Ocean Wind 1 Offshore Wind Farm Biological Assessment

For the United States Fish and Wildlife Service

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U.S. Department of the Interior
Bureau of Ocean Energy Management
Office of Renewable Energy Programs

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABBREVIATIONS AND ACRONYMS

Abbreviation	Definition
ACJV	Atlantic Coast Joint Venture
ADLS	Aircraft Detection Lighting System
APM	Applicant Proposed Measure
BA	Biological Assessment
BOEM	Bureau of Ocean Energy Management
CFR	Code of Federal Regulations
cm	centimeters
COP	Construction and Operations Plan
DEIS	Draft Environmental Impact Statement
DPS	Distinct Population Segment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FR	Federal Register
GIS	geographic information system
GPS	Global Positioning System
HDD	horizontal directional drilling
IPaC	Information for Planning and Consultation
km	kilometers
kV	kilovolt
Lease Area	Lease Area OCS-A 0498
m/s	meters per second
MABS	Mid-Atlantic Baseline Study
MDAT	Marine-life Data and Analysis Team
MW	megawatt
NJDEP	New Jersey Department of Environmental Protection
NJFW	New Jersey Fish and Wildlife
nm	nautical miles
O&M	operations and maintenance
Ocean Wind	Ocean Wind, LLC
OCS	Outer Continental Shelf
OSS	Offshore Substation
Project	Ocean Wind 1 Offshore Wind Farm, also Proposed Action
Proposed Action	Ocean Wind 1 Offshore Wind Farm, also Project
ROW	right-of-way
rpm	revolutions per minute
RSZ	rotor-swept zone
SCRAM	Stochastic Collision Risk Assessment for Movement
SPS	Significant Peripheral Structure
TJB	transition joint bay
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
WEA	Wind Energy Area
WNS	white-nose syndrome

Abbreviation	Definition
WTG	wind turbine generator

1. INTRODUCTION

Pursuant to Section 7(a)(2) of the Endangered Species Act (ESA), the Bureau of Ocean Energy Management (BOEM) requests informal consultation with the U.S. Fish and Wildlife Service (USFWS) regarding species that may be affected by the approval of a Construction and Operations Plan (COP) for the Ocean Wind 1 Offshore Wind Farm (Project, or Proposed Action). As detailed in the COP (Ocean Wind 2022), the proposed Project would include the construction, operations and maintenance (O&M), and eventual decommissioning of an approximately 1,100 megawatt (MW) offshore wind energy facility within BOEM Renewable Energy Lease Area OCS-A 0498 (Lease Area) located on the Outer Continental Shelf (OCS) approximately 15 miles (13 nautical miles [nm], 24 kilometers [km]) southeast of Atlantic City, New Jersey (Figure 1-1).

The proposed Project would consist of up to 98 wind turbine generators (WTGs), up to three offshore substations (OSSs), inter-array cables linking the individual WTGs to the OSS, and substation interconnector cables linking the OSSs to each other. Up to three offshore export cables (installed within two export cable route corridors) that connect to onshore export cable systems and two onshore substations with connections to the existing electrical grid in New Jersey at BL England and Oyster Creek would also be developed. The BL England export cable route corridor would landfall in Ocean City, New Jersey, and the Oyster Creek export cable route corridor would landfall in Lacey Township, New Jersey.

This Biological Assessment (BA) evaluates the potential effects of the proposed Project on ESA-listed species under the jurisdiction of the USFWS that would potentially occur within the Project area if BOEM were to approve the COP. ESA-listed species under the jurisdiction of the National Marine Fisheries Service are being evaluated in a separate BA. The species under the jurisdiction of the USFWS are primarily located onshore, and therefore this assessment focuses on the onshore Project components. This BA describes the proposed Project (Section 2), defines the Action Area (Section 3), describes the potentially affected ESA-listed species (Section 4), and provides an analysis and determination of how the proposed Project may affect ESA-listed species or their habitats (Section 5). The ESA Section 7 determinations are provided in Section 6 and the proposed avoidance, minimization, and mitigation measures are detailed in Section 2.4.

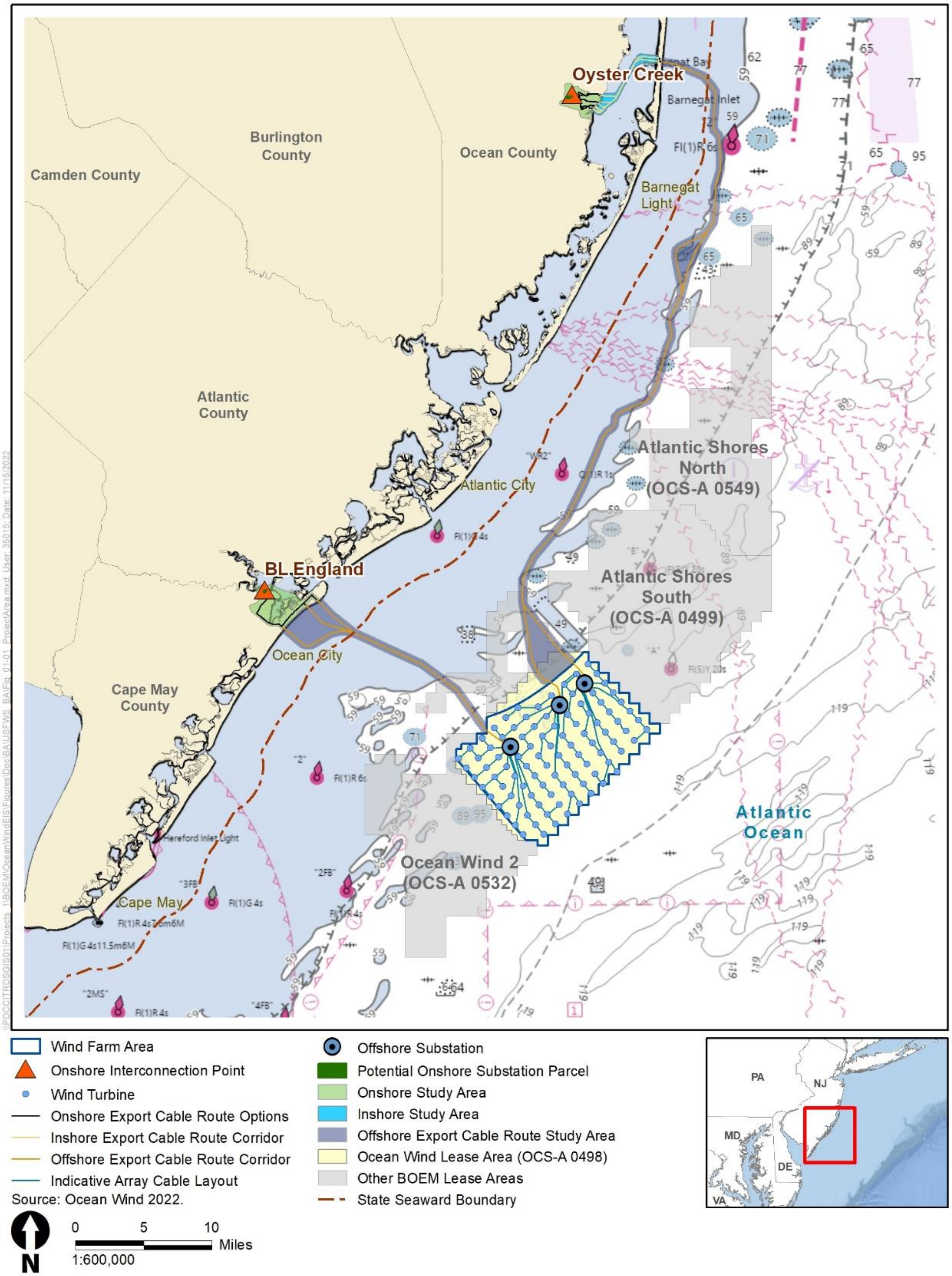


Figure 1-1 Ocean Wind 1 Project Location

1.1. BACKGROUND

In 2009, the Department of the Interior announced final regulations for the OCS Renewable Energy Program, which was authorized by the Energy Policy Act of 2005. The act, implemented by BOEM, provides a framework for issuing leases, easements, and rights-of-way (ROW) for OCS activities. BOEM's renewable energy program occurs in four distinct phases: (1) planning and analysis, (2) lease issuance, (3) site assessment, and (4) construction and operations. The location of the New Jersey Wind Energy Area (WEA) was identified by BOEM through a multi-year effort by state and federal regulatory agencies to identify OCS areas suitable for offshore renewable energy development in the Mid-Atlantic. The original Area of Interest considered by BOEM for leasing was reduced in size and aliquots were removed to address potential environmental constraints, user group conflicts, navigational safety, public health and safety, and stakeholder concerns (e.g., commercial fishing). The history of BOEM's planning and leasing activities offshore of New Jersey includes the following:

- On April 20, 2011, BOEM published in the *Federal Register* (86 FR 60283) a Call for Information and Nominations for Commercial Leasing for Wind Power on the OCS Offshore New Jersey. The public comment period for the call closed on June 6, 2011. In response, BOEM received 11 commercial indications of interest. After analyzing automatic identification system data and holding discussions with stakeholders, BOEM removed OCS Blocks Wilmington NJ18–02 Block 6740 and Block 6790 (A, B, C, D, E, F, G, H, I, J, K, M, N) and Block 6840 (A) to alleviate navigational safety concerns resulting from vessel transits out of the New York Harbor.
- On February 3, 2012, BOEM published in the *Federal Register* (77 FR 5560) a Notice of the Availability of an Environmental Assessment and a Finding of No Significant Impact for commercial wind lease issuance and site assessment activities on the Atlantic OCS offshore New Jersey, Delaware, Maryland, and Virginia.
- On July 21, 2014, BOEM published in the *Federal Register* (79 FR 42361) a Proposed Sale Notice requesting public comments on the proposal to auction two leases offshore of New Jersey for commercial wind energy development
- On September 25, 2015, BOEM announced in the *Federal Register* (80 FR 57862) that it published a Final Sale Notice, which stated a commercial lease sale would be held November 9, 2015, for the WEA offshore New Jersey. The New Jersey WEA was auctioned as two leases. RES America Developments, Inc., was the winner of Lease Area OCS-A 0498, and U.S. Wind, Inc., was the winner of lease OCS-A 0499.
- On April 14, 2016, BOEM received an application to assign 100% of the commercial lease OCS-A 0498 to Ocean Wind, LLC (Ocean Wind). BOEM approved the assignment on May 10, 2016.
- On February 14, 2017, BOEM received a request to extend the preliminary term for commercial lease OCS-A 0498 from March 1, 2017, to March 1, 2018. BOEM approved the request on March 1, 2017.
- On September 15, 2017, Ocean Wind submitted a Site Assessment Plan for commercial wind lease OCS-A 0498, which was subsequently revised on November 10, 2017; January 25, 2018; and February 23, 2018. BOEM approved the Site Assessment Plan on May 17, 2018.

