the PDE. However, the PJM queue reform finalized December 2022, pushed projects without existing interconnection queue positions, which US Wind does not have at Milford or Cool Spring, beyond the Project schedule timeframe. Therefore, US Wind dropped the alternative POIs from consideration, along with the terrestrial export cable corridors, Onshore Export Cable Corridor 3 and Onshore Export Cable Corridor 4, from the PDE in January 2023.

US Wind also evaluated the option of developing a new greenfield POI along the existing 230 kV line, apart from existing substations. Initial property screenings evaluated sites along the 230 kV transmission lines in Sussex County, Delaware. While this approach addressed some of the build-out constraints at the existing substations, the associated siting, land acquisition, onshore routing, and interconnection challenges limited its viability. US Wind abandoned the approach and did not include any candidate POIs outside of Indian River.

4.4.1 Alternatives Carried Forward

No viable POIs exist on the Delmarva Peninsula that can accept power produced by the Project and are economically feasible to construct on schedule, i.e., before 2030.

4.5 Landfall Locations

Landfall locations between the Lease area and POI along the Delmarva Peninsula were evaluated in conjunction with viable routes for the offshore export cables described in Section 4.6. Landfall locations were required to be near the coast and contain a previously disturbed open area for installation of the transition vaults and construction footprint for HDD and cable pulling. Locations away from neighborhoods and developed areas were preferred to avoid construction impacts to residents.

Landing offshore export cables on the Maryland coast were eliminated due to extensive commercial and residential development in Ocean City, Maryland, which extends from the Ocean City Inlet to the border with Delaware (Figure 4.5-1). Similarly, landing cables in Delaware south of Delaware Seashore State Park were eliminated due to similar dense development. Open areas to accommodate construction of the buried transition vaults and export cable pulling activities at shore, and in the limited areas which are potentially open, the route to the POI from potential landfall locations is infeasible due to the length of the onshore cable routes, magnitude of impacts from extreme cable lengths, and cost to install cables on land over the significant distances.

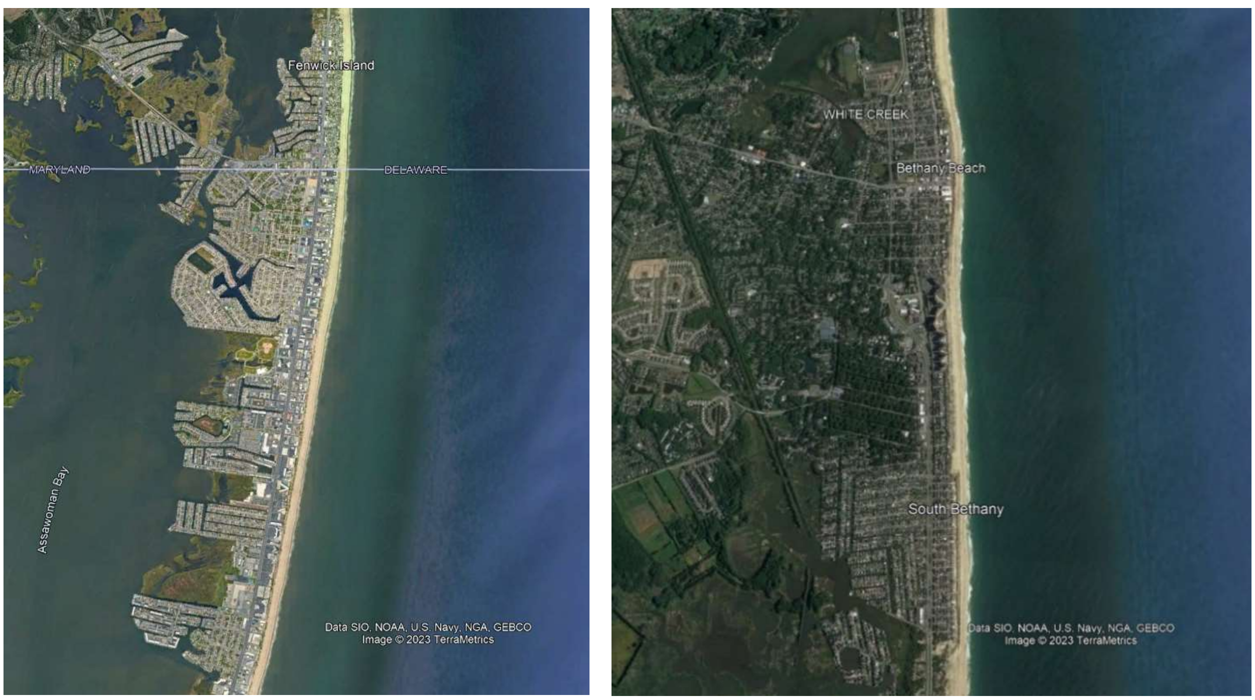

Figure 4.5-1. Examples of coastal development in Ocean City, Maryland and Delaware Border (left) and Delaware Development South of Indian River Bay (right)

Export cables also must avoid Indian River Inlet, a large connection between the Atlantic Ocean and Indian River Bay that is maintained by USACE.

The proposed landfall location at 3R's Beach Parking Lot includes sufficient, previously disturbed land (for the parking area) that would allow US Wind to construct the transition vaults underground and includes sufficient space for the temporary footprint of installation equipment to build the transition vaults, equipment to HDD under the protected dunes and beach to the Atlantic Ocean and HDD into Indian River Bay below the dunes, Coastal Highway 1, and wetlands, and equipment to pull the export cables into the transition vaults. US Wind would return the parking area to its current state with 6-8 manhole covers for maintenance access to transition vaults, so that the parking area can continue to be used for parking vehicles for recreational purposes and beach access.

A similar landing location was identified north of 3R's Beach at Tower Road with similar space which could be returned to current use after a brief period of construction. The onshore cable route from Tower Road is much longer than any route from 3R's Beach which creates greater disturbances, which is the reason Tower Road is not the proposed landing location.

Landfall for offshore export cables exiting Indian River Bay was identified as the closest available locations in relation to US Wind's new substations adjacent to the POI. US Wind evaluated other locations for US Wind's substations which are discussed in Section 4.4. No other viable location to land onshore export cables coming out of Indian River Bay via HDD were identified.

4.5.1 Alternatives Carried Forward

Tower Road and associated land-based cable route. Construction methods, temporary construction footprints, and cable infrastructure at Tower Road would be nearly identical as construction at the proposed 3R's Beach Parking Lot.

4.6 Offshore Export Cable Corridors

Offshore export cable corridors would ultimately contain up to four offshore export cables that transport power from the Lease area back to shore. US Wind considered offshore export cable corridors in conjunction with the proposed and alternative landfall locations identified above in Section 4.5.

Project considerations associated with offshore export cable routing included evaluations of transmission technology, type of export cables, construction feasibility, and available routing to the landfall locations, each of which is discussed in more detail in the following subsections.

4.6.1 Transmission Technology

US Wind is proposing to configure the Project's power collection and transmission system to employ High Voltage Alternating Current (HVAC). This configuration is the most common for onshore and offshore wind projects in the US and globally. Employing HVAC transmission for the Project facilitates equipment selection and design, interconnection to the US electric grid (and the proposed POI specifically), and project operations and maintenance. The voltage ranges defined in the PDE are aligned with contemporary equipment and component specifications and facilitate interconnection to the grid.

US Wind evaluated high voltage direct current (HVDC) transmission as a potential means to connect from the Lease area to the POI. It is neither technically nor economically feasible to use HVDC for the Project. The reasons for the infeasibility of this option are unrelated to the distance from shore. Implementing an HVDC connection at this stage of the development cycle, including the existing constraints regarding available real estate, would increase costs and cause schedule delays. Based upon current market conditions switching to HVDC would likely result in a delay of at least four years to the delivery of first power. HVDC would have a materially significant impact on onshore and offshore disturbances.

To accommodate HVDC transmission for the Project would require additional infrastructure offshore as well as onshore. Offshore, at least one additional HVDC platform – nominally twice the size of the largest alternating current (AC) OSSs currently included in the COP – would be needed to convert the power collected at the AC OSSs and convert it for transmission via one or two HVDC cables to shore. Onshore, at least one additional structure with a footprint exceeding the size of several football fields (see example in Figure 4.6-1) would be needed to convert the DC power to AC to be fed into the new US Wind onshore substations and then connected to the regional electrical grid. US Wind has not identified any land available near the POI for such a large structure, which would require a permanent disturbance on a coastal location that would create significant impacts to areas on the shore.

Figure 4.6-1. DC to AC power conversion building for 700 MW HVDC Norend cable between Norway and the Netherlands

4.6.2 Export Cables

US Wind is proposing to collect and convey all Project power employing high-voltage cables buried under the seabed, ground, and bay bed. The use of buried high-voltage, 3-conductor submarine cables for the Atlantic portion of the Project is the standard approach for offshore wind projects globally, as well as other US infrastructure projects.

US Wind carefully evaluated cable and construction options for the onshore export cable corridors. US Wind evaluated buried cables and overhead transmission. Overhead transmission, with transmission towers approximately 91 m (300 ft), offered several advantages for portions of the route, including lower costs, shorter schedules, and additional routing flexibility. US Wind ultimately rejected the option of overhead transmission cables for all onshore routes due to the potential for greater adverse environmental, stakeholder and visual impacts, particularly if employed through Indian River Bay.

4.6.3 Construction Feasibility

Avoiding and minimizing disturbance at the landfall locations were key considerations. Multiple cable landing and land-crossing construction approaches were considered, including trench and fill, and HDD. The first method involves excavation of a trench from the surface, laying the cable(s), and back-filling. HDD involves drilling of a bore hole under a land or water feature, installing a conduit along the bore hole, and pulling the cables through the conduit. While HDD requires some temporary surface excavation during construction, trench and fill approach is expected to have higher environmental, cultural, and/or stakeholder impacts at the landings and crossings.

Therefore, using HDD to install the export cables in ducts drilled underground would avoid impacts to beaches used by recreationists, beach and dune habitat used by birds, sea turtles, and other species, and wetlands in Indian River Bay. Trench and fill landing and crossing options were removed from consideration and are not carried through as alternatives. As described in the landfall location section (Section 4.5), temporary HDD equipment to drill and install ducts requires a preferably large area of previously disturbed land close to the coast and away from residential development. From such a location it would be feasible to HDD under the wetlands, beaches, dunes, and roads on the Delaware coast.

HDD from the Beach Landfall Locations into the Atlantic Ocean will require temporary protection around the HDD punchouts. The use of cofferdams at offshore HDD locations, with vibratory hammers to install sheet piles into the seafloor, were considered but not pursued due to the potential for increased underwater sound. US Wind proposes instead to use gravity cells.

Another aspect of construction feasibility is selection of routes and locations that will present the best opportunity to maintain burial of the offshore export cables without extensive cable protection on the seafloor. Based on the generally sandy conditions in the region installation of export cables to target penetration depth of 1-3 m (3.2-9.8 ft) is feasible along much, if not all, of the cable corridors. Earlier in the siting process US Wind included a potential corridor parallel to shore between the two landfall locations. The shore-parallel section was dropped from consideration due to concerns with crossing the immediately outside Indian River Inlet because of the potential for un-burying the cable due to the dynamic conditions and avoidance of future sand resource areas in the immediate vicinity.

4.6.4 Routing from the Lease Area to Landfall Locations

In 2019 US Wind identified a direct cable route from the Lease area to 3R's Beach (see Figure 4.6-2). The USCG proposed an anchorage area outside Delaware Bay which required relocation of the formerly proposed offshore export cable corridor to avoid the proposed anchorage area, formalized in March 2023, and ensure protection of US Wind's export cables and minimize interaction with anchoring cargo vessels. Additionally, the former route did not avoid established sand borrow areas. US Wind's proposed and alternative offshore export cable corridors are now routed to avoid these other maritime uses (see Figure 4.6-3).

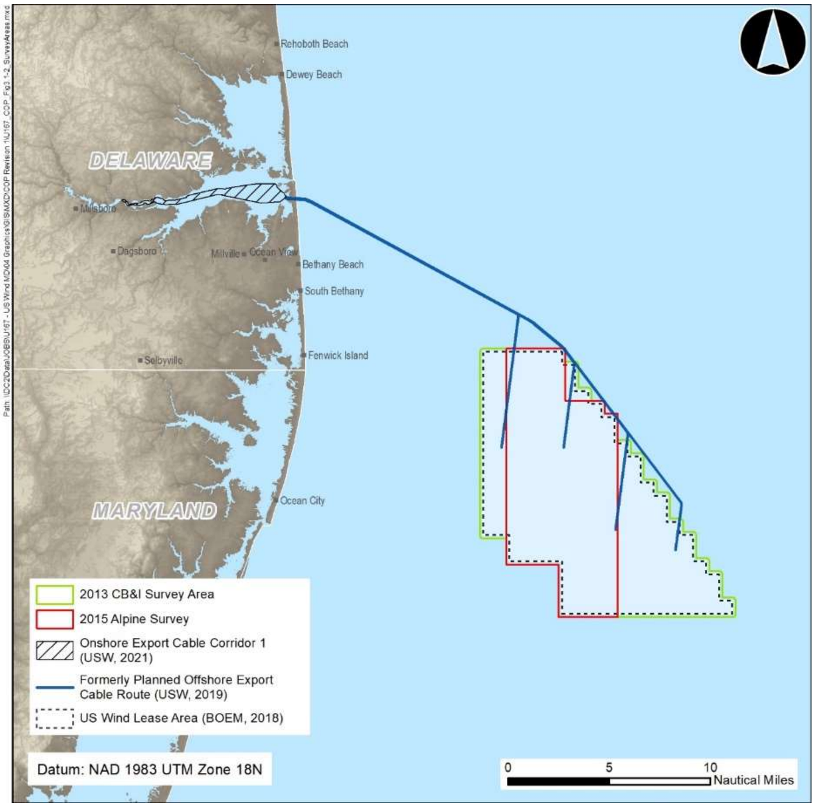

Figure 4.6-2. Formerly Planned Offshore Export Cable Route 2019

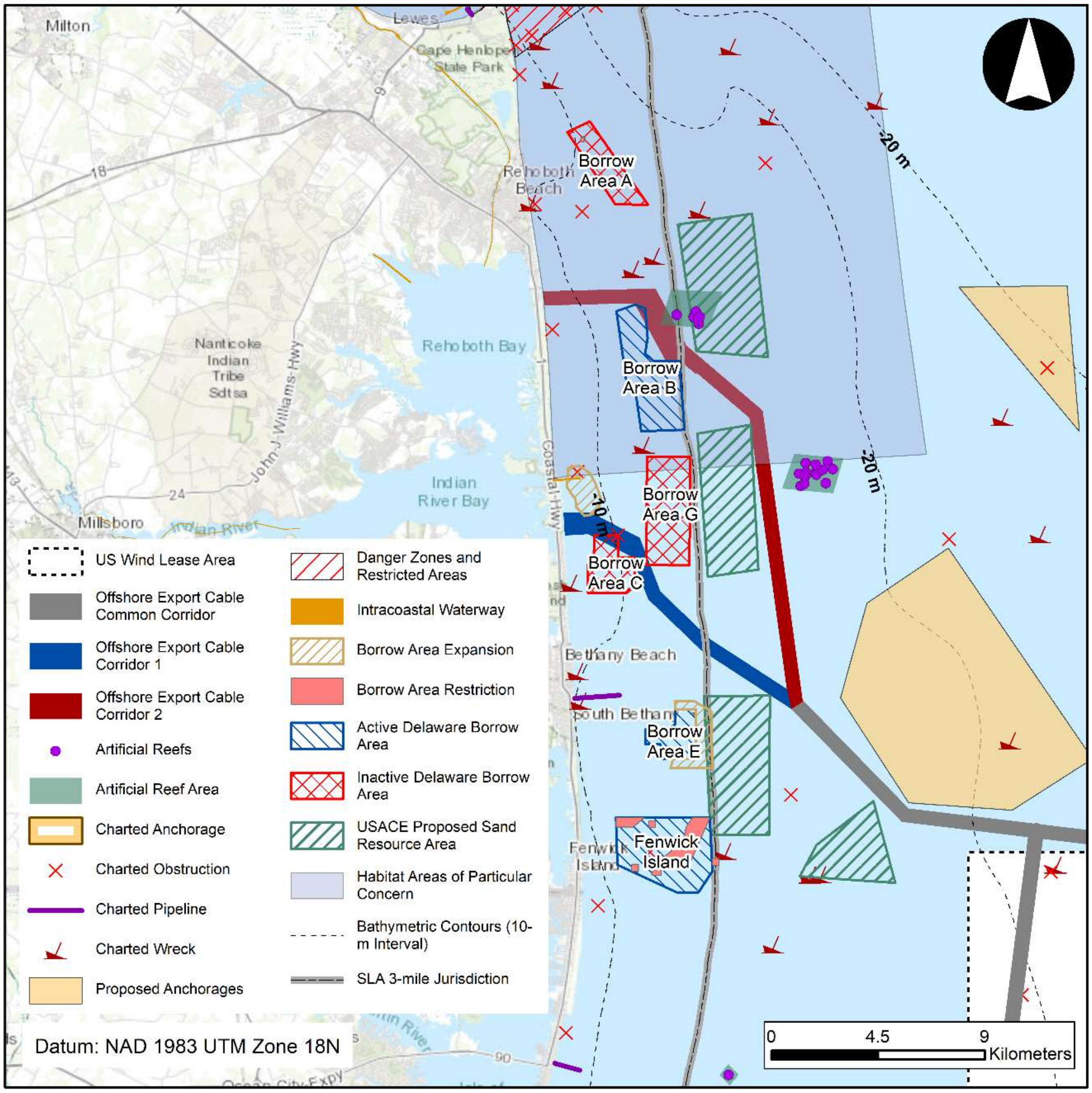

Figure 4.6-3. Revised Offshore Export Cable Corridor Routing Around Offshore Constraints

When establishing the revised corridors, US Wind set a 600 m (2,968 ft) corridor and surveyed the extents in 2021-2022. The wide corridor allows for micro-siting of the up to four offshore export cables within the corridor in relation to sand borrow areas (see Section 5.19) and potentially sensitive habitat, if any. In some areas of potential overlap or in close proximity to sand borrow areas and a recreational fish haven along Offshore Export Cable Corridor 2, the corridor was enlarged to allow additional opportunities for micro-siting while ensuring sufficient survey coverage for analysis of optimized routing. Similarly, for Offshore Export Cable Corridor 1 as it approaches 3R's Beach, the corridor was enlarged and shifted south to avoid a potential sand resource area outside Indian River Inlet identified by USACE.

Other routing options for the offshore export cables from the Lease area are not available to US Wind because the length of the cables would economically challenge the Project. Few viable routes to shore are available in the region to feasibly connect to the landfall locations and on to the POI.

4.6.5 Alternatives Carried Forward

Offshore Export Cable Corridor 2 with alternate landing location at Tower Road. Offshore Export Cable Corridor 2 would be installed using the same installation techniques as Offshore Export Cable Corridor 1. Differences of impact-producing factors in Offshore Export Cable Corridor 2 are described in relevant portions of Section 5.

4.7 Onshore Export Cable Corridors

After identification of the POI, US Wind evaluated routes from potential offshore export cable landing locations to the Indian River POI, which are identified as onshore export cable corridors. US Wind determined that the most efficient and least disruptive route from the proposed landing location at 3R's Beach to the POI is by burying onshore export cables in Indian River Bay, using HDD at both transitions from land to water to avoid impacts to wetlands on the eastern portion of Indian River Bay and on the western side from Indian River. By implementing measures such as time of year restrictions for construction activities on land and in Indian River Bay, turbidity monitoring during cable burial, and installation via HDD, impacts to recreation, sensitive species, water quality, and more would be minimized and mitigated as described in Section 5. US Wind will continue to consult with stakeholders and agencies such as DNREC and USACE regarding additional measures as necessary.

US Wind established a wide area as Onshore Export Cable Corridor 1 through Indian River Bay and surveyed the entire extent. The large area allows for optimal siting of the up to four cables through Indian River Bay and, as was done for the offshore export cable corridors, provides surveyed area within which to micro-site cables. US Wind continues to consult with agencies and stakeholders to identify preferred routing through Indian River Bay, with northern and southern routes identified in the eastern portion of the bay for consideration. Benthic habitat is the same in each route, with no SAV identified in either the northern or southern alignments. No potential archeological and cultural resources have been identified in either the northern or southern alignments.

In determining available routing for the onshore export cables from landfall locations to the POI, numerous routes have been evaluated. US Wind considered and rejected burying cables in Rehoboth Bay, north of Indian River Bay, due to concerns about sensitive bird and terrapin habitats, active aquaculture leases in Rehoboth Bay, and construction feasibility.

Terrestrial routes have been identified within existing rights-of-way (ROW), to potentially limit ground disturbance. The ROW may be crowded with buried utility lines and there is resistance from legacy users to locating additional cables, particularly power cables, in the ROWs. The concern goes both ways because US Wind also does not wish to install cables in locations that may be opened for future construction projects or utility maintenance. Co-location of export cables in existing ROWs also creates significantly more risk of future disturbances and impacts due to the existence of multiple other users and utility lines within the ROW and the likely need to conduct maintenance and repair.

US Wind includes several land-based routes as alternatives. However, burying cables in Indian River Bay to the POI is the shortest distance, installation can be achieved based on feedback from experienced cable installers, the burial depth is achievable and sufficient to protect the cable and minimize disturbances with and from outside parties, and mitigation measures are available to minimize environmental impacts. As analyzed in Section 5, Onshore Export Cable Corridor 1 also minimizes potential disturbance of cultural resources, avoids interference with ongoing and future infrastructure development projects in Delaware’s coastal region, and avoids impacts to wetlands. Dredging, which may be necessary for barge access, occurs relatively frequently in portions of Indian River Bay and has been identified by DNREC as a priority area for dredging in the state.

As part of the onshore export cable corridor siting process, US Wind evaluated optional locations for the new US Wind substations (see Figure 4.7-1). Land at the locations was not available, connecting the cables from the landing location proved infeasible for the Project schedule and construction feasibility, and connecting to the POI at DPL’s Indian River Substation via underground methods was not feasible due primarily to the distance from the POI and the ability to secure land onshore cable corridors through numerous properties could not be completed with any certainty due to the properties being under private ownership (and not for sale) and within the Project schedule.

4.7.1 Alternatives Carried Forward

US Wind includes Onshore Export Cable Corridors 1a, 1b, and 1c as alternative export cable routes, and Onshore Export Cable Corridor 2 from alternate landfall at Tower Road. All cables would interconnect via new US Wind substations to the POI and DPL’s Indian River Substation. This section briefly describes the location and installation methods for buried terrestrial cables. Throughout Section 5, information about potential impacts arising from the alternative onshore export cable corridors is included in the relevant “Impacts of Alternatives” subsections.

Cables would be buried along the terrestrial corridors, pending final design for any road or water crossings, along ROW, or ROW under development. Cables for any land-based routes would be (1/C) 230-275 kV single copper or aluminum core cables. Three single conductor (single phase) cables would be installed in parallel, possibly sharing a cement bound sand block (see Appendix I-J of US Wind’s Construction and Operations Plan) in the ROW, to complete the circuit from the OSS to the POI. US Wind is evaluating the potentially crowded conditions in the ROWs to determine the number of cables that could be accommodated if a particular corridor is selected.

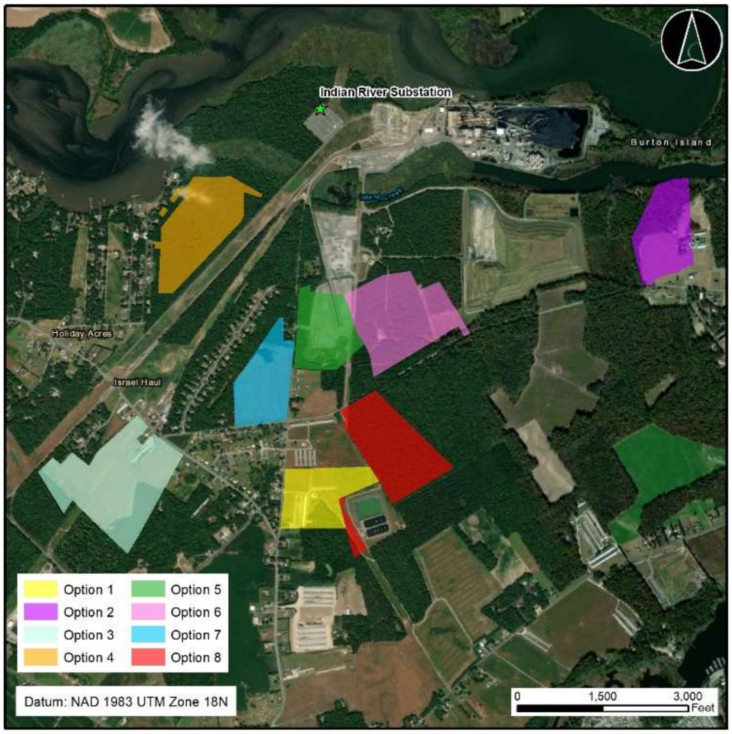

Figure 4.7-1. Evaluated US Wind Substation Locations in the Vicinity of the Indian River Substation

Installation of cables in the land-based corridors (Onshore Export Cable Corridors 1a, 1b, 1c, and/or 2) are planned in previously disturbed ROWs that may include additional infrastructure such as utility lines, telecommunication lines, water and gas lines. A land-based construction crew would install duct banks and transition joint vaults followed by a second construction crew that would pull the cables through the duct banks. Onshore export cable construction activities would typically be scheduled from 7 a.m. to 7 p.m., 6 days per week. US Wind assumes that construction would be seasonally restricted to avoid peak tourism such that work would take place only between approximately September 15 through May 15. Installation of up to four cables in a single construction season is not expected to be feasible. Land-based cable installation for all four cables is anticipated over two construction seasons, with up to three cables in one season and the last cable in the next season or installation split with two cables installed in successive construction windows. All work on onshore would likely necessitate staffing from state and local resources on the traffic congestion and management, even during offseason periods. There would also be the necessary restoration work to rebuild and repave the roads that would follow the installation activities as necessary.

A trench would be excavated in the ROW to install a duct bank approximately 203-267 cm (80-105 in) wide and approximately 76-228 cm (30-90 in) high, depending on the configuration, with up to 45 cm (18 in) of additional excavation on either side of the duct bank during construction. Up to four cables would be installed in duct banks of cement bound sand in either a horizontal or vertical configuration. The duct banks would be buried such that the top of the bank is a minimum of 91 cm (36 in) below grade.

Cable joint bays are anticipated to be installed approximately every 610 m (2,000 ft). Joint bays would be constructed within the disturbed ROW with outside dimensions approximately 8.5 m (28 ft) by 3 m (10 ft) by 3 m (10 ft), pending final design. Following installation of the duct banks a crew would pull the cables into the duct banks with joint bays.

The surface disturbance footprint during cable construction in ROWs is assumed to be approximately 15 m (50 ft) when installing a circuit for the excavator, laydown area alongside installation location, and access road alongside to feed materials. Small 2-lane roads would likely need to be closed for construction.

The loudest onshore cable installation equipment would be the excavator(s) operating up to 100-110 decibels (dB). Construction would abide by local noise ordinances and construction activity restrictions established in communities throughout the extensive commercial and residential areas along all of the alternative routes, which could increase construction time.

When reviewing the terrestrial cable routes, US Wind attempted to find the shortest, feasible distance along previously disturbed routes to minimize disruption to existing resources. As can be seen in the wetland maps provided in Section 5.5.2.3, avoiding wetlands and water bodies is nearly impossible. The region, particularly to the north of Indian River Bay and Rehoboth Bay, is low lying so that water is often within a few feet of roadways in some locations. Installing cables in such locations would require digging up the road, installing the cable ducts and cables, and then repaving the road because there is insufficient room on the shoulder of the road in the existing ROW. These conditions informed the selection of proposed routes with a goal of minimizing impacts to resources, and where avoidance was not feasible, selecting routes that were least harmful. Furthermore, US Wind has not identified any feasible terrestrial routes that would completely avoid water crossings.

“Critical water crossing” is used to identify locations where an unavoidable water body crossing, such as a manmade canal or tributary to Indian River Bay or Rehoboth Bay posing an obstacle or impact from the installation of an export cable. Water crossings, or building in close proximity to water bodies, would require co-locating export cables on existing bridges or horizontally directional drilling under the water body to cross it. However, in some cases the road is simply elevated above water and new cables would require building under the road itself, with all of the disturbance associated with such activity.

US Wind has identified the following terrestrial route water crossings along each route. At these water crossings cables would either be attached to the undersides of existing bridges or installed via HDD under the water body. Additional water crossings would be confirmed during site surveys during design and prior to the start of construction.

Onshore Export Cable Corridor 1a

Approximately 26 km (16 mi) from the landfall at 3R's Beach along existing DelDOT ROWs to Indian River POI via a southern route around Indian River Bay. The cables would exit the transition vaults at 3R's Beach, traverse south along Coastal Highway (Route 1), turning west on Fred Hudson Road, south on Central Avenue then along Route 26/Atlantic Avenue to Dagsboro, continuing north on Route 26/Main Street through Dagsboro, and then generally north along Iron Branch Road/Road 332 to the US Wind substations.

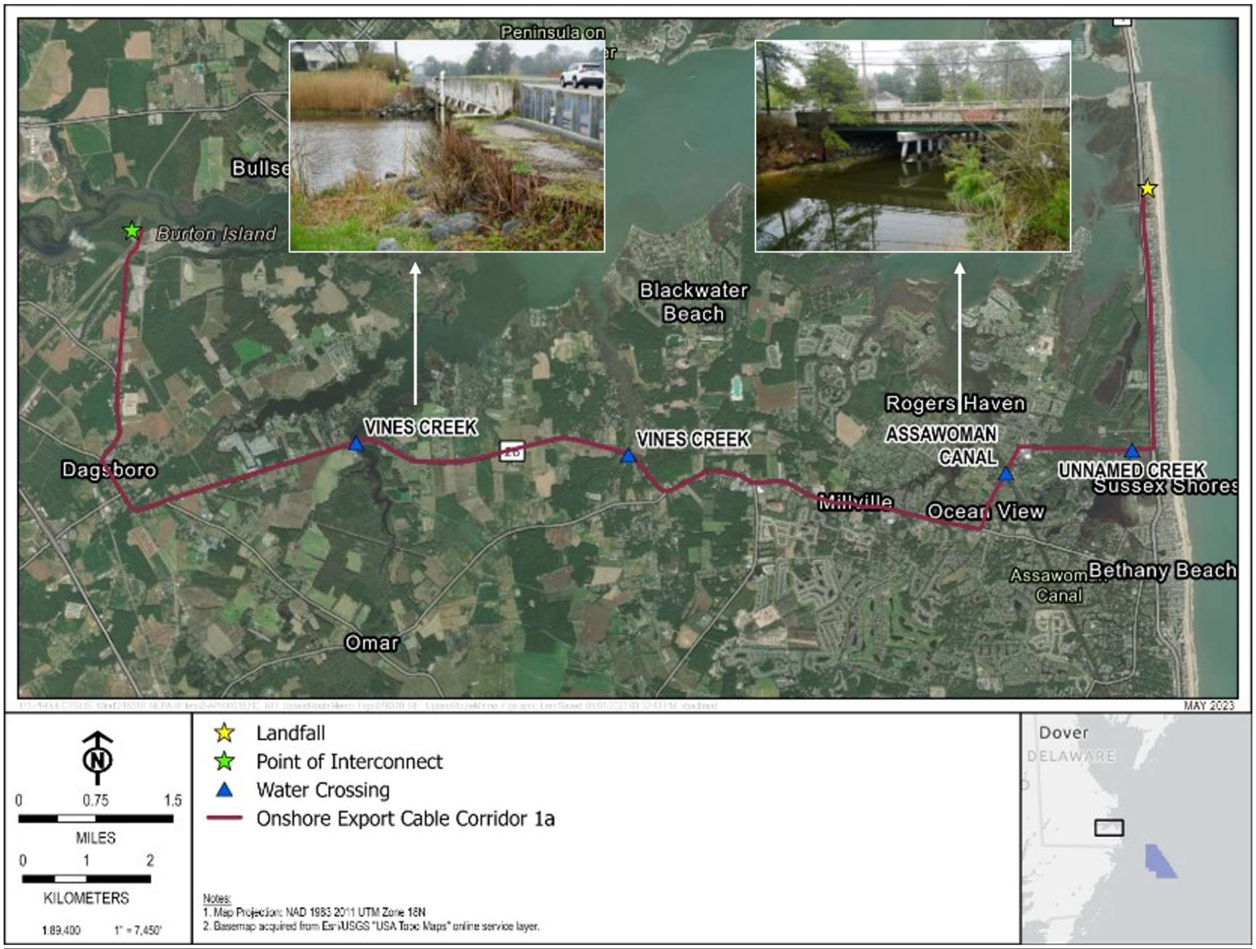

Figure 4.7-2. Onshore Export Cable Corridor 1a

There are a total of four (4) terrestrial water crossings along Onshore Export Cable Corridor 1a. Photographs of the crossings of the Assawoman Canal at Central Avenue and Vines Creek on Route 26 are found in Figure 4.7-2. Additional crossings include Blackwater Creek and an unnamed tributary into Salt Pond.

Onshore Export Cable Corridor 1b

Approximately 26 km (16 mi) along existing DelDOT ROWs and Sussex County ROWs under development from landfall at 3R's Beach to Indian River POI. Cables would exit the transition vaults at 3R's Beach along the same route as Onshore Export Cable Corridor 1a until west of

Millville then south on Route 17 until turning west/northwest along a Sussex County water line ROW, currently under development, across Route 26 then north in parallel with Iron Branch Road/Road 332 to the US Wind substations.

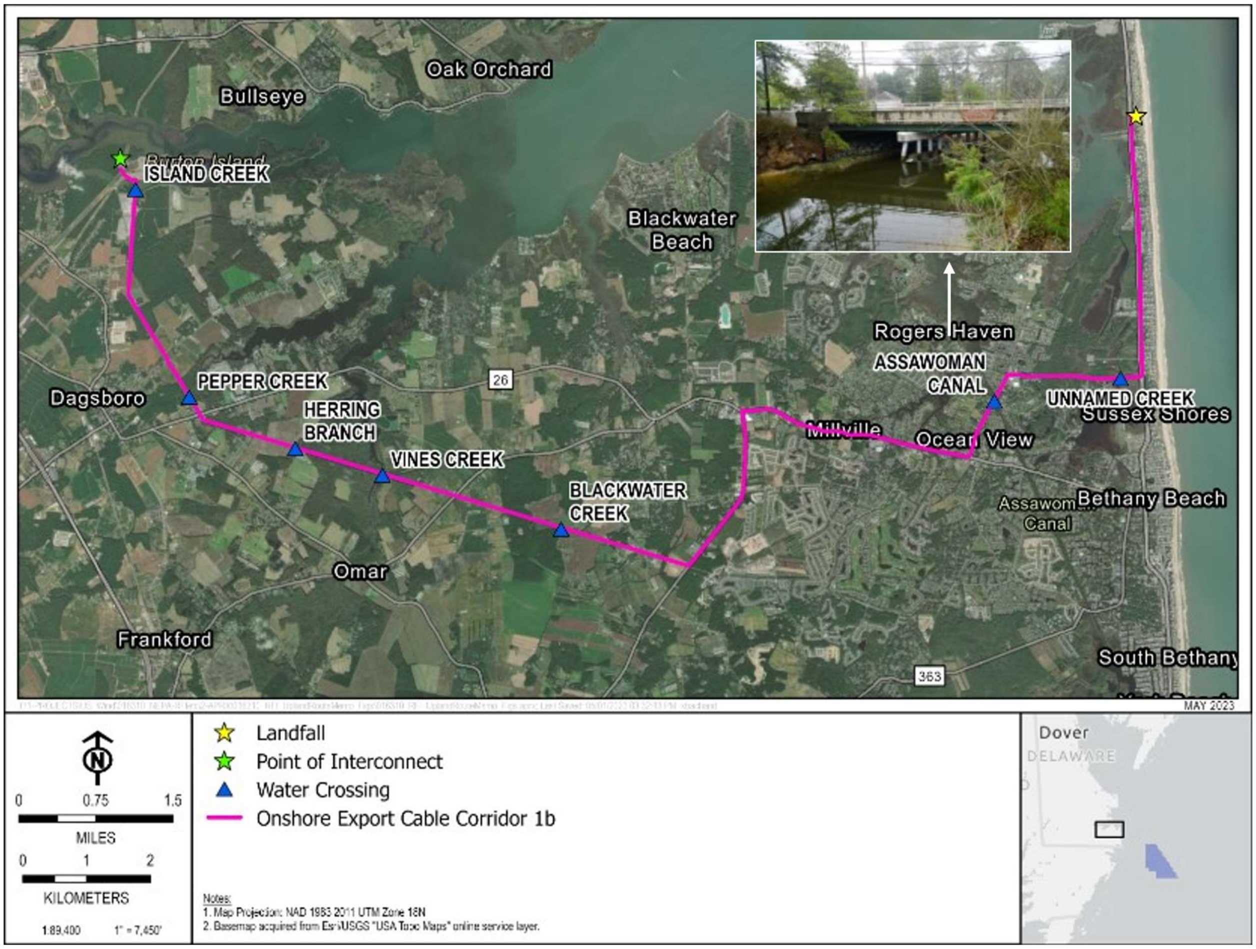

Figure 4.7-3. Onshore Export Cable Corridor 1b

There are a total of seven (7) terrestrial water crossings along Onshore Export Cable Corridor 1b, shown in Figure 4.7-3. The first two of the water crossings are the same as Corridor 1a (Assawoman Canal and an unnamed tributary into Salt Pond). The other five (5) crossings include Blackwater Creek and Vines Creek (no photographs), Herring Branch, Pepper Creek, and Island Creek.

Onshore Export Cable Corridor 1c

Approximately 27 km (17 miles) along existing DelDOT and Sussex County ROWs under development from landfall at 3R's Beach to Indian River POI. The cables would exit transition vaults at 3R's Beach, traverse south along Route 1 through Bethany Beach turning west on Wellington Avenue, south on Kent Avenue to an Exelon substation then turning generally west along an Exelon ROW, picking up the Sussex County ROW after crossing Route 17 and then traversing the same remaining route to the US Wind substations as Onshore Export Cable Corridor 1b.

There are a total of 32 water crossings along Onshore Export Cable Corridor 1c, shown in Figure 4.7-4. Water crossings include the Assawoman Canal, Blackwater Creek and Vines Creek, Herring Branch, Pepper Creek, and Island Creek. Additional crossings include unnamed streams or creeks and multiple retention ponds associated with adjacent residential developments. In areas with multiple ponds around residential developments, if Onshore Export Cable Corridor 1c is selected for construction, effort to microsite around these ponds would be made.

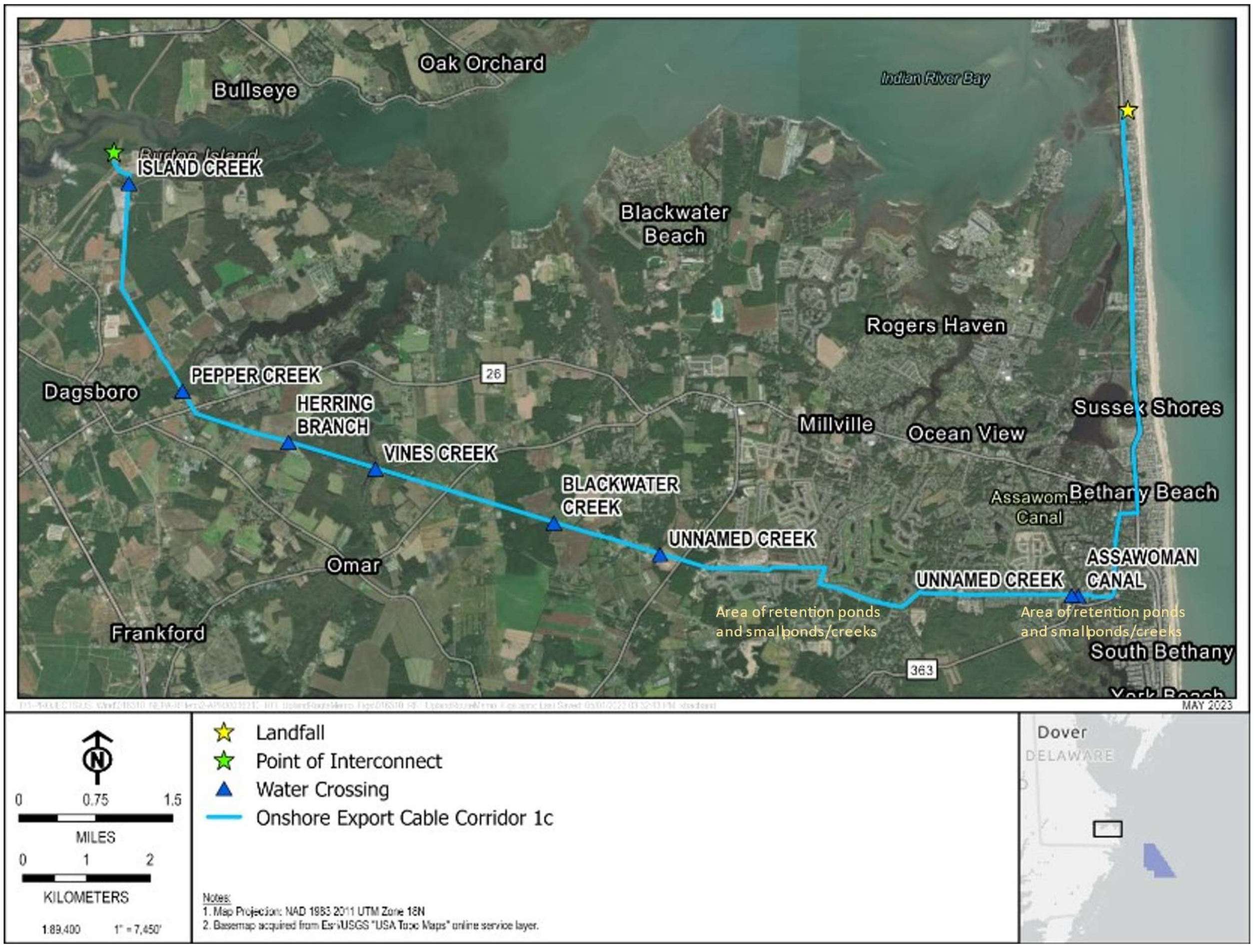

Figure 4.7-4. Onshore Export Cable Corridor 1c

Onshore Export Cable Corridor 2

Approximately 28 km (17 miles) along existing DelDOT ROWs from landfall at Tower Road to Indian River POI via a northern route around Indian River Bay. Cables would exit transition vaults at the Tower Road landfall, traverse north along Coastal Highway/Route 1 through Dewey Beach and Rehoboth, turning west along Airport Road, continuing south along Road 274, west along Route 1D, connecting to Route 24 south/John J Williams Highway to an Exelon overhead power line ROW, and then crossing Indian River via horizontal directional drill and continuing underground to the US Wind substations.

There are a total of eight (8) water crossings along Onshore Export Cable Corridor 2. Photographs of the crossings of Love Creek and Burton Pond on Route 24 are in Figure 4.7-5. Additional crossings include the Lewes and Rehoboth Canal (likely by HDD), Sarah Run, Unity Branch, Guinea Creek, Indian River (by HDD), and an unnamed stream flowing into Sarah Run.

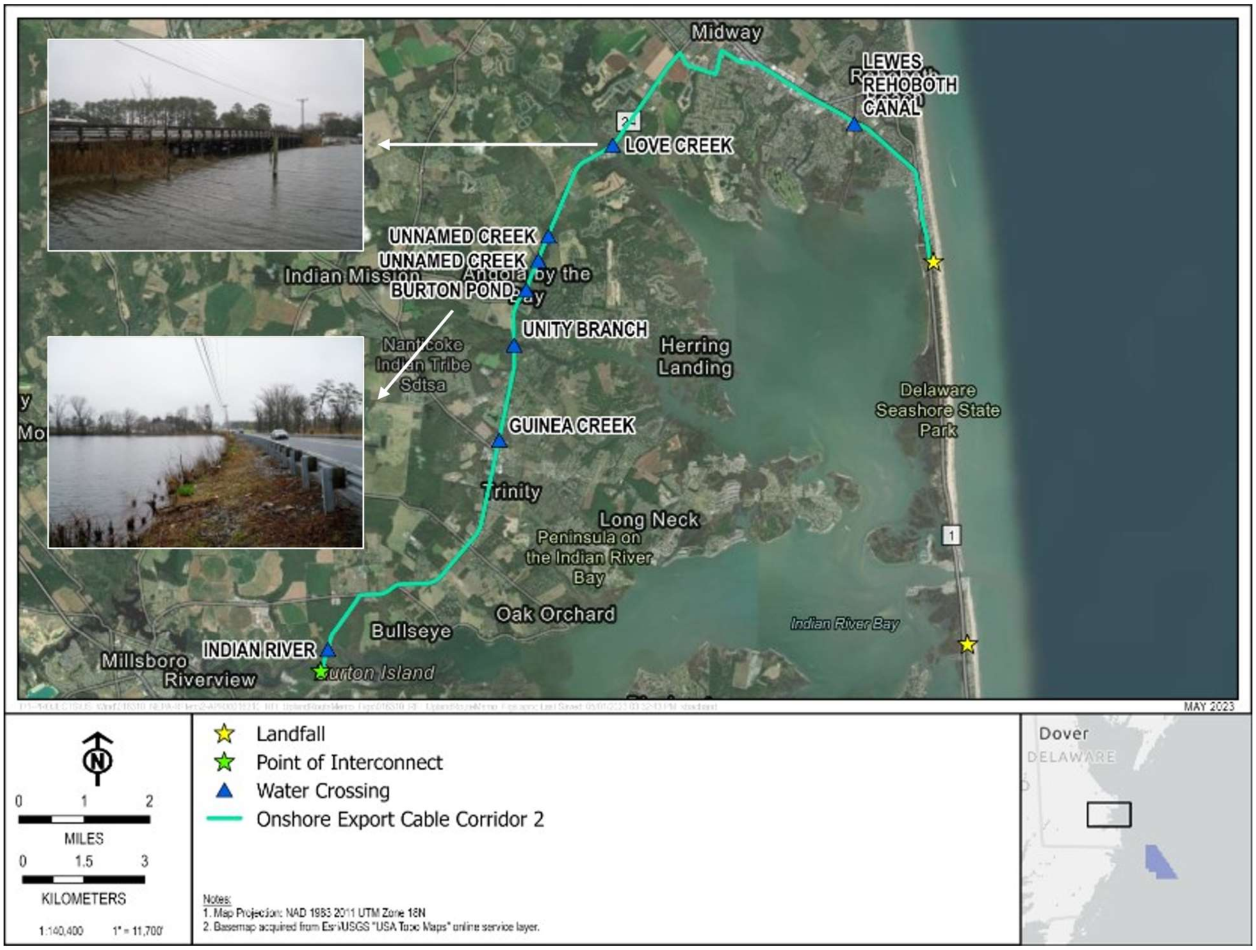

Figure 4.7-5. Onshore Export Cable Corridor 2

4.8 Operations and Maintenance Facility

The Maryland Public Service Commission (PSC) respectively issued Order No. 88192, dated 11 May 2017, and the PSC Order No.90011, dated 17 December 2021, which combined, awarded approximately 1.1 GW of ORECs for US Wind's Project. Pursuant to these PSC Orders, US Wind "shall use a port facility located in the Ocean City, Maryland region to serve as the operations and maintenance port."

Accordingly, US Wind, and its real estate and facility design and construction advisors have conducted a thorough review of the available waterside and upland sites in the Ocean City region potentially capable of providing a suitable location to serve as an effective, efficient, and safe Operations and Maintenance (O&M) Facility for the lifetime of US Wind's Project.

Several requirements have guided the search for the most suitable property. These requirements include:

- Secure, accessible pier space for effective, efficient, and safe mooring flexibility for four (4) Crew Transfer Vessels (CTVs), each approximately 30m (100 ft) in length
- Marine coordination center with VHF communications for vessel monitoring and connectivity to USCG and emergency response
- Workshop and warehouse space for spare parts and materials for Wind Turbine Generators (WTGs) and any other supporting components and systems needed for the lifecycle of the Project
    - Warehouse spacing to scale up commensurate with the number of WTGs installed
    - Stacking systems for pallets and forklift access
    - Storage for hazardous materials with adequate ventilation
    - Humidity controlled storage for electronic parts
    - Access suitable for effective, efficient, and safe loading, unloading, and handling operations
- Crew support facility
- Shoreside access for CTV fuel, water, and waste disposal
- WTG and Offshore Substations control and monitoring room
- Technical room with communications and supervisory control and data acquisition (SCADA) control panels
- 5-ton quayside cranes for simultaneous loading/unloading materials onto CTVs
- Office space for operations team personnel
- Adequate parking

Multiple sites were investigated in the region to determine their suitability. The pros and cons for each site are listed below (Table 4.8-1).

Table 4.8-1. Assessment of Potential O&M Facility Locations

Location	Pros	Cons
Proposed site: Combine 1 and 2	• Provides approximately 244 m (800 ft) of effective, efficient and safe CTV mooring space for the Project • Eliminates need to cut-in wet slips for CTVs	• Requires alignment of pier across two properties

Table 4.8-1. Assessment of Potential O&M Facility Locations

Location	Pros	Cons
	• Provides best protection for most CTVs along face of pier • Suitable for multi-stage build for the lifetime of the Project • Municipal water and sewage • Adequate parking	
Site 1	• Approximately 171 m (560 ft) waterfront pier space • Site can be acquired in time frame that supports Project construction schedule • Easy access to Ocean City inlet	• Very small acreage • Small footprint • Existing pier requires removal • No municipal water/sewage • Title concerns • Existing pier exposed to adverse weather conditions • Unknown ground conditions (anticipate concrete fill and debris)
Site 2	• Approximately 77 m (250 ft) waterfront • Site can be acquired in time frame that supports Project construction schedule • Site includes an approximately 929 m^2 (10,000 ft^2) lot for construction laydown/additional parking • Municipal water and sewage • Pier in usable condition	• Requires large cut-in slip for 3 of 4 CTVs • Unknown ground/fill conditions in cut-in area
Site 3	• Five adjacent lots with approximately 77 m (250 ft^2)' waterfront • Less exposure to Atlantic weather	• Owner assumes concurrent access and shared use of pier for Owner's commercial vessels, which is not possible for a secured site such as the O&M Facility • Existing building will require demolition • Requires large cut-in wet slips to accommodate 4 CTVs • Further inside harbor and closer to– greater vessel traffic • High cost
Site 4	• Upland site of approximately 4.4 acres with approximately 876 m^2 (9,430 ft^2) of older office/warehouse space	• Only 2.95 acres usable due to existing wetlands on site • Warehouse and office facilities not suitable for needs

Table 4.8-1. Assessment of Potential O&M Facility Locations

Location	Pros	Cons
	• Short distance to waterfront • Owner looking to move to new build office/warehouse site elsewhere	• Property no longer available
Site 5	• Upland site relatively close distance to waterfront Site can be acquired in time frame that supports Project construction schedule	• Tidal wetland resources are present throughout the middle of the site • Low lying area prone to flooding
Site 6	• Upland site of approximately 14.7 acres • No municipal water or sewage	• Significant tree clearance required • Distance from waterfront site makes it challenging to efficiently support WTG technician operations / logistics over life of project • Fronts busy highway and traffic light/crossover infrastructure do not exist
Site 7	• Upland site on buildable lot for sale • Protected from coastal surge • Outside FEMA 100 year flood zone • Access to Hwy 50 and rear access road • Rear access road and existing stop light infrastructure allows east bound highway crossing • Less expensive than waterfront property	• Distance from waterfront site; makes it challenging to efficiently support WTG technician operations / logistics over life of project

4.8.1 Alternatives Carried Forward

No other available, viable locations in the Ocean City, Maryland, region. Both properties included in the PDE in case one of the two is unavailable.

5.0 EXISTING CONDITIONS, POTENTIAL IMPACTS, AVOIDANCE AND MINIMIZATION

5.1 Introduction

This section provides an overview of existing conditions, an assessment of potential impacts and identification of proposed avoidance and minimization measures. The description of existing conditions and potential impacts is presented by resource type and addresses each of the proposed Project components, including the offshore wind farm on the OCS, the Offshore Export Cable Corridor(s) in the Atlantic Ocean and nearshore coastal waters, the barrier beach landfall, the Onshore Export Cable Corridor(s) in Indian River Bay, and the substations located near the Indian River. The potential impacts and proposed avoidance and minimization apply to the construction, operation, and maintenance phases of the proposed Project.

5.1.1 Impact Assessment Methodology

The potential impacts resulting from the Project will vary in nature, duration, type, extent, and overall significance. For the purposes of this assessment, an impact is defined as an environmental consequence that can be reasonably foreseen as a result of the proposed Project. The determination of overall significance of the impacts is based on a combination of the following criteria:

Nature of the impact is expressed as direct or indirect. The nature of the impact is dependent on whether a project activity directly or indirectly influences the resource or condition.

Duration of the impact is expressed as temporary or permanent. Temporary impacts are short-term and recover naturally within approximately three years. Permanent impacts are characterized as those impacts that will be chronic due to ongoing activities, resulting in a permanent or irreversible change to the existing resource condition.

Type of impact is expressed as positive or negative. Positive impacts will enhance the existing condition of the resource. Negative impacts are those impacts that have an adverse effect on the resource.

Extent refers to the impact's geographic area of influence. Extent is termed local if it is restricted to the immediate Project area.

The overall **significance** of the impact (negligible, minor, moderate, and major) is determined based on the combination of the nature, duration, type, and extent of the impact as follows:

- Negligible - An impact that is discountable or not measurable.
- Minor - The affected resource will recover completely without any remedial action once the impacting agent is eliminated.

- Moderate - Impacts to the affected resource are unavoidable; the viability of the affected resource is not threatened although some impacts may be irreversible, or; the affected resource would recover completely if proper avoidance and minimization is applied during the life of the Project or proper remedial action is taken once the impacting agent is eliminated.
- Major – Impacts to the affected resource are unavoidable; the viability of the affected resource may be threatened, and impacts may be irreversible, or; the affected resource would not recover completely if remedial action was taken.

Descriptions of the existing environmental conditions and potential environmental impacts associated with construction, operation, and maintenance of the Project are provided in the following sections. To the extent practicable, potential environmental impacts have been avoided or minimized. Where impacts have been determined to be unavoidable, additional protective measures have been incorporated into the Project design. These protective measures will be described as applicable.

5.2 Geology and Physical Conditions

This section is a summary of the site geology in the Lease area along the Offshore Export Cable Corridors and Onshore Export Cable Corridor 1. G&G survey reports are provided in COP Volume II, Appendix A (US Wind 2023). The geophysical survey report of the Lease area and Export Cable Corridors conducted in 2021-2022 has been provided in COP Appendix II-A1. The geophysical survey report of Onshore Export Cable Corridor 1 has been provided in COP Appendix II-A2.

5.2.1 Description of Affected Environment

5.2.1.1 Geological Background

The Lease area lies offshore from the Delmarva Peninsula, which is part of the Atlantic Coastal Plain Province of the eastern United States. The Atlantic coast is a passive margin and therefore a tectonically quiet area with dominant processes related to weathering and erosion. This creates a low relief landscape with thick accumulations of sedimentary deposits. The peninsula overlies a seaward thickening wedge of unconsolidated sediments dating back to Cretaceous time (> 65 million years ago), which are over 2,400 m (7,874 ft) thick near Ocean City, Maryland. Tertiary age (Paleocene-Eocene, 34 – 65 million years ago) marine sediments overlie the Cretaceous deposits (Hobbs, Krantz, and Wikel 2008; Andreasen et al. 2016) . A disconformity is present between the Eocene sediments and overlying marine Miocene sands, silts, and clays. The top of the Miocene (5 million years old) generally lies between 27 – 43 m (89 – 141 ft) below the Maryland coast.

The Tertiary aged sediments of the Delmarva Peninsula and coastal areas are disconformably overlain by younger Quaternary aged sediments consisting of fluvial sands and gravels, littoral and shallow marine clay, silt, and sand. Fluvial deposits comprise the majority of the Pleistocene age sediments (10,000 - 1.8 million years ago), with upper Pleistocene deposits consisting of barrier, back-barrier, and fore shelf origin.

Holocene sediments are typically fine to coarse-grained sands ranging in thickness from less than 1 to 10 m (3.2 to 32.8 ft), are generally deposited in coastal and marsh environments, and are similar to the Pleistocene littoral and shallow marine sediments.

Assateague - Fenwick barrier island is the wave dominated barrier island along the Maryland coast of the Delmarva Peninsula ((CB&I 2014; Oertel and Kraft 1994). Although once connected, a major hurricane in 1933 formed the Ocean City Inlet and separated the two islands. Once the inlet was formed, the inlet was stabilized and is now maintained by the USACE (CB&I 2014) . Coastal features, such as dune systems, back-bay lagoons and salt marshes, and sedimentary features, such as outwash fans, are typically observed (CB&I 2014) .

Indian River Bay, Delaware is located along the eastern shore of the Delmarva Peninsula and is part of the Atlantic Coastal Plain Province (Cross et al. 2013). Indian River Bay is comprised of Holocene age flood tidal delta deposits and lagoon deposits. The flood tidal delta deposits are light gray to gray, clean to silty, and silty sand and range from well-developed crossbedding to structureless. Lagoon deposits are generally comprised of medium grey to dark-grey clayey silt, with rare structures consisting of relic borrows, thin laminae of marsh grass fragments, or very fine sand. The Holocene age sediment deposits are up to 30 ft thick, with the thickest tidal delta deposits located in the eastern portion of Indian River Bay and the thickest lagoon deposits located near the center of Indian River Bay (Wunsch 2012)).

5.2.1.2 Geotechnical and Geophysical Surveys

Geotechnical and geophysical surveys were conducted in 2013, 2015, 2016, 2017, 2021, 2022, and 2023. The findings of those surveys are summarized in the COP (US Wind 2023) and include surveys of the entire Maryland Wind Energy Area (WEA) as well as portions of the Lease area and formerly planned offshore export cable route and Onshore Export Cable Corridor 1. Figure 5.2-1 depicts the Lease area and Export Cable Corridor survey areas from 2013 and 2015. Detailed summaries of the 2013, 2015, 2016 and 2017 geotechnical and geophysical surveys can be found in the COP (US Wind 2023). As noted in Section 5.2, US Wind provided the 2021-2022 geotechnical and geophysical survey results in the federal waters of the Atlantic to ensure that BOEM has adequate information to conduct its environmental analysis prior to issuing its final authorization for construction and operation activity. These 2021-2022 geophysical survey results are summarized below. Prior surveys are summarized in Table 5.2-1.

Table 5.2-1. Previous Geophysical and Geotechnical Surveys of Lease Area and Potential Cable Routes

Contractor	Year	Location	Type of Work
Coastal Planning & Engineering, Inc. (CB&I)	2013	- Lease Area	- High-resolution geophysical survey
Alpine Ocean Seismic Survey, Inc.	2015	- Portion of the Lease area	- High-resolution geophysical survey - Geotechnical borehole at former Met Tower location
Alpine Ocean Seismic Survey, Inc.	2016 and 2017	- Lease Area - Formerly planned offshore export cable route - Portion of Onshore Export Cable Corridor 1	- High-resolution geophysical survey - Geotechnical survey - Benthic survey

2021 TDI/Fugro Lease Area and Offshore Export Cable Corridors Survey

The Lease area and the Offshore Export Cable Corridors were surveyed during 2021 and 2022 by TDI Brooks International (TDI) and Fugro USA Marine, Inc (Fugro) (Figure 5.2-1 and 5.2-2). TDI vessels surveyed from April 3, 2021, to November 5, 2021. Fugro vessels surveyed from December 8, 2021, to May 23, 2022. The surveys consisted of three components: geophysical data, geotechnical data, and benthic data. Collected geophysical data from both surveys included side scan sonar seafloor imaging, marine magnetometer measurements, multibeam bathymetry, and seismic reflection data. The bathymetry data from both contractors was combined and can be found in Figure 5.2-3. TDI collected geotechnical data, consisting of vibracores and cone penetration tests, to examine sediment characteristics at depth. The benthic data consisted of grab samples for both infauna and grain size analysis, as well as planview imagery of the grab location and transect imagery collected using a remotely operated vehicle. The results of the benthic analysis can be found in COP Appendix II-D4 (US Wind 2023).

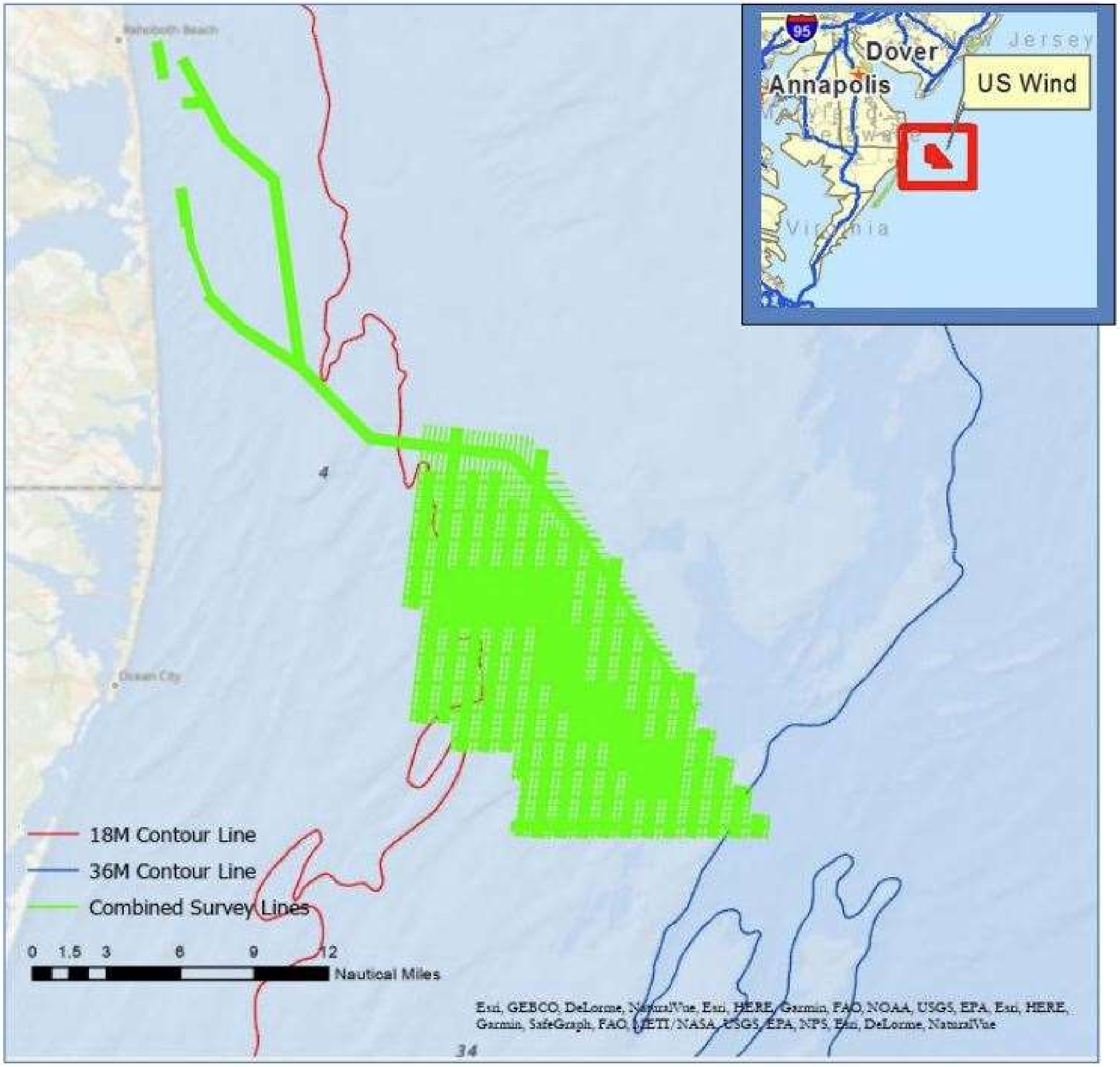

Figure 5.2-1. TDI Offshore Survey Extents

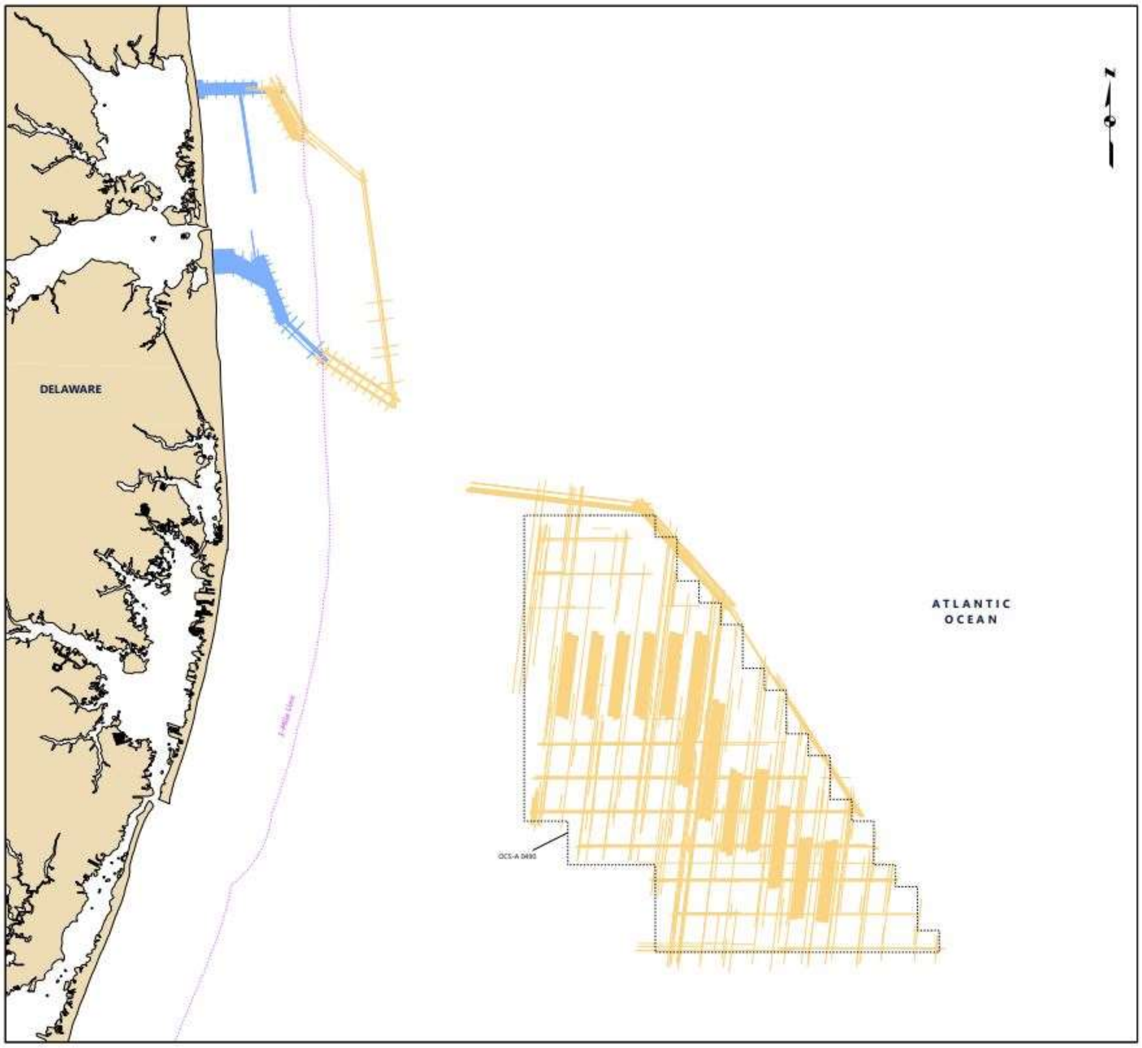

Figure 5.2-2. Fugro Offshore Survey Extents

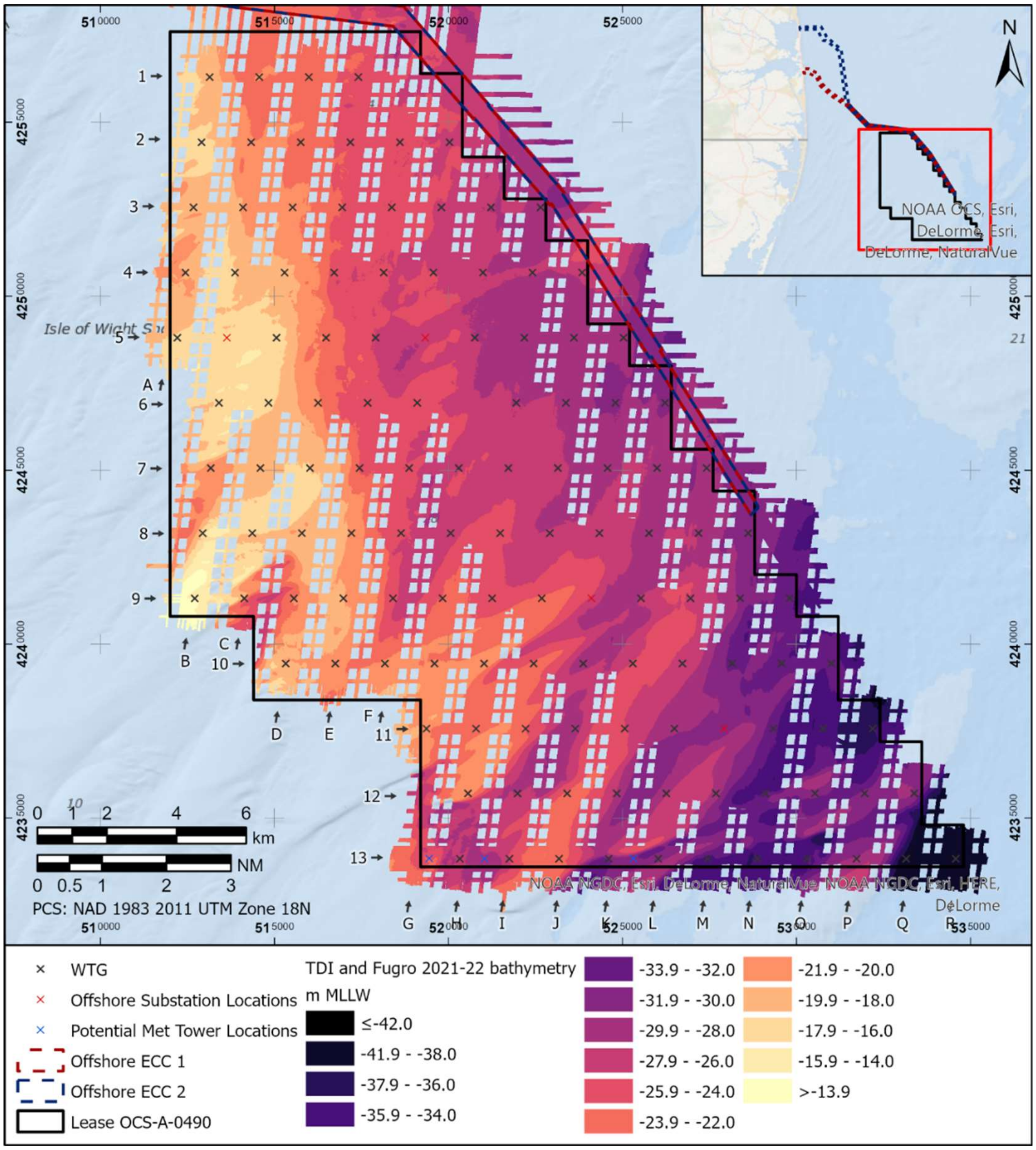

Figure 5.2-3. Merged Bathymetry Data from TDI/Fugro 2021-2022 Surveys

2022 and 2023 Indian River Bay Geotechnical and Geophysical Surveys

Geophysical survey of Indian River Bay was conducted by S.T. Hudson Engineers Inc. (S.T. Hudson) from May to June 2022. Collected geophysical data included side scan sonar seafloor imaging, marine magnetometer measurements, multibeam bathymetry, and seismic reflection data. The area surveyed is shown in Figure 5.2-4.

Geotechnical surveys in 2022-2023 included Indian River Bay and nearshore Atlantic locations in Delaware state waters, with vibracores, CPTs and deep CPTs collected. Alpine conducted nearshore Atlantic geotechnical surveys from September through December 2022. Ocean Surveys, Inc. and Sealaska Engineering and Applied Sciences (SEAS) conducted geotechnical surveys in Indian River Bay in September 2022 and January through March 2023, respectively.

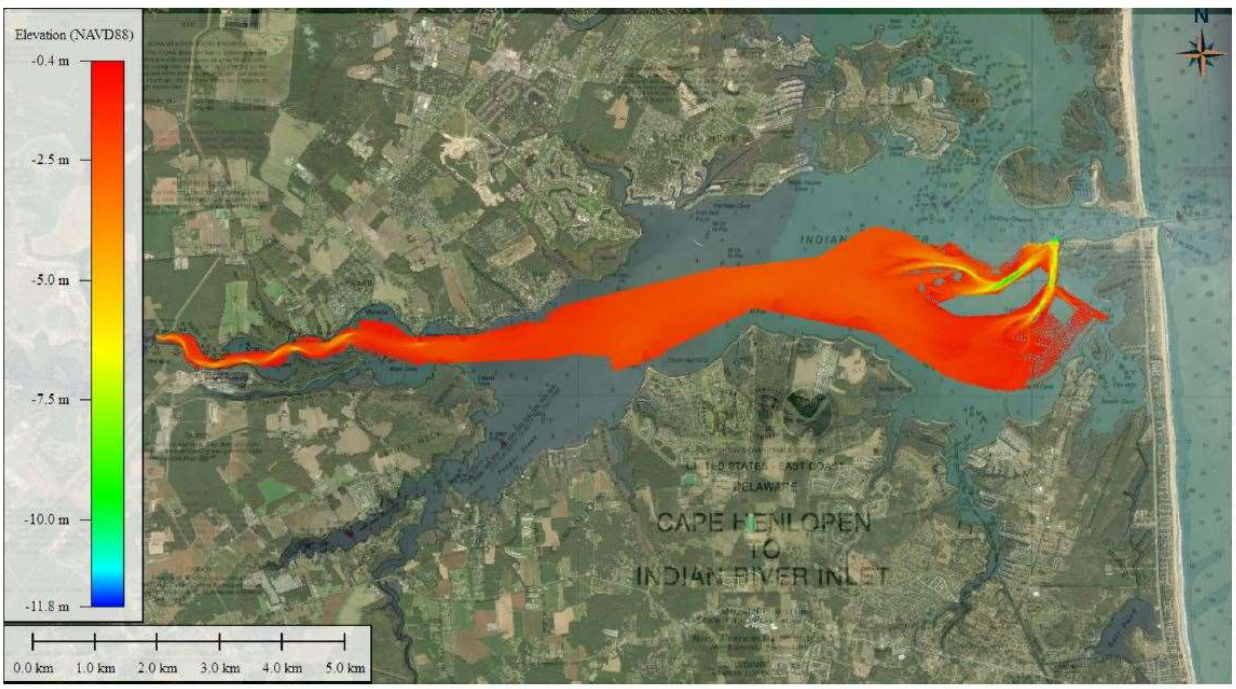

Figure 5.2-4. S.T. Hudson Geophysical Survey Extents

2022/2023 Updated Integrated Marine Site Characterization Reports

Following the completion of the updated surveys in 2021, 2022, and 2023, US Wind contracted Wood Thilstead to compile Integrated Marine Site Characterization Reports. Two separate reports are provided, which describe the conditions in federal waters (an updated COP Appendix II-A1) and for Delaware State waters, including Indian River Bay (COP Appendix II-A2). These reports focused on the following:

- Documentation of all investigations, surveys, in-situ, and laboratory testing.
- An analysis of the potential for various hazards and processes.

- Description of sediment layers with geotechnical design parameters.
- Recommendations for mitigating geologic hazards

5.2.1.3 Geological Features and Hazards

Lease Area

The G&G data collected during the CB&I, Alpine and TDI/Fugro surveys were reviewed for the presence of natural or man-made hazards which could impact development of the Project site. The following tables (Table 5.2-2) provide a summary of the potential hazards from the CB&I, Alpine, and TDI/Fugro surveys in the Lease area, as well as the Alpine survey of a portion of Onshore Export Cable Corridor 1.

A number of sonar targets and magnetic anomalies were identified during the survey. Additional information on these geologic features and hazard areas are provided in the reports referenced above and listed below.

Table 5.2-2. Lease Area Geological Features and Hazards Summary

	CB&I (2014)	Alpine (2015)	TDI/Fugro (2021)
Shallow Hazards			
Shallow Faults		Not Present	Not Present
Gas Seeps or Shallow Gas		Not Present	Potential to contain biogenic gas. No evidence of seafloor gas expulsion
Mobile Sediments	Active zones of sediment transport in the southwest corner of the survey area	Present throughout the survey area in the form of sand ripples.	Present throughout the survey area. Ranging from ephemeral ripples to major sand ridges
Potentially Unstable Slopes	Steep Slopes approaching 10° exist throughout the western and southern section of the survey area	Small slopes of two to five percent grade are located in the western and southern region of the survey area Larger scale sand ridges are present in the western and southeastern part of survey area	Average slope throughout the survey areas in 0.5° Slopes exceeding 2° are within only one percent of the area and confined to the lee sides of major sand waves and wrecks
Surface Live Bottoms (Rock exposed at the surface)		Not Present	Not Present

Table 5.2-2. Lease Area Geological Features and Hazards Summary

	CB&I (2014)	Alpine (2015)	TDI/Fugro (2021)
Buried Channels	Evidence of widespread paleochannels throughout the survey area Two highly organized buried channel complexes One large poorly organized buried tidal complex One smaller poorly organized buried channel and tidal complex	Buried paleochannels can be seen throughout the survey area	Buried paleochannels can be seen throughout the Survey Area
Scour Features	Active scouring in the southwest corner of the survey area	Potential scour area identified in the southwest area of survey, adjacent to sand ridges	Potential scour is possible due to sandy sediment. Scouring confirmed at seafloor obstructions
Ice Scour of Seabed Sediments	Not Applicable	Not Applicable	Not Applicable
Soft Sediments	Map Series 7: Hazard Anomaly Map (Appendix G		
Seismic Activity		Not Present	Not Present
Volcanic Activity		Not Present	Not Present
Man-made Hazards			
Cables / Pipelines		Not Present	Not Present
Debris	Magnetic Anomalies - 1,142 Side-scan Sonar Targets - 91	Magnetic Anomalies - 2,717 Side-scan Sonar Targets - 1,468	
Shipwrecks	Eight documented wrecks and obstructions on NOAA Chart 12200 Cape May to Cape Hatteras lie within the survey area	Four known shipwrecks and two potential wrecks were discovered within the survey area	Three wrecks were discovered within the Lease area.

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Table 5.2-2. Lease Area Geological Features and Hazards Summary

	CB&I (2014)	Alpine (2015)	TDI/Fugro (2021)
Ordinance		Possible throughout survey area due to active present and past military use in W-386 area	

Onshore Export Cable Corridor 1

The bay bottom along Offshore Export Cable Corridor 1 is relatively flat within Indian River Bay but exhibits areas of tidal scour near the cut banks along the Indian River as well as in areas west of Indian River Inlet. The bay bottom is moderately smooth along the survey corridor with some sand ripples and ridges observed. Intermittent areas of biogenic gas from the breakdown of organic matter in the sub-surface were noted. Table 5.2-3 summarizes the potential hazards of Onshore Export Cable Corridor 1.