- On August 15, 2019, Ocean Wind submitted its COP for the construction, operations, and conceptual decommissioning of the Project within the Lease Area. Updated versions of the COP were submitted on March 13, 2020; September 24, 2020; March 24, 2021; and November 16, 2021/December 10, 2021, May 27, 2022, and October 14, 2022. The COP is available for viewing at BOEM's website for the proposed Project at https://www.boem.gov/ocean-wind
- On December 8, 2020, Ocean Wind submitted an application to BOEM to assign a portion of lease OCS-A 0498 to Ørsted North America, Inc. BOEM approved the assignment on March 26, 2021. The lease area assigned to Ørsted North America, Inc., now carries the new lease number OCS-A 0532 (Figure 1-1).
- On March 30, 2021, BOEM published in the *Federal Register* (86 FR 16630) a Notice of Intent to Prepare an Environmental Impact Statement (EIS) for Ocean Wind's Proposed Wind Energy Facility Offshore of New Jersey.
- On June 24, 2022, BOEM released its Draft EIS (DEIS) for the Project, initiating a 45-day public review and comment period on the DEIS that will end on August 8, 2022.

1.2. CONSULTATION HISTORY

This informal consultation for Ocean Wind builds upon BOEM's experience with similar offshore wind assessment and development projects in the Atlantic. These consultations are available at: https://www.boem.gov/renewable-energy/fws-esa-consultations.

- On March 24, 2011, BOEM requested informal ESA Section 7 consultation with the USFWS for lease issuance and site assessment activities off New Jersey, Delaware, Maryland, and Virginia. On June 20, 2011, the USFWS concurred with BOEM's determinations that the risk to the endangered roseate tern (*Sterna dougallii dougallii*), threatened piping plover (*Charadrius melodus*), endangered Bermuda petrel (*Pterodroma cahow*), and candidate rufa red knot (*Calidris canutus rufa*) regarding lease issuance, associated site characterization (survey work), and site assessment activities (construction, O&M, and decommission of buoys and meteorological towers) was "small and insignificant" and therefore not likely to adversely affect the three ESA-listed species and one candidate species.
- On January 18, 2022, in preparation for the DEIS and this BA, BOEM used the USFWS (2022a) Information for Planning and Consultation (IPaC) system to determine the ESA-listed, proposed, or candidate species that may potentially occur in the Project area (summarized here and described in Section 2.4). A shapefile was uploaded into IPaC encompassing a polygon around: (1) the onshore components of the Project, as described in Section 2.1.1 and detailed in Section 3; (2) the offshore export cable routes; and (3) the Lease Area, which includes 98 WTGs and their foundations, substations, and inter-array cables (see Section 2.1.2. The IPaC system indicated that a total of 12[1] threatened, endangered, or candidate species may occur in the Project area and/or may be affected by the Proposed Action (see Appendix A).

[1] The USFWS (2022a) IPaC database identifies the roseate tern (*Sterna dougallii dougallii*) as potentially occurring areas in the vicinity of the Project; however, this federally endangered species is not identified by IPaC within the Action Area (see Appendix A).

- On February 11, 2022, BOEM submitted a preliminary draft of this BA to the USFWS New Jersey Field Office for their review concurrently with the Ocean Wind 1 DEIS. BOEM also provided the most recent version of the Ocean Wind 1 COP for reference. On April 11, 2022, the USFWS (W. Walsh, personal communication) provided comments back to BOEM, along with input from its Migratory Birds staff on Ocean Wind's proposed Avian and Bat Post-Construction Monitoring Framework (see Appendix B). Also, as requested by the USFWS, BOEM provided them with copies of the Project boundary shapefiles on April 19, 2022.
- On May 27, 2022, BOEM requested informal consultation with the USFWS. On July 1, 2022, the USFWS concurred with BOEM's determination that the Ocean Wind 1 Project will have no effect on the bog turtle (*Glyptemys muhlenbergii*) and sensitive joint-vetch (*Aeschynomene virginica*) and requested additional information. The USFWS also noted that additional information was necessary for the USFWS to concur with BOEM's determinations under Section 7 of the ESA for the northern long-eared bat (*Myotis septentrionalis*), piping plover (*Charadrius melodus*), rufa red knot (*Calidris canutus rufa*), roseate tern (Northeastern Distinct Population Segment [DPS]) (*Sterna dougallii dougallii*), eastern black rail (*Laterallus jamaicensis jamaicensis*), saltmarsh sparrow (*Ammodramus caudacutus*), monarch butterfly (*Danaus plexippus*), American chaffseed (Schwalbea americana), Knieskern's Beaked-rush (*Rhynchospora knieskernii*), seabeach amaranth (*Amaranthus pumilus*), and swamp pink (*Helonias bullata*). On August 23, 2022, BOEM addressed USFWS comments and provided the requested information.

2. DESCRIPTION OF PROPOSED ACTION

As detailed in Section 2.1 of the DEIS, the Proposed Action would allow Ocean Wind to construct, operate, maintain, and eventually decommission a wind energy facility approximately 1,100 MW in scale on the OCS offshore New Jersey within the range of design parameters outlined in Section 4 of the COP, Volume 1 (Ocean Wind 2022) (Alternative A). The Project proposed by Ocean Wind would include the construction and installation of both offshore and onshore facilities, including up to 98 WTGs, three OSSs, the offshore export cable routes, the onshore cable landfall sites, the onshore export cable routes, and the onshore substation locations (see Figure 1-1). The key components of the Project are summarized in Table 2-1. A schematic of the Project components is depicted in Figure 2-1. Further description of the Action Area is provided below in Section 3.

Table 2-1 Project Components

Project Component	Location	Project Details and Envelope Characteristic(s)
Wind Turbines	Offshore	• Up to 98 WTGs. • Rotor diameter up to 788 feet (240 meters). • Hub height up to 512 feet (156 meters) above MLLW. • Upper blade tip height up to 906 feet (276 meters) above MLLW. • Lowest blade tip height 70.8 feet (21.6 meters) above MLLW.
Foundations	Offshore	• Monopile foundations with transition piece; or one-piece monopile/transition piece, where the transition piece is incorporated into the monopile. • Foundation piles to be installed using a pile-driving hammer. • Scour protection around all foundations.
Inter-array Cable	Offshore	• Target burial depth of 4 to 6 feet (1.2 to 1.8 meters), depending on site conditions, navigation risk, and third-party requirement (final burial depth dependent on cable burial risk assessment and coordination with agencies). Cables could be up to 170 kV. • Preliminary layout available; however, final layout pending. • Maximum total cable length 190 miles (approximately 300 km). • Cable lay, installation and burial: Activities may involve use of a jetting tool (both jet ROV and/or jet sled), vertical injection, leveling, mechanical cutting, plowing (with or without jet-assistance), pre-trenching, CFE.
Offshore Substations	Offshore	• Up to three OSSs. • Total structure height up to 296 feet (90 meters) above MLLW. • Maximum length and width of topside structure 295 feet (90 meters; with ancillary facilities). • OSSs installed atop a modular support frame and monopile substructure or atop a piled jacket foundation substructure. • Foundation piles to be installed using a pile-driving hammer. • Scour protection installed at foundation locations where required.

Project Component	Location	Project Details and Envelope Characteristic(s)
Offshore Substations Interconnector Cable	Offshore	• Maximum 275 kV cables. Target burial depth 4 to 6 feet (1.2 to 1.8 meters), depending on conditions (final burial depth dependent on burial risk assessment and coordination with agencies). • Potential layout available; however, not yet finalized. • Maximum total cable length 19 miles (30.5 km). • Cable lay, installation and burial: Activities may involve use of a jetting tool, vertical injection, pre-trenching, scar plow, trenching (including leveling, mechanical cutting), plowing, CFE.
Offshore Export Cable	Offshore	• Up to three maximum 275 kV export cables. Target burial depth of 4 to 6 feet (1.2 to 1.8 meters), depending on site conditions, navigation risk, and third-party requirements (final burial depth dependent on burial risk assessment and coordination with agencies). • Two export cable route corridors, BL England and Oyster Creek. • Maximum total cable length 32 miles (51 km) for BL England and 143 miles (230 km) for Oyster Creek. • Cable lay, installation and burial: Activities may involve use of a jetting tool (jet ROV and/or jet sled), vertical injection, leveling, mechanical cutting, plowing (with or without jet-assistance), pre-trenching, backhoe dredger, CFE.
Landfall for the Offshore Export Cable	Onshore	• Open cut or trenchless (e.g., HDD, direct pipe, or auger bore) installation at landfall. • Up to six cable ducts for landfall, if installed by trenchless technology. • A reception pit (may be subsea pit, not yet finalized) would be required to be constructed at the exit end of the bore. • Construction reception pit: excavator barge, land excavator mounted to a barge, sheet piling from barge used for intertidal cofferdams, swamp excavators. • Sheet pile would be used at open cut landfall to stabilize the trench through the shoreline.
Onshore Export Cable	Onshore	• Connect with offshore cables at a TJB and carry electricity to the onshore substation. • Would be buried at a target burial depth of 4 feet (1.2 meters) (this represents a target burial depth rather than a minimum or maximum). • Could require up to a 50-foot (15-meter) wide construction corridor and up to a 30-foot (9-meter) wide permanent easement for Oyster Creek and BL England cable corridor excluding landfall locations and cable splice locations to accommodate space for splice vaults, joint bays, and HDD. Permanent easements are expected to be larger at splice vaults and TJB locations. • Up to eight export cables circuits will be required, with each cable circuit comprising up to three single cables. Cables will consist of copper or aluminum conductors wrapped with materials for insulation protection and sealing. • TJBs, splice vaults/grounding link boxes, and fiber optic system, including manholes; open cut or trenchless (e.g., horizontal directional drilling, direct pipe, or auger bore) installation at landfall.

Project Component	Location	Project Details and Envelope Characteristic(s)
Onshore Substations and Interconnector Cable	Onshore	• Two onshore substations located in proximity to existing substations with associated infrastructure. • Each onshore substation would require a permanent site (up to 13 acres [5.3 hectares] for BL England and up to 31.5 acres [12.7 hectares] for Oyster Creek interconnection point), including area for the substation equipment and buildings, energy storage, and stormwater management and landscaping. • For the Oyster Creek interconnection, overhead or underground transmission may be used from the onshore substation to an interconnection point at the Oyster Creek Generating Station. For the BL England interconnection, underground transmission would be used from the onshore substation to an interconnection point at Beesley's Power Substation. The Oyster Creek overhead grid connections would be up to 0.5 mile (0.8 km) long and will require up to six pole structures. Underground interconnection cables would be up to 0.5 miles long, with two splice vaults/grounding link boxes, and one pole with a maximum height of 117 feet for BL England and Oyster Creek. Trenches would be a maximum of 10.25 feet deep with an average width of 4.25 feet, and could require a 60-foot wide workspace corridor. • During construction, up to 3 acres [1.2 hectares] would be required for temporary workspace. • The main buildings within the substations would be up to 1,017 feet (310 meters) long, 492 feet (150 meters) wide and 82 feet (25 meters) tall. • Secondary buildings may be used to house reactive compensation, transformers, filters, a control room, and a site office. The external electrical equipment may include switchgear, busbars, transformers, high voltage reactors, static VAR (volt-amps reactive) compensator/static synchronous compensator, synchronous condensers, harmonic filters, and other auxiliary equipment. Lightning protection would include up to 35 lightning masts at Oyster Creek and up to 25 masts at BL England for a total height up to 98 feet (30 meters). • Maximum height of overhead lines would be 115 feet (35 meters). • Interconnector cable to existing sub-station

Source: Construction and Operations Plan Volume I, Table 4.4-1; Ocean Wind 2022
CFE = controlled-floor excavation; HDD = horizontal directional drilling; km = kilometers; kV = kilovolts; MLLW = mean lower low water; OSS = offshore substation; ROV = remotely operated vehicle; TJB = transition joint bay; VAR = volt-amps reactive; WTG = wind turbine generator

2.1. CONSTRUCTION AND INSTALLATION

The proposed Project would include the construction and installation of both onshore and offshore facilities. Construction and installation would begin in 2023 and be completed in 2025. Ocean Wind anticipates beginning construction of land-based components before the offshore components. A Project schedule is included in the Ocean Wind 1 COP Volume I, Chapter 4, Figure 4.5-1 (Ocean Wind 2022) and summarized below.