Table 5.2-3. Onshore Export Cable Corridor 1 Geological Features and Hazards

Shallow Hazards	
Shallow Faults	Not Present
Gas Seeps or Shallow Gas	Biogenic gas present in low concentrations. Small depressions present may be related to gas escape.
Mobile Sediments	Features ranging from ephemeral ripples to tidal shoals observed. Seasonal variation is expected. No evidence of slumps, slides, creep, or karst topography. Average slope for Onshore Export Cable Corridor 1 is approximately 0.5°.
Gas Hydrates	Not Present
Surface Line Bottoms, Buried Channels, and Scour Features	No intact or massive rock observed. Buried/infilled channels observed at shallow depths. Scour present within Indian River channel, shoal area tidal channels, and around seafloor debris. Scour patches possible in Indian River Bay. Ice scour is not expected nor observed.
Man-made Hazards	
Cables / Pipelines	Not Present

Table 5.2-3. Onshore Export Cable Corridor 1 Geological Features and Hazards

Artificial Reefs	Not Present
Debris	Debris was observed on the bay floor throughout the area. Future deposition of anthropogenic debris is possible due to marine recreational traffic within the area.
Other	Buoys are present, including for navigation. A possible infilled dredging channel has been observed.

5.2.2 Impacts

5.2.2.1 Construction

Lease Area

Throughout the construction and installation portion of the Project, sediment will be disturbed and displaced in the Lease area. Pile driving for the WTG and OSS foundations, the installation of scour protection, vessel anchoring, cable installation, and the installation of cable protection will impact the surficial geology within the Lease area. Pile driving will temporarily displace sediment; causing it to become suspended locally in the water column. Scour protection, which may include loose or bagged rocks or stones (Fugro 2011), will be placed atop the sediment around the bases of the WTG and OSS. This process may suspend finer grain sediment; however, any suspended sediment will settle out of the water column and then redeposit nearby on similar sediment type. Installation of the inter-array cables using the jet plow technique will cause a temporary disturbance to sediment, which will be suspended into the water column and then redeposited within, or within the vicinity of, the submarine cable routes. It is anticipated that the cable will be entirely subsurface, but up to ten percent may require cable protection in the form of concrete mattresses or similar which would be installed as needed.

Overall, there will be minor temporary impacts and moderate permanent impacts to the Lease area geology and physical conditions from construction activities.

Offshore Export Cable Corridors

The Offshore Export Cables will begin at an OSS in the Lease area and extend through the Offshore Export Cable Corridors to the proposed landfall located at the 3 R’s Beach in Delaware (or Tower Road in Delaware as an alternative). Based on feedback from the USACE, US Wind adjusted the cable corridor routes in order to avoid a USACE-identified sand resource in the area around Indian River Inlet.

The Offshore Export Cables will be installed beneath the seafloor using low–impact jet plow technology until reaching the offshore landfall. US Wind will use submarine cables that have electrical shielding and bury the cables in the seafloor when practicable (Sharples 2011). The installation of the Offshore Export Cables and associated cable protection may impact the surficial geology along the Offshore Export Cable Corridors.

The cable installation will cause a temporary disturbance and sediment will be suspended into the water column and then redeposited within, or within the vicinity of, the Offshore Export Cable Corridors. Dredging offshore, if required, will temporarily displace sediment; however, sediment will be replaced, and seabed conditions will be restored to their original conditions after the installation of the submarine cables. It is anticipated that the Offshore Export Cables will be entirely subsurface, but up to ten percent may require cable protection in the form of concrete mattresses or the equivalent which would be installed where burial depth is not achieved. While placing the concrete mattress over the existing sediment does not modify the sediment, it will increase the seafloor relief in that area.

HDD will be used to install the Offshore Export Cable beneath the barrier beach into the transition vault. This process entails installing a gravity cell and drilling a borehole through sediment layers, which avoids disturbing nearshore subtidal, intertidal, and beach or backshore zones and will not degrade the integrity of the stratigraphic units at the shoreline.

Onshore Export Cable Corridor 1

Onshore Export Cables would then continue along Onshore Export Cable Corridor 1 beneath Indian River Bay and extend to the substation landfall, which is located at the existing Indian River Power Plant. Low-impact jet plow technology will be used as the preferred method to install the cable in Indian River Bay. The HDD and gravity cells will be used to transition to and from Indian River Bay to land which is expected to minimize impacts to sediment. Turbidity monitoring will be conducted during construction as required by permitting authorities.

Dredging is anticipated for barge access in the shallow waters of Indian River Bay and to reach the required cable burial depth. The sediments of Indian River Bay can be generally categorized into “segments” as shown in Figure 5.2-5.

Clean dredged sediments from Segment 1 would be prioritized for beneficial reuse for beach nourishment north of the Indian River Inlet. Sediment from Segments 2 and 3 would be prioritized for beneficial reuse for habitat restoration projects within Indian River Bay and Indian River to the greatest extent practicable with the remaining material placed in offshore or land-based approved disposal facilities. Dredging would temporarily displace sediment and would stabilize after installation of submarine cables.

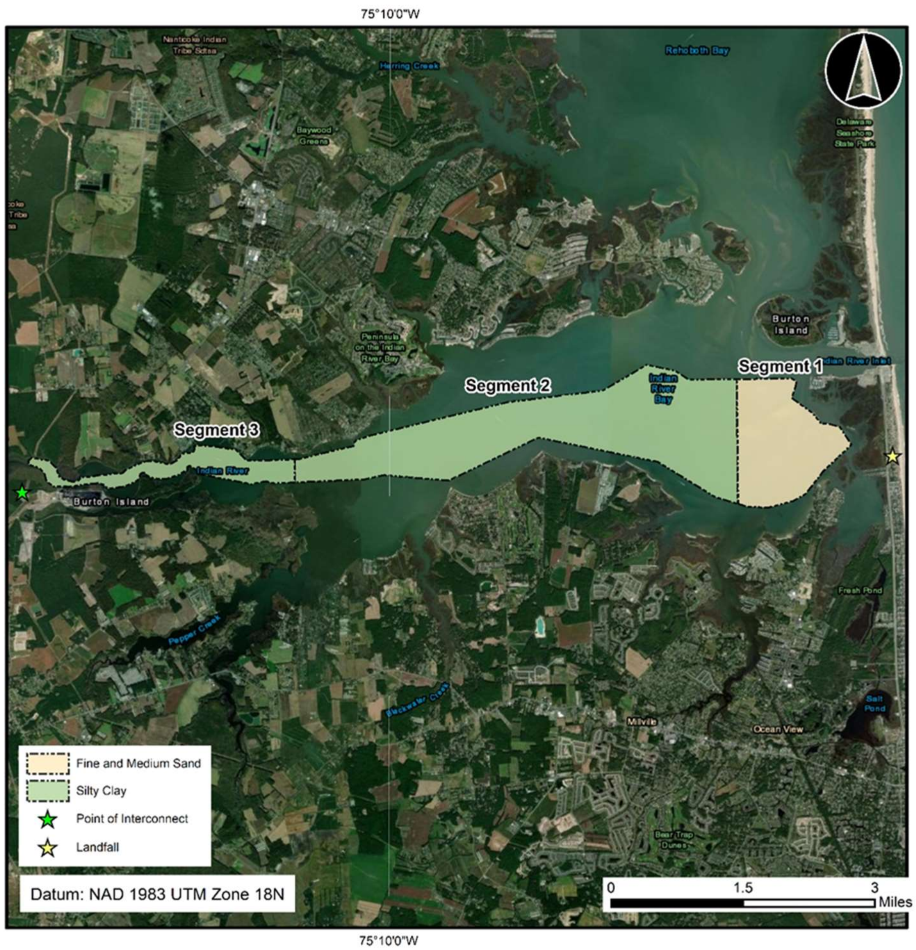

Figure 5.2-5. Sediment within Indian River Bay

Dredging in Indian River Bay is a relatively regular occurrence. Maintenance dredging occurs in portions of Indian River and Indian River Bay to aid navigation, including during the 1990s, 2009, 2010, 2020, and 2022-2023. At the conclusion of the 2013 and 2020 work, dredge material was placed along the shoreline of Delaware Seashore State Park and along the Route 1 highway and bridge, respectively. Additionally, maintenance dredging in Indian River is under consideration, with the material proposed to be used to restore degraded wetlands.

The installation of the Onshore Export Cables and associated cable protection, as well as potential dredging, may impact the surficial geology along Onshore Export Cable Corridor 1. The installation will cause a temporary disturbance and sediment will be suspended into the water column and then redeposited within, or within the vicinity of Onshore Export Cable Corridor 1. It is anticipated that the cable will be entirely subsurface, although up to ten percent may require cable protection in the form of concrete mattresses or the equivalent which would be installed if needed. While placing the concrete mattress over the existing sediment does not modify the sediment, it will increase the bay bottom relief in that area.

Overall, depending on the method of installation and the extent of concrete mattresses required, there will be minor to moderate temporary impacts with the potential for moderate permanent impacts to geology and physical conditions from the Onshore and Offshore Export Cables.

5.2.2.2 Operations

The submarine cables will be installed beneath the seabed; therefore, the operation of the submarine cables will not impact the surficial geology. Maintenance of the submarine cables and cable protection would include periodic inspections of the Onshore and Offshore Export Cables as well as inter-array cables.

In the event of damage occurring to a cable, processes similar to those used during construction and installation would be utilized to expose, repair, and rebury the cable. This activity may cause local sediment displacement and temporarily suspend sediment in the water column. Suspended sediment will settle out of the water column and be redeposited within, or within the vicinity of, the submarine cable corridor.

Overall, aside from repairing unplanned cable damages, operations of the Project are not expected to have temporary or permanent impacts to geology and physical conditions.

5.2.2.3 Impacts of Alternatives

Installation of export cables in Offshore Export Cable Corridor 2 would be conducted in the same manner as Offshore Export Cable Corridor 1, which would not result in additional impacts to geology or physical conditions of the Atlantic. Geological and hazard conditions within Offshore Export Cable Corridor 2 are similar, with the exception of a reported German mine location, which was destroyed.

Cable installation in any of the terrestrial routes (i.e., Onshore Export Cable Corridor 1a, 1b, 1c, or 2) would avoid impacts to the geology or physical conditions of Indian River Bay.

5.2.3 Mitigation and Monitoring

US Wind will implement the following mitigation measures to reduce Project impacts on geological resources.

5.2.3.1 Geological

- Select suitable geological locations for the installation of the WTG, OSS and Met Tower foundations and design foundations appropriate to geological conditions.
- To the greatest extent practicable, select areas with suitable seabed conditions for cable installation during cable route planning.

- Use submarine cables that have electrical shielding and bury the cables in the seafloor, when practicable.
- Minimize sediment disturbance by utilizing the best available technologies to achieve deep burial of submarine cable into a stable sediment layer (i.e., jet plow technology, HDD, gravity cells, etc.).
- Minimize the amount of scour protection required.

5.2.3.2 Munitions of Explosive Concern (MEC)/Unexploded Ordnance (UXO)

- Prior to construction, analyze survey data at installation locations to identify potential Munitions of Explosive Concern (MEC)/Unexploded Ordnance (UXO) and plan avoidance in line with industry best practices.
- Prepare an MEC/UXO Emergency Risk Management Plan prior to construction.
- Prior to construction activities, provide an MEC/UXO awareness briefing to vessel crews.

5.3 Water Quality

5.3.1 Description of Affected Environment

The Project area includes both open marine waters and inland waters. Marine waters include the Atlantic Ocean within the Lease area and along the Offshore Export Cable Corridors between the Lease area and the Delaware shoreline. Marine waters also include coastal waters that could be affected by Project activities (e.g., traversed by vessels during Project installation, operation, decommissioning, and/or non-routine events). Inland waters include waters of Indian River and Indian River Bay along Onshore Export Cable Corridor 1 from the Delaware coast to the proposed landfall at the Indian River Substation. Indian River Bay is part of the coastal watershed locally known as the Inland Bays, which also includes Rehoboth Bay and Little Assawoman Bay. Rehoboth Bay and Little Assawoman Bay are located outside of the Project area.

Water quality is controlled primarily by the anthropogenic inputs of land runoff, land point source discharges, and atmospheric deposition from discharges to the air. With increasing distance from shore, oceanic circulation patterns play an increasingly larger role in dispersing and diluting anthropogenic contaminants and determining water quality.

The condition of mid-Atlantic estuaries and coastal waters is fair to good in most locations, as measured by the National Coastal Condition Assessment (NCCA) water quality index (USEPA 2016). Among the water quality analytes examined, phosphorus and chlorophyll (algal productivity) were more likely to be rated as fair, while nitrogen, dissolved oxygen, and water clarity were predominantly rated as good. Coastal waters in the mid-Atlantic region have improved with regard to overall water quality since 2001 (USEPA 2016). The most consistent gains were observed in dissolved oxygen and water clarity.

5.3.1.1 Lease Area and Offshore Export Cable Corridors

Offshore water quality in the mid-Atlantic region is generally good and recent assessments have found no major indications of poor sediment or water quality. The region generally exhibits low nutrient concentrations and good dissolved oxygen and water clarity measurements (USEPA 2016). The 2006 mid-Atlantic Bight assessment found there were no major indications of poor sediment or water quality and that the dissolved oxygen, sediment contaminants, and sediment Total Organic Carbon (TOC) component indicators were rated good throughout the survey area (USEPA 2012). Additionally, the NOAA rated sediment contaminants and sediment TOC component indicators as good (Balthis et al. 2009).

Within state waters along the Offshore Export Cable Corridors, the Delaware Surface Water Quality Standards (7 DE Admin Code 7401) classify waters of the Atlantic Ocean as suitable for industrial water supply, primary contact recreation, secondary contact recreation, and fish, aquatic life, and wildlife habitat. Along Delaware's Atlantic coast, stormwater is the main source of pollutants, although water quality exceedances at beaches are rare (USEPA 2016).

<u>**Salinity, Temperature and Dissolved Oxygen**</u>

Deeper offshore waters of the Offshore Export Cable Corridors and Lease area appear to demonstrate little variation in salinity and temperature from location to location. However, vertical variation in these parameters does occur on a seasonal basis when the water column stratifies. This is supported by CTD cast data from numerous survey and research cruises within the Lease area presented on the World Ocean Database (World Ocean Database 2021).

Specifically, stratification typically reaches a maximum in the summer when surface waters are warmer and somewhat less saline than bottom waters (Table 5.3-1). This is followed by a turnover between September and October that results in a well-mixed and more uniform vertical salinity and temperature profile that lasts into the following spring.

Table 5.3-1. Range of Seasonal Conductivity, Temperature, and Depth Data Over Five Years Between 2014 and 2018, from the Lease Area and Adjacent Waters

Season	Depth (m)	Temperature (°C)			Salinity (PSU)		
		Min	Max	Mean	Min	Max	Mean
Spring	1	1.92	17.80	9.03	29.51	36.11	32.39
	20	4.14	12.86	8.33	31.31	35.63	33.25
	30	4.44	11.93	8.25	31.98	35.53	33.69
Summer	1	22.49	27.27	25.10	30.24	32.00	31.60
	20	10.00	18.62	14.04	32.09	33.16	32.46
	30	8.09	10.47	9.52	32.59	33.19	32.78
Fall	1	13.19	27.84	21.71	29.65	33.58	31.99

Table 5.3-1. Range of Seasonal Conductivity, Temperature, and Depth Data Over Five Years Between 2014 and 2018, from the Lease Area and Adjacent Waters

Season	Depth (m)	Temperature (°C)			Salinity (PSU)		
		Min	Max	Mean	Min	Max	Mean
	20	10.97	26.11	18.02	31.01	35.46	33.02
	30	9.91	21.18	16.15	32.19	35.10	33.39
Source: World Ocean Database, accessed 11/11/2021							

Additional CTD data were collected during benthic surveys conducted within the Maryland WEA in July 2013. The results from these surveys confirmed the presence of a strongly stratified water column. Coincident with this stratification was a reduction in dissolved oxygen from supersaturated conditions near the surface to less well-oxygenated (near 80 percent saturation) waters at the bottom. Water quality varied little horizontally, although a north-to-south gradient in the depths of the stratified layers was apparent (Guida et al. 2017).

The shallow coastal marine waters near the Offshore Export Cable Corridors are generally well-mixed, as indicated by salinity, temperature, and dissolved oxygen profiles. Scott and Wong (2012) collected water quality measurements in Delaware's Atlantic coastal waters as part of a study to characterize potential sand borrow areas. Over the course of this study, little to no stratification was observed at these locations, indicating a well-mixed water column. Salinity ranged from approximately 27 practical salinity units (psu) to almost 31 psu, while dissolved oxygen ranged from approximately 10 milligrams per liter (mg/L) to 12 mg/L (USEPA 2016).

<u>**Turbidity/Suspended Solids**</u>

The Lease area and adjacent coastal waters along the Offshore Export Cable Corridors are characterized by sand ridges and troughs that are oriented along a generally southwest to northeast axis (CB&I 2014; Conkwright, Van Ryswick, and Sylvia 2015). The sand ridges have a complex morphology that is superimposed with smaller scale bedforms (sand waves). This is suggestive of active sediment transport with frequent sediment mobilization, resuspension, and deposition occurring due to tides, currents, and storm activity. Along the Offshore Export Cable Corridors, wave action may also affect sediment transport in water depths shallower than approximately 20 m (66 ft). During these periods of naturally induced sediment transport, short-term increases in turbidity affecting water quality may occur.

Detailed studies of suspended sediment concentrations in the marine waters of the mid-Atlantic indicate turbidity can vary by an order of magnitude at a single location over time, from less than 1 mg/L to several hundred mg/L in federal waters. Higher values are typically associated with storm events (Louis Berger Group Inc. 1999).

An offshore sediment transport modelling study has been provided in COP Appendix II-B2 (US Wind 2023). This study addresses turbidity and total suspended solids from the construction phase along Offshore Export Cable Corridor 1. Turbidity and total suspended solids from construction along Offshore Export Cable Corridor 2 were assessed in Addendum 1 of COP Appendix II-B2 (US Wind 2023). Addendum 2 of COP Appendix II-B2 (US Wind 2023) provides sediment transport modeling results for the proposed trailing suction hopper dredging that may be needed to prepare the seafloor for construction at each of the four proposed OSS locations.

Sediment

Because the State of Delaware has issued guidelines for classifying potential ecological impacts of sediment contamination, a field investigation was conducted within Delaware State waters along the formerly planned Offshore Export Cable route in September 2016 for the purpose of collecting and analyzing environmental sediment core samples.

Six environmental vibracores were collected and sampled for bulk physical and chemical properties. Samples were predominantly medium-fine-grained sand and silt, contained little organic matter (0.3 – 3.8 percent), and had bulk densities of 1.3 – 2.0 grams per cubic centimeter (gm/cm^3) (81.4 – 127.8 pounds per cubic feet [lbs/ft^3]).

Of the six cores collected along the formerly planned Offshore Export Cable route, only one sample from one core exceeded a Delaware Ecological Marine Sediment Screening Level (DNREC 2018b). Sample VC-A-04-S1, collected at the sediment surface approximately 1 NM offshore, exceeded the screening levels for arsenic and nickel, as well as the NOAA Effects Range-Low (ERL) level for nickel. Arsenic is ubiquitous in the environment at low concentrations (1 to 40 milligrams per kilogram [mg/kg]), and is transported through natural phenomena such as erosion as well as through human activity, including the use of pesticides and as waste from metal refining processes (Tchounwou et al. 2014). Nickel is also a commonly encountered heavy metal that is widely used in the manufacturing of stainless steel and batteries.

Complete results of the sediment sample analysis described above are provided as COP Appendix II-A7 (US Wind 2023). Results of the 2016 environmental testing in the Atlantic Ocean are included in Appendix G for convenience.

US Wind is examining sediment data along the Offshore Export Cable Corridors 1 and 2, where approximately 50 vibracore locations were sampled during the summer of 2021. The resulting data has been provided in the geophysical survey report of the Lease area and Export Cable Corridors conducted during 2021 in COP Appendix II-A1 (US Wind 2023).

5.3.1.2 Onshore Export Cable Corridor 1

Onshore Export Cable Corridor 1 traverses Indian River Bay and estuarine portions of the Indian River. The Delaware Surface Water Quality Standards (7 DE Admin Code 7401) classify both of these waterbodies as suitable for industrial water supply; primary contact recreation; secondary contact recreation; and fish, aquatic life, and wildlife habitat. Parts of Indian River Bay are also classified as Harvestable Shellfish Waters (SFH). Additionally, both Indian River Bay and Indian

River have been designated as waters of Exceptional Recreational or Ecological Significance (ERES).

Despite these water quality classifications, Delaware's 2020 *Combined Watershed Assessment Report* (DNREC 2020a) lists both Indian River and Indian River Bay as impaired. Water quality impairments include bacteria, nutrients, temperature, and total suspended solids.

Salinity, Temperature and Dissolved Oxygen

According to data available from the Delaware Water Quality Portal monitoring station buoy, salinity in Indian River Bay ranges from approximately 18 to 34 psu and is typically greatest from July to October (DNREC 2023). Indian River Bay exhibits a strong salinity gradient defined by three salinity segments: oligohaline, mesohaline, and polyhaline/euhaline. Onshore Export Cable Corridor 1 primarily traverses the polyhaline portion of Indian River Bay, where salinity exceeds 18 psu and approaches marine conditions. The polyhaline zone includes the onshore landfall and most of Onshore Export Cable Corridor 1 to the west. Salinity gradually declines toward the substation landfall, which is located in the mesohaline zone of the Indian River. In this zone, salinity regularly falls below 25 psu, but generally remains above 15 psu (DNREC 2023) .

In Indian River Bay, water temperature ranges from approximately 14 degrees Celsius (°C) (34° Fahrenheit [F]) in the winter to the mid-20s°C (mid-70s°F) in the summer, with occasionally colder or warmer conditions. Shallow tidal creeks along the periphery of Indian River Bay may experience colder temperatures in the winter and warmer temperatures in the summer (DNREC 2023).

Dissolved oxygen levels in Indian River Bay range from 5.0 to 13 mg/L in the spring and from 3.5 to 8.9 mg/L in the summer, which is typically when dissolved oxygen drops to its lowest levels (DNREC 2023) . Adequate dissolved oxygen levels are critical to the survival of fish and other marine organisms. Hypoxic (low oxygen) events are rare but may have a significant impact on finfish and commercially harvested shellfish when they occur. In Indian River Bay, dissolved oxygen levels are typically adequate to support aquatic life year-round (DNREC 2023).

Turbidity/Suspended Solids

For tidal portions of Indian River Bay, the state water quality criterion for Total Suspended Solids (TSS) is a seasonal average of 20 mg/L from March 1 to October 31. Data collected from Indian River Bay since 2000, indicate a range in TSS from approximately 5 mg/L to more than 184 mg/L over the course of the year (DNREC 2023). Water clarity is too low to support the growth of submerged aquatic vegetation (SAV) in Indian River and most of Indian River Bay, although it generally improves from west to east (DCIB 2016).

A sediment dispersion analysis in Indian River Bay has been prepared and is provided as COP Appendix II-B1 (US Wind 2023). The analysis identified three potentially sensitive receptors:

- Tidal wetlands along the shoreline of Indian River Bay (sensitive to suspended sediment and deposition).
- Shellfish harvesting areas (sensitive to suspended sediment and deposition).
- The cooling water intake at the Indian River Power Plant (sensitive to suspended sediment). The Indian River Power Plant may soon be retired.

Sediment transport modelling for Indian River Bay is provided in COP Appendix II-B3, which indicates that the majority of suspended sediments will settle out of the water column following the completion of jet plowing fairly quickly (US Wind 2023).

Sediment

For the purpose of collecting and analyzing environmental sediment core samples, a field investigation was conducted, within a portion of what is now defined as Onshore Export Cable Corridor 1, during October 2017. Environmental vibracores were collected from 17 locations in Indian River Bay and tests of the parameters listed in Table 5.3-2 were conducted.

Table 5.3-2. List of Environmental Parameters, Indian River Bay, October 2017

Parameter	Method
Grain Size with Hydrometer	ASTM D422
Atterberg Limits	ASTM D4318
Specific Gravity	ASTM D854
Density of Soils/Solids	ASTM D7263
Total Organic Carbon and Black Carbon (TOC/BC)	Lloyd Kahn Method
Moisture, Ash, and Organic Matter	ASTM D2974
Total Metals [Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V and Zn]	EPA Method 6010C Hg by cold vapor Method 7471B
Polycyclic Aromatic Hydrocarbons (PAHs) and Alkyl PAH Homologs	EPA Method 8270D
Pesticides	EPA Method 8081A
PCB Congeners	EPA Method 1668C
Dioxins/Furans	EPA Method 1613B
Ammonia-Nitrogen	EPA Method 350.1
Phosphorus	EPA Method 365

Grain size analysis indicated that sediment samples were predominantly medium-fine-grained sand and silt, contained little organic matter (0.6 – 57 percent), and had bulk densities of 1.0 – 1.7 gm/cm^3 (60.5-107.4 lbs/ft^3). Of the samples analyzed from these cores, 15 exhibited concentrations of select target analytes that exceeded one or more of the Delaware Ecological Marine Sediment Screening Levels (DNREC 2018b).

Two samples (VC-IRB-05-S2 and VC-IRB-08-ALT-S2) exceeded the screening levels and Threshold Effect Levels (TELs) for one or both of the Polycyclic Aromatic Hydrocarbons (PAHs) acenaphthene and naphthalene (Buchanan 2008). However, because the detected PAH concentrations were not significantly elevated (detected concentrations less than twice the screening levels) relative to the screening levels and these two samples exhibited the highest TOC results at 31 percent and 25 percent, it is anticipated that these contaminants are bound to the organic materials and would not become more available to aquatic organisms as a result of the proposed Project. Furthermore, the detected PAH concentrations did not exceed screening values that are more indicative of adverse biological impacts, such as probable effect levels (PELs) (Buchanan 2008).

Thirteen samples exceeded the screening levels for metals (arsenic and/or nickel), although concentrations were at or below 12 mg/kg for arsenic and 23.8 mg/kg for nickel. Exceedances of the Delaware Department of Natural Resources and Environmental Control (DNREC) screening levels were detected in eleven of the samples for arsenic and thirteen of the samples for nickel. However, the following observations were also made regarding the presence of arsenic and nickel in sediments of Indian River Bay:

- These heavy metals are widespread within the shallow sediments in Indian River Bay. Arsenic and nickel are also the only two heavy metals that exceeded ERL levels in sediment samples that were previously collected during an assessment of the mid-Atlantic Bight in 2006 (Balthis et al. 2009).
- The mean concentration from all of the sediment cores for both of these heavy metals (5.92 mg/kg - arsenic; 12.70 mg/kg – nickel) is below the applicable DNREC screening levels and TELs.
- Detected heavy metal concentrations did not exceed screening values that are more indicative of adverse ecological impacts, such as PELs (Buchanan 2008).

Complete results of the sediment sample analysis are provided as COP Appendix II-A7 (US Wind 2023). Results of the 2017 environmental testing in Indian River Bay are included in Appendix G for convenience. At DNREC's request, US Wind will conduct additional sediment sampling in 2023.

Indian River Dredging Project: Analysis of Chemical Contaminants in Sediments (2020b)

In September 2019, DNREC collected ten sediment cores within Indian River to evaluate the potential environmental risk associated with a proposed maintenance dredging project in the federal channel (D.D.o.N.R.a.E.C. DNREC 2020b). Of the 40,000 cubic yards of proposed dredged material, about 23,000 cubic yards was proposed to be placed in a previously constructed upland confined disposal facility (CDF) near the project site. The remaining 17,000 cubic yards was proposed for beneficial reuse to restore/create wetlands owned by the Town of Millsboro.

The ten sediment cores collected by DNREC were composited into two samples, a surface sample and a subsurface sample. Polychlorinated biphenyls (PCBs) were detected in both surface and subsurface composite samples. Total PCB levels were not significantly different between the two samples (D.D.o.N.R.a.E.C. DNREC 2020b). Despite the presence of PCBs in the sediment samples, toxicity to aquatic life due to PCBs was not expected. Furthermore, neither the surface nor subsurface sample PCB results exceeded DNREC Soil Screening Values for protection of human health.

Several semi-volatile organic compounds (SVOCs) were detected in the sediment samples (D.D.o.N.R.a.E.C. DNREC 2020b). However, none of the SVOCs detected exceeded their compound specific Equilibrium Partitioning Sediment Benchmarks (ESBs) so potential toxicity to aquatic life from SVOCs was not expected. Furthermore, neither the surface nor subsurface sample SVOC results exceeded the applicable DNREC Soil Screening Levels for protection of human health.

Metals were also present in the sediment samples. However, toxicity to aquatic life from dredging activities due to metals was not expected and the potential toxic impact to humans was considered low based on a comparison of the analytical results with the applicable Delaware Screening Values. Estimated arsenic concentration exceeded the Delaware chronic toxicity standards for surface water but were within the range of sediment values detected regionally within the Delaware Inland Bays (D.D.o.N.R.a.E.C. DNREC 2020b).

Organochlorine pesticides were not detected in either of the sediment composite samples at concentrations exceeding analytical detection limits.

Overall, the results of the DNREC (2020b) study on sediment contamination within Indian River were consistent with the results of the 2017 survey of Indian River Bay completed by US Wind (see full report see COP Appendix II-A7, testing results provided as Appendix G to the Application).

Nutrients

Both nitrogen and phosphorus pollution are considered to be problematic in the Inland Bays watershed. DNREC conducted a Total Maximum Daily Loads (TMDL) analysis for nitrogen and phosphorus in Indian River and Indian River Bay in 1998 (DNREC 1998) and introduced a pollution control strategy (DCIB 2016). The majority of the pollutant reductions proposed in the plan targeted agriculture, because it is the dominant land use in the Inland Bays watershed (DCIB 2016). However, conversion of agricultural lands into developed areas has been occurring at a rapid pace since the plan was developed (DCIB 2016), making stormwater runoff an increasingly important driver of nutrient concentrations in the watershed.

A number of point sources have historically discharged nutrient pollution into Delaware's Inland Bays, but all of the significant sources of nutrient pollution have since been eliminated. The Town of Millsboro removed its wastewater discharge from the Indian River in 2015 (DCIB 2016), and the City of Rehoboth Beach rerouted its wastewater discharge from an outfall on Rehoboth Bay to an ocean outfall in 2018 (Peikes 2018). Of the thirteen nutrient pollution sources originally identified, only one small point source in Millsboro continues to discharge to the Indian River as of 2018 (DCIB 2018).

Water quality in the Indian River and Indian River Bay has been degraded by these sources of nutrient pollution. The water quality standard for dissolved inorganic phosphorus in both waterbodies is 0.010 mg/L (DNREC 1998). Average concentrations of dissolved inorganic phosphorus between 2011 and 2015 exceeded the standard at three of the four monitoring stations on the River and at three of the four monitoring stations in Indian River Bay (DCIB 2016). The four monitoring stations on the Indian River had average nitrogen concentrations more than double the standard of 0.14 mg/L, but three of the four stations in Indian River Bay met the standard (DCIB 2016). Algae concentrations in Indian River Bay have improved since 2010, but excess nutrients continue to fuel algal growth on the Indian River. From 2011 to 2015, concentrations of chlorophyll *a* at all four monitoring stations on the Indian River exceeded the 15 mg/L standard, but stations in Indian River Bay met the standard (DCIB 2016).

5.3.2 Impacts

5.3.2.1 Construction

Suspended Sediment/Deposition

Suspended sediment/deposition associated with construction is anticipated to have a negligible to minor impact on water quality. Pile driving during OSS and WTG foundation installation, use of jack-up and feeder vessels, jet plow operations during cable laying and embedment, and vessel anchoring will disturb sediment on the seafloor. The HDD operations at the landfall locations are also expected to result in some sediment disturbance in and around the gravity cells.

Lease Area

Increases in sediment suspension beyond baseline conditions will be limited during anchoring and pile driving. Sediment suspension is expected to be localized to the area of anchorage or pile driving activity and sediments directly disturbed by the anchor or jack-up vessel, respectively. The small volume of sediment displaced is expected to settle to the seafloor shortly thereafter. Therefore, water quality impacts associated with anchoring and pile driving are expected to be negligible.

For the installation of the OSSs, a trailing suction hopper dredge (TSHD) may be used to prepare the seafloor. Sediment is suspended using high-pressure water jets, then collected and stored on vessels until it is disposed at a desired location. COP Volume II, Appendix II-B2, Addendum 2 assessed the impacts of this dredging on suspended sediment at the OSSs locations. Modelling results indicated that suspended sediment would be greater than 10 mg/L within 250 m (820 ft) of the disposal locations (COP Volume II, Appendix II-B2). The sediment plume created by each disposal would be short-lived, with conditions returning to ambient levels in less than six hours.

Submarine Cables

The use of HDD at the landfalls will minimize water quality impacts in the nearshore environment, and gravity cells will help to contain sediment that becomes suspended in the water column. Some sediment may be displaced during the installation and removal of the gravity cells; however, this would be a relatively small volume of material that would settle out relatively quickly. Consequently, water quality impacts associated with HDD are anticipated to be negligible.

Although jet plow embedment is the least impactful method for installing submarine cables, jet plow operations during cable laying and embedment will result in the disturbance of sediments within the Lease area and along the Offshore Export Cable Corridors and Onshore Export Cable Corridor 1. Alternative cable installation methods may be necessary in Indian River Bay (e.g., vibro-injector or trenching) where jet plow operation is not feasible. This would result in suspended sediment concentrations that may vary from what would be produced by jet plow installation methods. However, increases in suspended sediment would still be expected to be temporary. Therefore, water quality impacts associated with alternative cable installation methods, if used, are anticipated to be minor.

Sediment suspension and deposition are expected to be locally higher in the immediate vicinity of jet plow operations. However, suspended sediment concentrations are expected to return to background levels no more than 24 hours after jet plow passage. Although concentrations of TSS associated with jet plow operations depend on the type of sediment present and the strength of local water currents, a study conducted by Elliott et al. (2017), of particle settlement during cable laying for the Block Island Wind Farm found that measured TSS concentrations during and after plowing were as much as two orders of magnitude smaller than modeled concentrations. Measured TSS concentrations two weeks post plowing were rarely distinguishable from background levels (Elliott et al. 2017).

Additionally, as discussed in Sections 5.3.1.1 and 5.3.1.2, some of the material suspended by the plow may contain elevated levels of arsenic and nickel that are common nearshore and inshore in the Project area. Therefore, water quality impacts associated with jet plow operations are expected to be minor.

Appropriate avoidance, minimization, and mitigation measures for potential impacts associated with the low concentrations of heavy metals and PAHs that were detected in some of the sediment samples collected along Onshore Export Cable Corridor 1 will be addressed in the water quality certificate obtained for this Project under Section 401 of the CWA. For example, turbidity monitoring will be conducted during Project construction, as required by the permitting authorities.

Sediment transport modeling for the Offshore Export Cable Corridors has been conducted and the results are provided as Appendix II-B2 and Onshore Export Cable Corridor 1 in Appendix II-B3 (US Wind 2023). These studies address turbidity and total suspended solids from the construction phase along the export cable corridors. Turbidity and TSS from construction along Offshore Export Cable Corridor 2 were assessed in Addendum 1 of COP, Appendix B2 (US Wind 2023). Addendum 2 of COP, Appendix B2 (US Wind 2023) provides sediment transport modeling results for the proposed trailing suction hopper dredging that may be needed to prepare the seafloor for construction at each of the four proposed OSS locations.

Based on sediment transport results for the Offshore Export Cable Corridors (COP Volume II, Appendix II-B2 (US Wind 2023)), the vast majority of sediments disturbed by the jet plow will quickly return to the cable installation trench. Areas of sediment deposition greater than 0.2 mm (0.008 in) will occur within 91 m (300 ft) of the proposed cable path. Based on sediment transport assessment results for Onshore Export Cable Corridor 1 (COP, Appendix II-B3 (US Wind 2023)), the vast majority of sediments disturbed by the jet plow in Indian River Bay will quickly return to the cable installation trench. A portion of the disturbed sediments will leave the immediate trench area, resulting in measurable, but temporary increases in suspended sediment that are anticipated to occur within 1,400 m (4,600 ft) of jet plow operations. Areas of sediment deposition greater than 5 mm (0.2 in) are also anticipated to occur within 30 m (95 ft) of jet plow operations.

Stormwater

Land-based construction activities related to the Project include the installation of the US Wind substations, associated laydown area and access roads and the possible construction of an O&M Facility. Potential stormwater impacts related to the construction of the Project include the discharge of sediment, or other pollutants, from the construction site(s) that may impact the quality of waters of the state. The total volume of stormwater discharge from the construction site is dependent on factors such as the size of the site and overall weather conditions.

The DNREC regulates construction activities that result in land disturbance equal to or greater than one acre that discharge stormwater to Waters of the State through the National Pollutant Discharge Elimination System (NPDES) Construction General Permit, effective March 11, 2021. Construction of the Project may result in the disturbance of approximately 0.08 km^2 (20 acres) of land during the construction activities noted above. US Wind anticipates that a Construction General Permit will be required and will develop an associated Stormwater Pollution Prevention Plan (SWPPP) for construction activities as appropriate.

Onshore Export Cable Corridor 1

Alternative cable installation methods may be necessary in Indian River Bay (e.g., vibro-injector or trenching) where jet plow operation is not feasible. This would result in suspended sediment concentrations that may vary from what would be produced by jet plow installation methods. However, increases in suspended sediment would still be expected to be temporary. Therefore, water quality impacts associated with alternative cable installation methods, if used, are anticipated to be minor.

Dredging would be conducted using mechanical, or most likely, hydraulic means, based on sediment information in Indian River Bay and Indian River. Mechanical dredging would involve the use of an excavator working off of a barge to dig out the sediment to be hauled away for disposal or reuse. Because mechanical dredging is robust and does not filter the dredge material, it is most often used to remove rock and gravel. The benefits of mechanical dredging are speed, mobility, accuracy, and the ability to handle larger dredge material. Its biggest potential drawback can be high resuspended sediment in the water column.

Hydraulic dredging involves a dredge that floats on the water and pumps the material as a slurry through a temporary pipeline to a barge or coastal location. A hydraulic dredge acts like a floating vacuum removing sediment precisely, and is best suited for removing fine silt, sand, and dirt. Hydraulic dredging has a lower percentage of suspended sediment than mechanical dredging although the process may take longer depending on the site.

The use of HDD at the landfalls will minimize water quality impacts in the nearshore environment, and gravity cells will help to contain sediment that becomes suspended in the water column. Some sediment may be displaced during the installation and removal of the gravity cells; however, this would be a relatively small volume of material that would settle out relatively quickly. Consequently, water quality impacts associated with HDD are anticipated to be negligible.

Appropriate avoidance, minimization, and mitigation measures for potential impacts associated with the low concentrations of heavy metals and PAHs that were detected in some of the sediment samples collected along Onshore Export Cable Corridor 1 will be addressed in the water quality certificate obtained for this Project under Section 401 of the Clean Water Act (CWA). For example, turbidity monitoring will be conducted during Project construction, as required by the permitting authorities.

Routine/Accidental Releases

During the course of construction, pollutants may be discharged into the environment as part of routine activities, such as the operation of construction vessels and vehicles, or due to accidental spills. Pollutants may be discharged directly into a waterbody or discharged into the air and deposited on the surface of a waterbody. It is anticipated that these releases will have a negligible impact on water quality.

Installation of the WTGs, OSSs, Met Tower, export cables, and inter-array cables will require the operation of vessels. Any discharge of greywater, uncontaminated bilge and ballast water, and treated deck drainage from construction vessels will comport with USCG and United States Environmental Protection Agency (EPA) requirements. Refer to COP Section 5.1 (US Wind 2023), for a discussion of waste generation and disposal. In addition, COP Appendix I-G (US Wind 2023) describes potential wastes generated by the Project and the means of storage or discharge. Volumes will be typical of those used in maritime construction activities.

While oil and grease, sanitary waste, and solid waste will be stored securely until they can be disposed on land in accordance with the Code of Federal Regulations (CFR) (33 CFR 151.10, CFR 140 and 149, and 33 CFR 151.51-77), it is possible that small amounts of litter could be unintentionally released to surface waters. Any de minimis amounts of litter inadvertently released during construction of the Project will be insignificant in comparison to the high existing levels of marine debris along the coastline within the Project area.

Procedures for preventing and controlling spills is documented in the Project's Construction Spill Prevention Control and Countermeasures (SPCC) Plan and Oil Spill Response Plans (OSRP). The OSRP can be found in COP Appendix I-A (US Wind 2023). As described in COP Section 5.0 (US Wind 2023), vessel engines will emit particulates into the air as they combust fuel. Vessels will comport with air permitting and emissions limitations and violations are not anticipated. In addition, the emissions of construction vessels will be insignificant in comparison with other existing sources of atmospheric deposition that impact the Atlantic Ocean. Small releases of lubricants, solvents, or other chemicals could occur during the installation of nacelles, turbines, and blades on the WTGs. In the event of a collision, allision, or other accident, oils and hydraulic fluids contained within components of the WTGs and OSSs could be spilled during installation; however, this is highly unlikely to occur. The OSRP located in COP Appendix I-A (US Wind 2023) will mitigate any impacts. As such, water quality impacts due to routine and accidental releases are anticipated to be negligible.

The HDD operation will include a drilling fluid fracture or overburden breakout monitoring program during borehole drilling operations to minimize environmental impacts, which at worst will be temporary and localized. The use of gravity cells will help contain any HDD drilling fluids that may be released. In the case of potential inadvertent release of HDD drilling fluids, nearshore waters of the Atlantic Ocean, Indian River Bay, and the Indian River could be affected by localized release of HDD drilling fluids from deeper subsurface borehole drilling, if drilling fluids are released and not properly contained by the gravity cells. However, HDD drilling fluids (bentonite, clay and water) are biologically inert and would not cause appreciable poor water quality conditions. The bentonite contained in the drilling fluid will gel or coagulate upon contact with saline or brackish water. In the event of a fluid release, the bentonite fluid density and composition will cause it to remain as a cohesive mass on the seabed, which can be quickly cleaned up and removed by diver-operated vacuum equipment. Given the small area covered and the short-term duration of HDD operations, impacts to water quality are expected to be negligible.

Construction vehicles will also emit particulates into the air as they combust fuel. While these particles could settle on the surface of the Indian River, Indian River Bay, or the Atlantic Ocean, much of the pollution associated with vehicle emissions will settle over land. The operation of construction vehicles in the Project area will be short-term and temporary, and insignificant when compared to existing sources of atmospheric pollutants that impact the Inland Bays and the Atlantic Ocean. Therefore, water quality impacts due to routine and accidental releases are anticipated to be negligible in nearshore waters. Project activities will comply with all reporting and monitoring conditions established under applicable permits.

5.3.2.2 Operations

Suspended Sediment/Deposition

Temporary increases in suspended sediment and resulting deposition would be possible during emergency cable repairs, if these become necessary over the course of Project operation, due to cable replacement and/or repair vessel anchoring. However, increases in suspended sediment concentrations will not be a routine occurrence during operations and will have localized impacts similar to or less than the impacts of construction; therefore, their impact on water quality is expected to be negligible.

Routine/Accidental Releases

It is anticipated that routine and accidental releases associated with the Project will have negligible impacts on water quality during operations. Over the lifetime of the installation, regular maintenance will be necessary, as well as potential non-routine repairs. Maintenance personnel and equipment will access the WTGs, OSSs, Met Tower, and submarine cables by boat. Boats traveling to the Project area may discharge sanitary waste, litter, and engine emissions into the Atlantic, as described in COP Volume II, Section 4.2.1 (US Wind 2023). However, the discharged volume of these materials would be small and unlikely to have a measurable impact on water quality. Materials such as paint, solvent, or lubricant could also be spilled during maintenance work, but these would also be used in relatively small quantities. Boats may also experience accidental oil spills. These scenarios are unlikely to occur, and spill prevention plans will mitigate any impacts. Because marine discharges are not a part of routine operations for the Project, it is anticipated that they will have a negligible impact on water quality.

5.3.2.3 Impacts of Alternatives

Installation of export cables in Offshore Export Cable Corridor 2 would be conducted in the same manner as Offshore Export Cable Corridor 1, which would not result in additional impacts to water quality of the Atlantic.

Cable installation in any of the terrestrial routes (i.e., Onshore Export Cable Corridor 1a, 1b, 1c, or 2) would avoid impacts to the water quality of the Bay. Indirect water quality impacts may result from stormwater runoff during terrestrial cable installation in areas adjacent to waterways and in construction areas related to water crossings (see Section 5.5). The Project would follow Best Management Practices (BMPs) and develop a SWPPP for the installation process.

5.3.3 Mitigation and Monitoring

US Wind will implement the following mitigation measures to reduce Project impacts on water quality.

- US Wind assumes all construction within Indian River Bay, including any dredging, would occur in October-March window, observing the general time of year restrictions for summer flounder and other species. Time of year restrictions would be determined through consultations with DNREC.
- Sediment disturbance associated with submarine cable laying will be minimized by jet plowing, HDD techniques and the use of gravity cells where feasible.
- Turbidity monitoring will be conducted during construction as required by the permitting authorities. Conduct TSS and water quality monitoring during cable installation activities and post installation as needed.
- A drilling fluid fracture contingency plan will be in place prior to the start of HDD activities. Operations will be shut down immediately in the event a frac-out occurs.
- US Wind will monitor for and report any environmental release or fish kill to the appropriate authorities, e.g., in Delaware State waters, reports will be made via DNREC 24-hour hotline.
- Project-specific SPCC Plan and Oil Spill Response Plan will be prepared prior to construction and for operations activities.
- US Wind will develop a SWPPP for onshore construction activities, as appropriate.
- Vessel operators, employees, and contractors will be briefed on marine trash and debris awareness elimination as described in Bureau of Safety and Environmental Enforcement (BSEE) Notices to Lessees (NTL) No. 2015-G03 *Marine Trash and Debris Awareness and Elimination*, per BOEM guidelines for marine trash and debris prevention.
- Vessels will adhere to USCG guidelines; follow applicable regulations related to the discharge of bilge water, gray water, and sanitary waste; maintain discharge permits, as appropriate; follow good maintenance and housekeeping procedures to prevent releases of oil and other chemicals to the sea; maintain up-to-date oil spill response plans to prevent, contain, and clean up any accidental spills.

5.4 Air Quality

5.4.1 Description of Affected Environment

Air quality may be impacted in the Project area, vessel routes and ports during the construction, operation and decommissioning of the Project as discussed below.

5.4.1.1 National Ambient Air Quality Standards

Air quality is characterized by comparing the ambient air concentrations of criteria pollutants to the National Ambient Air Quality Standards (NAAQS), which have been established by the EPA to be protective of public health and the environment. The Clean Air Act (CAA) establishes two types of NAAQS: (1) primary standards, which set limits to protect public health, including the health of "sensitive" populations (e.g., asthmatics, children, and the elderly); and (2) secondary standards, which set limits to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. The NAAQS have been established in 40 CFR Part 50 for each of the six criteria pollutants: sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$, particulate matter with a diameter less than or equal to 10 and 2.5 micrometers (μm), respectively), and lead (Pb).

Current NAAQS levels are provided in Table 5.4-1, below.

Table 5.4-1. National Ambient Air Quality Standards

Pollutant	Primary/ Secondary	Averaging Time	Level	Form
CO	Primary	8 hours	9 ppm	Not to be exceeded more than once per year
		1 hour	35 ppm	Not to be exceeded more than once per year
Pb	Primary and Secondary	Rolling 3-month average	0.15 ug/m^3	Not to be exceeded
NO_2	Primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Primary and Secondary	1 year	53 ppb	Annual Mean
O_3	Primary and Secondary	8 hours	0.07 ppm	Annual fourth-highest daily maximum 8-hour concentration averaged over 3 years
$PM_{2.5}$	Primary	1 year	12.0 μg/m^3	Annual mean, averaged over 3 years
	Secondary	1 year	15.0 μg/m^3	Annual mean, averaged over 3 years
	Primary and Secondary	24 hours	35 μg/m^3	98th percentile, averaged over 3 years
PM_{10}	Primary and Secondary	24 hours	150 μg/m^3	Not to be exceeded more than once per year on average over 3 years
SO_2	Primary	1 hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years

Table 5.4-1. National Ambient Air Quality Standards

Pollutant	Primary/ Secondary	Averaging Time	Level	Form
	Secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year
Source: NAAQS 2019				

When the monitored concentrations in an area exceed the NAAQS for any pollutant, the area is classified as "nonattainment" for that pollutant. The state of Maryland is presently "in attainment" with the NAAQS, except for 12 counties in the Baltimore and Washington, D.C., metropolitan areas. These counties are in densely populated urban core areas and are presently in nonattainment with the ozone NAAQS (Anne Arundel, Baltimore, Baltimore City, Calvert, Caroll, Cecil, Charles, Frederick, Harford, Howard, Montgomery and Prince George's Counties) and the SO_2 NAAQS (Anne Arundel and Baltimore Counties). The state of Virginia is presently in attainment with the NAAQS, except for nine counties in the Washington, D.C., metropolitan area, and Giles County. These counties are presently in nonattainment with the ozone NAAQS: Alexandria City, Arlington, Fairfax, Fairfax City, Falls Church, Loudoun, Manassas Park City, Manassas City and Prince William counties. Giles County is in nonattainment with the sulfur dioxide NAAQS. The state of Delaware is presently in attainment with the NAAQS, except for two counties in the Wilmington metropolitan area. Newcastle and Sussex Counties are presently in nonattainment with the ozone NAAQS (USEPA 2019) .

Ozone is a regional air pollutant issue. Prevailing southwest to west winds carry air pollution from the Ohio River Valley, where major nitrogen oxide (NOx) emission sources (e.g., power plants) are located, and from mid-Atlantic metropolitan areas to the northeast, contributing to high ozone concentrations in these areas. Major sulfur dioxide sources are power plants and other industrial facilities burning coal and other fossil fuels.

The EPA Regional Haze Rule requires state and federal agencies to develop and implement air quality plans to reduce the air pollution that causes decreased visibility in national wilderness areas and parks designated as Class I areas. The Class I areas closest to the Project are the Brigantine Wilderness Area in New Jersey and Shenandoah National Park in Virginia. Federal Land Managers must be notified of facilities that will be located within 100 km (62 mi) of a Class I area. The Project is not within that distance to any Class I area.

5.4.2 Impacts

Activities associated with the construction, operation, and decommissioning of the Project have the potential to temporarily affect air quality in the immediate area around Project activities. Potential offshore emission sources include tugboats, crane barges, cable laying vessels, crew boats, jack-up vessels, survey vessels, supply ships and generators. Land based emissions sources may include non-road construction equipment, worker vehicles and delivery vehicles. The WTGs and OSSs themselves are a negligible source of air emissions and will reduce shore-based emissions from existing fossil fuel power plants. Prevailing westerly (west to east flow) winds will minimize the dispersion of offshore emissions associated with the Project to onshore areas.

The combustion of fuels (diesel oil and gasoline) in the propulsion engines of vessels and stationary equipment on vessels installing the WTGs and OSSs (e.g., cranes and generators) will produce emissions of criteria pollutants. These emissions will primarily be NOx and CO, with lesser amounts of volatile organic compounds (VOCs), an O_3 precursor, and PM_{10} (mostly in the form of $PM_{2.5}$), and negligible amounts of sulfur oxides (SO_x) and Pb. Emissions of noncriteria pollutants are expected to be negligible. Greenhouse gas emissions, including carbon dioxide (CO_2) and small amounts of nitrous oxide (N_2O) and methane (CH_4) will also be emitted.

US Wind has not completed the design for its proposed onshore substations and it is unknown at the time whether sulfur hexafluoride (SF_6) will be used in its switchgear. US Wind will adopt the appropriate industry BMPs to minimize leaks of SF_6 from substation switchgear, if it is used as a coolant.

US Wind has utilized the BOEM Offshore Wind Energy Facilities Emission Estimating Tool, Version 2.0 (BOEM 2021a) to estimate the potential offshore emissions from the construction and operation of the Project, as well as the estimated emissions avoided due to the reduction in operation of onshore fossil fuel combustion facilities as a result of the energy generated by the Project.

Figure 5.4-1 shows the anticipated vessel routes and destinations. There are two vessel routes from the proposed staging facility at Sparrows Point, the Chesapeake and Delaware Canal (C & D Canal) route and the Chesapeake Bay route. Most vessels are anticipated to travel to the Project area using the Chesapeake Bay route and return to port using the C & D Canal route.

As described in COP Appendix II-C1 (US Wind 2023), detailed Project emissions summaries, including the expected number and size of each engine type, the expected usage of each engine, and the load and emission factors used for the potential Project emissions estimates are available.

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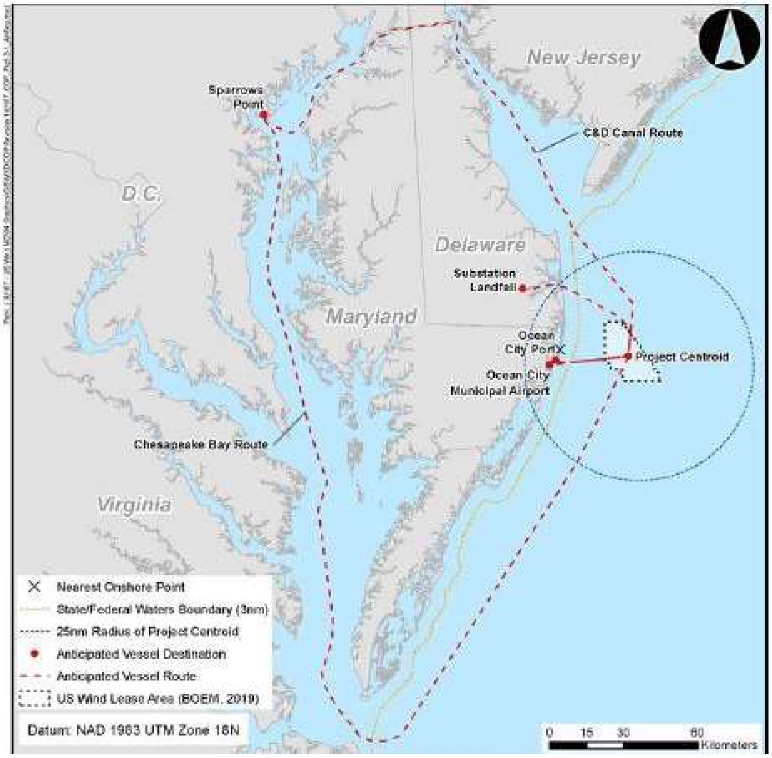

Figure 5.4-1. Air Regulatory Boundaries and Vessel Routes

5.4.2.1 Construction

It is anticipated that installation of the Project will require one or more jack-up vessels containing the installation crane and other support equipment. The jack-up vessel will be supported by additional tugboats, feeder vessels, and crew boats as necessary. Emissions from cable laying operations are also included in the construction emissions estimate. Detailed information on the expected Project emission sources during construction is provided as COP Appendix II-C1 (US Wind 2023). Estimated potential Project pollutant emissions during construction are provided below in Table 5.4-2.

Table 5.4-2. Estimated Potential Project Emissions During Construction

Pollutant	Metric Tons	Short Tons
NO_X	5,567	6,136
SO_2	216	238
$PM_{2.5}$	107	118
CO_2	358,5159	395,200
VOCs	55	61
HAPs	7.7	8.5

5.4.2.2 Operations

The Project will be powered by wind and will produce no emissions during normal operations. Back-up diesel generators will be located on the OSSs. There will be vessels servicing the Project periodically throughout its operational period. Additional information on the expected Project emission sources during operation is provided as COP Appendix II-C1 (US Wind 2023). Estimated potential Project pollutant emissions during operation are provided in Table 5.4-3.

Table 5.4-3. Estimated Project Potential Emissions During Operation

Pollutant	Metric Tons	Short Tons
NO_X	1,947	2,146
SO_2	75	83
$PM_{2.5}$	38	41
CO_2	125,438	138,271
VOCs	25	28
HAPs	4.5	5.0

5.4.2.3 Estimated Avoided Project Emissions

The Project will produce negligible emissions during operation and the energy generated will have the ability to displace the energy production from existing fossil fuel fired power plants resulting in avoided emissions from energy generation. The estimated avoided potential emissions for the proposed Project design capacity of 1,676 MW (114 14.7 MW WTG) are provided in Table 5.4-4.

Table 5.4-4. Estimated Potential Emissions – Avoided 1,676 MW Project

Pollutant	Metric Tons/ Project Lifespan	Short Tons/ Project Lifespan
NOX	46,774	51,560
SO2	72,981	80,447
PM2.5	8,387	9,245
CO2	97,148,921	107,088,323

The estimated avoided potential emissions for the maximum PDE capacity of 2,178 MW (121 18 MW WTG) are provided in Table 5.4-5.

Table 5.4-5. Estimated Potential Emissions – Avoided 2,178 MW Project

Pollutant	Metric Tons/ Project Lifespan	Short Tons/ Project Lifespan
NOX	60,785	67,003
SO2	94,840	104,543
PM2.5	10,899	12,014
CO2	126,247,225	139,163,704

5.4.2.4 Impacts of Alternatives

Installation of export cables in Offshore Export Cable Corridor 2 would be conducted in the same manner as Offshore Export Cable Corridor 1, which would not result in additional impacts to air quality.

Cable installation in any of the terrestrial routes (i.e., Onshore Export Cable Corridor 1a, 1b, 1c, or 2) would result in increased temporary emissions in onshore Delaware due to additional onshore cable installation vehicles (i.e., excavators, backhoe, generators, air compressors, and various other construction trucks). However, there would be no installation vessels operating within Indian River Bay, reducing temporary air emissions in this area.

5.4.3 Mitigation and Monitoring

US Wind will implement the following mitigation measures to reduce Project impacts on air quality.

- US Wind will obtain any necessary Clean Air Act permits under the State of Maryland's delegated program and comply with applicable permit conditions.
- Vessel engines will meet the applicable EPA and IMO marine engine emission standards.
- Engines will be operated and maintained in accordance with the manufacturer's recommendations and industry practices.
- Diesel fuel for use in the diesel engines will meet the per gallon fuel standards of 40 CFR 80.510(b) as applicable.
- Land based engines that meet the EPA non-road engine standards will be used, as applicable.
- Unnecessary idling of engines will be limited, where practicable.
- Where practicable, engines with add-on emission controls will be used.

As a result of these and other measures that may be identified during the permitting process, the impacts of the Project to air quality during construction, operation, and decommissioning will be minimized and the overall impact to onshore air quality is expected to be negligible.

5.5 Wetlands and Waterbodies

5.5.1 Description of the Affected Environment

The Project area includes coastal habitat between marine subtidal unconsolidated bottom on the Atlantic coast of the barrier beach to the east and intertidal salt marsh located at the substation landfall to the west. The following components of the Project are located within coastal habitat; the Barrier Beach Landfalls, Onshore Export Cable Corridor 1, and the proposed HDD locations within Indian River Bay. The habitat affected by each of these components is described below. Information about terrestrial cable routes can be found in Section 3.1.5 of this document. Further information about the wetland crossings for the terrestrial cable routes will be provided at a later date.

5.5.1.1 Barrier Beach Landfalls

Coastal habitats in the vicinity of the Barrier Beach Landfalls, defined as the Offshore Export Cable landfall locations at 3 R's Beach and Tower Road including the area where Onshore Export Cables would enter Indian River Bay via HDD to the west, includes areas that fall under the following National Wetland Inventory (NWI) classifications: estuarine and marine deepwater (marine and estuarine subtidal unconsolidated bottom), estuarine and marine wetland (marine and estuarine intertidal unconsolidated shore, Atlantic coastal beach and dune, and tidal salt marsh), freshwater emergent wetland (non-tidal freshwater marsh), and freshwater forested/scrub-shrub (non-tidal freshwater scrub-shrub wetland). These habitat types are discussed in the following sections.

Unconsolidated Bottom and Shore

Largely unvegetated, regularly flooded, marine intertidal unconsolidated shore of the sand subclass (M2US2N) (USDOI and USFWS 2018b)) occupies the intertidal zone on the eastern side of the Barrier Beach Landfalls. Marine subtidal unconsolidated bottom (M1UBL) (USDOI and USFWS 2018b)) is located east of the intertidal shore. There is estuarine subtidal unconsolidated bottom (E1UBL) (USDOI and USFWS 2018b)) in Indian River Bay, west of 3 R's Beach. As described in COP Appendix II-A6 (US Wind 2023), sediment cores collected in Indian River Bay indicate that the substrate is a mixture of predominantly sand (approximately 65 percent) and silt (approximately 35 percent).

Atlantic Coastal Beach and Dune

Above the high-tide line, sandy beaches extend landward to grassy dunes and overwash areas, to a complex of shrub-dominated back dunes. Coastal dunes near the Barrier Beach Landfalls support a variety of grasses, but the dominant species is American beach grass (*Ammophila breviligulata*). These grassed areas develop on the crests and faces of primary foredunes as well as within the backdune area.

Tidal Salt Marsh

The eastern side of Indian River Bay in Delaware Seashore State Park includes 0.65 km^2 (160 acre) of estuarine intertidal salt marsh. Salt marsh consists of two distinct habitats: high marsh (E2EM1Pd) (USDOI and USFWS 2018b)) and low marsh (E2EM1Nd) (USDOI and USFWS 2018b)). The former occurs at a higher elevation, where it is subject to shorter tidal inundation, while the latter is flooded for extended periods during daily tidal cycles. High marsh experiences a salinity ranging from 18 to 30 parts per thousand and is dominated by saltgrass (*Distichlis spicata*) and saltmeadow cordgrass (*Spartina patens*) (Mitsch and Gosselink 2007). High marsh also provides microhabitats such as tidal creeks, salt pannes and pools. The more seaward low marsh is a stressful environment for most plant species due to high salinity and frequent flooding and is predominately vegetated by smooth cordgrass (*Spartina alterniflora*).

Non-tidal Freshwater Scrub-Shrub Wetland

A 0.03 km^2 (6.70 acre) non-tidal freshwater scrub-shrub wetland (PSS3A) (USDOI and USFWS 2018b) is located on the western or inland side of the landfall location at 3 R's Beach, adjacent to Route 1, approximately 1.6 km (1 mi) south of the Indian River Bay Inlet. This wetland type only experiences temporary flooding and is able to support shrubs and low saplings. Loblolly pines (*Pinus taeda*), black gum (*Nyssa sylvatica*), red maple (*Acer rubrum*), red cedar (*Juniperus virginiana*), and American holly (*Ilex opaca*) are saplings that may be found in scrub-shrub wetlands around Indian River Bay (DCIB 2017). These trees may provide nesting habitat for piscivorous birds that forage in salt marshes, such as bald eagles (*Haliaeetus leucocephalus*), egrets, herons, and osprey (*Pandion haliaetus*) (DCIB 2017).

Non-tidal Freshwater Marsh

The HDD operations area will be staged out of the proposed landfall location at the existing 3R's Beach parking lot. There is a 809 square meter (m^2) (0.2 acre) freshwater marsh (PEM1E) (USDOI and USFWS 2018b)) immediately south of the parking lot. The dune and swale landforms in this area create wetland habitat in the depressions between sand dunes. The Bethany Beach Firefly (*Photuris bethaniensis*), named for its type locale south of the Barrier Beach Landfalls, inhabits shrub thickets in these interdunal swales (Heckscher and Bartlett 2004). (For additional information on threatened and endangered species information refer to Section 5.14 of this document).

Barrier Beach Landfall Coastal Habitat – 3 R's Beach

The 3R's Beach landfall location is the proposed landfall location. From the 3R's Beach landfall location, Onshore Export Cable Corridor 1 traverses in Indian River Bay proceeding westerly in Indian River for connection to the Interconnection Facilities. Location of gravity cells and export cable routes are approximate.

Barrier Beach Landfall Coastal Habitat – Tower Road

A second cable landfall location under evaluation is Tower Road and is associated with Onshore Export Cable Corridor 2. There are no non-tidal freshwater wetlands at this location.

5.5.1.2 Onshore Export Cable Corridor 1

From the Barrier Beach Landfall at 3R's Beach, Onshore Export Cable Corridor 1 continues westward across Indian River Bay. The benthos of Indian River Bay are discussed in Section 5.6 of this document. Indian River Bay does not currently host SAV (DCIB 2017). Hummocks, areas of higher elevation that provide coastal habitat for wildlife, are dispersed throughout Indian River Bay. The locations of these hummocks shift over time due to sediment transport and deposition in Indian River Bay.

5.5.1.3 Substation Landfall

After crossing Indian River Bay, Onshore Export Cable 1 would travel up the Indian River and under a tidal salt marsh and uplands before connecting to the proposed Interconnection Facilities. A 0.18 km^2 (45 acre) estuarine intertidal high marsh (E2EM1Pd) (USDOI and USFWS 2018b) has established in the low-energy environment on the inside of a meander bend about 2.7 km (1.7 mi) from the confluence of Indian River and Pepper Creek at Indian River Bay (Figure 5.5-1) (Appendix A, Sheet 36). The marsh is partially ditched or drained, indicating that it has a history of human impact.

A relatively small freshwater mixed (needle-leaved evergreen and broad-leaved deciduous) forested wetland (PFO4/1Cd) has been mapped just inland from the salt marsh and northeast of the Indian River Substation (Appendix A, Sheet 36) (USDOI and USFWS 2018b)). This wetland type is considered a habitat of conservation concern because it is rare in the state and has the potential to harbor a high diversity of uncommon species.

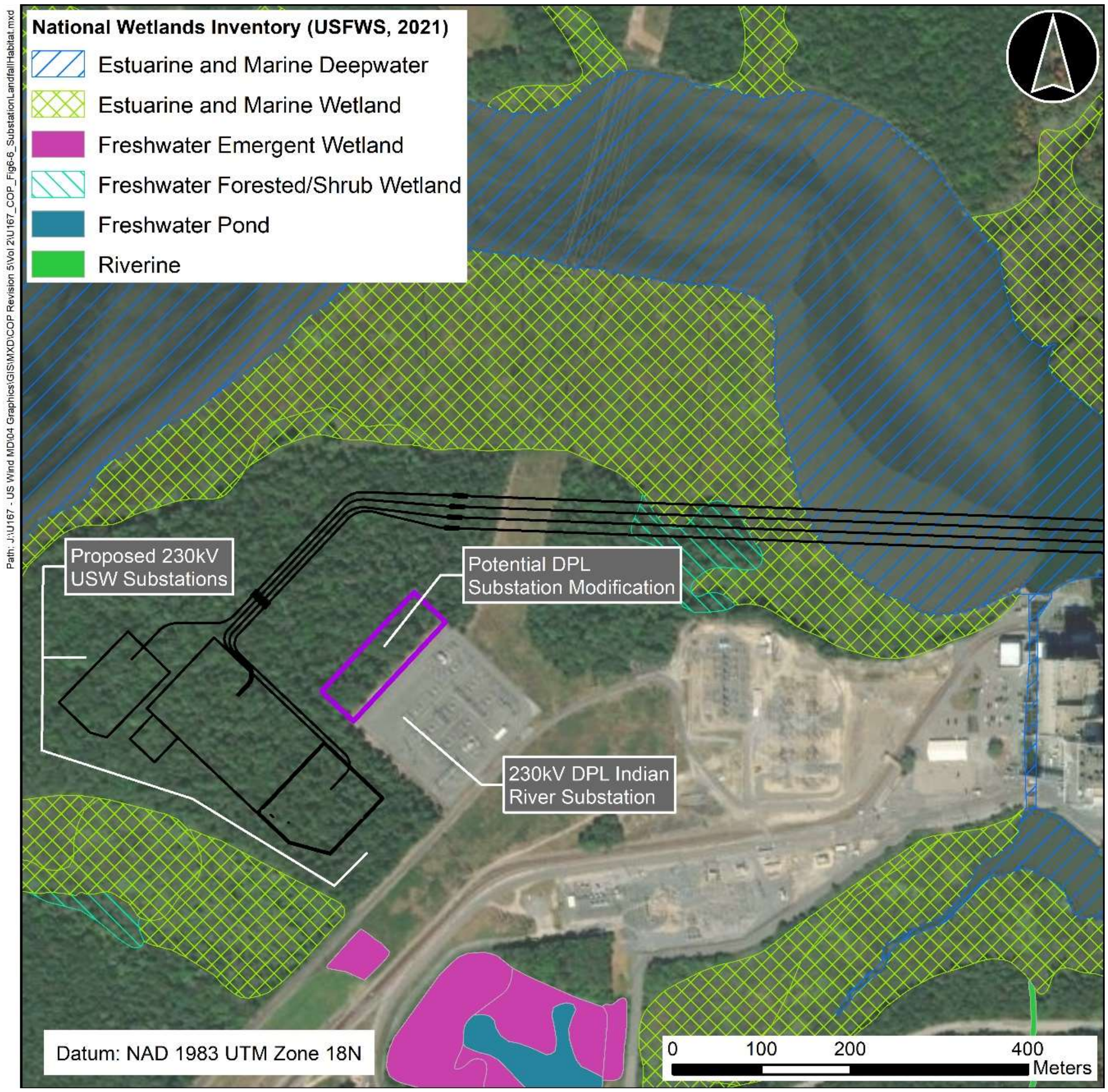

Figure 5.5-1. Substation Landfall Coastal Habitat

In May 2021, Landmark Science & Engineering (Landmark) performed a wetland field delineation in the area around the proposed US Wind substations and substation landfall, shown in Appendix A, Sheet 36. Investigation of the study area concluded that vegetated tidal wetlands and non-tidal wetland fringe were present in relation to Indian River and Indian Creek. In addition to tidally influenced areas, the upland portion of the study area contains scrub-shrub vegetation and saplings. Based on this field delineation, the upland area is mostly mixed forest vegetation, mainly deciduous and coniferous species. There is a large emergent tidal wetland with a non-tidal wetland fringe along the border with the Indian River. North of the existing substation there is an emergent forested non-tidal wetland, which may be of conservation concern, as noted above. On the westernmost side of the study area, there is an emergent scrub/shrub tidal wetland with a non-tidal wetland fringe. The detailed results can be found in COP Appendix II-G1 (US Wind 2023).

5.5.2 Impacts

5.5.2.1 Construction

Habitat Alteration

The Barrier Beach Landfalls are planned in parking lots that have already been disturbed and are expected to have negligible habitat alteration impacts. The transition vault box will be installed, and HDD operations will occur in the proposed landfall location at the existing 3R's Beach parking lot or Tower Road parking lot, which are already disturbed. Any material from land-based excavations will be stockpiled in accordance with a storm water management plan and used for backfill or repurposed as required. Limiting ground disturbance to the parking lot also avoids impacting the hydrology of the site since the parking lot is already a compacted surface.

The Offshore Export Cables and Onshore Export Cable 1 will be installed using HDD (see Appendix A, Sheets 36-38). The HDD operations will only disturb the ground at the bore entry and exit for each cable. By minimizing ground disturbance, the Project minimizes the area in which complex vegetation re-establishment may be needed. This also reduces the chance of impacting the Bethany Beach firefly, which is exclusively located in Bethany Beach, Delaware and seabeach amaranth, which live in coastal areas (see Section 5.14.6 for more information).

Because ground disturbance will be minimized using the proposed construction approach, it is anticipated that habitat alteration of wetlands and waterbodies in the Project area will be negligible.

US Wind plans to use a suitable preexisting facility located pier side in the Ocean City, Maryland area for an O&M Facility and associated warehouse and crew support facility. C If required due to real estate constraints, US Wind has also planned for the construction of a facility in close proximity to the harbor in order to limit its footprint in the Ocean City harbor area. Any construction would occur in previously developed areas.

Routine and Accidental Releases

Vessel traffic associated with construction activities is expected to produce routine and accidental releases of pollutants that will have negligible impacts on wetlands and waterbodies. Construction-related impacts from routine and accidental releases, including drilling fluid that could be released in the event of a frac-out during HDD, are discussed in Section 5.3.2. Spills of oil and hazardous chemicals can inhibit the growth of aquatic plants and harm or kill aquatic animals. Litter and other marine debris can also injure or suffocate aquatic animals. However, since the routine releases associated with this Project are anticipated to be small quantities of clean discharge and accidental releases associated with this Project are unlikely, the impacts of routine and accidental releases associated with the Project are anticipated to be negligible.

5.5.2.2 Operations

Routine and Accidental Releases

Potential impacts to wetlands and waterbodies due to routine and accidental releases associated with Project operations and maintenance are anticipated to be less than impacts associated with construction. Potential impacts of routine and accidental releases during operations and maintenance are discussed in Section 5.3.2. Vessels may be used to transport maintenance materials and personnel to the Project in the event that the WTGs, OSS, or submarine cables are in need of repair. Vessels may release sanitary waste and engine emissions as part of their routine operations and may inadvertently release trash, oil, or other chemicals that could impact wetlands and waterbodies; however, the impact of these releases is anticipated to be negligible due to the anticipated low frequency of maintenance and the low likelihood of accidental discharge.

5.5.2.3 Impacts of Alternatives

Installation of export cables in Offshore Export Cable Corridor 2 would be conducted in the same manner as Offshore Export Cable Corridor 1, which would not result in additional impacts to wetlands or water bodies.

Cable installation in any of the terrestrial routes (i.e., Onshore Export Cable Corridor 1a, 1b, 1c, or 2) could result in potential temporary impacts to numerous wetlands or water bodies adjacent to or crossed by the selected alignment. Wetlands for the alternative terrestrial routes are shown in Figure 5.5-2. These areas would be avoided where possible and BMPs would be implemented. Streams or rivers would be crossed via either HDD or by hanging the cable from an existing bridge (see Section 4.7 for construction detail by route).

5.5.3 Impact Avoidance and Minimization

The Project has been sited and designed to avoid and minimize potential impacts to wetlands and waterbodies by using previously disturbed areas, such as existing ROW or ROW under development, as practicable, and the use of HDD technology to install the Onshore Export Cables under wetland areas. Where avoidance is not possible, the Project proposes to minimize wetland impacts during construction by maintaining buffers around wetlands, implementing BMPs for erosion and sediment control, and maintaining natural surface draining patterns, as practicable.

Figure 5.5-2. Alternative Terrestrial Routes Wetlands

5.5.4 Mitigation and Monitoring

US Wind will implement the following mitigation measures to reduce Project impacts on wetlands and waterbodies.

- US Wind will install cables using HDD to avoid impacts to coastal dunes and interdunal wetlands and to minimize bottom disturbance.
- US Wind will use turbidity curtains for in-water work as needed.
- US Wind will minimize ground disturbance by confining cable infrastructure, such as transition vaults and HDD operations, to previously disturbed lands as much as practicable.
- Onshore construction activities will be scheduled to avoid impacting sensitive coastal habitats, where practicable.
- Between May 1 and August 1, construction activities will not occur within 100 m (328 ft) of hummocks in Indian River Bay in order to avoid impacts to nesting terns.
- US Wind will minimize impacts on SAV where practicable. No submerged aquatic vegetation has been identified in areas proposed for permanent or temporary disturbance.
- US Wind will establish and maintain buffers around wetlands, implement BMPs to minimize erosion and control sediments and maintain natural surface drainage patterns, as practicable.
- US Wind will locate cable landfalls and onshore facilities so as to avoid impacts to known nesting beaches, where feasible. The use of HDD for cable installation under the Barrier Beach Landfalls will avoid impacts on beaches.
- Project-specific SPCC Plan will be prepared prior to construction and for operations activities.
- US Wind will develop a SWPPP for onshore construction activities, as appropriate.
- Agency consultation and monitoring regarding coastal habitats will be conducted as needed to mitigate disturbances, as practicable.
- US Wind would prioritize beneficial reuse of dredge material (i.e., wetland restoration, beach renourishment), based on the material characteristics and opportunities as they present themselves, over placement in offshore or onshore disposal areas.
- US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, Protected Species Observers (PSO) data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.

5.6 Benthic Resources

5.6.1 Description of Affected Environment

In developing earlier versions of its benthic habitat assessment and mapping approach, US Wind relied on guidance from the BOEM June 2019, *Guidelines for Providing Benthic Habitat Survey Information for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585* (BOEM 2019). However, following issuance of the Greater Atlantic Regional Fisheries Office's (GARFO) May 27, 2020 *Updated Recommendations of Mapping Fish Habitat* (NOAA Fisheries 2021f), subsequent consultations with BOEM and GARFO on June 15, 2020, and GARFO's March 29, 2021 *Updated Recommendations for Mapping Fish Habitat*, US Wind revised its habitat mapping approach for surveys that were undertaken in 2021.

This approach commenced with the review of earlier Lease area geophysical and seafloor sampling surveys by US Wind and others, which were used to provide initial context for coarse-scale identification of potentially complex seafloor habitat locations. Following this, US Wind initiated acoustic surveys, the preliminary results of which were then used in tandem with previously existing data to select locations for targeted seafloor sampling in the Lease area. Data products used to support the benthic habitat survey and mapping work include multibeam echosounder bathymetry and backscatter, as well as sidescan sonar mosaics, reflectivity, high-relief targets, and identification of bedforms (e.g., sand ripples).

In the Offshore Export Cable Corridors, preliminary acoustic survey results were not available prior to initiating selection of the benthic sample locations. Therefore, benthic sample locations were selected at discrete intervals of approximately 1 km (0.62 mi) to provide geographic coverage for characterization of benthic habitats.

The 2021 benthic habitat survey program was conducted in July and August of 2021. It included collection of 0.04 m^2 (0.43 ft^2) benthic grabs, still imagery, and video transects. Separate benthic grab samples were collected and processed for bulk physical and macrofaunal analysis at each sampling location. Still plan view imagery was collected at each benthic grab location using a grab-mounted camera. Video transects were approximately 180 m in (590 ft) length and included collection of both oblique and plan view imagery.

The results of the fully processed acoustic mapping and targeted seafloor sampling have been integrated to produce final data products that include both characterization and delineation of benthic habitat according to the NOAA Fisheries-modified CMECS taxonomic framework identified in GARFO's March 29, 2021 *Updated Recommendations for Mapping Fish Habitat*.

Benthic field surveys completed within the Project area are summarized in Table 5.6-1. The most recent work, completed by US Wind in 2021, is summarized below. Additional information can be found in the COP (US Wind 2023).

Table 5.6-1. Lease Area Geological Features and Hazards Summary

Surveyor	Year	Location	Type of Work
Northeast Fisheries Science Center Living Marine Resources Cooperative Science Center (Guida et al. 2017)	2013	- Vicinity of the Lease Area	- Sediment sampling - Benthic grab sampling - Survey trawls - Video surveys
ESS Group, Inc.	2015	- Portion of the Lease area (former location of the Met Tower)	- Benthic imagery - Benthic grab sampling
ESS Group, Inc.	2016	- Offshore Export Cable Corridors	- Benthic imagery - Benthic grab sampling
ESS Group, Inc.	2017	- Portion of Onshore Export Cable Corridor 1	- Benthic grab sampling

5.6.1.1 Lease Area

2021 Benthic Field Survey

The results of the 2021 Benthic Survey are provided as COP Appendix II-D4 (US Wind 2023). The 2021 Benthic Survey Report delineates complex seafloor features using NOAA Fisheries modified CMECS classifications.

In July and August of 2021, US Wind contracted TRC Companies, Inc (TRC) (formerly ESS Group, Inc.) to carry out a Project-specific field survey of benthic resources in the Lease area. This survey involved the collection of benthic grabs at 120 locations across the Lease area, as well as collection of video transects via ROV at 70 locations.

Of the 120 benthic grab sample locations selected in the Lease area, 60 were fixed locations co-located with proposed WTG or OSS locations. These locations were selected to ensure broad geographic characterization of portions of the Lease area that may be directly impacted by Project construction. The other 60 locations were selected to characterize potential complex habitat, as identified by preliminary interpretation of the 2021 HRG acoustic data and supplemented by other existing sources of data (CB&I 2014; Alpine 2015; Guida et al. 2017). Areas targeted as potential complex habitat were mapped by one or more of these sources as more likely to contain unconsolidated hard bottom, such as gravel, gravel mixes, and gravelly substrates.