- Onshore Export Cables and Onshore Substations: Q3 of 2023 to Q1 of 2025
- Landfall Cable Installation: Q3 of 2023 to Q2 of 2024
- Offshore Export Cable Installation: Q1 of 2024 to Q4 of 2024
- Offshore Foundations (WTG and OSS): Q2 of 2024 to Q4 of 2024
- Inter-array Cable Installation: Q3 of 2024 to Q1 of 2025
- WTG and OSS Installation and Commissioning: Q3 of 2024 to Q4 of 2025

2.1.1 ONSHORE ACTIVITIES AND FACILITIES

The proposed onshore Project elements include the landfall site, the transition joint bay (TJB) that connects the offshore export cable to the onshore export cable, the onshore export cable route(s) to the onshore substation, and the connection from the onshore substation to the existing grid (see Figure 2-1). These elements collectively compose the Onshore Action Area. Section 4 of the COP, Volume I, *Project Description*, provides additional details about onshore construction and installation methods (Ocean Wind 2022).

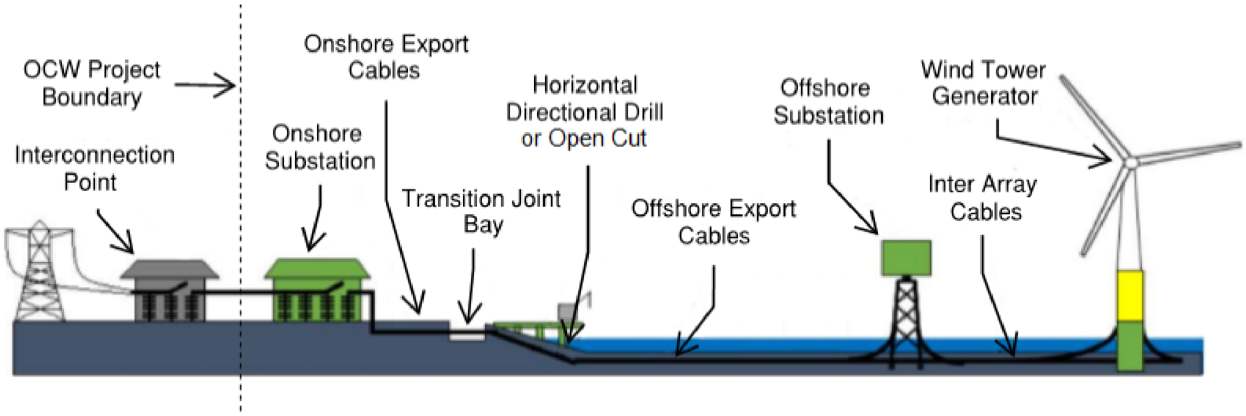


Figure 2-1 Overall Project Concept

The proposed Project includes two interconnection points with the Pennsylvania-New Jersey-Maryland transmission system (PJM Interconnection): BL England and Oyster Creek. Within both areas, Ocean Wind has not selected a single option for the offshore export cable landfall and onshore export cable routes, but rather, using a project design envelope approach, retains several options to allow for review of the Project through site-specific field surveys, site investigations, agency coordination, and stakeholder outreach. Further, retaining options within a study area allows for greater flexibility as the Project design advances (e.g., number of circuits), as technological advances occur, and as supply chain characteristics evolve in the U.S. offshore wind market. To reach the onshore substations at BL England and Oyster Creek, the offshore export cables would make landfall at the designated locations and follow the onshore cable routes as shown on Figure 2-2 and Figure 2-3, respectively. The transition of the export cables from offshore to onshore would occur at a TJB and be accomplished by using open cut (i.e., trenching) or trenchless methods (bore or horizontal directional drilling [HDD]). HDD is a subsurface installation technique that will create an underground conduit through which the export cable will transition. HDD avoids impacts to the beach and nearshore environment. The landfall for BL England includes beaches that are included in the U.S. Army Corps of Engineers (USACE) beach nourishment program. Based on USACE guidance, the cable must be buried at depths not attainable by open cut or trenching (30 feet or more), and therefore HDD is the preferred option. Ocean Wind proposes to temporarily install sheet piling to stabilize and support an open cut trench during cable installation at the Island Beach State Park – Barnegat Bay landfall as well as at the Oyster Creek Mainland (Holtec property) landfall, if open cut is selected as the preferred landfall method. Following cable installation, the temporary sheet piling would be removed, and the shoreline restored.

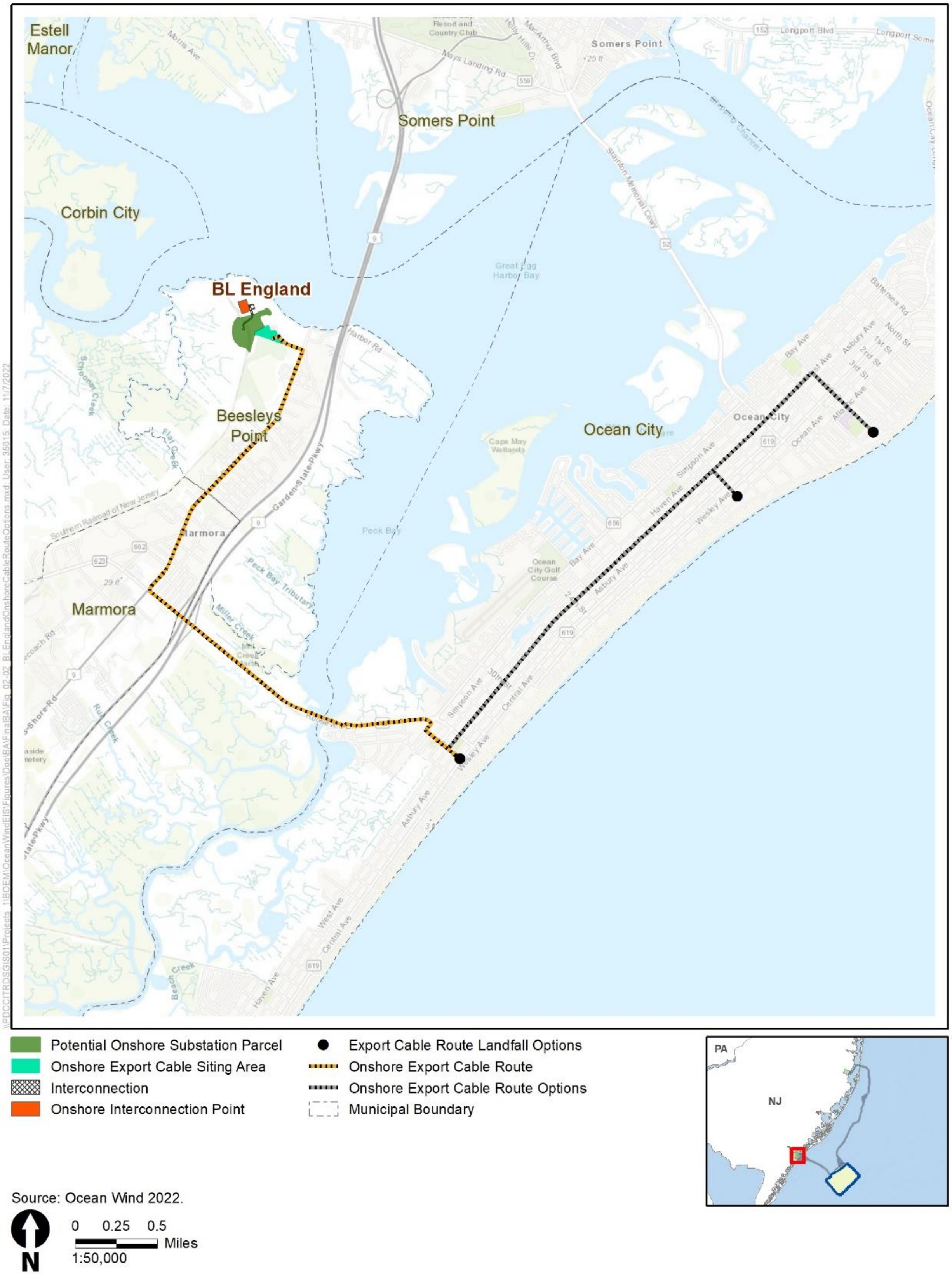


Figure 2-2 BL England Landfall and Onshore Cable Route Options to BL England Substation

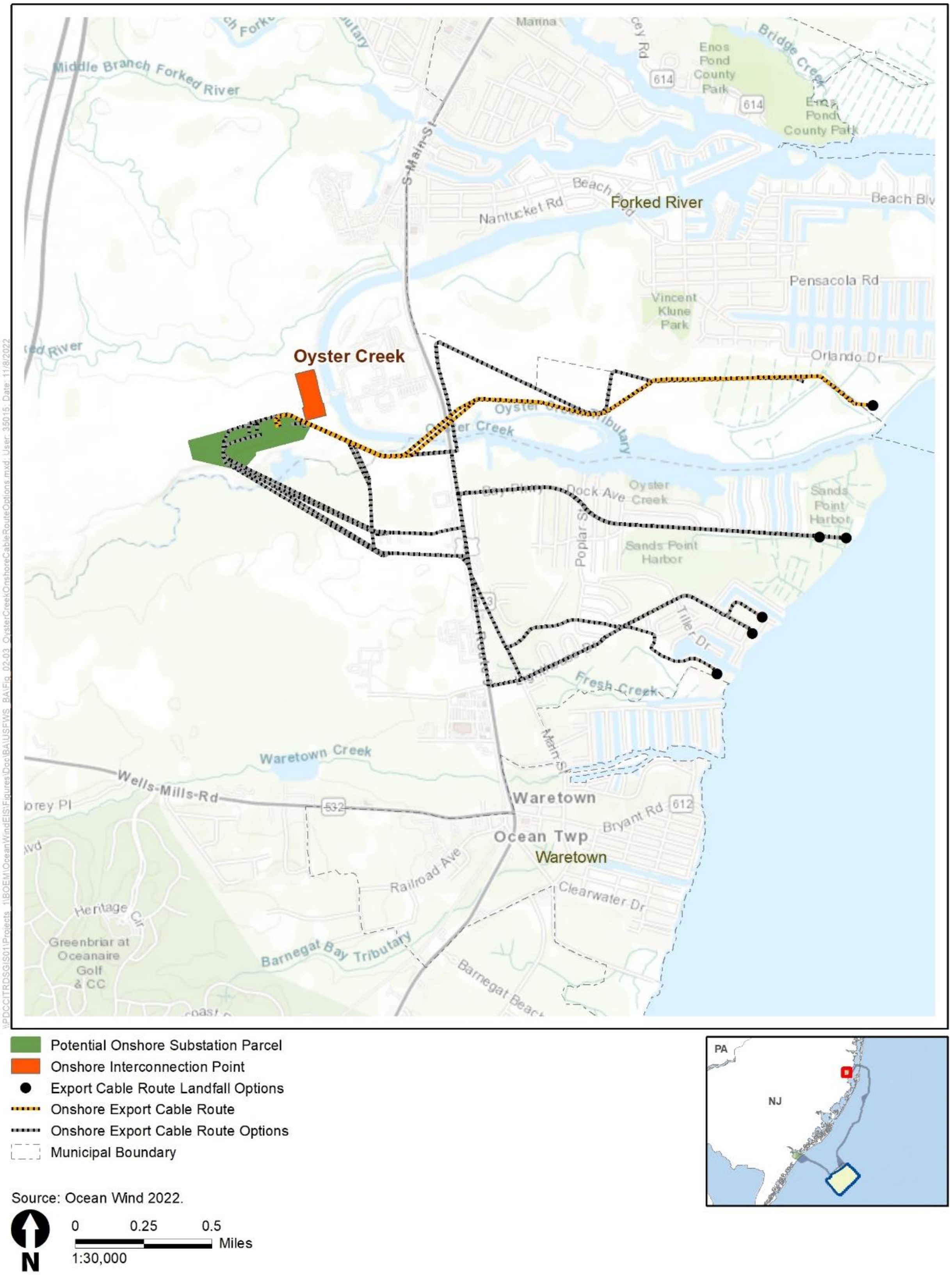


Figure 2-3 Oyster Creek Landfall and Onshore Cable Route Options to Oyster Creek Substation

HDD entry and exit points at landfall would include a temporary work area. At the BL England landfall, one pit is proposed and would affect approximately 0.75 acre on surface streets. In the Oyster Creek area, two receiving pits at Island Beach State Park and two receiving pits at the Holtec property are proposed to be excavated to a depth between 15 to 20 feet below ground surface. This would affect about 4.8 acres on Island Beach State Park and 6 acres at the landfall on the Holtec property in previously disturbed wetlands. The pits would measure approximately 200 by 125 feet. From the receiving pits, the cables would be installed in two trenches at Oyster Creek as they enter and exit the landfall area (Ocean Wind 2022).

Onshore export cables would be buried and housed within a single duct bank buried along the onshore export cable route. The planned duct bank would be encased in concrete with a target burial depth of 4 feet. The duct bank would include six conduits for the power cables, two conduits for fiber optic communications cables, and two conduits for ground continuity conductors. Installation of onshore export cable would require up to a 50-foot (15-meter) wide construction corridor and up to a 30-foot (9-meter) wide permanent easement for the Oyster Creek and BL England cable corridors excluding landfall locations and cable splice locations. The northern Oyster Creek onshore cable route option that crosses Route 9 and Oyster Creek on a southwest diagonal would be installed using trenchless technology to avoid opening Route 9 in an area that has had recent utility work.

The proposed onshore export cable routes would terminate at the BL England and Oyster Creek substation sites. The proposed BL England substation is sited at the location of a coal, oil, and diesel plant in Upper Township that was retired in phases between 2014 and 2019. The substation would occupy up to 13 acres (5.3 hectares) (Figure 2-4). The proposed Oyster Creek substation is sited at the location of the Oyster Creek nuclear plant in Lacey Township, which was retired and is being decommissioned. The substation would occupy up to 31.5 acres (12.7 hectares) (Figure 2-5). For the Oyster Creek interconnection, overhead or underground transmission may be used from the onshore substation to an interconnection point at the Oyster Creek Generating Station. For the BL England interconnection, underground transmission would be used from the onshore substation to an interconnection point at Beesley’s Power Substation. The Oyster Creek overhead grid connections would be up to 0.5 mile (0.8 km) long and will require up to six pole structures. Underground interconnection cables would be up to 0.5 miles long, with two splice vaults/grounding link boxes, and one pole with a maximum height of 117 feet for BL England and Oyster Creek. Trenches would be a maximum of 10.25 feet deep with an average width of 4.25 feet, and could require a 60-foot wide workspace corridor.

Figure 2-4 Map of Proposed BL England Substation and Interconnection Point

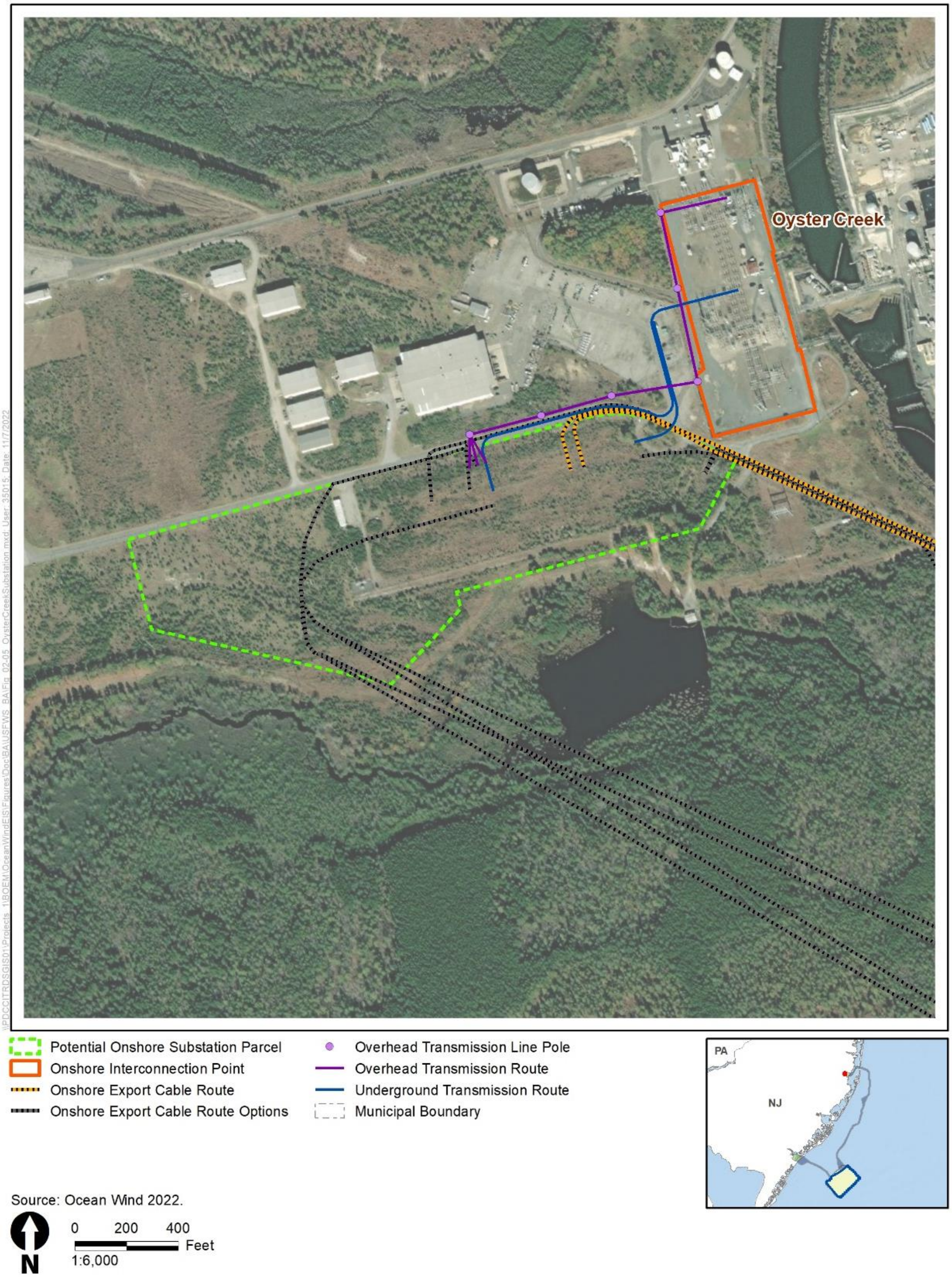


Figure 2-5 Map of Proposed Oyster Creek Substation and Interconnection Point

2.1.2 OFFSHORE ACTIVITIES AND FACILITIES

The proposed offshore Project components include WTGs and their foundations, up to three OSSs and their foundations, scour protection for foundations, inter-array and substation interconnection cables, and offshore export cables. These proposed offshore WTGs and OSS are more than approximately 14 miles (12 nm, 23 km) offshore. Section 4 of the COP, Volume I, *Project Description*, provides additional details about offshore construction and installation methods (Ocean Wind 2022).

Ocean Wind proposes the installation of up to 98 WTGs extending up to 906 feet (276 meters) above mean lower low water with a spacing of 1.2 by 0.9 miles (1 by 0.8 nm, 1.9 by 1.5 km) between WTGs in a southeast-northwest orientation within the 68,450-acre [27,700-hectare) Wind Farm Area. Refer to Figure 2-6 for a schematic drawing of the maximum WTG design parameters. Ocean Wind would mount the WTGs on monopile foundations. A monopile foundation typically consists of a single steel tubular section, composed of sections of rolled steel plate welded together. A transition piece is fitted over the monopile and secured via bolts or grout. OSSs would be placed on either monopile or piled jacket foundations. Piled jacket foundations are formed of a steel lattice construction, composed of tubular steel members and welded joints, and secured to the seabed by hollow steel pin piles attached to each of the jacket feet. Schematic drawings and renderings of the WTG monopile foundation type and indicative figures of the OSS monopile and piled jacket foundations are included in COP Volume I, Section 6.1.1 (Ocean Wind 2022). The WTG foundations would have a maximum seabed penetration of 164 feet (50 meters). Where required, scour protection would be placed around foundations to stabilize the seabed near the foundations, as well as the foundations themselves. The scour protection would be a maximum of 8.2 feet (2.5 meters) in height and would extend away from the foundation as far as 43 feet (13.1 meters). Each WTG would contain approximately 1,585 gallons of transformer oil and 146 gallons of general oil (for hydraulics and gearboxes). Other chemicals used would include diesel fuel, coolants/refrigerants, grease, paints, and sulfur hexafluoride. COP Volume I, Section 8.1 provides additional details related to proposed chemicals and their anticipated volumes (Ocean Wind 2022).

Ocean Wind proposes to install foundations and WTGs using up to two jack-up vessels, as well as necessary support vessels and barges as listed in COP Volume I, Table 6.1.2-1 (Ocean Wind 2022). After the seabed has been prepared for foundations, Ocean Wind would begin pile driving until the target embedment depth is met. Installation of monopile and piled jacket foundations is similar, although piled jacket foundations would require more seabed preparation for each of the jacket feet.