Of the 70 benthic imagery transects completed in the Lease area, ten were fixed locations co-located with proposed WTG or OSS locations. The remaining 60 imagery transects were selected to characterize the areas of potential complex habitat. The axes of these transects were aligned to capture features of interest (e.g., high-relief objects, areas of higher reflectivity or rugosity) based on preliminary interpretation of the 2021 HRG acoustic data.

5.6.1.2 Offshore Export Cable Corridors

The deeper waters of the Offshore Export Cable corridors are euhaline and similar in many ways to those of the Lease area, with vertical thermal and salinity gradients during the summer months. Shallower coastal waters near the offshore landfall are typically well-mixed throughout the year and subject to more variable temperatures, as described in Section 5.3.1.1.

Benthic habitats in nearshore shelf and offshore areas of Delaware are primarily composed of reworked Holocene deposits with sand as the dominant grain size in most areas (Reid et al. 2005; Coastal Planning & Engineering 2014). The area is generally shaped by sedimentary processes from high wave energy in the Atlantic Ocean. The intense wave action has generated sandy ridges interspersed with depressions, the spacing of which vary substantially with distance from shore. These features tend to become larger and more widely spaced toward the southeast, where they may be spaced 2 to 4 km (1.2 to 2.4 mi) apart and extend tens of kilometers (tens of miles) from end to end. The ridges and adjacent depressions are generally oriented along a southwest to northeast axis with a maximum relief of 5 to 10 m (16 to 32 ft) from trough to crest (Coastal Planning & Engineering 2014). The Offshore Export Cable Corridors traverse the northern periphery of these ridges where the relief is generally less pronounced and takes the form of broad flats in some areas.

Benthic habitats in Delaware coastal waters are variable, but are often dominated by sandy substrates with varying levels of gravel and or silt, and shell hash (Cutter et al. 2000). A prior study of the benthic community in Delaware coastal waters suggests dominance of fine-grained benthic habitats by polychaete worms, followed by mollusks and crustaceans (Cutter et al. 2000). Among polychaetes, the ampharetid worm *Asabellides oculata*, the mud worm *Spio setosa*, and the bee worm *Spiophanes bombyx* were common. The majority of mollusks observed were bivalves, though gastropods were also present at lower densities. The crustacean assemblage was dominated by amphipods, although crabs, cumaceans, and other taxa were also present. On coarser substrates, mollusks and crustaceans comprised a larger portion of the benthic community, with Astarte clams (*Astarte* spp.), the crenella bean mussel (*Crenella glandula*), blue mussel (*Mytilus edulis*), and the amphipod *Byblis serrata* most common. Infaunal organism abundance varied greatly, ranging from 90/m^2 to 70,600/m^2. Likewise, taxa richness varied from three to 40 taxa per sample.

2021 Benthic Field Survey

The results of the 2021 Benthic Survey are provided as COP Appendix II-D4 (US Wind 2023). The 2021 Benthic Survey Report delineates complex seafloor features using NOAA Fisheries modified CMEC classifications.

In July and August of 2021, US Wind contracted TRC to conduct a field survey of benthic resources along the Common Export Cable Corridor and Offshore Export Cable Corridors 1, 2 and 2a (Figure 5.6-1). Upon further communication with USACE, Offshore Export Cable Corridor 2a was removed from consideration to avoid a USACE-identified sand resource in the area around Indian River Inlet. This survey involved collection of benthic grabs at 69 locations along the Offshore Export Cable Corridors as well as the collection of 29 video transects via ROV.

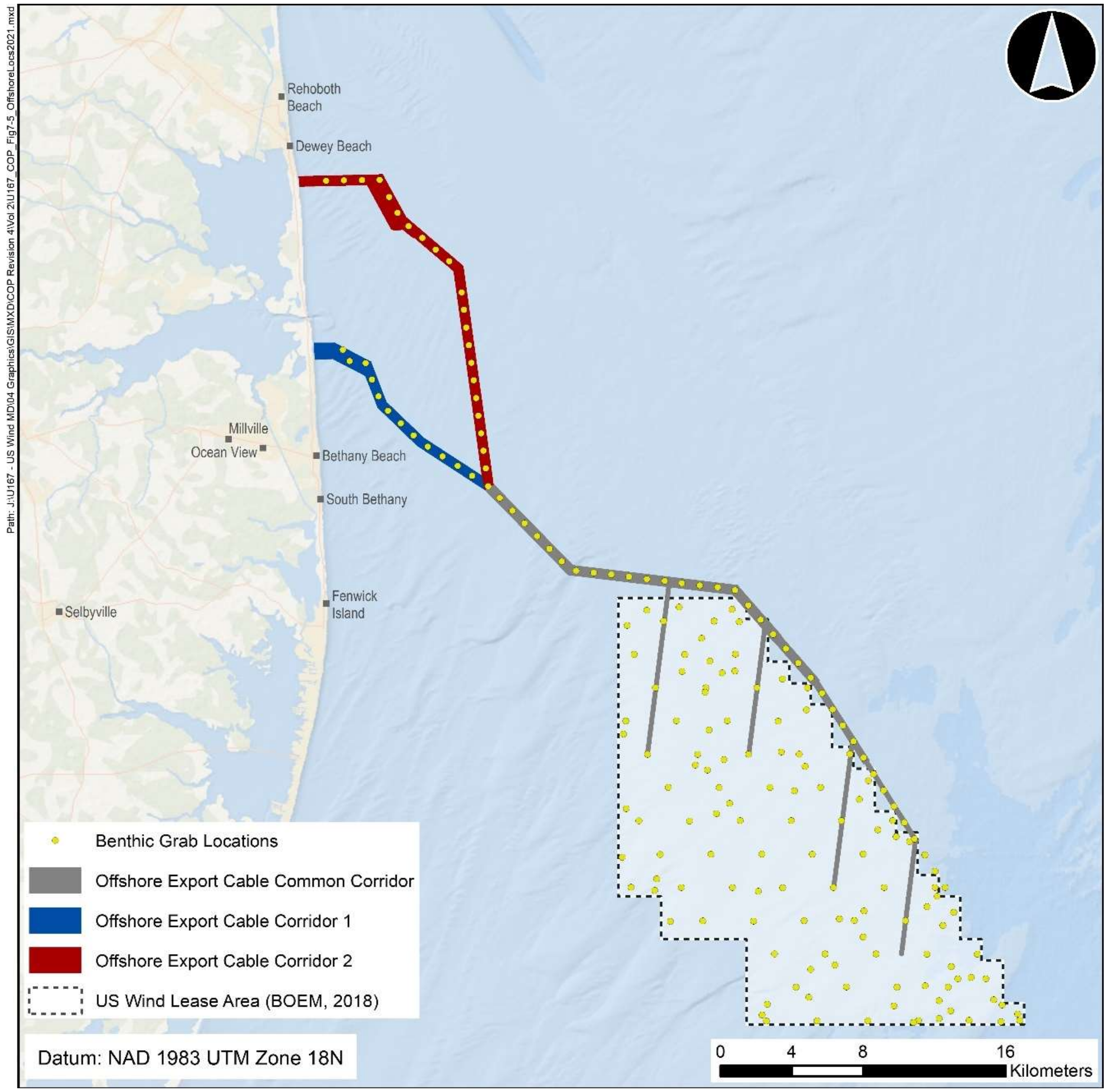

Figure 5.6-1. 2021 Benthic Field Survey Sample Locations

5.6.1.3 Onshore Export Cable Corridors

Onshore Export Cable Corridor 1 extends through Indian River Bay from 3R's Beach landfall location to the vicinity of the Indian River Substation. Salinity and sediment composition are the major factors controlling benthic species distribution in Indian River Bay (DIBEP 1993). Indian River Bay exhibits a strong salinity gradient with salinity generally increasing from west to east, as described in Section 5.3.1.2.

Onshore Export Cable Corridor 1 primarily traverses the polyhaline portion of Indian River Bay, where salinities approach marine conditions and generally remain above 18 psu (DIBEP 1993; DEMAC et al. 2017). However, the westernmost portions of Onshore Export Cable Corridor 1, including the substation landfall, are located in the mesohaline zone, where salinity tends to be lower but also highly variable, depending on the magnitude of freshwater inputs from Indian River and other watershed tributaries. Benthic habitat in Indian River Bay is diverse and consists of areas of mud, sand, and mixed substrate (Chaillou et al. 1996). Muddy substrates are more prevalent than sand, especially in the upper portion of Indian River Bay. The overall silt-clay content in the Indian River Bay system is estimated to be 60 percent (Chaillou et al. 1996).

A review of historical data (for the period 1974-1976) characterized the benthic community structure of each salinity region within Indian River Bay (DIBEP 1993). Samples from the mesohaline region, which includes the area near the substation landfall, contained an average of 19 species and had an average density of 6,776 individuals/m^2. Polychaetes accounted for 49 percent of all taxa in this salinity segment, with the disturbance-tolerant spionid worm *Streblospio benedicti* comprising the majority of individuals. Crustaceans accounted for 34 percent of all taxa, with the aorid amphipod *Leptocheirus plumulosis* and the ampeliscid amphipod, *Ampelisca abdita,* comprising the majority of individuals. Bivalves accounted for four percent of all taxa in this salinity segment, with the amethyst gem clam (*Gemma gemma*) and dwarf surf clam (*Mulinia lateralis*) comprising the majority of individuals.

Samples from the polyhaline region of Indian River Bay were similar to those collected from mesohaline areas in both taxonomic diversity and organism density, but differed in community composition (DIBEP 1993). Polyhaline samples contained an average of 18 species, and organism density averaged 6,484 individuals/m^2. Polychaetes accounted for 31 percent of all taxa in polyhaline areas of Indian River Bay. The capitellid worm *Heteromastus filiformis* was the most abundant species, followed by the spionid worm *S. benedicti.* Crustaceans also accounted for 31 percent of all taxa, with the amplescid amphipod *A. abdita* and the aorid amphipod *L. plumulosus* comprising the majority of individuals. Mollusks, including commercially important shellfish, were more abundant in polyhaline areas of Indian River Bay than in all other regions. Mollusks accounted for 27 percent of all taxa in the region, and blue mussel and the clam *Macoma tenta* were the most abundant species (DIBEP 1993). A more recent assessment of benthic communities in Indian River Bay, conducted in 1993, identified a total of 141 species from 15 different taxonomic groups with an average of 17 taxa per sample (Chaillou et al. 1996). Chaillou et al (1996) also reported an average density of 34,889 organisms/m^2 in Indian River Bay samples, which is much higher than reported from and earlier survey conducted by the Delaware Inland Bays Estuary Program Scientific and Technical Advisory Committee (DIBEP) (DIBEP (1993).

Community composition also differed between the two studies; the most abundant taxonomic group observed by Chaillou et al. (1996) was crustaceans (75 percent of total abundance), with polychaetes accounting for only 17 percent of the total abundance. However, polychaetes were the most taxonomically rich group with 60 species, followed by crustaceans (29 species), bivalves (15 species), and gastropods (12 species). The most abundant crustacean species were the amphipods *A. abdita* and *Corophium acherusicum*. *S. benedicti* and *Mediomastus ambiseta* were the most abundant polychaetes. Of the bivalves and gastropods, the northern dwarf tellin (*Tellina agilis*), amethyst gem clam, and the pitted baby-bubble (*Rictaxis punctostriatus)* were the most abundant species. Chaillou et al. (1996) concluded that approximately 77 percent of Indian River Bay is characterized by degraded benthic habitat.

2022 Benthic Field Survey

The results of the 2022 Benthic Survey are summarized below and provided as COP Appendix II-D4 (US Wind 2023). This benthic report delineates complex seafloor features using NOAA Fisheries modified CMEC classifications.

A field survey of benthic resources within Indian River Bay in the area of the Onshore Export Cable Corridors (including the Onshore Export Cable Common Corridor, Onshore Export Cable North Corridor, and Onshore Export Cable South Corridor) was conducted in August of 2022 (Figure 5.6-2). This survey involved collection of benthic grabs at 35 locations.

The taxa observed across the Onshore Export Cable Corridors are typical of soft-sediment habitats, with no significant difference between survey locations. As part of the 2022 Indian River Bay sampling program, a shellfish density survey was conducted at the Bott and Wong (2012) sites that were accessible via wading (less than 1.2 m [4 ft] deep) (Bott and Wong 2012). Six hard clams were collected, ranging in size from 3.7-11.0 cm (1.5-4.3 in).

5.6.2 Impacts

5.6.2.1 Construction

Habitat Alteration

The primary impacts to benthic organisms from construction activities will result from the placement of the WTG, OSS, and Met Tower foundations and associated scour protection, the installation of the submarine cables, the use of gravity cells at the landfalls, dredging for barge access in Indian River Bay, and seafloor disturbance due to vessel anchoring. Slow-moving or sessile organisms inhabiting benthic sediments in areas directly within the footprint of these activities will suffer mortality from crushing or burial. Although motile organisms, including crabs, lobsters, sea scallops, and horseshoe crabs, may be able to vacate installation areas and avoid direct mortality, these organisms could be temporarily displaced by construction activities.

The values presented in Table 5.6-2 and Table 5.6-3 reflect the maximum PDE scenario for each construction element (e.g., the use of monopile foundations for the OSSs, the use of a tracked vessel for installation of the entire Onshore Export Cable, etc.). A summary of the estimated maximum permanent and temporary bottom disturbance in offshore areas and in Indian River Bay are presented in Table 5.6-2.

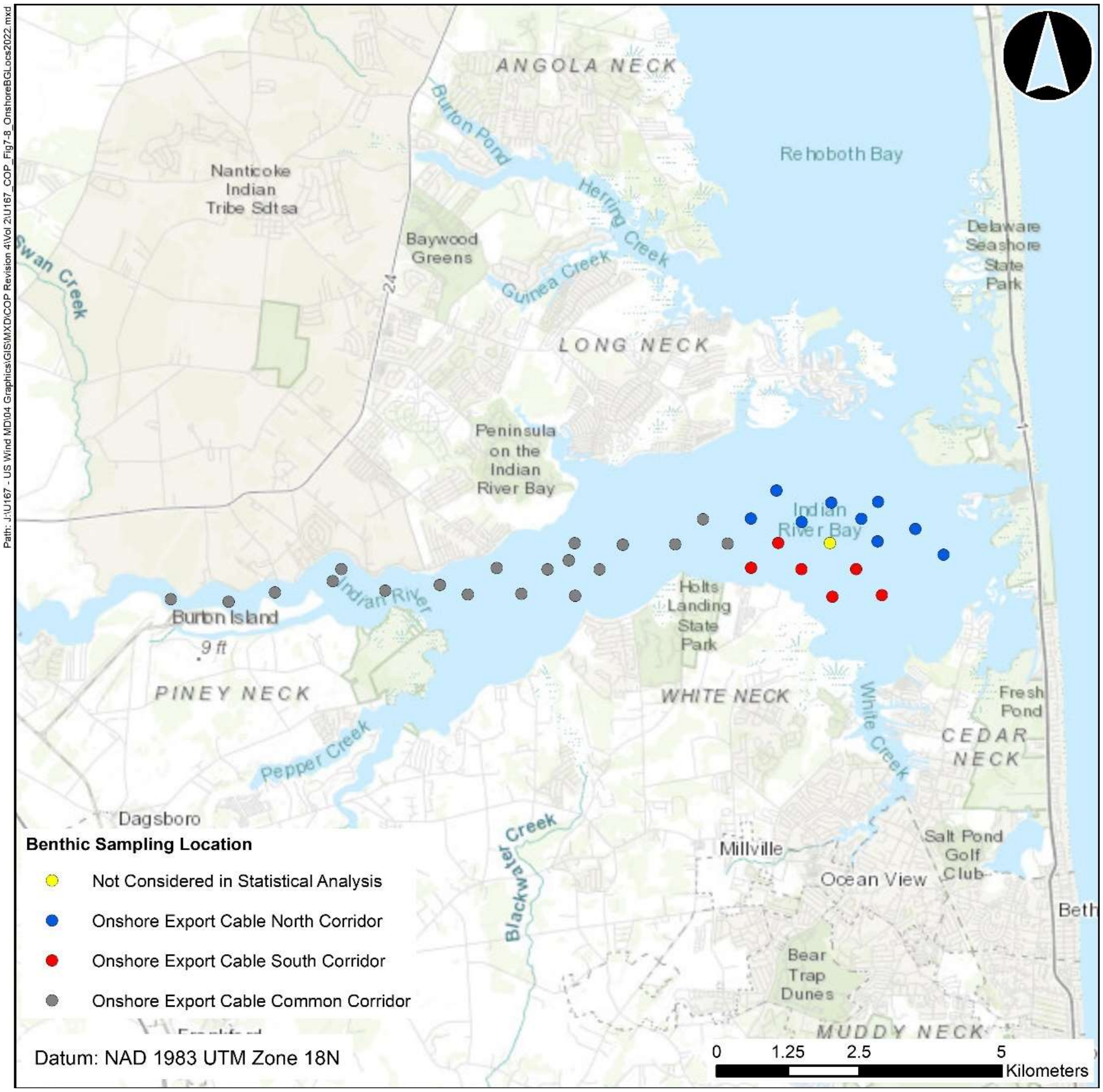

Figure 5.6-2. 2022 Onshore Export Cable Corridors Benthic Field Survey Sample Locations

Table 5.6-2. Estimated Maximum Offshore Seafloor Disturbance

Disturbance Type	Project Component	Max Area of Disturbance	
		km^2	acres
Permanent	*WTGs, OSSs, and Met Tower Foundations and Scour Protection*	*0.11*	*27.3*
	Each WTG foundation, up to 121 WTGs	0.000095	0.02348

Table 5.6-2. Estimated Maximum Offshore Seafloor Disturbance

Disturbance Type	Project Component	Max Area of Disturbance	
		km²	acres
	Scour protection at each WTG, up to 121 WTGs	0.000760	0.18786
	Each OSS foundation (monopile), up to 4 OSSs	0.000095	0.02348
	Scour protection at each OSS, up to 4 OSSs	0.000760	0.18786
	Met Tower foundation	0.000003	0.00063
	Inter-Array and Offshore Export Cable Protection (if needed)	*0.26*	*63.98*
	Each Offshore Export Cable, up to 4 cables	0.035	8.5
	Inter-Array Cables	0.12	29.98
	Total Permanent Disturbance	**0.37**	**91.3**
Temporary	Anchoring	0.06	15.57
	Offshore Export Cable Installation	0.14	34.00
	Construction area per cable, up to 4 cables	0.034	8.5
	Inter-array Cable Installation	0.12	29.98
	Jack-up Vessels	0.25	62.27
	Total Temporary Disturbance	**0.57**	**141.81**

A summary of the estimated maximum permanent and temporary bottom disturbance in onshore Bay areas are presented in Table 5.6-3.

Table 5.6-3. Estimated Maximum Onshore Bay Bottom Disturbance

Disturbance Type	Project Component	Max Area of Disturbance	
		km²	acres
Permanent	Onshore Export Cable protection (if needed)	0.04	10.10
	Total Permanent Disturbance	**0.04**	**10.10**
Temporary	Onshore export cable installation	0.68	168.27
	Each Onshore Export Cable, up to 4 cables	0.17	42.1
	HDD Gravity Cell Deployment - Barrier Beach Landfall	0.00	1.19

Table 5.6-3. Estimated Maximum Onshore Bay Bottom Disturbance

Disturbance Type	Project Component	Max Area of Disturbance	
		km^2	acres
	HDD Gravity Cell Deployment -Substation	0.00	0.59
	Dredging – Barge Access	1.17	288.8
	Total Temporary Disturbance*	**0.68**	**170.05**

Permanent Disturbance

Offshore permanent bottom disturbance will occur in the footprint of WTG, OSS and Met Tower foundations and associated scour protection. Seafloor leveling, if needed, is expected to occur within the footprint of the permanent disturbance due to the scour protection.

Additional permanent seafloor impacts could occur where burial depth of the Offshore Export Cable may be insufficient, requiring the installation of cable protection in the form of rock or concrete mattresses. Installation of foundations, scour protection and cable mattresses would crush or bury benthic organisms in the footprint. However, because cable laying operations will be located in areas with primarily sandy substrates, and the Project has been sited to avoid known hard bottom habitats to the extent possible, cable protection requirements are expected to be minimal.

See Section 7.2.2 below for a discussion of the impacts of permanent benthic habitat alteration due to installation of cable protection, the WTGs, OSSs and the Met Tower. Offshore temporary bottom disturbance will result from installation of Offshore Export Cable anchoring, and the use of jack-up vessels. Cables will be installed using a jet plow, which will minimize the area of temporary bottom disturbance compared to other installation methods (e.g., dredging). This installation method would result in maximum mortality-inducing disturbance of a corridor of seafloor along the length of the inter-array cables and Offshore and Onshore Export Cable Corridors. Sediment vibrations caused by movement of the cable installation equipment might elicit avoidance behaviors from certain mobile species (e.g., crabs, lobsters, amphipods), but sessile or slow-moving organisms that remain within the directly impacted portion of the cable laying area during installation will suffer mortality (USDOE and MMS 2009).

WTG, OSS, and Met Tower installation procedures will likely use dynamically positioned (DP) vessels, which may reduce disturbance as they would not come in contact with the seabed. However, anchoring may be necessary during construction activities, which would result in temporary bottom disturbance caused by anchor placement and anchor chain contact.

To minimize temporary impacts from potential anchoring, vessels will avoid anchoring in locations with sensitive habitats when possible and will utilize mid-line anchor buoys to decrease anchor line sweep impacts. Under the maximum impact scenario, areas of the seafloor are expected to be temporarily impacted by the jack-up vessels during installation of foundations and the WTG and OSS. Any depressions in the seafloor caused by the jack-up vessel legs are expected to backfill naturally.

As described in Section 3.0 of this document, HDD will be used at the offshore, onshore and substation landfalls to minimize impacts to nearshore habitats. For Onshore Export Cable Corridor 1, this operation would require the installation of eight gravity cells, up to four on the Atlantic Ocean side of the barrier beach and up to four in Indian River Bay, and up to four gravity cells at the Indian River Substation landfall, which would require the dredging of sediment from an approximately 0.01 km^2 (1.8 acres) area. Onshore Export Cable Corridors 1a-c, and 2 would only require four gravity cells on the Atlantic side of the Tower Road landfall location with a disturbance of approximately 0.002 km^2 (0.59 acres). Organisms in the dredged area would suffer mortality but the gravity cells would be removed following HDD operations.

Although benthic communities will experience localized mortality and habitat disturbance during construction, these impacts are expected to be temporary and spatially limited. Organisms inhabiting soft sediment communities along the Offshore Export Cable Corridors and in the Lease area are regularly exposed to natural disturbance due to the motile nature of sandy sediments in the region (Guida et al. 2017). These recurrent disturbance events contribute to spatial heterogeneity and resource patchiness in the region (S.F. Thrush and Dayton 2002), and organisms inhabiting this region are adapted to these conditions. Similarly, the benthic community represented in samples collected from the Onshore Export Cable Corridor 1 included many pollution-tolerant and opportunistic species, characterized by rapid dispersal capabilities and high reproductive rates suited to colonization of disturbed areas (e.g., *S. benedicti*, (Levin 1986); *M. ambiseta* (Hughes 1996).

As the areas disturbed by construction activities would constitute only a small percentage of benthic habitats in the region, organisms are expected to rapidly recolonize these locations from surrounding undisturbed habitats. Examinations of monitoring results from the Block Island Wind Farm indicate that areas of seafloor disturbance associated with WTG installation, primarily caused by contact with lift boat spud legs and anchors, are likely to physically recover over a short time period; approximately 46 percent of disturbance areas had completely healed within one year of construction activities (HDR 2018).

Physical seafloor recovery was more rapid in areas of fine-grained sand than in areas of medium to coarse grained sand (HDR 2018). Benthic communities in mobile sand habitats, like those of the Lease area and Offshore Export Cable Corridors, have also been observed to recover from natural sediment movement in less than a year (Lindholm, Auster, and Valentine 2004), though the rate of recovery can vary due to local species diversity and organism density. Studies examining dredging impacts have suggested benthic recovery times ranging from three months to 2.5 years (Brooks et al. 2006), 1.5 to 2.5 years (D. H. Wilber and Clarke 2007), or up to 3.0 years (D. H. Wilber and Clarke 2007). Recovery times are impacted by the size of the disturbed areas and the composition of the benthic community in surrounding habitats (D. H. Wilber and

Clarke 2007), but community composition may not return to baseline conditions until three or more years after the disturbance event (BOEM 2016).

Installation of these structures, and the submarine cables would only disturb habitats in a small portion of the region offshore of Delaware and Maryland. Large areas of undisturbed benthic habitat will be preserved, which will allow for rapid recolonization of impacted areas. As the Project has been sited to avoid sensitive or rare habitats, including hard bottom areas, artificial reefs, clam beds, and SAV beds, impacts to the benthic community due to installation-related habitat alterations are expected to be minor and temporary.

Suspended Sediment/Deposition

Seafloor-disturbing activities will cause localized and temporary increases in suspended sediment levels and sediment deposition rates, primarily near the areas dredged for barge assess and the submarine cables but also near the WTG, OSS, Met Tower, and gravity cell locations.

Increases in suspended sediment will occur during installation of the submarine cables. Based on sediment transport results for the Offshore Export Cable Corridors and Onshore Export Cable Corridor 1, the vast majority of sediments disturbed during jet plow operation will quickly return to the cable installation trench. A portion of disturbed sediment will leave the immediate trench area, resulting in measurable, but temporary, increases in suspended sediment levels. In the Offshore Export Cable Corridor, sediment deposition in excess of 0.2 mm (0.008 in) will occur within 91 m (300 ft) of the proposed cable path. In Onshore Export Cable Corridor 1, temporary increases in suspended sediment are anticipated to occur within 1,400 m (4,600 ft) of jet plow operations. Sections 5.3 and 5.6 provide details of the expected suspended sediment and deposition due to construction activities.

Elevated suspended sediment concentrations can clog the filtering organs of filter feeding benthic invertebrates, leading to decreased feeding efficiency (S. Thrush et al. 2004). However, many bivalve species, including blue mussel, surf clam, and sea scallop, are able to cope with temporarily increased suspended sediment concentrations by selectively rejecting filtered inorganic material as pseudofeces prior to ingestion (Bayne et al. 1993; Robinson, Wehling, and Morse 1984; MacDonald and Ward 1994). Sessile filter feeding organisms, including tunicates, corals, and sponges are most sensitive to elevated suspended sediment concentrations (S. Thrush et al. 2004). However, the Project has been sited to avoid hard bottom habitats where these taxa are found. Impacts to benthic communities from increased suspended sediment levels are expected to be negligible.

Resuspension of contaminated sediments due to human activities can have negative impacts on benthic communities. However, impacts of this nature are not anticipated to result from Project activities, as sediments within the Project area are not known to be highly contaminated, as described in COP, Section 4.0 (US Wind 2023). Therefore, exposure of benthic organisms to harmful levels of resuspended contaminants is not expected.

In areas where deposition is highest, benthic organisms may become buried. Surface-dwelling motile organisms and actively burrowing organisms are at low risk of harm from burial, as these species will be able to vacate the affected area during disturbance or unbury themselves. However, sessile or less motile buried organisms located in the disturbed area may experience mortality or metabolic impacts due to smothering. However, these conditions are expected to be localized and result in negligible to minor impacts to benthic communities.

5.6.2.2 Operations

Operational impacts for maintenance activities are included below. All other impacts are discussed in COP, Volume II, Section 7.0 (US Wind 2023).

Suspended Sediment/ Deposition

Certain activities associated with O&M such as cable repair will result in localized disruption of seafloor sediments and associated temporary increases in suspended sediment concentration. However, these impacts are anticipated to be limited in scope and extent. Therefore, O&M impacts to benthic resources from suspended sediment and deposition are anticipated to be negligible.

5.6.2.3 Impacts of Alternatives

Installation of export cables in Offshore Export Cable Corridor 2 would be conducted in the same manner as Offshore Export Cable Corridor 1, which would not result in additional impacts to benthic resources within the Atlantic. Offshore Export Cable Corridor 2 consisted of a similar benthic community as compared to Offshore Export Cable Corridor 1. However, there was a higher percentage of heterogenous complex benthic habitat within Offshore Export Cable Corridor 2, which is discussed further in US Wind's Information to Support Essential Fish Habitat Assessment (COP Appendix II-E1 (US Wind 2023))

Cable installation in any of the terrestrial routes (i.e., Onshore Export Cable Corridor 1a, 1b, 1c, or 2) would avoid impacts to the benthic resources within Indian River Bay.

5.6.3 Mitigation and Monitoring

US Wind will implement the following mitigation measures to reduce Project impacts on benthic resources.

- US Wind assumes all construction within Indian River Bay, including any dredging, would occur in October-March window, observing the general time of year restrictions for summer flounder and other species. Time of year restrictions would be determined through consultations with DNREC.
- The Project has been sited to avoid sensitive or rare habitats (such as high-density clam beds) where feasible, and habitat disturbance will be minimized to the extent practicable.

- Shellfish relocation/restoration in Onshore Export Cable Corridor 1 will be evaluated pre- and post- installation if warranted.
- Cables will be installed using a jet plow to the greatest extent possible. Any dredging needed is expected to be limited to the gravity cells.
- HDD will be used at landfall locations.
- Potential impacts from anchoring will be minimized by avoiding locations with sensitive habitats and utilizing mid-line anchor buoys.
- Use submarine cables that have proper electrical shielding and bury the cables in the seafloor, when practicable.
- Conduct a site-specific study of potential EMF impacts on electrosensitive marine organisms.

5.7 Finfish and Essential Fish Habitat

5.7.1 Description of Affected Environment

The waters along the Atlantic Coast are home to a wide variety of fish species, and the number and types of species present depend on differences in habitat conditions. The Project area includes finfish and Essential Fish Habitat (EFH) in Indian River Bay and the western Atlantic Ocean. Invertebrates, such as shellfish and horseshoe crabs are discussed in Section 5.6, of this document. The benthic habitat in the Project area is dominantly sandy sediment type and is almost homogenous in that the variations in sediment type observed only occur in small spatial scale. Benthic habitat is important for fish habitat and influences site fidelity in fish species.

Fish assemblages include pelagic, demersal, highly migratory, and estuarine fishes. Pelagic fishes are those that generally occur throughout the water column being neither close to the bottom or near the shore, and in contrast demersal fishes (groundfish) are those that occur on or near the ocean bottom. Highly migratory species are those that travel great distances for resources or reproduction, often from the South Atlantic to as far north as the Gulf of Maine. Estuarine fishes are those that occur in brackish water between marine and river environments, such as in Indian River Bay.

Fish species that are protected under a federal Fishery Management Plan (FMP) are discussed in further detail in Section 5.7.1.7, of this document as well as COP Appendix II-E1 (US Wind 2023).

Finfish species listed as threatened and/or endangered are discussed in Section 5.14, of this document. Fish species of commercial and recreational importance are discussed in Section 5.18.2 of this document.

Table 5.7-1 lists fish species that may be present in the Project area.

Table 5.7-1. Fish Species Potentially Occurring in the Project Area

Species	Scientific Name	Habitat Association	EFH in Project Area	Commercial / Recreational Importance	Atlantic Ocean	Indian River Bay
Albacore tuna	*(Thunnus alalunga)*	Pelagic	●	●	●	
Alewife	(*Alosa pseudoharengus*)	Pelagic		●	●	●
American conger	(*Conger oceanicus*)	Benthic				●
American eel	(*Anguilla rostrata*)	Demersal			●	●
American sand lance	(*Ammodytes americanus*)	Demersal				●
American shad	(*Alosa sapidissima*)	Pelagic		●	●	●
Atlantic angel shark	*(Squantina dumeril)*	Demersal	●		●	
Atlantic butterfish	*(Peprilus triacanthus)*	Demersal / Pelagic (spring to fall)	●	●	●	●
Atlantic cod	*(Gadus morhua)*	Demersal	●	●	●	●
Atlantic croaker	*(Micropogonias undulates)*	Demersal		●	●	●
Atlantic herring	*(Clupea harengus)*	Pelagic	●	●	●	●
Atlantic mackerel	*(Scomber scombrus)*	Pelagic	●	●	●	
Atlantic menhaden	(*Brevoortia tyrannus*)	Pelagic		●		●
Atlantic needlefish	(*Stongylura marina*)	Demersal				●
Atlantic sea scallop	(*Placopecten magellanicus*)	Benthic	●	●		●
Atlantic sharpnose shark	(*Rhizoprionodon terraenovae*)	Pelagic	●		●	●
Atlantic silverside	(*Menidia menidia*)	Pelagic		●		●
Atlantic sturgeon	(*Acipenser oxyrinchus oxyrinchus*)	Demersal			●	
Atlantic surf clam	(*Spisula solidissima*)	Benthic	●		●	
Bay anchovy	(*Anchoa mitchilli*)	Pelagic		●	●	●
Bergall	(*Tautogolabrus adspersus*)	Demersal		●		●
Black drum	(*Pogonias cromis*)	Demersal		●		●
Black sea bass	*(Centropristis striata)*	Demersal	●	●	●	●
Blueback herring	(*Alosa aestivalis*)	Pelagic			●	●

Table 5.7-1. Fish Species Potentially Occurring in the Project Area

Species	Scientific Name	Habitat Association	EFH in Project Area	Commercial / Recreational Importance	Atlantic Ocean	Indian River Bay
Bluefin tuna	*(Thunnus thynnus)*	Pelagic	●	●	●	●
Bluefish	*(Pomatomus saltatrix)*	Pelagic	●	●	●	●
Blue shark	(*Prionace glauca*)	Pelagic	●		●	
Broad striped anchovy	(*Anchoa hepsetus*)	Pelagic			●	●
Clearnose skate	*(Raja eglanteria)*	Demersal	●		●	●
Common thresher shark	(*Alopias vulpinus*)	Pelagic	●		●	
Crevalle jack	(*Caranx hippos*)	Pelagic		●	●	●
Dusky shark	*(Carcharhinus obscurus)*	Pelagic	●	●	●	
Feather blenny	(*Hypsoblennius hentz*)	Demersal				●
Flathead grey mullet	(*Mugil cephalus*)	Demersal		●		●
Fourspine stickleback	(*Apeltes quadracus*)	Demersal			●	●
Giant manta ray	*(Mobula birostris)*	Pelagic			●	
Gray snapper	(*Lutjanus griseus*)	Demersal / Pelagic		●	●	●
Hogchoker	(*Trinectes maculatus*)	Demersal				●
Inland silverside	(*Menidia beryllina*)	Pelagic				●
Inshore lizardfish	(*Synodus foetens*)	Pelagic				●
Little skate	*(Leucoraja erinacea)*	Demersal	●		●	
Little sculpin	(*Myoxocephalus aenaeus*)	Demersal				●
Longfin inshore squid	(*Doryteuthis pealeii*)	Pelagic		●	●	●
Monkfish	(*Lophius americanus*)	Demersal	●	●	●	
Mummichog	(*Fundulus heteroclitus*)	Demersal			●	●
Naked goby	(*Gobiosoma bosc*)	Demersal				●
Northern kingfish	(*Menticirrhus saxatilis*)	Demersal			●	●
Northern pipefish	(*Syngathus fuscus*)	Demersal			●	●

Table 5.7-1. Fish Species Potentially Occurring in the Project Area

Species	Scientific Name	Habitat Association	EFH in Project Area	Commercial / Recreational Importance	Atlantic Ocean	Indian River Bay
Northern puffer	(*Sphoeroides maculatus*)	Demersal			●	●
Northern seahorse	(*Hippocampus erectus*)	Demersal			●	●
Northern sea robin	*(Prionotus carolinus)*	Demersal			●	●
Northern sennet	(*Sphyraena borealis*)	Demersal				●
Northern shortfin squid	(*Illex illecebrosus*)	Demersal	●		●	●
Northern stargazer	(*Astroscopus guttatus*)	Demersal			●	●
Ocean quahog	(*Artica islandica*)	Benthic	●		●	●
Oyster toadfish	(*Opsanus tau*)	Demersal				●
Pinfish	*(Lagodon rhomboides)*	Demersal		●		●
Pollock	*(Pollachius virens)*	Demersal	●	●		●
Rainwater killifish	(*Lucania parva*)	Pelagic				●
Red drum	(*Sciaenops ocellatus)*	Demersal		●		●
Red hake	*(Urophycis chuss)*	Demersal	●	●	●	●
Rough silverside	(*Membras martinica*)	Pelagic				●
Sand tiger shark	*(Carcharias taurus)*	Pelagic	●	●	●	●
Sandbar shark	*(Carcharhinus plumbeus)*	Pelagic	●	●	●	
Scup	*(Stenotomus chrysops)*	Demersal (fall) / Pelagic	●	●	●	●
Seaboard goby	(*Gobiosoma ginsburgi)*	Demersal				●
Sheepshead minnow	(*Cyprinodon variegatus variegatus*)	Demersal				●
Shortfin mako	*(Isurus oxyrinchus)*	Pelagic	●	●	●	
Shortnose sturgeon	Shortnose sturgeon (*Acipenser brevirostrum*)	Demersal				
Silver hake	(*Merluccius bilinearis*)	Demersal (night) / Pelagic (day)	●	●	●	
Silver perch	(*Bairdiella chrysoura*)	Demersal				●

Table 5.7-1. Fish Species Potentially Occurring in the Project Area

Species	Scientific Name	Habitat Association	EFH in Project Area	Commercial / Recreational Importance	Atlantic Ocean	Indian River Bay
Skipjack tuna	*(Katsuwonus pelamis)*	Pelagic	●	●	●	
Smallmouth flounder	(*Etropus microstomus*)	Demersal			●	●
Smoothhound shark	*(Mustelus canis)*	Demersal	●		●	●
Spiny dogfish	*(Squalus acanthias)*	Demersal	●	●	●	
Spot	*(Leiostomus xanthurus)*	Demersal		●	●	●
Spotfin butterflyfish	(*Chaetodon ocellatus*)	Demersal				●
Spotfin killifish	(*Fundulus luciae*)	Demersal				●
Spotted hake	*(Urophycis regia)*	Demersal			●	●
Spotted seatrout	(*Cynoscion nebulosus*)	Demersal		●		●
Striped bass	*(Morone saxatilis*)	Demersal		●		●
Striped cusk-eel	(*Ophidion marginatum*)	Demersal				●
Striped sea robin	(*Prionotus evolans*)	Demersal		●		●
Summer flounder	*(Paralichthys dentatus)*	Demersal	●	●	●	●
Striped killifish	(*Fundulus majalis*)	Demersal				●
Tautog	*(Tautoga onitis*)	Demersal			●	
Three-spined stickleback	*(Gasterosteus aculeatus)*	Benthopelagic				●
Tiger shark	(*Galeocerdo cuvier)*	Pelagic	●		●	
Weakfish	*(Cynoscion regalis)*	Demersal			●	●
White mullet	(*Mugil curema*)	Demersal				●
White perch	(*Morone americana*)	Demersal		●		●
Windowpane flounder	*(Scopthalmus aquosus)*	Demersal	●		●	●
Winter flounder	(*Pseudopleuronectes americanus*)	Demersal	●	●	●	
Winter skate	*(Leucoraja ocellata)*	Demersal	●		●	●
Witch flounder	(*Glytocephalus cynoglossus*)	Demersal	●		●	●
Yellowfin tuna	*(Thunnus albacares)*	Pelagic	●	●	●	●
Yellowtail flounder	*(limanda ferruginea)*	Demersal	●	●	●	

(Sources: (Able and Fahay 2010); NOAA Fisheries *EFH Mapper* ; (USDOI and BOEM 2012); (Nelson and Monaco 2000);("FishBase" 2018)

5.7.1.1 Fish Species Richness and Biomass

Fish species richness and biomass data were developed by the Marine-Life Data and Analysis Team (MDAT) (Curtice et al. 2018; Fogarty and Perretti 2016), using data from the NOAA NEFSC fall trawl surveys (Figures 5.7-1 through 5.7-4). Therefore, these data do not reflect absolute fish biomass or species richness hotspots, but rather serve as fishery descriptors.

Figure 5.7-1 presents the expected species richness along the northeastern coast of the United States, based on trawl surveys which are dependent upon vessel and gear type. As reflected by NEFSC calculations, fish species richness in the Lease area would be expected to reach approximately 35 to 40 species per tow, which is above average for the northeastern United States coast as a whole (not pictured).

Figure 5.7-2 presents the expected total biomass along the northeastern coast of the United States, based on trawl surveys. As reflected by NEFSC calculations, biomass in the Lease area may be somewhat higher than the surrounding areas reaching up toward 85 to 230 kilograms (kg) (187 to 507 pounds [lbs]) per tow. However, these numbers may still be low for the coast along the northeastern United States, where a single tow can yield thousands of kg of fish.

Figure 5.7-3 presents the expected demersal fish biomass and Figure 5.7-4 presents the expected forage fish biomass along the northeastern coast of the United States. In the Lease area demersal fish biomass ranges from seven to 14 kg (15 to 31 lbs) per tow, and forage fish biomass ranges from five to 58 kg (11 to 128 lbs) per tow, in a hotspot on the western side of the Lease area. The low biomass of demersal and forage fish suggests that large predatory fish are common in the Lease area.

5.7.1.2 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires fishery management councils to: (1) describe and identify EFH in their respective regions; (2) specify actions to conserve and enhance that EFH; and (3) minimize the adverse impacts of fishing on EFH. The Magnuson-Stevens Act requires federal agencies to consult on activities that may adversely affect EFH designated in FMP. Additionally, fishery management councils identify HAPCs within FMPs. HAPCs are discrete subsets of EFH that provide extremely important ecological functions or are especially vulnerable to degradation. A HAPC has been identified for the sandbar shark in a portion of the nearshore area off the Delaware coast and into Delaware Bay, north of the Project area. All vegetated areas of summer flounder EFH are considered HAPCs.

Table 5.7-2 provides a list of species in the Project area for which one or more life stages has been designated EFH and FMP.

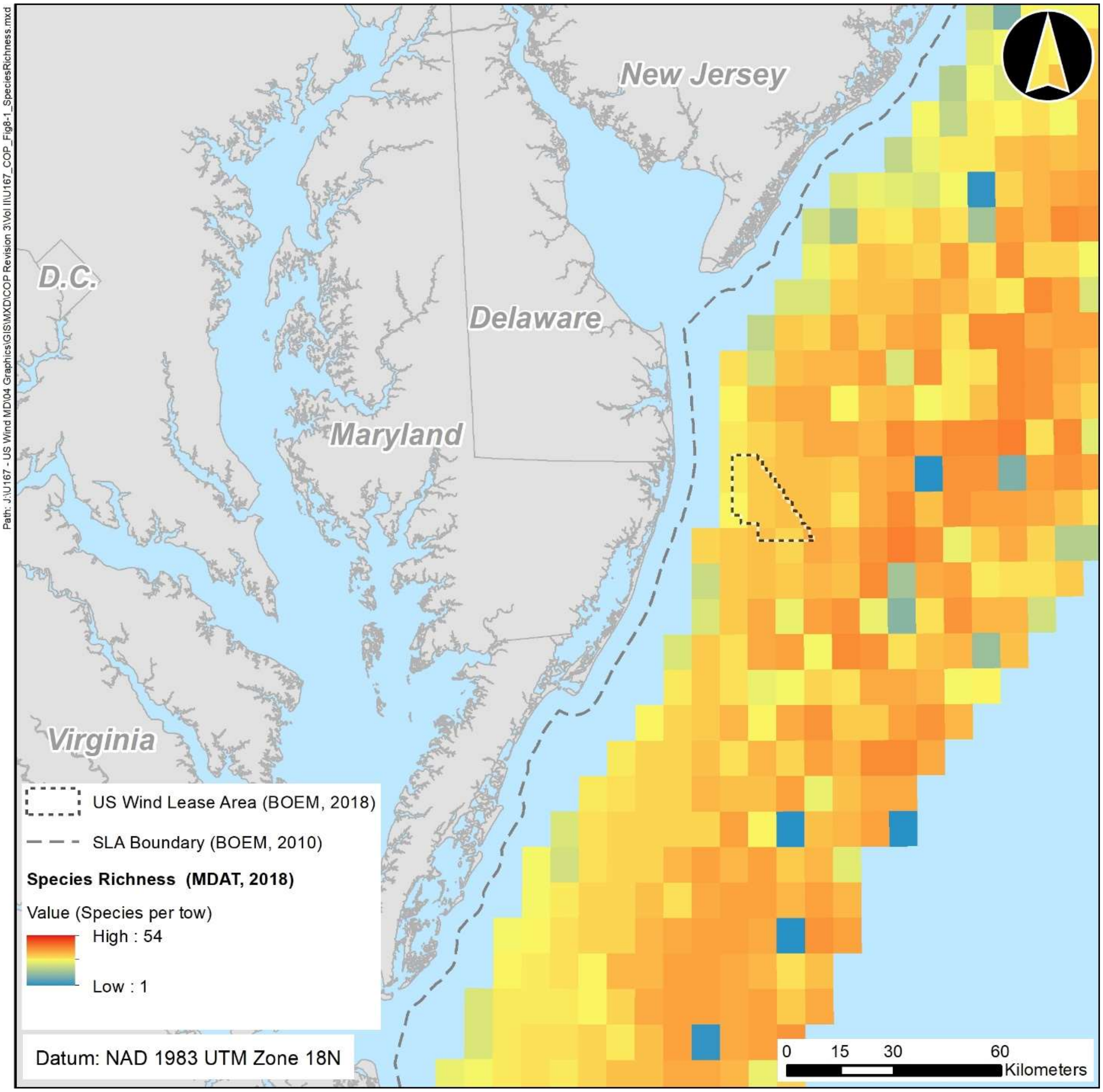

Figure 5.7-1. Fish Species Richness in the Project Area

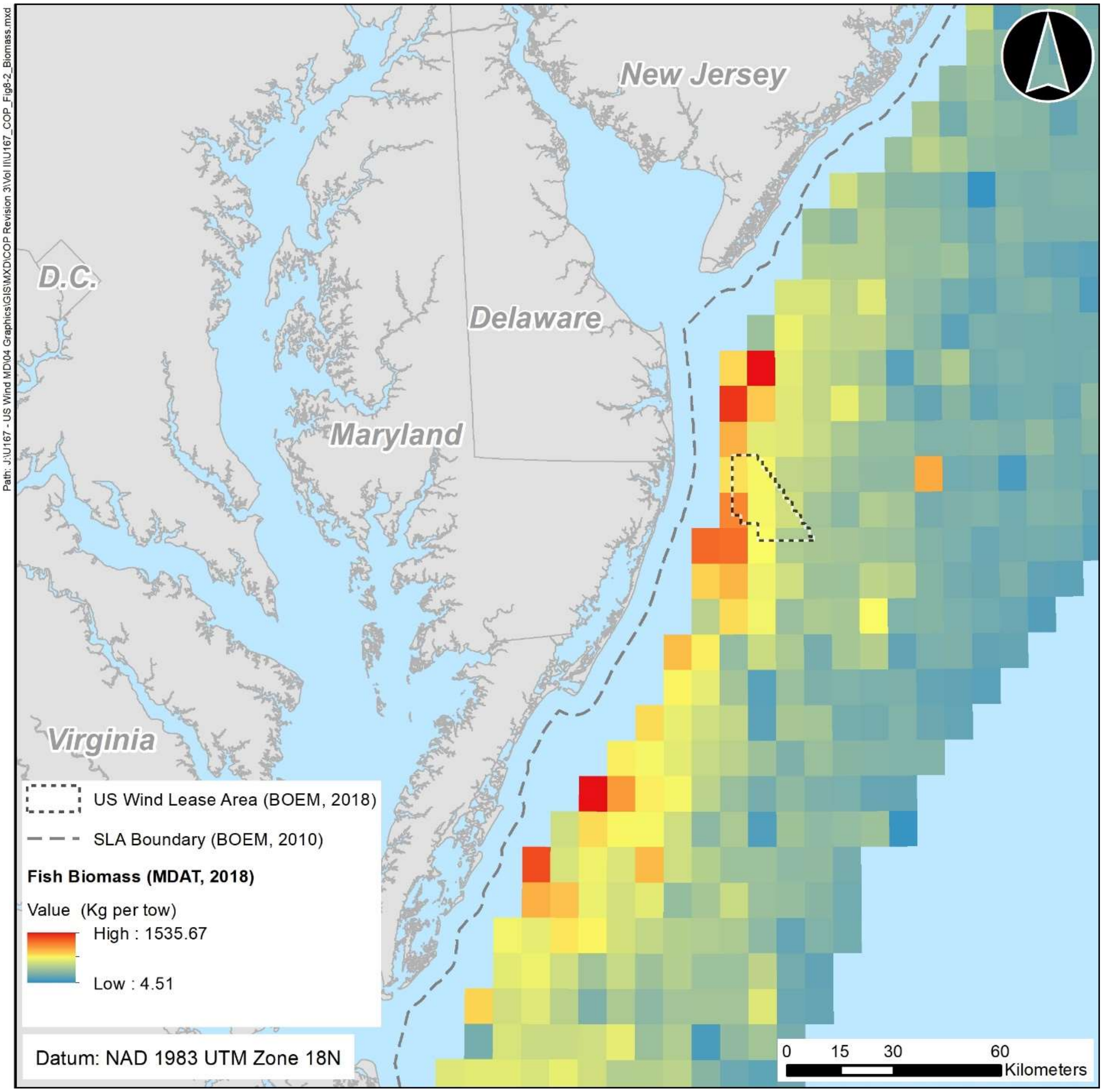

Figure 5.7-2. Fish Biomass in the Project Area

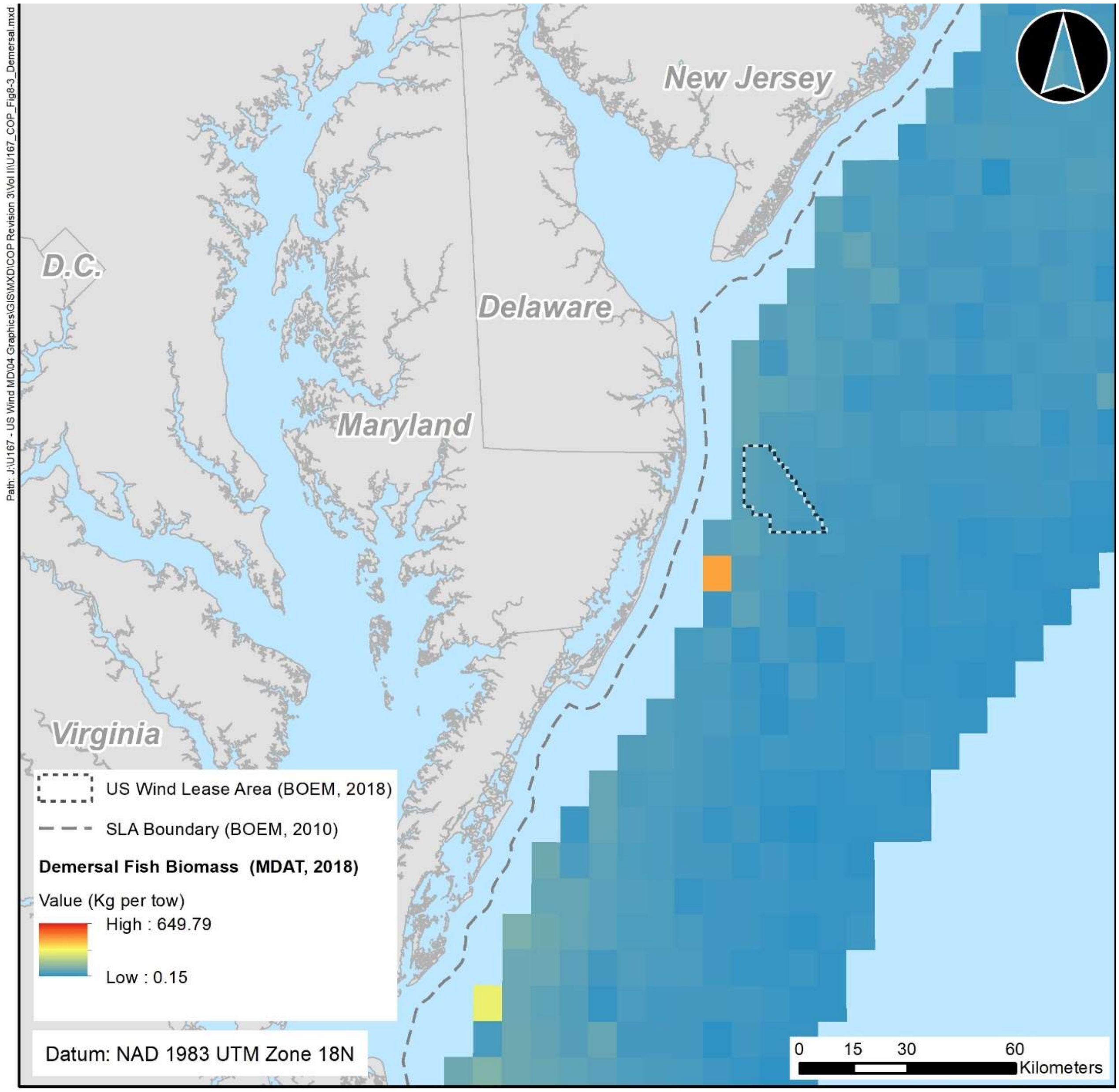

Figure 5.7-3. Demersal Fish Biomass in the Project Area

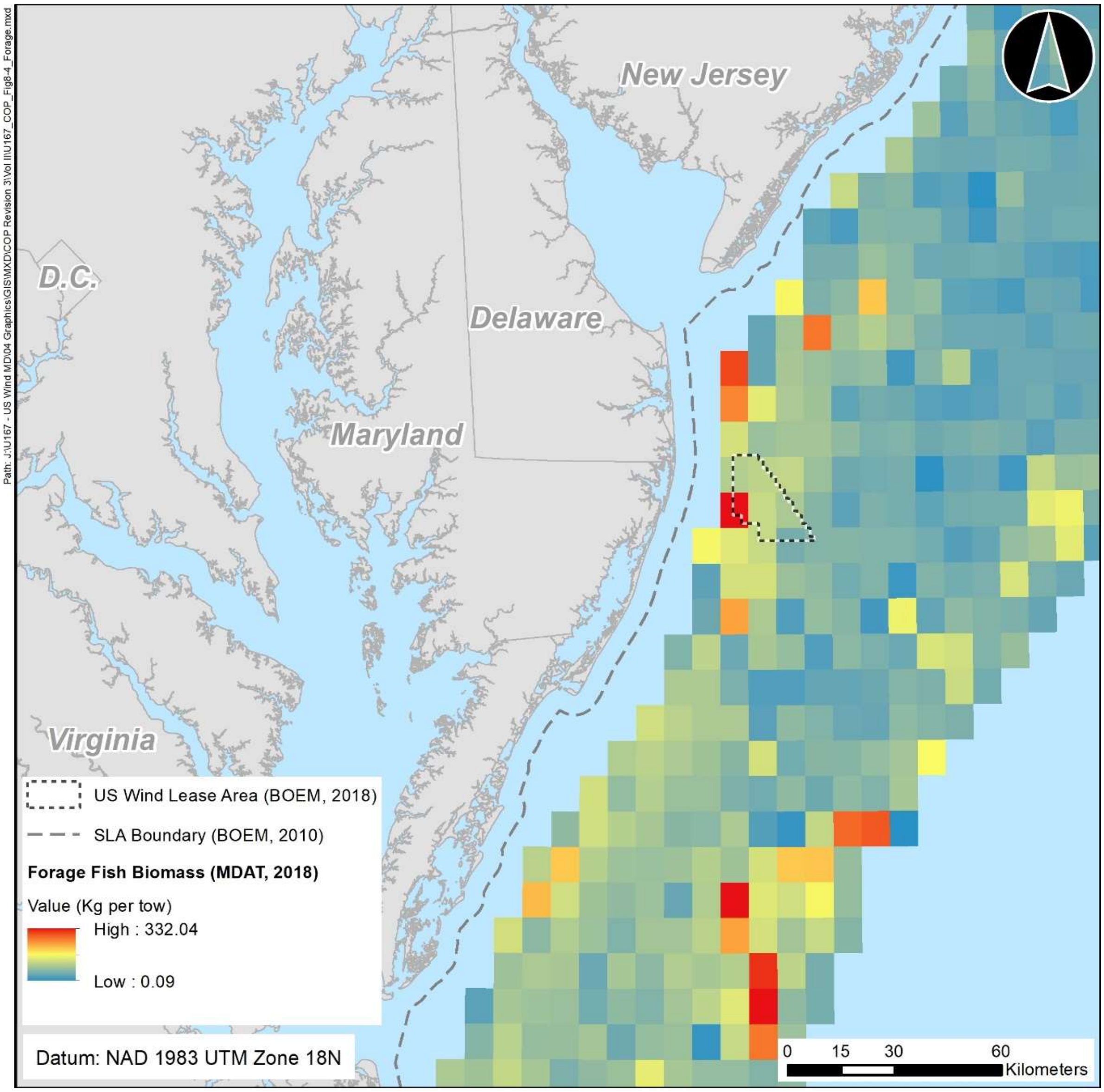

Figure 5.7-4. Forage Fish Biomass in the Project Area

Table 5.7-2 Summary of EFH Designations for Species in the Project Area

	Eggs			Larvae/Neonates			Juveniles/Subadults			Adults		
	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area
Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan (MAFMC)												
Atlantic mackerel (*Scomber scombrus*)			●					●	●		●	●
Long finned squid (*Loligo pealeii*)	●	●	●					●	●		●	●
Northern shortfin squid (*Illex illecebrosus*)								●				
Atlantic butterfish (*Peprilus triacanthus*)		●	●		●	●	●	●	●	●	●	●
Atlantic Surfclam and Ocean Quahog Fishery Management Plan (MAFMC)												
Atlantic surf clam (*Spisula solidissima*)								●	●			
Ocean quahog (*Artica islandica*)									●		●	●
Bluefish Fishery Management Plan (MAFMC)												
Bluefish (*Pomatomus saltatrix*)		●	●		●	●	●	●	●	●	●	●
Spiny Dogfish Fishery Management Plan (MAFMC)												
Spiny dogfish (*Squalus acanthias*)							●	●	●	●	●	●
Summer Flounder, Scup, and Black Sea Bass Fishery Management Plan (MAFMC)												
Summer flounder (*Paralichthys dentatus*)			●	●	●	●	●	●	●	●	●	●
Scup (porgy) (*Stenotomus chrysops*)							●	●	●	●	●	●
Black sea bass (*Centropristis striata*)					●	●	●	●	●		●	●

Table 5.7-2 Summary of EFH Designations for Species in the Project Area

	Eggs			Larvae/Neonates			Juveniles/Subadults			Adults		
	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area
Atlantic Highly Migratory Species (NOAA HMS)												
Sharks												
Atlantic angel shark (*Squatina dumerili*)					•	•		•	•		•	•
Atlantic sharpnose shark (*Rhizopriondon terraenovae*)										•	•	•
Blue shark (*Prionace glauca*)								•	•		•	•
Common thresher shark (*Alopias vulpinus*)*				•	•	•	•	•	•	•	•	•
Dusky shark (*Carcharhinus obscurus*)					•	•		•	•		•	•
Sand tiger shark (*Carcharias taurus*)				•	•	•	•	•	•	•	•	•
Sandbar shark (*Carcharhinus plumbeus*)				•	•	•	•	•	•	•	•	•
Shortfin mako shark (*Isurus oxyrinchus*)					•	•		•	•		•	•
Smoothhound shark (*Mustelus canis*)*				•	•	•	•	•	•	•	•	•
Tiger shark (*Galeocerdo cuvier*)								•	•		•	•
Tunas												
Albacore tuna (*Thunnus alalunga*)								•	•			
Bluefin tuna (*Thunnus thynnus*)								•	•			•
Skipjack tuna (*Katsuwonus pelamis*)										•	•	•

Table 5.7-2 Summary of EFH Designations for Species in the Project Area

	Eggs			Larvae/Neonates			Juveniles/Subadults			Adults		
	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area
Yellowfin tuna (*Thunnus albacares)*								●	●			
Northeast Multispecies Fishery Management Plan (NEFMC)												
Atlantic cod (*Gadus morhua*)			●		●	●					●	
Pollock (*Gadus Pollachius*)					●							
Red hake (*Urophycis chuss*)	●	●	●	●	●	●	●	●	●	●	●	●
Silver Hake (*Merluccius bilinearis*)		●			●							
Windowpane flounder (*Scophthalmus aquosus*)	●	●	●	●	●	●	●	●	●	●	●	●
Witch Flounder (*Glytocephalus cynoglossus*)		●	●		●	●					●	●
Yellowtail flounder (*Limanda ferruginea*)		●	●		●	●			●		●	●
Atlantic Herring Fishery Management Plan (NEFMC)												
Atlantic herring (*Clupea harengus*)							●	●	●		●	●
Atlantic Sea Scallop Fishery Management Plan (NEFMC)												
Atlantic sea scallop (*Placopecten magellanicus*)		●	●		●	●		●	●		●	●
Monkfish Fishery Management Plan (NEFMC)												
Monkfish (Goosefish) (*Lophius americanus*)		●	●		●	●						
Skate Fishery Management Plan (NEFMC)												
Clearnose Skate (*Raja eglanteria*)							●	●	●	●	●	●

Table 5.7-2 Summary of EFH Designations for Species in the Project Area

	Eggs			Larvae/Neonates			Juveniles/Subadults			Adults		
	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area	Onshore Export Cable Corridor 1	Offshore Export Cable Corridors	Lease Area
Little Skate (*Leucoraja erinacea)*							●	●	●	●		
Winter Skate (*Leucoraja ocellata*)							●	●	●	●	●	●
Coastal Migratory Pelagics Fishery Management Plan (SAFMC)												
Cobia (*Rachycentron canadum*)*												
King mackerel (*Scomberomorus cavalla*)*												
Spanish mackerel (*Scomberomorus maculatus*)*												

* no life stage breakdown provided

MAFMC = Mid-Atlantic Fisheries Management Council

NEFMC = New England Fisheries Management Council

NOAA HMS = NOAA's Highly Migratory Species Division

SAFMC = South Atlantic Fishery Management Council

References: NOAA Fisheries 2013, NOAA Fisheries 2022, NOAA Fisheries 2021a

Table 5.7-3 provides the respective Regional Fishery Management Council responsible for species management of EFH designated species with potential to occur in the Project area.

TRC provided BOEM information to support the EFH designated species within the Project area. A discussion of potential Project-related impacts to these species is presented as COP Appendix II-E1 (US Wind 2023).

Table 5.7-3. EFH Species with Regional Fishery Management Plan and Council Locations

New England FMP Species	Mid-Atlantic FMP Species	Atlantic HMS FMP Species
Atlantic herring	Atlantic mackerel	Albacore tuna
Atlantic sea scallop	Atlantic surf clam	Atlantic angel shark
Atlantic cod	Black sea bass	Atlantic bluefin tuna
Clearnose skate	Bluefish	Atlantic sharpnose
Little skate	Long-finned squid	Blue shark
Monkfish	Ocean quahog	Common thresher shark
Pollock	Scup	Dusky shark
Red hake	Spiny dogfish	Sand tiger shark
Silver hake	Summer flounder	Sandbar shark
Yellowtail flounder		Shortfin mako
Windowpane flounder		Skipjack tuna
Winter skate		Smooth dogfish
Witch flounder		Tiger shark
		Yellowfin tuna

5.7.1.3 Metocean Buoy Monitoring

US Wind deployed the Monitoring Buoy (Metocean Buoy) within the Lease area for a planned two-year metocean data collection campaign during the site assessment term of the Lease. The Metocean Buoy and its associated seabed mounted Trawl Resistant Bottom Mount (TRBM) have been equipped with a suite of wildlife monitoring sensors as provided in the related Metocean Buoy SAP approved May 5, 2021. This includes a fish telemetry receiver within the TRBM that records detections of previously tagged fish species within the Lease area.

5.7.2 Impacts

5.7.2.1 Construction

Habitat Alteration

As discussed in Section 3.0 of this document the installation of submarine cables, foundations, and scour protection, dredging for barge access, and the operation of jack-up and anchored vessels during construction would alter benthic habitat in Indian River Bay and the Atlantic Ocean. Immobile and slow-moving benthos may be lost during these installations, temporarily reducing the potential food supply for demersal fish until these species recover to pre-construction population levels.

It is anticipated that habitat alteration would have a negligible to minor impact on finfish. The reduction in benthic food supply would be temporary and localized, and the loss of soft-bottom habitat associated with the Project would be small relative to the overall extent of benthic habitat available within and around the Project area. Impacts to summer flounder HAPC will be minimized by using DP to minimize the need for construction vessels to anchor to the seafloor and by using midline buoys to reduce seafloor scarring when construction vessels need to anchor for offshore construction activities. Installation of the cable routes through Onshore Export Cable Corridor 1 will be planned to avoid SAV to the extent feasible. No SAV or seagrass beds have been documented in the Project area.

Turbidity/Suspended Sediment

Increases in turbidity and TSS are expected to occur during foundation construction, submarine cable laying and dredging for barge access in Indian River Bay but will be minimized by using installation techniques such as jet plow and hydraulic dredging, when possible. It is anticipated that suspended sediment and sedimentation would have a negligible to minor impact on finfish and EFH. As discussed in Section 5.6 of this document, turbidity levels along the Offshore Export Cable Corridors and Onshore Export Cable Corridor 1 could be significantly elevated for a period of less than 24 hours during cable installation activities. Dredging for barge access in the Indian River Bay would also result in temporarily increased suspended sediment levels in the vicinity of project activities. While some fish may struggle to navigate during this time due to reduced visibility and alterations in water chemistry, others may benefit from the increased turbidity because it will help conceal them from predators (D.H. Wilber and Clarke 2001).

Gilled fish may also experience increased respiration during periods of increased turbidity in order to maintain sufficient oxygen intake (Newcombe and Jensen 1996). As suspended sediment settles out of the water column, fish eggs could be buried, and demersal fish that feed on benthic organisms may experience difficulty finding food (USDOI and MMS 2007). However, it is expected that most fish will seek food and shelter outside of the Project area when vessel traffic and other construction noises begin. Construction of onshore and nearshore export cables will be planned to occur outside the spring spawning season. Additionally, gravity cells will be placed around the

HDD boreholes to contain sediment at the landfalls. As suspended sediment concentrations are expected to return to background levels quickly after construction ceases, it is anticipated that the impact of increased turbidity and suspended sediment on finfish would be negligible to minor depending on the species.

Noise

Pile driving, dredging for barge access in Indian River Bay, and vessel traffic would produce noise during construction. The impacts of construction noises on fish are not as well understood as the impacts of noises on marine mammals. Like marine mammals, fish responses to sounds are species-specific, but all fish are expected to exhibit behavioral responses to sounds at larger distances than those at which they would exhibit physiological responses. Historically, 150 decibels (dB) has been used as the threshold above which fish may modify their behavior, although recent work suggests that this number may be conservative ((California Department of Transportation (Caltrans) 2009). The most likely behavior change in fish is avoiding the source of noise, but some species may be attracted to noises (Normandeau Associates 2012). In either case, the most severe impact would be that fish may be deterred from annual migration routes, which could interfere with their feeding and reproductive success.

Potential physiological impacts to fish exposed to construction noise include stress, injury, and death. While fish may experience minor loss of hearing as a result of exposure to intense sounds, the loss would not be permanent as fish have the ability to repair or replace damaged sensory hairs (Lombarte et al. 1993). However, exposure to continuous boat noise over a period of half an hour can increase cortisol levels in fish (Wysocki, Dittami, and Ladich 2006). Continuous noise exposure over multiple hours can reduce fishes' sensitivity to sound, which may make them less likely to notice predators and prey, physical hazards, and communication from other fish (Normandeau Associates 2012). Most of the scientific literature discusses noise impacts to mature fish, but a study of sole (*Soleidae* spp.) found no response in larvae to sounds as loud as 206 dB (Bolle et al. 2012).

Exposure to pile driving noise has been shown to cause internal bleeding and organ damage (Halvorsen et al. 2012) and even death in some cases ((California Department of Transportation (Caltrans) 2009). A study on black sea bass *(Centropristis striata)* auditory detection bandwidth and thresholds done by Stanley et al. (2020) revealed juvenile black sea bass have low thresholds. In comparison, adult black sea bass have decreased auditory sensitivity as compared to juveniles but are more sensitive to sound relative to other species (Stanley et al. 2020). The results also show that the most sensitive range of sound detection capabilities directly overlaps with the highest sound energy created from pile driving activity. This suggests that black sea bass will be able to hear noise from pile driving in many circumstances (Stanley et al. 2020).

An underwater acoustic assessment was conducted to evaluate the potential for pile driving noise to impact fish populations (COP Appendix II-H1 [US Wind 2023]). US Wind will implement sound attenuation and other mitigation measures during pile driving to reduce the impact of pile driving noise.

It is anticipated that construction noise will have a negligible to minor impact on finfish. The most sensitive of fish species do not present physiological impacts at cumulative sound exposures less than 203 dB relative to 1 microPascal squared per second (re 1 μPa^2s) of pressure, and species that do not have swim bladders (i.e., flatfish, sharks and rays) present no physiological impacts at sound exposures as high as 216 dB re 1 μPa (Normandeau Associates 2012). Pile driving source levels as high as 235 dB re 1 μPa_{pp} have been calculated as close as 1 m (3.3 ft) distance away from the pile (J. Tougaard et al. 2009a), so fish eggs and any fish that do not have an avoidance response to the noise may be negatively impacted by noise from the file being installed via driving. However, since fish can restore their own hearing loss, and fish such as Chinook salmon (*Oncorhynchus tshawytscha*) exposed to sounds as loud as 213 dB re 1 μPa have recovered from physical injury in a matter of days (Casper et al. 2012), it is expected that most species of fish will experience temporary impacts from which both the individual and its population will be able to recover.

Best practices such as soft-start procedures, will be used to initiate pile driving throughout the course of Project construction in order to allow fish to vacate the affected area before they are exposed to more severe noise impacts. Additionally, sound attenuation technologies designed to minimize underwater sound would reduce the number of fish exposed to potentially injurious noise levels.

Vessel Traffic

There is a risk that construction vessels may hit aquatic organisms, potentially causing injury or death. It is anticipated that vessel traffic will have a negligible impact on finfish. Fish may differ their spatial distribution patterns in the presence of construction vessels. For example, skipjack tunas have shown attraction responses to floating objects (NOAA Fisheries 2006) which may draw them toward construction vessels. However, avoidance or attraction responses to construction vessels are not expected to have a net impact on fish, either positive or negative. In the event of collision with a construction vessel, fish are unlikely to be harmed due to their small size relative to the vessel, which allows the vessel to absorb the fish’s momentum with no real impact to the fish or the vessel.

Lighting

If Project construction activities extend before sunrise or after sunset, artificial lighting may be used. It is anticipated that such construction lighting would have a negligible impact on finfish and EFH. While it is possible that fish may alter their movement toward or away from the light (Orr, Herz, and Oakley 2013), this reaction is not well-studied, and it is not expected that this behavior would have a net impact on fish, either positive or negative. Lighting will be limited to areas of active construction, which will leave most of the Project area unaffected at any given time.

Hydraulic Entrainment

Operation of the jet plow (for cable installation) and the hydraulic dredge (during dredging for barge access in Indian River Bay) would result in bycatch of fish eggs, larvae, and other plankton, due to hydraulic entrainment. The jet plow intakes water via a surface-oriented intake, Therefore, naturally occurring surface plankton could be entrained in the system. The hydraulic dredge would uptake water, along with sediments, from the bottom of Indian River Bay, entraining plankton present in this area. Fish eggs and larvae entrained during jet plowing and hydraulic dredging would likely experience mortality (reviewed in Wenger et al. (2017)). In addition to direct uptake of plankton, water movement caused by jet plowing and hydraulic dredging may indirectly impact fish eggs and larvae due to mixing of the water column. The sediment mixing from the jet plow will inadvertently mix plankton in the waters. The duration and extent of impacts would be limited and short-term and planktonic assemblages would recover from the disturbance (BOEM 2021c).

Routine/Accidental Releases

As discussed in Section 3.0, of this document, wastes from Project construction vessels may be released into Indian River Bay or the Atlantic Ocean either as part of their allowed operations or during an accidental spill. Because permissible releases are relatively clean and accidental releases would be infrequent and dilute quickly in these large bodies of water, it is anticipated that routine and accidental releases will have a negligible impact on finfish.

5.7.2.2 Operations

Operational impacts for maintenance activities are included below. All other impacts are discussed in COP, Volume II, Section 8.0 (US Wind 2023).

Turbidity/Suspended Sediment

Increases in turbidity and TSS are expected to occur during foundation construction and submarine cable laying. Routine operations of the Project will not affect turbidity levels in Indian River Bay or the Atlantic Ocean. However, should the submarine cables or WTG, OSS or Met Tower foundations require repair during the lifetime of the Project, sediment disturbance may occur. The impacts of increases in turbidity associated with Project maintenance would be similar to but less than the impacts of turbidity increases incurred during Project construction.

Noise

During Project operation, noise would be produced by vessels and the WTGs. Aquatic organisms that reside in the Project area are likely habituated to the sound of vessel traffic and unlikely to respond to it. Noises produced by the movement of the WTG are not expected to be loud enough to exceed thresholds at which fish would begin to experience behavioral or physiological impacts.

Vessel Traffic

Over the lifetime of the installation, regular maintenance will be necessary, as well as potential non-routine repairs. Maintenance personnel and equipment will access the WTGs, OSSs, Met Tower, and submarine cables by boat. The impact of maintenance vessel traffic on finfish would be similar to but less than the impacts of vessel traffic during Project construction.

Lighting

Artificial lighting will be installed on the WTGs, OSSs and Met Tower for navigational safety purposes. It is not expected that this lighting will impact fish because it is not intended to penetrate the water's surface. Should any of the Project infrastructure be compromised during the lifetime of the Project, it is possible that maintenance vessels may need to use artificial lighting while repairing or replacing the infrastructure during nighttime hours. The impacts of this lighting on finfish would be similar to but less than the impacts of artificial lighting used during Project construction.

Routine/Accidental Releases

Emissions of liquids and gases into the environment are not part of the Project's routine operations. However, fuel discharges may occur if the Project infrastructure necessitates maintenance vessel trips, and lubricating oils contained within the WTGs could be released if the structures are damaged. The impact of these releases on finfish would be similar to but less than the impacts of routine and accidental releases that occur during Project construction.

5.7.2.3 Impacts of Alternatives

Offshore Export Cable Corridor 2 falls within a HAPC for sandbar shark. However, additional impacts to the sandbar shark HAPC, finfish or essential fish habitat of the Atlantic are not anticipated from installation of export cables in Offshore Export Cable Corridor 2 because the same installation techniques would be used.

Cable installation in any of the terrestrial routes (i.e., Onshore Export Cable Corridor 1a, 1b, 1c, or 2) would avoid impacts to finfish or essential fish habitat of Indian River Bay.

5.7.3 Mitigation and Monitoring

US Wind will implement the following mitigation measures to reduce Project impacts on finfish and EFH.

- US Wind assumes all construction within Indian River Bay, including any dredging, would occur in October-March window, observing the general time of year restrictions for summer flounder and other species. Time of year restrictions would be determined through consultations with DNREC.

- Conduct surveys and review existing data to identify important, sensitive, and unique marine habitats to be avoided.
- Minimize construction activities as practicable in areas containing anadromous fish during migration periods.
- Seafloor disturbance during construction will be minimized as practicable.
- Impacts to summer flounder HAPC will be minimized by using DP where feasible to minimize the need for construction vessels to anchor to the seafloor and using midline buoys to reduce seafloor scarring when construction vessels need to anchor.
- Sediment disturbance associated with submarine cable laying will be minimized by jet plowing, HDD techniques and the use of gravity cells where feasible.
- Soft-start procedures and sound attenuation will be used during foundation pile driving.
- Fish monitoring equipment including nanotag antennas has been installed on the Metocean Buoy.
- Work lighting will be limited to the extent practicable to areas of active construction in coordination with USCG and other agencies as appropriate.
- Project-specific SPCC Plan and Oil Spill Response Plan will be prepared prior to construction and for operations activities.
- Vessel operators, employees, and contractors will be briefed on marine trash and debris awareness elimination as described in BSEE NTL No. 2015-G03 *Marine Trash and Debris Awareness and Elimination*, per BOEM guidelines for marine trash and debris prevention.
- Vessels will adhere to USCG guidelines; follow applicable regulations related to the discharge of bilge water, gray water, and sanitary waste; maintain discharge permits, as appropriate; follow good maintenance and housekeeping procedures to prevent releases of oil and other chemicals to the sea; maintain up-to-date oil spill response plans to prevent, contain, and clean up any accidental spills.
- Use submarine cables that have proper electrical shielding and bury the cables in the seafloor, when practicable.
- Conduct a site-specific study of potential EMF impacts on electrosensitive marine organisms. n electrosensitive marine organism was performed by Exponent (Exponent 2023).
- US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.

5.8 Marine Mammals

5.8.1 Description of the Affected Environment

The following description of the affected environment for marine mammals draws upon recent studies focused on offshore areas that include the Lease area and areas around the Lease area that could be affected by the Project. In addition to the studies described below, other resources referenced include New Jersey's Ocean/Wind Power Ecological Baseline Studies Final Report: January 2008 – December 2009 (Geo-Marine 2010). This section has been updated to be consistent with the US Wind Application for Letter of Authorization under the Marine Mammal Protection Act (MMPA) for the Maryland Offshore Wind Project. A list of the surveys considered can be found in Table 5.8-1. For a full description, see COP, Volume II, Section 9.0 (US Wind 2023).

Table 5.8-1. Marine Mammal Surveys in the Project Area

Survey	Year	Location	Type of Work
Mid-Atlantic Baseline Studies (Williams et al. 2015a, 2015b)	Between 2012 and 2014	- Coasts of Delaware, Maryland, and Virginia - Expansion into Maryland State waters	- High-definition digital aerial surveys - Boat-based surveys
Virginia Aquarium & Marine Science Center Foundation (Barco et al. 2015)	Between 2013 and 2015	- Lease area (formerly the Maryland WEA)	- Aerial surveys
University of Maryland Center for Environmental Science Biological Laboratory and the Cornell University Bioacoustics Research Program (Bailey et al. 2018)	November 2014 to January 2017	- Lease area (formerly the Maryland WEA)	- Marine Autonomous Recording Units (MARUs) - Cetacean PODs (C-PODs)
US Wind G&G Surveys	2015, 2016, 2017, 2021, 2022 and 2023	- Lease area - Offshore Export Cable Corridors - Onshore Export Cable Corridor 1	- PSO observations
Duke Marine Geospatial Ecology Laboratory (MGEL) (MGEL 2022)	Last updated Spring 2022	- Western North Atlantic	- Modelled data based on collaborations with numerous academic and independent research organizations, and state and federal agencies

Table 5.8-1. Marine Mammal Surveys in the Project Area

Survey	Year	Location	Type of Work
NOAA Fisheries Stock Assessment Reports (Waring et al. 2015a; Waring et al. 2014; Hayes et al. 2021; Hayes et al. 2019a; Hayes, Josephson, et al. 2018; Hayes et al. 2017a)	Multiple	- United States Exclusive Economic Zone (EEZ)	- Contain estimates of stock sizes and annual human-caused serious injury/mortality
Woods Hole Oceanographic Institution (WHOI) and University of Maryland Center for Environmental Science (UMCES)	Ongoing	- Lease area	- Near real-time acoustic data for low frequency whales (i.e., North Atlantic right whales, fin, sei, and humpback whales)

5.8.1.1 Overview

The Atlantic Coast's marine mammals are represented by members of the taxonomic orders Cetacea, Carnivora, and Sirenia. The order Cetacea includes the mysticetes (baleen whales) and the odontocetes (toothed whales). Occurrence of cetacean species is generally widespread in Western North Atlantic waters with many of the large whales and populations of smaller toothed whales undergoing seasonal migrations along the length of the United States Atlantic coast. The order Carnivora, suborder Pinnipedia, family Phociade, includes two species of seal that may occur in the mid-Atlantic, though these animals are mainly found in the North Atlantic. The order Sirenia is represented by the West Indian manatee, which occurs mainly in the South Atlantic.