Ocean Wind proposes to construct up to three OSSs to collect the electricity generated by the offshore turbines. OSSs help stabilize and maximize the voltage of power generated offshore, reduce potential electrical losses, and transmit energy to shore. OSSs are generally installed in two phases: first the foundation substructure would be installed in a similar method to that described above, then the topside structure would be installed on the foundation structure. More information on installation can be found in COP Volume I, Section 6.1.2 (Ocean Wind 2022). Each substation is expected to require two primary vessels, which may include jack-up vessels, jack-up barges, sheerleg barges, or Heavy-Lift Vessels, as well as necessary support vessels and barges as listed in COP Volume I, Table 6.1.2-2 (Ocean Wind 2022).

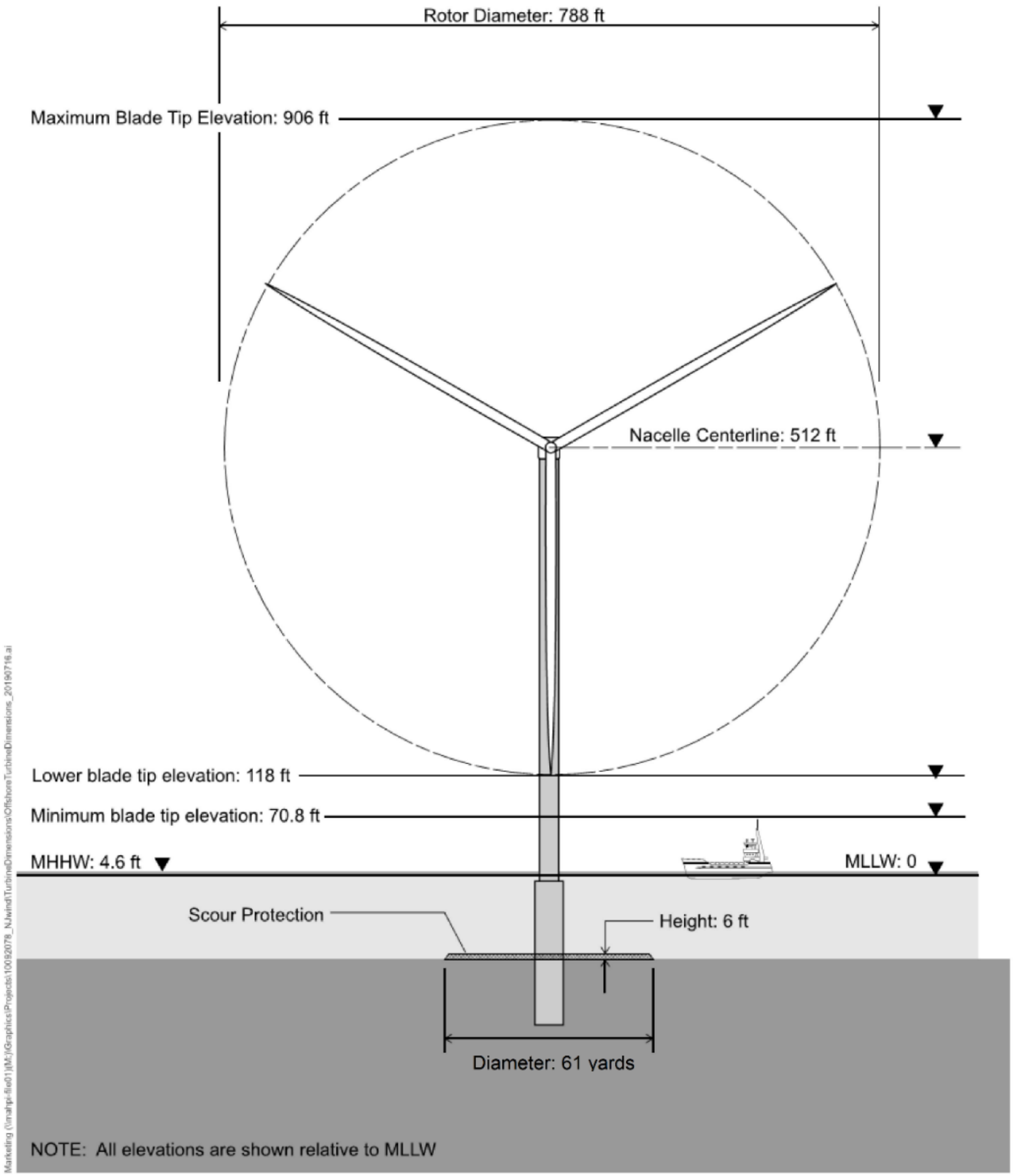


Figure 2-6 Wind Turbine Schematic Under the Maximum Design Scenario

OSSs would consist of a topside structure with one or more decks on either a monopile or piled jacket foundation. Inter-array cables would transfer electrical energy generated by the WTGs to the OSSs. OSSs would include step-up transformers and other electrical equipment needed to connect the 66-kilovolt (kV) inter-array cables to the 275-kV or 220-kV offshore export cables. Substations would be connected to one another via substation interconnector cables. Up to two interconnector cables with a maximum voltage of 275 kV would be buried beneath the seabed.

The WTGs and OSSs would be lit and marked in accordance with Federal Aviation Administration (FAA) and U.S. Coast Guard (USCG) lighting standards and consistent with BOEM best practices. Ocean Wind proposes to implement an Aircraft Detection Lighting System (ADLS) to automatically activate lights when aircraft approach. Ocean Wind would paint WTGs no lighter than radar-activated light (RAL) 9010 Pure White and no darker than RAL 7035 Light Grey. In addition, the lower sections of each structure would be marked with high-visibility yellow paint from the water line to an approximate height of at least 50 feet (15 meters), consistent with International Association of Marine Aids to Navigation and Lighthouse Authorities guidance.

Two offshore export cable route corridors are proposed by Ocean Wind in the COP: Oyster Creek and BL England (Ocean Wind 2022). Up to two offshore export cables would be buried under the seabed within the Oyster Creek export cable route corridor to make landfall and deliver electrical power to the Oyster Creek substation. The offshore export cable route corridor to Oyster Creek would begin within the Wind Farm Area and proceed northwest to the Atlantic Ocean side of Island Beach State Park. There are two route options to cross Island Beach State Park, as shown on Figure 2-7. The inshore export cable route corridor to Oyster Creek would exit the bay side of the Island Beach State Park and cross Barnegat Bay southwest to make landfall near Oyster Creek in either Lacey or Ocean Township. One offshore export cable would be buried under the seabed within the BL England export cable route corridor to make landfall and deliver electrical power to the BL England substation. The BL England offshore export cable route corridor would begin within the Wind Farm Area and proceed west to make landfall in Ocean City, New Jersey. Each offshore export cable would consist of three-core 275-kV alternating current cables.

Offshore export cables would be installed similarly to the inter-array cables. The installation vessel would transit to and take position at the landfall location and the cable end would be pulled into the preinstalled duct ending in the TJB. The installation vessel would transit the route toward the OSS, installing the cable by simultaneous lay and burial (plow/jetting/cutting) or surface lay and burial by a cable burial vessel (jetting/cutting/control flow excavation).

In the event that cables cannot achieve proper burial depths or where the proposed cables would cross existing infrastructure, Ocean Wind proposes the following protection methods: (1) rock placement, (2) concrete mattress placement, (3) front mattress placement, (4) rock bags, or (4) seabed spacers. When the cable has been installed, post cable-lay surveys and depth-of-burial surveys would be conducted to determine if the cable has reached the desired depth. The remedial protection measures described above may be required in places where the target burial depth cannot be met.

Onshore Export Cable Route
Inshore Export Cable Route
Inshore Export Cable Route Option
Offshore Export Cable Route
Temporary Work Area

Source: Ocean Wind 2022.

N
0 200 400 Feet
1:3,600

Figure 2-7 Cable Route Options at Island Beach State Park

The construction and installation phase of the proposed Project would make use of both construction and support vessels to complete tasks in the Wind Farm Area. Construction vessels would travel between the Wind Farm Area and the following ports that are expected to be used during construction: Atlantic City, New Jersey as a construction management base; Paulsboro, New Jersey or from Europe directly for foundation fabrication and load out; Norfolk, Virginia or Hope Creek, New Jersey for WTG pre-assembly and load out; and Port Elizabeth, New Jersey or Charleston, South Carolina, or directly from Europe for cable staging. During installation of inter-array and substation interconnection cables, Ocean Wind anticipates a maximum of 20 vessels operating during a typical workday in the Wind Farm Area. For offshore export cable installation, Ocean Wind anticipates a maximum of 26 vessels operating during a typical workday.

Maintenance dredging of the Oyster Creek channel portion of the Barnegat Inlet Federal Navigation Project would be performed by Ocean Wind in order to allow for passage of construction vessels into Barnegat Bay if the next regularly planned maintenance dredging is not performed prior to construction of the Project. The U.S. Army Corps of Engineers conducts maintenance dredging of this channel as part of its regular operations and maintenance duties. All dredging would be performed within the authorized project limits and in accordance with USACE environmental reviews (USACE 2020).[2] The dredged material disposal will be in conformance with EPA Guidelines, USACE Guidelines, N.J.A.C. 7:7 Appendix G for the Management and Regulation of Dredging Activities and Dredged Material in New Jersey's Tidal Waters, and applicable State Surface Water Quality Standards at N.J.A.C. 7:9B and permit conditions. The Sediment Sampling and Analysis Plan (SSAP) has been approved by NJDEP, however, the sampling has not occurred yet. The disposal facility will be determined based on sampling results and written consent will be provided to NJDEP once acquired from the facility to document the acceptance of the material.

2.2. OPERATIONS AND MAINTENANCE

The proposed Project is anticipated to have an operating period of 35 years.[3] Ocean Wind would use an onshore O&M facility in Atlantic City, New Jersey, sited at the location of a retired marine terminal. Ørsted plans to rehabilitate this former marina facility near Absecon Inlet to create a port facility off the Mid-Atlantic coast that can service potential wind farms. The O&M facility would include offices, control rooms, warehouses, and workshop space. Approximately 500 feet (152 meters) of dockside harbor facilities and associated parking facilities would be added. The City of Atlantic City intends to secure authorization for marina upgrades, namely, dredging in the marina and at Absecon Inlet, for the benefit of multiple marina users. Ørsted's rehabilitation of the former marina facility (including office and warehouse construction) and the City of Atlantic City's marina upgrades are being separately reviewed and authorized by the USACE and state and local agencies. The improvements are not dependent on the Proposed

[2] USFWS concluded that the project would not affect federally listed species, as they would not be in the action area.

[3] BOEM assumes that the proposed Project would have an operating period of 35 years. Ocean Wind's lease with BOEM (Lease OCS-A 0498) has an operations term of 25 years that commences on the date of COP approval. While Ocean Wind would need to request and be granted an extension of its operations term, this BA assumes the Project would operate for a longer period possibly in order to avoid underestimating any potential effects.

Action being analyzed in this BA and are being handled under separate ESA Section 7 consultation.

The proposed Project would include a comprehensive maintenance program, including preventive maintenance based on statutory requirements, original equipment manufacturers' guidelines, and industry best practices. Ocean Wind would inspect WTGs, OSSs, foundations, offshore export cables, inter-array cables, onshore export cables, and other parts of the proposed Project using methods appropriate for the location and element.

2.2.1 Onshore Activities and Facilities

The onshore substations, onshore export cables, and grid connections would include inspections, preventive maintenance, and as needed, corrective maintenance. Inspections of these facilities would occur as often as weekly. Routine preventive maintenance would occur annually for main servicing, but servicing of individual components may occur each quarter. Maintenance programs would conform to the equipment manufacturers' warranty requirements.

2.2.2 Offshore Activities and Facilities

Routine maintenance is expected for WTGs, foundations, and OSS. Ocean Wind would conduct annual maintenance of WTGs, including safety surveys, blade maintenance, and painting as needed. Foundation inspections would be conducted 1 year, 2 to 3 years, and 5 to 8 years post-commissioning. Preventive maintenance of OSSs would be routinely performed up to 12 times per year. The offshore export cables, inter-array cables, and OSS interconnector cables typically have no maintenance requirements unless a failure occurs. Spare parts for key Project components may be housed at the O&M facility so Ocean Wind could initiate repairs expeditiously.

Ocean Wind would need to use vessels, vehicles, and aircraft during the O&M activities described above. The Project would use a variety of vessels to support O&M, including crew transfer vessels, service operation vessels, jack-up vessels, and supply vessels. In a year, the Proposed Action would generate a maximum of 908 crew vessel trips, 102 jack-up vessel trips, and 104 supply vessel trips, crew transfer vessel trips, or service operations vessel trips (COP Volume I, Section 6.1.3.5, Table 6.1.2-11; Ocean Wind 2022).

2.3. DECOMMISSIONING

Under 30 Code of Federal Regulations (CFR) Part 585 and commercial Renewable Energy Lease OCS-A 0498, Ocean Wind would be required to remove or decommission all facilities, projects, cables, pipelines, and obstructions and clear the seafloor of all obstructions created by the proposed Project.[4] All foundations would need to be removed 15 feet (4.6 meters) below the mudline (30 CFR 585.910(a)). Absent permission from BOEM, Ocean Wind would have to achieve complete decommissioning within 2 years of termination of the lease and either reuse, recycle, or responsibly dispose of all materials removed. Ocean Wind has submitted a conceptual decommissioning plan as part of the COP, and the final decommissioning application would outline Ocean Wind's process for managing waste and recycling proposed Project components (COP Volume I, Section 6.3; Ocean Wind 2022). Although the proposed Project is anticipated to

[4] Although described herein as part of the Proposed Action, decommissioning activities are not considered in the analysis of this BA because they will be subject to separate consultation pursuant to ESA Section 7.

have an operation life of 35 years, it is possible that some installations and components may remain fit for continued service after this time. Ocean Wind would have to apply for and be granted an extension if it wanted to operate the proposed Project for more than the 25-year operations term stated in their lease.

BOEM would require Ocean Wind to submit a decommissioning application upon the earliest of the following dates: 2 years before the expiration of the lease, 90 days after completion of the commercial activities on the commercial lease, or 90 days after cancellation, relinquishment, or other termination of the lease (see 30 CFR 585.905). Upon completion of the technical and environmental reviews, BOEM may approve, approve with conditions, or disapprove the lessee's decommissioning application. This process would include an opportunity for public comment and consultation with municipal, state, and federal management agencies. Ocean Wind would need to obtain separate and subsequent approval from BOEM to retire in place any portion of the proposed Project. Approval of such activities would require compliance under National Environmental Policy Act and other federal statutes and implementing regulations.

If the COP is approved or approved with modifications, Ocean Wind would have to submit a bond (or another form of financial assurance) that would be held by the U.S. government to cover the cost of decommissioning the entire facility in the event that Ocean Wind would not be able to decommission the facility.

2.3.1 ONSHORE ACTIVITIES AND FACILITIES

At the time of decommissioning, some components of the onshore electrical infrastructure may still have substantial life expectancies. Ocean Wind would work with the onshore grid operators to potentially reallocate some or all of these assets. Depending on the needs at the time, the onshore cables installed overhead may either be used for other projects or removed. There are no proposed plans to disrupt streets or onshore public utility ROWs by excavating or deconstructing buried onshore facilities and components.

2.3.2 OFFSHORE ACTIVITIES AND FACILITIES

For both WTGs and OSSs, decommissioning would be a "reverse installation" process, with turbine components or the OSS topside structure removed prior to foundation removal. Ocean Wind would remove monopile foundations by cutting below the seabed level in accordance with standard practices and seabed conditions at the time of demolition. The scour protection placed around the base of each monopile, if used, would be left in place as the default option to preserve the marine life that may have established itself on the substrate. Offshore cables would either be left in place or removed, or a combination of both, depending on regulatory requirements at the time of decommissioning. It is anticipated that the array cables would be removed using controlled-flow excavation or a grapnel to lift the cables from the seabed.

2.4. AVOIDANCE AND MINIMIZATION MEASURES

This section outlines the avoidance and minimization measures that are part of the Proposed Action. The Ocean Wind COP, Volume II, Table 1.1-2 provides a list of Applicant Proposed Measures (APMs) to avoid, minimize, or mitigate impacts, and to perform monitoring of potential impacts (Ocean Wind 2022). The measures that Ocean Wind has proposed are listed in Table 2-2, with the affected species identified. In addition, Ocean Wind has provided a framework for avian and bat post-construction monitoring, provided as Appendix B of this BA.

BOEM considered additional avoidance and minimization measures that could further reduce potential effects of the Proposed Action on ESA-listed animals and plants during the development of this BA. These potential measures are listed in Table 2-3. Some or all of these measures may be required as a result of ESA Section 7 consultation with the USFWS. Any measures imposed through consultations will be included in the Final BA. The additional measures presented in Table 2-3 may not all be within BOEM’s statutory and regulatory authority to require; however, other jurisdictional governmental agencies may potentially require them. BOEM may choose to incorporate one or more additional measures in the record of decision on the Final EIS and adopt those measures as conditions of COP approval.

Table 2-2 Applicant Proposed Measures (Committed to by Ocean Wind) to Avoid and Minimize Potential Effects of the Proposed Action

APM Number	Measure	Northern Long-eared Bat	Birds	Monarch Butterfly	Plants
GEN-01	**Site onshore export cable corridors and landfall within existing ROWs or previously disturbed/developed lands to the extent practicable.**	X	X	X	X
GEN-02	Site onshore, cable landfall and offshore facilities to avoid known locations of sensitive habitat (such as known nesting beaches) or species during sensitive periods (such as nesting season); important marine habitat **(such as high density, high value fishing grounds as determined by fishing revenues estimate [BOEM Geographical Information System (GIS) Data])**; and sensitive benthic habitat; to the extent practicable. Avoid hard-bottom habitats and seagrass communities, where practicable, and restore any damage to these communities.	X	X	X	X
GEN-03	Avoid areas that would require extensive seabed or onshore alterations to the extent practicable.	X	X	X	X
GEN-04	Bury **onshore** and offshore cables below the surface or seabed to the extent practicable and inspect offshore cable burial depth periodically during project operation, as described in the Project Description, to ensure that adequate coverage is maintained to avoid interference with fishing gear/activity.	X	X		
GEN-05	**Use existing port and onshore operations and maintenance (office, warehouse, and workshop) facilities to the extent practicable** and minimize impacts to seagrass by restricting vessel traffic to established traffic routes where these resources are present.	X	X	X	X
GEN-06	Develop and implement a site-specific monitoring program to ensure that environmental conditions are monitored during construction, operation, and decommissioning phases, designed to ensure environmental conditions are monitored and reasonable actions are taken to avoid and/or minimize seabed disturbance and sediment dispersion, consistent with permit conditions. The monitoring plan will be developed during the permitting process, in consultation with resource agencies.	X	X	X	X
GEN-07	**Implement aircraft detection lighting system (ADLS) on WTGs**. Comply with FAA, BOEM, and USCG lighting, marking and signage requirements to aid navigation per USCG navigation and inspection circular 02-07 (USCG 2007) and comply with any other applicable USCG requirements while minimizing the impacts through appropriate application including directional aviation lights that minimize visibility from shore. **Information will be provided to allow above water obstructions and underwater cables to be marked in sea charts, aeronautical charts, and nautical handbooks.**	X	X	X	

APM Number	Measure	Northern Long-eared Bat	Birds	Monarch Butterfly	Plants
GEN-08	To the extent practicable, use appropriate installation technology designed to minimize disturbance to the seabed and sensitive habitat (such as beaches and dunes, wetlands and associated buffers, streams, hard-bottom habitats, seagrass beds, and the near-shore zone); avoid anchoring on sensitive habitat; and implement turbidity reduction measures to minimize impacts to sensitive habitat from construction activities.	**X**	**X**	**X**	**X**
GEN-09	During pile-driving activities, **use ramp up procedures as agreed with National Marine Fisheries Service (NMFS) for activities covered by Incidental Take Authorizations,** allowing mobile resources to leave the area before full-intensity pile-driving begins.	**X**			
GEN-10	Prepare waste management plans and hazardous materials plans as appropriate for the Project.	**X**	**X**	**X**	**X**
GEN-11	Establish and implement erosion and sedimentation control measures in a **Stormwater Pollution Prevention Plan (SWPPP**, authorized by the State), and Spill Prevention, Control, and Countermeasures (SPCC) Plan to minimize impacts to water quality (signed/sealed by a New Jersey Professional Engineer and prepared in accordance with applicable regulations such as NJDEP Site Remediation Reform Act, Linear Construction Technical Guidance, and Spill Compensation and Control Act). Development and implementation of an Oil Spill Response Plan (OSRP, part of the SPCC plan) and SPCC plans for vessels.	**X**	**X**	**X**	**X**
GEN-12	**Where HDD trenchless technology methods are used, develop, and implement an Inadvertent Return Plan that includes measures to prevent inadvertent returns of drilling fluid to the extent practicable and measures to be taken in the event of an inadvertent return.**	**X**	**X**	**X**	**X**
GEN-13	**Restore disturbance areas in the Onshore Project Area to pre-existing contours** (maintaining natural surface drainage patterns) and allow vegetation to become reestablished once construction activities are completed, to the extent practicable.	**X**	**X**	**X**	**X**
GEN-14	Develop and implement a communication plan to inform the USCG, **Department of Defense (DOD) headquarters,** harbor masters, **public, local businesses**, commercial and recreational fishers, **among others** of construction and maintenance activities and vessel movements, **as coordinated by the Marine Coordination Center and Marine Affairs**	**X**	**X**	**X**	**X**
GEN-15	**Develop and implement an Onshore Maintenance of Traffic Plan to minimize vehicular traffic impacts during construction. Ocean Wind will designate and utilize onshore construction vehicle traffic routes, construction parking areas, and carpool/bus plans to minimize potential impacts.**	**X**	**X**	**X**	**X**