Table 5.8-2 lists the marine mammal species that are known to occur at least occasionally in the mid-Atlantic OCS region and have a known stock presence in the area. Several of these species are known to occur only rarely in the mid-Atlantic OCS region and are modeled to occur at very low densities in the Project area (MGEL 2022). Due to the habitat preferences and distributions of these species, they are not likely to be affected by Project activities, so are not discussed further.

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Fueling our future, naturally.

Table 5.8-2. Marine Mammals with Potential Occurrence in the Project Area

Common Name	Scientific Name	Stock	ESA/ MMPA Status[a]	Best Abundance Estimate of Stock[b]	MGEL Density Models[c]		MABS Mid-Atlantic Surveys[d]		MABS MD Surveys[e]		VAQF Survey[f]	MD WEA Acoustic Survey[g]	General Occurrence within the Project Area
					Estimated Mean Density in buffered Lease area during Month of Max Density (#/25 km²)	Month of Max Density	Boat Survey Sightings[da]	Aerial Survey Sightings[db]	Boat Survey Sightings[ea]	Aerial Survey Sightings[eb]	Aerial Survey Sightings[fa]	Presence Detected[ga]	
Order Cetacea													
Baleen Whales (Mysticeti)													
North Atlantic right whale	*Eubalaena glacialis*	Western North Atlantic	E/D	368	0.019	February	1	8	0	0	5 (13)	Y	Common
Fin whale	*Balaenoptera physalus*	Western North Atlantic	E/D	6,802	0.0535	January	3	1	0	0	9 (14)	Y	Common
Humpback whale	*Megaptera novaeangliae*	Gulf of Maine		1,393	0.04675	April	12	2	1	1	2 (2)	Y	Common
Minke whale	*Balaenoptera acutorostrata*	Canadian East Coast		21,968	0.1875	May	3	3	3	1	1 (1)	Y	Common
Sei whale	*Balaenoptera borealis*	Nova Scotia	E/D	6,292	0.01525	April	1	0	0	0	0		Rare

Table 5.8-2. Marine Mammals with Potential Occurrence in the Project Area

Common Name	Scientific Name	Stock	ESA/ MMPA Status[a]	Best Abundance Estimate of Stock[b]	MGEL Density Models[c]		MABS Mid-Atlantic Surveys[d]		MABS MD Surveys[e]		VAQF Survey[f]	MD WEA Acoustic Survey[g]	General Occurrence within the Project Area
					Estimated Mean Density in buffered Lease area during Month of Max Density (#/25 km^2)	Month of Max Density	Boat Survey Sightings[da]	Aerial Survey Sightings[db]	Boat Survey Sightings[ea]	Aerial Survey Sightings[eb]	Aerial Survey Sightings[fa]	Presence Detected[ga]	
Blue whale	*Balaenoptera musculus*	Western North Atlantic	E/D	402	0.00025	Annual	0	0	0	0	0		Rare
Toothed Whales (Odontoceti)													
Atlantic spotted dolphin	*Stenella frontalis*	Western North Atlantic		39,921	0.37625	August	4	0	0	0	1 (45)		Uncommon
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	Western North Atlantic		93,233	0.19947	May	0	0	0	0	0		Uncommon
Bottlenose dolphin	*Tursiops truncatus*	Western North Atlantic Offshore;	D[aa]	62,851	2.763	August	874	677	243	340	417 (2978)	Y	Common
		W. N. Atl. Northern		6,639	12.3185								

Table 5.8-2. Marine Mammals with Potential Occurrence in the Project Area

Common Name	Scientific Name	Stock	ESA/ MMPA Status[a]	Best Abundance Estimate of Stock[b]	MGEL Density Models[c]		MABS Mid-Atlantic Surveys[d]		MABS MD Surveys[e]		VAQF Survey[f]	MD WEA Acoustic Survey[g]	General Occurrence within the Project Area
					Estimated Mean Density in buffered Lease area during Month of Max Density (#/25 km²)	Month of Max Density	Boat Survey Sightings[da]	Aerial Survey Sightings[db]	Boat Survey Sightings[ea]	Aerial Survey Sightings[eb]	Aerial Survey Sightings[fa]	Presence Detected[ga]	
		Migratory Coastal											
Clymene dolphin	*Stenella clymene*	Western North Atlantic		4,237	0.00006	Annual	0	0	0	0	0		Rare
Cuvier's beaked whale	*Ziphius cavirostris*	Western North Atlantic		5,744	0.00[ca]	Annual	0	0	0	0	0		Rare
Dwarf sperm whale	*Kogia sima*	Western North Atlantic		7,750[ba]	0.00[cb]	Annual	0	0	0	0	0		Rare
False killer whale	*Pseudorca crassidens*	Western North Atlantic		1,791	0.00[ca]	Annual	0	0	0	0	0		Rare
Fraser's dolphin	*Lagenodelphis hosei*	Western North Atlantic		UNK	0.00[ca]	Annual	0	0	0	0	0		Rare

Table 5.8-2. Marine Mammals with Potential Occurrence in the Project Area

Common Name	Scientific Name	Stock	ESA/ MMPA Status[a]	Best Abundance Estimate of Stock[b]	MGEL Density Models[c]: Estimated Mean Density in buffered Lease area during Month of Max Density (#/25 km^2)	MGEL Density Models[c]: Month of Max Density	MABS Mid-Atlantic Surveys[d]: Boat Survey Sightings[da]	MABS Mid-Atlantic Surveys[d]: Aerial Survey Sightings[db]	MABS MD Surveys[e]: Boat Survey Sightings[ea]	MABS MD Surveys[e]: Aerial Survey Sightings[eb]	VAQF Survey[f]: Aerial Survey Sightings[fa]	MD WEA Acoustic Survey[g]: Presence Detected[ga]	General Occurrence within the Project Area
Harbor porpoise	*Phocoena*	Gulf of Maine/ Bay of Fundy		95,543	0.91325	January	0	3	0	1	0	Y	Uncommon
Killer whale	*Orcinus orca*	Western North Atlantic		UNK	0.0005	Annual	0	0	0	0	0		Rare
Long-finned pilot whale	*Globicephala melas*	Western North Atlantic		39,215	0.0975	Annual	0	0	0	0	0		Uncommon
Melon-headed whale	*Peponocephala electra*	Western North Atlantic		UNK	0.00[ca]	Annual	0	0	0	0	0		Rare
Blainville's beaked whale	*Mesoplodon densirostris*	Western North Atlantic		10,107[bb]	0.00025	Annual	0	0	0	0	0		Rare

Table 5.8-2. Marine Mammals with Potential Occurrence in the Project Area

Common Name	Scientific Name	Stock	ESA/ MMPA Status[a]	Best Abundance Estimate of Stock[b]	MGEL Density Models[c]		MABS Mid-Atlantic Surveys[d]		MABS MD Surveys[e]		VAQF Survey[f]	MD WEA Acoustic Survey[g]	General Occurrence within the Project Area
					Estimated Mean Density in buffered Lease area during Month of Max Density (#/25 km²)	Month of Max Density	Boat Survey Sightings[da]	Aerial Survey Sightings[db]	Boat Survey Sightings[ea]	Aerial Survey Sightings[eb]	Aerial Survey Sightings[fa]	Presence Detected[ga]	
Gervais' beaked whale	*Mesoplodon europaeus*	Western North Atlantic		10,107[bb]	0.00025	Annual	0	0	0	0	0		Rare
True's beaked whale	*Mesoplodon mirus*	Western North Atlantic		10,107[bb]	0.00025	Annual	0	0	0	0	0		Rare
Northern bottlenose whale	*Hyperoodon ampullatus*	Western North Atlantic		UNK	0.00[ca]	Annual	0	0	0	0	0		Rare
Pantropical spotted dolphin	*Stenella attenuata*	Western North Atlantic		6,593	0.001	Annual	0	0	0	0	0		Uncommon
Pygmy sperm whale	*Kogia breviceps*	Western North Atlantic		7,750[ba]	0.00[cb]	Annual	0	0	0	0	0		Rare
Risso's dolphin	*Grampus griseus*	Western North Atlantic		35,215	0.04225	December	0	1	0	1	0		Rare

Table 5.8-2. Marine Mammals with Potential Occurrence in the Project Area

Common Name	Scientific Name	Stock	ESA/ MMPA Status[a]	Best Abundance Estimate of Stock[b]	MGEL Density Models[c]		MABS Mid-Atlantic Surveys[d]		MABS MD Surveys[e]		VAQF Survey[f]	MD WEA Acoustic Survey[g]	General Occurrence within the Project Area
					Estimated Mean Density in buffered Lease area during Month of Max Density (#/25 km²)	Month of Max Density	Boat Survey Sightings[da]	Aerial Survey Sightings[db]	Boat Survey Sightings[ea]	Aerial Survey Sightings[eb]	Aerial Survey Sightings[fa]	Presence Detected[ga]	
Rough-toothed dolphin	*Steno bredanensis*	Western North Atlantic		136	0.0005	Annual	0	0	0	0	0		Rare
Short-beaked common dolphin	*Delphinus delphis*	Western North Atlantic		172,974	1.98475	December	209	52	26	27	24 (199)	Y	Common
Short-finned pilot whale	*Globicephala macrorhynchus*	Western North Atlantic		28,924	0.00975	Annual	0	0	0	0	0		Uncommon
Sperm Whale	*Physeter macrocephalus*	North Atlantic	E/D	4,349	0.0015	May	0	0	0	0	0		Rare
Spinner dolphin	*Stenella longirostris*	Western North Atlantic		4,102	0.00[ca]	Annual	0	0	0	0	0		Rare
Striped dolphin	*Stenella coeruleoalba*	Western North Atlantic		67,036	0.001	Annual	0	0	0	0	0		Rare

Table 5.8-2. Marine Mammals with Potential Occurrence in the Project Area

Common Name	Scientific Name	Stock	ESA/ MMPA Status[a]	Best Abundance Estimate of Stock[b]	MGEL Density Models[c]: Estimated Mean Density in buffered Lease area during Month of Max Density (#/25 km²)	MGEL Density Models[c]: Month of Max Density	MABS Mid-Atlantic Surveys[d]: Boat Survey Sightings[da]	MABS Mid-Atlantic Surveys[d]: Aerial Survey Sightings[db]	MABS MD Surveys[e]: Boat Survey Sightings[ea]	MABS MD Surveys[e]: Aerial Survey Sightings[eb]	VAQF Survey[f]: Aerial Survey Sightings[fa]	MD WEA Acoustic Survey[g]: Presence Detected[ga]	General Occurrence within the Project Area
White-beaked dolphin	*Lagenorhynchus albirostris*	Western North Atlantic		536,016	0.00[ca]	Annual	0	0	0	0	0		Rare
Order Carnivora													
Earless seals (Phocidae)													
Harbor seal	*Phoca vitulina*	Western North Atlantic		61,336	0.1699	January	0	0	0	0	0		Rare
Gray seal	*Halichoerus grypus*	Western North Atlantic		27,300	0.1699	January	0	0	0	0	0		Rare
Order Sirenia													
Manatee (Trichechidae)													
West Indian manatee	*Trichechus manatus*	Florida	T	8,810[bc]			0	0	0	0	0		Rare

[e]All species are protected under the MMPA, D = Depleted under the MMPA, E = Endangered under the ESA, T= Threatened under the ESA
[aa]Western North Atlantic Northern Migratory Coastal stock only
[b]Source: NOAA Stock Assessment Reports (Hayes et al. 2022, 2021, 2020, 2019; Waring et al. 2015). UNK indicates that stock size is unknown.
[ba]Estimated abundance includes both dwarf and pygmy sperm whales
[bb]Estimated abundance for all *Mesoplodon* spp. beaked whales
[bc]Best population estimate for the state of Florida (USFWS 2022).
[c]Source: MGEL 2022. Manatee densities not modeled.
[ca]Density estimates in the buffered Lease area not provided in MGEL (2022).
[cb]Estimated density includes both dwarf and pygmy sperm whales
[d]Source: Williams et al. 2015a
[da]Total number of individuals observed during 16 boat-based surveys of the mid-Atlantic conducted between March 2012 and May 2014. Only sightings of individuals identified to species are included. Additional MM sightings not included in table: 113 unidentified dolphin, 11 unidentified whale, 4 unidentified large whale
[db]Total number of individuals observed during 15 digital video aerial surveys of the mid-Atlantic conducted between March 2012 and May 2014. Additional MM sightings not in table: 1044 small beaked cetacean to 3m, 188 unidentified dolphin, 63 unidentified toothed whale, 1 unidentified fin/sei whale, 5 unidentified cetacean, 1 unidentified medium whale
[e]Source: Williams et al. 2015b
[ea]Total number of individuals observed during 16 boat-based surveys in the vicinity of the MD WEA conducted between April 2012 and April 2014. Only sightings of individuals identified to species are included. Additional sightings of MM not included in table: 29 unidentified dolphin, 4 unidentified whale
[eb]Total number of individuals observed during 14 aerial surveys in the vicinity of the MD WEA conducted between March 2012 and May 2014. Additional sightings or MM not classified to species: 644 small beaked cetacean to 3 m, 102 unidentified dolphin, 6 unidentified toothed whale, 1 unidentified medium whale
[f]Source: Barco et al. 2015
[fa]Total number of sightings (and total number of individuals observed) during monthly aerial surveys of the MD WEA and surrounding waters between July 2013 and June 2015. Additional MM sightings not reported in table: 11 (18) unidentified dolphin, 1 (1) unidentified whale, 2 (2) unidentified baleen whale
[g]Source: Bailey et al. 2017
[ga]Y indicates marine mammal species detected during monthly passive acoustic monitoring of the MD WEA and surrounding waters between November 2014 and January 2017

5.8.1.2 Cetaceans

The status and distribution of species likely to be impacted by project activities are discussed below. The blue whale (*Balaenoptera musculus)* is classified as absent from the mid-Atlantic OCS region (BOEM 2014) and is highly unlikely to be found within the relatively shallow waters of the Lease area. Similarly, the sperm whale (*Physeter macrocephalus)* generally occurs in mid-ocean regions, over the continental slope and along the continental shelf edge (S.A. Hayes et al. 2020) and is not likely to be present in the Lease area. However, these endangered species listed under the Endangered Species Act (ESA) may be encountered by vessels traveling to the Lease area from overseas or the Gulf of Mexico, so are discussed below.

Although 15 cetacean species have the potential for occurrence in the Project region, Table 5.8-2 indicates the frequency of occurrence for nine species in the Project area and these species are therefore discussed in the following sections below. All cetacean species are federally protected by the MMPA. The status and distribution of species classified as either common or uncommon in the Project area are discussed below. Discussion and life history information for all threatened and endangered cetacean species can be found in Section 5.13.

5.8.1.3 Pinnipeds

The status and distribution of two pinniped species, both federally protected by the MMPA, are discussed below. Both gray and harbor seals are rare in the mid-Atlantic region but are considered here because one unidentified seal was observed during the 2017 HRG survey Onshore Export Cable Corridor 1 in Indian River Bay (Alpine 2017).

5.8.2 Impacts

Marine mammals in the Project area have the potential to be impacted by a variety of factors associated with Project activities. Given the presence of marine mammals in the Project area, US Wind has designed the Project to minimize and mitigate the potential for mortality, injury, and disturbance. The potential Project noise and vessel traffic impacts on marine mammals are discussed in more detail in Sections 5.8.2.1, 5.8.2.2, and 5.8.2.3 of the Application.

5.8.2.1 Construction

<u>Vessel Noise</u>

Marine mammals are heavily reliant upon sound for navigation, communication, reproduction, prey location, and predator avoidance. Marine mammal responses to anthropogenic sound exposure can range from apparent indifference to behavioral changes or physical injury, depending upon the sound source and species. Project construction activities that will generate noise with the potential to impact marine mammals include vessel traffic (including use of Dynamic Positioning thrusters [DP thrusters]).

Increased vessel traffic associated with installation activities could impact marine mammals due to the noise from work boats. Vessel noise is primarily composed of low-frequency components caused by propeller cavitation, though rotational and reciprocal machinery movement, and hydrodynamic water movement over the boat hull also contribute to sound generation (Hildebrand 2009). As the intensity of vessel noise is largely related to ship size and speed (Hildebrand 2009), exposure of marine mammals to noise from construction and installation vessels would be variable.

Vessel noise can elicit behavioral responses in marine mammals. Recent research has indicated that porpoises can exhibit behavioral response to low levels of high frequency sound present in vessel noise (Dyndo et al. 2015) and NARW are vulnerable to communication masking due to low frequency vessel traffic (L.T. Hatch et al. 2012). Similarly, high levels of vessel traffic (e.g., from whale watching operations) have been noted to cause behavior changes in many cetacean species (reviewed in Parsons 2012). The Lease area and adjacent waters are well-traveled by commercial shipping traffic in the nearby shipping lanes as well as recreational and commercial fishing, and ambient sound from vessels is relatively high. Marine mammals in the region are likely habituated to vessel noise. The underwater acoustic assessment as COP Appendix II-H1 (US Wind 2023), provides a brief summary of documented ambient noise levels in and around the Lease area based on the passive acoustic study conducted by H. Bailey et al. (2018a).

Construction vessel noise related to the Project would be limited, as boats will travel to and from the Project area at reduced speeds and will remain stationary at work sites for extended periods of time. DP thrusters may be used during Project installation activities. NOAA Fisheries has indicated that the sound produced by this equipment is similar to that generated by transiting vessels (communications cited in (CSA Ocean Sciences 2018a, 2018b; Tetra Tech 2018)). Any impacts to marine mammals due to vessel noise during Project installation would be temporary, with behavior rapidly returning to normal following passage of a vessel, and it is unlikely that such short-term effects would result in long-term population-level impacts.

Pile Driving

Impact pile driving is proposed to install the WTGs, OSSs and the Met Tower piled jacket and monopile foundations. Monopile foundations will take up to two days to install including approximately two to four hours of pile driving. Numerous factors, including water depth, impact the sound levels produced by pile driving (HDR 2019), but this procedure generates loud sound pressures (235 dB re 1 uPapp at 1m), (Jakob Tougaard et al. 2009b). This activity could affect marine mammals detailed in Table 5.8-2 and has the potential to cause PTS in marine mammals located close to the piling. Because pile driving generates low frequency impulsive sounds, low frequency cetaceans (baleen whales) are likely the most at risk due to the alignment of these species' hearing ranges with the sound frequencies typically generated from pile driving.

Of particular concern is the North Atlantic right whale (NARW), one of the rarest and most endangered whale species in the world, which is known to occur in the Lease area year-round (Williams et al. 2015c; S. Barco et al. 2015; H. Bailey et al. 2018b). The NARW are more vulnerable to communication masking by anthropogenic sounds than other baleen whales due to the lower sound source levels of NARW communication calls compared to the songs of other species (e.g., fin and humpback) (Clark et al. 2009). This species is under stress throughout its range, and research into one area of the NARW's range has identified a dramatic decrease in potential communication space since the 1950's due to increasing vessel traffic and offshore activities (63 percent loss of communication opportunities on Stellwagen bank) (L.T. Hatch et al. 2012).

Though mid-frequency cetaceans, including dolphins, are not as susceptible to pile driving noise as those species that rely upon low-frequency vocalizations, these mammals could also be impacted by noise from Project construction activities. Certain species, like bottlenose dolphins, are unlikely to experience permanent damage from pile driving, though behavioral effects are likely. Field measurements of pile driving noise off Northeastern Scotland indicated that sound levels sufficient to cause behavioral disturbance, due to masking of bottlenose dolphin communication whistles, were present up to 50 km (27 NM) from the sound source (H. Bailey et al. 2010). However, sound levels sufficient to cause permanent injury to bottlenose dolphin were only present within 100 m (328 ft) of the pile driving activity (H. Bailey et al. 2010). Though pile driving noise could result in behavioral impacts to bottlenose dolphins, temporary displacement from the area is the most likely response, and dolphins have shown some ability to modify their behavior when exposed to communication-masking sound levels (reviewed in David 2006). Bottlenose dolphins are common within the Project area, and are expected to experience temporary displacement, but no permanent injury or population-level impacts are anticipated.

Pile driving noise is also likely to impact harbor porpoises, which are present but uncommon in the region of the Lease area. Pile driving noise has been documented to cause displacement of porpoises up to 25 km (13.5 NM) away from the sound source (J. Tougaard et al. 2012; Jakob Tougaard et al. 2009b), and vocalizations of this species have been documented to remain below pre-activity levels until 24 to 72 hours after cessation of pile driving (Brandt et al. 2011). Because breaks between pile driving events are expected to be less than 72 hours, porpoises could be functionally excluded from the Project area for the duration of pile driving operations (Brandt et al. 2011). However, local porpoise distributions are expected to return to pre-event levels within a few days of the completion of pile driving. Impacts to harbor porpoises due to construction within the Lease area are expected to be temporary, and a limited number of individuals are expected to be exposed to pile driving noise due to the scarcity of this species.

An underwater acoustic assessment was conducted to evaluate the potential for the Project's pile driving noise to impact marine mammals as discussed in COP Appendix II-H1 (US Wind 2023). This assessment, and the resulting modeled distances to marine mammal hearing thresholds, are conservative, as the model assumed that animals would remain in the area. Table 5.8-3 reflects the hammer schedule with varying hammer energy and durations at 11-m monopile, a 3-m skirt pile, and a 1.8-m pin pile. Additionally, sound propagation modeling was based upon environmental conditions in the Project area in April and in May, the months during which pile driving may occur that has the lowest transmission loss (no pile driving will occur between the months of December and April).

Table 5.8-3. Hammer Schedule

Pile Type/Number Installed per Day	Hammer Energy (kJ)	Duration at Energy Level (minutes)	Blows per Minute	Number of Blows	Total Duration for Pile Install (minutes)	Total Number of Blows for Pile Install
11-m Monopile – 1 per day	1100	30	20	600	120	4800
	2200	60	40	2400		
	3300	30	60	1800		
3-M Skirt Pile – 4 Piles per day	1500	480	40	19,200	480	19,200
1.8-m Pin Pile – 3 Piles per day	500	360	8.3	2,988	240	2,988

The unmitigated modeled range to the regulatory behavioral threshold for the pile driving of a monopile was 13,650 m (44,783) ft) for marine mammals. The unmitigated modeled range to the injury marine mammal thresholds were greatest for the LF cetaceans with ranges for the SEL threshold from 850 m (29,035 ft). Table 5.8-4 below provides modeled ranges to the marine mammal behavioral and injury regulatory thresholds assuming various levels of noise attenuation for the driving of the 11-m diameter pile. US Wind will implement sound attenuation measure during pile driving with a minimum reduction of 10 dB, and a target of 20 dB reduction. US Wind will implement additional mitigation and monitoring measures as described in, Section 5.8.3 to minimize noise impacts to marine mammals.

Table 5.8-4. Modeled Ranges to Behavioral and Injury Regulatory Threshold Levels for Low-Frequency Cetaceans (Impulsive Sounds)

Mitigation	0 dB	10 dB	20 dB
Injury Threshold (183 dB ($L_{E,LF,24h}$))	8,850 m (29,035 ft)	2,900 m (9,514 ft)	650 m (2,133 ft)
Behavioral Threshold (160 dB (L_p))*	13,650 m (44,783 ft)	5,250 m (17,224 ft)	1,650 m (5,413 ft)

Source: See COP Appendix II-H1 (US Wind 2023)
*For marine mammals overall.

Vessel Traffic

Vessel collisions with marine mammals can cause serious injury or death and are a leading cause of mortality for certain species. Baleen whales are most at risk from ship strikes, and species including fin whale, NARW, humpback whale, and sperm whale are particularly vulnerable (Laist et al. 2001). Most ship strikes resulting in severe injury or death occur from ships traveling at 14 knots or faster and strikes from larger vessels (>80 m [262 ft]) are more likely to result in mortality (Laist et al. 2001).

The highly endangered NARW experiences the most numerous per capita vessel strikes (Vanderlaan and Taggart 2007) and is especially vulnerable because it primarily utilizes busy coastal areas, swims slowly, and congregates at or just below the water surface (NOAA Fisheries 2018). This species also shows no avoidance response when exposed to approaching vessels (Nowacek, Johnson, and Tyack 2003), perhaps indicating habituation to ubiquitous vessel noise in its habitat. However, vessel speed restrictions are effective in decreasing NARW ship strikes; vessel speed limits of 10 knots have been shown to reduce ship strike mortality risk by 80 to 90 percent (Conn and Silber 2013). Construction vessels will follow NOAA Fisheries collision avoidance guidance, including vessel speed restrictions to minimize the risks to NARW and other marine mammals. In addition, US Wind will continue to evaluate technologies that may increase the ability to detect marine mammals from vessels, such as thermal detection technologies. US Wind anticipates that vessel strike avoidance measures will be modified to reflect conditions set by NOAA Fisheries following the application for Incidental Harassment Authorization (IHA) or Letter of Authorization (LOA). Impacts to marine mammals from vessel strikes are expected to be negligible.

For information about the proposed Project ports, vessel trips, and routes can be found in: Section 4.1 for information about construction ports, Section 3.7 for information about operations and maintenance ports, and COP Appendix II-C1 (US Wind 2023), as Figure 1 and Tables 2 and 3 for vessel routes and trips.

Entanglement and Marine Debris

Entanglement will not pose a risk to marine mammals during Project construction. US Wind does not anticipate the use of anchored vessels during construction. If used, mooring lines during WTG, OSS, Met Tower, and submarine cable installation will be of relatively large diameter and will generally be kept under tension, eliminating entanglement risk. US Wind will follow BOEM guidelines for marine trash and debris prevention (Section 5.3.2 of this document). Therefore, construction impacts to marine mammals due to entanglement and marine debris are anticipated to be negligible.

Routine/Accidental Releases

During the course of Project construction, pollutants may be discharged into the environment as part of routine activities, such as the operation of construction vessels and vehicles, or due to accidental spills. See Section 5.3.2 for a discussion of the impacts of routine and accidental releases during Project activities. Water quality impacts due to routine and accidental releases are anticipated to be negligible and are therefore not anticipated to impact marine mammals or their prey species.

Suspended Sediment/Deposition

Pile driving during WTG, OSS and Met Tower foundation installation, the use of jack-up and feeder vessels, jet plow operations during cable laying and embedment, vessel anchoring, and the installation and removal of gravity cells will disturb sediment on the seafloor. See Section 5.3.2 for a discussion of the impacts of these activities on suspended sediment levels and sediment deposition. Water quality impacts associated with jet plow operations, HDD, and other bottom-disturbing activities are expected to be minor and temporally limited and are not anticipated to directly impact marine mammals.

Impacts to marine mammal prey species due to bottom disturbing activities are also expected to be minor. Though direct bottom disturbance and sediment deposition will result in localized mortality of benthic organisms, impacts to communities of benthic crustacean and shellfish species which may serve as prey for marine mammals are expected to be negligible (Section 5.6.2.1). Therefore, impacts to marine mammals are not anticipated to result from bottom disturbing activities related to Project construction.

5.8.2.2 Operations

Operational impacts for maintenance activities are included below. All other impacts are discussed in COP, Volume II, Section 9.0 (US Wind 2023).

Vessel Noise

Project O&M activities will require vessel travel within the Project area. Vessel noise has the potential to impact marine mammals (Section 5.8.2.1). However, as the region is heavily traveled by commercial shipping and fishing vessels, low levels of vessel noise associated with Project activities are not anticipated to alter acoustic conditions.

Vessel Traffic

Vessel traffic associated with O&M activities could endanger marine mammals (Section 5.8.2.1). US Wind will implement vessel strike avoidance procedures in consultation with NOAA Fisheries. Trained observers or PSOs will be present on vessels, therefore the risk of harm to marine mammals from vessel strikes is considered negligible. In addition, US Wind will continue to evaluate technologies that may increase the ability to detect marine mammals from vessels, such as thermal detection technologies.

Entanglement and Marine Debris

Entanglement will not pose a risk to marine mammals during Project operations. Submarine cables will be buried approximately 1 to 4 m (3 to 13 ft) beneath the seafloor or covered with protective material (e.g., concrete mattresses) when target burial depths are not achievable. Similarly, the diameter of the WTG and OSS foundation structures will be 1.5 to 4.0 m (4.9 to 13 ft) for jacket foundation piles, 8 to 12 m (26 to 39 ft) for monopiles and 10 to 15 m (33 to 49 ft) for jacket on suction buckets and do not pose an entanglement risk. Secondary entanglement, due to marine debris becoming snagged on WTG and OSS foundations, is a risk for marine mammals. However, the likelihood of this occurrence is low as the structures are largely free of protrusions upon which such debris could attach. US Wind will follow BOEM guidelines for marine trash and debris prevention (Section 5.3.2). Therefore, operations impact to marine mammals due to entanglement and marine debris are anticipated to be negligible.

5.8.2.3 Impacts of Alternatives

Installation of export cables in Offshore Export Cable Corridor 2 would be conducted in the same manner as Offshore Export Cable Corridor 1, which would not result in additional impacts to marine mammals within the Atlantic. Offshore Export Cable Corridor 2 encompasses similar pelagic habitat as Offshore Export Cable Corridor 1, therefore, marine mammal presence is expected to be similar.

Cable installation in any of the terrestrial routes (i.e., Onshore Export Cable Corridor 1a, 1b, 1c, or 2) would avoid impacts to marine mammals within Indian River Bay.

5.8.3 Mitigation and Monitoring

US Wind will implement the following mitigation measures to reduce Project impacts on marine mammals.

Pile Driving

US Wind will implement the following pile driving sound mitigation measures:

- Prepare a pile driving monitoring plan, to include details about the measures listed below, prior to construction activities. Mitigation measures may be modified to reflect conditions set by NOAA Fisheries following the application for IHA or LOA associated with construction activities.
- Implement sound attenuation technologies such as double bubble curtains and nearfield attenuation devices to reduce underwater pile driving noise by 10 dB, with a target of 20 dB.
- Pile driving is planned between May 1 and November 30. Pile driving, if necessary, in November, may require additional mitigation measures such as larger clearance or exclusion zones.

- Establish a clearance zone prior to pile driving using a combination of visual and acoustic monitoring for large whales. The clearance zone is to be monitored for a minimum of 60 minutes and the zone must be clear for 30 minutes before beginning soft-start procedure.
- Once clearance zone is confirmed clear of marine mammals, pile driving will begin with minimum hammering at low energy for no less than 30 minutes (soft-start).
- Additional restrictions on pile driving will include: no simultaneous pile driving; no more than one monopile driven per day; daylight pile driving only unless health and safety issues require completion of a pile; and initiation will not begin within 1.5 hours of civil sunset or in times of low visibility when the visual clearance zone and exclusion zone cannot be visually monitored, as determined by the lead PSO on duty.
- Establish an exclusion zone using a combination of visual and acoustic monitoring for large whales. Pile driving will be halted if species enters defined exclusion zone, with exceptions for health and safety considerations as well as technical feasibility.
- Visual clearance and exclusion zones will be monitored by PSOs which are individuals with a current NOAA Fisheries approval letter as a PSO.

Vessel Strike Avoidance

US Wind will implement the following vessel strike avoidance mitigation measures:

- PSOs or trained observers will be present on crew vessels and other project vessels.
- US Wind will ensure that from November 1 through April 30, vessel operators monitor NOAA Fisheries NARW reporting systems (e.g., Early Warning System, Sighting Advisory System, and Mandatory Ship Reporting System) for the presence of NARWs.
- Vessels 19.8 m (65 ft) in length or greater will operate at speeds of 10 knots or less in NARW Special Management Areas (SMAs) Additionally, all vessels will operate at speeds of 10 knots or less in Right Whale Slow Zones, identical to Dynamic Management Areas (DMAs), to protect visually or acoustically detected NARW. US Wind will incorporate the proposed revision to the NARW vessel speed rule for vessels 10.6-19.8 m (35-65 ft) in length upon implementation.
- All vessels will maintain a minimum separation distance of 500 m (1,640 ft) or greater from any sighted NARW. If a NARW is sighted within this exclusion zone while underway, the vessel will steer a course away from the NARW at 10 knots or less until the 500 m (1,640 ft) minimum separation distance has been established. If a NARW is sighted within 100 m (328 ft) of an underway vessel, the vessel operator will immediately reduce speed and promptly shift the engine to neutral. If the vessel is stationary, the operator will not engage engines until the NARW has moved beyond 100 m (328 ft).
- All vessels will maintain a minimum separation distance of 100 m (328 ft) or greater from any sighted non-delphinid cetaceans other than the NARW. If a non-delphinid cetacean is sighted within this exclusion zone while underway, the vessel operator will immediately reduce speed and promptly shift the engine to neutral. The vessel operator will not engage the engines until the non-delphinid cetacean has moved beyond 100 m (328 ft). If the vessel is stationary, the operator will not engage engines until the non-delphinid cetacean has moved beyond 100 m (328 ft).
- All vessels will maintain a minimum separation distance of 50 m (164 ft) or greater from any sighted delphinid cetacean or pinniped, except if the mammal approaches the vessel.

If a delphinid cetacean or pinniped approaches an underway vessel, the vessel will avoid excessive speed or abrupt changes in direction to avoid injury to these organisms. Additionally, vessels underway may not divert to approach any delphinid cetacean or pinniped.

- US Wind will continue to evaluate technologies that may increase the ability to detect marine mammals from vessels, such as thermal detection technologies.

Other Mitigation and Monitoring

US Wind will implement the following other mitigation and monitoring measures:

- Use submarine cables that have proper electrical shielding and bury the cables in the seafloor, when practicable.
- Vessel operators, employees, and contractors will be briefed on marine trash and debris awareness elimination as described in BSEE NTL No. 2015-G03 ("Marine Trash and Debris Awareness and Elimination"), per BOEM guidelines for marine trash and debris prevention.
- Vessels will adhere to United States Coast Guard (USCG) guidelines; follow applicable regulations related to the discharge of bilge water, gray water, and sanitary waste; maintain discharge permits, as appropriate; follow good maintenance and housekeeping procedures to prevent releases of oil and other chemicals to the sea; maintain up-to-date oil spill response plans to prevent, contain, and clean up any accidental spills.
- The Metocean Buoy includes acoustic recorders to detect and identify marine mammal calls.
- US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.
- Additional opportunities to support passive acoustic monitoring of marine mammals in and around the Lease area are ongoing through a partnership with the University of Maryland Center for Environmental Science.

5.9 Sea Turtles

5.9.1 Description of Affected Environment

Sources

The following description of the affected environment for sea turtles draws upon recent studies and literature focused on offshore areas that include the mid-Atlantic WEAs and areas around the WEAs that could be affected by the Project. The most relevant studies relating to sea turtle occurrence are shown in Table 5.9-1.

Table 5.9-1. Marine Mammal Surveys in the Project Area

Survey	Year	Location	Type of Work
Mid-Atlantic Baseline Studies (Williams et al. 2015a, 2015b)	Between 2012 and 2014	- Coasts of Delaware, Maryland, and Virginia - Expansion into Maryland State waters	- High-definition digital aerial surveys - Boat-based surveys
Virginia Aquarium & Marine Science Center Foundation (Barco et al. 2015)	Between 2013 and 2015	- Lease area (formerly the Maryland WEA)	- Aerial surveys
US Wind G&G Surveys	2015, 2016, 2017, 2021, 2022 and 2023	- Lease area - Offshore Export Cable Corridors - Onshore Export Cable Corridor 1	- PSO observations

<u>Overview</u>

Five species of sea turtle can be found offshore of the United States Atlantic coast. Four of these species have the potential to utilize the Project area, all of which are listed as endangered or threatened under the ESA (Table 5.9-2). These species include the loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*), green (*Chelonia mydas*), and Kemp's ridley (*Lepidochelys kempii*) sea turtles (USDOI and BOEM 2012). Loggerhead turtles are common in the vicinity of the Lease area, while green, leatherback, and Kemp's ridley turtles are less frequently observed, as described in the following sections.

A total of 136 turtle observations were recorded in the Maryland WEA during the MABS survey (Williams et al. 2015c, 2015a). In general, Williams et al. (2015c) suggested that the Maryland WEA does not appear to be an area with consistently high numbers of sea turtles throughout time (a population hotspot). Though the range of the endangered hawksbill turtle (*Eretmochelys imbricata)* includes the Project area, this species prefers tropical and sub-tropical waters and is rarely found in the mid-Atlantic (USDOI and USFWS 2018a). However, this species may be encountered by vessels traveling to the Project area from ports in the Gulf of Mexico. Detailed discussions of the four turtle species likely to occur in the Project area, and hawksbill turtles, are presented in Section 5.14.4.

Table 5.9-2 Sea Turtles with Potential Occurrence in the Project Area

Common Name	Scientific Name	ESA Status	MABS Mid-Atlantic Surveys[a]		MABS MD Surveys[b]		MABS WEA Surveys[c]	VAQF Survey[d]	Relative Occurrence in Project Area
			Boat Survey Sightings[a]	Aerial Survey Sightings[ab]	Boat Survey Sightings[ba]	Aerial Survey Sightings[bb]	Annual count per hour per km^2 [ca]	Aerial Survey Sightings[da]	
Family Cheloniidae (hardshell sea turtles)									
Loggerhead turtle	*Caretta*	Threatened*	89	188	15	22	0.00047	809 (833)	Common
Green turtle	*Chelonia mydas*	Threatened *	0	11	0	5	0.00020	45 (45)	Uncommon
Kemp's Ridley turtle	*Lepidochelys kempii*	Endangered*	0	38	0	8	0.00012	1 (1)	Uncommon
Hawksbill turtle	*Eretmochelys imbricata*	Endangered*	0	2	0	1	0.00004	0 (0)	Rare
Family Dermochelyidae (leatherback sea turtle)									
Leatherback turtle	*Dermochelys coriacea*	Endangered*	15	122	3	16	0.00025	14 (14)	Common

[a]Source: Williams et al. 2015a
[aa]Total number of individuals observed during 16 boat-based surveys of the mid-Atlantic conducted between March 2012 and May 2014. Only sightings or individuals identified to species are included. Additional sea turtle sightings not included in table: 6 small turtles (loggerhead, green, hawksbill, or Kemp's ridley), 4 unidentified turtles.
[ab]Total number of individuals observed during 15 digital video aerial surveys of the mid-Atlantic conducted between March 2012 and May 2014. Additional sea turtle sightings not in table: 1397 small turtles.
[b]Source: Williams et al. 2015b
[ba]Total number of individuals observed during 16 boat-based surveys in the vicinity of the MD WEA conducted between April 2012 and April 2014. Only sightings or individuals identified to species are included. Additional sightings of sea turtles not included in table: 2 small turtles.
[bb]Total number of individuals observed during 14 aerial surveys in the vicinity of the MD WEA conducted between March 2012 and May 2014. Additional sightings of sea turtles not classified to species: 312 small turtles.
[c]Source: Williams et al. 2015a and 2015b.
[ca]Annual count of observations per hour of survey effort per square km within the MD WEA. Additional sightings of sea turtles not classified to species: 0.00449 small turtles per hour per km^2.

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Table 5.9-2 Sea Turtles with Potential Occurrence in the Project Area

Common Name	Scientific Name	ESA Status	MABS Mid-Atlantic Surveys[a]		MABS MD Surveys[b]		MABS WEA Surveys[c]	VAQF Survey[d]	Relative Occurrence in Project Area
			Boat Survey Sightings[a]	Aerial Survey Sightings[ab]	Boat Survey Sightings[ba]	Aerial Survey Sightings[bb]	Annual count per hour per km^2 [ca]	Aerial Survey Sightings[da]	

[d]Source: Barco et al. 2015
[da]Total number of sightings (and total number of individuals observed) during monthly aerial surveys of the MD WEA and surrounding waters between July 2013 and June 2015. Additional sea turtle sightings not reported in table: 83(84) unidentified hard-shelled turtles.
*Detailed life histories for these threatened and endangered species can be found in Section 5.13.

5.9.2 Impacts

Sea turtles in the Project area have the potential to be impacted by a variety of factors associated with Project activities. The impacts of noise and vessel traffic on these organisms are discussed in more detail in Sections 5.9.2.1, 5.9.2.2, and 5.9.2.3.

5.9.2.1 Construction

Noise

Sea turtles may use auditory signals to locate prey, avoid predators, and aid in navigation (Dow Piniak, Mann, et al. 2012). Though adult sea turtles are not known to use sound for communication, hatchlings vocalize in the nest, which may play a role in the synchronization of emergence (McKenna 2016). Relatively little is known about sea turtle hearing capabilities, but recent studies have identified hearing thresholds by examining electrical responses of the auditory nervous system following the application of a sound stimulus (auditory evoked potentials [AEPs]). Results of these studies indicate that sea turtles are generally sensitive to low-frequency sounds, though hearing thresholds vary by species and age.

Examinations of juvenile green sea turtle AEPs indicate that this species can hear sounds between 50 and 800 hertz (Hz) in air, and 50 and 1600 Hz in water (Dow Piniak, Eckert, Mann, et al. 2012; Piniak et al. 2012). Maximum hearing sensitivity in this species was observed between 300 and 400 Hz in air and 50 and 400 Hz in water, and sensitivity to sounds sharply decreased at frequencies above 400 Hz (Dow Piniak, Eckert, Mann, et al. 2012). An earlier study, utilizing different methodology, reported a narrower hearing range for subadult green turtles of between 100 and 500 Hz (most sensitive between 200 and 400 Hz), and noted that individuals collected from Maryland exhibited an expanded hearing range compared to individuals collected from Hawaii (Bartol and Ketten 2006). This study also described Kemp's ridley turtle hearing, which was found to range from 100 and 500 Hz and was most sensitive between 100 and 200 Hz (Bartol and Ketten 2006). The hearing range of loggerhead turtles has been described to range from 100 and 1131 Hz (Martin et al. 2012) and 50 and 1100 Hz (Lavender, Bartol, and Bartol 2014). Similar to the other sea turtle species described above, leatherback hatchlings responded to stimuli between 50 and 1600 Hz in air and 50 and 1200 Hz in water, and maximum sensitivity was documented in response to sounds below 400 Hz (Dow Piniak, Eckert, Harms, et al. 2012).

Little is known about sea turtle physiological responses to sound, including if these organisms experience temporary or permanent threshold shifts as a result of noise exposure (Popper et al. 2014), but these organisms are believed to be less sensitive to hearing damage than marine mammals. Additionally, little is known about turtle behavioral responses to sound (Dow Piniak, Eckert, Mann, et al. 2012; Dow Piniak, Eckert, Harms, et al. 2012). Exposure to high levels of pervasive noise may influence sea turtle behavior (Samuel et al. 2004), and individuals exposed to loud noises are expected to exhibit an avoidance response (McCauley et al. 2000). Behavioral impacts could also result from communication masking, perhaps leading to decreased feeding activity.

Overall, NOAA has not established formal acoustic guidance for sea turtles, however, Finneran et al. (2017) provides thresholds for noise-induced injury and behavioral impacts for ESA-listed species associated with pile driving. The thresholds for sea turtles are 175 dB re 1 micro Pascal (root means square) µPa RMS for behavioral impacts (DON 2017). For physiological impacts, weighted acoustics threshold levels range from 189 dB re 1µPa^2-s (TTS) to 204 dB re 1µPa^2-s (injury) for impulsive signals and 220 dB re 1µP$a^2$2-s (injury) for non-impulsive signals (GARFO 2018). Sea turtle hearing ranges overlap with low-frequency sounds produced by multiple Project activities, including pile driving and vessel noise, which are discussed below.

Pile Driving

Impact pile driving is proposed during installation of WTG, OSS, and Met Tower piled jacket and monopile foundations. Though the impacts of pile driving on sea turtles are not understood, this activity generates loud sound pressures within the hearing range of these organisms.

The impacts of loud impulsive sounds on sea turtles are unclear, but individuals located close to the sound source (where noise levels exceed 204 dB re 1 µPa RMS) may experience physiological damage. Sea turtle behavioral responses to pile driving noise may include avoidance behavior, as was noted by McCauley at al. (2000) during seismic airgun survey activities. This study examined the responses of two caged sea turtles (one green and one loggerhead) to airgun noise and documented increased swimming speeds when the organisms were exposed to sound louder than 166 dB re 1 µPa RMS (McCauley et al. 2000). The turtles exhibited erratic behavior and were deemed to be in an agitated state, indicating a probable avoidance response, when exposed to sound levels exceeding 170 dB re 1 µPa RMS (McCauley et al. 2000).

Impacts to sea turtles due to pile driving noise are likely to be minor due to the implementation of mitigation measures, including the monitoring of exclusion zones and employment of soft-start procedures, as well as the deployment of mitigation measures such as double bubble curtains or nearfield attenuation devices. Physiological damage to sea turtles is not expected, as this would only occur within the exclusion zone, in the area immediately surrounding pile driving activities. Any sea turtles present in the vicinity of pile driving activities are expected to rapidly vacate the area upon the initiation of soft start procedures. Additionally, pile driving activities, and any associated impacts, would be short term, temporary, and in discrete locations, and therefore are not anticipated to result in long-term impacts to sea turtle populations in the area.

An underwater acoustic assessment was conducted to evaluate the potential for pile driving noise to impact sea turtles (COP Appendix II-H1 [US Wind 2023]). This assessment, and the resulting modeled distances to sea turtle hearing thresholds, are conservative, as the model assumed that animals would remain in the area and that varying hammer energies and durations would be used for the total duration of the driving of the piles (11-m monopiles, 3-m skirt piles, and 1.8-m pin piles). Additionally, sound propagation modeling was based upon environmental conditions in the Project area in April and in May, as these are the months during which pile driving may occur that have the lowest transmission loss (no pile driving will occur between the months of December and March). US Wind will implement mitigation and monitoring measures as described in Section 5.9.3 to minimize noise impacts to sea turtles.

The other type of foundation under consideration are jackets on suction buckets. The installation of these foundations would not require pile driving and would generate much lower levels of noise than the installation of traditional piles.

Vessel Noise

Increased noise caused by vessel traffic associated with Project activities could impact sea turtles. Vessel noise is primarily composed of low-frequency components (Hildebrand 2009) and is therefore within the hearing ranges of the sea turtle species likely to occur in the Project area. Exposure of sea turtles to noise from construction and operations vessels would be variable, as the intensity of vessel noise is largely related to ship size and speed (Hildebrand 2009). Because the Project area and adjacent waters are already well-traveled and host active fishing (commercial and recreational) and shipping industries, sea turtles in the region are likely habituated to vessel noise. Construction vessel noise would be limited, as boats will travel to and from the Project area at low speeds and will remain stationary at work sites for extended periods of time. During Project installation activities, DP thrusters may be used. NOAA Fisheries has indicated that the sound produced by this equipment is similar to that generated by transiting vessels (communications cited in (CSA Ocean Sciences 2018a, 2018b; Tetra Tech 2018). Any impacts to sea turtles are expected to be temporary, with behavior rapidly returning to normal following passage of a Project vessel, and it is unlikely that such short-term effects would result in long-term population-level impacts.

Vessel Traffic

Though sea turtles spend a majority of the time submerged (Southwood et al. 1999; Houghton et al. 2002; Scott A. Eckert 2006), these organisms are vulnerable to vessel collisions when feeding or basking in surface waters or breathing at the water surface (NOAA Fisheries 2017f). These interactions can result in serious injury or death (Susan Barco et al. 2016; Hazel et al. 2007). Hazel et al. (2007) observed that green turtles likely habituate to vessel noise and found that the proportion of turtles that fled from approaching vessels decreased with increasing vessel speed. This study concluded that turtles in surface waters may not be able to effectively avoid being struck by vessels traveling in excess of four knots (Hazel et al. 2007). The risk of vessel strike during Project activities is limited as vessels will follow NOAA Fisheries collision avoidance guidance such as establishing minimum separation distances from sea turtles.

For information about Project ports vessel trips and routes please see COP Volume I, Section 3.1 (US Wind 2023). For information about construction ports see COP Volume I Section 3.1 (US Wind 2023). For information about O&M ports, COP Volume I Section 2.7 (US Wind 2023). See

Figure 1 and Tables 2 and 3 in COP Appendix II-C1 (US Wind 2023) for more information about vessel routes and trips.

Entanglement and Marine Debris

Entanglement will not pose a risk to sea turtles during Project construction. US Wind does not anticipate the use of anchored vessels during construction. If used, mooring lines will be of relatively large diameter and will generally be kept under tension, eliminating entanglement risk. All CWA and other federal regulations regarding marine debris will be followed during construction activities. Items that have the potential to become marine debris will be disposed of on shore. Construction activities are not anticipated to generate marine debris and will therefore not pose a risk to sea turtles.

Land Disturbance

US Wind will locate cable landfalls and onshore facilities so as to avoid impacts to known sea turtle nesting beaches, where feasible. The use of HDD for cable installation under the Barrier Beach Landfalls will avoid impacts on beaches. Construction is anticipated to occur outside of turtle nesting season. Agency consultation and monitoring will be conducted as needed to mitigate disturbances.

Routine/Accidental Releases

During the course of construction, pollutants may be discharged into the environment as part of routine activities, such as the operation of construction vessels and vehicles, or due to accidental spills. See Section 5.3.2 for a discussion of the impacts of routine and accidental releases during Project activities. Water quality impacts due to routine and accidental releases are anticipated to be negligible and are therefore not anticipated to impact sea turtles or their prey species.

Suspended Sediment/Deposition

Pile driving during WTG, OSS and Met Tower foundation installation, the use of jack-up and feeder vessels, jet plow operations during cable laying and embedment, vessel anchoring, and the installation and removal of gravity cells will disturb sediment on the seafloor. The use of mechanical trenching or conventional cable plowing will also result in sediment disturbance, though this activity will be limited only to areas where site conditions do not allow for the use of jet plowing. See Section 5.3.2 for a discussion of the impacts of these activities on suspended sediment levels and sediment deposition. Water quality impacts associated with jet plow operations, HDD, and other bottom-disturbing activities are expected to be minor and temporally limited and are not anticipated to directly impact sea turtles.

Impacts to sea turtle prey species due to bottom disturbing activities are also expected to be minor. Though direct bottom disturbance and sediment deposition will result in localized mortality of benthic organisms, impacts to communities of benthic crustacean and shellfish species which may serve as prey for sea turtles are expected to be negligible (Section 5.6.2.1). Similarly, local increases in suspended sediment concentrations are expected to have negligible to minor, and spatially limited, impacts on other sea turtle prey species including jellyfish, ctenophores, and salps, and fish (Section 5.7.2.1). Therefore, impacts to sea turtles are not anticipated to result from bottom-disturbing activities related to project construction.

5.9.2.2 Operations

Operational impacts for maintenance activities are included below. All other impacts are discussed in COP, Volume II, Section 10.0 (US Wind 2023).

Vessel Noise

Project O&M activities will require vessel travel within the Project area. Vessel noise has the potential to impact sea turtles (Section 5.9.2.1). However, as the region is heavily traveled by commercial shipping and fishing vessels, low levels of vessel noise associated with Project activities are not anticipated to alter acoustic conditions.

Vessel Traffic

Vessel traffic associated with Project O&M activities could endanger sea turtles (Section 5.9.2.1). Project vessels will follow NOAA Fisheries collision avoidance guidance, therefore the risk of harm to sea turtles from vessel strike is negligible. Vessel strike avoidance procedures would be the same as described and referenced above for the construction portion of the Project.

Entanglement and Marine Debris

Entanglement will not pose a risk to sea turtles during Project operation. Submarine cables will be buried approximately 1 to 4 m (3 to 13 ft) beneath the sea floor or covered with protective material (e.g., concrete mattresses) when target burial depths are not achievable. Similarly, the minimum diameter of the WTG foundation structures will be 8.0 m (26.2 ft) for each monopile, and the minimum diameter of the OSS foundation structures will be 8.0 m (26.2 ft) for each monopile, 2 m (6.6 ft) for each jacket foundation pile, and 10 m (32.8 ft) for jacket on suction buckets and do not pose an entanglement risk. Secondary entanglement, due to marine debris becoming snagged on WTG foundations, is a risk for sea turtles. However, risk of this occurrence is low as the structures are largely free of protrusions upon which such debris could attach.

Additionally, under the CWA and other federal regulations regarding marine debris will be followed during operations activities. Items that have the potential to become marine debris will be disposed of on shore. Operations activities are not anticipated to generate marine debris and will therefore not pose a risk to sea turtles.

5.9.2.3 Impacts of Alternatives

Installation of export cables in Offshore Export Cable Corridor 2 would be conducted in the same manner as Offshore Export Cable Corridor 1, which would not result in additional impacts to sea turtles within the Atlantic. Offshore Export Cable Corridor 2 encompasses similar pelagic habitat as Offshore Export Cable Corridor 1, therefore, sea turtle presence is expected to be similar.

Cable installation in any of the terrestrial routes (i.e., Onshore Export Cable Corridor 1a, 1b, 1c, or 2) would avoid impacts to sea turtles, if present, within Indian River Bay.

5.9.3 Mitigation and Monitoring

US Wind will implement the following mitigation measures to reduce Project impacts on sea turtles.

Pile Driving

- Implement sound attenuation technologies such as double bubble curtains and nearfield attenuation devices to reduce underwater pile driving noise by 10 Db, with a target of 20 Db.
- Establish a clearance zone prior to pile driving using visual monitoring for sea turtles. Once clearance zone is confirmed clear of protected species, pile driving will begin with minimum hammering at low energy for no less than 30 minutes (soft-start).
- Additional restrictions on pile driving will include: no simultaneous pile driving; no more than one monopile driven per day; daylight pile driving only unless health and safety issues require completion of a pile; and initiation will not begin within 1.5 hours of civil sunset or in times of low visibility when the visual clearance zone and exclusion zone cannot be visually monitored, as determined by the lead PSO on duty.
- Establish an exclusion zone using visual monitoring for sea turtles. Pile driving will be halted if species enters defined exclusion zone, with exceptions for health and safety considerations as well as technical feasibility.
- Visual clearance and exclusion zones will be monitored by individuals with a current NOAA Fisheries approval letter as a PSO.

Vessel Strike Avoidance

- Vessels will observe NOAA Fisheries collision avoidance guidance, such as establishing minimum separation distances from sea turtles.
- Trained observers will be present on crew vessels and other project vessels without PSOs.

US Wind will implement the following other mitigation and monitoring measures:

- US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.
- Submarine cables that have electrical shielding will be used and the cables will be buried in the seafloor, where practicable.
- Vessel operators, employees, and contractors will be briefed on marine trash and debris awareness elimination as described in BSEE NTL No. 2015-G03 *Marine Trash and Debris Awareness and Elimination*, per BOEM guidelines for marine trash and debris prevention.
- Vessels will adhere to USCG guidelines; follow applicable regulations related to the discharge of bilge water, gray water, and sanitary waste; maintain discharge permits, as appropriate; follow good maintenance and housekeeping procedures to prevent releases of oil and other chemicals to the sea; maintain up-to-date oil spill response plans to prevent, contain, and clean up any accidental spills.
- US Wind will locate cable landfalls and onshore facilities so as to avoid impacts to known nesting beaches, where feasible. The use of HDD for cable installation under the Barrier Beach Landfalls will avoid impacts on beaches.
- Construction is anticipated to occur outside of turtle nesting season. Agency consultation and monitoring will be conducted as needed to mitigate disturbances.

5.10 Upland Habitats

5.10.1 Description of Affected Environment

The terrestrial portion of the Project area is in the Delmarva region and includes the proposed Interconnection Facilities and the O&M Facility. The Barrier Beach Landfalls are considered in Section 5.5 of this document, as a coastal resource.

Interconnection Facilities

Several federal agencies and non-governmental organizations (NGO) have developed systems to classify and describe distinct regions and sub-regions of North America with respect to geography, geology, hydrology, vegetation, and wildlife which are used in the section to describe terrestrial portions of the Project. The Interconnection Facility is located in the Virginian Barrier Island and Coastal Marshes (63d) Level IV Ecoregion (Indian River Bay) which is part of the larger Middle Atlantic Coastal Plain (63) Level III Ecoregion under the EPA hierarchical classification system. The EPA defines Ecoregions as “areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources; they are designed to serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components. Because they include large-scale geophysical patterns in the landscape that are linked to the faunal and floral assemblages and processes at the ecosystem scale, ecoregions provide a useful means for simplifying and reporting on more complex patterns of biodiversity" (USEPA 1999).

The Nature Conservancy (TNC) also classifies North America into Ecoregions based on shared biotic and abiotic characteristics (Groves et al. 2002). The TNC system places the Interconnection Facilities in the Chesapeake Bay Lowlands (CBY) Ecoregion. The United States Forest Service (USFS) classification system places most of Delaware, including the Interconnection Facilities, in the Outer Coastal Plain Mixed Forest Province (R.G. Bailey 1995). These forests are dominated by evergreen oaks and members of the laurel and magnolia families.

The DNREC designates State Wildlife Areas (SWAs) through its general authority to manage and conserve all forms of regulated state wildlife. SWAs or refuges are any land or water body of the state, whether in public or private ownership, designated by DNREC in the interest of conservation of wildlife. According to DNREC and the USFWS, the Interconnection Facilities are not located in the vicinity of any state or federally owned conservation land (USFWS 2021a).

The proposed Interconnection Facilities are adjacent to the existing Indian River Substation in Sussex County, Delaware. The area in the vicinity of the proposed Interconnection Facilities includes areas of forest, the existing Indian River Substation, and the nearby Indian River Power Plant. Associated infrastructure includes overhead powerlines, rail lines, and paved access roads.

As it is expected that the proposed Interconnection Facilities will be installed within previously disturbed areas to the extent feasible, Project impacts to terrestrial species and upland habitats will be minimal.

O&M Facility
US Wind plans to construct a facility located pier side in the Ocean City, Maryland area for the O&M Facility, including a warehouse and crew support facility, and upgrades to existing pier structures. It is anticipated that any construction related to the O&M Facility will occur on previously disturbed land. Replacement of the existing bulkhead may require a footprint slightly offshore of the existing face of the bulkhead/quay wall, although the amount of encroachment into the water will be minimized as practicable. The O&M Facility is not discussed further in this section because disturbance of terrestrial species and habitat alteration is considered to have already occurred from the development of the pre-existing facilities.

5.10.2 Impacts

Impacts to upland habitats during the construction and operation will be negligible to minor and be limited to the areas surrounding the Project areas.

5.10.2.1 Construction

Impacts to upland habitats during construction will be negligible to minor. Construction within the Onshore Export Cable Corridors and at the O&M Facility will be located in existing ROWs or within previously disturbed areas to the extent feasible. Project impacts to upland habitats will be minimal. Disturbance to habitat alteration is considered to have already occurred from the development of the pre-existing facilities.

The Interconnection Facilities will consist of new US Wind substations, with possible configurations that may result in varying degrees of forested habitat loss and require vegetation clearing.

5.10.2.2 Impacts of Alternatives

The potential alternative land-based Onshore Export Cable Corridors would be installed in existing ROW within previously disturbed lands to the extent feasible. However, if selected, the route may be adjacent to areas of known natural resources, including forests, freshwater habitats, and other conservation lands (Figure 5.10-1). These lands can provide habitat to evergreen bayberry, swamp pink, and Northern long-eared bat, which are protected species that may occur within the Project area (see Section 5.14 for a discussion of threatened and endangered species). To reduce impacts to upland habitats and species, BMPs and existing disturbed lands would be utilized to avoid additional impacts to terrestrial habitat and species, where feasible. US Wind would consult with DNREC to determine if there are any upland species of concern within the Project area before the start of construction.

5.10.3 Mitigation and Monitoring

US Wind will implement various mitigation measures to reduce Project impacts on upland habitats.

- For the construction laydown areas and site access, existing disturbed areas will be used where possible.
- Silt fences and hay bales will be used to prevent discharges into wetlands or WOTUS.
- Methods to reduce engine emissions (i.e., restricting engine idling) will be implemented during construction and operation where possible.
- US Wind will develop a SPCC Plan and a SWPPP for onshore construction activities, where appropriate.
- Impacts to lighting will be reduced based on best management practices (i.e., no lighting at night unless in an emergency, down-shielded light fixtures).

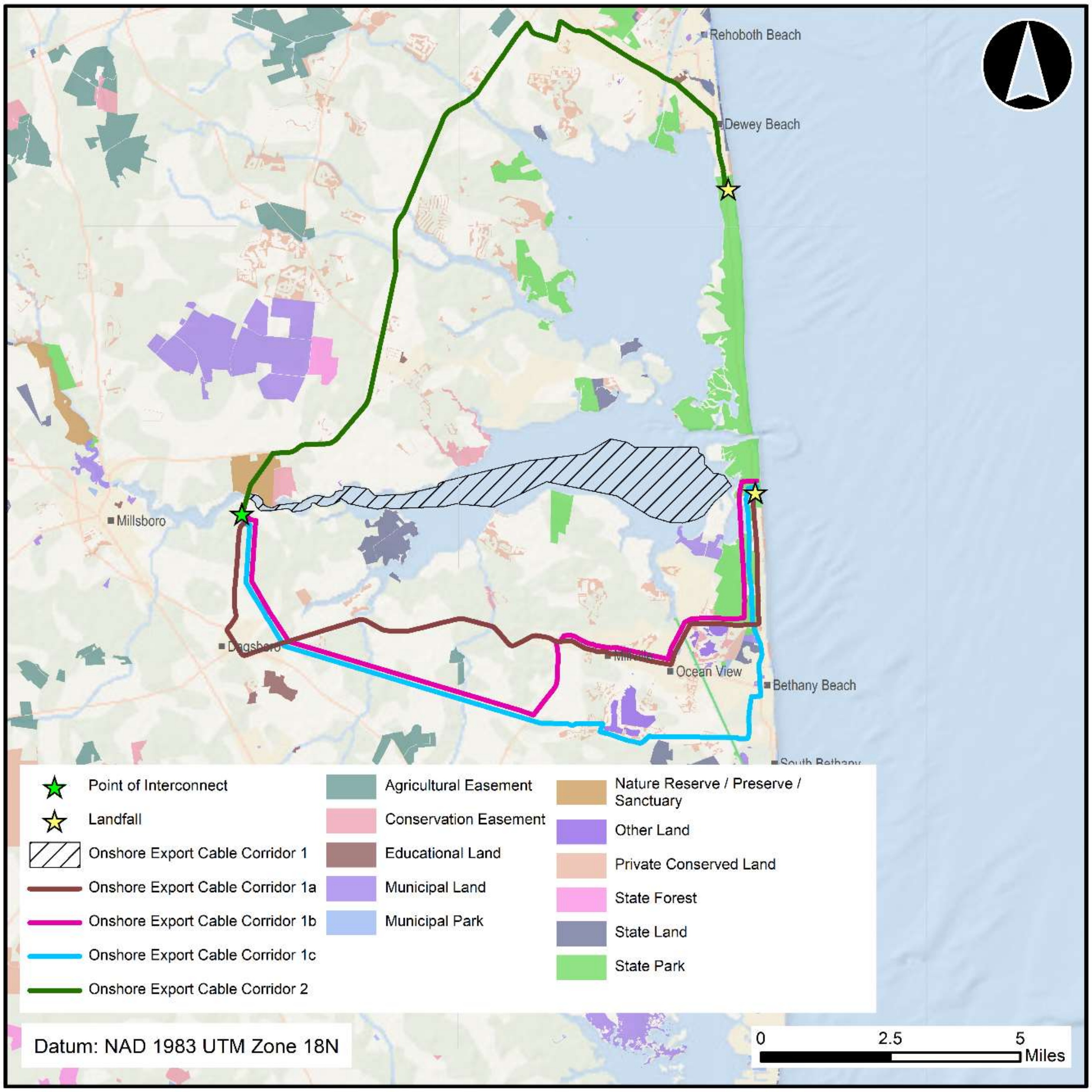

Figure 5.10-1. Natural Resources along the Land-based Onshore Export Cable Corridors

5.11 Bats

5.11.1 Description of Affected Environment

Up to ten species of bats are present in Delaware and Maryland during at least a portion of the year (Table 5.11-1) (DNREC 2012; MDDNR 2015). All ten species breed in Delaware and Maryland and are present from the spring through the late summer or fall. Following the completion of their annual reproductive cycle, the four species in the genera *Nycticeius*, *Lasiurus*, and *Lasionycteris* (the “tree bats”) migrate out of the area to more southerly wintering grounds (Cryan 2003). By contrast, the six species in the genera *Eptesicus*, *Myotis*, and *Perimyotis* (the "cave bats") remain in the mid-Atlantic region and begin moving into local winter hibernacula (primarily caves and mines). Among the cave bats are the federally endangered northern long-eared bat (NELB) (*Myotis septentrionalis*) (DNREC 2012) (80 FR 17973).

Table 5.11-1. Bats of Delaware and Eastern Maryland

Common Name	Scientific Name	Federal Status
Cave Bats		
Big brown bat	*Eptesicus fuscus*	
Eastern small-footed bat	*Myotis leibii*	
Little brown bat	*Myotis lucifugus*	
Northern long-eared bat	*Myotis septentrionalis*	Endangered*
Eastern pipistrelle (Tri-colored bat)	*Perimyotis subflavous*	
Tree Bats		
Evening bat	*Nycticeius humeralis*	
Hoary bat	*Lasiurus cinereus*	
Eastern red bat	*Lasiurus borealis*	
Silver haired bat	*Lasionycteris noctivagans*	
Source: DNREC 2012a, MDNR 2015b *Life history information about this endangered species can be found in Section 5.13, of this document.		

While the specific migration patterns of bats are not well-documented, many species are known to travel along linear landscape features such as rivers and topographic ridges during daily movements and migration, suggesting a preference for overland migration routes. Bats are also known to migrate along the coast. In the mid-Atlantic, eastern red bats (*Lasiurus borealis*), hoary bats (*Lasiurus cinereus*), and silver-haired bats (*Lasionycteris noctivagans*) migrate through Assateague Island National Seashore, a barrier island off the coast of Maryland (Johnson, Gates, and Zegre 2011).

Metocean Buoy Monitoring

US Wind has deployed the Metocean Buoy within the Lease area for a planned two-year metocean data collection campaign during the site assessment term of the Lease. The Metocean Buoy and its associated seabed mounted TRBM have been equipped with a suite of wildlife monitoring sensors as provided in the related Metocean Buoy SAP approved May 5, 2021. This includes a bat acoustic sensor mounted on the Metocean Buoy which monitors the nocturnal calls of migrating bat species within the Lease area.

5.11.1.1 Onshore Occurrence

Bats use a variety of natural and anthropomorphic terrestrial habitats during their active period between spring and fall. All bat species that occur in the mid-Atlantic region feed primarily on insects captured in flight and are typically attracted to areas where large numbers of flying insects may be found. These include areas of open water (streams and ponds), clearings, forest canopies, agricultural areas, and around streetlights and other artificial light sources. Depending on the species, summertime diurnal roosting sites may include buildings and other man-made structures or trees beneath loose or peeling bark, in cavities, or among foliage on branches. In the fall, tree bats begin their relatively long-distance migrations to more southerly portions of their range, where they may remain active throughout the year. Cave bats, by contrast, complete relatively short-distance migrations from summer habitats to local hibernacula, where they overwinter until the following spring (DNREC 2012).

Analysis by Johnson et al. (2011) examined seasonal bat activity along the Atlantic Coast at Assateague Island. By using three Anabat II detectors spread throughout the island, it was determined that bats were using Assateague Island during migration activity, although the study did not specify the extent of the use of Assateague Island by bats (Johnson, Gates, and Zegre 2011). Silver-haired bats (*Lasionycteris noctivagans*) used the barrier island as a stopover during migration, while hoary bats (*Lasiurus cinereus*) and eastern red bats were either migrants or residents year-round. The analysis concluded that bats may be attracted to offshore structures as a resting or mating area, although the results represented an index of bat activity, not a count, and it would be difficult to assess or predict the number of bats affected by offshore wind farms.

DNREC has installed acoustic bat detectors in six locations in Indian River Bay area and collected data during the 2019 to 2021 summer breeding season (DNREC 2021). Based on an analysis of the recorded bat calls, DNREC estimates that there is a 90 to 100 percent likelihood that *Myotis* were present in 2020 in the vicinity of the detector and that NLEBs are potentially present in the area.

5.11.1.2 Offshore Occurrence

Most information on offshore bat activity in the mid-Atlantic comes from the New Jersey Ecological Baseline Study which includes survey results for bats over the New Jersey WEA offshore New Jersey out to 37 km (20 NM) (NJDEP 2010). Shipboard acoustic surveys using Anabat II detectors were conducted in March, April, May, June, August, September, and October of 2009. No bats were detected during the March, April, or June surveys, and one bat (either a big brown bat or silver-haired bat) was detected in May. Detection frequency increased in the late summer to early fall, with eight nights of bat detections during the August, September, and October surveys. Eastern red bat was the most frequently detected species during this period with 19 identifiable recordings, followed by six detections of big brown/silver-haired bats (recordings not identifiable to species), three recordings of *Myotis* species, one recording of a hoary bat, and 25 unidentifiable records. The mean detection distance from shore was 10.6 km (5.2 NM) and the farthest distance was 19.2 km (10.4 NM) (NJDEP 2010).

In an effort to understand where and when bats occur offshore (beyond 5.5 km (3 NM) from land), an acoustic survey of bat activity on islands, offshore structures, and coastal sites in the Gulf of Maine, mid-Atlantic, and Great Lakes regions was conducted between 2012 to 2014 (Stantec Consulting Services 2016). While research vessels detected bats up to 130 km (70 NM) from land (east of New Jersey), the study documented a statistically significant decline in bat activity as distance from shore increased across the three study areas. Furthermore, the results showed pronounced seasonal patterns and strong influence of weather variability on bat activity depending on region. The study suggests that because of the absence of suitable offshore roost habitat, bats only occur offshore during periods of migration and foraging; as a result, they are presumably less frequent offshore than at terrestrial sites. While the study did not quantify the number of bats present in the offshore environment during different times of year, the results of the study suggest the potential for bats to occur in the vicinity of offshore wind energy facilities.

During the recent MABS, 12 presumed eastern red bats were visually observed in the month of September off the coast of New Jersey, Delaware, and Virginia. All observations occurred between 16 and 70 km (9.1 and 22.6 NM) from shore, averaging 30 km (16.2 NM) (S.K. Hatch et al. 2013). Flight elevation for six of the twelve bats was estimable; of these, five were flying over 200 m (660 ft) above sea level (S.K. Hatch et al. 2013). US Wind is collecting data regarding the presence of bats offshore by taking advantage of resources deployed in the Lease area and along the Offshore Export Cable Corridors. US Wind has deployed a long-term acoustic detector on the Metocean Buoy to gather pre-construction data on the presence of bats in the Lease area. The acoustic detector mounted on the Metocean Buoy monitors for and records the nocturnal calls of bats of any bats passing through the Lease area, which can be used to identify the bat species. The Metocean Buoy is expected to be deployed for up to two years (May 2021 to May 2023).

US Wind deployed acoustic detectors on the vessels engaged in completing the 2021-2022 HRG and geotechnical survey campaigns within the Lease area and along the Offshore Export Cable Corridors. The acoustic detectors mounted on the survey vessels monitored ultrasonic calls of bats throughout the 2021-2022 offshore surveys. Nocturnal call data collected is used to identify the bat species and, using recorded vessel positioning data, their location.

Although the survey primarily focused on activities in the Lease area and export cable corridors, the bat detectors were operational and recording when the vessels had power; therefore, detections were observed in port, in the offshore environment, and in the Lease area. Three areas were developed to categorize proximity and bat activity: in port, offshore, and in Lease area (Figure 5.11-1). Port detections are defined as detections recorded within three miles from the Fairleads Shipyard in Newport News, Virginia. Offshore detections are defined as all detections recorded in the marine environment excluding detections in the port and Lease area. Lease area detections are defined as detections recorded within the boundaries of the Lease area. The Lease area is about 10.5 miles offshore of Maryland and encompasses approximately 124 square mi (79,616 acres) (Figure 5.11-1).

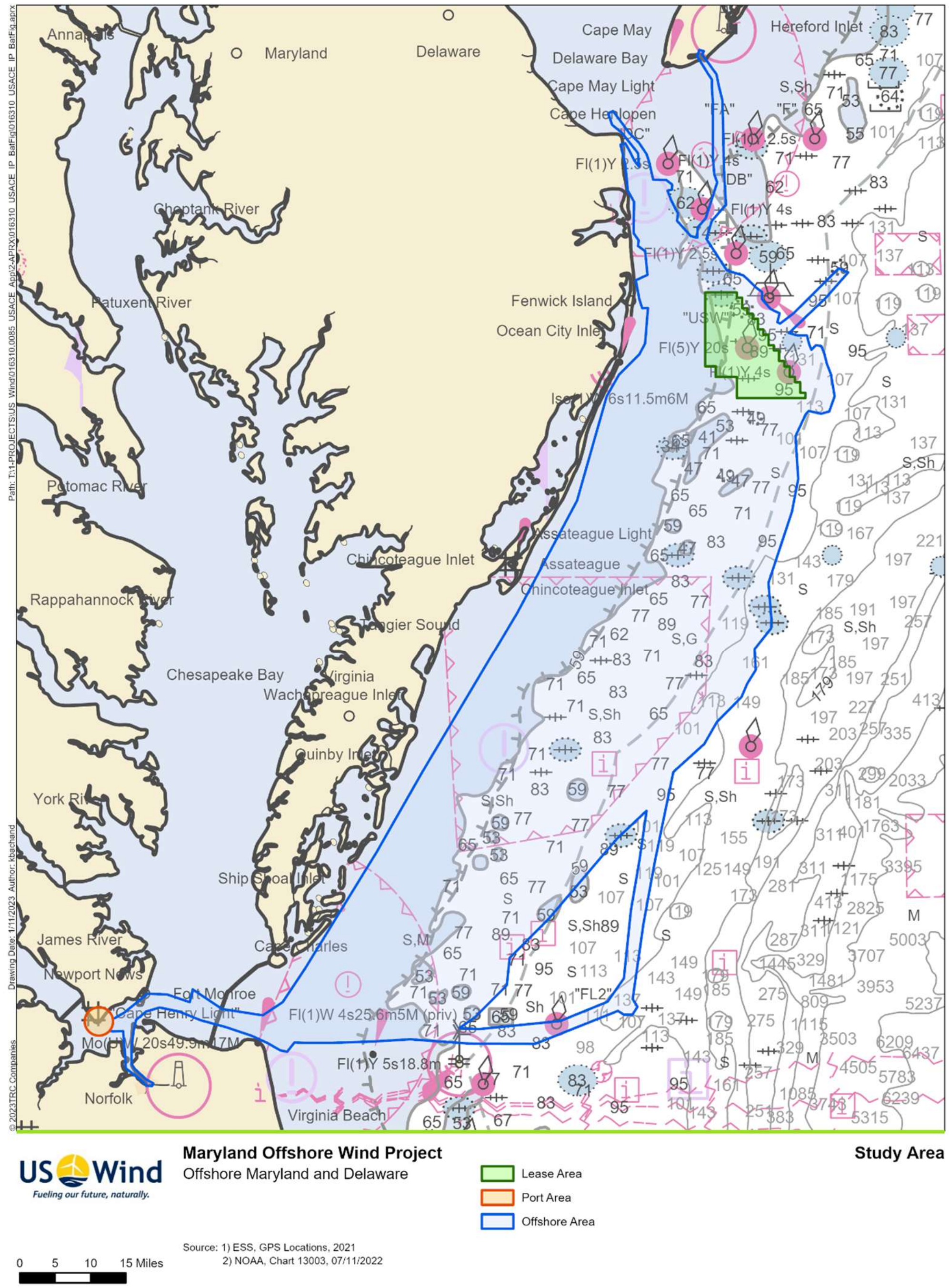

Figure 5.11-1 Offshore Bat Study Area 2021

The monitoring period coincided with the HRG and geotechnical surveys of the Lease area. An Anabat Swift bat detector was deployed on the Brooks between March 31, 2021, and October 21, 2021. The Emma Anabat Swift was deployed between April 25, 2021, and November 5, 2021. Finally, an Anabat Swift was deployed on the Regulus between December 14, 2021, and April 23, 2022.

Bat detections were compared to time to analyze the seasonality of bat activity. Seasonal patterns and bat activity were observed coinciding with late summer migration. The months of highest bat detections were August and September. Eastern Red Bats detection density was highest in both August and September, while Big Brown Bat and Silver haired Bats peaked in August, and Mexican Free-tailed Bats peaked in September. 78 percent of all bat detection occurred between August and October 2021. One detection was observed in December 2021. No subsequent detections were identified for the remainder of the survey, which concluded in April 2022.

The most frequently detected bat was identified as the eastern red bat, representing 51 percent of bats identified to species or species group. Bat detections in the Lease area represented approximately nine percent of all bat detections. Table 5.11-2 depicts the combined species composition in port, offshore, and within the Lease Area. The results of this survey show that as distance from shore increases, the number of bat species and bat detections decrease.

Table 5.11-2. Combined Species Composition

Species Name	In Port	Offshore	Lease Area	Total
Big Brown Bat	2	1	0	3
Eastern Red Bat	43	26	7	75
Silver-haired Bat	1	2	2	5
Mexican Free-tailed Bat	13	0	0	13
No Identification	35	11	5	51

The bat data collected by the Metocean Buoy and the survey boat acoustic detectors will be used to assess the presence of bats within the Lease area and along the Offshore Export Cable Corridors.

5.11.2 Impacts

This section discusses the potential impacts to bat species that may occur during Project construction, operation, and decommissioning. Bats could potentially be impacted by activities that occur in the offshore environment, including within the Lease area and along the Offshore Export Cable Corridors. Project-related activities in the coastal and terrestrial environments may also affect bats.

5.11.2.1 Construction

Habitat Alteration

The area in the vicinity of the Interconnection Facilities is comprised primarily of forested habitats, and due to the relatively general nature of many bat species' habitat preferences, may provide suitable habitat for one or more bat species. Construction impacts in the vicinity of the Interconnection Facilities are discussed in more detail in Section 5.12 and includes vegetation clearing and grubbing. These activities may have the potential to degrade the suitability of the area as habitat for bats. However, given the relatively small size of the footprint of the Interconnection Facilities and the large area of roosting and foraging habitat that will remain available for use by bat species in the immediate vicinity, the effect of this potential impact is considered negligible.

The USFWS has established a recommended seasonal time of year (TOY) restriction for tree clearing activities in areas where the federally listed NELB may occur. This tree clearing TOY restriction recommended for NELB is expected to be protective of other bat species which may occur in the area. To avoid or minimize impacts to northern long-eared bat during the summer maternity period, the USFWS recommends tree clearing activities occur between August 1 and May 30. The Project will adopt this tree clearing TOY restriction.

Construction of the Interconnection Facilities will generate noise that has the potential to result in disturbance or displacement of bats during the construction period. However, noise generating construction activities will generally take place during daylight hours when bats are inactive in their diurnal roosts. Construction activities are not expected to occur at night when bats are actively foraging, and thus are unlikely to interfere with the ability of bats to echolocate or result in significant disturbance or displacement of bats from the vicinity of the Interconnection Facilities. In addition, the area is currently impacted by noise generated by the existing Indian River Power Plant and Indian River Substation. Therefore, the effect of this potential impact is considered negligible.

Lighting

Construction of the Interconnection Facilities may generate artificial lighting that has the potential to result in disturbance or displacement of bats during the construction period. However, construction activities will generally take place during daylight hours when bats are inactive in their diurnal roosts. Construction activities are not expected to occur at night, when bats are actively foraging, and thus are unlikely to interfere with bat behavior or cause disturbance or displacement effects. In addition, the area in the vicinity of the proposed Interconnection Facilities is currently exposed to artificial lighting generated by the existing Indian River Power Plant and Indian River Substation. Therefore, the effect of this potential impact is considered negligible.

5.11.2.2 Impacts of Alternatives

Installation of export cables in Offshore Export Cable Corridor 2 would be conducted in the same manner as Offshore Export Cable Corridor 1, which would not result in additional impacts to bats occurring over the Atlantic.

For cable installation in any of the terrestrial routes (i.e., Onshore Export Cable Corridor 1a, 1b, 1c, or 2), there would be no additional impacts to upland habitats along the selected route. Prior to the start of construction, US Wind would contact DNREC for a current list of known bat hibernacula within the Project area. Bat sightings during construction would be reported to

DNREC as part of its Bat Program. Cable installation would occur within previously disturbed areas and BMPs would be utilized when near any known bat hibernacula.

5.11.3 Mitigation and Monitoring

US Wind will implement the following mitigation measures to reduce Project impacts on bats.

- Tree clearing activities required for Project construction are not planned between June 1 and July 31 to avoid or minimize impacts to NELB during the summer maternity period.
- The Metocean Buoy has been equipped with a bat acoustic recorder to monitor for the nocturnal calls of bats within the Lease area for up to two years.
- Acoustic recorders to collect incidental bat calls offshore have been deployed on survey vessels throughout the Lease area and along the Offshore Export Cable Corridors.
- US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.

5.12 Terrestrial Species

5.12.1 Vegetation

The primary natural vegetative community types present in the vicinity of the Interconnection Facilities are: Southern Atlantic coastal plain mesic hardwood forest and North Atlantic coastal plain hardwood forest (DEDFW 2015). In general, highly fragmented and dominated by a mix of hickories, oaks, and tulip poplar, Southern Atlantic coastal plain mesic hardwood forests often develop on moist, acidic, nutrient-poor soils in the coastal plain on a variety of landforms, including flatwoods, undulating uplands, ravines, and lower slopes. This is one of the common forested habitats in Delaware and it is not listed as a habitat of conservation concern.

North Atlantic coastal plain hardwood forests are found on acidic, sandy soils and are largely dominated by oaks, with pines occasionally as a codominant. An herbaceous layer is typically not well developed and is patchy to sparse throughout the forest floor. According to the Delaware Wildlife Action Plan, this habitat community is considered a habitat of conservation concern (DEDFW 2015).

5.12.2 Wildlife Communities

The wildlife community in the vicinity of the Interconnection Facilities is expected to be typical of that associated with the two habitat community types described above. Both the Southern Atlantic coastal plain mesic hardwood forest habitat and the North Atlantic coastal plain hardwood forest habitat have relatively similar vegetation and physical characteristics and therefore would be expected to host a similar wildlife community. Examples of typical mammal species that may be found in these habitats include: white-tailed deer (*Odocoileus virginianus*), eastern gray squirrel (*Sciurus carolinensis*), and red fox (*Vulpes vulpes*). Typical bird species that could occur in both forest types include: red-tailed hawk (*Buteo jamaicensis*), broad-winged hawk (*Buteo platypterus*), barred owl (*Strix varia*), downy woodpecker (*Dryobates pubescens*), Carolina chickadee (*Poecile carolinensis*), blue-winged warbler (*Vermivora cyanoptera*), Tennessee warbler (*Leiothlypis peregrine*), and blue jay (*Cyanocitta cristata).* Some examples of reptile and amphibian species that may be found in both forest types include: American toad (*Anaxyrus americanus*), Cope's gray tree frog (*Hyla chrysoscelis*), wood frog (*Lithobates sylvaticus*), eastern garter snake (*Thamnophis sirtalis*), and eastern box turtle (*Terrapene 5-74arolina*) (DEDFW 2015; Dove, Nyman, and editors 1995). These lists are intended to provide examples of representative wildlife species that could be expected to occur in these habitat types and are not exhaustive.

5.12.3 Impacts

5.12.3.1 Construction

Construction of the Interconnection Facilities entails new US Wind substations and expansion of a DPL Substation, along with a temporary construction laydown area, and related infrastructure.

The following section describes potential impacts to terrestrial habitats and wildlife species that may occur during construction of the Interconnection Facilities.

Habitat Alteration

The construction of the Interconnection Facilities will result in habitat alteration and impacts are anticipated to be minor. Habitat alteration will generally entail the conversion of currently vegetated, pervious areas to non-vegetated, impervious areas. This habitat alteration will in turn result in an incremental loss of habitat available for use by wildlife species commensurate with the degree of alteration. US Wind substations consisting of new substations and an access road with a combined footprint of approximately 10.3 acres may result in varying degrees of forested habitat loss and require tree and vegetation clearing. Construction at the Interconnection Facilities also includes expansion of the DPL Substation, at 7,432 m^2 (1.8 acres). Existing disturbed areas will be used for the construction laydown area and access roads where feasible.

Onshore export cables traversing Onshore Export Cable Corridor 1 would exit Indian River Bay via HDD to the US Wind substations. The HDD activities would take place within the footprint of the Interconnection Facilities and would not require any additional clearing. As discussed in US Wind (2023) Volume II, Section 13.0, the NELB has not been identified as being present in the vicinity of the Interconnection Facilities, however it may occur in Delaware and eastern Maryland. Bats tend to use coastal systems, such as barrier islands (specifically Assateague Island), as stopovers during seasonal migrations, which is further discussed in US Wind (2023) Volume II, Section 13.1.1. The USFWS has established a recommended seasonal TOY restriction for tree clearing activities between June 1 and July 31 in areas where the federally-listed NELB may occur. Project related tree clearing activities will be avoided during this TOY restriction period.

Noise

Construction of the Interconnection Facilities will generate noise that may temporarily displace wildlife. Noise impacts are considered negligible to minor, with maximum sound levels from substation construction activities estimated to be approximately 100-110 dB. Any increase in noise levels during construction will be temporary and limited.

Vehicle Traffic

The use of construction-related vehicles and equipment at the Interconnection Facilities may result in impacts to wildlife in the vicinity due to increased noise, emissions, and the potential for vehicle strikes. Vehicle strikes may result in mortality of individual wildlife; however most mobile species would be expected to temporarily relocate from areas of active construction. Given the infrequent nature of vehicle strikes, this potential impact is expected to be negligible.

Air Emissions and Routine and Accidental Releases

Routine releases are chemical releases that would be expected to occur during construction and primarily include engine emissions from construction-related vehicles and equipment. Engine emissions are an unavoidable result of the use of construction vehicles and equipment for any construction project and are not specific to the proposed Project. However, methods to reduce engine emissions will be implemented during construction of the proposed Project, including restricting engine idling. Air quality impacts associated with the generation of vehicle emissions at the Interconnection Facilities will be negligible and temporary in nature.

Accidental releases could occur during construction from the HDD operations (in the case of an accidental frac-out of bentonite) and the use of construction vehicles and equipment. A construction SPCC Plan will be developed and implemented in accordance with applicable local, state, and federal requirements. The SPCC Plan will identify control measures proposed to prevent spills of fuel, oil, lubricants, and other chemicals as well as best management practices to be implemented to prevent and contain chemical releases into the environment. Given the nature of construction-related equipment and methods proposed at the Interconnection Facilities, if an accidental release did occur the impacts associated with such a release would be negligible and temporary.

5.12.3.2 Operations

The following section will discuss potential impacts to terrestrial habitats and wildlife species that may occur during operation of the proposed Project. Operational impacts for maintenance activities are included below. All other impacts are discussed in COP, Volume II, Section 10.0 (US Wind 2023).

Noise

Periodic maintenance and inspection activities may result in an increase in noise; however, the incremental increase in noise levels resulting from these activities would be negligible and temporary in nature.

Vehicle Traffic

The Interconnection Facilities will not be staffed on a regular basis; therefore, vehicle traffic during operations is expected to be limited to periodic maintenance and inspection activities. There is a potential for vehicle strikes of wildlife during these activities; however, given the expected intermittent use of vehicles at the site and the relatively infrequent nature of vehicle strikes, this impact would be negligible.

Air Emissions and Routine and Accidental Releases

Routine releases are chemical releases that would be expected to occur during inspections and maintenance of the Project and primarily include engine emissions from vehicles and equipment. Engine emissions are an unavoidable result of the use of vehicles and equipment and are not specific to the proposed Project. However, methods to reduce engine emissions will be implemented during the operations and maintenance, including restricting engine idling. Vehicle use at the facility would occur infrequently for routine inspection and maintenance purposes. Air quality impacts associated with the generation of vehicle emissions at the Interconnection Facilities during operations will be negligible and temporary in nature.

Accidental releases of chemicals could occur during operations. Such releases would most likely entail the release of oil-filled equipment within the US Wind substations or interconnection substation or a release of fuel, oil, or other chemicals during routine maintenance of the facility. The facility will be designed to include built-in containment to prevent the accidental release of chemicals into the environment. An SPCC Plan will be developed for the facility and will be implemented in the event of an accidental release.

5.12.3.3 Impacts of Alternatives

If a terrestrial route was chosen (i.e., either Onshore Export Cable Corridor 1a, 1b, 1c, or 2) over Onshore Export Cable Corridor 1 through Indian River Bay, there could be potential impacts to terrestrial species along the selected route. These species may include evergreen bayberry, swamp pink, and Northern long-eared bat. However, cable installation would occur within previously disturbed areas and BMPs would be utilized when near any sensitive habitat, meaning impacts would be negligible. US Wind would consult with DNREC to determine if there are any terrestrial species of concern within the Project area before the start of construction.

5.12.4 Mitigation and Monitoring

US Wind will implement the following mitigation measures to reduce Project impacts on terrestrial species and upland habitats.

- Previously disturbed areas will be used for the construction laydown area and access roads where feasible.
- Tree clearing activities required for Project construction are not planned between June 1 and July 31 to avoid or minimize impacts to NELB during the summer maternity period.
- Methods to reduce engine emissions will be implemented during construction and operation of the proposed Project where practicable, including restricting engine idling.
- Project-specific SPCC Plan will be prepared prior to construction and for operations activities.
- US Wind will develop a SWPPP for onshore construction activities, as appropriate.
- Lighting-related impacts will be minimized by using BMPs where feasible. Examples of BMPs to minimize the adverse impacts of artificial lighting will include not lighting the facility at night except in the case of an emergency that requires an immediate response, and the use of down-shielded light fixtures to reduce the visibility of light by birds, bats, and insects flying above the facility.

5.13 Avifauna

Table 5.12-1 below, details the migratory bird species that could occur within the onshore portions of the Project area, based on USFWS Information for Planning and Consultation (IpaC) results.

Table 5.12-1. Migratory Birds That May Occur in the Project Area

Common Name	Scientific name	Level of Concern
Bald Eagle	*Haliaeetus leucocephalus*	Non-BCC Vulnerable *
Bonaparte’s Gull	*Chroicocephalus philadelphia*	Non-BCC Vulnerable
Canada Warbler	*Cardellina canadensis*	BCC Rangewide (CON **)
Clapper Rail	*Rallus crepitans*	BCC-BCR ***
Common Loon	*Gavia immer*	Non-BCC Vulnerable
Common Tern	*Sterna hirundo*	Non-BCC Vulnerable
Double-crested Cormorant	*Phalacrocorax auritus*	Non-BCC Vulnerable
Dunlin	*Calidris alpina arcticola*	BCC-BCR
Evening Grosbeak	*Coccothraustes vespertinus*	BCC Rangewide (CON)

Table 5.12-1. Migratory Birds That May Occur in the Project Area

Common Name	Scientific name	Level of Concern
Great Black-backed Gull	*Larus marinus*	Non-BCC Vulnerable
Herring Gull	*Larus argentatus*	Non-BCC Vulnerable
Lesser Yellowlegs	*Tringa flavipes*	BCC Rangewide (CON)
Prairie Warbler	*Dendroica discolor*	BCC Rangewide (CON)
Prothonotary Warbler	*Protonotaria citrea*	BCC Rangewide (CON)
Red-breasted Merganser	*Mergus serrator*	Non-BCC Vulnerable
Red-headed Woodpecker	*Melanerpes erythrocephalus*	BCC Rangewide (CON)
Red-throated Loon	*Gavia stellata*	BCC Rangewide (CON)
Ring-billed Gull	*Larus delawarensis*	Non-BCC Vulnerable
Royal Tern	*Thalasseus maximus*	Non-BCC Vulnerable
Ruddy Turnstone	*Arenaria interpres morinella*	BCC-BCR
Rusty Blackbird	*Euphagus carolinus*	BCC Rangewide (CON)
Semipalmated Sandpiper	*Calidris pusilla*	BCC Rangewide (CON)
Short-billed Dowitcher	*Limnodromus griseus*	BCC Rangewide (CON)
Surf Scoter	*Melanitta perspicillata*	Non-BCC Vulnerable
Willet	*Tringa semipalmata*	BCC Rangewide (CON)
Wood Thrush	*Hylocichla mustelina*	BCC Rangewide (CON)

Source: (USFWS 2021a, 2021b)
* BCC: Bird of Conservation Concern
** CON: Continental US and Alaska
*** BCR: Bird Conservation Regions (BCC in these areas only)

5.13.1 Marine Birds

Marine birds are avian species adapted to life in the marine environment, which is characterized by relatively deep, offshore waters generally located 5.5 km (3 NM) or more from the coast. Marine birds may be distinguished from coastal birds, which are adapted to life in relatively shallow, nearshore waters and associated habitats along shorelines, and from terrestrial birds (or "land birds") that primarily occur in terrestrial habitats inland from the coast. While some marine bird species may be found in coastal areas, marine birds are the species most likely to regularly occur offshore. Many marine bird species spend much of their life cycle at sea, coming to land only during the nesting season.

The marine bird community in the mid-Atlantic consists of species that breed outside of the region and spend all or part of the non-breeding season in the region (such as gannets and alcids), and of species that breed in coastal areas in the region and take advantage of marine habitats for foraging or resting (such as gulls and terns). Refer to Table 5.12-2 for marine bird families occurring in the Project area. Additional description of the marine bird community in the Lease area and an avian risk assessment are provided as COP, Appendix II-N1 (US Wind 2023).

Table 5.12-2. Marine Bird Families Occurring in the Project Area

Family (Common Name)	Distribution and Ecology
Alcidae (Alcids)	Breed in isolated colonies along northern rocky coastlines and overwinter in marine waters as far south as the mid-Atlantic.
Sulidae (Gannets)	Strongly associated with nearshore and offshore marine environments and almost never seen over land, except at breeding colonies. Found in the mid-Atlantic from fall to winter.
Podicipedidae (Grebes)	Strongly aquatic and typically leave the water only to net. Typically nest in inland wetlands, and some species disperse to coastal and marine areas during the winter.
Laridae (Gulls and Terns)	Several gull species nest in colonies on coastal beaches and small islands in the mid-Atlantic. A few gull species are found in the Project area year-round, while other are present only during winter or migration. Terns nest on sandy beaches and flats above the high tide line. Some tern species breed in the mid-Atlantic, while others are found there only casually or during migration.
Stercorariidae (Jaegers and Skuas)	Nest outside the mid-Atlantic region but occur in offshore waters along the Atlantic coast during other times of the year. Occur in the Project area during spring and fall.
Anatidae (Sea Ducks)	Sea ducks can be commonly found in deeper waters of the offshore environment. Sea ducks breed in the northern latitudes (Canada and Alaska) and migrate to southern wintering grounds along the coast. The mid-Atlantic region represents the southern limit of the wintering range of several sea ducks.
Procellariidae (Shearwaters and Fulmars)	Rarely come close to shore except during the nesting period, and do not breed in the mid-Atlantic. May be found in the mid-Atlantic in the Spring.

Table 5.12-2. Marine Bird Families Occurring in the Project Area

Family (Common Name)	Distribution and Ecology
Hydrobatidae (Storm-petrels)	Found in pelagic environments throughout much of the year and return to land only to nest. Nest outside of the mid-Atlantic region and range widely during the non-breeding season. May be found in the mid-Atlantic from Spring through Summer.
Various Species	Typically, not associated with marine and coastal habitats in the Project area except during migration. Any species using the Atlantic Flyway could potentially occur in the Project area during migration.

5.13.2 Coastal Birds

Birds that may be present in the coastal habitat found in the Project area have been documented by the MABS Project and an expansion of the MABS study funded by the MDNR and the MEA (Williams et al. 2015d; Williams et al. 2015e). This section also considers other species that could occur in mid-Atlantic coastal habitats during at least a portion of the year based on data from field guides and mapping resources (Ridgely et al. 2003; Sibley 2014; Cornell University 2016; NAS 1996). These species can be grouped by shared habitats and life history characteristics as shown in Table 5.12-3. Groups that are most likely to be impacted by the Project are discussed below. At least some species in each of the first nine groups of birds listed in Table 5.12-3 may be present in the Project area year-round and nest there as well. Migratory birds are only likely to be in the Project area while stopping along their migration routes.

Table 5.12-3. Coastal Bird Families Occurring in the Project Area

Order	Family	Distribution and Ecology
Suliformes	Phalacrocoracidae (Cormorants)	Sit and swim on water. Roost colonially on perches. Nest colonially in the mid-Atlantic; found there year-round.
Pelecaniformes	Pelecanidae (Brown Pelican)	Typically seen sitting on water or in flight. Nests colonially on islands in the mid-Atlantic; found there year-round.
Charadriiformes (Shorebirds)	Recurvirostridae (Avocets and Stilts) Haematopodidae (Oystercatchers) Charadriidae (Plovers) Scolopacidae (Sandpipers, Yellowlegs, Godwits, Dowitchers, Snipe, and Phalaropes)	Diverse group that uses a variety of habitats including beaches, dunes, mudflats, saltmarshes, and rocky coasts. Found in the mid-Atlantic year-round, though few species nest there.

Table 5.12-3. Coastal Bird Families Occurring in the Project Area		
Order	**Family**	**Distribution and Ecology**
Pelecaniformes (Wading Birds)	Ardeidae (Bitterns, Egrets, Herons, and Night-herons) Threskiornithidae (Ibises)	Nest in coastal areas of the mid-Atlantic; found there year-round.
Gruiformes	Rallidae (Rails, Coots, and Gallinules)	Rails inhabit coastal marshes. Several species breed in the mid-Atlantic and occur there year-round. Coots and gallinules inhabit ponds and marshes, often near the coast. Coots winter in the mid-Atlantic.
Anseriformes (Waterfowl)	Anatidae (Geese, Swans, and Ducks)	Diverse group that uses a variety of habitats including coastal ponds, bays, saltmarshes, and rivers. Most do not breed in the Project area and are present primarily during winter; however, a handful of species do breed in the Project area including Canada goose (*Branta canadensis*), Mallard, Wood Duck, and Hooded Merganser.
Coraciiformes	Alcedinidae (Belted Kingfisher)	Uses sheltered waters, including coastal bays and marshes. Nests in mid-Atlantic and occurs there year-round.
Passeriformes (Saltmarsh Perching Birds)	Emberizidae (Saltmarsh Sparrow and Seaside Sparrow) Icteridae (Red-winged Blackbird) Troglodytidae (Marsh Wren and Sedge Wren)	Nest in marshes along the mid-Atlantic coast and winter in the Project area. Wrens and Sparrows found in the mid-Atlantic primarily during breeding season. Red-winged Blackbird in the mid-Atlantic year-round.
Various (Birds of Prey)	Pandionidae (Osprey) Accipitridae (Eagles, Hawks, and Harriers) Falconidae (Falcons) Strigidae (Owls) Cathartidae (Vultures)	Found in mid-Atlantic coastal habitats year-round. Osprey and bald eagle nest prominently and feed in coastal areas. Northern Harrier (*Circus hudsonius*), Merlin (*Falco columbarius*), Peregrine Falcon (*F. peregrinus*), and Short-eared Owl (*Asio flammeus*) nest in terrestrial habitats but hunt in open coastal habitats.
Passeriformes	Various Species	Typically not associated with marine and coastal habitats in the Project area except during migration. Any species using the Atlantic Flyway could potentially occur in the Project area during migration.

5.13.2.1 DNREC Colonial Bird Study

The DNREC began colonial nesting waterbird (CWB) surveys in Rehoboth Bay in 2019. Survey teams counted birds, including laughing gulls (*Leucophaeus atricilla*), herring gulls (*Larus argentatus*), great black-backed gulls (*Larus marinus*), great egrets (*Ardea alba*) and Forster's tern (*Sterna forsteri*), from the water using spotting scopes or binoculars during the April – September time period (DNREC 2021). Locations for the surveys, shown in Figure 5.12-1, were selected based on historic breeding records for Species of Greatest Conservation Need (DEDFW 2015). Although hundreds of nesting birds of various species have been documented at these locations, exact nest locations, reproductive success and colony boundaries are currently undetermined. US Wind will review data for applicability to the Project when it becomes available as DNREC plans to continue this study.

5.13.2.2 Mid-Atlantic Baseline Study

According to the MABS survey, cormorants and waterfowl are among the most frequently encountered birds on the mid-Atlantic coast. Most waterfowl are likely to be present in the Project area during their migration between northern breeding grounds and southern wintering areas. Green-winged teal (*Anas crecca*), brant (*Branta bernicla*), and mallard (*A. Platyrhyncos*) are common in the Project area in the fall (Williams et al. 2015e). Waterfowl that may breed in the Project area include mallard, wood duck (*Aix sponsa*), and hooded merganser (*Lophodytes cucullatus*). Most waterfowl feed on aquatic vegetation and invertebrates. Shorebirds and pelicans are also likely to be present. Both double-crested cormorant (*Phalacrocorax auritus*) and brown pelican (*Pelecanus occidentalis*) are common in the mid-Atlantic region year-round, where they nest and feed on small schooling fish, such as menhaden and anchovies. Similar to waterfowl, while nearly three dozen shorebird species may be found in the Project area throughout the year, relatively few species would nest there. American oystercatcher (*Haematopus palliatus*), piping plover (*Charadrius melodus*), spotted sandpiper (*Actitis macularius*), and willet (*Tringa semipalmata*) are among the few shorebirds that may nest locally.

Overwintering shorebird species include black-bellied plover (*Pluvialis squatarola*), ruddy turnstone (*Arenaria interpres*), dunlin (*Calidris alpina*), and sanderling (*C. Alba*). Most shorebirds that may nest in the Project area build nests on the ground in beach face and back-dune habitats or in grassy marshes above the high tide line. Resident and migratory species often feed on invertebrates found in the intertidal zone.

Wading birds, saltmarsh perching birds, and birds of prey that may overwinter in the Project area may potentially be impacted by Project activities that are scheduled to occur in winter months. Wading birds that may overwinter in the Project area include American bittern (*Botaurus lentiginosus*), great blue heron (*Ardea herodias*), black-crowned night heron (*Nycticorax nycticorax*), and white ibis (*Eudocimus albus*). Wading birds feed primarily on fish, amphibians, crayfish, and aquatic insects. Saltmarsh perching birds that may nest and overwinter in the Project area include saltmarsh sparrow (*Ammodramus caudacutus*), seaside sparrow (*A. Maritimus*),

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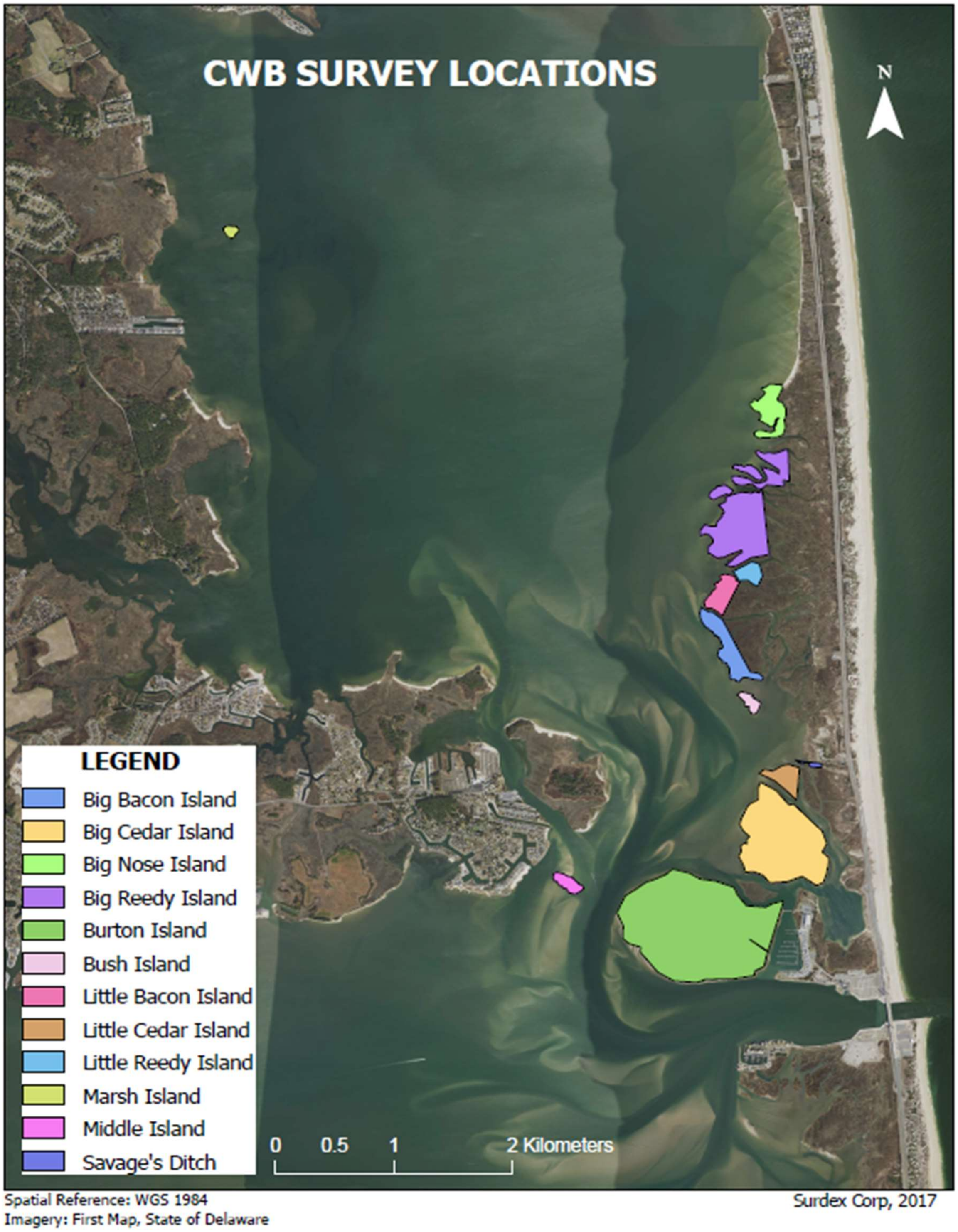

Figure 5.12-1 Rehoboth Bay Colonial Waterbird Nesting Survey Locations

marsh wren (*Cistothorus palustris*), sedge wren (*C. Platensis*), and red-winged blackbird (*Agelaius phoeniceus*). The two wren species and red-winged blackbird nest in vegetation, while the two sparrow species nest directly on the ground, usually just above the high tide line. As top-level consumers in coastal food webs, birds of prey do not typically achieve large populations, which can make them more sensitive to disturbances than more abundant species. Osprey were the only raptors that were detected repeatedly during the MABS boat surveys (Williams et al. 2015d; Williams et al. 2015e). Osprey typically nest in bare trees or on nesting platforms overlooking saltmarshes and are adapted to an exclusive diet of fish.

5.13.3 Terrestrial Birds

Typical bird species that could occur in the upland communities of the Project area include: red-tailed hawk (*Buteo jamaicensis*), broad-winged hawk (*Buteo platypterus*), barred owl (*Strix varia*), downy woodpecker (*Dryobates pubescens*), Carolina chickadee (*Poecile carolinensis*), blue-winged warbler (*Vermivora cyanoptera*), Tennessee warbler (*Leiothlypis peregrine*), and blue jay (*Cyanocitta cristata).*

5.13.4 Impacts

As discussed in COP Appendix II-N1 (US Wind 2023), the overall risk of adverse impacts to birds from the construction, operation, and decommissioning of the Project is influenced by two primary considerations: (1) the nature of the potential impact-producing factors and (2) the potential for exposure of birds to those impact-producing factors. The second of these, the potential for exposure of birds to impact-producing factors, is discussed in COP Appendix II-N1 (US Wind 2023). This section discusses the potential impacts during Project construction, operation, and decommissioning to birds, as well as the proposed measures to avoid or minimize these potential impacts. This analysis assumes 100 percent WTG operation as a conservative estimate, which is consistent with the PDE approach for the COP. Marine birds could potentially be impacted by factors that occur in the offshore environment, including within the Lease area and along a portion of the Offshore Export Cable Corridors. As discussed in COP Appendix II-N1 (US Wind 2023), the overall risk to marine birds from the construction operation of the Project is considered to be minor. Project-related activities in the coastal and terrestrial environments are not likely to adversely affect coastal or terrestrial birds but are also addressed in this section.

5.13.4.1 Construction

Impacts to birds during construction may result from activities related to installation of the WTGs, OSSs, Met Tower, Inter-array Cables, and Export Cables. In general, the primary potential impacts to birds that could result from these activities is disturbance or displacement due to the generation of noise, the movement of vessels through the area, the generation of artificial lighting, and habitat alteration. The nature of this potential impact is expected to be indirect, as the effects of noise, vessel traffic, and artificial lighting may alter the behavior of individual birds such that they are potentially displaced from or attracted to the Project area. Activities associated with construction will be temporary in duration, and any potential impacts associated with these activities will likewise be temporary. If disturbance or displacement of birds did occur, this impact would be considered negative, as it would entail an alteration of the natural behavior of individuals and cause them to expend energy that they otherwise would not have in the absence of the Project. The extent of potential disturbance/displacement impacts associated with construction activities is expected to be localized to the immediate vicinity of the Project area.

Noise

Noise will be generated in the offshore environment during construction by pile driving operations, vessels (including cable installation and other vessels), and other construction related activities. Noise generated during construction has the potential to result in disturbance and/or displacement of individual birds in the vicinity of noise-generating activities. Pile driving operations are likely to be the most significant noise generating activity in the offshore environment and the one most likely to result in disturbance or displacement of marine birds due to the high intensity of the sound produced and the intermittent frequency of the activity. Pile driving may also result in the displacement of avian prey (especially fish, see Section 5.7) from the vicinity of the activity, which may negatively impact foraging success of marine birds in the area. Noise associated with vessel operations is unlikely to result in disturbance or displacement of marine birds due to the constant and low intensity of the sound, the existing operation of vessels in the offshore environment, and the transient nature of the activity. Therefore, the impacts of noise generated during construction on marine birds are expected to be negligible to minor.

Vessel Traffic

A variety of marine vessels will be used during construction in the offshore environment. Vessels will be used during construction to transport personnel and equipment between the Lease area and shore; to install the WTGs, OSSs, Met Tower, inter-array cables, and Export Cables; and for other purposes. Vessels will use established vessel courses and not disturb colonial waterbird nesting sites in the Chesapeake and Atlantic Coastal Bays Critical Area. The use of vessels in the offshore environment has the potential to result in micro-scale disturbance of individual birds and has the potential to attract marine birds. Micro-scale disturbance may occur if an individual bird is sitting on the water in the direct path of a vessel and is forced to relocate to avoid the vessel. In this scenario, the individual would likely swim or fly a short distance to avoid the path of the vessel and then continue with its previous behavior (i.e., feeding and resting); individuals would not be expected to be displaced from the wider area by the use of vessels.

The use of vessels in the marine environment may also result in attraction of some marine birds. Gulls in particular are frequently attracted to and follow commercial fishing vessels in search of food; this behavior often extends to non-fishing vessels as well. The potential attraction of seabirds, especially gulls, to vessels used during construction may be considered an adverse impact as it results in an alteration to the behavior of the individual birds that may affect foraging and cause an expenditure of energy that would otherwise not occur. However, this impact is expected to be temporary and restricted to the immediate vicinity of the activity, and therefore is considered a negligible impact.

Lighting

Artificial lighting may be generated by activities conducted in the offshore environment during construction, including the use of vessels and lighting of temporary structures. Artificial lighting has the potential to indirectly impact seabirds by attracting individuals to lighted structures or vessels and thus may increase the risk of collision (Boehlert and Gill 2010). The potentially attracting effects of artificial lighting may be more pronounced at night or during inclement weather, when visibility is generally poorer and the ability of birds to avoid structures may be reduced. This effect is more likely to be of concern during operation and the potential impacts of artificial lighting during construction are expected to be negligible.

Habitat Alteration

The offshore export cables and Onshore Export Cable 1 will be installed using HDD. The HDD operations will only disturb the ground at the bore entry and exit for each cable. By minimizing ground disturbance, the Project minimizes the area in which complex vegetation re-establishment may be needed. Minimizing ground and vegetation disturbance also avoids impacts to coastal birds. The potential impacts to birds from habitat alteration due to HDD are negligible.

The Project has been designed to avoid impacts to coastal dunes and interdunal wetlands because they provide critical habitat for rare, threatened, and endangered coastal bird species for much of the year.

The construction of the Interconnection Facilities will result in habitat alteration and impacts to birds are anticipated to be minor. Habitat alteration will generally entail the conversion of currently vegetated, pervious areas to non-vegetated, impervious areas. This habitat alteration will in turn result in an incremental loss of habitat available for use by bird species commensurate with the degree of alteration.

5.13.4.2 Operations

Impacts to birds during operations may result from several factors. The primary potential impact of concern is mortality or injury resulting from collision with WTGs (rotating blades or towers). Other potential impacts include disturbance and/or displacement due to noise or vessel traffic, the potential attracting effects of artificial lighting, and displacement due to the presence of the wind energy facility.

DNREC identified a bald eagle nest on Burton Island, where the Indian River Power Plant is located in response to a request from US Wind (DNREC 2017b). Project activities will not intersect the nest location, but if any work is done east of the Power Plant, DNREC requests that US Wind contact United States Fish and Wildlife Services (USFWS) about the nest location. (DNREC 2017b).

Operational impacts for maintenance activities are included below. All other impacts are discussed in COP, Volume II, Sections 6.0 and 12.0 (US Wind 2023).

Noise

Noise will be generated in the offshore environment during the operation of vessels used for routine inspections of the facility and by activities related to maintenance or repair of Project infrastructure. Noise associated with the operation of vessels in the marine environment is not expected to result in disturbance or displacement of marine birds. Similarly, noise associated with activities related to maintenance or repair of Project infrastructure are expected to have a low potential for disturbance or displacement impacts due to the infrequent nature of these activities and the likely low intensity of noise associated with them. Where avoidance behavior of birds around offshore wind energy facilities has been documented, this is more likely due to the desire to avoid the WTG structures themselves than displacement resulting from increased noise levels in the vicinity of the facility. Therefore, the impacts of noise generated during operations on marine birds are expected to be negligible.

Vessel Traffic

The use of vessels during operations is likely to be functionally the same as during construction in the context of potential impacts to marine birds. This activity would be expected to occur less frequently than during construction, but over a longer period of time. The use of vessels in the offshore environment during operations is expected to result in negligible impacts to marine birds. Vessels will use established vessel courses and not disturb colonial waterbird nesting sites in the Chesapeake and Atlantic Coastal Bays Critical Area. Vessel traffic through the Lease area is expected to be reduced once the WTGs are operational as current vessel traffic will be rerouted to a proposed Traffic Separation Scheme extension (Section 5.15).

Visible Structures

The most significant physical alteration to the marine environment during operations will be the presence of the WTG structures. The physical presence of the WTG structures in the offshore environment may result in two distinct yet related impacts to marine birds: displacement and collision-related mortality or injury. These potential impacts are discussed below. For this section and those that follow, it was assumed that the WTGs would be operating 100 percent of the time, as is consistent with a PDE approach.

5.13.4.3 Impacts of Alternatives

Selection of Offshore Export Cable Corridor 2 would not result in additional impacts to birds occurring over the Atlantic, as the same installation techniques would be used.

If a terrestrial route was chosen (i.e., either Onshore Export Cable Corridor 1a, 1b, 1c, or 2) over Onshore Export Cable Corridor 1 through Indian River Bay, there may be impacts to terrestrial birds along the selected route. Cable installation would occur within previously disturbed areas and BMPs would be utilized when near any sensitive habitat. Onshore construction noise may temporarily impact birds by prevent use of trees and other habitat in the immediate vicinity of the Project. Birds that use Indian River Bay as a feeding or resting area would no longer be directly impacted by cable installation activities. US Wind would consult with DNREC to determine if there are any avian species of concern within the Project area before the start of construction.

5.13.5 Mitigation and Monitoring

US Wind will implement the following measures to avoid and minimize Project impacts on birds.

- US Wind will install cables using HDD to avoid impacts to coastal dunes and interdunal wetlands used by coastal birds and to minimize bottom disturbance.
- Between May 1 and August 1, construction activities will not occur within 100 m (328 ft) of hummocks in Indian River Bay in order to avoid impacts to nesting terns.
- US Wind will locate cable landfalls and onshore facilities so as to avoid impacts to known nesting beaches, where feasible. The use of HDD for cable installation under the Barrier Beach Landfalls will avoid impacts on beaches.
- Measures that minimize lighting impacts on avian species will be implemented where feasible, as approved by FAA, BOEM, USCG and other regulatory agencies.
- Anti-perching measures may be installed on the deck/access platform of the WTGs to discourage birds from resting on and congregating around the structures.
- US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.

5.14 Threatened and Endangered Species

5.14.1 Life Histories of Federally Listed Threatened and Endangered Species

The following species are listed under the USFWS, DNRC, or MDNR as threatened, endangered or candidate species and shown in Table 5.13-1, below.

5.14.2 Finfish

Two sturgeon species listed as endangered under the ESA may occur in the Project area are the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) and shortnose sturgeon (*Acipenser brevirostrum*). Both are anadromous species, spawning in rivers and spending their adult lives in the open ocean. The giant manta ray *(Mobula birostris)* is listed as threatened under the ESA, may also occur in the Project area.

Table 5.13-1 Federal and State Threatened and Endangered Species with Potential Occurrence in the Project Area

	Common Name	Scientific Name	Federal Status	DE State Status	MD State Status	Location	Observed in Project Area
Finfish	Atlantic Sturgeon	*Acipenser oxyrinchus*	E	E	E	Marine	No
	Shortnose Sturgeon	*Acipenser brevirostrum*	E	E	E	Marine	No
	Giant Manta Ray	*Mobula birostris*	T	-	-	Marine	Yes
Marine Mammals	North Atlantic Right Whale	*Eubaelena glacialis*	E	E	E	Marine	Yes
	Fin Whale	*Balaenoptera physalus*	E	E	E	Marine	Yes
	Sei Whale	*Balaenoptera borealis*	E	E	E	Marine	Yes
	Blue Whale	*Balaenoptera musculus*	E	E	E	Marine	No
	Sperm Whale	*Physeter macrocephalus*	E	E	E	Marine	No
	West Indian Manatee	*Trichechus manatus*	T	-	-	Marine	No
Sea Turtles	Loggerhead Turtle	*Caretta caretta*	T	E	T	Marine	Yes
	Leatherback Turtle	*Demochelys coriacea*	E	E	E	Marine	Yes
	Green Turtle	*Chelonia mydas*	T	E	T	Marine	Yes
	Kemp's Ridley Turtle	*Lepidochelys kempii*	E	E	E	Marine	Yes
	Hawksbill Turtle	*Eretmochelys imbricata*	E	-	E	Marine	Yes

Table 5.13-1 Federal and State Threatened and Endangered Species with Potential Occurrence in the Project Area

	Common Name	Scientific Name	Federal Status	DE State Status	MD State Status	Location	Observed in Project Area
Terrestrial Vegetation	Seabeach Amaranth	*Amaranthus pumilus*	T	-	S1	Coastal	No
	Evergreen Bayberry	*Morella caroliniensis*	-	-	S2	Coastal	No
	Swamp Pink	*Helonias bullata*	T	-	S2	Wetland	No
Terrestrial Wildlife	Bethany Beach Firefly	*Photuris bethaniensis*	-	E	-	Coastal	No
	Monarch Butterfly	*Danaus plexippus*	C	-	-	Upland	Unknown
	Northern Long-eared Bat	*Myotis septentrionalis*	E	E	T	Upland	No
Avifauna	Roseate Tern	*Sterna dougallii*	E	-	X	Marine	Yes
	Bermuda Petrel	*Pterodroma cahow*	E	SC	-	Marine	No
	Piping Plover	*Charadrius melodus*	T	E	E	Coastal	No
	Rufa Red Knot	*Calidris canutus rufa*	T	-	(T)	Coastal	No
	Eastern Black Rail	*Laterallus jamaicensis*	T	-	-	Coastal	No

E = Endangered; T = Threatened; (T) = Appears likely to become endangered in MD;
X = Endangered/Extirpated (MD only); SC= Special Concern

Mitigation and monitoring measures as relate to finfish are presented in Section 5.7.3.

Atlantic Sturgeon (*Acipenser oxyrinchus*)

The Atlantic sturgeon is an estuarine-dependent, anadromous species that is found along the eastern coast of North America from Canada to Florida. They spend the majority of their lives in the marine environment, but spawn in freshwater. They are present in 36 coastal rivers in the United States, and spawning takes place in at least 20 of these rivers. Larvae and juveniles remain in riverine or estuarine areas where they were spawned and move to higher salinity waters as subadults. Subadults and adults migrate seasonally throughout marine waters. In the summer, they are found in shallow waters of about ten to 20 m (32.8 to 65.6 ft), and in the winter they move to deeper waters of about 20 to 50 m (65.6 to 164.0 ft) (Secor et al. 2020). Current threats to Atlantic sturgeon include ship strikes, bycatch, habitat degradation/loss, climate change and habitat impediments such as dams (BOEM 2013; NOAA Fisheries 2017a). Critical habitat for the New York Bight DPS of Atlantic sturgeon includes approximately 547 km (340 mi) of aquatic habitat in the Hudson, Connecticut, Housatonic, and Delaware Rivers (82 FR 39160), and does not coincide with the Project area.

In 2011, telemetered Atlantic sturgeon were detected in nearshore waters off the coast of Maryland, along the southern end of the Delmarva Peninsula. Atlantic sturgeon were observed in shallow, well-mixed, relatively warm freshwater near the 25 m (82 ft) isobath and appeared to be associated with a water mass tied to Delaware Bay (Oliver et al. 2013). Additionally, matching telemetry records with derived seascapes indicate that Atlantic sturgeon prefer a seascape that is associated with the coastline of Delaware Bay and the Atlantic Ocean, with a mean temperature of 19.8 °C (68 ˚F) and a mean reflectance of 0.0073 solar reflectivity $(sr)^{-1}$ at 443 mm (1.45 ft) (Breece et al. 2016). Based on these studies, Atlantic sturgeon would be more likely to occur near the coast rather than further offshore in the Lease area. The Delaware Division of Fish and Wildlife has not reported occurrences of Atlantic sturgeon within the Inland Bays (USACE 2015). Marine-phase Atlantic sturgeon migrate through Delaware’s coastal waters in mid-late March through mid-May and early September through mid-December (DNREC 2017b).

In 2016-2018, tri-annular surveys of acoustically tagged sturgeon revealed an in-depth migratory pattern of movement of Atlantic sturgeon by Secor et al. (2020). Detections of Atlantic sturgeon occurred throughout the fall and the early winter months and briefly during the spring. Within these periods of occurrence, Atlantic sturgeon were at mid-range depths in the Lease area during the fall but occurred in shallower regions within and outside the Lease area in the spring. Detections for Atlantic sturgeon showed stronger association with cross-self depth and environmental gradients rather than specific seabed characteristics. The results show that Atlantic sturgeon occurred extensively in the Lease area as transients, and that the Lease area occurred within the migration corridor.

<u>Shortnose Sturgeon (*Acipenser brevirostrum*)</u>

The shortnose sturgeon is an anadromous species found in large rivers and estuaries of the North America eastern seaboard from the Indian River in Florida to the St. John River in Canada. The shortnose sturgeon is not found in any of the Delaware Inland Bays systems which include Rehoboth Bay, Indian River Bay, and Little Assawoman Bay, but is found in the Delaware River. Adults migrate downstream in the fall and upstream in the spring to spawn. Larvae and juveniles are found in deep channels of rivers with strong currents. Shortnose sturgeon are most commonly found in the estuary of their respective river. While they do occasionally enter the marine environment, they generally remain close to shore, and are not likely to be present in the Lease area (Moser and Ross 1995; Collins and Smith 1997; Dadswell et al. 1984). Current threats to shortnose sturgeon include dams, pollution, and habitat alteration (NOAA Fisheries 2015). Shortnose sturgeon is not known to occur within the Delaware Inland Bays (USACE 2015).

<u>Giant Manta Ray (*Mobula birostris*)</u>

Giant manta ray are large bodied, pelagic planktivores that are broadly spread in tropical and temperate waters of the Pacific, Atlantic and Indian Oceans. This species is not regularly encountered in large numbers and overall encountered with far less frequency than any other manta species despite having a larger distribution across the globe (IUCN 2011). While manta rays feed typically in shallow waters, they can dive as deep as 1,000 m (3,300 ft) (Miller and Klimovich 2016). Giant manta rays are observed to migrate by following prey abundance (Farmer et al. 2021). It is understood that the population of this species is in decline, and it is ESA threatened throughout its range, which includes New England/mid-Atlantic, the Pacific Islands, and the Southeast. Giant mantas are slow growing and long-lived with low fecundity and reproductive output with a gestation period up to one year. These biological traits make them prone to overexploitation, with their most direct threats being by-catch and intentional hunting for gill rakers by the Asian market (White, Giles, and Dharmadi 2006).

Recorded occurrences of giant manta rays within the Project are considered rare and only two recorded observations in 2016 and 2021 confirm giant manta ray range is off the coast of Delaware. Farmer et al. (2021) integrated decades of sightings and survey effort data from numerous sources in a comprehensive species distribution modeling (SDM) framework for the eastern United States and revealed that giant manta rays were most commonly detected at productive nearshore and shelf-edge upwelling zones at surface thermal frontal boundaries within a temperature range of approximately 20 to 30°C (68 to 86°F). The SDMs predicted high nearshore concentrations off northeast Florida during April, with the distribution extending northward along the shelf-edge as temperatures warm, leading to higher occurrences north of Cape Hatteras, North Carolina from June to October, and then south of Savannah, Georgia from November to March as temperatures cool (IUCN 2011; Miller and Klimovich 2016; Marshall et al. 2011; Farmer et al. 2021; White, Giles, and Dharmadi 2006).

5.14.3 Marine Mammals

Five of the total 16 cetacean species listed as federally endangered under the ESA have the potential to occur in the Project area: the NARW (*Eubaelena glacialis*), the fin whale (*Balaenoptera physalus*), the sei whale (*Balaenoptera borealis*), the sperm whale (*Physeter macrocephalus*), and the blue whale (*Balaenoptera musculus*).

Potential impacts to marine mammals are discussed in Section 5.8.2. Mitigation measures to reduce impacts and monitoring are presented in Section 5.8.3.

North Atlantic Right Whale (*Eubaelena glacialis*)

North Atlantic right whales (NARW) are among the rarest of all marine mammal species. These whales average approximately 15.25 m (50 ft) in length and can weigh 63,503 kg (70 tons) (NOAA Fisheries 2022d). NARW have stocky black bodies with no dorsal fin, and bumpy, coarse patches of skin on their heads called callosities (NOAA Fisheries 2022d). Right whales are slow moving grazers that feed on dense concentrations of prey, primarily zooplankton and copepods belonging to the *Calanus* and *Pseudocalanus* genera (Hayes et al. 2022), anywhere in the water column from the surface to the seafloor (NOAA Fisheries 2022d). NARWs are usually observed in groups of less than 12 individuals, and most often as single individuals or pairs, though larger groups of actively socializing right whales, known as “surface active groups”, may be observed in feeding or breeding areas (Jefferson, Webber, and Pitman 2008).

The NARWs occurring in United States waters belong to the western Atlantic stock. The size of this stock is considered to be extremely low relative to its Optimum Sustainable Population (OSP) in the United States Atlantic EEZ. The most recent official estimate of minimum NARW population size was 368 individuals, which was presented in the 2021 NOAA stock assessment report and reflects estimated abundance as of November 2019 (Hayes et al. 2022). However, more recent estimates indicate that the NARW population has fallen to 340 individuals (Pettis, Pace, and Hamilton 2022). Historically, the NARW population suffered severely from commercial overharvesting. Currently, human interaction, through vessel strikes and entanglements, is the primary threats to this species. NARW are currently experiencing an Unusual Mortality Event (UME); elevated numbers of dead or seriously injured NARW have been recorded in Canada and the United States since 2017 (NOAA Fisheries 2021a). Due to the small NARW population size, it is estimated that human sources of mortality have a disproportionately large effect on population growth (Hayes et al. 2022). Additionally, changes to right whale habitat have caused migration into new territory, which has exposed right whales to new anthropogenic threats (NOAA Fisheries 2022a). The NARW is a strategic stock[10] and is listed as endangered under the ESA. NMFS has

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[10] A strategic stock is defined by the MMPA as a stock for which the level of direct human-caused mortality exceeds the potential biological removal, is declining and is likely to be listed as threatened under the ESA in the foreseeable future or is currently listed as threatened or endangered under the ESA or designated as depleted under the MMPA.

designated two critical habitat areas for the NARW (located approximately 600 km from Lease Area, (NOAA Fisheries 2022e).

The NARW is a strongly migratory species that undertakes well-defined seasonal movements. However, this species exhibits condition-dependent partial migration; though all NARW have the potential to migrate each winter to the southeastern United States, only a portion of the NARW population migrates in any given year (Gowan et al. 2019). Generally, NARW occupy feeding grounds in New England waters, the Canadian Bay of Fundy and Scotian Shelf, and the Gulf of St. Lawrence in spring, summer, and fall, and travel to their sole known calving and wintering grounds in the waters of the southeastern United States (Kenney and Vigness-Raposa 2009). Mid-Atlantic waters are a primary migration corridor during these seasonal migrations (Knowlton, Ring, and Russel 2002; Firestone et al. 2008). Mapped migration routes along the Atlantic coast are close to both major ports and shipping lanes (Hayes et al. 2022). Recently, NARWs have been observed increasingly in the mid-Atlantic region (G.E. Davis et al. 2017). Observations from recent aerial and acoustic surveys indicate that NARW are present in the region of the Lease area throughout the year, with maximum abundance reported during the late winter and early spring (Williams et al. 2015c; S. Barco et al. 2015). These observation patterns suggest that though pulses of NARW travel through mid-Atlantic waters during seasonal migrations, the region may also be a destination for non-breeding individuals (S. Barco et al. 2015).

Fin Whale (*Balaenoptera physalus*)

Fin whales are the second largest whale species, ranging from 25 to 26 m (82 to 85 ft) in length (Hayes et al. 2022; NOAA Fisheries 2022c). Fin whales typically feed on krill and schooling fish in the Gulf of Maine and the waters surrounding New England (Hayes et al. 2022; NOAA Fisheries 2022c). Fin whales are fast swimmers and are most commonly found in groups of two to seven individuals, although they have been observed feeding in larger groups of mixed species (Hayes et al. 2022; NOAA Fisheries 2022c).

Fin whales in the Project area would be expected to be part of the Western North Atlantic stock, which is comprised of fin whales off the eastern coast of the United States, Nova Scotia, and the southeastern coast of Newfoundland. The best abundance estimate available for the Western North Atlantic fin whale stock is 6,802 individuals (Hayes et al. 2022). Like most other whale species present along the United States east coast, ship strikes, and fisheries entanglements are perennial causes of serious injury and mortality, although contaminants and climate-related changes may impact this population as well (Hayes et al. 2022).The Western North Atlantic population is listed as a strategic stock under the MMPA because it is listed as an endangered species under the ESA. Critical habitat has not been designated by the ESA for fin whales in the western Atlantic (NMFS 2022).

The range of the Western North Atlantic stock of fin whales extends from the Gulf of Mexico and Caribbean Sea to the southeastern coast of Newfoundland in the north (Hayes et al. 2022). Generally, fin whales migrate from the Arctic and Antarctic coastal feeding areas in the summer to deeper tropical breeding and calving areas in the winter (NOAA Fisheries 2022c). During migration, they generally travel in open seas away from coastal areas. However, calving, mating, and wintering locations are unknown for most of the fin whale population, and data from the north Pacific indicates that fin whales may not undergo large-scale annual migratory movements (Hayes et al. 2022). Recent acoustic and visual surveys indicate that fin whales are relatively abundant in the region of the Lease area, compared to other baleen whale species (Williams et al. 2015a; H. Bailey et al. 2018a; S. Barco et al. 2015). Fin whales were most abundant in the region of the Lease area during the winter and early spring (Williams et al. 2015c; S. Barco et al. 2015) but are present in the area during all seasons, with lowest abundances likely occurring in summer and early fall (H. Bailey et al. 2018b).

<u>Sei Whale (*Balaenoptera borealis*)</u>

Sei whales are large sleek-bodied baleen whales that can reach 12 to 18 m (40 to 60 ft) in length (NOAA Fisheries 2022f). This species is dark-bluish gray to black in color, with a pale underside, and is usually observed in small groups of two to five individuals (NOAA Fisheries 2022f). Sei whales are largely planktivorous, feeding primarily on euphausiids and copepods, but will also feed on small schooling fishes and cephalopods (NOAA Fisheries 2022f). Sei whales capture maneuverable prey (e.g., fish and euphausiids) in surface and subsurface waters (Segre et al. 2021). The sei whale is often observed in deeper waters characteristic of the continental shelf edge region (Hain et al. 1985), though they have been observed to make episodic and unpredictable incursions into shallower inshore waters (Hayes et al. 2022).

Sei whales found in United States mid-Atlantic waters belong to the Nova Scotia stock, which includes the continental shelf waters north to Newfoundland (Hayes et al. 2022). The best abundance estimate available for the Nova Scotia sei whale stock is 6,292 individuals (Hayes et al. 2022). The Nova Scotia sei whale stock is listed as a strategic stock under the MMPA because this species is listed as endangered under the ESA. There are currently no critical habitat areas established for the sei whale.

In United States waters, sei whales are generally found in the Gulf of Maine and in the region of George's Bank (Hayes et al. 2022). The distribution and movement patterns of the sei whale are not well known, but this species is believed to migrate from temperate and subpolar summer feeding grounds to wintering grounds in tropical and subtropical latitudes (NMFS 2021). Sei whales are most commonly observed in United States waters near George's bank in the spring (Hayes et al. 2022). This species was also commonly detected in northern areas, including feeding grounds from southern New England to the Scotian Shelf, during late summer and fall (Davis et al. 2020). In winter months, sei whale acoustic detections were recorded along the entire United States coastline, though detections in the Southeastern United States were generally limited to offshore areas (Davis et al. 2020). Sei whales' mate and give birth during the winter, though specific breeding locations are currently unknown (NOAA Fisheries 2022f). Recent visual and acoustic surveys did not yield any confirmed sightings or detections of sei whales in the region of the Lease area (Williams et al. 2015c; H. Bailey et al. 2018b; S. Barco et al. 2015) though this species was sighted once during surveys of the mid-Atlantic (Williams et al. 2015a) and was acoustically detected in the Lease area in October 2021 (WHOI 2022) .

<u>Blue Whale (*Balaenoptera musculus*)</u>

Blue whales' range throughout the world's oceans, with the exception of Arctic waters, and are the largest animal that has ever existed (NOAA Fisheries 2022b). Individuals in the subspecies *Balaenoptera musculus musculus*, which are found in the North Atlantic and the North Pacific, can reach lengths of over 27 m (90 ft) (NOAA Fisheries 2022b; S.A. Hayes et al. 2020). Blue whales are slender and mottled blue gray in color and are most frequently observed alone or in pairs in deeper continental shelf, slope, and open ocean habitats (USDOI and BOEM 2012; NOAA Fisheries 2022b). Blue whales feed primarily on krill, though they will occasionally consume copepods and fish (NOAA Fisheries 2022b). In the North Atlantic, blue whales are most frequently encountered in the waters off eastern Canada and are only occasional visitors in EEZ zone waters (Wenzel, Mattila, and Clapham 1988; CeTAP 1982).

Blue whales observed in United States Atlantic waters belong to the western North Atlantic Stock (S.A. Hayes et al. 2020). The best available abundance estimate for this stock of blue whales is 402 individuals (S.A. Hayes et al. 2020). This estimate is based upon a catalogue of photo-identified blue whale individuals from the Gulf of Saint Lawrence compiled between 1980 to 2008 (S.A. Hayes et al. 2020). Though ship strikes and fisheries entanglements are regarded as threats to this species, there have been no recent observations of fishery-related mortalities or serious injuries to blue whales in United States Atlantic EEZ or Atlantic Canadian waters (S.A. Hayes et al. 2020). Blue whales are listed as endangered under the ESA and there are currently no critical habitat areas established for this species.

The distribution and migratory patterns of north Atlantic blue whales are not well known, though individuals generally travel from summer feeding grounds to winter breeding grounds, and abundance is largely driven by the availability of prey species (NOAA Fisheries 2022b). In the northwestern Atlantic, blue whales are most commonly found in the Gulf of Saint Lawrence in spring, summer, and fall, and in waters off of southern Newfoundland in winter (S.A. Hayes et al. 2020). Infrequent sightings of blue whales in the Atlantic EEZ have generally occurred in late summer (July/August), and this region may represent the southern limit of the species' range (S.A. Hayes et al. 2020). The blue whale is generally considered to be absent from mid-Atlantic waters (USDOI and BOEM 2012), and recent visual and acoustic surveys did not yield any confirmed blue whale detections or sightings in the region of the Lease area (S. Barco et al. 2015; Williams et al. 2015c, 2015a). Blue whales tend to occur in more northern regions of the Atlantic, and offshore at or beyond the continental shelf break, and therefore are unlikely to be found in the Lease area. However, this species could be encountered by vessels transiting to the Lease area from overseas ports.

<u>Sperm Whale (*Physeter macrocephalus*)</u>

The sperm whale is the largest of all toothed whales; males can reach 16 m (52 ft) in length and weigh over 40,823 kg (45 tons), and females can attain lengths of up to 11 m (36 ft) and weigh over 13,607 kg (15 tons) (Perrin, Wursig, and Thewissen 2002). This species tends to be uniformly dark gray in color, though lighter spots may be present on the ventral surface. Sperm whales frequently dive to depths of over 400 m (1,300 ft) in search of their prey, which includes large squid, fishes, octopus, sharks, and skates (Perrin, Wursig, and Thewissen 2002). Sperm whales have a worldwide distribution in deep water and range from the equator to the edges of the polar ice packs (H Whitehead 2002). Sperm whales form stable social groups and exhibit a geographic social structure; females and juveniles form mixed groups and primarily reside in tropical and subtropical waters, whereas males are more solitary and wide-ranging and are found at higher latitudes (H Whitehead 2002; H. Whitehead 2003).

Though Reeves and Whitehead (1997) and Dufault et al. (1999) suggest that sperm whale populations lack clear geographic structure, all sperm whales found off the United States Atlantic coast are part of the North Atlantic stock. The best recent population estimate for the North Atlantic stock of sperm whale is 4,349 individuals (S.A. Hayes et al. 2020). This stock is classified as depleted and strategic under the MMPA (S.A. Hayes et al. 2020), and sperm whales are also listed as endangered under the ESA. There are no critical habitat areas designated for the sperm whale (S.A. Hayes et al. 2020).

Sperm whales mainly reside in deep-water habitats on the OCS, along the shelf edge, and in mid-ocean regions (S.A. Hayes et al. 2020). Sperm whale migratory patterns are not well defined. However, in United States Atlantic EEZ waters sperm whales appear to exhibit seasonal movement patterns (CeTAP 1982; T.M. Scott and Sadove 1997). Sperm whales are concentrated to the east and north of Cape Hatteras during winter months (S.A. Hayes et al. 2020). This distribution shifts northward in spring, when sperm whales are most abundant in the central portion of the mid-Atlantic Bight to the southern region of Georges Bank (S.A. Hayes et al. 2020). In summer, sperm whale distribution expands to include the area east and north of Georges Bank and the continental shelf to the south of New England, and in fall sperm whales are most abundant on the continental shelf to the south of New England and remain abundant along the continental shelf edge in the mid-Atlantic Bight (S.A. Hayes et al. 2020). Recent visual and acoustic surveys did not yield any confirmed sightings or detections of sperm whales in the region of the Lease area (S. Barco et al. 2015; H. Bailey et al. 2018b; Williams et al. 2015c) or in the mid-Atlantic (Williams et al. 2015a).

<u>West Indian Manatee (*Trichechus manatus*)</u>

The west Indian manatee is federally listed as threatened. Although individual sightings of manatees have occurred in the mid-Atlantic in summer months, and even as far north as Massachusetts, warm weather sightings are most common in Florida and coastal Georgia (Rathbun, Bonde, and Clay 1982; Schwartz 1995; Fertl et al. 2005; USFWS 2021d). West Indian manatees are a sub-tropical species and cannot tolerate temperatures below 20°C (68°F) for extended periods of time. It is highly unlikely that this species will be encountered in the Project area.

5.14.4 Sea Turtles

Five species of sea turtle, all of which are listed as endangered or threatened under the ESA, have the potential to utilize the Project area. These species include the loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*), green (*Chelonia mydas*), Kemp's ridley (*Lepidochelys kempii*), and hawksbill (*Eretmochelys imbricata*) turtle.

Impacts to sea turtles are discussed in Section 5.9.2. and mitigation and monitoring measures are presented in Section 5.9.3.

Loggerhead Turtle (*Caretta caretta*)

Loggerhead turtles can reach 1 m (3 ft) in length, have a reddish-brown, slightly heart shaped carapace, and feed primarily upon hard-shelled prey including mollusks, crabs, and horseshoe crabs (NOAA Fisheries 2017e). This species has a circumpolar distribution, and inhabits continental shelves, bays, estuaries, and lagoons throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans (Dodd 1998). Loggerheads occur in continental shelf waters of the Northwest Atlantic from Florida to Nova Scotia (USFWS and NOAA Fisheries 2008), although their presence varies seasonally due to changes in water temperature (Shoop and Kenney 1992; Epperly, Braun, and Chester 1995; Epperly, Braun, and Veishlow 1995; Braun-McNeill and Epperly 2004).

Loggerhead turtles occurring off the Atlantic coast of the United States belong to the northwest Atlantic Ocean Distinct Population Segment (DPS). The most recent regional abundance data for the loggerhead turtle was collected in 2010. The preliminary regional abundance was approximately 588,000 individuals based on only positive identifications of loggerhead sightings, and approximately 801,000 individuals based on positive identifications and a portion of unidentified turtles from the survey (National Marine Fisheries Service Northeast Fisheries Science Center 2011). The primary threat to loggerhead turtle populations worldwide is incidental capture in fishing gear, primarily in longlines and gillnets, but also in trawls, traps and pots, and dredges (NOAA Fisheries 2017e). Loggerhead sea turtles in the northwest Atlantic Ocean DPS are listed as threatened under the ESA. There are 38 critical habitat areas designated for this DPS of loggerhead sea turtles, including nearshore reproductive habitat, *Sargassum* habitat, migratory corridors, breeding areas and wintering habitat. However, all critical habitat areas are located to the south of the Project area.

Adult loggerheads migrate seasonally from nesting beaches to foraging grounds (T.E.W.G. TEWG 2000b). Though it is rare for this species to nest north of Virginia, a limited number of loggerhead nests have been observed in Maryland and Delaware (NPS 2017; DNREC 2018a). During spring and summer months, loggerhead turtles are abundant in coastal waters off New York and the mid-Atlantic states and are found as far north as New England (S.J. Morreale and Standora 1989). In late September through mid-October, loggerhead turtles begin to migrate southward to coastal areas off the south Atlantic states, particularly from Cape Hatteras, North Carolina, to Florida (S.J. Morreale and Standora 1989; Musick, Barnard, and Keinath 1994).

During the winter, loggerhead turtles tend to aggregate in warmer waters along the western boundary of the Gulf Stream off Florida (N. B. Thompson 1988), or hibernate in bottom waters and soft sediments in channels and inlets along the Florida coast (Ogren and McVea Jr. 1981; Butler, Nelson, and Henwood 1987). As coastal water temperatures warm in the spring, loggerheads begin to migrate to inshore waters of the southeast United States and move up the United States Atlantic coast (Epperly, Braun, and Chester 1995; Epperly et al. 1995; Braun-McNeill and Epperly 2004). Recent multi-year surveys specific to the Lease area and the surrounding nearshore waters indicate that loggerhead sea turtles are common between May and October (Williams et al. 2015c). This species was the most frequently observed turtle in the Lease area; loggerheads accounted for 93 percent of all turtles identified to species during the VAQF survey (S. Barco et al. 2015). Loggerheads appear to enter the area beginning in mid-May and leave the region when water temperatures drop in October (S. Barco et al. 2015).

Leatherback Turtle (*Demochelys coriacea*)

Leatherbacks are the largest living turtles, reaching up to 2 m (6.5 ft) in length, and are the only sea turtle that lacks a hard, bony shell (NOAA Fisheries 2017d). The leatherback gets its name from its distinctive longitudinally ridged carapace, which is composed of layers of oily connective tissue overlain on loosely interlocking dermal bones (NOAA Fisheries 2017d). This species is the most wide-ranging of all sea turtles, and is found in tropical, subtropical, and cold-temperate waters (USFWS and NOAA Fisheries 1992; Carriol and Vader 2002).Unlike most other sea turtles, which feed upon hard-shelled organisms, leatherbacks consume soft bodied prey, including salps and jellyfish (NOAA Fisheries 2017d).

Leatherback turtles found along the eastern United States Atlantic coast belong to the northwest Atlantic DPS. Like all other DPSs, the northwest Atlantic leatherback DPS is at high risk of extinction (USFWS and NOAA Fisheries 2020). The best available estimate of nesting female leatherback abundance in the NW Atlantic DPS is 20,659 females, 1,694 of which nest in the United States (USFWS and NOAA Fisheries 2020). This estimate includes all nesting areas utilized by the DPS, largely concentrated from Florida throughout the wider Caribbean region (Dow et al. 2007). Threats to leatherback sea turtles include fisheries bycatch, habitat loss, vessel strikes, incidental ingestion of marine debris, legal and illegal harvest of turtles and eggs, climate change, disease, oil and gas activities, and coastal development, among others (USFWS and NOAA Fisheries 2020). Leatherback turtles are currently listed as endangered under the ESA. There are no critical habitat areas designated for the leatherback sea turtle along the United States Atlantic coast.

Leatherback turtles are highly migratory, exploiting convergence zones and upwelling areas in the open ocean, along continental margins, and in archipelagic waters (S. Morreale et al. 1994; S. A. Eckert 1999). In the north Atlantic Ocean, leatherback turtles regularly occur in deep waters (>100 m (328 ft)) but are also sighted in coastal areas of the United States continental shelf (USFWS and NOAA Fisheries 1992). Leatherback turtle seasonal movement patterns are dictated by sea surface temperatures (Davenport and Balazs 1991; Luschi et al. 2006). Following breeding and nesting in Florida and the tropical Caribbean, leatherback turtles in the northwestern

Atlantic DPS move northward and westward beyond the shelf break in the spring. During the summer months, leatherbacks move into fairly shallow coastal waters, apparently following their preferred jellyfish prey. Leatherbacks become more numerous off the mid-Atlantic and southern New England coasts in late spring and early summer, and by late summer and early fall, leatherbacks may be found in the waters off eastern Canada (CeTAP 1982; Shoop and Kenney 1992; N.B. Thompson et al. 2001; James et al. 2006). In response to cooling sea surface temperatures in the fall, leatherback turtles move offshore and begin a southward migration to their winter breeding grounds (Payne, Selzer, and Knowlton 1984). Recent multi-year surveys specific to the Lease area and the surrounding nearshore waters indicate that leatherback sea turtles routinely occur between May and October (Williams et al. 2015c; S. Barco et al. 2015). This species was infrequently detected in spring and was most abundant in the Lease area in summer and fall (S. Barco et al. 2015). The MABS survey identified September and October as the peak period of leatherback occurrence in the Project area (Williams et al. 2015c, 2015a).

Green Turtle (*Chelonia mydas*)

The green turtle is the largest hard-shelled sea turtle and can reach over 1 m (3 ft) in length (NOAA Fisheries 2017b). This species has an oval carapace that is variable in color and can be green, brown, yellow, gray, or black (NOAA Fisheries 2017b). Unique among sea turtles, the adult green turtle is exclusively herbivorous and eats seagrass and algae (NOAA Fisheries 2017b). Green turtles are found worldwide, and are known to occur in temperate waters, though they are generally found in tropical and subtropical regions (NOAA Fisheries 2017b; National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991).

Green turtles in waters along the eastern United States Atlantic coast belong to the north Atlantic DPS. Estimates of the population size of the north Atlantic DPS of green turtles are unavailable. Current human-caused threats to green sea turtles include destruction of nesting habitats, noise and light pollution on coastal beaches, boat strikes, disease, and entanglements with fishing gear and marine debris (USDOC 2007; Epperly, Braun, and Chester 1995; TEWG 2000a; NOAA Fisheries 2017b). The north Atlantic DPS of Green turtles is listed as threatened under the ESA. The only designated critical habitat area for green sea turtles surrounds an island off the coast of Costa Rica and is far to the south of the Project area (NOAA Fisheries 2017b).

In the western North Atlantic, green turtles are found in inshore and nearshore waters from Texas to Massachusetts (NOAA Fisheries 2017b). Like other sea turtles, green turtles display highly migratory behavior, making seasonal coastal and annual transoceanic migrations(Godley et al. 2003; Godley et al. 2008; Godley et al. 2010). However, green turtles appear to occupy smaller home ranges than other sea turtle species (Seminoff, Resendiz, and Nichols 2002; Makowski, Seminog, and Salmon 2006; Broderick et al. 2007). This species generally feeds in shallow lagoons, inlets, reefs, shoals, and bays that have abundant algae or sea grass (USDOC 2007). Females nest between June and September on mainland or island sandy beaches along the southeastern United States coast and are not known to nest as far north as the mid-Atlantic states (NOAA Fisheries 2017b). Though green turtles are reported to use the coastal waters of North Carolina and Virginia as summer foraging habitat (Mansfield et al. 2009), this species is generally classified as uncommon in the mid-Atlantic and is usually a transient species present during the summer and fall. The only designated critical habitat area for green sea turtles surrounds an island off the coast of Costa Rica and is far to the south of the Project area (NOAA Fisheries 2017b). Recent surveys of the Lease area and surrounding waters indicated that green turtles were the second most frequently observed turtle species in the Maryland WEA in the VAQF study; they accounted for five percent of all turtles identified to species and were most abundant during the summer (S. Barco et al. 2015). In contrast, green turtles were uncommonly observed in Maryland waters during the MABS survey; only five were identified over the duration of the study (Williams et al. 2015c).

Kemp's Ridley Turtle (*Lepidochelys kempii*)

The Kemp's ridley turtle has a nearly circular grayish-green carapace and is the smallest sea turtle in the world, reaching only 60 to 70 cm in length (24 to 28 in). This species feeds primarily on swimming crabs, but will also consume fish, jellyfish, and mollusks (NOAA Fisheries 2017c). Kemp's ridley turtles primarily reside in the nearshore neritic zone, and rarely venture into waters deeper than 50 m (160 ft) (NOAA Fisheries 2017c; Byles, Nelson, and Henwood 1994).

The most recent estimate of the Kemp's ridley turtle population is 7,000 to 8,000 nesting females (USFWS and NOAA Fisheries 2007). As this species is female biased, there are likely several thousand additional males (USFWS and NOAA Fisheries 2007). Kemp's ridley sea turtles exhibit unique nesting behavior observed in only one other sea turtle species; during events called "arribada" female turtles arrive onshore in large, synchronous aggregations to nest (NOAA Fisheries 2017c). This species nests almost exclusively in the western Gulf of Mexico, primarily in the states of Tamaulipas and Veracruz, Mexico (BOEM 2014). Recent data indicate a decrease in the number of Kemp's ridley nests since 2010 (NOAA Fisheries 2017c). Like other sea turtle species, the Kemp's ridley is threatened by habitat loss (specifically of nesting beaches in the Gulf of Mexico), commercial fishery gear entanglement, disease, climatic changes, and pollution (USDOI and USFWS 1999). The Kemp's ridley turtle is listed as endangered under the ESA. There are no critical habitat areas designated for the Kemp's ridley sea turtle, though petitions to designate areas on the Texas coast and marine habitat in the Gulf of Mexico are currently being reviewed.

The Kemp's ridley sea turtle is found most commonly along the eastern coast of North America, from the Gulf of Mexico to Nova Scotia (NOAA Fisheries 2017c; BOEM 2014). After nesting and breeding in Mexico, this species travels to foraging grounds in shallow coastal waters, embayment's, and estuarine systems along the Atlantic seaboard, where they remain for the duration of the spring and summer (BOEM 2014). The Kemp's ridley is present in areas including Chesapeake Bay, Pamlico Sound, Charleston Harbor, and Delaware Bay during the summer (USFWS and NOAA Fisheries 2007) and is the second most common turtle reported off the coast of Virginia (VIMS 2014). Kemp's ridley turtles begin leaving northern areas in mid-September, and most have departed for warmer southern waters by the beginning of November (Burke, Standora, and Morreale 1989; S.J. Morreale and Standora 1989). Wintering habitats for Kemp's ridley turtles include shelf habitats off of Florida and waters south of Cape Hatteras, North Carolina

(Gitschlag 1996). Kemp's ridley turtles occur in the Project area but were infrequently observed during recent multi-year surveys of the Lease area and surrounding waters (S. Barco et al. 2015). Most observations of this species in the Project area were reported in September and October (Williams et al. 2015c).

Hawksbill Turtle (*Eretmochelys imbricata*)

Hawksbill turtles can reach 65 to 90 cm in length (26 to 35 in) and have highly patterned amber and brown shells and distinctive beak-like mouths (NOAA Fisheries 2021c). This species has a circumtropical distribution in the Atlantic, Pacific, and Indian Oceans (NOAA Fisheries 2021c). Adult hawksbill turtles are most commonly found in shallow coastal areas on healthy coral reefs, though juveniles live in pelagic waters, and utilize floating algal mats for shelter (NOAA Fisheries 2021c; USDOI and USFWS 2018a). This species feeds primarily on sponges, but will also consume algae, mollusks, crustaceans, jellyfish, and other marine organisms (NOAA Fisheries 2021c).

No DPSs have been established to date for the hawksbill turtles (NOAA 2013). Estimating hawksbill turtle populations and evaluating trends is difficult, as this species nests in low densities on small beaches (NOAA Fisheries 2021c). Current estimates place the number of hawksbill nests laid in United States at 600 to 1,150 nests, located in Puerto Rico and the United States Virgin Islands (NOAA Fisheries 2021c). Nesting is rare in the continental United States and is limited to the Florida Keys and the southeastern shore of Florida (NOAA Fisheries 2021c). Historical declines in hawksbill turtle populations were largely driven by harvest of these animals for their beautifully patterned shells, which were used to make a variety of decorative products (USDOI and USFWS 2018a). The hawksbill is threatened by habitat loss (specifically of coral reef habitats), entanglement in commercial fishing gear, disease, vessel strikes, incidental ingestion of marine debris, and intentional harvest (NOAA Fisheries 2021c). The hawksbill turtle is listed as endangered under the ESA. Critical habitat for the Hawksbill turtle has been designated around Mona Island, located to the west of Puerto Rico (NOAA 1998).

In the western Atlantic, hawksbill turtles are largely confined to tropical and subtropical waters, and are found in the Gulf of Mexico, the Caribbean, and the waters surrounding Puerto Rico, the United States Virgin Islands, and southern Florida (NOAA Fisheries 2021c). This species is regarded as uncommon north of Florida (BOEM 2014) and rare in the mid-Atlantic (USDOI and BOEM 2012), though deceased individuals have rarely been reported from as far north as Cape Cod (Mass DFW 2019). Hawksbill turtles are believed to exhibit a mixed migratory strategy, with some individuals traveling great distances between nesting beaches and foraging areas (generally nesting between April and November), and others remaining in proximity to their natal beaches (NOAA 2013). Hawksbill turtles were very rarely observed during recent multi-year studies of the Lease area and surrounding waters (only two confirmed sightings of this species were recorded in October 2012, (Williams et al. 2015c, 2015a). Due to the rarity of this species in the region, it is highly unlikely that Project activities would impact hawksbill turtles (USDOI and BOEM 2012). However, vessels transiting to the Project area from ports in the Gulf of Mexico or Caribbean may encounter this species.

5.14.5 Terrestrial Vegetation

Three plant species that may occur in the Project area are listed as federally threatened or endangered or are state listed (Table 5.13-1) including seabeach amaranth (*Amaranthus pumilus*) swamp pink (*Helonias bullata)*, and evergreen bayberry (*Morella caroliniensis*).

Potential impacts on plant species can be found in Section 5.11.1

Seabeach Amaranth (*Amaranthus pumilus)*

The threatened seabeach amaranth is an annual plant species typically found in the lower foredunes of sandy beaches on the Atlantic coast (USDOI and USFWS 2018d). Seeds germinate as early as May, and plants flower as early as June and occasionally as late as December (USDOI and USFWS 2018d). Seabeach amaranth was historically found on barrier islands throughout the Atlantic coast from South Carolina to Massachusetts (USDOI and USFWS 1993). When all known populations were lost outside of New York, North and South Carolina, the species was proposed and accepted for ESA listing in 1993 (USDOI and USFWS 1993; Maryland Natural Heritage Program 2021).

Populations in Sussex County, Delaware have since been identified, although they are declining. Hundreds of seedlings have been planted north of the Project area at Delaware Seashore State Park to help restore a self-sustaining population (USDOI and USFWS 2018e). The area around the Barrier Beach Landfalls also provides suitable habitat for this species. Recent numbers in Delaware have fluctuated between a few dozen and a few hundred plants per year since 2000 (USDOI and USFWS 2018e).

The species is highly sensitive to habitat alteration and fragmentation, but because all known populations occurred on private lands at the time of listing, critical habitat has not been designated for this species (USDOI and USFWS 1993). Beach maintenance activities, including grooming and shoreline stabilization, threaten the continued existence of seabeach amaranth. Erosion, flooding, herbivory, competition, and all-terrain vehicle use during the plant's flowering and fruiting also stress seabeach amaranth populations.

Evergreen Bayberry (*Morella caroliniensis*)

The evergreen bayberry, also referred to as southern bayberry or small bayberry, is a perennial shrub species that is listed as endangered by the State of Maryland. It is typically found in man-made or disturbed habitats, dunes, forest edges, meadows and fields, ridges, and ledges (Native Plant Trust 2021).

The plant consists of woody stems that grow from the base with waxy, aromatic leaves. Over winter, the leaves will either drop off the plant or will wither and persist, and new leaves will sprout in spring. Bark along the woody stems ranges from white to grey and is generally smooth (Native Plant Trust 2021).

Although evergreen bayberry is native to Maryland and Delaware, it is classified by Maryland as S1, Critically Imperiled/Highly State Rare due to restricted range, few populations or occurrences, steep declines, or severe threats. Evergreen bayberry is known to occur in less than five populations across the state of Maryland (Maryland Natural Heritage Program 2021).

<u>Swamp Pink *(Helonias bullata)*</u>

Swamp pink is a federally threatened plant species and is listed as endangered in the state of Maryland (U.S.F.a.W.S. USFWS 2022). It has smooth, oblong, dark green leaves that form an evergreen rosette with a flowering stalk that can grow over three feet tall (U.S.F.a.W.S. USFWS 2022). The stalk is topped by a 1- to 3-in cluster of pink flowers dotted with blue anthers (U.S.F.a.W.S. USFWS 2022).

Swamp pink is found in perennially saturated, spring-fed, nutrient-poor, shrub swamps and forested wetlands (Virginia DCR n.d.). It requires stable water levels and can tolerate only brief or infrequent flooding (Virginia DCR n.d.). Swamp pink is found in New Jersey, Delaware, Maryland, Virginia, the Carolinas, and Georgia and is found primarily in coastal plains and mountains (Virginia DCR n.d.).