APM Number	Measure	Northern Long-eared Bat	Birds	Monarch Butterfly	Plants
GEN-16	Prior to the start of operations, Ocean Wind will hold training to establish responsibilities of each involved party, define the chains of command, discuss communication procedures, provide an overview of monitoring procedures, and review operational procedures. This training will include all relevant personnel, crew members and protected species observers (PSO). New personnel must be trained as they join the work in progress. Vessel operators, crew members and PSOs shall be required to undergo training on applicable vessel guidelines and the standard operating conditions. Ocean Wind will make a copy of the standard operating conditions available to each project-related vessel operator.	**X**	**X**	**X**	**X**
GEN-17	**Implement Project and site-specific safety plans (Safety Management System).**	**X**	**X**	**X**	**X**
GEO-03	Conduct periodic and routine inspections to determine if non-routine maintenance is required.	**X**	**X**	**X**	**X**
GEO-04	**In contaminated onshore areas, comply with State regulations requiring the hiring of a Licensed Site Remediation Professional (LSRP) to oversee the linear construction project and adherence to a Materials Management Plan (MMP). The MMP prepared for construction can also be followed as a best management practice when maintenance requires intrusive activities.**	**X**	**X**	**X**	**X**
WQ-02	**Construction support vessels will not refuel at sea. All vessels will be certified by the Project to conform to vessel operations and maintenance protocols designed to minimize the risk of fuel spills and leaks.**	**X**	**X**	**X**	
TCHF-01	Coordinate with the New Jersey Department of Environmental Protection (NJDEP) and United States Fish and Wildlife Service (USFWS) to identify unique or protected habitat or known habitat for threatened or endangered and candidate species and avoid these areas to the extent practicable.	**X**	**X**	**X**	**X**
TCHF-02	**Conduct maintenance and repair activities in a manner to avoid or minimize impacts to sensitive species and habitat such as beaches, dunes, and the near-shore zone.**	**X**	**X**	**X**	**X**
BIRD-01	Evaluate avian use **by conducting pre-construction surveys for raptor nests, wading bird colonies, seabird nests, and shorebird nests during nesting periods**. (Focus being listed species or species identified of special concern by the Federal or State government.)		**X**		
BIRD-02	**An avian species monitoring plan for ESA-listed species and/or other priority species or groups will be developed and coordinated with NJDEP and USFWS and implemented as required (see Appendix B).**		**X**		
BIRD-03	**Cut trees and vegetation, when possible, during the winter months when most migratory birds are not present at the site.**	**X**	**X**		
BIRD-04	Use lighting technology that minimizes impacts on avian and bat species to the extent practicable.	**X**	**X**		
BIRD-06	**Provide wind turbine air gaps (minimum blade tip elevation to the sea surface) to minimize collision risk to marine birds which fly close to ocean surface.**		**X**		

APM Number	Measure	Northern Long-eared Bat	Birds	Monarch Butterfly	Plants
BIRD-07	**Ocean Wind has sited WTGs and OSS in the eastern portion of the original Lease Area, outside the migratory pathway, to reduce exposure to birds.**	X	X		
BAT-01	**Onshore, the Project will avoid potential impacts by conducting tree clearing during the winter months, to the extent practicable.**	X	X	X	
BAT-02	**If tree clearing is required in areas with trees suitable for bat roosting during the period when northern long-eared bats may be present, develop avoidance and minimization measures in coordination with USFWS and NJDEP and conduct pre-construction habitat surveys.**	X			

Notes: Bold items are beyond the requirements of or more specific than BOEM best management practices.
Acronyms: APM = Applicant-Proposed Measure; BOEM = Bureau of Ocean Energy Management; ESA = Endangered Species Act; FAA = Federal Aviation Administration; HDD = horizontal directional drilling; OSS = offshore substation; ROW = right-of-way; USCG = U.S. Coast Guard; WTG = wind turbine generator
APM Codes: BAT = Bat; BIRD = Bird; GEN = General; GEO = Geological Resources; TCHF = Terrestrial and Coastal Habitats; WQ = Water Quality

Table 2-3 Additional Measures Proposed to Avoid and Minimize Potential Effects of the Proposed Action

No.	Description	Northern Long-eared Bat	Birds	Monarch Butterfly	Plants
1	BOEM will require that Ocean Wind conducts pre-construction habitat surveys for ESA-listed plants and implement avoidance and minimization measures in coordination with USFWS and NJDEP.				X
1.a.	Swamp Pink: If Ocean Wind elects to construct an Oyster Creek onshore cable route option other than the Holtec property route, Ocean Wind must retain a USFWS qualified surveyor to conduct a survey in accordance with USFWS swamp pink survey guidelines of all suitable habitats (i.e., forested wetlands) that will be subject to temporary disturbance or permanent modification as a result of Project activities, both during construction and from post-construction O&M activities, including areas crossed by HDD. The survey area will also include all forested wetlands within 300 feet of upland disturbance. Ocean Wind must submit the survey area(s), timing, methods, and qualifications of the surveyor(s) for BOEM and USFWS approval prior to the start of the survey. A survey report, including maps and associated spatial files in an ESRI ArcMap/ArcPro compatible format, must be provided to BOEM and USFWS for review no later than 30 calendar days after the survey has been completed. BOEM and USFWS will complete their reviews and identify any deficiencies that require a report revision by Ocean Wind within 30 calendar days of receipt of the survey report. If any swamp pink is found during the survey, the surveyor must document the distribution and abundance of plants and submit both the full survey report and a completed Natural Heritage Rare Plant Species Reporting Form (https://www.nj.gov/dep/parksandforests/natural/docs/NHRPSR_Form.pdf) to BOEM, USFWS, and the New Jersey Natural Heritage Program. If swamp pink is present in or adjacent to Project activities, Ocean Wind must coordinate with BOEM and USFWS to develop appropriate conservation measures that Ocean Wind is required to implement to avoid adverse effects to this species including through direct and indirect effects to its habitat.				X

No.	Description	Northern Long-eared Bat	Birds	Monarch Butterfly	Plants
1.b.	Knieskern's beaked-rush: If Ocean Wind elects to construct an Oyster Creek onshore cable route option other than the Holtec property route, Ocean Wind must retain a USFWS qualified surveyor to conduct a survey between July and September and in accordance with USFWS Knieskern's beaked-rush survey guidelines of all suitable habitats that will be subject to temporary disturbance or permanent modification as a result of Project activities, both during construction and from post-construction O&M activities, including areas crossed by HDD. Survey areas must not be mowed for at least one month prior to the survey. Ocean Wind must submit the survey area(s), timing, methods, and qualifications of the surveyor(s) for BOEM and USFWS approval prior to the start of the survey. A survey report, including maps and associated spatial files in an ESRI ArcGIS/ArcPro compatible format, must be provided to BOEM and USFWS for review no later than 30 calendar days after the survey has been completed. BOEM and USFWS will complete their reviews and identify any deficiencies that require a report revision by Ocean Wind within 30 calendar days of receipt of the survey report. If any Knieskern's beaked-rush is found during the survey, the surveyor must document the distribution and abundance of plants, and submit both the full survey report and a completed Natural Heritage Rare Plant Species Reporting Form to both USFWS and the New Jersey Natural Heritage Program. If Knieskern's beaked-rush is present in or adjacent to Project activities, Ocean Wind must coordinate with BOEM and USFWS to develop appropriate conservation measures that Ocean Wind is required to implement to avoid adverse effects to this species.				X
1.c.	American chaffseed: Ocean Wind must retain a USFWS qualified surveyor to conduct a survey of all suitable American chaffseed habitats between June 1 and August 15 that will be subject to temporary disturbance or permanent modification as a result of Project activities, both during construction and from post-construction O&M activities, including areas crossed by HDD. Survey areas must not be mowed for at least one month prior to the survey and the survey will cover all areas of suitable habitat, not just transects. Ocean Wind must submit the survey area(s), timing, methods, and qualifications of the surveyor(s) for BOEM and USFWS approval prior to the start of the survey. A survey report, including maps and associated spatial files in an ESRI ArcGIS/ArcPro compatible format, must be provided to BOEM and USFWS for review no later than 30 calendar days after the survey has been completed. BOEM and USFWS will complete their reviews and identify any deficiencies that require a report revision by Ocean Wind within 30 calendar days of receipt of the survey report. If any American chaffseed is found during the survey, the surveyor must document the distribution and abundance of plants and submit both the full survey report and a completed Natural Heritage Rare Plant Species Reporting Form to BOEM, USFWS, and the New Jersey Natural Heritage Program. If American chaffseed is present in or adjacent to Project activities, Ocean Wind must coordinate with BOEM and USFWS to develop appropriate conservation measures that Ocean Wind is required to implement to avoid adverse effects to this species.				X

No.	Description	Northern Long-eared Bat	Birds	Monarch Butterfly	Plants
2	BOEM will require that Ocean Wind conducts pre-construction surveys for milkweed (*Asclepias* spp.) and implement monarch butterfly avoidance and minimization measures in coordination with USFWS and NJDEP.			X	
2.a.	For areas where vegetation disturbance will occur during Project construction or post-construction operations and maintenance activities, Ocean Wind must survey the affected area for milkweed (*Asclepias* spp.) before the start of work. Ocean Wind must avoid clearing milkweed to the extent practical from May 15 through September 30 when monarch caterpillars may be present. If/when the monarch is proposed for federal listing, BOEM and Ocean Wind will coordinate with the USFWS prior to initiating any in-season vegetation disturbance that may involve milkweed.			X	
2.b.	GEN-13 will be modified to enhance monarch butterfly habitat in coordination with USFWS and NJDEP. BOEM will require that Ocean Wind develops a Revegetation Plan to enhance monarch butterfly habitat for areas of temporary disturbance and incidental to other Project activities. Ocean Wind must consult the New Jersey Monarch Butterfly Conservation Guide in developing the plan and submit the plan for USFWS review.			X	
2.c.	Ocean Wind will not use herbicide for right-of way maintenance and in other portions of the Project where milkweed is likely to occur.			X	
3	BOEM will require that Ocean Wind implements monitoring and/or other conservation measures to minimize disturbance of rufa red knots and other ESA-listed birds, in coordination with USFWS and NJDEP.		X		
3.a.	To minimize attracting birds to operating turbines, Ocean Wind must install bird perching-deterrent devices on WTGs and OSSs. The location of bird-deterrent devices must be proposed by Ocean Wind based on best management practices applicable to the appropriate operation and safe installation of the devices. Ocean Wind must confirm the locations of bird perching-deterrent devices as part of the as-built documentation it must submit with the FDR.		X		
3.b.	Ocean Wind must use an FAA-approved vendor for the Aircraft Detection Lighting System (ADLS), which will activate the FAA hazard lighting only when an aircraft is in the vicinity of the wind facility to reduce visual impacts at night. Ocean Wind must confirm the use of an FAA-approved vendor for ADLS on WTGs and OSSs in the FIR.		X		
3.c.	Ocean Wind must light each WTG and OSS in a manner that is visible by mariners in a 360-degree arc around the WTG and OSS. To minimize the potential of attracting migratory birds, the top of each light shall be shielded to minimize upward illumination (Conditional on USCG approval).		X		
3.d.	For overhead power lines, Ocean Wind must follow best practices from the Avian Power Line Interaction Committee.		X		