Swamp pink reproduces primarily by vegetative means. Relatively few plants reach the flowering stage and reproduce via seeds, and very few seeds and seedlings survive (Virginia DCR n.d.), Seed dispersal is limited, although high fat content allows the seeds to float which may contribute to higher dispersal (Virginia DCR n.d.).

Swamp pink is wetland-dependent and activities which have impacts on water quality and quantity may impact swamp pink survival (Virginia DCR n.d.). Activities that increase sedimentation, pollutant runoff, or flooding may negatively impact the species (Virginia DCR n.d.).

5.14.6 Terrestrial Mammals and Insects

One mammal species, the northern long-eared bat (NLEB, *Myotis septentrionalis*) is listed as federally threatened and has the potential to occur in the Project area. One insect species, the monarch butterfly (*Danaus plexippus*), is currently listed as a federal candidate species (Table 5.13-1). A candidate species is recognized as those species for which sufficient information is available to support a proposal for listing as federally endangered or threatened, but for which preparation and publication of a proposal is precluded by higher priority listing actions by USFWS (50 CFR 424.15).

Mitigation and monitoring measures as relate to these mammal and insect species are presented in Section 5.11.5.

Northern Long-eared Bat (*Myotis septentrionalis*)

One federally listed bat species, the NLEB, may occur in Delaware and eastern Maryland. The endangered NLEB was subject to a 4(d) rule under ESA 8 FR 1900 (Table 5.13-1). However, on November 30, 2022, the USFWS published a final rule to the FR (87 FR 73488) to uplist the status of the NLEB from threatened to endangered. The final rule listing this species as endangered was set to go into effect after 60 days from publishing in the FR on January 30, 2023 (50 CFR Part 17). On March 31, 2023, the NLEB was officially listed as endangered under the ESA.

The NLEB is a medium-sized bat that has been listed as endangered at the federal level due to summer habitat loss or degradation, impacts to hibernacula, and white-nose syndrome. White-nose syndrome poses the most severe and immediate threat to NLEB and is the primary reason for the species listing (USDOI and USFWS 2018c).

Northern long-eared bats are widely distributed in the eastern United States and Canada, with the exception of the far southeastern United States (USDOI and USFWS 2018c). During summer months reproductive females roost singly or in colonies in wooded areas, while nonreproductive females and males roost in cooler places such as caves and mines (DNREC 2012; USDOI and USFWS 2018c). Typically, NLEB migrate to their hibernacula sites (caves and abandoned mines) in August and September, and then enter hibernation around October and November. In April, the bats emerge from hibernation and migrate back to their summer habitat where they feed on insects. Suitable summer habitat for NLEB includes a wide variety of forested habitats, adjacent and interspersed non-forested habitats (i.e., emergent wetlands, adjacent edges of agricultural fields, old field, and pastures), forests and woodlots containing potential roosts (live trees and/or snags ≥3 in diameter at breast height (dbh) with exfoliating bark, cracks, crevices, and/or cavities), and other wooded areas with variable amounts of canopy closure (DNREC 2012; USDOI and USFWS 2018c).

Based on a review of the IPaC online database, NLEB is not expected to occur in the vicinity of the onshore substations or the offshore export landfall. However, suitable habitat is present elsewhere in the Project area, and it is possible that NLEB could occur in the area.

Bethany Beach Firefly (*Photuris bethaniensis*)

The Bethany beach firefly is a small, tan firefly with dark brown or black markings that is endemic to the Delaware coast. It is easily identified by its distinct flash pattern of two green flashes. The insect is listed as endangered by the State of Delaware and is under review for listing under the Endangered Species Act by USFWS (University of Minnesota Department of Entomology N.d.).

The fireflies have very specific habitat needs and require freshwater interdunal swale wetland habitats within 500 m of the coast (DEDFW 2015). Their habitat is at risk of saltwater intrusion from storm surges, rising sea levels, and land development (University of Minnesota Department of Entomology N.d.).

Impacts to the Bethany Beach firefly are discussed in Section 5.5.

Monarch Butterfly (*Danaus plexippus*)

As of December 2020, the monarch butterfly (*Danaus plexippus*) (87 FR 26152 26178) became a candidate for listing, due to decreasing population size as a result of habitat loss and fragmentation (USFWS 2021c).

The monarch butterfly population is known or is believed to occur in almost all of the United States, including Pennsylvania, Delaware, and Maryland. Typically, monarchs breed year-round and if in temperate climates, can undergo long-distance migration and live for an extended period of time. In the fall in eastern North America, monarchs begin migrating to their respective overwintering sites. Monarchs can migrate distances over three thousand kilometers.

Impacts to the monarch butterfly are discussed in Section 5.12.

5.14.7 Avifauna

Five coastal species that are classified as threatened or endangered under the federal ESA may be found in the Project area and are discussed in Section 5.13. These include these avian species include roseate terns (*Sterna dougallii*), Bermuda petrel (*Pterodroma cahow*), piping plover (*Charadrius melodus*), rufa red knot (*Caldiris canutus rufa*), and eastern black rail (*Laterallus jamaicensis jamaicensis*).

Based on correspondence and consultation with the USFWS and DNREC Division of Fish and Wildlife, no federally listed species have been identified in the vicinity of the proposed Interconnection Facilities (DNREC 2017b). DNREC has noted the existence of a nearby bald eagle nest (DNREC 2017b), which is discussed in more detail in Section 5.5.

Mitigation and monitoring measures as related to avifauna are presented in Section 5.12.6.

Roseate Tern (*Sterna dougallii*)

Roseate terns (52 FR 42064) are medium-sized waterbirds that are strongly associated with coastal and marine habitats, including seacoasts, bays, estuaries, and offshore waters. Roseate terns forage mainly by plunge-diving and contact-dipping (in which the bird’s bill briefly contacts the water) or surface-dipping over shallow sandbars, reefs, or schools of fish. They are adapted for fast flight and relatively deep diving and often submerge completely when diving for fish (USDOI and USFWS 2015b). Along the Atlantic coast, roseate terns nest primarily on islands in sandy beach, open bare ground, and grassy habitats, typically near areas with cover or shelter (NatureServ 2015).

Roseate tern is a widespread but localized species in coastal habitats throughout the world. The Atlantic subspecies (*S. d. dougallii*) breeds in two discrete areas in the western hemisphere:

northeastern North America from the Canadian Maritime Provinces to Long Island, New York, and the northern Caribbean, including the Bahamas and the Florida Keys (USDOI and USFWS 1998). The northeastern population is listed as endangered by the governments of the United States and Canada, as well as by several northeastern states. Historically, the northeastern breeding population extended as far south as Virginia; however, several factors have caused the breeding range of the population to contract (USDOI and USFWS 2015b).

Northeastern roseate terns are thought to migrate through the eastern Caribbean and along the northern coast of South America to wintering grounds along the eastern coast of Brazil (USDOI and USFWS 2010). The most current abundance estimate for the northeastern population is approximately 3,200 nesting pairs (Nisbet, Gochfeld, and Burger 2014). The Caribbean breeding population is listed as threatened at the federal level. Individuals from this population are occasionally found nesting along the southeastern coast of the United States as far north as North and South Carolina (USDOI and USFWS 2015b).

The need for extending ESA protections to the roseate tern was identified based primarily on the concentration of the population into a small number of breeding sites, and to a lesser extent, observed declines in the population (USDOI and USFWS 1998). The most important factor in breeding colony loss was predation by herring gulls (*Larus smithsonianus*) and/or great black-backed gulls (*Larus marinus*). To date, critical habitat for roseate tern has not been designated by the USFWS. Roseate tern breeding colonies once existed on Assateague Island in Maryland (Stewart and Robbins 1958); however, there are currently no roseate tern breeding colonies in Maryland or Delaware. During boat and aerial surveys conducted between 1978 and 2009 this species was observed in Maryland and Delaware waters during spring months (O'Connell *et al*. 2009). Roseate tern was not detected in the WEA during the MABS surveys (Williams et al. 2015a, 2015b).

<u>Bermuda Petrel (*Pterodroma cahow*)</u>

The Bermuda petrel (35 FR 8491), also known as the cahow, is a medium-sized petrel in the tubenose family that also includes shearwaters and fulmars. Like other tubenoses, Bermuda petrels are strongly aerial and pelagic. Feeding occurs at sea and individuals come to land only to nest on a few small, rocky islands in the Bermuda Archipelago. The Bermuda petrel population declined rapidly in the years following European colonization of Bermuda due primarily to predation by introduced pests and over-exploitation by humans. The decline of the Bermuda petrel occurred so rapidly that by the early to mid-1600s the species was believed to be extinct. Scattered observations of living and deceased birds were reported in the early 20th century, prompting the organization of a formal survey effort. In 1951, seven pairs of Bermuda petrels were discovered nesting on a few small islands off Bermuda. The government of Bermuda implemented measures to conserve the species following its rediscovery, which have resulted in population gains (Madeiros, Flood, and Zufelt 2014). Nevertheless, the Bermuda petrel continues to be imperiled due to several factors, including low population size, restricted geographic range, predation, hurricanes, and climate change. Recent estimates indicate a total population of approximately 400 to 500 individuals (Madeiros 2005, 2012). In 1970, the Bermuda petrel was listed by the United States Department of the Interior under the Endangered Species Conservation Act of 1969 (35 FR 6069, 83 Stat. 275), later replaced by the ESA of 1973.

Despite its highly restricted breeding range, Bermuda petrels may occur over a relatively large area of the northwestern Atlantic Ocean during the non-breeding season. The non-breeding range of the species is poorly understood due to the low number of confirmed observations; Bermuda petrels are similar in appearance to other related species that also occur in the northwestern Atlantic and distinguishing between species at sea can be challenging. Bermuda petrels may occur in deep waters between Newfoundland and South Carolina, based on a combination of visual observations and a satellite telemetry study of twelve individuals (Madeiros 2012).

Due to the small population size and the relatively small size of the Project area relative to the potential range of Bermuda petrels in the northwestern Atlantic, this species is unlikely to occur in the Project area.

Piping Plover (*Charadrius melodus*)

The piping plover (50 FR 50726) is a small, migratory shorebird that breeds on beaches from Newfoundland to North Carolina (Elliot-Smith and Haig 2004; USDOI and USFWS 1996). According to USFWS (USDOI and USFWS 2009b), piping plovers that breed on the Atlantic coast belong to the subspecies *C. m. melodus*. The Atlantic Coast population is classified as threatened (USDOI and USFWS 2015a) and by both Delaware and Maryland as endangered (DNREC 2013; MDNR 2016). The most recent abundance estimates by USFWS estimate approximately 1,762 nesting pairs in 2011 (USDOI and USFWS 2012).

Piping plovers inhabit coastal sandy beaches and mudflats. They use open, sandy beaches close to the primary dune of barrier islands for breeding, preferring sparsely vegetated open sand, gravel, or cobble for nesting sites. They feed on marine worms, fly larvae, beetles, insects, crustaceans, mollusks, and other small invertebrates. They forage along the wrack zone, or line, where dead or dying seaweed, marsh grass, and other debris is left on the upper beach by high tides (USDOI and USFWS 2015a).

A key threat to the Atlantic coast population is habitat loss resulting from shoreline development (USDOI and USFWS 1996). Piping plovers are sensitive to human activities, and disturbances from anthropogenic activities can cause breeding birds to abandon their nests. Since the listing of this species under the ESA in 1986, the Atlantic coast piping plover population has increased 234 percent (USDOI and USFWS 2009b). Although increased abundance has reduced near-term vulnerability to extinction, piping plovers remain sparsely distributed across their Atlantic Coast breeding range, and populations are highly vulnerable to even small declines in survival rates of adults and fledged juveniles (USDOI and USFWS 2009b).

The USFWS has designated critical habitat for the wintering population of piping plovers in coastal areas south of the Project area from North Carolina to Texas (USDOI and USFWS 2001, 2008, 2009a). Some piping plovers migrate to the Bahamas and West Indies from mid-September to

March. Although precise routes of migration are not firmly established, it is possible that Piping Plovers could be present in the Project area during migration.

Rufa Red Knot *(Calidris canutus rufa)*

The rufa red knot (79 FR 73705) is a medium-sized shorebird that was added to the list of threatened species under the ESA in December of 2014 (USDOI and USFWS 2014). Its listing became effective on January 15, 2015. Large flocks of red knot migrate long distances between breeding grounds in the mid- and high-arctic and wintering grounds in southern South America (USDOI and USFWS 2013). Their northward migration through the contiguous United States occurs April to June, and their southward migration occurs July to October.

Delaware Bay is the most important spring migration stopover in the eastern United States., because it is the final place at which the birds can refuel in preparation for their nonstop journey to the Arctic (Baker et al. 2013). Red knots arriving at Delaware Bay depend on readily available and easily digestible foods such as juvenile clams and mussels and horseshoe crab eggs to restore their depleted energy reserves (USDOI and USFWS 2013).

Up to 90 percent of the entire red knot population can be present in Delaware Bay in a single day (Cornell University 2017). Although their precise migration route has not been firmly established (Niles et al. 2010), it is possible that these birds could be present in the Project area during spring and fall migrations. Due to challenges with the species' migratory habits and differing survey methods across the red knots' range, a range-wide population estimate does not exist; however, survey counts in the mid-Atlantic estimate 48,955 knots stopping in Delaware Bay (2013) and 5,547 to 8,482 knots annually stopping in Virginia (2011 to 2014) (USDOI and USFWS 2014).

Along the mid-Atlantic coast, red knots forage along sandy beaches, tidal mudflats, salt marshes, and peat banks (USDOI and USFWS 2014). In Delaware Bay, they feed primarily on horseshoe crab eggs, and the timing of their arrival at Indian River Bay typically coincides with the annual peak of the horseshoe crab spawning period in May and June (USDOI and USFWS 2014; The Nature Conservancy 2021). Red knots are also known to occur in Maryland (USDOI and USFWS 2014), although they were not observed in the MABS surveys (Williams et al. 2015c, 2015a).

Surveys of wintering red knots along the coasts of southern Chile and Argentina and during spring migration along the United States coast indicate that a serious population decline occurred in the 2000s (USDOI and USFWS 2013). This population decline has been attributed to a reduction in horseshoe crabs (Cornell University 2017; USDOI and USFWS 2013), which are harvested primarily for use as bait and secondarily to support the biomedical industry (USDOI and USFWS 2003) but serve as an essential food source for red knot. Other threats to red knot include habitat destruction resulting from beach erosion and shoreline protection and stabilization projects, the inadequacy of existing regulatory mechanisms, human disturbance, and competition with other species for limited food resources.

<u>Eastern Black Rail (*Laterallus jamaicensis jamaicensis*)</u>

The threatened eastern black rail (85 FR 63764), a subspecies of the black rail, is a small marsh bird that occurs in salt, brackish, and freshwater wetlands in the eastern United States (USFWS 2019). It was listed as threatened on October 8, 2020, with the rule becoming effective on November 9, 2020 (USDOI and USFWS 2020). Both Maryland and Delaware list this species as a black rail in their records and classify the species as endangered (DEDFW 2015; MDNR 2016).

Eastern black rail wetland habitat requires dense overhead cover, moist to saturated soils, and nearby shallow water for foraging (USFWS 2019). The species lives across the elevation gradient between the lower wetland area and the higher upland area of estuarine and palustrine marshes. The upland area serves as a refuge from predation and as a means to escape flooding. Due to their nests being built in moist soil or shallow water, flooding is a frequent cause of nest failure for eastern black rails (USDOI and USFWS 2020). This species rarely flies and runs to escape predators through the vegetation present in the wetland. eastern black rails feed on a variety of small aquatic and terrestrial invertebrates and seeds (USFWS 2019).

The eastern black rail has declined in numbers throughout the entirety of its range. Historically, Chesapeake Bay was considered an important breeding area, but the distribution and counts of the species has declined in recent studies, with study areas in Maryland experiencing a 13.8 percent annual rate of decline (Watts 2016). Past stressors include habitat degradation and fragmentation, mainly due to past conversion of marshes and wetlands into agricultural and urban areas and ditching due to mosquito control (USDOI and USFWS 2020). Current stressors include continued development in marsh and wetland areas, sea level rise due to climate change, and incompatible land management (i.e., poorly timed fires, grazing, or mechanical treatment) (USDOI and USFWS 2020).

5.15 Cultural, Historic, and Archaeological Resources

5.15.1 Offshore Marine Archeological Resources: Research Methodology & Surveys

R. Christopher Goodwin & Associates, Inc. (RCG&A), prepared a two volume marine archeological assessment, “Marine Archaeological Resources Assessment for the Maryland Offshore Wind Project Located on the Outer Continental Shelf Block OCS-A 0490 and Offshore Maryland and Delaware” (COP Appendix II-I1 [US Wind 2023]). This assessment considered high-resolution geophysical (HRG) surveys of the Lease area, Offshore Export Cable Corridors, and Onshore Export Cable Corridor 1. Volume I encompassed the Project areas that fall within federal waters, inclusive of approximately 32,256 ha (79,706.31 ac) in the Lease area and 3,009.63 ha (7,436.95 ac) in the Offshore Export Cable Corridors. Volume II contained the portions of the Offshore Export Cable Corridors that fall into state waters, which encompass 1,168.74 ha (2,888.02 ac) between the Three Nautical Mile limit and the Atlantic side of the barrier island, and Onshore Export Cable Corridor 1 in Indian River Bay, which encompassed 679.1 ha (1,677.9 ac). From the data, 13 shipwrecks were identified in the Lease area, along with 14 Ancient Submerged Landforms (ASLFs). Five shipwrecks were identified within the Offshore

Export Cable Corridors, with four of these wrecks falling within state waters and outside of the preliminary Area of Potential Effect. The evaluation of ASLFs was informed by the geotechnical campaigns, including CPTs, boreholes and VCs. Boreholes provided dateable samples to determine which landforms were likeliest to contain preserved archaeological materials.

The revised Marine Archaeological Resource Assessment was conducted to assist in compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA) (54 USC 304108), and its implementing regulations in 36 CFR 800, entitled Protection of Historic Properties and 36 CFR Parts 60 and other related Parts, entitled National Register of Historic Places. The work will also assist BOEM in its application of the National Environmental Policy Act (NEPA) of 1969 (42 USC 4321), Archaeological and Historic Preservation Act of 1974 (16 USC 469); the Abandoned Shipwreck Act of 1987 (43 U.S.C. 2101-2106); and that the work is consistent with BOEM's Guidelines for Providing Archaeological and Historic Property Information (BOEM 2020). Survey efforts for state waters have been coordinated at the state level with Delaware's State Historic Preservation Office (DE SHPO). US Wind has complied with Lease stipulations under Section 4.2, Archaeological Survey Requirements, including providing notice to applicable tribes for pre-survey meetings.

US Wind engaged with consulting parties, including Native American Tribes, to discuss the potential for seabed disturbance and associated effects to identified marine archaeological resources and options to avoid, minimize or mitigate any adverse effects to NRHP eligible resources. All potential resources have been assigned minimum avoidance zones as the principal measure of preservation. Avoidance will be achieved primarily through micro-siting, except in the case of Target 8, which will be avoided through construction planning around its avoidance area.

Disturbance to the seafloor during construction activities has the potential to encounter and cause significant, long-term and adverse effects to unidentified submerged cultural resources. Although remote sensing surveys conducted in accordance with current professional standards for cultural resource identification are expected to be highly effective in identifying submerged cultural resources, the possibility of encountering an unidentified and unanticipated submerged cultural resource is always present during dredging and construction activities. As a result, US Wind will implement an Unanticipated Discoveries Plan, including archaeological resource identification training.

A public, non-technical summary of the marine archeological resource assessment is provided as Appendix II-I1a in the COP.

5.15.2 Terrestrial Archeological Resources: Research Methodology & Surveys

The Project has the potential to impact terrestrial archeological sites or historic built resources through disturbance or displacement from construction and operations onshore at the Barrier Beach Landfalls, Onshore Export Cable Corridors, US Wind substation locations, and the O&M Facility. RCG&A has prepared a Terrestrial Archaeology Resource Assessment (COP Appendix II-I2 [US Wind 2023]) for the maximum Area of Potential Effect, including a February 2023 Phase

I site investigation at the location of US Wind Substations to identify potential resources and mitigation measures. Due to ongoing land negotiations, a shift in the US Wind Substations resulted in a portion of the revised APE that was not included in the Phase I site investigation. Supplemental Phase I survey is underway.

US Wind planned onshore Project elements in areas currently disturbed and at locations that avoid known terrestrial archeological resources.

Avoidance will be confirmed during construction by implementation of an approved Onshore Construction Monitoring Plan as well as archeological and tribal monitors, as appropriate. Similar to marine resources, there is potential to encounter unidentified and unanticipated cultural resources. Therefore, US Wind will implement an Unanticipated Discoveries Plan, including archaeological resource identification training.

A public, non-technical summary of the terrestrial archeological resource assessment wis included as Appendix II-I2a in the COP.

5.15.3 Visual Impacts to Historical Resource Analysis

Section 5.15 and the Historic Resources Visual Effects Analysis, provided as COP Appendix II-I3 [US Wind 2023]), address visual and viewshed impacts to historic resources.

5.15.4 Impacts of Alternatives

For cable installation in any of the terrestrial routes (i.e., Onshore Export Cable Corridor 1a, 1b, 1c, or 2) there may be impacts to cultural, historic, or archaeological resources that fall along or adjacent to the selected route. Onshore Export Cable Corridor 2 traverses areas close to the Indian Mission School (or the Nanticoke Indian Center) and Nanticoke tribal areas and road closures during the installation of the cables would temporarily limit access to these sites and potentially impact the visual character of the site if construction vehicles and work is visible from the resource.

The alternative cable corridors are largely situated within previously disturbed ROW's reflecting areas of low archaeological sensitivity. However, all of the alternative corridors traverse landscapes that were well occupied historically and traverse environments known to have been used extensively by Indigenous groups both historically and during the precontact periods. As such, portions of the alternative corridors that extend outside of the disturbed ROWs and occupy any undisturbed land were generally classified as locations of high or moderate archaeological sensitivity. Additional archaeological investigations would be needed should any of these alternative routes be selected for construction. Assuming any cultural resource sites could be avoided, once construction and installation is complete, there would be no permanent impacts to cultural, historic, or archaeological resources, as all cables would be installed underground.

5.15.5 Mitigation and Monitoring

Proposed mitigation and monitoring measures are refined based on the results of the Marine Archaeology Resource Assessment (COP Appendix II-I1 [US Wind 2023]), the Terrestrial Archaeology Resource Assessment (COP Appendix II-I2 [US Wind 2023]) and the Historic Resources Visual Effects Analysis (COP Appendix II-I3 [US Wind 2023]). US Wind will assess additional avoidance or mitigation measures if they arise under the Section 106 consultation process.

- The results of HRG and geotechnical surveys have been used to identify potential marine cultural resources and preserved submerged landforms. by micro-siting Project elements and planning construction around established avoidance areas.
- Mitigation measures commensurate with potential adverse effects to historic properties impacted by views to the Project are proposed in a Historic Preservation Treatment Plan, through continuing coordination with SHPOs and consulting parties.
- Planning has taken into account previously recorded cultural resources and areas of high archaeological probability, as well as the extent of prior disturbance, in order to minimize project impacts to known or potential archaeological resources. US Wind will avoid potential terrestrial cultural resources identified.
- US Wind will develop an Unanticipated Discovery Plan to be implemented during onshore and offshore construction.
- US Wind will continue to coordinate with the appropriate SHPO and Native American tribes to refine measures to minimize and mitigate impacts to potential cultural resources generally and if particular resources are identified.

5.16 Visual Resources

5.16.1 Visual Impact Assessment

A *Visual Impact Assessment* for the Project can be found in COP Appendix II-J1 (US Wind 2023).

The Visual Impact Assessment examined the visual impact of the offshore Project components (WTGs, OSSs, Met Tower) and the onshore components (US Wind Substations, O&M Facility) as relates to the existing visual character during Project operations. Aspects discussed included existing visual policies and regulations and the effect on user groups, landscape/seascape character setting, environmental justice areas, and visually sensitive natural resources in the study area.

5.16.2 Description of Affected Environment

A Visual Study Area (VSA) for the Project was established that extends 69 km (43 mi) as a radius buffer around the WTGs. For daytime observations, this study area is conservative as meteorological conditions will likely reduce the visual threshold distance dramatically in daytime and nighttime conditions. The resulting VSA is 20,373 km^2 (7,866 mi^2) in area and encompasses 144 km (89 mi) of oceanfront shoreline in Maryland, Delaware, Virginia, and New Jersey (excluding Delaware Bay). Approximately 4,574 km^2 (1,766 mi^2) (22 percent) of the area is landward of the shoreline (i.e., the shoreward study area). The balance of the VSA is area within the Atlantic Ocean. Section 5.17 provides more details on the specific oceanfront areas that may be affected by the visual impact from the Project.

The design envelope for the Project considers a range of different WTGs, with capacity ratings up to 18 MW, and OSSs, with capacity ratings of 400MW or 800MW. The total number of proposed WTGs deployed is 114 to 121. For the purposes of the visual assessment, an 18 MW offshore WTG was selected for evaluation, based on the assumption it would be the most visible. The WTGs were also assumed to be in the 121 potential locations under consideration and oriented in a grid pattern with spacing of approximately 1.02 NM (1.17 mi) N-S x 0.77 NM (0.89 mi) E-W apart. The WTGs will be connected to up to four OSSs where the voltage will be increased, and the power transmitted to the Interconnection Facilities via the offshore and onshore export cables. OSS designs used simulated a maximum height of 43 meters (144 feet) and 39 m (128 ft) above MSL for the 400MW and 800MW substations, respectively.

The foundation of all WTGs would be painted yellow (RAL 1023) from the level of Mean Higher High Water (MHHW) to 15 meters (50 feet) above MHHW. Ladders at the foundation base of all turbines would be painted in a color that contrasts with the recommended yellow for ease of identification for operations and maintenance personnel. All major upper WTG components would be painted with color no lighter than RAL 9010 Pure White and no darker than RAL 7035 Light Grey (BOEM 2021b). The WTG paint color will be determined in consultation with BOEM, FAA, and USCG.

The WTGs are proposed to have aviation safety lighting consisting of two medium-intensity flashing red lights atop the nacelle and four low-intensity flashing red lights mid-tower around the tower in a ring. The medium and low intensity flashing red lights will be configured to flash simultaneously. The OSSs are proposed to have two medium intensity flashing red obstruction aviation lights, four low intensity flashing red obstruction lights in a ring, and a helicopter hoist status light. Navigation lighting is anticipated on the WTGs and OSSs. A revised version of COP Appendix I-K2 in US Wind (2023) provides a proposed Project lighting and marking scheme, subject to further review and discussion with BOEM, FAA, and USCG.

The proposed onshore facilities will consist of up to three US Wind substations and interconnection to the Indian River Substation located adjacent to the Indian River Power Plant near Millsboro, Delaware. The US Wind substations are proposed to be located west and northwest of the substation with the submarine cable entering the US Wind substations underground, then transitioning to an overhead configuration to make the short connections to the Indian River Substation. The Indian River Substation location is anticipated to require expansion to the northwest to allow the interconnections. The proposed additional facilities are consistent with the existing substation visual character and appearance in terms of components and height, however, at the request of BOEM, were evaluated in the VIA.

The proposed O&M Facility would be located near the Ocean City Inner Harbor, an area characterized by industrial development, maritime industrial use, and commercial activities. The Facility would consist of a quayside for crew transfer vessels and material on- and off-loading, as well as a warehouse, administrative building, and other supporting facilities.

5.16.3 Impacts

The primary impacts to visual resources during construction would be from the vessels and equipment involved in transporting Project components to the staging area and then to the Project area. This equipment will include large jack-up barges and other large transport vessels, as well as mobile cranes, cable laying vessels, and tugboats. There will be an increase in vessel traffic associated with the transport of Project components and personnel, but large vessel activity is not uncommon in this region and impacts to visual resources will be minor and temporary. The use of lighting during construction has not yet been determined and will be decided in consultation with construction contractors and applicable local agencies.

Post-construction impacts to visibility from the transmission interconnection will be negligible, because the offshore and onshore export cables will be submarine or underground. The expansion of the Indian River Substation will be consistent with the existing substation visual character and appearance in terms of components and height and therefore negligible visual impacts will occur in the immediate vicinity of the cable landfall and existing substation. The visual impact of the onshore substation is discussed in COP Appendix II-J1 (US Wind 2023).

When viewed from coastal vantage points, WTGs appear low on the distant horizon and these areas already have significant elements within their existing visual environment, such as flying banners and advertising boats. When detectable, the somewhat regular vertical form of the tubular towers will contrast with the horizontal form of the water/sky horizon. The proposed neutral off-white color of the turbine tower, nacelle, and blades will be viewed against the background sky. When the WTGs are backlit, the degree of visual contrast is more noticeable than if viewed in a front- or side-lit condition. Color contrast decreases as distance increases and will diminish or disappear completely during periods of haze, fog, or precipitation.

From the shoreline, the proposed WTGs will be the tallest visible elements on the horizon, though at a far distance and will appear shorter than passing vessels. From most foreground and mid-ground vantage points (from vessels on the ocean), the WTGs will be perceived as the main visual element. When viewed from vantage points on land, the WTGs perceived scale and presence is considerably reduced. Inland views are typically screened by dunes, low hills, and existing vegetation or buildings.

When visible from inland locations, views will typically include existing coastal light sources that include commercial and residential building sources, streetlights, and vehicle headlights. The

WTG lights in the night sky would be expected to be noticeable from certain beach areas and coastal areas when in operation and under certain atmospheric conditions. When visible, they will appear low on the horizon and will appear to vary in intensity due to the slow flash rate, intermittent shadowing as rotating blades pass in front of the light source, and the atmospheric conditions.

From offshore locations (i.e., on recreational vessels, charter boats, fishing vessels, or commercial vessels), views would consist mainly of the Project, the open ocean, and other offshore vessels. Views of the Project itself would vary based on the viewers proximity to the Project. Atlantic OCS views would be dominated by the Project components, with its prominence decreasing as viewers neared the shoreline. Components may be obscured from view during foggy conditions or inclement weather but would become visible as viewers approached the Project area.

Visual impacts depend on the distance from shore, earth curvature, and atmospheric conditions that could screen some, or all, of the foundation and portions of the tower, nacelle, and rotor. Overall, visual impacts to coastal onshore viewers (e.g., beachgoers, hikers and bikers, office workers) of WTGs in daylight would be expected to be minor to moderate. Impacts to offshore viewers (e.g., fishers, charter boat crews, freight transport, recreational boaters) would be expected to be moderate to major, based on the viewers' proximity to the WTGs. When the aviation lights are activated, these lights would likely be visible on clear nights from the shoreline. Weather conditions such as fog, haze, clouds or precipitation would greatly limit the visibility of the WTGs and lighting from the shore. Weather conditions such as fog, haze, clouds or precipitation would greatly limit the visibility of the WTGs and lighting from the shore. WTGs are expected to have no visual impact when the lights are off. When the FAA lights on the WTGs are on during the night, the impact would be moderate to major, particularly when no other artificial light source is present. However, an ADLS Efficacy Analysis (included within COP Appendix II-J1 as Appendix E (US Wind 2023)) concluded the use of an ADLS-controlled lighting system would result in a more than 99% decrease in the length of time the FAA lights would be lit compared to illumination during all nighttime hours. Based on an evaluation of historical flight data near the Lease area, lights would be on for approximately 5 hours, 46 minutes, and 22 seconds over the course of a year (COP Appendix II-J1, Appendix E (US Wind 2023)).

In addition to the *Visual Impact Assessment* (COP Appendix II-J1 (US Wind 2023)), a *Historic Resources Visual Effects Analysis* is provided as COP Appendix II-I3 (US Wind 2023).

5.16.4 Impacts of Alternatives

Cable installation in any of the terrestrial routes (i.e., Onshore Export Cable Corridor 1a, 1b, 1c, or 2) would result in temporary impacts to visual resources that fall along or adjacent to the selected route. The presence of construction vehicles and other equipment during installation of the cables, which would consist of the installation of duct banks and transition joints, would potentially impact the visual character of the resource if construction vehicles and work is visible. However, once construction and installation are complete, there would be no permanent impacts to visual resources, as all cables would be installed underground.

5.16.5 Mitigation and Monitoring

US Wind will implement the following mitigation measures to reduce Project impacts on visual resources.

- US Wind commits to use aircraft detection lighting system (ADLS), or equivalent technology such as light dimming, if commercially feasible and approved by BOEM in consultation with FAA, USCG and other agencies. Use of ADLS would reduce nighttime obstruction lighting by 99% compared to not using ADLS. and maintain safety zones around active construction areas, and mark areas with highly visible marking and lighting.
- The Project will minimize aviation lighting impacts, such as aiming lighting upward and using the longest permissible off cycles, in consultation with the FAA and BOEM.
- Lighting and marking will be implemented in consultation with FAA, BOEM, USCG and other regulatory agencies.
- Uniform spacing of WTGs and OSSs.
- The WTGs and towers will be FAA-recommended paint color, which generally blends well with the sky at the horizon. The final WTG paint color will be determined in consultation with BOEM, FAA, and USCG.
- All offshore and onshore export cables are planned to be buried, or in locations where burial may not be achievable, protected to the greatest extent practicable.

5.17 Navigation and Military Activities

5.17.1 Offshore Navigation

The waters around the Project area are utilized by a mix of commercial shipping, military, fishing, and recreational vessels. As part of the environmental review for the establishment of the Maryland WEA in the mid-Atlantic region, BOEM excluded an area of concern for potential navigational impacts identified by the USCG within the Maryland WEA (mid-Atlantic, Final Environmental Assessment, p. vi (Jan. 2012)). The analysis concluded that none of the mid-Atlantic WEAs overlapped with the existing USCG Traffic Separation Scheme (Id. at p. 152). Under the Ports and Waterways Safety Act, the USCG must reconcile the need for safe access routes with other reasonable uses of the area involved (46 U.S.C. 470003). The USCG has conducted an Atlantic Coast Port Access Route Study (ACPARS) as part of BOEM's "Smart from the Start" offshore wind energy initiative (See Final ACPARS Report, 82 FR 16510 [April 5, 2017[).

The USCG announced a new Port Access Route Study (PARS) on May 5, 2020 (85 FR 26695) (USCG 2020) for the seacoast of New Jersey including the offshore approaches to the Delaware Bay. The USCG published a draft report on the New Jersey PARS on September 24, 2021 (86 FR 53089) (USCG 2021). In the draft report, the USCG proposes to extend the existing Traffic Separation Scheme along the eastern side of the Lease area and continuing to the southeast 11 km (5 NM) beyond the boundary of the Lease area (Figure 5.16-1). On March 24, 2022, the USCG announced the completion of the New Jersey PARS (87 FR 16759). This announcement reported the study's recommendation that the existing Traffic Separation Scheme approaching the Delaware Bay be extended past the Lease area. On September 9, 2022, the USCG published the Consolidated Port Approaches and International Entry and Departure Transit Areas Port Access Route Studies (CPAPARS) (87 FR 55449). This report summarizes the findings of the four regional studies completed along the Atlantic coast and provides recommendations to updating navigational routes (U.S.C.G.O.o.N.S. USCG 2023).

DNV Energy USA. Inc. (DNV) prepared a *Navigation Safety Risk Assessment* (NSRA) for the Project to evaluate the potential for risks to navigation from the construction, operation, and decommissioning of the Project. A copy of the NSRA is provided as COP Appendix II-K1 (US Wind 2023). USCG guidance *Navigation and Vessel Inspection Circular No. 01-19 (NVIC 01-19)* was used in the preparation of the NSRA (USCG 2019). The NSRA serves as the outline and basis for evaluating the potential impact of the Project on the marine transportation system, including navigation safety, traditional uses of waterways and USCG missions. The NSRA also identifies reasonable methods of controlling or mitigating potential Project impacts.

The NSRA prepared for the Project evaluates the current Traffic Separation Scheme and the benefits of the Traffic Separation Scheme extension proposed in the USCG's September 2021, New Jersey PARS draft report. The Traffic Separation Scheme extension reduced by approximately half the modeled frequency of a cargo, carrier, or tanker vessel striking, or alliding with, a Project structure at speed.

For the NSRA, the 2019 Automatic Identification System vessel traffic data served as the most recent, representative source of marine traffic data available for a full one-year period. To understand general vessel traffic patterns in the waters surrounding the Lease area, Automatic Identification System tracks were plotted to illustrate vessel transit routes and densities. The vessel traffic data analysis revealed different vessel type routes when comparing cargo ships, tankers, and towing vessel traffic. Based on the Automatic Identification System data included in the NSRA, US Wind concludes the highest densities of vessel traffic in the Traffic Survey Area are the entrance to Delaware Bay, the Ocean City Inlet, and within the two Traffic Separation Scheme Approaches (Delaware Bay Eastern Approach and Southeastern Approach). Other patterns show an inshore, coastwise tug-tow route that crosses the Traffic Separation Scheme and follows the coast as well as generally north-south routes well offshore. Commercial fishing traffic appears in the data as both transit routes to and from the ports of Ocean City, Maryland and Cape May, New Jersey.

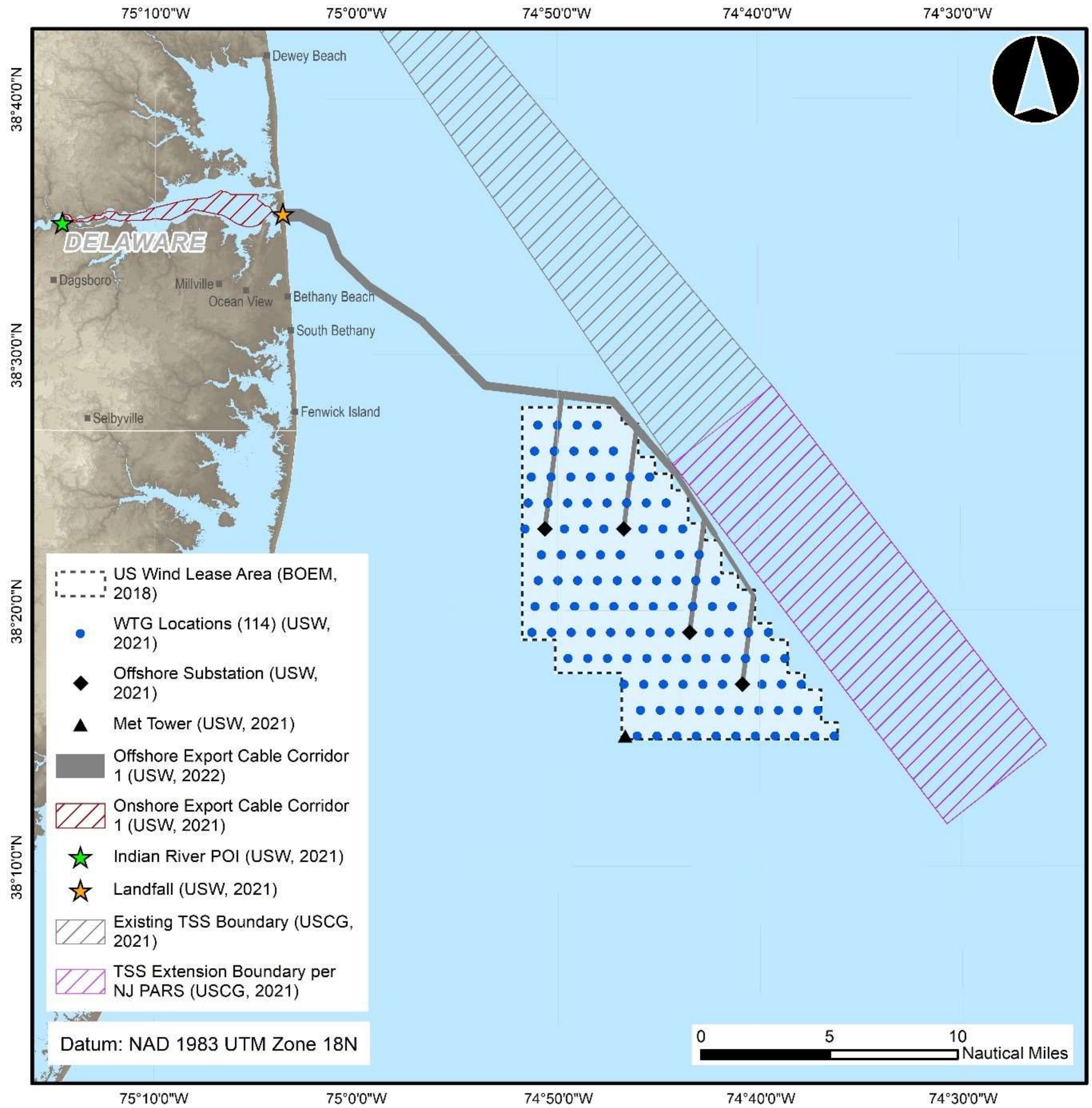

Figure 5.16-1. Proposed Project Layout with Traffic Separation Scheme Extension

As described in the NSRA, a future case model was developed using the Marine Accident Risk Calculation System (MARCS) to estimate the increase in the number of marine accidents that may result from the Project. The main results of the modeling indicated that the risk of collision increases from a small baseline level to approximately one accident every 25 years, primarily due to the assumed increase in vessel traffic generated by the Project. The risk of allision would increase, as would be expected due to new structures in the Lease area, however, the overwhelming majority of the increased allision frequency involves smaller ships navigating in the Lease area with low severity consequences for the vessels and the structures. The risk of higher severity consequence powered allisions of large vessels is expected to be approximately one allision every 520 years.

According to the NSRA, the MARCS modeling provides a reasonable and conservative maximum estimate of the additional risk that could result from the presence of the Project assuming the additional transits added to Automatic Identification System adequately represent the actual traffic. If the number of transits were half of the number in the model, one would expect the risk would reduce significantly. The adoption of mitigation measures, such as use of AIS technology within the Lease area, could further decrease the Project's risk for collision or allision.

The results of the MARCS modeling presented in the NSRA demonstrated the significant potential benefit of the proposed 1.9 km (1 NM) buffer between Project structures and the proposed Traffic Separation Scheme boundary in reducing allision risk for large vessels with the Project and significantly decreasing the navigational safety risk associated with the Project. The MARCS modeling presented in the NSRA was also conducted with and without the proposed 1.9 km (1 NM) buffer between Project structures and the adjacent Traffic Separation Scheme to assess the potential reduction in navigational risk that may be associated with adopting such a buffer zone. The modeled allision frequency per structure per year for drift allisions with large vessels decreased approximately seven percent with the 1.9 km (1 NM) Traffic Separation Scheme buffer implemented. The modeled allision frequency per structure per year for higher severity consequence powered allisions with large vessels decreased approximately 30 percent with the 1.9 km (1 NM) Traffic Separation Scheme buffer implemented. The modeled total allision frequency per structure per year for large vessels decreased approximately 11 percent with the 1.9 km (1 NM) Traffic Separation Scheme buffer implemented.

The impact of the Project on emergency rescue operations was also evaluated. The search pattern used by the USCG during search and rescue (SAR) operations may be impacted if the Project's offshore structures restrict possible flying and sailing search routes within the Lease area. The USCG is evaluating whether the lanes between WTGs provide sufficient access to conduct an air search, because the presence of the offshore structures makes it difficult to search for a small object such as a person in the water. US Wind is working with the USCG to identify mitigation measures that may increase mariner and responder situational awareness in the vicinity of the Lease area such as cameras, distinct markings on towers, and enhanced communication connectivity that may increase location certainty and reduce required search activity for mariners or objects with unknown locations.

The potential Project effects on vessel communications, marine radar and positioning systems were evaluated and it was determined that most instances of interference can be mitigated through the proper use of radar gain controls and Automatic Identification System data transmission, favorable placement of vessel radar antennas and regular communication and safety broadcast from vessels operating in the Lease area. Numerous factors may impact marine radar and a post-construction analysis may be conducted to identify the effects on marine radar and to assess potential mitigation methods.

The Offshore Export Cables and inter-array cables will be buried below the seabed. Buried cables present potential snagging risks for vessel anchors. Sufficient cable burial depth and cable protection, including concrete matting where necessary, and routing the offshore export cables to avoid anchoring sites will help protect the cables and OCS users from any potential contact with vessel anchors. US Wind routed the Offshore Export Cable Corridors to the south of anchorage grounds proposed by USCG in the November 29, 2019, Notice of Inquiry, request for comments, 874 CFR 16126 (Figure 5.16-2), which was formally proposed in a Notice of Proposed Rulemaking, 87 FR 16126, on March 22, 2022. The rule became effective on August 11, 2022 (87 CFR 41248).

A Cable Burial Risk Assessment based on the 2021-2022 geophysical and shallow geotechnical surveys in the Lease area has been provided in COP Appendix II-K5 (US Wind 2023) and along the Offshore Export Cable Corridors in COP Appendix II-K7 (US Wind 2023).

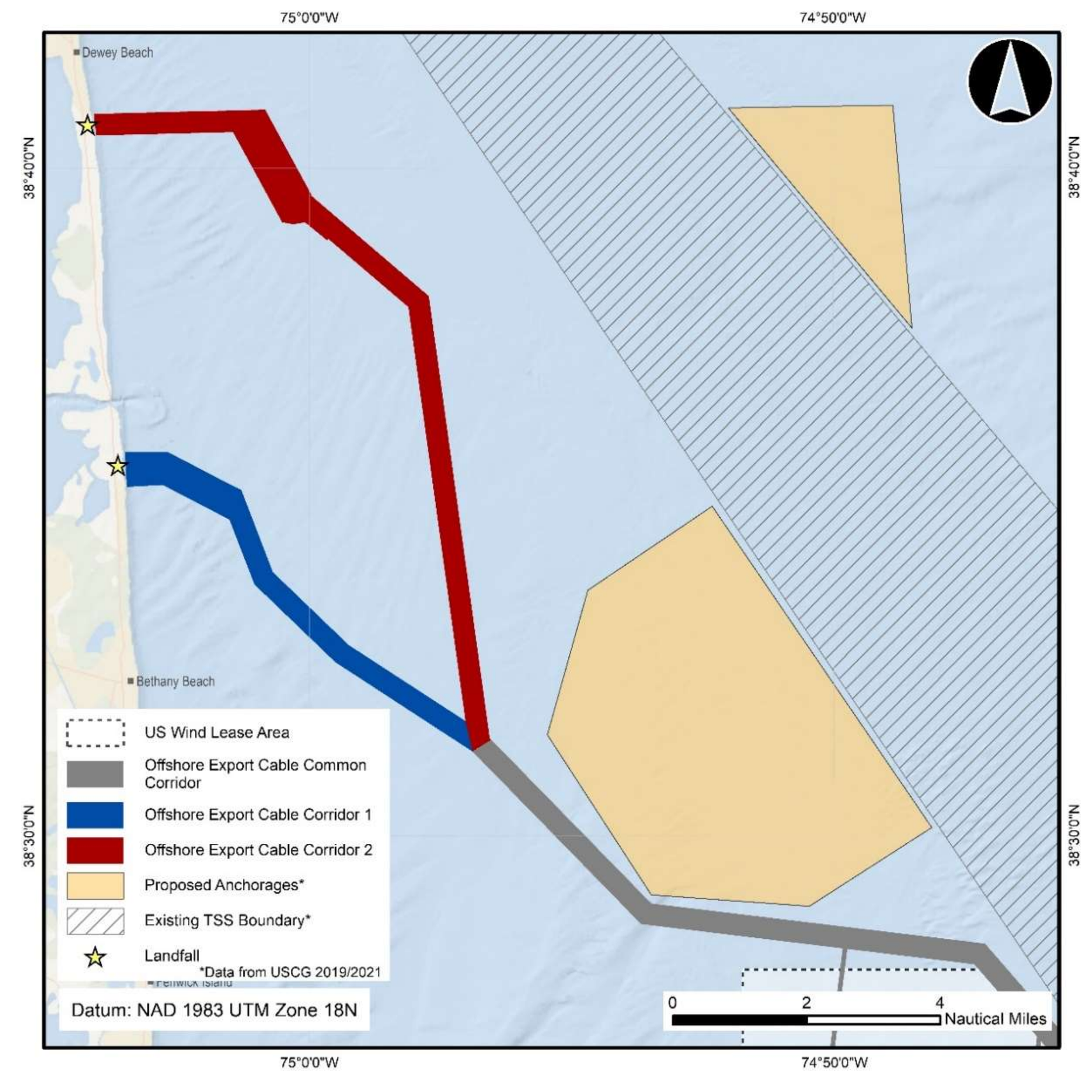

Figure 5.16-2. Location of USCG Anchorage Areas

5.17.2 Navigation in Indian River Bay

The Indian River Inlet and Bay Federal Navigation Project is located within Indian River Bay and Indian River, terminating at Millsboro, Delaware (Figure 5.16-3). The ongoing project is considered general operation and maintenance of the existing navigation channel. The project provides a safe navigation channel for commercial, recreational and USCG use. Indian River Inlet is the only water access point into the Delaware Inland Bay area that includes Indian River Bay and Rehoboth Bay (U.S.A.C.o.E. USACE 2022). USACE does not maintain the Federal Navigation Channel west of Indian River Inlet. However, DNREC has dredged the portions of the channel through Indian River and proposes dredging the portions passing through Indian River Bay. DNREC maintains portions of the Channel by dredging and has designated the Channel a high priority for maintenance based on function and public stakeholder survey results.

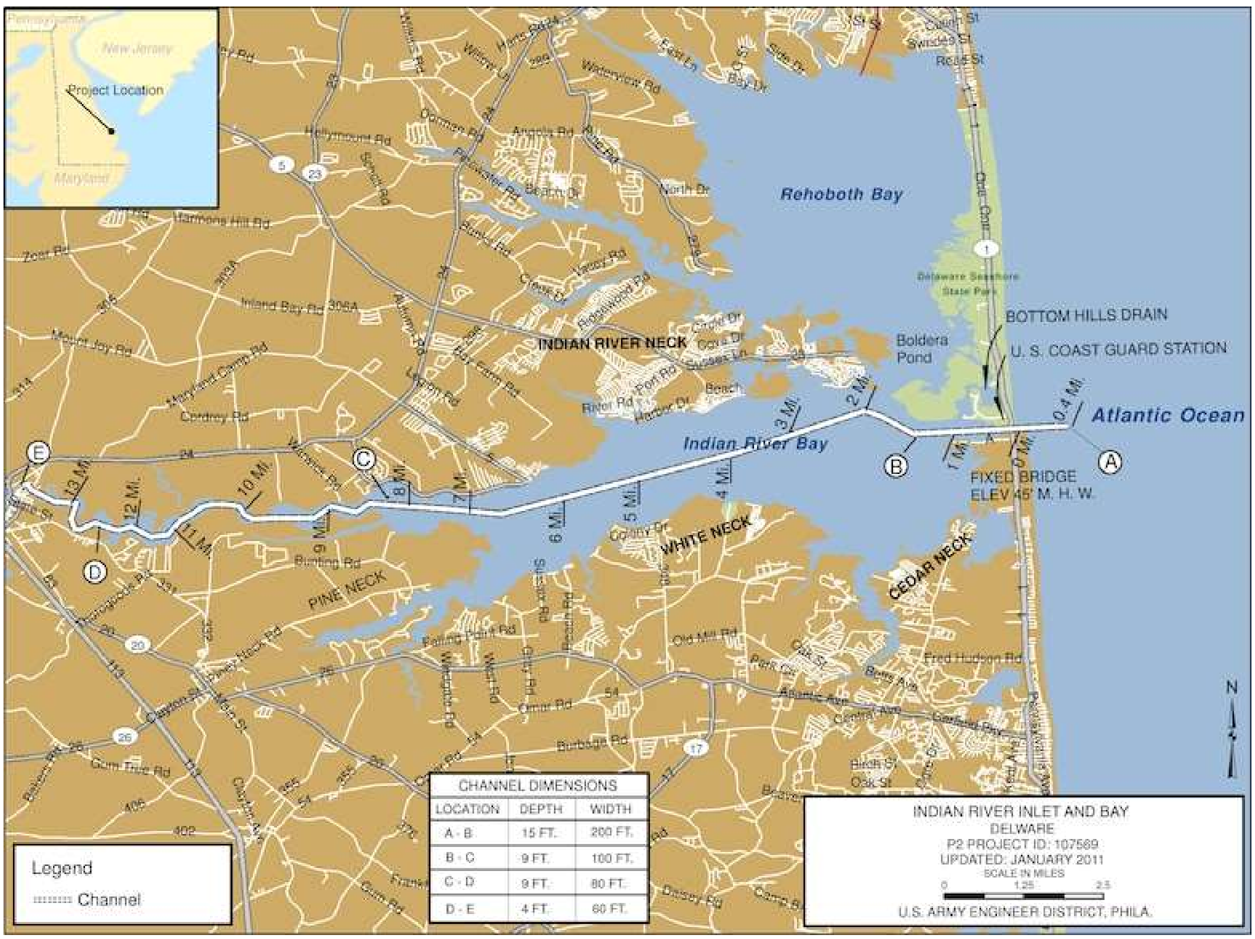

Figure 5.16-3. Indian River Inlet and Bay Federal Navigation Project (USACE 2022)

The Indian River Inlet and Bay Federal Navigation Channel begins 0.6 km (0.4 miles) offshore of the Indian River Inlet and proceeds through Indian River Bay and the Indian River until the highway bridge in Millsboro (U.S.A.C.o.E. USACE 2022). The channel varies from 61-18 m (200-60 ft wide) and 4.6-1.2 m (15-4 ft) deep as it proceeds inland (Figure 5.16-3).

In response to a draft Section 408 Review Request submitted to USACE on February 1, 2023, USACE directed US Wind to install export cables no less than 1.8 meters (6 feet) below the authorized depth of the Channel. The Channel does not have a fixed location through much of Indian River Bay. A channel is marked each year by the U.S. Coast Guard by marker buoys indicating the deeper portions of the route for navigation. DNREC communicated to US Wind in recent meetings that US Wind's buried export cables should not impede the ability of future dredging projects for maintenance of the Channel. Based on feedback from USACE and DNREC, US Wind is planning to bury the export cables 4.9 m (16 ft) below MLLW through much of Indian River Bay to properly protect the export cables and avoid conflict with maintenance activities if future dredging occurs.

To achieve the target burial depth US Wind and its contractors have determined dredging may be necessary in locations along the cable routes for barge access. Maximum dredging disturbance is assumed to be within 90 m (295 ft) wide along the route. This footprint is within the planned 193-m (633 ft) area of temporary construction disturbance.

Dredging along the routes would be a maximum of 1.8 m (6 ft), varying from 1-6 ft (0.3-1.8 m) depending on location. Much of the route would be 1 m (3 ft) or less. Maximum volume of dredging, assuming all 4 cables installed in a single season, and across the entirety of the 295-ft width of the cable corridor, is found in Table 5.17-1.

Table 5.17-1. Bottom Disturbance Due to Dredging within Indian River Bay

Dredging	Location	Maximum Area of Dredging (m^2)	Total			
			m^2	ft^2	km^2	acres
Barge Access	Indian River Bay	1,168,873	1,168,873	12,581,750	1.17	288.8

5.17.3 Military Activities

The U.S. Navy Fleet Area Control and Surveillance Facility, Virginia Capes (FACSFAC VACAPES) was established in 1977 with the mission of scheduling, controlling, and overseeing military operating areas, training routes, and bombing ranges for the northeastern United States (Commander of U.S. Naval Forces, 2016). Naval Air Force Atlantic oversees 290,079 square km (112,000 square mi) of offshore air, surface, and sub-surface operating areas from Narragansett Bay, Rhode Island to Charlestown, South Carolina. Sailors provide air traffic control for more than 98,000 sorties per year while ensuring all operation aspects are deconflicted from more than 300 hazardous events per year, including missile exercises, unit level training, NASA rocket launches, gunnery evolution, or underwater detonation drills. In addition, the air traffic control mission includes separation of military and commercial flights along the East Coast (FACSFAC VACAPES, Fleet Area Control and Surveillance Facility, Virginia Capes 2018).

The Navy Operating Area (OPAREA) is located in the coastal and offshore waters of the western North Atlantic Ocean adjacent to Delaware, Maryland, Virginia, and North Carolina. The northernmost boundary of the Virginia Capes Operating Area (VACAPES) Range Complex is located 68.5 km (37 NM) off the entrance to Delaware Bay at latitude 38º45'N, the farthest point of the eastern boundary is 340.8 km (184 NM) east of Chesapeake Bay at longitude 72º41' W, and the southernmost point is 194.5 km (105 NM) southeast of Cape Hatteras, North Carolina, at latitude 39º19' N. The western boundary of the VACAPES Range Complex OPAREA lies 5.6 km (3 NM) from the shoreline at the boundary separating state and federal waters (50 CFR §218.1). The total operational area encompasses approximately 94,875 km^2 (27,661 NM^2) of surface waters (Virginia Capes Range Complex Final Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) 2009). Figure 5.16-4 shows the Project area in relationship to VACAPES, Military Training Routes (MTR) and Military Operating Areas (MOA).

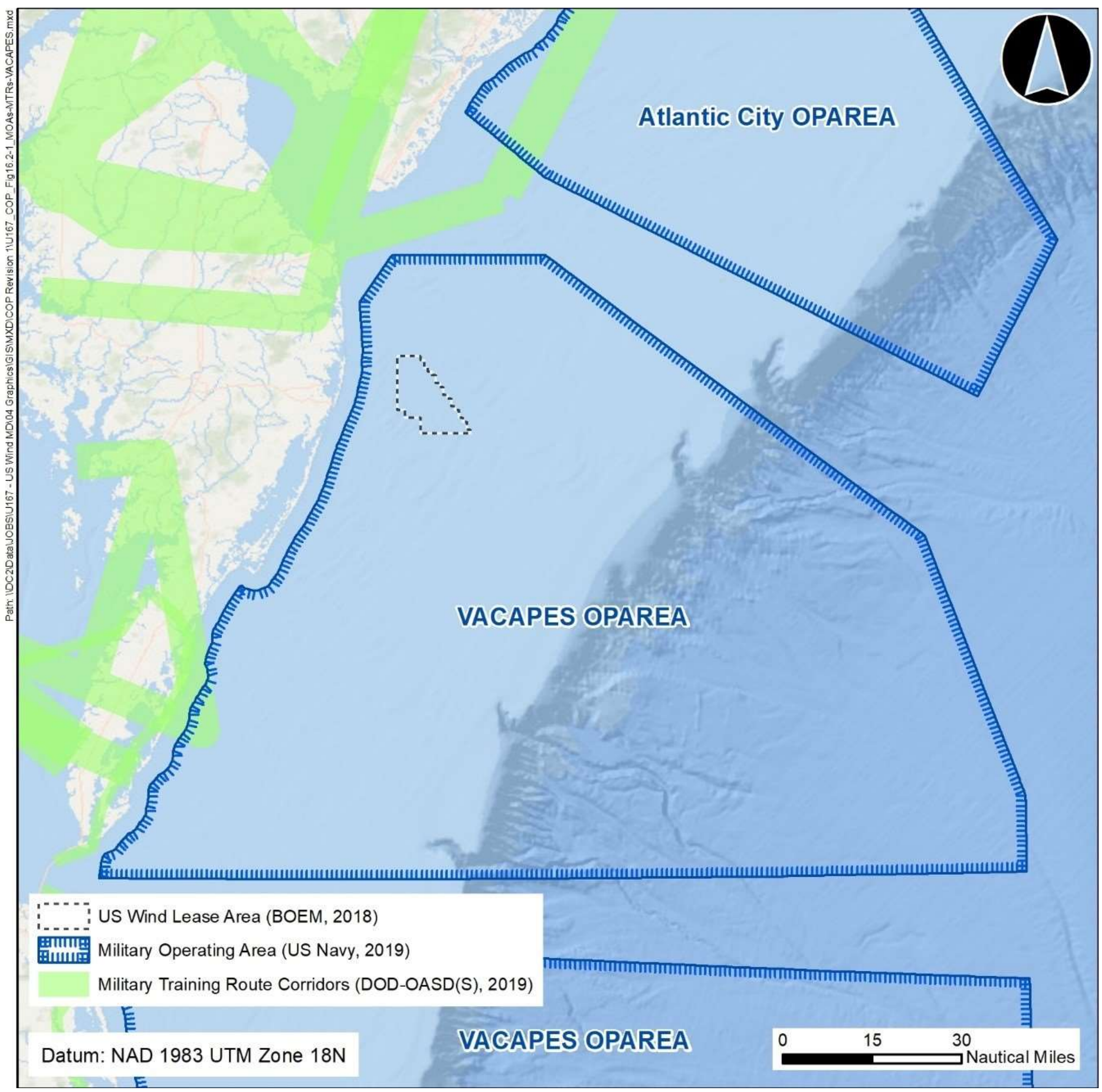

Figure 5.16-4. Project Relationship to VACAPES, MTRs and MOAs

US Wind has initiated consultations with United States Fleet Forces (USFF) N46 and Fleet Forces Atlantic Exercise Coordination Center (FFAECC) at Naval Air Station (NAS) Oceana, Virginia. FFAECC coordinates all regional military/other agency activities (both sea and air) for the VACAPES Operating Area and ensures events are de-conflicted. US Wind has also sent a Request for Informal Review to the Military Aviation Assurance Siting Clearinghouse in 2020. A second Request for Informal Review sent the Clearinghouse in 2022 updated the Project Design Envelope and the potential NORAD impact was again identified. Based on the FAA Determination of No Hazard, US Wind understands that the DoD will not be requiring a mitigation agreement for the Project. US Wind has separately consulted with National Telecommunications and Information Administration (NTIA) and NOAA Integrated Ocean Observation System (IOOS). A draft mitigation plan outline has been initiated with NOAA IOOS for high frequency radar impact mitigation/infill.

US Wind will continue to consult with Fleet Forces Command prior to any construction or decommissioning activity, regarding the location, density, and planned periods of activity, to minimize potential conflicts with DoD activities in the VACAPES OPAREA. During the US Wind survey activities conducted along the Offshore Export Cable Corridors in 2021, FFAECC requested that the geotechnical and geophysical Contractor and survey Vessel Masters coordinate daily with FFAECC, avoid designated areas and comply with any of their requests during survey operations. As a result, US Wind is familiar with FFAECC requirements for Commercial Vessels Working in the VACAPES OPAREAS, will provide all Service Request Forms to FFAECC that are required prior to initiation of construction or decommissioning activities in the Lease Area, and will comply with all FFAECC directives, including any related to lighting or instrumentation, to avoid potential impacts during Project activities.

The Project is located below a variety of United States territorial and international airspace classifications, including some controlled and special-use airspace. The Project area is entirely within the Air Defense Identification Zone (ADIZ), in which all aircraft are subject to ready identification in the interest of national security. The majority of the Project area underlies both the Atlantic Low Control Area, which is designated as Class E controlled airspace above 518 m (1,700 ft), and the VACAPES “W-386,” which is a National Defense Operating Area off the mid-Atlantic coast that is used for various surface, subsurface, and air-to-surface exercises. The Obstruction Evaluation and Airspace Analysis (COP Appendix II-K4 [US Wind 2023]) includes an assessment of impacts to MTRs and MOAs.

5.17.4 Lighting and Marking

Lighting and marking per FAA regulations regarding aviation obstruction lighting of structures and BOEM’s Lighting and Marking of Structures Supporting Renewable Energy Development (BOEM 2021b) will be installed on the WTGs, OSSs and the Met Tower. US Wind will place lighting and signage on applicable structures to aid navigation per USCG circular NVIC 01-19 Guidance on the Coast Guard’s roles and responsibilities for Offshore Renewable Energy Installations (USCG 2019) and comply with any other applicable USCG requirements. See COP Volume II, Appendix

II-K2 (US Wind 2023), for the proposed Project lighting and marking scheme which is described below, however, is subject to further review and discussion with BOEM, FAA, and USCG.

The WTGs are proposed to have aviation safety lighting consisting of two medium-intensity flashing red obstruction aviation lights atop the nacelle, four low-intensity flashing red obstruction lights mid-tower around the tower in a ring, and a helicopter hoist status light. The aviation lights will flash simultaneously at 30 flashes per minute (FPM). The structure aviation safety lights will be visible in all directions in the horizontal plane.

There would also be amber flashing navigation beacons of different intensities installed. All turbines will be marked conspicuously and distinctly for both day and night recognition. The foundation base of all turbines will be painted yellow (RAL 1023) all around from the level of MHHW to 15 m (50 ft) above MHHW. Ladders at the foundation base of all turbines will be painted in a color that contrasts with the recommended yellow for ease of identification for operations and maintenance personnel. The turbines and towers will be painted with color no lighter than RAL 9010 Pure White and no darker than RAL 7035 Light Grey. The amber flashing navigation lights will be energized from sunset to sunrise and from sunrise to sunset in restricted visibility. The navigation lights will be visible in all directions from the horizontal.

Each WTG will be designated, marked, and charted with a unique alphanumeric designation for quick recognition and reference by mariners and agencies for search and rescue, law enforcement, and other purposes. The bottom of the alphanumeric designation will be located at least 9 m (30 ft) and no more than 15 m (50 ft) above MHHW. They will be approximately 3 m (10 ft) in height, will be visible above any service platforms in a 360 arc from the water's surface, and will be applied with retro-reflecting paint to enhance visibility under low light conditions. Each WTG's unique alphanumeric designation will be duplicated below the service platforms.

OSS are anticipated to be less than 61 m (199 ft) and therefore are not anticipated to be marked with aviation safety lights. Each OSS would be marked with six or ten second yellow flashing marine lanterns with 360° visibility and with a 3.7 km (2 NM) operational range.

Perimeter structures, located on the corners or other significant peripheral points, will be marked with quick flashing yellow marine lanterns with 360° visibility and an operational range of at least 9.26 (5 NM). Intermediate perimeter structures, located along the outside boundary, will be marked with 2.5-second flashing yellow marine lanterns with 360° visibility and an operational range of at least 5.6 km (3 NM). Inner boundary structures will be marked with six or ten second yellow flashing marine lanterns with 360° visibility and with a 3.7 km (2 NM) operational range. Lights servicing the same structure designation will be synchronized.

The Met Tower would be equipped with white marine lanterns with an operational range of 18.52 (10 NM), although the final location of the Met Tower may alter the lighting and marking scheme if it is a significant peripheral structure. Based on the anticipated height of the mast above mean sea level, US Wind anticipates that the Met Tower will include aviation safety lighting.

Directional fog signals would be placed on alternating perimeter structures. Each device will sound a four second prolonged blast at intervals not to exceed 30 seconds with a range of 3.7 km (2 NM). Each device will be capable of Mariner Radio Activated Sound Signal activation by keying very high frequency (VHF) radio frequency 83A five times within ten seconds and continue to sound its signal for 45 minutes after VHF activation.

There will be aviation visibility meters and Mariner Radio Activated Sound Signals and marine visibility meters on perimeter structures. Automatic identification system (AIS) transponders will be placed on alternating perimeter structures capable of transmitting signals marking the locations of all structures within the facility, subject to approval by the USCG.

ADLS is planned for the Project if technically feasible, commercially available, and approved for use by FAA, BOEM, and USCG. FAA obstruction lighting on the WTGs would only illuminate when aircraft are approaching the Lease area. Use of ADLS would significantly reduce the amount of time FAA obstruction lights would be lit. Capitol Air Space Group completed an Aircraft Detection Lighting System Efficacy Analysis, which is provided within COP Appendix II-J1, as Appendix E (US Wind 2023). Use of ADLS in the Project woud reduce nighttime FAA lighting by 99%, with the WTGs lit with obstruction FAA lights less than 6 hours in a year based on prior flight information.

5.17.5 Aviation

The airport closest to the Project area is the Ocean City Municipal Airport (KOXB). This non-towered airport is located approximately 31 km (17 NM) west of the Lease Area. The Salisbury-Ocean City Wicomico Regional Airport offer air service a few miles outside Snow Hill. The National Aeronautics and Space Administration (NASA) Goddard Space Flight Center's Wallops Flight Facility (WFF) is located approximately 67 km (36 NM) from the Lease Area. NASA conducts science, technology, and educational flight projects from WFF aboard rockets, balloons, and UAV's, using the Atlantic waters for operations on almost a daily basis (USDOI and BOEM 2012).

US Wind conducted an Obstruction Evaluation and Airspace Analysis to identify potential risks associated with the placement and/or height of the WTGs, OSSs and the Met Tower, provided as COP Appendix II-K4 (US Wind 2023). US Wind also conducted an Air Traffic Flow Analysis to determine the number of instrument flight rules operations potentially affected by the placement and/or height of the WTGs, provided as COP Appendix II-K6 (US Wind 2023). The analysis concluded that the number of flights that could have been receiving radar vectoring services within the affected airspace is well below the threshold for a significant volume of instrument flight rules (IFR) operations.

5.17.6 Radar

The Lease area is located within the range of a long-range radar facility at Dover Air Force Base and the WFF radar facility. Three of the four OSSs and associated WTGs are located within range of these facilities. The WFF radar facility is used to track launch and flight activities conducted by

NASA and its partners. The radar may be used to track air-to-air, air-to-surface, surface-to-air, and surface-to-surface missile exercises, gunnery exercises, aircraft flights and rocket launches. When the Wallops Island radar is not in use for range support activities, it may be released to the FAA (USDOI and BOEM 2012).

The Military Aviation and Installation Assurance Siting Clearinghouse (Clearinghouse) was established in 2011 and provides a timely, transparent, and repeatable process that can evaluate potential impacts of renewable energy projects and other projects with military activities, and explore mitigation options, while preserving the DoD mission through collaboration with internal and external stakeholders.

The Clearinghouse formal review process applies to projects filed with the FAA obstruction evaluation process and addresses all energy projects greater than 61 m (199 ft) above ground level, proposed for construction within military training routes or special use airspace, whether on private, state, or federal property. All energy project proponents are encouraged to seek informal reviews as early as possible to identify potential compatibility concerns in advance.

On April 23, 2020, US Wind submitted a Request for Informal Review to the Clearinghouse. The results of the informal review indicated that ten WTGs in the northwestern portion of the Lease area were of North American Aerospace Defense Command (NORAD) concern. A second Request for Informal Review, submitted January 24, 2022, to the Clearinghouse updated the Project Design Envelope and the potential NORAD impact was again identified. On May 22, 2023, the FAA issued Determinations of No Hazard to Air Navigation for the WTG array. Based on issuance of the Determinations of No Hazard, no mitigation agreement with DoD is anticipated at this time.

US Wind conducted studies of potential interference of proposed WTGs with commercial air traffic control radar systems, national defense radar systems, high frequency coastal radars and weather radar systems. The proposed WTGs will be within line of sight of two Air Route Surveillance Radar and Airport Surveillance Radar locations. In addition, the proposed WTGs are within line of sight or within the instrumented range of six high frequency radar locations. The proposed WTGs are greater than 15 km (8 NM) from three navigation aid sites, so no further analysis of potential impacts was necessary. No impacts to weather radars are expected. The *Radar Impact Evaluation* is provided as COP Appendix II-K3 (US Wind 2023).

5.17.7 MEC/UXO

In 2021, US Wind contracted EPI Group (EPI) to conduct a desk-based threat and risk assessment and management strategy for MEC/UXO for the Lease area and Offshore Export Cable Corridors (EPI Group 2023).The report indicates that the most likely potential for MEC/UXO is within the nearshore Offshore Export Cable Corridors and from vessels sunk by mine action within the Lease area. Although there is the potential for MEC/UXO across the Lease area, this concern was assessed to not be a significant threat.

The probability of encountering MEC for this Project is considered to be moderate to low. MEC is reasonably expected to be identified during HRG survey activities that include side-scan sonar and a magnetometer array. Smaller items of MEC that may be missed during such surveys are considered of lower risk and the risk may be considered to be ALARP. Recommended mitigation measures for reducing the risk of MEC are provided as Section 5.2.3.

The EPI prepared *Combined MEC/UXO Detailed Threat and Risk Assessment and Risk Mitigation Strategy for the OCS-A 0490 Offshore Lease Report*, is provided as COP Appendix II-A3 (US Wind 2023).

5.17.8 Impacts

DNV prepared a NSRA for the Project to evaluate the potential for risks to navigation from the construction and operation of the Project. A copy of the NSRA is provided in COP Appendix II-K1. USCG guidance "Navigation and Vessel Inspection Circular No. 01-19 (NVIC 01-19)" was used in the preparation of the NSRA (USCG 2019). The NSRA serves as the outline and basis for evaluating the potential impact of the Project on the marine transportation system, including navigation safety, traditional uses of waterways and USCG missions. The NSRA also identifies reasonable methods of controlling or mitigating potential Project impacts.

Onshore Export Cable Corridor 1 may overlap the Indian River Inlet and Bay Federal Navigation Channel in some areas, particularly in Indian River (see Appendix D). In locations within or near the Federal Navigation Channel to export cables would be buried at least 1.8 m (6 ft) below the authorized maintenance depth of the Indian River Inlet and Bay Federal Navigation Channel. Impacts to the Indian River Inlet and Bay Federal Navigation Channel Civil Works project would be avoided by burying the cables below the authorized depth.

5.17.9 Impacts of Alternatives

Under the PDE approach, with a maximum of 121 WTGs, there would be an increased risk to navigation, as these turbines are within 1 NM (1.2 miles) of the expanded Traffic Separation Scheme.

Installation of export cables in Offshore Export Cable Corridor 2 would be conducted in the same manner as Offshore Export Cable Corridor 1, which would not result in additional impacts to navigation and military activities occurring within the Atlantic.

Cable installation in any of the terrestrial routes (i.e., Onshore Export Cable Corridor 1a, 1b, 1c, or 2) would result in temporary impacts to federal navigation channels within the Project area during construction. The cable route would cross either the Assawoman Canal (Onshore Export Cable Corridor 1a, 1b, 1c) or the Lewes and Rehoboth Canal (Onshore Export Cable Corridor 2) via HDD or attaching cables to existing bridges, depending on the final route selected. Once installation is complete, there may be no permanent impacts to federal navigation channels.

5.17.10 Mitigation and Monitoring

US Wind will implement the following mitigation measures to reduce Project impacts on navigation and military activities.

- US Wind commits to use ADLS, or equivalent technology such as light dimming, if commercially feasible and approved by BOEM in consultation with FAA, USCG and other agencies. Use of ADLS would reduce nighttime obstruction lighting by 99% compared to not using ADLS.
- Uniform spacing of WTGs and OSSs of 1.89 km (1.02 NM) north/south and 1.43 km (0.77 NM) east/west.
- A proposed 1.9 km (1 NM) buffer zone between Project structures and the Traffic Separation Scheme outer boundary.
- Coordinate with the appropriate regulatory agencies and other stakeholders during construction to provide timely and effective communications regarding planned vessel movements and construction activities.
- Work with USCG to establish and maintain safety zones around active construction areas, and mark areas with highly visible marking and lighting.
- Bury submarine cables at least 2 m (6 ft) below the authorized depth of the Indian River Bay federal navigation channel.
- Use existing transit lanes for construction and maintenance vessels to the extent practicable.
- Route Offshore Export Cable Corridors to avoid USCG proposed anchorage.
- Lighting and marking will be implemented following guidelines as practicable and in consultation with FAA, BOEM, USCG and other regulatory agencies.
- Monitor Project operations continuously and maintain Project emergency contact channels with the USCG and other relevant agencies and stakeholders.
- US Wind will work with the USCG to identify measures that may increase mariner and responder situational awareness in the vicinity of the Lease area such as cameras, distinct markings on towers, and enhanced communication connectivity.
- Develop emergency procedures for potential vessel allisions with Project structures and other maritime emergencies, such as search and rescue, in consultation (e.g., coordinated drills) with relevant agencies and stakeholders. Establish appropriate chain of command with USCG and MDNR to respond to emergencies in a timely, efficient manner and address ongoing issues. Procedures and potential equipment packages to benefit mariners, e.g., WTG cameras or data connectivity enhancements, will be developed through stakeholder outreach.
- Meteorological and ocean observations from the Met Tower will be made available to the public.

- Prior to construction, analyze survey data at installation locations to identify potential MEC/UXO and plan avoidance in line with industry best practices.
- Prepare an MEC/UXO Emergency Risk Management Plan prior to construction.
- Prior to construction activities, provide an MEC/UXO awareness briefing to vessel crews.

5.18 Socio-Economics

Socioeconomic resources discussed in this section are varied, from employment and transportation infrastructure to tourism and commercial fishing. The majority of socioeconomic resources are evaluated at the county level. US Wind proposes construction vessels will primarily utilize a port in Baltimore County, Maryland, associated with the Project's staging and marshalling area, and the O&M Facility is proposed in Worcester County, Maryland. The Barrier Beach Landfalls and Interconnection Facilities are located in Sussex County, Delaware. Offshore the presence of WTGs, OSSs, and the Met Tower in the Lease area and associated submarine cables may affect activities in nearby counties. Figure 5.18-1 illustrates the locations of the potentially affected counties.

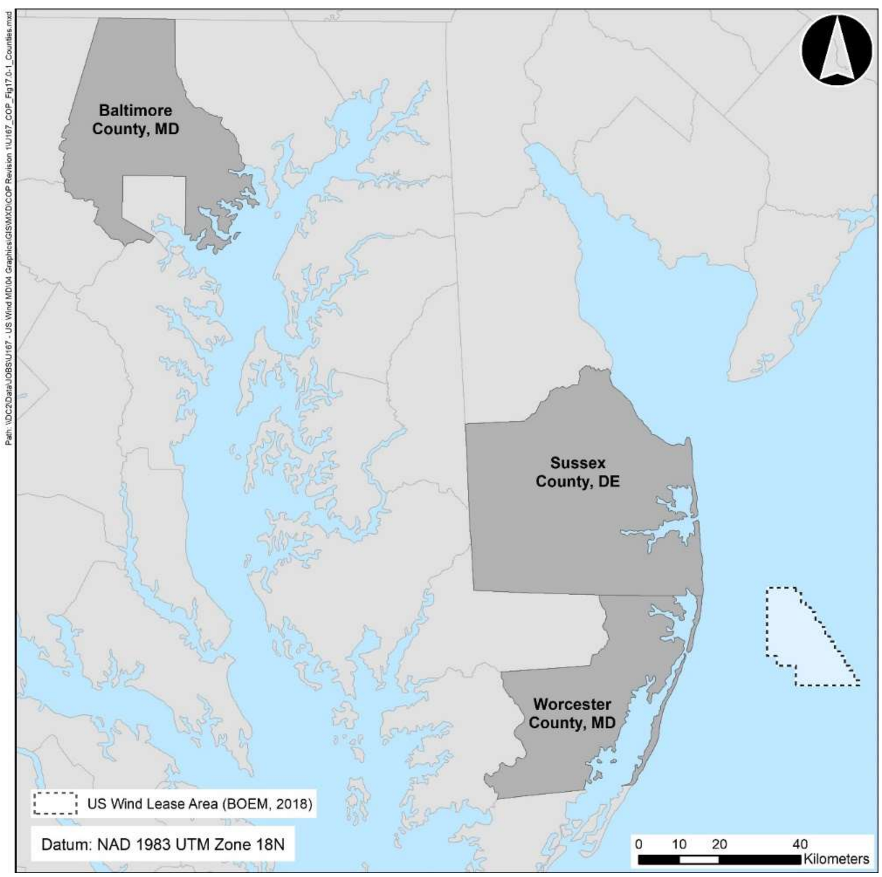

Figure 5.18-1. Counties Potentially Affected by the Project

5.18.1 Demographics, Economy, and Employment

5.18.1.1 Description of Affected Environment

This section describes the populations and economic status of the counties within the Project area. Population data are primarily derived from the United States Census Bureau (USCB). Industry data are primarily derived from the National Ocean Economics Program (NOEP), which reports financial data in 2012 dollars. The NOEP provides statistics for the "ocean economy" (or "ocean-based industries"), comprised of industries that use ocean resources, such as marine fisheries, transportation, and offshore mining, and for all industries that conduct business in coastal counties (the "coastal economy"). Many of the statistics referenced in this section are also listed in Table 5.18-1.

Table 5.18-1. Demographic, Economic and Employment Statistics for Counties in the Project Area

Location	Estimated Population (2019)	Median Income 2015-2019	Per capita Income 2015-2019	Employment (2019)	Unemployment (2019)
Sussex County, DE	234,225	$63,162	$35,491	74,351	4,501
State of Delaware	**973,764**	**$68,287**	**$35,450**	**413,410**	**26,481**
Baltimore County, MD	827,370	$76,866	$40,105	335,413	25,391
Worcester County, MD	52,276	$63,499	$38,080	19,535	1,246
State of Maryland	**6 million**	**$84,805**	**$42,122**	**2,380,865**	**164,396**
United States	**328 million**	**$62,843**	**$34,103**	**132,989,428**	**8,713,400**
Sources: (USCB 2019a, 2019b)					

5.18.1.2 Impacts

The discussion of impacts on the demographics, economy, and employment in the Project area below uses the economic impact assessment, found in COP Appendix II-L1 (US Wind 2023).

The assessment used Impact Analysis for Planning (IMPLAN), a predictive model that uses matrices to relate the performance of economic variables for 546 industries (as of completion of the modeling exercise for this Project) for national, state, and county geographies. The Project was modeled under two scenarios over a seven year fabrication, construction and commissioning timeframe, Scenario 1 is based on using 114 WTGs of the 220 m rotor diameter platform (14.7 MW), and Scenario 2 is based on a PDE maximum with 121 WTGs of the 250 m rotor diameter platform (18 MW). In both scenarios the WTGs are on monopile foundations. The scenarios were modeled with a constant 2021 value, based on a "bill-of-goods" approach to expenditures and labor involved in procurement, installation, and administration during construction. The results of this modeling were in the form of direct, indirect, and induced economic impacts of the Project in the form of, respectively, jobs created due to local operations and spending, jobs created by suppliers, and jobs created due to increased local income and spending as part of construction of the Project.

According to the IMPLAN modeling results, the direct economic impacts of the Project would be driven by expenditures on labor, materials, and equipment used for construction. Scenario 1 of the IMPLAN results tallies the total economic impact for Maryland during the construction phase of the Project. Over the course of the entire construction period, it is estimated that the Project will create the equivalent of 16,780 job years[11] (direct, indirect, and induced) associated with new business activity in Maryland with total sales effects valued at $3.44 billion for the state (see Table 5.18-2 and Table 5.18-3).

Table 5.18-2. Scenario 1 Construction Activities Impact on Maryland's Economy

Impact	All Years
Jobs (in job years)	**16,783**
Sales (Million 2021$)	**$3,440.1**
State and County (all counties) Tax Revenue (Million 2021$)	**$147.2**
Labor Income (Million 2021$)	**$1,246.9**
Value Added/Gross Regional Product (Million 2021$)	**$1,918.9**

Table 5.18-3. Scenario 2 Construction Activities Impact on Maryland's Economy

Impact	All Years
Jobs (in job years)	**18,717**
Sales (Million 2021$)	**$3,861.5**
State and County (all counties) Tax Revenue (Million 2021$)	**$162.8**
Labor Income (Million 2021$)	**$1,386.1**
Value Added/Gross Regional Product (Million 2021$)	**$2,127.5**

The Project presents an opportunity for the region, and Maryland in particular, to benefit from the economic activity related to the creation of a new industry. US Wind is focused on building out a local supply chain to benefit the Project and the broader United States offshore wind industry. US Wind believes that a diverse, well-compensated, and well-trained workforce delivers ahigh-quality product and service, which is why US Wind is committed to creating full and equitable business opportunities for minority, women-owned, veteran-owned, and HUBZone businesses in the

[11] One job year is equivalent to one job for one year.

development of the Project. In November 2021, US Wind was awarded the "Best Practices Award" by the Maryland Minority Contractors Association for the company's work to maximize minority business enterprise (MBE) participation in the Project. Additionally, US Wind signed agreements with organized labor such as United Steelworkers, Baltimore-DC Building and Construction Trades, and the International Brotherhood of Electrical Workers, to support union engagement with offshore wind in the region.

Construction

It is not anticipated that construction will negatively impact the population of the Project area. The onshore components, the Barrier Beach Landfalls, and Interconnection Facilities, are not proposed in residential areas and interference with the operations of existing business enterprises would be temporary. The Project is expected to bring new economic and employment opportunities to the Project area.

US Wind has engaged in good-faith consultations with the Maryland Governor's Office of Small, Minority & Women Business Affairs (GOSBA) and the Office of the Attorney General (AG's Office) for establishing a clear plan for MBE participation goals and procedures. These consultative efforts with GOSBA and the Maryland Attorney General's Office resulted in the establishment of US Wind's 2022 MBE Supplier Diversity Business Development and Local Content Policy, which will optimize US Wind's efforts to implement the MBE 15% goal.

US Wind continued educational engagement efforts, primarily focused towards ongoing partnerships with Baltimore City Public Schools. The successful completion of the KidWind Challenge – a national competition helping educators and students explore renewable energy – resulted in 1st, 2nd, and 3rd place winnings by Mergenthaler Vocational Technical High School during the state rounds. US Wind participated in recent Seagoing PAC meetings for Baltimore City Public Schools. Furthermore, connections were made with Coppin State University and Wor-Wic Community College representatives regarding the development of offshore wind manufacturing training.

US Wind continues to make visibility efforts by discussing projects and broadcasting upcoming opportunities within the MBE community to encourage diverse bidding. Recently efforts have included delivering company-sponsored presentations at the Baltimore President's Roundtable and at the Turner Station Conservation Team community meeting and exhibiting at the Maryland Washington Minority Companies Association 20th Annual 2023 Spring Breakfast Meeting/Business Showcase Expo.

US Wind also routinely participated in community outreach events with a variety of organizations including Prince George's County Legislative Wrap Up 2023; Capital Region Minority Supplier Development Council MBE Input Committee Annual Breakfast; Southern Maryland Minority Chamber of Commerce; Prince George Chamber of Commerce Coffee Connections; Lower Shore Workforce Alliance Offshore Wind Workforce Roundtable; Bi-County Business Roundtable

Breakfast; and Prince George's Office of Central Services Supplier Development & Diversity Division Small Business meeting.

Operations

It is anticipated that the operations and maintenance of the Project will positively impact the population of the Project area. Analysis of potential jobs and spending during operations of the Project is included in COP Appendix II-L1 (US Wind 2023) and shows this impact to the region and to Maryland once the Project is operational (see Table 5.18-4 and Table 5.18-5).

Table 5.18-4. Scenario 1 O&M Impact on Maryland's Economy

Impact	All Years
Jobs (in job years)	**2,936**
Sales (Million 2021$)	**$2,163.0**
Labor Income (Million 2021$)	**$1,103.6**
Value Added/Gross Regional Product (Million 2021$)	**$1,371.3**

Table 5.18-5. Scenario 2 O&M Impact on Maryland's Economy

Impact	All Years
Jobs (in job years)	**3,702**
Sales (Million 2021$)	**$2,721.7**
Labor Income (Million 2021$)	**$1,389.4**
Value Added/Gross Regional Product (Million 2021$)	**$1,725.6**

Impacts of Alternatives

Cable installation in any of the terrestrial routes (i.e., Onshore Export Cable Corridor 1a, 1b, 1c, or 2) would avoid impacts in Indian River Bay. However, Sussex County and local municipalities are undertaking projects to accommodate significant growth in the county, up 20.4 percent from 2010 to 2020[12]. New infrastructure and new traffic patterns, resulting from growth in the region, are planned during the potential period of construction, specifically outside of the peak recreation season, which is the same window of construction for US Wind. US Wind's construction activities have the potential to directly overlap with infrastructure construction and require overhaul or repair of recently installed projects. Announced planned projects along specific routes include:

[12] https://www.census.gov/quickfacts/fact/table/sussexcountydelaware/PST045222

- Onshore Export Cable Corridor 1a and 1b: sidewalk construction on Fred Hudson Road, sewer line and pump station installation on Vines Creek Road, and intersection improvement at State Route 26 and Falling Point Road.
- Onshore Export Cable Corridor 2: Pedestrian improvement projects in the Dewey Beach area in 2027-2028, intersection upgrades and road extension from Airport Road to State Route 24, and intersection improvements with turn lanes, bike paths, and pedestrian infrastructure at State Route 24 and Warrington Road.

Installation of up to four export cables in the land-based routes would result in significant temporary disruption along roads and statewide bike routes in Sussex County, Delaware, and may affect ongoing infrastructure projects undertaken by the Delaware Department of Transportation (DelDOT) and others. Road closures would be necessary during construction along any of the routes, resulting in rerouting and temporary access impacts to commercial, residential, and municipal properties such as schools, hospitals, recreation centers, and religious centers along all of the routes. Construction would be planned outside of the recreational season (mid-May through mid-September) and would therefore primarily affect residents and businesspeople in the area, as well as tourists and recreational traffic to a lesser extent.

5.18.2 Commercial and Recreational Fisheries

5.18.2.1 Description of Affected Environment

Commercial and recreational fishing is common throughout the mid-Atlantic region. Commercial fishing within the Project area is managed by the Mid-Atlantic Fishery Management Council, NOAA's Highly Migratory Species Office, and the Atlantic States Marine Fisheries Commission. There are a number of FMPs in place for regulating and managing fisheries in the region. These include plans for summer flounder, scup, black sea bass, spiny dogfish, Atlantic mackerel, squid, butterfish, bluefish, surfclam, ocean quahog, and tilefish. See Section 5.7 for additional information on fishery management plans.

Commercial fishing in the Project area occurs primarily offshore in both Maryland and Delaware. Aquatic invasive species data for fishing vessels (vessels type classified as "Fishing", traveling at 5 knots or less) in the vicinity of the Project area in 2019 indicate that activity was primarily located outside of the Lease area. Within the Project area, vessel tracks were largely consolidated along a route between Ocean City and offshore fishing grounds to the east of the Lease area. (Table 5.18-6 and Table 5.18-7)

Table 5.18-6. Delaware Commercial Landings Revenue, 2017 to 2020

Species	2017	2018	2019	2020	2017 - 2020 Total	Percent (%)
Crab, blue	$7,318,230	$7,574,143	$8,479,459	$7,195,054	$30,566,886	73.3
Oyster, Eastern	$701,035	$644,134	$994,059	$456,833	$2,796,061	6.7

Table 5.18-6. Delaware Commercial Landings Revenue, 2017 to 2020

Species	2017	2018	2019	2020	2017 - 2020 Total	Percent (%)
Withheld for confidentiality	$946,144	$960,824	$446,575	$329,388	$2,682,931	6.4
Bass, Black Sea	$277,610	$512,794	$493,616	$429,426	$1,713,446	4.1
Whelk, Knobbed	$237,230	$639,987	$518,137	$260,753	$1,656,107	4.0
Bass, Striped	ND	ND	$470,237	$477,684	$947,921	2.3
Crab, Horseshoe	ND	ND	$287,394	$218,405	$505,799	1.2
Clam, Quahog, Northern	$101,178	$73,050	$72,566	$41,900	$288,694	0.7
Lobster, American	$194,902	ND	ND	$85,450	$280,352	0.7
Eel, American	ND	$96,777	$42,614	$5,722	$145,113	0.3
Menhaden, Atlantic	$8,938	$17,082	$8,369	$15,985	$50,374	0.1
All other species	$14,381	$25,274	$14,677	$6,348	$60,680	0.1
Total	**$9,799,648**	**$10,544,065**	**$11,827,703**	**$9,522,948**	**$41,694,364**	**100**

Source: (NOAA Fisheries 2021e)
ND = no data available

Table 5.18-7. Maryland Commercial Landings Revenue, 2017 to 2020

Species	2017	2018	2019	2020	2017 - 2020 Total	Percent (%)
Crab, Blue	$48,535,248	$45,307,942	$48,058,247	$33,174,255	$175,075,692	60.0
Oyster, Eastern	$10,473,078	$6,741,398	$9,949,103	$9,209,648	$36,373,227	12.5
Bass, Striped	$7,060,881	$6,021,992	$6,014,945	$4,535,955	$23,633,773	8.1
Withheld for confidentiality	$5,559,224	$6,402,021	$3,970,662	$6,000,027	$21,931,934	7.5
Scallop, Sea	$944,785	$1,208,629	$2,403,227	$1,710,241	$6,266,882	2.1
Bass, Black Sea	$1,235,518	$1,253,816	$1,192,217	$960,083	$4,641,634	1.6
Catfish, Blue	$920,308	$1,082,032	$1,134,435	$876,953	$4,013,728	1.4
Menhadens	$648,149	$732,878	$627,099	$964,225	$2,972,351	1.0
Clam, Soft	$1,662,770	$911,325	$212,798	$29,350	$2,816,243	1.0

Table 5.18-7. Maryland Commercial Landings Revenue, 2017 to 2020

Species	2017	2018	2019	2020	2017 - 2020 Total	Percent (%)
Eel, American	$1,399,552	ND	$842,812	ND	$2,242,364	0.8
Flounder, Summer	$563,964	$608,333	$402,484	$484,708	$2,059,489	0.7
Swordfish	$157,185	ND	$194,935	$683,600	$1,035,720	0.4
Shad, Gizzard	ND	$555,233	$248,245	$141,590	$945,068	0.3
Perch, White	ND	ND	$936,549	ND	$936,549	0.3
Tuna, Bigeye	ND	ND	$570,570	$352,607	$923,177	0.3
Tuna, Yellowfin	$394,043	$173,904	$254,642	$100,581	$923,170	0.3
Whelk, Channeled	$12,167	$68,732	$288,222	$312,395	$681,516	0.2
Lobster, American	$208,084	$175,993	$82,436	$80,793	$547,306	0.2
Shark, Dogfish, Spiny	$295,487	$97,349	ND	$64,646	$457,482	0.2
Spot	$167,147	$113,323	$44,852	$131,232	$456,554	0.2
Crab, Horseshoe	$320,887	$46,142	ND	$65,287	$432,316	0.1
Perch, Yellow	$93,841	$74,018	$105,487	$51,561	$324,907	0.1
Conchs	$161,774	$14,925	$64,242	ND	$240,941	0.1
Crab, Jonah	$73,596	$60,399	$50,866	$39,390	$224,251	0.1
Croaker, Atlantic	$137,953	$76,944	$5,355	$2,817	$223,069	0.1
All other species	$486,071	$258,051	$331,679	$277,141	$1,352,942	0.5
Total	**$81,511,712**	**$71,985,379**	**$77,986,109**	**$60,249,085**	**$291,732,285**	**100**

Source: (NOAA Fisheries 2021e)
ND = no data available

Figure 5.18-2, commercial fishing revenue is relatively low in the Project area compared to areas further offshore.

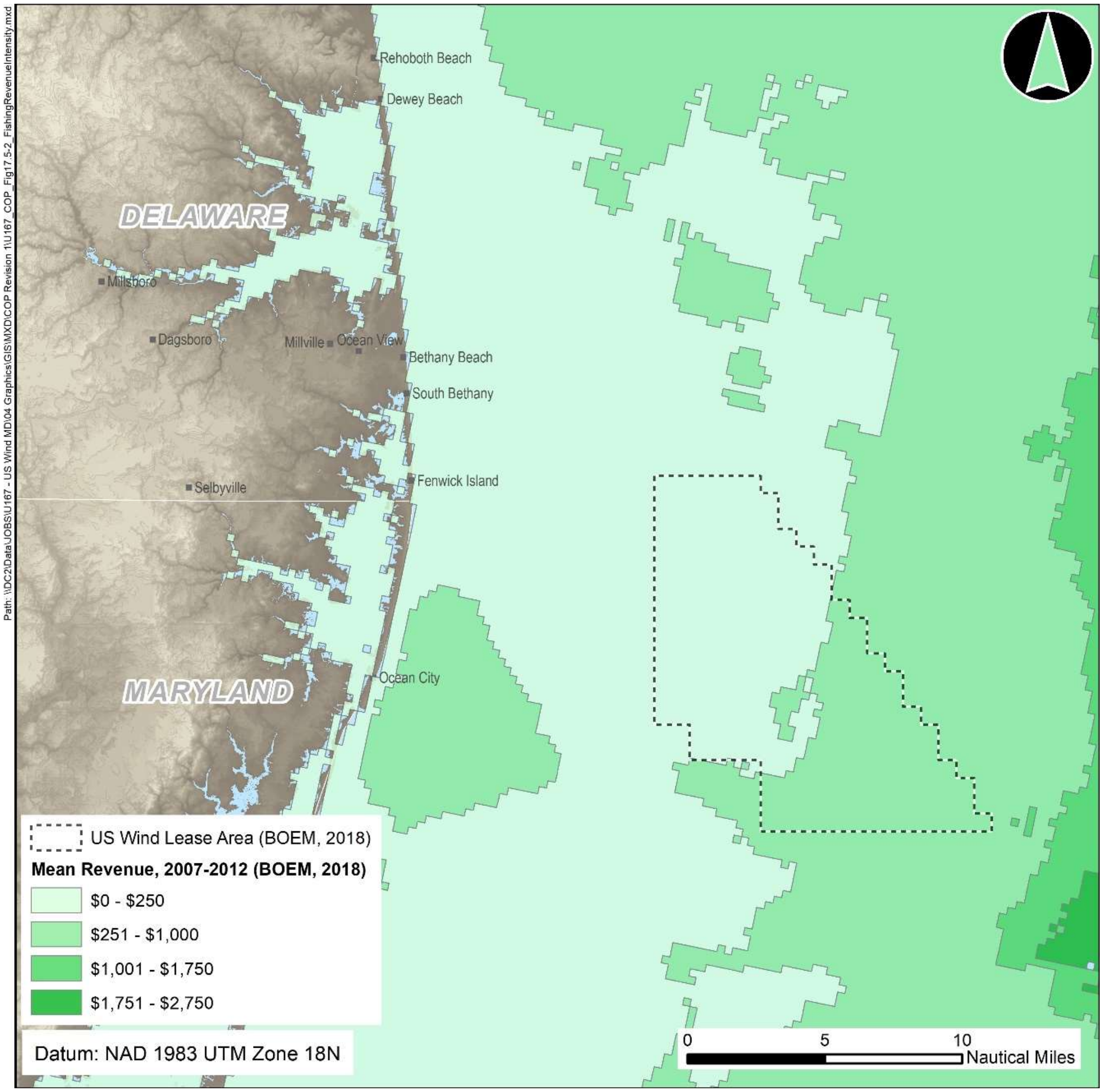

Figure 5.18-2. Lease Area and Revenue-Intensity Raster from Commercial Fishing Activity

As discussed in the FAR, of the ports in the region, Ocean City receives the most landings from commercial fishing within the Lease area (COP Appendix II-F2 (US Wind 2023)). Vessels from Ocean City accounted for the greatest percentage of commercial fishing vessel trips to the Project area of any port from 2008 through 2019 (NOAA Fisheries 2021b, 2021d) The small commercial fishing fleet out of Ocean City is dominated by trawlers, gill netters, dredgers, and potters (MDDNR 2021). The majority (68 percent of vessels served by Ocean City are small, with a length of less than 15 m (50 ft) (NOAA NEFSC 2014). Fish packing facilities have not been active in Delaware since the 1980's, so vessels that depart from Delaware typically land their catch in Ocean City to take advantage of one of the three packing facilities as well (NOAA Fisheries n.d.). The Worcester County Commission zoned the Ocean City harbor as a commercial marine district and oversees a commercial dock in West Ocean City (NOAA Fisheries n.d.).

Fisheries and Gear Types

US Wind contracted Sea Risk Solutions to conduct a study of fisheries and fishing activities in the Lease area (Sea Risk Solutions 2021) (COP Appendix II-F2, Section 2.0 (US Wind 2023)). For a detailed discussion of fisheries gear types utilized in the Lease area.

Potential Commercial Fishery Activity Exposure to Lease Area Activities

Fisheries landings data from 2008 to 2019 in the Lease area were compiled and summarized by NOAA Fisheries ((NOAA Fisheries 2021b, 2021d), (COP Appendix II-F2 (US Wind 2023)). The Lease area was subdivided into two portions (western and eastern, US Wind 1 and US Wind 2, respectively) by NOAA Fisheries for the 2021 fisheries assessments (NOAA Fisheries 2021b, 2021d), (COP Appendix II-F2 (US Wind 2023)). This data informed the *2021 Sea Risk Solutions Fisheries Assessment Report*.

Between 2008 and 2019, total annual fisheries revenue within the Lease area averaged $217,583, and total annual landings averaged 315,917 lbs (Table 5.18-8) (COP Appendix II-(US Wind 2023)). While the Lease area is lightly fished and the fisheries revenue in the area is low in the context of the region, this revenue is critical to those few fishermen who derive important portions of their incomes from the Lease area (COP Appendix II-F2 (US Wind 2023)).

Table 5.18-8. Revenue and Landings from within the Lease Area 2008 – 2019

Year	Total Lease Area	
	Revenue	Landings (lbs)
2008	$279,000	452,000
2009	$393,000	180,000
2010	$256,000	664,000
2011	$200,000	254,000
2012	$163,000	304,000
2013	$148,000	439,000
2014	$173,000	298,000
2015	$271,000	202,000
2016	$256,000	264,000
2017	$145,000	280,000

Table 5.18-8. Revenue and Landings from within the Lease Area 2008 – 2019

Year	Total Lease Area	
	Revenue	Landings (lbs)
2018	$209,000	361,000
2019	$118,000	93,000
Annual Average	**$217,583**	**315,917**

Source: COP Volume II, Appendix II-F2 (US Wind 2023)
US Wind 1 and US Wind 2 combined, rounded to the nearest 1,000.

Within the Lease area, the FMPs that derived the most revenue between 2008 to 2019, and were therefore the most exposed to potential impacts from development, were the sea scallop, and summer flounder, scup, and black sea bass FMPs (NOAA Fisheries 2021b, 2021d). Harvest of species for which there is no federal FMP also accounted for a significant portion of twelve-year revenue in Lease area (NOAA Fisheries 2021b, 2021d). Landings and revenue data for the most impacted FMPs, and other impacted FMPs, in each portion of the Lease area are presented in Table 5.18-9 (NOAA Fisheries 2021b, 2021d).

Table 5.18-9 Total Revenue for Most Impacted FMPs within the Lease Area, 2008 – 2019

FMP	Twelve Year Revenue	Percentage of 12-Year Revenue (%)
Sea Scallop	$865,000	33.1
No Federal FMP	$666,000	25.5
Summer Flounder, Scup, Black Sea Bass	$381,000	14.6
Surfclam, Ocean Quahog	$176,000	6.7
Spiny Dogfish	$145,000	5.6
Mackerel, Squid, and Butterfish	$127,000	4.9
All Others[1]	$250,000	9.6

Source: NOAA Fisheries 2021a and 2021b
[1]All Others indicates all FMPs not listed, including those with less than three permits or dealers impacted which were not identified in NOAA Fisheries 2021a and 2021b to protect confidentiality.

In the Lease area, sea scallops, whelk, summer flounder, surf clams, and black sea bass accounted for over 65 percent of 12-year revenue (COP Appendix II-F2 (US Wind 2023)). Landings data for additional species, and 12-year and average annual revenue by species, are presented in COP Appendix II-F2 (US Wind 2023)) (Table 5.18-10).

Table 5.18-10. Total Revenue by Species within the Lease Area, 2008 – 2019

Species	Twelve Year Revenue	Percentage of 12-Year Revenue (%)
Sea Scallop	$869,501	33.6
Whelk	$284,119	11.0
Summer Flounder	$211,209	8.2
Surf Clam	$175,246	6.8
Black Sea Bass	$169,040	6.5
All Others	$880,369	34.0
Source: Appendix II-F2		

A variety of different gear types are utilized within the Lease area (NOAA Fisheries 2021b, 2021d). Though sea scallop dredging accounts for the greatest percentage of revenue of any gear type in the Lease area, revenue has declined in recent years (COP Appendix II-F2 (US Wind 2023)). Other gear types that account for significant percentages of revenue with the Lease area include bottom trawling, pot fishing (other non-lobster), and sink gillnetting (NOAA Fisheries 2021b, 2021d). The "All Others" category includes species with less than three permits or dealers impacted to protect data confidentiality. Landings data by gear type in each portion of the Lease area are presented in NOAA Fisheries (NOAA Fisheries 2021b, 2021d) (Table 5.18-11).

Table 5.18-11. Total Revenue by Gear Type within the Lease Area, 2008 – 2019

Gear Type[1]	Twelve Year Revenue	Percentage of 12-Year Revenue (%)
Dredge-Scallop	$854,000	32.7
Trawl-Bottom	$531,000	20.4
Pot-Other	$462,000	17.7
Gillnet-Sink	$226,000	8.7
Dredge-Clam	$219,000	8.4
All Others	$209,000	8.0
Pot-Lobster	$60,000	2.3
Seine-Purse	$27,000	1.0
Longline-Bottom	$9,000	0.3
Gillnet-Other	$11,000	0.4
Handline	<$500	<0.01
Source: (NOAA Fisheries 2021b, 2021d) [1]"All Others" includes species with less than three permits or dealers impacted to protect confidentiality.		

Nearly three quarters of fisheries revenue derived from the Lease area is landed at three ports; Ocean City, Maryland, Cape May, New Jersey, and New Bedford, Massachusetts (COP Appendix II-F2 (US Wind 2023)). A majority of all revenue from the Lease area between 2008 and 2019 was landed at the ports of Ocean City and Cape May, which are located within 25 km (16 mi) and 53 km (33 mi) of the Lease area, respectively (NOAA Fisheries 2021b, 2021d). Revenue data for the most impacted ports for each portion of the Lease area (eastern and western) are presented in COP Appendix II-F2 (US Wind 2023).

Recreational Fishing Resources

The majority of recreational fishing in Delaware occurs in inland waters. Total catch for recreational fishing in Delaware from 2018 to 2021, including observed harvest, reported harvest, and released fish is included in Table 5.18-12. Top species by catch include summer flounder, bluefish, black sea bass, and white perch. For each of the top 12 species by catch, over 60 percent of the catch occurred in inland waters for all species except black sea bass, striped mullet, and smooth dogfish (NOAA Fisheries 2021d).

US Wind contracted Sea Risk Solutions to conduct a study of fisheries and fishing activities in the Lease area (Sea Risk Solutions 2021). See Section 4.1 of COP Appendix II-F2 (US Wind 2023) for a discussion of recreational fishing in the Lease area include sport fishing opportunities such as world-famous fishing tournaments for billfishes and tunas. Tournaments include the White Marlin Open, the Big Fish Classic, the Ocean City Tuna Tournament, the Ocean City Marlin Club Canyon Kickoff and the Heels and Reels Tournament.

The most important offshore fishing ground in the vicinity of the Project area is located offshore of Delaware. This area, known for its rocky bottom and corals, is referred to as the “Old Grounds” (See Figure 5.18-3). The Old Grounds is heavily used for recreational and for-hire charter fishing, primarily targeting winter flounder, summer flounder, black sea bass, tautog, and red hake.

Artificial reefs have been established offshore to provide substrate that encourages growth of marine invertebrates and provides protection for crustaceans and fish. They also provide recreational fishing opportunities. None are located within the Lease area. Offshore Export Cable Corridor 2 could potentially intersect with a currently unused portion on an artificial reef and fish haven location. US Wind enlarged Offshore Export Cable Corridor 2 to avoid this area in case future efforts are undertaken to expand the area of structure within the artificial reef. The artificial reef locations and charted wreck sites that may also create habitat are shown in Figure 5.18-3.

In the Delaware Inland Bays, over 200,000 recreational fishing trips are made per year (DCIB 2016). In Indian River Bay, fishing access areas include Rosedale’s Beach, Massey Landing, Holts Landing, Indian River Marina, and Indian River Inlet. Rosedale’s Beach is located at the base of Indian River; Massey Landing and Holts Landing are located near the center of the Bay, on the north and south shores, respectively; and Indian River Marina is located to the east of Indian River Inlet (DNREC 2017a).

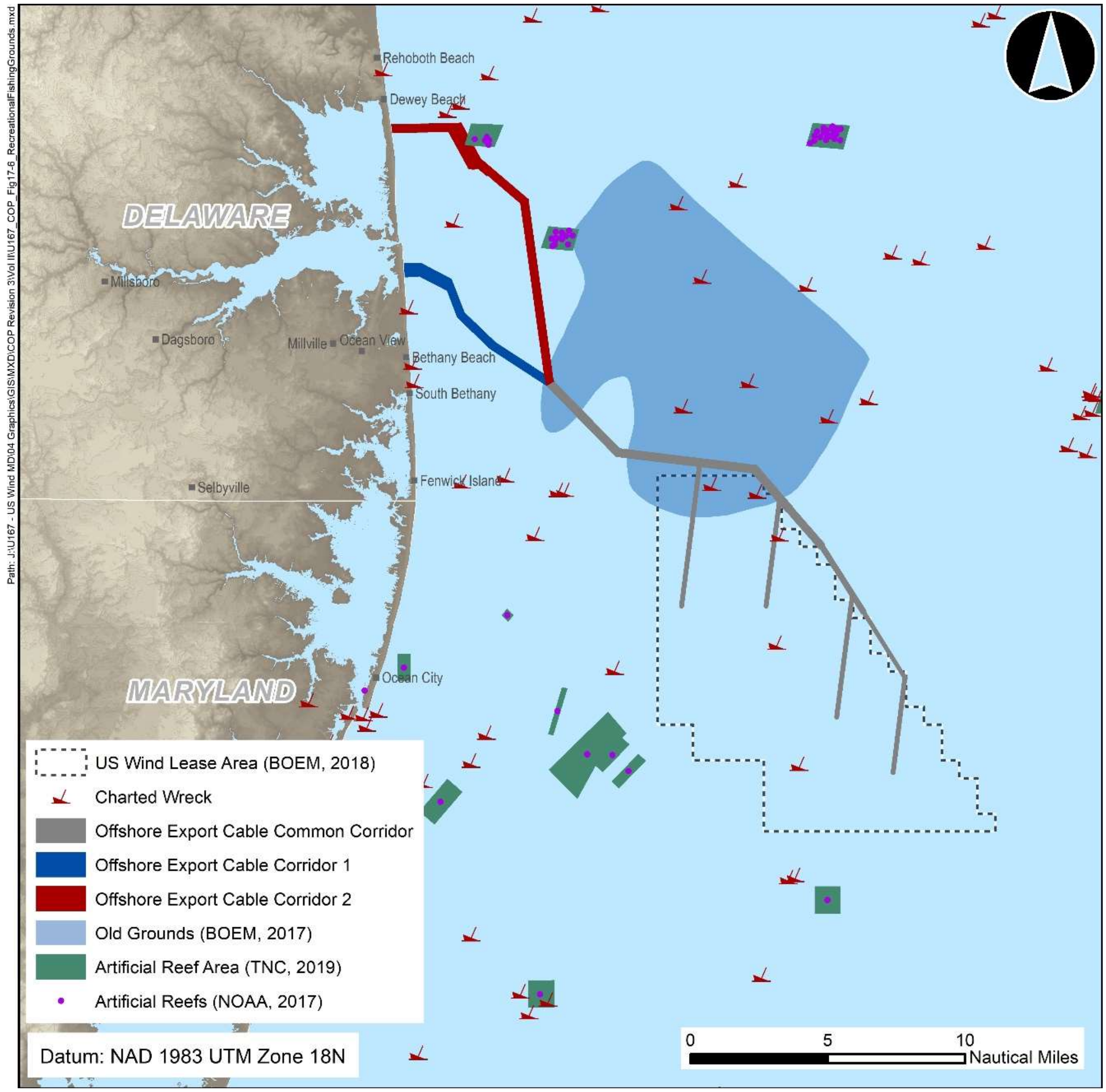

Figure 5.18-3. Location of Old Grounds Fishing Area and Artificial Reefs

Table 5.18-12. Delaware Recreational Fishing Total Catch, 2018 to 2021

Species	Ocean > 3 mi		Ocean <= 3 mi		Inland		Total	
	Catch (# individuals)	Percent of species catch (%)	Catch (# individuals)	Percent of species catch (%)	Catch (# individuals)	Percent of species catch (%)	Catch (# individuals)	Percent of Grand Total (%)
Atlantic Croaker	50,742	6	56,337	6	807,986	88	915,065	3.08
Summer Flounder	769,211	33	56,411	2	1,499,017	64	2,324,639	7.81
Bluefish	52,042	4	524,269	35	903,569	61	1,479,880	4.97
Black Sea Bass	1,717,529	65	25,342	1	902,526	34	2,645,397	8.89
White Perch	NP	0	3,725	0	2,113,592	100	2,117,317	7.12
Spot	NP	0	161,218	15	898,274	85	1,059,492	3.56
Striped Bass	45,651	4	84,624	6	1,173,652	90	1,303,927	4.38
Tautog	149,181	11	38,025	3	1,222,324	87	1,409,530	4.74
Oyster Toadfish	24,738	3	9,169	1	893,856	96	927,763	3.12
Channel Catfish	NP	0	NP	0	496,277	100	496,277	1.67
Smooth Dogfish	76,994	14	172,114	32	288,431	54	537,539	1.81
Striped Mullet	NP	0	44,404	81	10,439	19	54,843	0.18
All other Species	3,033,421	21	1,136,800	8	10,307,174	71	14,477,395	48.67
Grand Total	**4,311,822**	**13**	**5,001,251**	**15**	**24,674,898**	**73**	**29,749,064**	**100.00**

Source: (NOAA Fisheries 2021d)
Species is not present/not taken from the area

The vast majority of recreational fishing in Maryland also occurs in inland waters such as lakes, rivers and inland bays. Total catch for recreational fishing in Maryland from 2018 to 2021 is included in Table 5.18-13. Top species by catch include white perch, striped bass, and spot. For each of the top twelve species by catch, over 80 percent of the catch occurred in inland waters for all species except bluefish and black sea bass (NOAA Fisheries 2021d). The density of recreational fishing vessels that included federally permitted party boats and charter boat trips is illustrated in Figure 5.18-4.

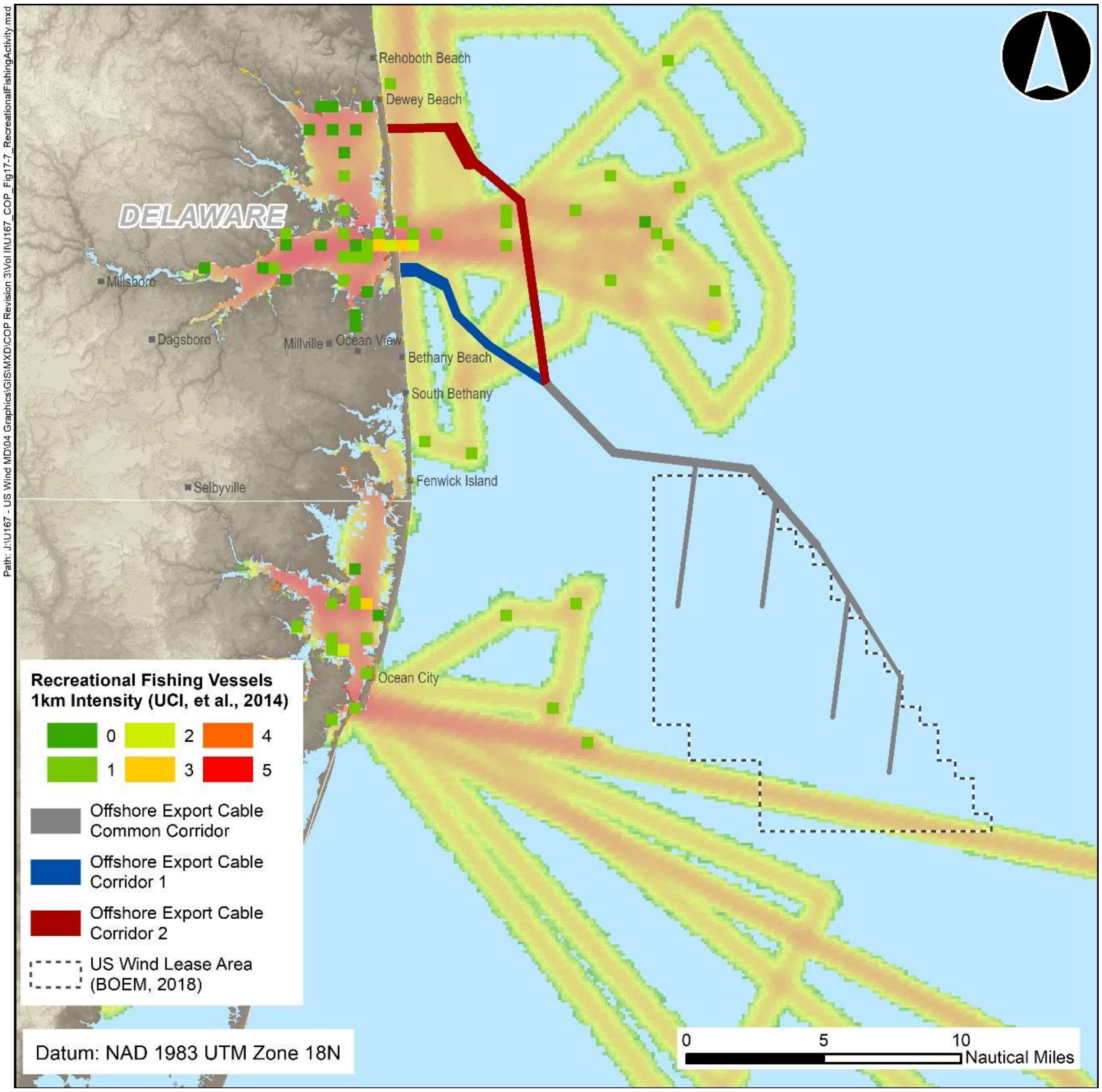

Figure 5.18-4. Recreational Fishing Vessel Activity in the Project Area

Table 5.18-13 Maryland Recreational Fishing Total Catch, 2018 to 2021

Species	Ocean > 3 mi		Ocean <= 3 mi		Inland		Total	
	Catch (# individuals)	Percent of Species Catch (%)	Catch (# individuals)	Percent of Species Catch (%)	Catch (# individuals)	Percent of Species Catch (%)	Catch (# individuals)	Percent of Grand Total (%)
White Perch	NP	0	NP	0	39,872,049	100	39,872,049	15.68
Striped Bass	17581	0	46,233	0	26,223,121	100	26,286,935	10.34
Spot	66	0	121,085	0	24,172,004	100	24,293,155	9.56
Atlantic Croaker	16,792	0	36,755	1	6,592,912	99	6,646,459	2.61
Channel Catfish	NP	0	NP	0	9,236,335	100	9,236,335	3.63
Largemouth Bass	NP	0	NP	0	2,368,920	100	2,368,920	0.93
Summer Flounder	417,826	13	67,049	2	2,628,975	84	3,113,850	1.22
Black Sea Bass	1,449,363	28	42,557	1	3,601,666	71	5,093,586	2.00
Bluefish	50,334	3	336,188	20	1,327,997	77	1,714,519	0.67
Yellow Perch	NP	0	NP	0	1,786,285	100	1,786,285	0.70
Hickory Shad	NP	0	NP	0	168,650	100	168,650	0.07
Tautog	82,462	6	107,034	8	1,130,785	86	1,320,281	0.52
All other species	3,007,663	2	885,265	1	128,448,645	97	132,341,573	52.05
Grand Total	**5,042,087**	**2**	**1,642,166**	**1**	**247,558,344**	**97**	**254,242,597**	**100.00**

Source: NOAA Fisheries 2021
NP= Species is not present/not taken from the area

Potential Recreational Fishery Activity Exposure to Lease Area Activities

As referenced in the above discussion of potential commercial fishery exposure to Lease area activities, a BOEM study (Kirkpatrick et al. 2017) assessed existing recreational fisheries-related activities in the Lease area for exposure to wind energy development. It also assessed exposure of shoreside dependents, which include businesses that directly support (e.g., gas stations, bait and ice dealers, transportation, etc.) and/or use the landings of commercial and recreational fisheries (e.g., first point of sale dealers, etc.). Data in the study specific to recreational fisheries activities conducted and/or related to recreational fishing within the Lease area are summarized below.

Table 5.18-14 summarizes recreational fishery activity exposure by state in terms of for-hire boat trips, for-hire angler trips, private angler trips, and total expenditures. Recreational fishing activity was considered exposed if it occurs on or near the Lease area. Shore-based fishing is not included as these anglers will not, most likely, be exposed to Lease area development activities. Recreational fishing activity exposure, attributable to the Lease area, range from less than one percent to less than seven percent of activity totals in each category. Overall, expenditures for recreational fishing trips are most exposed in New Jersey, at 6.8 percent of total expenditures (Kirkpatrick et al. 2017).

Table 5.18-14. State-Level Average Annual Exposure of Recreational Fishery to Lease Area, 2007-2012

State	Total For-Hire Boat Trips	Percent Total For-Hire Boat Trips Exposed	Total For-Hire Angler Trips	Percent Total For-Hire Angler-Trips Exposed	Total Private Boat Angler-Trips	Percent Total Private-Boat Angler-Trips Exposed	Total Expenditures (private boat and for-hire)	Percent Total Expendi-tures Exposed
MD	696	6.3	12,422	6.6	1,704,515	0.36	$16,122,478	2.9
DE	1,093	1.7	12,512	2.6	522,766	4.53	$19,771,177	5.0
NJ	8,177	0	153,989	0	3,028,511	1.56	$44,135,406	6.8
Source: Kirkpatrick et al. 2017								

Table 5.18-15 shows that Ocean City, Maryland and Indian River, Delaware, the ports closest to the Project area, had the highest number of for-hire boat trips exposed to the Lease area per year during the BOEM report study period. For both ports, these exposed trips were a small percentage of total for-hire trips. Cape May, New Jersey had the highest total exposure for angler trips (both for-hire and private) and angler expenditures (Kirkpatrick et al. 2017).

Table 5.18-15. Lease Area Average Annual Private Boat and For-Hire Recreational Exposure by Port Group, 2007-2012

Port Group	Exposed For-Hire Boat Trips	Percent For-Hire Boat Trips Exposed	Exposed For-Hire Angler-Trips	Exposed Private Boat Angler-Trips	Percent Total Angler-Trips Exposed	Total Expenditures (Private Boat and For-Hire)	Percent Total Expenditures Exposed
Maryland							
Ocean City	44	6.3	823	4,364	2.3	$12,328,325	3.1
Pocomoke City	0	0	0	1,767	2.0	$3,794,153	2.0
Delaware							
Indian River	18	5.2	316	5,512	6.0	$4,473,090	6.1
Lewes	~0	~0	2	8,424	5.7	$6,813,618	4.9
Milford	~0	7.7	1	0	~0	$2,092,891	~0
Other Sussex	~0	1.0	~0	9,726	6.0	$6,391,579	6.0
New Jersey							
Cape May	1	~0	7	47,348	9.7	$32,011,401	9.4
Ocean City	~0	0.1	2	0	~0	$1,646,222	~0
Sea Isle City	~0	0.1	10	0	~0	$2,373,273	~0
Wildwood	~0	0.1	8	0	~0	$8,104,510	~0
Total	**63**	**0.4**	**1,168**	**77,141**	**5.4**	**$80,029,061**	**5.6**
Source: Kirkpatrick et al. 2017							

The study concluded that generally recreational fisheries, nor their shoreside dependents, are not highly exposed to development of the Lease area (Kirkpatrick et al. 2017).

5.18.2.2 Impacts

Construction

Activities associated with Project construction have the potential to impact commercial and recreational fisheries, though these impacts are expected to be minor and temporary.

US Wind has partnered with the University of Maryland Center for Environmental Science (UMCES) on a study of commercial and recreational fisheries. The primary goal of the 8-year UMCES Fishery Resource Monitoring program is to evaluate how Ocean City Maryland commercial and recreational fisheries for black sea bass will adapt and be impacted by the

Project. Wind turbine foundations will add three-dimensional structure where very little currently exists. Under these new conditions, highly aggregated distributions of BSB centered on turbines are expected to result in increased catches by commercial and recreational fisheries. Additionally, black sea bass sensitivity to the percussive and vessel noises associated with turbine construction could cause dispersal from turbine and project regions resulting in short-term disruptions in catch. Commercial and recreational fishers are working with the UMCES team to evaluate changed black sea bass catch rates between 2-year periods: before, during, and after turbine construction within the project area, beginning in 2023. Monitoring designs utilize Before-After-Gradient and Before-After-Control-Impact procedures testing hypothesized changes in catch amplitude and variance. The commercial pot survey consists of rigs of 15 commercial pots each, with pots spaced proximate and distant to turbine structures to capture both turbine- and project-scaled changes in black sea bass catch rates. Monthly pot surveys (Mar-Nov) of six rigs, four in the project area and two in an adjacent control area, deploy ropeless EdgeTech devices to avoid whale and turtle entanglements. Statistical power analysis during an initial trial year (2022) showed that the sampling design supports detecting a >4-fold increase in catch rates. The recreational survey compares two existing well-fished artificial reef sites (control) to two turbine sites during monthly surveys (May-Oct) through standardized bottom drift and jig angling techniques. Both commercial and recreational surveys examine patterns of black sea bass colonization to new foundations as well as size, sex and diet metrics during all phases of the study.

Habitat Alteration

Construction activities, including cable burial, gravity cell installation, and contact of anchors and jack-up vessels with the seafloor, will temporarily alter habitat in the area. Benthic organisms located in the path of the jet plow, beneath jack-up vessel legs, in areas of anchor chain sweep, and within gravity cell footprints, will likely experience mortality. However, these impacts will be temporary and localized, as seafloor habitats are expected to undergo rapid physical and biological recovery following disturbance (Refer to Volume II, Section 7.0).

The installation of WTGs, OSSs, Met Tower, scour protection, and cable protection (in areas where cable burial depth is insufficient) will result in direct mortality to organisms located in the footprint of these structures, as well as long-term impacts to the benthic community resulting from conversion of soft sediment habitat to hard substrate (see Section 5.6.2). The area impacted by these activities will be limited and commercial and recreational fisheries are not expected to be impacted.

The offshore export cables and up to four WTGs with associated inter-array cables may be located within the Old Grounds recreational fishing area. As all of the primary species of interest in this area are demersal, Project construction may have temporary minor impacts on recreational fishing in this area. It is expected that demersal fish will temporarily move out of the Project area during active construction and return after construction noise and sediment disturbance have stopped (see Section 5.7.2).

Noise and Suspended Sediment/Deposition

Exposure to elevated sound levels associated with construction activities, including vessel and pile driving noise, is expected to have negligible to minor impacts on fish, and therefore commercial and recreational fisheries, within the Project area. Fish are likely to respond to this activity by temporarily avoiding the area of the sound source (see Section 5.7.2). Similarly, Project activities, including the installation of onshore export cables in Indian River Bay, have the potential to result in temporary and localized increases in suspended sediment concentrations. These water quality changes could impact finfish, and individuals are likely to vacate the area immediately surrounding Project activities (see Section 5.7.2). As avoidance behavior in response to noise and water quality changes will be temporally limited, impacts on commercial and recreational fishing will be negligible.

Space-Use Conflicts

US Wind does not propose any long-term vessel exclusions during construction of the Project. Temporary exclusion areas, including fishing restrictions, will occur in the area of offshore construction activities for safety reasons. Restrictions would be temporary and are anticipated to have negligible impact on commercial and recreational fisheries.

Modest increases in vessel traffic will occur in and around ports used for Project mobilization. However, these temporary changes are unlikely to impact either commercial or recreational fisheries activity. Where feasible, space-use conflicts will be mitigated through the implementation of BMPs as described in BOEM's 2014 report on this topic (Ecology and Environment Inc. 2014).

One of the BMPs for commercial wind energy development identified by BOEM is that a lessee designate a Fisheries Liaison and develop a fisheries communication plan (BOEM 2015). The plan, which is implemented with the assistance of the liaison, allows Lessees to acquire information from representatives of the fishing community and to fully consider the impacts of construction and operation of proposed facilities throughout the life of the Project. US Wind contracted Sea Risk Solutions as the Fishing Liaison Officer. Sea Risk Solutions developed a Fisheries Communication Plan for US Wind to address installation, operation, and decommissioning of the Project as well as activities prior to Project construction such as surveys and deployment of the Metocean Buoy (COP Appendix II-F1 (US Wind 2023)). The Fisheries Communication Plan identifies the Fisheries Liaison who serves as US Wind's outreach representative to the fishing industry and two Fisheries Representatives who represent the local fishing community. A summary of meetings that US Wind has conducted with the fishing community will be included in the stakeholder engagement summary (COP Appendix II-L2 (US Wind 2023)).

Operations

Space-Use Conflicts and Noise

US Wind does not plan to establish any long-term vessel exclusion areas around WTGs, OSSs, Met Tower or other structures during operation of the Project. Temporary and localized fishing and navigation restrictions may be necessary in the immediate area of Project maintenance activities. Noise resulting from maintenance activities has the potential to elicit avoidance responses from fish. However, as fish are expected to rapidly return to these areas following completion of maintenance actions, these activities are not anticipated to impact commercial or recreational fisheries.

The addition of Project components (WTGs, OSSs and Met Tower) will introduce new structures within the Lease area and will result in increased vessel allision risk (COP Appendix II-K1 (US Wind 2023)). However, these structures will be widely spaced, lit, and marked per USCG guidelines. These factors, coupled with sound boat handling practices, will minimize potential risks to navigation.

The use of mobile gear within the Lease area and along the offshore export cables is unlikely to be restricted during Project operations, as cables will be buried 1 to 4 m (3 to 13 ft) below the seafloor. In areas where sufficient burial depth is not attainable, cable protection in the form of concrete mattresses or rock will be installed. These materials may present a risk for gear entanglement. However, burial is the preferred cable protection approach, and cable protection will be minimized to the greatest extent practicable.

Impacts of Alternatives

Installation of export cables in Offshore Export Cable Corridor 2 would be conducted in the same manner as Offshore Export Cable Corridor 1 which would not result in additional impacts to commercial and recreational fisheries within the Atlantic. A recreational fish haven (DE9) is located immediately to the east of a portion of Offshore Export Cable Corridor 2. During surveys, Offshore Export Cable Corridor 2 was expanded in the vicinity of the fish haven to allow for micro-siting while ensuring sufficient survey coverage for analysis of optimized routing. Sand Borrow Area B, which is currently used for beach nourishment projects is located immediately to the west (see Section 5.19.1) and would also require a buffer to avoid conflict.

Cable installation in any of the terrestrial routes (i.e., Onshore Export Cable Corridor 1a, 1b, 1c, or 2) would avoid impacts to fisheries in Indian River Bay.

Mitigation and Monitoring

US Wind will implement the following mitigation measures to reduce Project impacts on recreational and commercial fisheries.

- US Wind will concentrate onshore construction activities outside of the summer recreation season to the greatest extent practicable and will coordinate with DNREC Parks and Recreation to minimize interference with beach activities.
- US Wind has sited and developed Project elements to minimize disturbance to resources, to the extent practicable, enjoyed by residents of and visitors to the region.
- US Wind developed a Fisheries Communication Plan, in conjunction with the designated Fisheries Liaison Officer and will work with fisheries stakeholders to update it as appropriate.
- US Wind established a process for gear loss compensation for commercial fishermen.
- US Wind will work cooperatively with commercial/recreational fishing entities and interests to review planned activities and ensure that the construction and operation activities will minimize potential conflicts.
- US Wind will conduct pre- and post-construction monitoring for regionally important species, in a partnership with the University of Maryland Center for Environmental Science to study black sea bass, to identify commercial and recreational fishing impact.
- US Wind will implement practices and operating procedures to reduce the likelihood of vessel accidents and fuel spills. An Oil Spill Response Plan has been prepared and will be implemented for construction and for operations activities.
- WTGs, OSSs, and the Met Tower will be marked per USCG guidelines in consultation with USCG, BOEM and other regulatory agencies as appropriate.
- Submarine cables will be buried and regularly inspected to maintain cable burial.
- A site-specific study of potential EMF impacts, if any, will be conducted for species such as horseshoe crabs, conch, and finfish.

5.19 Other Uses

5.19.1 Description of Affected Environment

Marine Minerals

Following the 1994 amendments to the Outer Continental Shelf Lands Act (OCSLA), BOEM may offer and enter into a noncompetitive, negotiated lease to mine sand, shell, or gravel located in marine environments for certain types of projects that receive funding or authorization from the Federal Government. The primary function of BOEM’s marine minerals program as such is identifying and mining sand on the OCS to be used for beach nourishment and coastal restoration projects (USDOI and BOEM 2012). Most of the area between the Lease area and the Submerged Lands Act boundary is considered to contain sand resources. The Isle of Wight Shoal; Fenwick Shoal; Weaver Shoal; and Shoals A, B, C, D are located in this area, and the Delaware Sand Resource Area is located further north, offshore from the location of the Barrier Beach Landfalls (USDOI and BOEM 2014).

Sediment in these areas ranges from poorly to very well sorted sands, and the mean grain size of sediment in these areas is medium sand or greater. Weaver Shoal and Isle of Wight Shoal are suitable sources for replenishing sand on beaches in Ocean City and Assateague Island. It is estimated that there are more than 253 million cubic m (8,934 million cubic ft) of sand with high resource potential and more than 100 million cubic m (3,521 million cubic ft) of sand with moderate resource potential in the Maryland sand borrow areas and 35 million cubic m (1,236 million cubic ft) of usable sand resources in the Delaware Sand Resource Area (Louis Berger Group Inc. 1999). Based on discussions with USACE, US Wind rerouted the cable corridors to avoid active or inactive sand resource areas near the Indian River Inlet, including eliminating Offshore Export Cable Corridor 2a from consideration. While extensive efforts to avoid sand resource areas were made, a small portion of Offshore Export Cable Corridor 1 overlaps with the northeast corner of Borrow Area C, as well as the southwest corner of Borrow Area G before making landfall (Figure 5.19-1a). Borrow Areas C and G are currently inactive. USACE expressed that Borrow Area C is depleted, and the USACE expressed no concern regarding any overlap with inactive borrow areas. Fenwick Shoal is currently a proposed sand resource area and is a concern of both USACE and BOEM (Figure 5.19-1c). The portion of the shoal that falls offshore of Delaware is approximately 44.3 km^2 (10,940 acres), of which Offshore Export Cable Common Corridor occupies approximately 3.0 km^2 (753 acres), or 6.9%.

During the drafting of the offshore export cable corridors, great care was taken to avoid sand borrow areas and sand resource areas. However, due to the proximity of these areas to each other and the location of the USCG anchorage area (to the north of the Lease area), avoiding sand borrow and resource areas entirely is not feasible. Communication with BOEM's marine minerals program and the USACE indicated that encroachment on the inactive sand borrow areas would be acceptable given that no active areas are impacted. In correspondence with USACE in the initial stages of the 408 Request, USACE requested that Offshore Export Cable Common Corridor be moved north to avoid the Fenwick Shoal, a move that is not practicable or feasible due to the newly established USCG anchorage area to the north.

Utilities

There are no known or documented submerged cables, pipelines, or military seabed assets in the vicinity of the Project area. Two offshore wind energy lease areas are located to the north of US Wind's Lease area: OCS-A 0519, under Skipjack Offshore Energy, LLC, and OCS-A 0482 under GSOE I, LLC.

5.19.2 Impacts

5.19.2.1 Construction

Marine Minerals

It is not anticipated that construction will interfere with marine minerals operations. Active mineral resources are not present in the Lease area, and construction barges will be part of routine traffic passing by the borrow areas offshore Ocean City. No sand resource (borrow) areas have been identified in the vicinity of the Lease area (USDOI and BOEM 2012). The USACE Proposed sand resource areas have been identified to the west of the Lease area in close proximity to the Offshore Export Cable Corridors.

Offshore Export Cable Corridor 1 overlaps a small portion of two inactive sand borrow areas (Borrow Areas C and G) (Figure 5.19-1a). It also overlaps a proposed sand borrow area to the immediate east of the Indian River Inlet (Figure 5.19-1a). Offshore Export Cable Corridor 1 passes within approximately 25 m (82 ft) of the proposed Borrow Area M (Figure 5.19-1b). US Wind will use the available space outside of the sand borrow area boundaries but within Offshore Export Cable Corridor 1.

Offshore Export Cable Common Corridor passes within approximately 247 m (810 ft) of the proposed borrow area at Fenwick Shoal (Figure 5.19-1c).

Cable separation between the four potential export cables would be approximately three times the water depth consistent with the recommendations from the ICPC. US Wind will microsite the cables within the 600-m offshore export cable corridors to avoid impacts to active sand borrow areas and sand resources areas where possible. Final cable alignments may encroach on inactive areas, per correspondence with BOEM's marine minerals program and the USACE.

Utilities

It is not anticipated that construction will interfere with offshore utilities. No submerged cables or pipelines have been identified in the Project area. The proposed Offshore Export Cable Corridors and vessel routes avoid crossing any neighboring wind energy lease areas. US Wind is willing to coordinate with appropriate parties about future submarine cable crossings as needed.

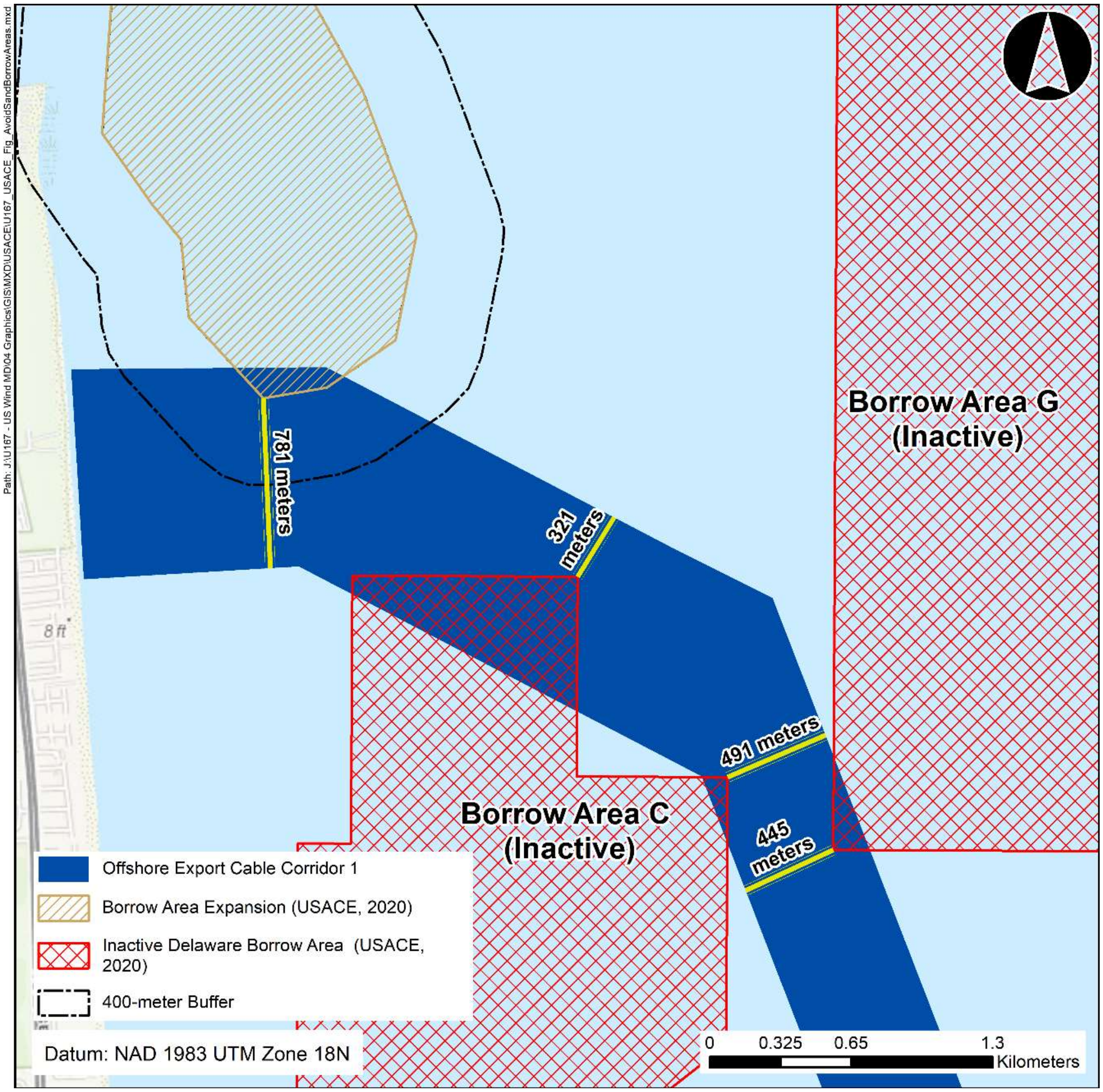

Figure 5.19-1a. Sand Borrow Area Avoidance – Offshore Export Cable Corridor 1

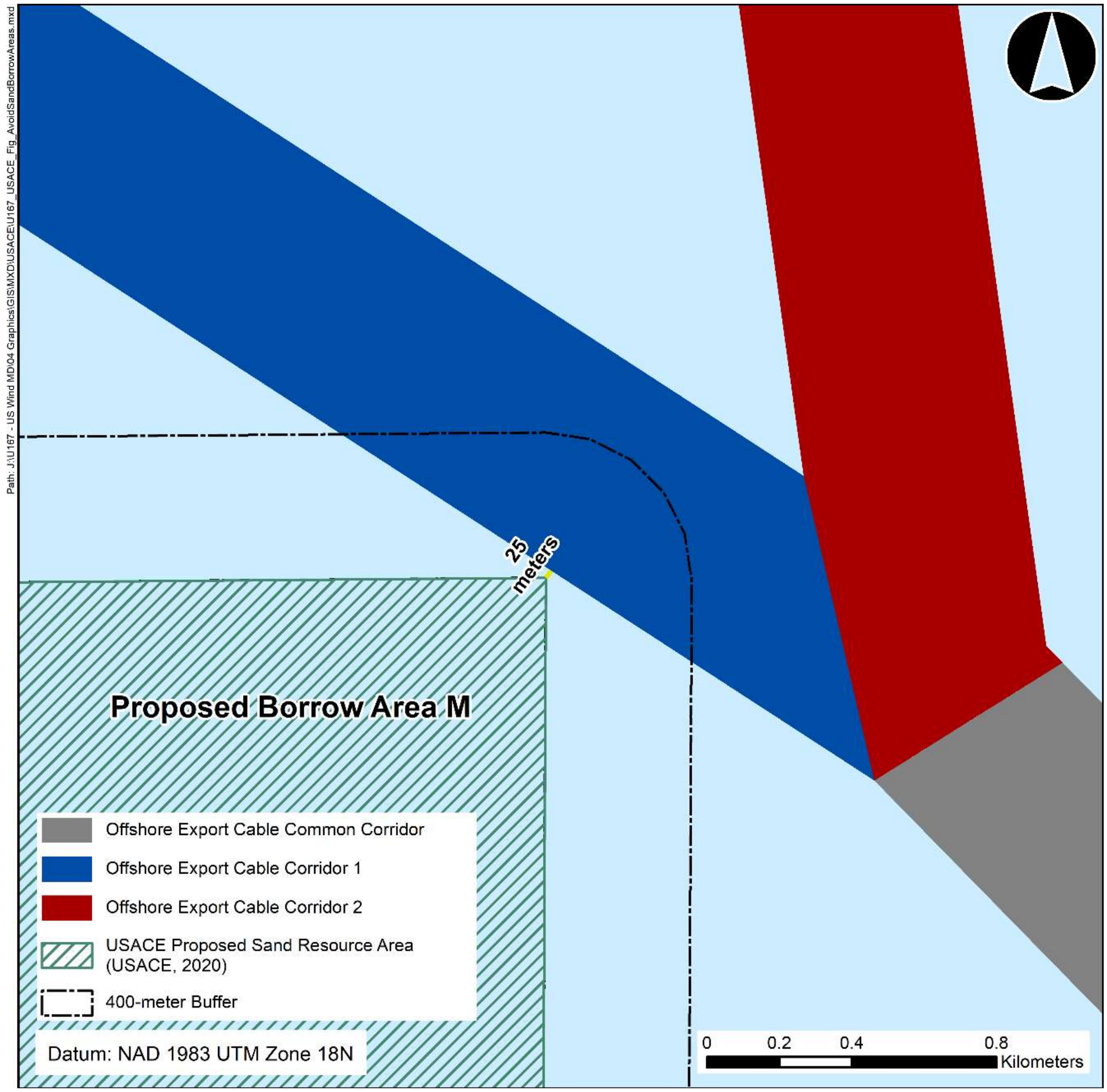

Figure 5.19-1b. Sand Borrow Area Avoidance – Offshore Export Cable Corridor 1

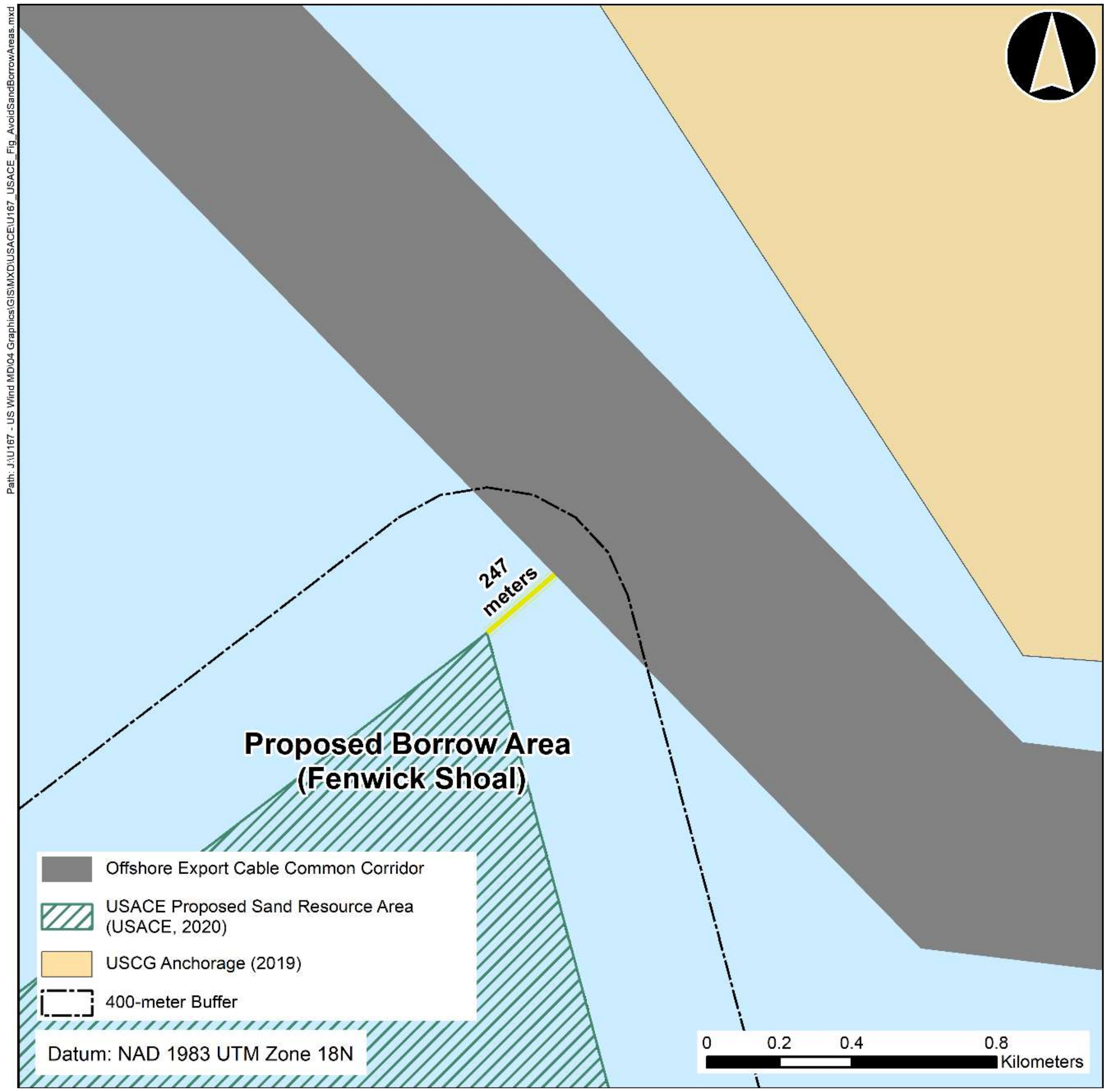

Figure 5.19-1c. Sand Borrow Area Avoidance - Offshore Export Cable Common Corridor

5.19.2.2 Operations

The Offshore Export Cable Corridors have been designed to avoid active and inactive sand borrow areas to the extent practicable (Figure 5.19-2). Due to other constraints in locating the Offshore Export Cable Corridors, there are several sections that would be in close proximity to and potentially overlap with existing active and inactive sand borrow areas. Based on discussions with USACE, there are no concerns regarding any overlap with inactive borrow areas.

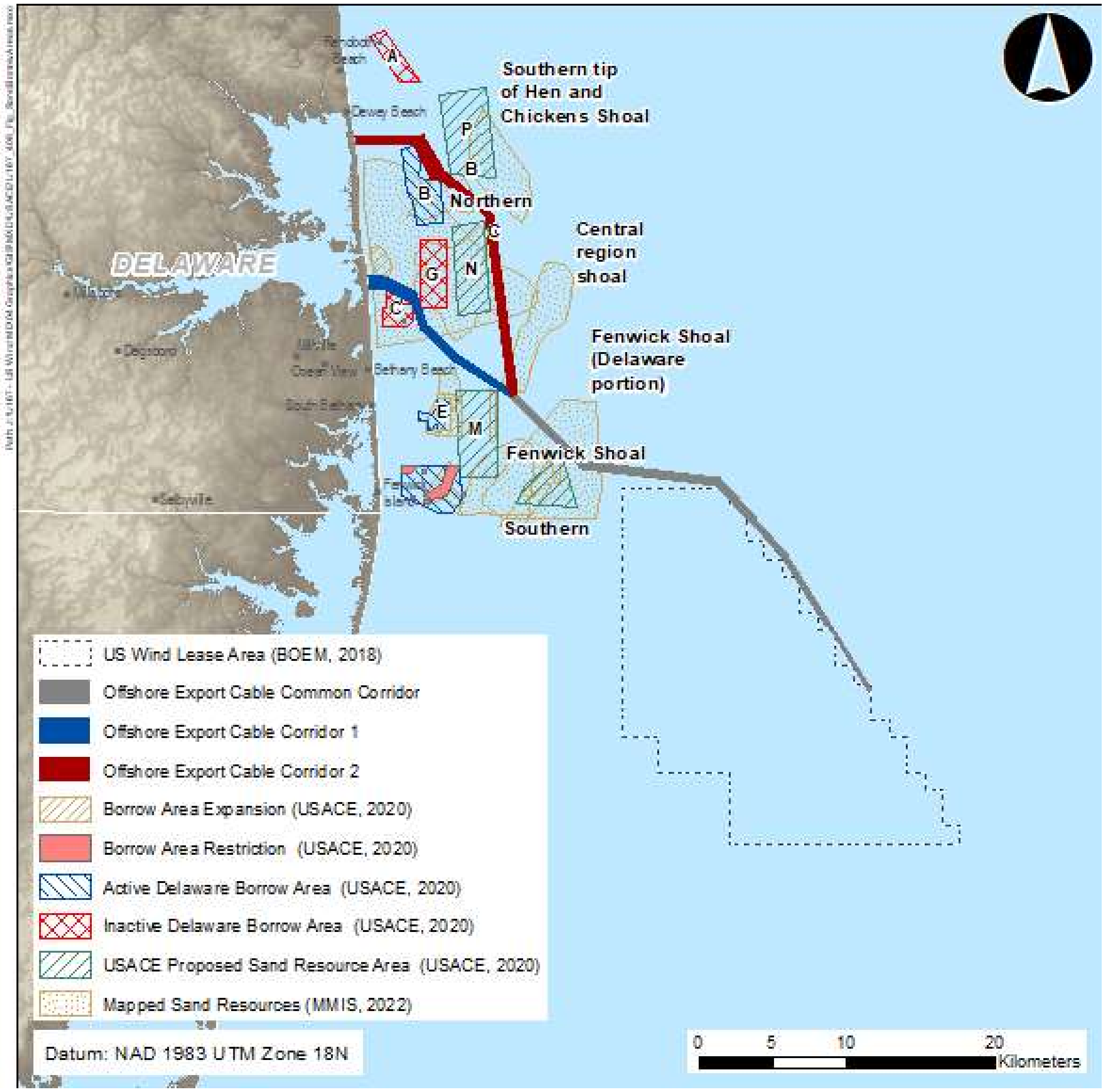

Figure 5.19-2. Sand Borrow Areas

5.19.2.3 Impacts of Alternatives

Offshore Export Cable Corridor 2 overlaps active sand borrow areas or lies within USACE's preferred buffer of 400 m (1,312 ft) (see Figure 5.19-3). It overlaps active Borrow Area B in two locations with maximum distances of approximately 302 m (990 ft) and 116 m (379 ft) (Figure 5.19-3a). Offshore Export Cable Corridor 2 passes within approximately 85 m (279 ft) of the proposed Borrow Area P (Figure 5.19-3b). It also overlaps proposed Borrow Area N with a maximum distance of approximately 9 m (30 ft) (Figure 5.19-3b). Impacts to sand borrow areas would be greater if Offshore Export Cable Corridor 2 were selected than for Offshore Export Cable Corridor 1. Offshore Export Cable Corridor 2 runs a gauntlet through active and proposed sand borrow areas, with few small gaps accounting for the USACE-preferred 400-m (1,312-ft) buffer area (see Figure 5.19-1a).

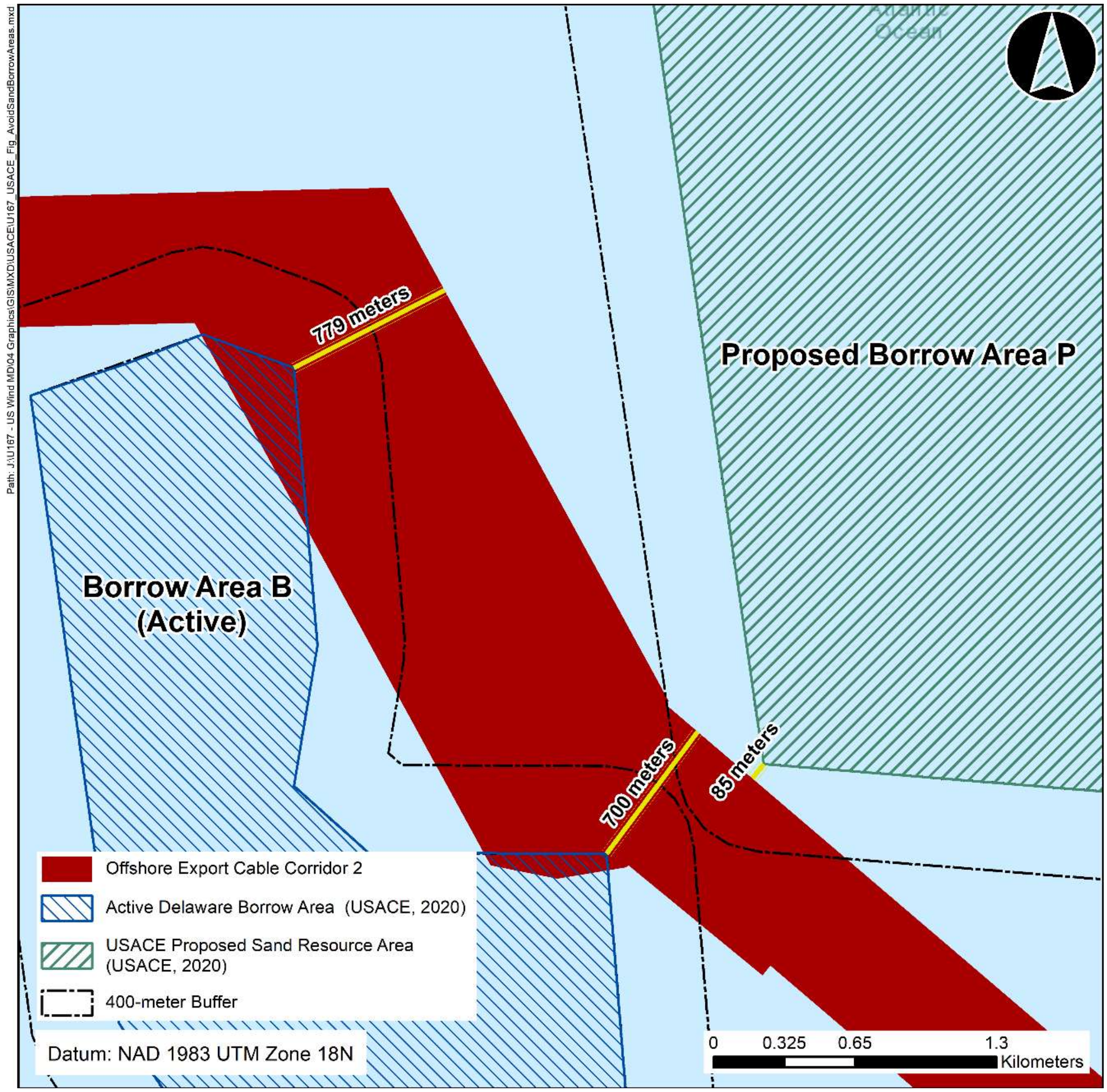

Figure 5.19-3a. Sand Borrow Area Avoidance – Offshore Export Cable Corridor 2

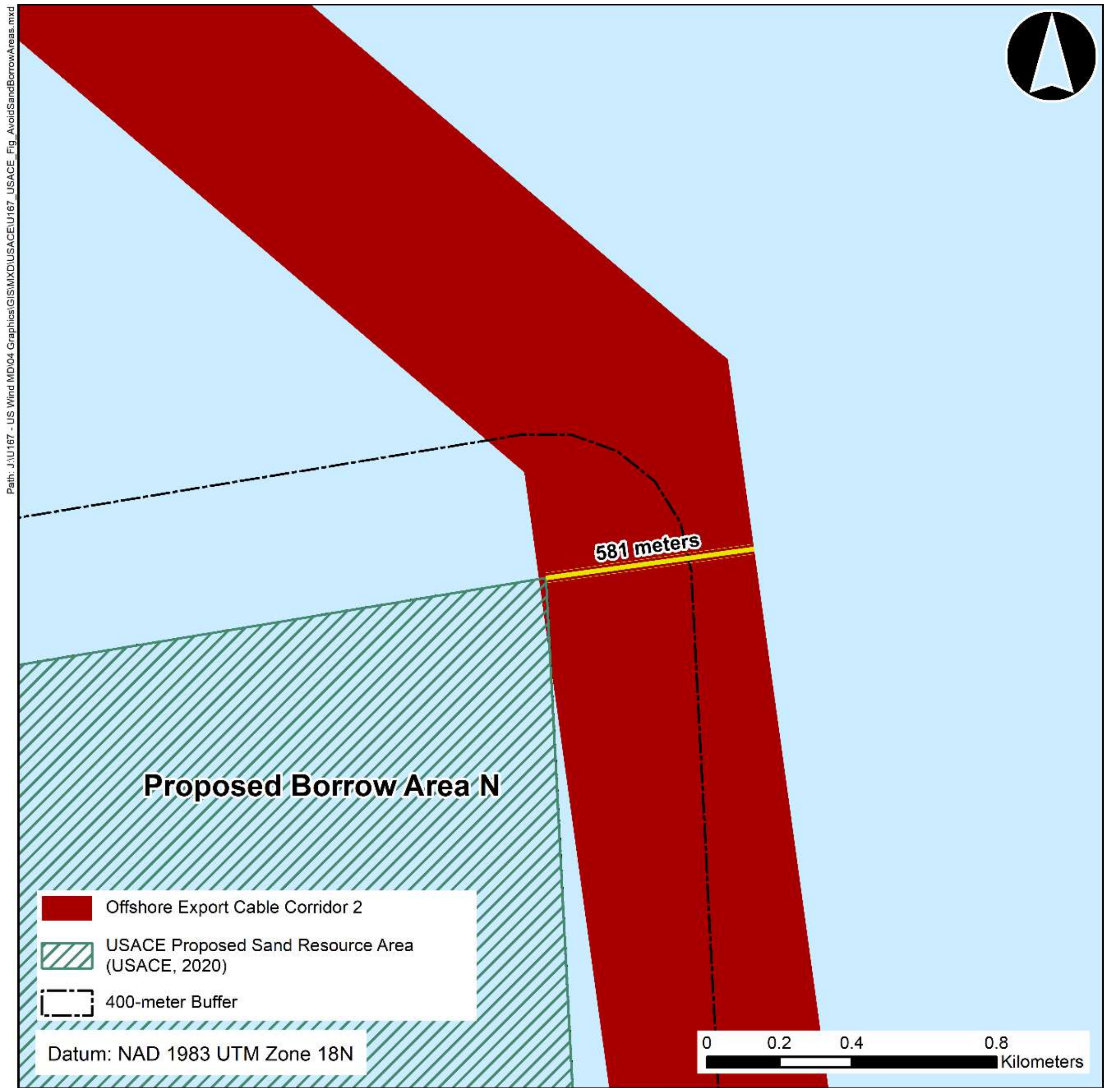

Figure 5.19-3b. Sand Borrow Area Avoidance – Offshore Export Cable Corridor 2

Cable installation in any of the terrestrial routes (i.e., Onshore Export Cable Corridor 1a, 1b, 1c, or 2) has the potential to impact utilities during construction due to existing utilities in crowded ROWs. Co-location of export cables in existing ROWs also creates significantly more risk of future disturbances and impacts due to the existence of multiple other users and utility lines within the ROW and the likely need to conduct maintenance and repair.

5.19.2.4 Mitigation and Monitoring

US Wind will implement the following mitigation measures to reduce Project impacts on socioeconomic resources.

- US Wind will work with local officials to develop a traffic management plan to reduce impacts to local traffic during construction.
- US Wind will concentrate onshore construction activities outside of the summer recreation season to the greatest extent practicable and will coordinate with DNREC Parks and Recreation to minimize interference with beach activities.
- US Wind will coordinate with local stakeholders to develop opportunities for eco-tourism related to the Project.
- US Wind has sited and developed Project elements to minimize disturbance to resources, to the extent practicable, enjoyed by residents of and visitors to the region.
- Onshore cables and facilities at the Barrier Beach Landfalls will be buried.
- US Wind developed a Fisheries Communication Plan, in conjunction with the designated Fisheries Liaison Officer and will work with fisheries stakeholders to update it as appropriate.
- US Wind established a process for gear loss compensation for commercial fishermen.
- US Wind will work cooperatively with commercial/recreational fishing entities and interests to review planned activities and ensure that the construction and operation activities will minimize potential conflicts.
- US Wind will conduct pre- and post-construction monitoring for regionally important species, in a partnership with the University of Maryland Center for Environmental Science to study black sea bass, to identify commercial and recreational fishing impact.
- US Wind will implement practices and operating procedures to reduce the likelihood of vessel accidents and fuel spills. An Oil Spill Response Plan has been prepared and will be implemented for construction and for operations activities.
- WTGs, OSSs, and the Met Tower will be marked per USCG guidelines in consultation with USCG, BOEM and other regulatory agencies as appropriate.
- Submarine cables will be buried and regularly inspected to maintain cable burial.
- Conduct a site-specific study of potential EMF impacts on electrosensitive marine organisms.
- Efforts to route Offshore Export Cable Corridors to avoid marine mineral resources areas to the extent practicable has been undertaken.
- US Wind is committed to creating full and equitable business opportunities for minority, women-owned, veteran-owned, and HUBZone businesses in the development of the Project.

- US Wind has hired a team of MBE participation and compliance experts to lead the company's outreach efforts to minority businesses and community organizations.
- US Wind is coordinating with area organized labor organizations to develop a skilled local workforce for the Project.
- US Wind has a strong interest in the welfare of workers employed by the construction managers, contractors and subcontractors on all components of the Project.
- US Wind is committed to achieving substantial involvement of Maryland-based small businesses in all phases of the Project.
- US Wind is committed to creating opportunities for Delaware-based companies able to deliver supply chain components and/or perform on-site work in Delaware.
- US Wind has a particular focus on creating meaningful economic opportunities for environmental justice communities in the Baltimore, Maryland area.
- US Wind will support workforce initiatives that are focused on providing support to minority and low-income populations, women, veterans, and underserved communities.

5.20 Coastal Zone Management Consistency

The Coastal Zone Management Act (CZMA) authorizes states to manage the development and use of coastal waters and adjacent lands. The Act authorizes the state to conduct a consistency review of federal actions that may affect a state's coastal uses and/or resources in accordance with the CZMA, US Wind has sought to avoid or minimize impacts to environmental and coastal resources throughout the siting, design, and development of the Project. Accordingly, US Wind provides consistency certifications herein. 16 USC 1451; 15 CFR Part 930.

The Project has been sited and designed, and will be constructed and operated, in a manner that is consistent with the applicable MDNR Coastal Management Program (CMP) Enforceable Coastal Policies. The policies were approved by the NOAA on October 19, 2020 (Effective July 6, 2020). The policies that are relevant to the Project are provided in COP Volume II, Appendix II-M1 (US Wind 2023) and are accompanied by a brief description of the Project consistency with the policies. This is a voluntary submission as the Project is outside of the Maryland coastal zone (7 Del. C. c: 5104 § 1.3).

The entire state of Delaware has been designated as the Coastal Zone Management Area. The Act authorizes the state to conduct a consistency review of federal actions that may affect Delaware's coastal uses and/or resources. In addition, portions of the Project are within the Delaware Coastal Zone, which generally runs the length of the state along the Delaware River, the Delaware Bay, the Inland Bays and the Atlantic Ocean. US Wind is therefore required to submit a coastal zone management consistency certification for the Project for the state of Delaware. The US Wind Project has been sited and designed, and will be constructed and operated, in a manner that is consistent with the applicable DNREC CMP policies (updated November 2018). The policies that are relevant to the Project are provided in COP Appendix II-

M2 (US Wind 2023) and are accompanied by a brief description of the Project consistency with the policies.

6.0 COMPLIANCE WITH SECTION 404(b)(1) GUIDELINES

6.1 Introduction

The Project has been sited and designed to avoid and minimize impacts to WOTUS and environmental resources subject to review under Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the CWA. The Alternatives Analysis (Section 4.0 of this document) describes the selection of the offshore component locations and foundations, point of interconnect, landfall, and offshore and onshore routing. A summary of the findings of the Alternatives Analysis can be found in Section 4.0 above and the Project's compliance with the Section 404(b)(1) guidelines is presented in Section 6.2.

6.2 Compliance with Guidelines

The Section 404(b)(1) guidelines (or the "Guidelines") were developed to restore and maintain the chemical, physical, and biological integrity of waters of the United States through the control of discharges of dredged or fill material. The guidelines state that dredged or fill material should not be discharged into the aquatic ecosystem unless it can be demonstrated that such a discharge would not have an unacceptable adverse impact. Section 6.2.1 defines and addresses the conditions that need to be satisfied to make a finding that a proposed discharge of dredged or fill material complies with the guidelines. Sections 6.2.2 and 6.2.3 address the specific impacts associated with the discharge of dredge or fill material on the physical, chemical, and biological characteristics of the aquatic ecosystem while Sections 6.2.4 and 6.2.5 address impacts on special aquatic sites and human use characteristics. Evaluation and testing conducted for the Project is described in Section 6.2.6 and actions that will be taken to minimize adverse effects are included in Section 6.2.7.

The Section 404(b)(1) guidelines focus extensively on the discharge of dredge and fill material into waters of the United States (WOTUS). The definitions applicable to discharge of dredge and fill material are provided in 33 CFR §232.2:

> *Discharge of dredged material.*
>
> > *(1) Except as provided below in paragraph (2), the term discharge of dredged material means any addition of dredged material into, including redeposit of dredged material other than incidental fallback within, the waters of the United States…*
>
> *Discharge of fill material.*
>
> > *(1) The term discharge of fill material means the addition of fill material into waters of the United States…*
> >
> > *(2)(i)… Placement of pilings in waters of the United States that does not have or would not have the effect of a discharge of fill material shall not require a Section 404 permit. Placement of pilings for linear projects, such as bridges, elevated walkways, and powerline structures, generally does not have the effect of a discharge of fill material…*

Fill material.

> *(1) Except as specified in paragraph (3) of this definition, the term fill material means material placed in waters of the United States where the material has the effect of:*
>
> > *(i) Replacing any portion of a water of the United States with dry land; or*
> >
> > *(ii) Changing the bottom elevation of any portion of a water of the United States.*
>
> *(2) Examples of such fill material include, but are not limited to: rock, sand, soil, clay, plastics, construction debris, wood chips, overburden from mining or other excavation activities, and materials used to create any structure or infrastructure in the waters of the United States.*
>
> *(3) The term fill material does not include trash or garbage.*

The resource areas subject to USACE jurisdiction, in accordance with 33 CFR §328.3, include:

- The territorial seas, tidal waters, and non-tidal waters (33 CFR 328.4). WOTUS include those waters listed in § 328.3 (a), (b), and (c) respectively.
- All wetlands located within the jurisdiction of DNREC, and wetlands in Delaware. Wetlands within DNREC jurisdiction are also under jurisdiction of the USACE. There are no transition buffer areas associated with wetlands subject to USACE and DNREC jurisdiction;
- All United States waters within the jurisdiction of DNREC, which are proposed to be filled (permanently or temporarily). The USACE has defined its jurisdiction by using the Spring High Tide (SHT) Line as the maximum landward limit of their jurisdiction. Any alteration or filling of wetlands seaward of the SHT (permanent or temporary) is within the jurisdiction of the USACE;
- USACE jurisdiction over tidal waters of the United States as outlined in Section 10 of the Rivers and Harbors Act and Section 404 of the CWA. Section 10 specifies that the USACE jurisdiction in tidal waterways extends to the mean high water line, where mean high water is the line on the shore established by the average of all high tides (USACE 2022a);
- The USACE jurisdiction in territorial seas begins at the shoreline and extends in a seaward direction, a distance of three nautical miles. Moreover, the Outer Continental Shelf Lands Act extends the jurisdiction of the USACE, under Section 10 of the Rivers and Harbors Act, to the seaward limit of the outer continental shelf for the construction of artificial islands, installations, and other devices on the seabed (USACE 2022a).

Project activities subject to USACE jurisdiction include construction of the WTG foundations, OSS foundations, Met Tower foundation, and scour protection around foundations. Additional activities subject to USACE jurisdiction include installation of nearshore and offshore export cables, which includes construction of gravity cells (if required) at the landfalls, dredging and backfill within the gravity cells (if required), HDD ducts at landfall, dredging (if required) for cable lay barge access, and embedment of the four submarine cables.

Impacts to wetlands and WOTUS from the Project, including areas within the Atlantic Ocean and Indian River Bay that are under the USACE jurisdiction, as well as a section in Delaware that is under the jurisdiction of DNREC, are discussed within the Application. Refer to Sections 5.5.2 and 5.6.2 of this document, which present the temporary and permanent impacts to wetlands, WOTUS, and benthic resources anticipated as a result of the Project.

Descriptions of the Project are provided in Section 2.0 of the Application, and Project Plans (drawings) are provided in Appendices B-F which includes offshore component diagrams, offshore and onshore export cable plans, substation plans, and O&M Facility plans. Anticipated construction methods for the various Project components are detailed in Section 3.0. The Alternatives Analysis for the Project is provided in Section 4.0.

The data and analyses presented in the Application (Section 5.0) represent the culmination of field investigations, laboratory analyses, modeling, and other studies conducted in response to regulatory requirements and numerous consultations with federal, state, and local regulatory officials regarding project design, and review of potential land use and environmental impacts of the Project. These assessments demonstrate that the Project's environmental impacts will be almost exclusively limited to the construction phase. The sections of the Application are organized to provide details on the Project, the activities that are subject to USACE review, potential impacts, and proposed avoidance and minimization measures.

In addition to the Project's compliance with the Section 404(b)(1) guidelines, the Project must also comply with the USACE Section 408 Request (Section 408 Request is provided under separate cover). The USACE may grant Section 408 permission for another party to alter a Civil Works project upon a determination that the alteration proposed will not be injurious to the public interest and will not impair the usefulness of the Civil Works project. For example, USACE may grant permission to parties for the use or temporary occupation of designated USACE offshore sand borrow areas, provided such work is not injurious to the public interest of this project to achieve mining for beach renourishment and highway projects. The purpose of the USACE Section 408 action, as determined by EC 1165-2-220, is to evaluate the applicant's request and determine whether the proposed alterations are injurious to the public interest or impair the usefulness of the USACE project. The USACE Section 408 permission is needed to ensure that Congressionally-authorized projects continue to provide their intended benefits to the public.

6.2.1 Restrictions on Discharge

Subpart B, 40 CFR Section 230.10(a), RESTRICTIONS ON DISCHARGE - no discharge of dredged material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences.

The proposed Project requires the use of Indian River Bay to interconnect the Onshore Export Cable Corridor 1 between the HDD Operations Area and the Onshore Substations in Delaware.

Dredging will be required at both sides of the landfalls for the transition between the uplands and submarine cables, as well as potential dredging in shallow waters of Indian River Bay for cable lay barge access. Dredged material may be beneficially reused or disposed of offsite with appropriate approvals. The material dredged for the gravity cell and cable trench may be reused as backfill for the submarine cable if it is structurally suitable for use as cover over the submarine cables or as backfill. This action will return sediment to the same general location of the seafloor from which it was removed, and the seafloor will be returned to pre-existing contours. If the material is not deemed suitable, clean backfill will be imported. Therefore, this discharge will not have adverse effects, and there is no practicable alternative that would have less adverse environmental consequences to avoid direct disturbance of the riverbed for the submarine cable installation.

There is no practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem without significant adverse environmental consequences. That is, there are no practicable alternatives which do not involve a discharge of dredged or fill material into the WOTUS, and there are no practicable alternatives that would result in discharges of dredged or fill material at other locations in WOTUS that would have a lower impact on the aquatic ecosystem.

The Project has been designed and will be constructed and operated in a manner consistent with the applicable policies of the DNREC and USACE.

Subpart B, Section 230.10(b), RESTRICTIONS ON DISCHARGE - No discharge of dredged or fill material shall be permitted if it:

1. ***Causes or contributes, after consideration of disposal site dilution and dispersion, to violations of any applicable State water quality standard;***

The proposed Project will not cause or contribute to violations of any applicable state water quality standard as demonstrated in the water quality analysis in Section 5.3 above. This will be achieved based on implementation of the avoidance and minimization measures described herein and the Section 401 Water Quality Certifications to be issued by the State of Delaware prior to issuance of the USACE permit.

2. ***Violates any applicable toxic effluent standard or prohibition under section 307 of the Act;***

The proposed Project will not violate any applicable toxic effluent standard or prohibition under CWA Section 307.

3. ***Jeopardizes the continued existence of species listed as endangered or threatened under the ESA of 1973, as amended, or results in likelihood of the destruction or adverse modification of a habitat which is determined by the Secretary of Interior or Commerce, as appropriate, to be a critical habitat under the ESA of 1973, as amended.***

If an exemption has been granted by the Endangered Species Committee, the terms of such exemption shall apply in lieu of this subparagraph;

As demonstrated in the discussion in Section 5.13 above, the Project will not jeopardize the continued existence of any species listed as endangered or threatened under the ESA or result in the likelihood of the destruction or adverse modification of critical habitat under the ESA. This conclusion will be confirmed with the resolution of the ESA consultation to be undertaken and completed prior to the issuance of the USACE permit.

4. ***Violates any requirement imposed by the Secretary of Commerce to protect any marine sanctuary designated under title III of the Marine Protection, Research, and Sanctuaries Act of 1972.***

The Project will not affect any marine sanctuary designated under Title III of the Marine Protection, Research, and Sanctuaries Act of 1972; thus, no such requirements will be violated.

Subpart B, Section 230.10(c), RESTRICTIONS ON DISCHARGE - no discharge of dredged or fill material shall be permitted which will cause or contribute to significant degradation of the waters of the United States.

The Project construction methods were specifically selected to minimize sediment turbidity and resuspension. Results from the hydrodynamic and sediment transport model (Section 5.3) indicate increases in suspended sediment concentrations greater than 200 mg/L are predicted to be limited to distances less than 137 m (450 ft) from the Offshore Export Cables and inter-array cables for short periods of time. Increases in suspended sediment above 10 mg/L are predicted to have a short duration, with concentrations predicted to drop below that threshold within 24 hours after the completion of jetting operations (COP Appendix II-B2 (US Wind 2023)).

Within Onshore Export Cable Corridor 1, temporary increases in suspended sediment are anticipated to occur within 1,400 m (4,600 ft) of jet plow operations. Areas of sediment deposition greater than 5 mm (0.2 in) are also anticipated to occur within 30 m (95 ft) of jet plow operations (COP Appendix II-B2 (US Wind 2023)). In addition, the Project area routinely experiences high levels of suspended sediment under naturally occurring conditions as described in Section 5.3; therefore, short-term increases in TSS from Project construction is not expected to have an appreciable impact on species that may be passing through the Project area. Most species are anticipated to temporarily avoid the area of disturbance during construction. As a result, the short-term and localized increases in suspended sediment concentrations resulting from jet plow activities will not contribute to significant degradation of the waters of the United States.

Subpart B, Section 230.10(d), RESTRICTIONS ON DISCHARGE - no discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem.

Dredging would occur at the landfalls within the gravity cells, as well as potential dredging in shallow waters of Indian River Bay for cable lay barge access. The gravity cells are designed to contain and minimize the amount of suspended sediment released in the water column.

In addition, US Wind will minimize in-water construction activities as practicable in areas containing anadromous fish during migration periods. By limiting in-water construction activities during spawning months, the Project reduces impacts to finfish. These construction methodologies will also minimize impacts to other aquatic resources and will avoid adverse effects on life stages of aquatic organisms and other wildlife dependent on aquatic ecosystems.

The Project will not have adverse effects on aquatic ecosystem diversity, productivity, or stability. There will be temporary, minimal impacts to fish, wildlife habitat, and wetland resources. The upland cables will be installed underground, and the submarine cables will be embedded in the Atlantic Ocean and Indian River Bay; therefore, it will not have adverse effects on recreational, aesthetic and economic values of land use and environmental resources or WOTUS encountered along the linear route.

6.2.2 Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem

Subpart C, Section 230.20(a), SUBSTRATE - the proposed Project will not change the complex physical, chemical, or biological characteristics of the substrate in the Project area.

The Project will not permanently change the physical, chemical, or biological characteristics of the substrate in the Atlantic Ocean and Indian River Bay. Benthic community impacts will be limited in scope, both temporally and spatially. Potential impacts to the benthic habitat and substrate of the Atlantic Ocean and Indian River Bay will result from the placement of the WTG, OSS, and Met Tower foundations and associated scour protection, the installation of submarine cables, seafloor disturbance due to vessel anchoring during the installation of the WTGs, OSSs, and the Met Tower, the use of gravity cells at the landfalls, and dredging for barge access.

Construction-related impacts to the benthic habitat and substrate along the proposed submarine cable route will be minimized through the use of jet plow, or similar, technology in shallow waters. The use of jetting techniques, with narrow trenches, will limit the disturbance to the seafloor and benthic resources. The use of jetting construction methods, along with the opportunistic recolonization of benthic organisms following construction activities, will minimize impacts to the benthic resources along the cable route. Based on these considerations, the degree of the Project’s effect on the characteristics of the substrate in the vicinity of the submarine cable installation will be minor.

The dredged areas and depths within the gravity cells at the landfalls will be the minimum amount necessary to facilitate these landfall transitions. If clean backfill is used, the placement of the clean sand backfill over the installed submarine cable between offshore and onshore cable routes will not alter elevation or contours therefore the water circulation, depth, current pattern, water fluctuation, and/or water temperature will not be affected. Jet plow embedment methods for submarine cable installations are considered the most effective and least environmentally damaging compared to traditional mechanical dredging and trenching operations. Therefore, this method will be used to install the submarine cables between each Landfall. Restoration of the seafloor's bottom contour and benthic profile after jet plow embedment will occur, but the restoration rate will depend on localized sediment transport regimes along the submarine cable route. Given the relatively higher tidal current velocities and natural sediment transport regime found in this area, restoration of the benthic profile is expected to occur over a relatively short period of time.

Dredging is anticipated for barge access in the shallow waters of Indian River Bay and to reach the required cable burial depth. As stated in Section 5.2, sediment would be prioritized for beneficial reuse for beach renourishment north of the Indian River Inlet, habitat restoration within Indian River Bay and Indian River to the greatest extent practicable. Remaining sediment would be placed in offshore or land-based disposal facilities.

Although some mortality of benthic organisms would be expected within the limits of the gravity cells and within the immediate path of the submarine cable route, the dredged areas within the gravity cells, the jet plow trench areas, and barge access areas are minimal compared to surrounding habitat in the Atlantic Ocean and Indian River Bay; therefore, no significant impacts are expected. Benthic infauna have the capacity to quickly reestablish after disturbances such as jet plowing or dredging activities. Following installation activities, it is expected that benthic infauna will undergo relatively rapid recolonization, thereby minimizing the impact to the benthic community and finfish species that feed on these benthic macroinvertebrates. Indirect impacts from sediment resuspension should be minimal as discussed below. Therefore, as demonstrated, the Project is expected to be in compliance with Subpart C, Section 230.20 of the Guidelines.

Subpart C, Section 230.21, SUSPENDED PARTICULATE/TURBIDITY - the proposed Project will not result in greatly elevated levels of suspended particulates in the water column over long periods of time.

US Wind performed quantitative hydrodynamic modeling to predict suspended sediment concentrations and cumulative deposition of sediment from jetting activities to install the submarine cables as described in Section 5.3 of the Application. Suspended sediment concentrations associated with jetting installation will primarily be concentrated for a short duration in the near-bottom portion of the water column and will return to ambient conditions within 24 hours after jetting has occurred. As a result, the temporary and short-term turbidity generated during construction and installation is not expected to have an appreciable impact on water quality or aquatic resources.

Subpart C, Section 230.22, WATER - the proposed Project will not change the chemistry or physical characteristics of the receiving water through the introduction of chemical constituents in suspended or dissolved form.

The Project will include jetting installation of the submarine cables along the submarine cable route. The use of jet plow technology will limit the suspension of sediment and any existing sediment contaminants, to the immediate vicinity of the submarine cable corridor. The vast majority of suspended sediment is predicted to rapidly settle back into the trench after passage of the jet plow, resulting in impacts that are indistinguishable from those potentially resulting from natural water column interaction with the existing seafloor surface sediment. Further, as evidenced in Section 5.3 of the Application, the results of the sediment dispersion modeling analysis demonstrate that there are no predicted exceedances of water quality criteria associated with any chemical contaminants present in the sediments.

The use of water jetting technology will not result in the introduction of chemical constituents in suspended or dissolved form that would change the clarity, color, odor, and/or taste of the water nor will the use of jetting devices reduce or eliminate the suitability of the Atlantic Ocean and Indian River Bay for population of aquatic organisms, and for human consumption, recreation, and aesthetics.

Dredging within Indian River Bay will not change the chemical or physical characteristics of the surrounding waters through the introduction of chemical constituents, in either suspended or dissolved form. Turbidity monitoring would occur during dredging to monitor the change in ambient conditions. Exceedances of water quality criteria are not expected from any chemical contaminants present during dredging.

Subpart C, Sections 230.23 through 25, CURRENT PATTERNS, NORMAL WATER FLUCTUATIONS, SALINITY GRADIENTS - the proposed Project will not modify current patterns and water circulation by obstructing flow, changing the direction or velocity of water flow and circulation, or otherwise change the dimensions of the affected waters.

The submarine cable installation, including dredging and gravity cell installation at the landfalls and dredging for barge access, would not result in any permanent changes to the seafloor profile or affect flow patterns. Thus, the Project will not result in a change in the normal water-level fluctuation patterns, nor affect the daily, seasonal and/or annual tidal fluctuations. The Project will not divert or restrict the flow of either fresh or salt water and it will not change existing salinity gradients of Indian River Bay.

6.2.3 Potential Impacts on Biological Characteristics of the Aquatic Ecosystem

Subpart D, Section 230.30 of the Guidelines requires an evaluation of effects on threatened or endangered species.

<u>Marine Mammals</u>

Five marine mammal species are listed as federally endangered under the ESA that may be impacted by Project activities: the NARW, the fin whale, the sei whale, sperm whale, and blue whale. The status and distribution of cetacean species likely to be impacted by Project activities are discussed in Section 5.14. Of the five federally endangered marine mammal species, three have been observed within the Project area; NARW, the fin whale and the sei whale.

Marine mammals in the Project area have the potential to be impacted by a variety of factors associated with Project activities. Given the presence of marine mammals in the Project area, US Wind has designed the Project to minimize and mitigate the potential for mortality, injury and disturbance. The impacts from construction, operation, and decommissioning are summarized below.

Project construction activities that will generate noise with the potential to impact marine mammals include pile driving (impact hammer and vibratory) and vessel traffic (including use of DP thrusters). The impacts of noise and vessel traffic on marine mammals during construction are discussed in detail in Section 5.8.2. US Wind will implement sound attenuation measures during pile driving with a minimum reduction of 10 dB, and a target of 20 dB reduction when driving monopiles. US Wind will implement additional mitigation and monitoring measures as described in Section 5.8.3 to minimize noise impacts to marine mammals. Impacts to marine mammals due to vessel noise during Project installation would be temporary, with behavior rapidly returning to normal following passage of a vessel, and it is unlikely that such short-term effects would result in long-term population-level impacts. Vessel strike avoidance measures may be modified to reflect conditions set by NOAA Fisheries following the application for a Letter of Authorization (LOA). Impacts to marine mammals from vessel strikes are expected to be negligible.

Impacts during Project operations include vessel noise, vessel traffic, and entanglement and marine debris. Noise produced by the operation of the WTGs is unlikely to result in population-level impacts to marine mammals. Project O&M activities will require vessel travel within the Project area. Vessel noise has the potential to impact marine mammals (Section 5.8.2.1). However, as the region is heavily traveled by commercial shipping and fishing vessels, low levels of vessel noise associated with Project activities are not anticipated to alter acoustic conditions. Entanglement will not pose a risk to marine mammals during Project activities, as US Wind does not anticipate the use of anchored vessels during construction. If moored lines are necessary, these lines would be large in diameter and kept under tension to reduce the risk of entanglement. US Wind will follow existing regulations, including the CWA, for marine trash and debris prevention; therefore, impacts from marine debris on marine mammals will be minor.

Sea Turtles

Sea turtles in the Project area have the potential to be impacted by a variety of factors associated with Project activities. Impacts from construction, operations, and decommissioning are summarized below.

During construction, pile driving, and vessels are the two main Project activities that could cause increased noise within the hearing ranges of the sea turtle species likely to occur within the Project area. Any sea turtles present in the vicinity of pile driving activities are expected to rapidly vacate the area upon the initiation of soft start procedures. Additionally, pile driving activities, and any associated impacts, would be short term, temporary, and in discrete locations, and therefore are not anticipated to result in long-term impacts to sea turtle populations in the area. Any impacts to sea turtles are expected to be temporary, with behavior rapidly returning to normal following passage of a Project vessel, and it is unlikely that such short-term effects would result in long-term population-level impacts. The risk of vessel strike during Project activities is limited as vessels will follow NOAA Fisheries collision avoidance guidance such as establishing minimum separation distances from sea turtles. The impacts of noise and vessel traffic on these organisms are discussed in detail in Section 5.9.2.1. Other impacts that may occur during construction are entanglement and marine debris, land disturbance, routine/accidental releases, and suspended sediment/deposition, Details about these impacts can be found in Section 5.9.2.1.

During operations, impacts may include vessel noise, vessel traffic, entanglement, and marine debris. Operational noise is not expected to approach levels that could harm sea turtles, although behavioral responses are possible. Vessel noise has the potential to impact sea turtles. However, as the region is heavily traveled by commercial shipping and fishing vessels, low levels of vessel noise associated with Project activities are not anticipated to alter acoustic conditions. Vessel traffic associated with Project O&M activities could endanger sea turtles, Project vessels will follow NOAA Fisheries collision avoidance guidance, therefore the risk of harm to sea turtles from vessel strike is negligible. Vessel strike avoidance procedures would be the same as described and referenced above for the construction portion of the Project. Entanglement would not pose a risk to sea turtles during Project operation, as US Wind does not anticipate the use of anchored vessels during construction. US Wind will follow existing regulations, including the CWA, for marine trash and debris prevention; therefore, impacts from marine debris on sea turtles will be minor. Details about impacts to sea turtles from Project operations can be found in Section 5.9.2.2.

As demonstrated in the discussion in Section 5.13, the Project is not expected to result in mortality to threatened or endangered species or the destruction of habitats of such species. This conclusion will be confirmed with NOAA Protected Species Division consultation for threatened and endangered species, to be undertaken and completed prior to the issuance of the USACE Permit.

Subpart D, Section 230.31 - the proposed Project will not significantly affect populations of fish, crustaceans, mollusks, and other food web organisms.

As specified in Section 5.13, the Atlantic and shortnose sturgeons, and the giant manta ray are three federally listed finfish species that may be found within the Atlantic Ocean portion the Project area. Neither the Atlantic sturgeon nor the shortnose sturgeon have been observed within the Lease area. An aerial survey conducted in 2022 documented two giant manta rays within the Project area. Recent occurrences of giant manta rays within the Project are considered rare with only two previous recorded observations in 2016 and 2021.

Potential impacts to fish and benthic species from the placement of WTG, OSS, and Met Tower foundations and associated scour protection, the installation of the submarine cables, seafloor disturbance due to vessel anchoring during WTG, OSS, and Met Tower installation and the use of gravity cells at the landfalls will be localized and temporary, resulting primarily from direct and indirect seafloor sediment disturbance from the narrow jetting corridor along the proposed submarine cable route. Slow-moving or sessile organisms inhabiting benthic sediments in areas directly within the footprint of these activities will suffer mortality from crushing or burial. Although motile organisms, including crabs, lobsters, sea scallops, and horseshoe crabs, may be able to vacate installation areas and avoid direct mortality, these organisms could be temporarily displaced by construction activities.

Seafloor-disturbing activities will cause localized and temporary increases in suspended sediment levels and sediment deposition rates, primarily near the submarine cables but also near the WTG, OSS, Met Tower, and gravity cell locations. Sediment disturbance will be minimized by minimizing dredging for barge access and through the use of low-impact jetting over the majority of the seafloor installation. Utilization of jetting to install cables minimizes disturbance to the benthic environment and requires dredging to be used only at the gravity cell locations near the landfalls. Consequently, and as evaluated in greater detail within Sections 5.6 and 5.7 of the Application, the degree of impact to fish, crustaceans, mollusks, and other food web organisms is expected to be temporary, localized, and minor.

Subpart D, Section 230.32, OTHER WILDLIFE – requires an evaluation of the Project's impact on wildlife associated with aquatic ecosystems including resident and transient aquatic mammals, birds, reptiles and amphibians.

Marine Mammals

Table 5.8-1 lists marine mammals with potential occurrence in the Project area. Detailed descriptions of these species can be found in Section 5.8. Impacts to these species during construction, operations, and decommissioning can be found in Section 5.8 and are also summarized in Section 6, Subpart D, Section 230.30 above.

Marine Birds

The Project area provides habitat for various species of water birds as detailed in Sections 5.12 and 5.13 of the Application. Impacts to marine birds during construction may result from activities related to installation of the WTGs, OSSs, Met Tower, inter-array cables, and export cables. In general, the primary potential impact to marine birds that could result from these activities is disturbance or displacement due to the generation of noise, the movement of vessels through the area, and the generation of artificial lighting. Noise associated with vessel operations is unlikely to result in disturbance or displacement of marine birds due to the constant and low intensity of the sound, the existing operation of vessels in the offshore environment, and the transient nature of the activity. Therefore, the impacts of noise generated during construction on marine birds are expected to be negligible to minor. The potential attraction of seabirds, especially gulls, to vessels used during construction may be considered an adverse impact as it results in an alteration to the behavior of the individual birds that may affect foraging and cause an expenditure of energy that would otherwise not occur. However, this impact is expected to be temporary and restricted to the immediate vicinity of the activity, and therefore is considered a negligible impact. The potential impacts of artificial lighting during construction are expected to be negligible.

Impacts to marine birds during operations may result from several factors. The primary potential impact of concern is mortality or injury resulting from collision with WTGs (rotating blades or towers). Other potential impacts include disturbance and/or displacement due to noise or vessel traffic, and displacement due to the presence of the wind energy facility. The impacts of noise generated during operations on marine birds are expected to be negligible. The use of vessels in the offshore environment during operations is expected to result in negligible impacts to marine birds. The most significant physical alteration to the marine environment during operations will be the presence of the WTG structures. Other impacts to marine birds during operations include vessel traffic, lighting, visible structures, and displacement. Details about these impacts can be found in Section 5.12.

6.2.4 Potential Impacts on Special Aquatic Sites

Subpart E, Sections 230.40 through 230.43 - the Project will not result in significant impacts to sanctuaries, wetlands, mud flats and vegetated shallows.

§ 230.40 Sanctuaries and refuges

No sanctuaries or refuges are affected by the proposed Project. Considering the avoidance and minimization measures planned for construction and operation of the upland cables, submarines cables, onshore and OSSs, WTGs, and the Met Tower, these Project components are not expected to materially:

1. Disrupt the breeding, spawning, migratory movements or other critical life requirements of resident or transient fish and wildlife resources;
2. Create unplanned, easy and incompatible human access to remote aquatic areas;
3. Create the need for frequent maintenance activity;
4. Result in the establishment of undesirable competitive species of plants and animals;
5. Change the balance of water and land areas needed to provide cover, food, and other fish and wildlife habitat requirements in a way that modifies sanctuary or refuge management practices;
6. Result in any other adverse impacts.

§ 230.41 Wetlands

The Project area includes coastal habitat between marine subtidal unconsolidated bottom on the Atlantic coast of the barrier beach to the east and intertidal salt marsh located at the substation landfall to the west. The following components of the Project are located within coastal habitat;

the Barrier Beach Landfalls, Onshore Export Cable Corridor 1, and the proposed HDD locations within Indian River Bay. The habitat affected by each of these components is described below.

The offshore and onshore export cables will be installed using HDD. The HDD operations would disturb the seabed and ground at the bore entry and exit for each cable. By minimizing ground disturbance, the Project minimizes the area in which complex vegetation re-establishment may be needed.

The cable transition vaults at the Barrier Beach Landfalls are planned in parking lots that have already been disturbed and are expected to have negligible habitat alteration impacts. The transition vault box will be installed, and HDD operations will occur in the proposed landfall location at the existing 3 R's Beach parking lot or Tower Road parking lot. Any material from land-based excavations will be stockpiled in accordance with a storm water management plan and used for backfill or repurposed as required. Limiting ground disturbance to the parking lot also avoids impacting the hydrology of the site because the parking lot is already a compacted surface.

Ground disturbance would be minimized using the proposed construction approach; therefore, it is anticipated that habitat alteration of wetlands and waterbodies in the Project area will be negligible.

Freshwater wetland impacts are not anticipated during Project construction or operation.

Additional details regarding the Project's effects on wetlands are provided in Section 5.5.

§ 230.42 Mud flats

No mud flats are affected by the proposed Project.

§ 230.43 Vegetated shallows

No vegetated shallows are affected by the proposed Project.

§ 230.44 Coral reefs

No coral reefs are affected by the proposed Project.

§ 230.45 Riffle and pool complexes

No riffle and pool complexes are affected by the proposed Project.

6.2.5 Potential Impacts on Human Use Characteristics

Subpart F, Sections 230.50 through 230.54, require an evaluation of the Project's effects on the quality of municipal or private water supplies; recreational and commercial

fisheries; water-related recreation; aesthetics; parks, national and historical monuments, national seashores, wilderness areas, research sites, and similar preserves.

§ 230.50 Municipal and private water supplies

The presence of structures in saltwater and brackish water is not expected to intermingle with any municipal or private water supplies used during construction or operation of the Project. The extent of sediment dispersion due to submarine cable installation is minor and localized and no adverse effects would occur if there were water supplies within the vicinity of the Project area. Therefore, the Project will not affect the quality of municipal or private water supplies with respect to color, taste, odor, chemical content, and suspended particulate concentration.

§ 230.51 Recreational and commercial fisheries

Activities associated with Project construction have the potential to impact commercial and recreational fisheries, though these impacts are expected to be minor and temporary. Impacts to commercial and recreational fisheries during construction include habitat alteration, noise and suspended sediment/deposition, and space-use conflicts. Details can be found in Section 5.18.2 of this document.

Impacts from construction activities including cable burial, gravity cell installation, and contact of anchors and jack-up vessels with the seafloor, will be temporary and localized, as seafloor habitats are expected to undergo rapid physical and biological recovery following disturbance. Therefore, commercial and recreational fisheries are not expected to be impacted. The installation of WTGs, OSSs, Met Tower, scour protection, and cable protection (in areas where cable burial depth is insufficient) may result in direct mortality to organisms located in the footprint of the structures, although it is expected to be limited and commercial and recreational fisheries are not expected to be impacted. The offshore export cables and up to four WTGs with associated inter-array cables may be located within the Old Grounds recreational fishing area. As the primary species of interest in this area are demersal, Project construction may have temporary minor impacts on recreational fishing in this area. It is expected that demersal fish will temporarily move out of the Project area during active construction and return after construction noise and sediment disturbance have stopped.

Avoidance behavior in response to noise and water quality changes would be temporally limited and impacts on commercial and recreational fishing will be negligible. US Wind does not propose any long-term vessel exclusions during construction of the Project. Temporary exclusion areas, including fishing restrictions, will occur in the area of offshore construction activities for safety reasons. Restrictions would be temporary and are anticipated to have negligible impacts on commercial and recreational fisheries. Modest increases in vessel traffic will occur in and around ports used for Project mobilization. However, these temporary changes are unlikely to impact either commercial or recreational fisheries activity. Where feasible, space-use conflicts will be mitigated through the implementation of BMPs as described in BOEM’s 2014 report on this topic (Ecology and Environment Inc. 2014).

Impacts to commercial and recreational fishing during operations include space-use conflicts and noise. Details can be found in Section 5.17.3.2 of the Application. More information on impacts to recreational and commercial fishing can be found in COP, Appendix II-F2 (US Wind 2023).

§ 230.52 Water-related recreation

Impacts to recreation in the Project area will be moderate during construction and short-term in nature. The Barrier Beach Landfalls in Delaware at the proposed 3 R's Beach or Tower Road parking lots will be inaccessible while HDD operations for the landfalls are active. Off-season beachgoers who would typically drive to these locations in the Delaware Seashore State Park would have to temporarily find alternate parking, use alternate transportation, or, most likely, use an alternate beach. Potential beachgoers in this area range from surfers and swimmers to fishermen and beachcombers.

Construction vessel traffic may also impact recreation and tourism in the Project area. Recreational boaters may experience limited access to parts of the near-shore Indian River Bay and minor travel delays due to conflicts with construction vessels. These are routine impacts that can occur between any two vessels while at sea and are generally nothing more than inconveniences. The visual and auditory effects of increased vessel traffic in the Project area can also impact the aesthetic value of the landscape for recreationalists and tourists. Visual impacts of the Project are discussed in greater detail in COP Appendix II-J1 (US Wind 2023).

US Wind would prioritize beneficial reuse of clean dredge material, anticipated to be available primarily in the eastern portion of Indian River Bay, for beach renourishment north of the Indian River Inlet Bridge. Dredged material has been used to restore beaches north of the bridge in Delaware Seashore State Park. An April 2013 Environmental Assessment (EA) prepared by the Philadelphia District of the U.S. Army Corps of Engineers evaluated the dredging of 520,000 cubic yards of material from the flood shoal west of Indian River Inlet Bridge to the authorized depth of -24 ft NAVD, with the dredged material to be beneficially used to replace sand removed by Hurricane Sandy to stabilize and nourish the Delaware Seashore State Park and to rebuild the dune system to protect the existing roadway and Indian River Inlet Bridge. The EA concluded that the proposed beneficial use of the dredged material was the most cost effective and least damaging alternative that would meet the project goals and that the proposed project was not a major Federal action significantly affecting the human environment, so an Environmental Impact Statement (EIS) was not required. Given the continued importance of tourism to the area's economy, the use of dredge material would benefit recreation and tourism in the area.

Based on the proposed Project schedule, impacts to recreation will be short-term and have no long-term impacts. US Wind proposes concentrating construction activities for land-based onshore export cables and at Barrier Beach Landfalls outside of the summer recreation season (Memorial Day to Labor Day) to minimize negative impacts.

Routine Project operations would have a negligible impact on recreation and tourism. Maintenance activities are expected to occur on a routine basis. Any emergency maintenance that is required will be addressed promptly, and only the portion of the Project area that pertains to the affected infrastructure would be impacted. Few, if any, recreators are expected to forego a trip to a particular location due to occasional increases in boat traffic or similar potential indirect impacts associated with maintenance activities (USDOI and MMS 2007).

§ 230.53 Aesthetics

The primary impacts to visual resources during construction would be from the vessels and equipment involved in transporting Project components to the staging area and then to the Project area. This equipment will include large jack-up barges and other large transport vessels, as well as mobile cranes, cable laying vessels, and tugboats. There will be an increase in vessel traffic associated with the transport of Project components and personnel, but large vessel activity is not uncommon in this region and aesthetics impacts will be minor and temporary.

Post-construction impacts to visibility from the transmission interconnection will be negligible, because the offshore and onshore export cables will be submarine or underground. The expansion of the Indian River Substation will be consistent with the existing substation visual character and appearance in terms of components and height and therefore negligible aesthetics impacts will occur in the immediate vicinity of the cable landfall and existing substation. The visual impact of the onshore substation is discussed in COP Appendix II-J1 (US Wind 2023).
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Visual impacts depend on the distance from shore, earth curvature, and atmospheric conditions that could screen some or all of the foundation, and portions of the tower, nacelle, and rotor. Overall, visual impacts to coastal onshore viewers (e.g., beachgoers, hikers and bikers, office workers) of WTGs in daylight would be expected to be minor to moderate. Impacts to offshore viewers (e.g., fishers, charter boat crews, freight transport, recreational boaters) would be expected to be moderate to major, based on the viewers' proximity to the WTGs. When the aviation lights, ADLS, are activated, these lights would likely be visible on clear nights from the shoreline. However, use of ADLS would limit the amount of time lights would be on to only when aircraft pass overhead. Weather conditions such as fog, haze, clouds, or precipitation would greatly limit the visibility of the WTGs and lighting from the shore. Therefore, the presence of a flashing light or lights on WTGs at night would result in moderate impacts under clear conditions (BOEM 2021b).

See Section 5.14.2, of this document for additional details on visual and aesthetic resources.

§ 230.54 Parks, national and historical monuments, national seashores, wilderness areas, research sites, and similar preserves

The onshore cable routes do not cross national and historical monuments, national seashores, wilderness areas, research sites, or similar preserves.

6.2.6 Evaluation and Testing

§ 230.60 General evaluation of dredged or fill material and § 230.61 Chemical, biological, and physical evaluation and testing

In accordance with Subpart G of the Guidelines, Evaluation and Testing, US Wind conducted an integrated marine geophysical/hydrographic survey, geologic/sediment sampling program, and benthic evaluation along the proposed submarine cable route. The investigation was designed to collect relevant environmental conditions data; to assess and characterize existing conditions, including water depths, seafloor morphology, and structural features and sub-seafloor stratigraphy; and to provide information to assist in characterizing sediment transport processes for the Project area. The results of chemical and biological testing of seafloor sediments in the submarine cable corridor are provided in Section 5.3 and Section 5.6, respectively.

6.2.7 Actions to Minimize Adverse Effects

In accordance with Subpart H, Actions to Minimize Adverse Effects, the Project has been sited and designed, and will be operated and maintained, in a manner that will avoid or otherwise minimize the impacts to wetlands and other waters of the United States. The construction and installation methodology selected for this Project is the least environmentally damaging practicable alternative. The use of low-impact jet plow technology for the cable installation and HDD operations at the Barrier Beach Landfalls, combined with the short-term duration of these activities and adherence to acceptable in-water work windows, serve as appropriate avoidance and minimization of potential project-related impacts. The Project will not cause or contribute to significant degradation of the WOTUS.

§ 230.70 Actions concerning the location of the discharge

Disturbances associated with the submarine cable installation will be minimized through the use of jet plow technology and HDD, which, as demonstrated throughout Section 5.0 of this document, are not anticipated to result in significant impacts. Dredging activities associated with the Barrier Beach Landfalls will be limited and localized within the gravity cells, which will be up to 1.78 acres of disturbance. Provided such a limited area the effects associated with this work are anticipated to be minor and will not result in significant impacts.

§ 230.71 Actions concerning the material to be discharged

Sediment suspension in the water column during submarine cable installation will be minimized through the use of jet plow technology and HDD, which, as demonstrated throughout Section 5.0 of this document, are not anticipated to result in significant impacts to marine resource areas or species. The small volume of dredged material from the landfalls will be removed and deposited offsite in accordance with all applicable regulations. Clean sand backfill or articulated concrete mattresses may be placed over the installed submarine cable after installation to restore the bottom to pre-construction elevations.

Dredging is anticipated for barge access in the shallow waters of Indian River Bay and to reach the required cable depth. Clean sediments would be beneficially reused for beach renourishment north of the Indian River Inlet or for habitat restoration within Indian River Bay and Indian River to the greatest extent practicable. Remaining material would be placed in offshore or land-based approved disposal facilities.

§ 230.72 Actions controlling the material after discharge

Sediment suspension in the water column during submarine cable installation will be minimized through the use of jet plow technology and HDD, which, as demonstrated throughout Section 5.0 of the Application, are not anticipated to result in significant impacts to river resource areas or species. The submarine cable installer will have the ability to decrease jet plow installation speed or reduce jetting pressures if unexpected amounts of sediment are discharged during construction. US Wind will ensure timely burial and installation of the cables to minimize the time of dredging. Clean sand backfill or articulated concrete mattresses may be placed over the installed submarine cable after installation to restore the bottom to pre-construction elevations. The gravity cells are anticipated to minimize sediment suspension as well. These activities are not anticipated to result in significant impacts during installation.

§ 230.73 Actions affecting the method of dispersion

Sediment suspension in the water column during submarine cable installation will be minimized through the use of jet plow technology and HDD, which as demonstrated throughout Section 5.0 of this document, are not anticipated to result in significant impacts to marine resource areas or species. The submarine cable installer will have the ability to decrease jet plow installation speed if unexpected amounts of sediment are discharged during construction. At the landfalls, the cables will be installed via HDD, which will minimize impacts to the nearshore environment. Limited dredging activities will be required for the installation of the gravity cell structures at the landfalls as well. This dredging will be localized and limited in the extent of these activities. These activities are not expected to result in significant impacts to water quality or other environmental resources.

§ 230.74 Actions related to technology

The Project will utilize low-impact jet plow technology, or similar equipment such as a vertical injector, HDD at the landfalls, and the installation of gravity cells at the landfalls, which are demonstrated in the Application not to result in significant impacts to physical and chemical characteristics of the aquatic ecosystem; biological characteristics of the aquatic ecosystem; special aquatic sites; or human use characteristics.

The use of jet plow technology minimizes impacts to environmental resources along the submarine cable route and in the Project area.

The use of HDD at the landfalls will minimize or eliminate the potential for physical impacts to the seafloor in the nearshore areas between the gravity cells and the SHT Line of Indian River Bay. This reduces the physical impacts to environmental resources along the shoreline.

§ 230.75 Actions affecting plant and animal populations

Avoidance and minimization measures to minimize effects to plant and animal populations are included in the Alternatives Analysis (Section 4.0 of this document) and environmental resources analyses in Section 5.0 of this document. In-water TOY restrictions will be adhered to, thus avoiding sensitive finfish life stages. Based on the measures detailed in these sections, the Project is not anticipated to have a significant impact on plant or animal populations during construction or operation.

§ 230.76 Actions affecting human use

Water-related Recreation

Construction would not be conducted between Memorial Day and Labor Day. US Wind proposes concentrating construction activities for land-based onshore export cables and at Barrier Beach Landfalls outside of the summer recreation season to minimize negative impacts.

Aesthetics

US Wind will implement the following mitigation measures to reduce Project impacts on visual resources. US Wind commits to use ADLS, or equivalent technology such as light dimming, if commercially feasible and approved by BOEM in consultation with FAA, USCG and other agencies. The Project will minimize aviation lighting impacts, such as aiming lighting upward and using the longest permissible off cycles, in consultation with the FAA and BOEM. Lighting and marking will be implemented in consultation with FAA, BOEM, USCG and other regulatory agencies. Uniform spacing of WTGs and OSSs. The WTGs and towers will be an FAA-recommended paint color, which generally blends well with the sky at the horizon. The final WTG paint color will be determined in consultation with BOEM, FAA, and USCG. All offshore and onshore export cables are planned to be buried, or in locations where burial may not be achievable, protected to the greatest extent practicable.

§ 230.77 Other actions. (a) In the case of fills, controlling runoff and other discharges from activities to be conducted on the fill; (b) In the case of dams, designing water releases to accommodate the needs of fish and wildlife; (c) In dredging projects funded by Federal agencies other than the Corps of Engineers, maintain desired water quality of the return discharge through agreement with the Federal funding authority on scientifically defensible pollutant concentration levels in addition to any applicable water quality standards; (d) When a significant ecological change in the aquatic environment is proposed by the discharge of dredged or fill material, the permitting authority should

consider the ecosystem that will be lost as well as the environmental benefits of the new system

This Project will not involve the use of fills with runoff or runoff from fill; dams; federal dredging projects; or significant ecological changes to the aquatic environment. Therefore, this section is not applicable to the Project.

6.3 BMPs, Mitigation and Monitoring Summary

Section 6.3 provides a summary of potential impacts, BMPs, mitigation and monitoring measures associated with the Project by subject matter.

6.3.1 Geology and Shallow Hazards

Potential Impacts	BMPs, Mitigation and Monitoring Measures
Construction	
Sediment disturbance/displacement	• Select suitable geological locations for the installation of the WTG, OSS and Met Tower foundations and design foundations appropriate to geological conditions. • To the greatest extent practicable, select areas with suitable seabed conditions for cable installation during cable route planning.
Surficial geology impacts	• Use submarine cables that have proper electrical shielding and bury the cables in the seafloor, when practicable. • Minimize sediment disturbance by utilizing the best available technologies to achieve deep burial of submarine cable into a stable sediment layer (i.e., jet plow technology, HDD, gravity cells, etc.). • Minimize the amount of scour protection required.
Munitions of Explosive Concern (MEC)/ Unexploded Ordinance (UXO)	• Prior to construction, analyze survey data at installation locations to identify potential MEC/UXO and plan avoidance or clearance in line with industry best practices. • Prepare an MEC/UXO Emergency Risk Management Plan prior to construction. • Prior to construction activities, provide an MEC/UXO awareness briefing to vessel crews.
Operations	
Sediment disturbance/displacement	• Select suitable geological locations for the installation of the WTG, OSS and Met Tower foundations and design foundations appropriate to geological conditions.

Potential Impacts	BMPs, Mitigation and Monitoring Measures
	• To the greatest extent practicable, select areas with suitable seabed conditions for cable installation during cable route planning. • Minimize the amount of scour protection required.

6.3.2 Water Quality

Potential Impacts	BMPs, Mitigation and Monitoring Measures
Construction	
Turbidity/Total Suspended Solids (TSS)	• US Wind assumes all construction within Indian River Bay, including any dredging, would occur in October-March window, observing the general time of year restrictions for summer flounder and other species. Time of year restrictions would be determined through consultations with DNREC. • Sediment disturbance associated with submarine cable laying will be minimized by jet plowing, HDD techniques and the use of gravity cells where feasible. • Turbidity monitoring will be conducted during construction as required by the permitting authorities. Conduct TSS and water quality monitoring during cable installation activities and post installation as needed.
Frac-out from HDD activities	• A drilling fluid fracture contingency plan will be in place prior to the start of HDD activities. Operations will be shut down immediately in the event a frac-out occurs.
Routine and accidental discharges from vessels	• US Wind will monitor for and report any environmental release or fish kill to the appropriate authorities, e.g., in Delaware State waters, reports will be made via DNREC 24-hour hotline. • Project-specific SPCC Plan and Oil Spill Response Plan will be prepared prior to construction and for operations activities. • US Wind will develop a SWPPP for onshore construction activities, as appropriate. • Vessel operators, employees, and contractors will be briefed on marine trash and debris awareness elimination as described in BSEE NTL No. 2015-G03 Marine Trash and Debris Awareness and Elimination, per BOEM guidelines for marine trash and debris prevention. • Vessels will adhere to USCG guidelines; follow applicable regulations related to the discharge of bilge water, gray water, and sanitary waste; maintain discharge permits, as

Potential Impacts	BMPs, Mitigation and Monitoring Measures
	appropriate; follow good maintenance and housekeeping procedures to prevent releases of oil and other chemicals to the sea; maintain up-to-date oil spill response plans to prevent, contain, and clean up any accidental spills.
Operations	
Routine and accidental discharges from vessels	• US Wind will monitor for and report any environmental release or fish kill to the appropriate authorities, e.g., in Delaware State waters, reports will be made via DNREC 24-hour hotline. • Project-specific SPCC Plan and Oil Spill Response Plan will be prepared prior to construction and for operations activities. • US Wind will develop a SWPPP for onshore construction activities, as appropriate. • Vessel operators, employees, and contractors will be briefed on marine trash and debris awareness elimination as described in BSEE NTL No. 2015-G03 Marine Trash and Debris Awareness and Elimination, per BOEM guidelines for marine trash and debris prevention. • Vessels will adhere to USCG guidelines; follow applicable regulations related to the discharge of bilge water, gray water, and sanitary waste; maintain discharge permits, as appropriate; follow good maintenance and housekeeping procedures to prevent releases of oil and other chemicals to the sea; maintain up-to-date oil spill response plans to prevent, contain, and clean up any accidental spills.

6.3.3 Air Quality

Potential Impacts	BMPs, Mitigation and Monitoring Measures
Construction and Operations	
Emissions	• US Wind will obtain any necessary CAA permits under the state of Maryland's delegated program and comply with applicable permit conditions. • Vessel engines will meet the applicable EPA and IMO marine engine emission standards. • Engines will be operated and maintained in accordance with the manufacturer's recommendations and industry practices. • Diesel fuel for use in the diesel engines will meet the per gallon fuel standards of 40 CFR 80.510(b) as applicable.

	• Land based engines that meet the EPA non-road engine standards will be used, as applicable. • Unnecessary idling of engines will be limited, where practicable. • Where practicable, engines with add-on emission controls will be used.

6.3.4 Coastal Habitat

Potential Impacts	BMPs, Mitigation and Monitoring Measures
Construction	
Habitat alteration	• US Wind will install cables using HDD to avoid impacts to coastal dunes and interdunal wetlands and to minimize bottom disturbance. • US Wind will minimize ground disturbance by confining cable infrastructure, such as transition vaults and HDD operations, to previously disturbed lands as much as practicable. • Onshore construction activities will be scheduled to avoid impacting sensitive coastal habitats, where practicable. • Between May 1 and August 1, construction activities will not occur within 100 m (328 ft) of hummocks in Indian River Bay in order to avoid impacts to nesting terns. • US Wind will minimize impacts on SAV where practicable. No submerged aquatic vegetation has been identified in areas proposed for permanent or temporary disturbance. • US Wind will establish and maintain buffers around wetlands, implement BMPs to minimize erosion and control sediments and maintain natural surface drainage patterns, as practicable. • US Wind will locate cable landfalls and onshore facilities so as to avoid impacts to known nesting beaches, where feasible. The use of HDD for cable installation under the Barrier Beach Landfalls will avoid impacts on beaches. • Construction is anticipated to occur outside of turtle nesting season. Agency consultation and monitoring will be conducted as needed to mitigate disturbances. • Project-specific SPCC Plan will be prepared prior to construction and for operations activities. • US Wind will develop a SWPPP for onshore construction activities, as appropriate.

Potential Impacts	BMPs, Mitigation and Monitoring Measures
	• Agency consultation and monitoring regarding coastal habitats and species will be conducted as needed to mitigate disturbances, as practicable. • US Wind would prioritize beneficial reuse of dredge material (i.e., wetland restoration, beach renourishment), based on the material characteristics and opportunities as they present themselves, over placement in offshore or onshore disposal areas. • US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.

6.3.5 Benthic Resources

Potential Impacts	BMPs, Mitigation and Monitoring Measures
Construction	
Seabed and bay bottom disturbance	• US Wind assumes all construction within Indian River Bay, including any dredging, would occur in October-March window, observing the general time of year restrictions for summer flounder and other species. Time of year restrictions would be determined through consultations with DNREC. • The Project has been sited to avoid sensitive or rare habitats (such as high-density clam beds) where feasible, and habitat disturbance will be minimized to the extent practicable. • Shellfish relocation/restoration in Onshore Export Cable Corridor 1 will be evaluated pre- and post- installation if warranted. • Cables will be installed using a jet plow to the greatest extent possible. Any dredging needed is expected to be limited to the gravity cells. • HDD will be used at landfall locations.
Vessel Anchoring	• Potential impacts from anchoring will be minimized by avoiding locations with sensitive habitats and utilizing mid-line anchor buoys.

• Operations	
Electromagnetic Fields (EMF)	• Use submarine cables that have proper electrical shielding and bury the cables in the seafloor, when practicable. • Conduct a site-specific study of potential EMF impacts on electrosensitive marine organisms

6.3.6 Finfish and Essential Finfish Habitat

Potential Impacts	BMPs, Mitigation and Monitoring Measures
Construction	
Habitat and migration	• US Wind assumes all construction within Indian River Bay, including any dredging, would occur in October-March window, observing the general time of year restrictions for summer flounder and other species. Time of year restrictions would be determined through consultations with DNREC. • Conduct surveys and review existing data to identify important, sensitive, and unique marine habitats to be avoided. • Seafloor disturbance during construction will be minimized as practicable. • Impacts to summer flounder HAPC will be minimized by using dynamic positioning where feasible to minimize the need for construction vessels to anchor to the seafloor and using midline buoys to reduce seafloor scarring when construction vessels need to anchor. • Minimize construction activities as practicable in areas containing anadromous fish during migration periods.
Monitoring	• Fish monitoring equipment including nanotag antennas has been installed on the Metocean Buoy. • US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.
Turbidity/TSS impacts	• Sediment disturbance associated with submarine cable laying will be minimized by jet plowing, HDD techniques and the use of gravity cells where feasible.
Pile driving noise	• Soft-start procedures and sound attenuation will be used during foundation pile driving.

Potential Impacts	BMPs, Mitigation and Monitoring Measures
Lighting	• Work lighting will be limited to the extent practicable to areas of active construction in coordination with USCG and other agencies as appropriate.
Routine and accidental discharges from vessels	• Project-specific SPCC Plan and Oil Spill Response Plan will be prepared prior to construction and for operations activities. • Vessel operators, employees, and contractors will be briefed on marine trash and debris awareness elimination as described in BSEE NTL No. 2015-G03 Marine Trash and Debris Awareness and Elimination, per BOEM guidelines for marine trash and debris prevention. • Vessels will adhere to USCG guidelines; follow applicable regulations related to the discharge of bilge water, gray water, and sanitary waste; maintain discharge permits, as appropriate; follow good maintenance and housekeeping procedures to prevent releases of oil and other chemicals to the sea; maintain up-to-date oil spill response plans to prevent, contain, and clean up any accidental spills.
Operations	
EMF	• Use submarine cables that have proper electrical shielding and bury the cables in the seafloor, when practicable. • Conduct a site-specific study of potential EMF impacts on electrosensitive marine organisms.

6.3.7 *Marine Mammals*

Potential Impacts	BMPs, Mitigation and Monitoring Measures
Construction	
Pile Driving	• Prepare a pile driving monitoring plan, to include details about the measures listed below, prior to construction activities. Mitigation measures may be modified to reflect conditions set by NOAA Fisheries following the application for IHA or Letter of Authorization (LOA) associated with construction activities. • Implement sound attenuation technologies such as double bubble curtains and nearfield attenuation devices to reduce underwater pile driving noise by 10 Db, with a target of 20 Db. • Pile driving is planned between May 1 and November 30. Pile driving, if necessary, in November may require additional mitigation measures such as larger clearance or exclusion zones.

Potential Impacts	BMPs, Mitigation and Monitoring Measures
	• Establish a clearance zone prior to pile driving using a combination of visual and acoustic monitoring for large whales. The clearance zone is to be monitored for a minimum of 60 minutes and the zone must be clear for 30 minutes before beginning soft-start procedure. • Once clearance zone is confirmed clear of marine mammals, pile driving will begin with minimum hammering at low energy for no less than 30 minutes (soft-start). • Additional restrictions on pile driving will include: no simultaneous pile driving; no more than one monopile driven per day; daylight pile driving only unless health and safety issues require completion of a pile; and initiation will not begin within 1.5 hours of civil sunset or in times of low visibility when the visual clearance zone and exclusion zone cannot be visually monitored, as determined by the lead PSO on duty. • Establish an exclusion zone using a combination of visual and acoustic monitoring for large whales. Pile driving will be halted if species enters defined exclusion zone, with exceptions for health and safety considerations as well as technical feasibility. • Visual clearance and exclusion zones will be monitored by PSOs which are individuals with a current NOAA Fisheries approval letter as a PSO.
Vessel Strike Avoidance	• PSOs or trained observers will be present on crew vessels and other Project vessels. • US Wind will ensure that from November 1 through April 30, vessel operators monitor NOAA Fisheries North NARW reporting systems (e.g., Early Warning System, Sighting Advisory System, and Mandatory Ship Reporting System) for the presence of NARWs. • Vessels 19.8 m (65 ft) or larger will operate at 10 knots or less in NARW Special Management Areas (SMAs). Additionally, all vessels would operate at speeds of 10 knots or less in Right Whale Slow Zones, identical to Dynamic Management Areas (DMAs), to protect visually or acoustically detected NARW. US Wind will incorporate the proposed revision to the NARW vessel speed rule for vessels 10.6-19.8 m (35-65 ft) in length upon implementation. • All vessels will maintain a minimum separation distance of 500 m (1,640 ft) or greater from any sighted NARW. If a NARW is sighted within this exclusion zone while underway, the vessel would steer a course away from the whale at 10

Potential Impacts	BMPs, Mitigation and Monitoring Measures
	knots (18.5 km/hr) or less until the 500 m (1,640 ft) minimum separation distance has been established. If a NARW is sighted within 100 m (328 ft) of an underway vessel, the vessel operator would immediately reduce speed and promptly shift the engine to neutral. If the vessel is stationary, the operator would not engage engines until the NARW has moved beyond 100 m (328 ft). • All vessels will maintain a minimum separation distance of 100 m (328 ft) or greater from any sighted non-delphinid cetacean other than the NARW. If a non-delphinid cetacean sighted within this exclusion zone while underway, the vessel operator would immediately reduce speed and promptly shift the engine to neutral. The vessel operator would not engage the engines until the no-delphinid cetacean has moved beyond 100 m (328 ft). If the vessel is stationary, the operator would not engage engines until the non-delphinid cetacean has moved beyond 100 m (328 ft). • All vessels will maintain a minimum separation distance of 50 m (164 ft) or greater from any sighted delphinid cetacean or pinniped, except if the mammal approaches the vessel. If a delphinid cetacean or pinniped approaches an underway vessel, the vessel would avoid excessive speed or abrupt changes in direction to avoid injury to these organisms. Additionally, vessels underway may not divert to approach any delphinid cetacean or pinniped. • US Wind will continue to evaluate technologies that may increase the ability to detect marine mammals from vessels, such as thermal detection technologies.
Routine/Accidental Releases from Vessels	• Vessel operators, employees, and contractors will be briefed on marine trash and debris awareness elimination as described in BSEE NTL No. 2015-G03 *Marine Trash and Debris Awareness and Elimination*, per BOEM guidelines for marine trash and debris prevention. • Vessels will adhere to USCG guidelines; follow applicable regulations related to the discharge of bilge water, gray water, and sanitary waste; maintain discharge permits, as appropriate; follow good maintenance and housekeeping procedures to prevent releases of oil and other chemicals to the sea; maintain up-to-date oil spill response plans to prevent, contain, and clean up any accidental spills.
Monitoring	• The Metocean Buoy includes acoustic recorders to detect and identify marine mammal calls. • US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be

Potential Impacts	BMPs, Mitigation and Monitoring Measures
	made available to government, research, and environmental groups, among others. • Additional opportunities to support passive acoustic monitoring of marine mammals in and around the Lease area in conjunction with ongoing research efforts by others, such as the University of Maryland Center for Environmental Science, will continue to be explored.
Operations	
EMF	• Use submarine cables that have proper electrical shielding and bury the cables in the seafloor, when practicable.
Monitoring	• US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php. • Additional opportunities to support passive acoustic monitoring of marine mammals in and around the Lease area in conjunction with ongoing research efforts by others will continue to be explored.

6.3.8 Sea Turtles

Potential Impacts	BMPs, Mitigation and Monitoring Measures
Construction	
Pile Driving	• Implement sound attenuation technologies such as double bubble curtains and nearfield attenuation devices to reduce underwater pile driving noise by 10 Db, with a target of 20 Db. • Establish a clearance zone prior to pile driving using visual monitoring for sea turtles. Once clearance zone is confirmed clear of protected species, pile driving will begin with minimum hammering at low energy for no less than 30 minutes (soft-start). • Additional restrictions on pile driving will include: no simultaneous pile driving; no more than one monopile driven per day; daylight pile driving only unless health and safety issues require completion of a pile; and initiation will not begin within 1.5 hours of civil sunset or in times of low visibility when the visual clearance zone and exclusion zone

Potential Impacts	BMPs, Mitigation and Monitoring Measures
	cannot be visually monitored, as determined by the lead PSO on duty. • Establish an exclusion zone using visual monitoring for sea turtles. Pile driving will be halted if species enters defined exclusion zone, with exceptions for health and safety considerations as well as technical feasibility. • Visual clearance and exclusion zones will be monitored by PSOs which are individuals with a current NOAA Fisheries approval letter as a PSO.
Vessel Strike Avoidance	• Vessels will observe NOAA Fisheries collision avoidance guidance, such as establishing minimum separation distances from sea turtles. • Trained observers will be present on crew vessels and other Project vessels without PSOs.
Habitat Alteration	• US Wind will locate cable landfalls and onshore facilities so as to avoid impacts to known nesting beaches, where feasible. The use of HDD for cable installation under the Barrier Beach Landfalls will avoid impacts on beaches. • Construction is anticipated to occur outside of turtle nesting season. Agency consultation and monitoring will be conducted as needed to mitigate disturbances.
Routine/Accidental Releases	• Vessel operators, employees, and contractors will be briefed on marine trash and debris awareness elimination as described in BSEE NTL No. 2015-G03 *Marine Trash and Debris Awareness and Elimination*, per BOEM guidelines for marine trash and debris prevention. • Vessels will adhere to USCG guidelines; follow applicable regulations related to the discharge of bilge water, gray water, and sanitary waste; maintain discharge permits, as appropriate; follow good maintenance and housekeeping procedures to prevent releases of oil and other chemicals to the sea; maintain up-to-date oil spill response plans to prevent, contain, and clean up any accidental spills.
Monitoring	• US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php.
Operations	

Potential Impacts	BMPs, Mitigation and Monitoring Measures
EMF	• Submarine cables that have electrical shielding will be used and the cables will be buried in the seafloor, where practicable. • Conduct a site-specific study of potential EMF impacts on electrosensitive marine organisms.

6.3.9 *Terrestrial Species and Upland Habitats*

Potential Impacts	BMPs, Mitigation and Monitoring Measures
Construction	
Habitat Alteration	• Previously disturbed areas will be used for the construction laydown area and access roads where feasible. • Tree clearing activities required for Project construction are not planned between June 1 and July 31 to avoid or minimize impacts to northern long-eared bat during the summer maternity period.
Accidental Releases	• Project-specific SPCC Plan will be prepared prior to construction and for operations activities. • US Wind will develop a SWPPP for onshore construction activities, as appropriate.
Air Emissions	• Methods to reduce engine emissions will be implemented during construction and operation of the proposed Project where practicable, including restricting engine idling.
Operations	
Lighting	• Lighting-related impacts will be minimized by using BMPs where feasible. Examples of BMPs to minimize the adverse impacts of artificial lighting will include not lighting the facility at night except in the case of an emergency that requires an immediate response, and the use of down-shielded light fixtures to reduce the visibility of light by birds, bats, and insects flying above the facility.
Accidental Releases	• Project-specific SPCC Plan will be prepared prior to construction and for operations activities. • US Wind will develop a SWPPP for onshore construction activities, as appropriate.
Air Emissions	• Methods to reduce engine emissions will be implemented during construction and operation of the proposed Project where practicable, including restricting engine idling.

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6.3.10 Marine Birds

Potential Impacts	BMPs, Mitigation and Monitoring Measures
Construction	
Monitoring	• US Wind proposes preconstruction and post-construction aerial, digital surveys to monitor for avoidance and displacement of avian species (COP, Appendix II-N2 (US Wind 2023)). • Avian monitoring equipment, including nanotag antennas and acoustic sensors, have been installed on the Metocean Buoy. • US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is provided on the following website: https://remote.normandeau.com/uswind_home.php. • Measures that minimize lighting impacts on avian species will be implemented where feasible, as approved by FAA, BOEM, USCG, and other regulatory agencies.
Operations	
Attractions	• Anti-perching measures may be installed on the deck/access platform of the WTGs to discourage birds from resting on and congregating around the structures.
Lighting	• Measures that minimize lighting impacts on avian species will be implemented where feasible, as approved by FAA, BOEM, USCG, and other regulatory agencies.

6.3.11 Bats

Potential Impacts	BMPs, Mitigation and Monitoring Measures
Construction	
Habitat Alteration	• Tree clearing activities required for Project construction are not planned between June 1 and July 31 to avoid or minimize impacts to northern long-eared bat during the summer maternity period.
Monitoring	• The Metocean Buoy has been equipped with a bat acoustic recorder to monitor for the nocturnal calls of bats within the Lease area for up to two years. • Acoustic recorders to collect incidental bat calls offshore have been deployed on survey vessels throughout the Lease area and along the Offshore Export Cable Corridors. • US Wind will compile a comprehensive wildlife survey and observation information database to include surveys, PSO data, and other wildlife monitoring records. Data will be made available to government, research, and environmental groups, among others. Information is

	provided on the following website: https://remote.normandeau.com/uswind_home.php.

6.3.12 Cultural, Historic, and Archaeological Resources

Potential Impacts	BMPs, Mitigation and Monitoring Measures
Construction	
	• The results of HRG and geotechnical surveys have been used to identify potential marine cultural resources and preserved submerged landforms. US Wind will avoid impacts to potential marine cultural resources and submerged landforms by micro-siting Project elements and planning construction around established avoidance areas. • Mitigation measures commensurate with potential adverse effects to historic properties impacted by views to the Project are proposed in a Historic Preservation Treatment Plan, through continuing coordination with SHPOs and consulting parties. • Planning has taken into account previously recorded cultural resources and areas of high archaeological probability, as well as the extent of prior disturbance, in order to minimize Project impacts to known or potential archaeological resources. US Wind will avoid potential terrestrial cultural resources identified. • US Wind will develop an Unanticipated Discovery Plan to be implemented during onshore and offshore construction. • US Wind will continue to coordinate with the appropriate SHPO and Native American tribes to refine measures to minimize and mitigate impacts to potential cultural resources generally and if particular resources are identified.

6.3.13 Visual Resources

Potential Impacts	BMPs, Mitigation and Monitoring Measures
Operations	
	• US Wind commits to use ADLS if commercially feasible and approved by BOEM in consultation with FAA, USCG, and other agencies. • The Project will minimize aviation lighting impacts, such as aiming lighting upward and using the longest permissible off cycles, in consultation with the FAA and BOEM.

Potential Impacts	BMPs, Mitigation and Monitoring Measures
	• Lighting and marking will be implemented in consultation with FAA, BOEM, USCG, and other regulatory agencies. • Uniform spacing of WTGs and OSSs. • Use an FAA-recommended paint color that is not pure white (RAL 90) for any WTG components visible from shore. The WTG paint color will be determined in consultation with BOEM, FAA, and USCG. All offshore and onshore export cables are planned to be buried, or in locations where burial may not be achievable, protected to the greatest extent practicable.

6.3.14 Navigation, Air Traffic, and Military Activities

Potential Impacts	BMPs, Mitigation and Monitoring Measures
Construction	
Navigation Safety	• Coordinate with the appropriate regulatory agencies and other stakeholders during construction to provide timely and effective communications regarding planned vessel movements and construction activities. • Work with USCG to establish and maintain safety zones around active construction areas, and mark areas with highly visible marking and lighting. • Use existing transit lanes for construction and maintenance vessels to the extent practicable. • Route Offshore Export Cable Corridors to avoid USCG proposed anchorage. • Develop emergency procedures for potential vessel allisions with Project structures and other maritime emergencies, such as search and rescue, in consultation (e.g., coordinated drills) with relevant agencies and stakeholders. Establish appropriate chain of command with USCG and MDNR to respond to emergencies in a timely, efficient manner and address ongoing issues. Procedures and potential equipment packages to benefit mariners, e.g., WTG cameras or data connectivity enhancements, will be developed through stakeholder outreach. • Bury submarine cables at least 2 m (6 ft) below the Indian River Bay federal navigation channel.
Operations	

Potential Impacts	BMPs, Mitigation and Monitoring Measures
Navigation Safety	• Uniform spacing of WTGs and OSSs of 1.89 km (1.02 NM) north/south and 1.43 km (0.77 NM) east/west • A proposed 1.9 km (1 NM) buffer zone between Project structures and the Traffic Separation Scheme outer boundary. • Use existing transit lanes for construction and maintenance vessels to the extent practicable. • Monitor Project operations continuously and maintain Project emergency contact channels with the USCG and other relevant agencies and stakeholders. • US Wind will work with the USCG to identify measures that may increase mariner and responder situational awareness in the vicinity of the Lease area such as cameras, distinct markings on towers, and enhanced communication connectivity. • Develop emergency procedures for potential vessel allisions with Project structures and other maritime emergencies, such as search and rescue, in consultation (e.g., coordinated drills) with relevant agencies and stakeholders. Establish appropriate chain of command with USCG and MDNR to respond to emergencies in a timely, efficient manner and address ongoing issues. Procedures and potential equipment packages to benefit mariners, e.g., WTG cameras or data connectivity enhancements, will be developed through stakeholder outreach.
Aircraft Traffic Safety	• US Wind commits to use ADLS, or equivalent technology such as light dimming, if commercially feasible and approved by BOEM in consultation with FAA, USCG, and other agencies. Use of ADLS would reduce nighttime obstruction lighting by 99% compared to not using ADLS. • Lighting and marking will be implemented following guidelines as practicable and in consultation with FAA, BOEM, USCG, and other regulatory agencies.
Monitoring	• Meteorological and ocean observations from the Met Tower will be made available to the public.

6.3.15 Socioeconomics

Potential Impacts	BMPs, Mitigation and Monitoring Measures
Construction	
Local Impacts	• US Wind will work with local officials to develop a traffic management plan to reduce impacts to local traffic during construction. • US Wind has sited and developed Project elements to minimize disturbance to resources, to the extent practicable, enjoyed by residents of and visitors to the region.

Potential Impacts	BMPs, Mitigation and Monitoring Measures
	• Route Offshore Export Cable Corridors to avoid marine mineral resources areas to the extent practicable.
Tourism Impacts	• US Wind will concentrate onshore construction activities outside of the summer recreation season to the greatest extent practicable and will coordinate with DNREC Parks and Recreation to minimize interference with beach activities.
Fisheries Impacts	• US Wind developed a Fisheries Communication Plan, in conjunction with the designated Fisheries Liaison Officer and will work with fisheries stakeholders to update it as appropriate. • US Wind established a process for gear loss compensation for commercial fishermen. • US Wind will work cooperatively with commercial/recreational fishing entities and interests to review planned activities and ensure that the construction and operation activities will minimize potential conflicts. • US Wind will conduct pre- and post-construction monitoring for regionally important species, in a partnership with the University of Maryland Center for Environmental Science to study black sea bass, to identify commercial and recreational fishing impact.
Operations	
Routine/Accidental Vessel Releases	• US Wind will implement practices and operating procedures to reduce the likelihood of vessel accidents and fuel spills. An Oil Spill Response Plan has been prepared and will be implemented for construction and for operations activities.
Fisheries Impacts	• US Wind developed a Fisheries Communication Plan, in conjunction with the designated Fisheries Liaison Officer and will work with fisheries stakeholders to update it as appropriate. • US Wind established a process for gear loss compensation for commercial fishermen. • US Wind will work cooperatively with commercial/recreational fishing entities and interests to review planned activities and ensure that the construction and operation activities will minimize potential conflicts. • US Wind will evaluate potential pre- and post-construction monitoring for regionally important species, such as black sea bass, to identify commercial and recreational fishing impact.
EMF	• Conduct a site-specific study of potential EMF impacts on electrosensitive marine organisms.

Potential Impacts	BMPs, Mitigation and Monitoring Measures
Visual Impacts	• Onshore cables and facilities at the Barrier Beach Landfalls will be buried. • WTGs, OSSs, and the Met Tower will be marked per USCG guidelines in consultation with USCG, BOEM, and other regulatory agencies as appropriate. • Submarine cables will be buried and regularly inspected to maintain cable burial.
Construction and Operations	
Economic Benefits	• US Wind will coordinate with local stakeholders to develop opportunities for eco-tourism related to the Project. • US Wind is committed to creating full and equitable business opportunities for minority, women-owned, veteran-owned, and HUBZone businesses in the development of the Project. • US Wind has hired a team of MBE participation and compliance experts to lead the company's outreach efforts to minority businesses and community organizations. • US Wind is coordinating with area organized labor organizations to develop a skilled local workforce for the Project. • US Wind has a strong interest in the welfare of workers employed by the construction managers, contractors, and subcontractors on all components of the Project. • US Wind is committed to achieving substantial involvement of Maryland-based small businesses in all phases of the Project. • US Wind is committed to creating opportunities for Delaware-based companies able to deliver supply chain components and/or perform on-site work in Delaware. • US Wind has a particular focus on creating meaningful economic opportunities for environmental justice communities in the Baltimore, Maryland area. • US Wind will support workforce initiatives that are focused on providing support to minority and low-income populations, women, veterans, and underserved communities.

7.0 CONCLUSIONS

The proposed Project has been designed to be in compliance with applicable USACE regulations and guidelines under Section 404(b)(1) of the CWA and 33 USC 408 (provided under separate cover). Impacts from construction of the Project would be temporary; there will not be any permanent or lasting impact on the physical, chemical, or biological characteristics of the aquatic ecosystem. Any discharges of dredged or fill material will be conducted in a manner that will minimize potential adverse impacts to WOTUS and special aquatic sites. Furthermore, the construction methodologies selected by US Wind will not cause or contribute to significant degradation of the WOTUS, or on the aquatic ecosystem. In addition, there will be no significant impacts to threatened and endangered species or to cultural and archaeological resources. The Project has been designed to avoid creating impacts where possible, and to minimize and/or mitigate impacts where avoidance is not practicable. All applicable federal, state, and local licenses, permits, and certifications will be obtained.

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