No.	Description	Northern Long-eared Bat	Birds	Monarch Butterfly	Plants
3.e.	Both during and after construction, Ocean Wind must avoid Project-related intrusion (i.e., access through or disturbance from personnel or equipment) into any beach or dune from March 1 to August 31. In the event that emergency access to this area is needed during the restricted season, Ocean Wind must coordinate with the USFWS and the NJFW's Endangered and Nongame Species Program to seek approval.		X		
3.f.	Both during and after construction, Ocean Wind must avoid Project activities within 500 feet of any beach or dune from March 15 to August 31. In the event that essential access to this area is needed during the restricted season, Ocean Wind must coordinate with the USFWS and the NJFW's Endangered and Nongame Species Program to seek approval.		X		
3.g.	Rufa red knot: Along onshore export cable routes, Ocean Wind must avoid permanent modification of suitable red knot habitats. Where temporary habitat disturbance is unavoidable, Ocean Wind must develop a restoration plan in coordination with USFWS for BOEM and USFWS approval.		X		
3.h.	Roseate tern: Ocean Wind must avoid disturbing roosting terns to the extent practicable during construction and operations and maintenance, affording at least a 300-foot buffer for people on foot and for vehicles to avoid flushing the birds. USFWS anticipates most staging flocks of terns will occur from July through September.		X		
3.i.	Eastern black rail and saltmarsh sparrow: No planned or routine Project entry or intrusion into Wetlands A, B, or C (adjacent to Roosevelt Blvd.) either during or after construction will occur. Emergency access must be coordinated with USFWS and NJFW. If Ocean Wind elects to construct an Oyster Creek onshore cable route option other than the Holtec property route, Ocean Wind must retain a species expert to conduct a desktop and field assessment and to map suitable eastern black rail and saltmarsh sparrow habitat within the limits of disturbance. Ocean Wind must provide the assessment, mapping and associated spatial files in an ESRI ArcMap/ArcPro compatible format, and qualifications of the expert to BOEM and USFWS for review no later than 30 calendar days after the assessment has been completed. BOEM and USFWS will complete their reviews and identify any deficiencies that require a report revision by Ocean Wind within 30 calendar days of receipt of the assessment. If areas of suitable eastern black rail and/or saltmarsh sparrow habitat will be impacted by Project activities, Ocean Wind must coordinate with BOEM and USFWS to develop appropriate conservation measures that Ocean Wind is required to implement to avoid adverse effects to these species. Conservation measures will include that construction activities and other Project-related intrusions into areas of suitable habitat will be seasonally restricted from April 1 through September 30 (April 1 through September 30 for eastern black rail and May 1 to September 30 for saltmarsh sparrow) in order to minimize the risk of directly disturbing or injuring adults, eggs, or chicks during sensitive periods of the breeding season.		X		

No.	Description	Northern Long-eared Bat	Birds	Monarch Butterfly	Plants
4	BOEM will require that Ocean Wind conducts pre-construction surveys for ESA-listed bats and implements avoidance and minimization measures in coordination with USFWS and NJDEP.	X			
4.a.	GEN-13 will be modified to enhance bat habitat in coordination with USFWS and NJDEP. Ocean Wind must develop and implement a replanting plan in areas of temporary deforestation. The replanting plan must include the identification of specific tree species and densities, timing of planting, protection of saplings from herbivory, monitoring, and invasive species control in order to provide high-quality bat habitat and must be provided to BOEM and USFWS for approval prior to commencing onshore construction activities.	X			
4.b.	If Ocean Wind elects to construct an Oyster Creek onshore cable route option other than the Holtec route, Ocean Wind must coordinate with BOEM, USFWS, and NJDEP prior to commencing onshore construction activities. After coordination with BOEM, USFWS, and NJDEP, Ocean Wind must retain the services of a USFWS Recognized and Qualified Bat Surveyor to conduct presence/absence surveys (acoustic or mist netting) along the proposed route that are consistent with the USFWS' Rangewide Indiana Bat and Northern Long-eared Bat Survey Guidelines. A survey work plan must be submitted for USFWS approval before commencing the survey. A survey report, including maps and associated spatial files in an ESRI ArcGIS/ArcPro compatible format, must be provided to BOEM and USFWS for review no later than 30 calendar days after the survey has been completed. BOEM and USFWS will complete their reviews and identify any deficiencies that require a report revision by Ocean Wind Based on the results of the presence/absence survey, USFWS may recommend additional field investigations, such as a tree survey to assess roost habitat suitability and/or a mist netting/bat tracking effort to locate occupied roosts. If potential NLEB or tricolored bat roosting habitat will be impacted by Project activities, Ocean Wind must coordinate with BOEM and USFWS to develop appropriate conservation measures that Ocean Wind is required to implement to avoid adverse effects to this species. Conservation Measures may include a seasonal restriction on tree clearing and avoidance of likely or known roost trees.	X			
4.c.	Ocean Wind will coordinate with the USFWS prior to any clearing of trees (> 3 inches dbh) required during operation and maintenance.	X			
4.d.	Ocean Wind must contact USFWS to assess the potential risk to ESA-listed bat species should any abandoned or dilapidated buildings or structures require demolition during the O&M phase. If USFWS determines that adverse effects exist, Ocean Wind must notify BOEM and coordinate with USFWS to develop appropriate mitigation measures that Ocean Wind is required to implement to avoid adverse effects to listed bat species.	X			

5	BOEM will require that Ocean Wind develops and implements an Avian and Bat Post-Construction Monitoring Plan based on COP Appendix III, Appendix AB Avian and Bat Post-Construction Monitoring Framework in coordination with USFWS, NJDEP, and other relevant regulatory agencies. Annual monitoring reports will be used to determine the need for adjustments to monitoring approaches, consideration of new monitoring technologies, and/or additional periods of monitoring. Prior to commencing offshore construction activities, Ocean Wind must submit an Avian and Bat Post-Construction Monitoring Plan for BOEM and USFWS review. BOEM and USFWS will review the Avian and Bat Post-Construction Monitoring Plan and provide any comments on the plan within 30 calendar days of its submittal. Ocean Wind must resolve all comments on the Avian and Bat Post-Construction Monitoring Plan to BOEM and USFWS's satisfaction before implementing the plan. a. Monitoring. Ocean Wind must conduct monitoring as outlined in COP Appendix III, Appendix AB Avian and Bat Post-Construction Monitoring Framework, which will include acoustic monitoring of bat presence and use of radio-tags and radar to monitor movement of ESA-listed birds in the vicinity of the Project. b. Annual Monitoring Reports. Ocean Wind must submit to BOEM (at renewable_reporting@boem.gov), USFWS, and BSEE (at OSWSubmittals@bsee.gov) a comprehensive report after each full year of monitoring (pre- and post-construction) within 6 months of completion of the last avian survey. The report must include all data, analyses, and summaries regarding ESA-listed and non-ESA-listed birds and bats. BOEM, USFWS, and BSEE will use the annual monitoring reports to assess the need for reasonable revisions (based on subject matter expert analysis) to the Avian and Bat Post-Construction Monitoring Plan. BOEM, BSEE, and USFWS reserve the right to require reasonable revisions to the Avian and Bat Post-Construction Monitoring Plan and may require new technologies as they become available for use in offshore environments. c. Post-Construction Quarterly Progress Reports. Ocean Wind must submit quarterly progress reports during the implementation of the Avian and Bat Post-Construction Monitoring Plan to BOEM (at renewable_reporting@boem.gov) and the USFWS by the 15th day of the month following the end of each quarter during the first full year that the Project is operational. The progress reports must include a summary of all work performed, an explanation of overall progress, and any technical problems encountered. d. Monitoring Plan Revisions. Within 15 calendar days of submitting the annual monitoring report, Ocean Wind must meet with BOEM and USFWS to discuss the following: the monitoring results; the potential need for revisions to the Avian and Bat Post-Construction Monitoring Plan, including technical refinements or additional monitoring; and the potential need for any additional efforts to reduce impacts. If BOEM or USFWS determines after this discussion that revisions to the Avian and Bat Post-Construction Monitoring Plan are necessary, BOEM may require Ocean Wind to modify the Avian and Bat Post-Construction Monitoring Plan. If the reported monitoring results deviate substantially from the impact analysis included in the Final BA, Ocean Wind must transmit to BOEM recommendations for new mitigation measures and/or monitoring methods. e. Operational Reporting (Operations). Ocean Wind must submit to BOEM (at	X	X		

No.	Description	Northern Long-eared Bat	Birds	Monarch Butterfly	Plants
	renewable_reporting@boem.gov) and BSEE (at OSWSubmittals@bsee.gov) an annual report summarizing monthly operational data calculated from 10-minute SCADA data for all turbines together in tabular format: the proportion of time the turbines were operational (spinning at >x rpm) each month, the average rotor speed (monthly revolutions per minute [rpm]) of spinning turbines plus 1 standard deviation, and the average pitch angle of blades (degrees relative to rotor plane) plus 1 standard deviation. BOEM and BSEE will use this information as inputs for avian collision risk models to assess whether the results deviate substantially from the impact analysis included in the Final BA. f. Raw Data. The Lessee must store the raw data from all avian and bat surveys and monitoring activities according to accepted archiving practices. Such data must remain accessible to BOEM, BSEE and USFWS, upon request for the duration of the Lease. The Lessee must work with BOEM to ensure the data are publicly available.				
6	Ocean Wind must provide an annual report to BOEM and USFWS documenting any dead (or injured) birds or bats found on vessels and structures during construction, operations, and decommissioning. The report must contain the following information: the name of species, date found, location, a picture to confirm species identity (if possible), and any other relevant information. Carcasses with federal or research bands must be reported to the United States Geological Survey Bird Band Laboratory, available at https://www.pwrc.usgs.gov/bbl/. Any occurrence of a dead ESA-listed bird or bat must be reported to BOEM, BSEE, and USFWS as soon as practicable (taking into account crew and vessel safety), but no later than 24 hours after the sighting, and, if practicable, the dead specimen will be carefully collected and preserved in the best possible state.	X	X		

BOEM = Bureau of Ocean Energy Management; BSEE = Bureau of Safety and Environmental Enforcement; ESA = Endangered Species Act; NJDEP = New Jersey Department of Environmental Protection; USFWS = U.S. Fish and Wildlife Service

3. ACTION AREA

The Action Area is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR § 402.02). The Action Area for the proposed Project includes onshore areas where Project activities and facilities would occur, as described above in Section 2.1.1; and the offshore areas where WTGs, OSS, inter-array cables, and offshore export cables would be located, as described above in Section 2.1.2.

Six of the 13 species covered in the BA can fly and could therefore potentially occur within both onshore and offshore areas. For the remaining flightless species, the Action Area encompasses the areas affected by the onshore export cables and onshore substations in the vicinity of the BL England Generating Station and the Oyster Creek Generating Station (see Figure 1-1). The onshore areas, as depicted in Figure 2-2 and Figure 2-3, include all areas that would be affected by the Proposed Action and are hereafter referred to as the "BL England area" and the "Oyster Creek area."

3.1. BL ENGLAND AREA

The proposed landfall sites in the BL England area are along the coastline of the barrier island in Ocean City, New Jersey. The three landfall options are located primarily in developed areas. The 5th Street landfall is in a paved municipal parking lot, and both the 13th Street landfall and 35th Street landfall options are located within the local roadway. However, unvegetated beaches and vegetated dunes occur along the coastline. The 35th Street landfall route, shown in orange in Figure 2-2, is Ocean Wind's preferred landfall and route for the BL England onshore export cable; the other landfall sites are secondary options. HDD is planned for the landfall and includes the creation of a cofferdam and associated anchoring area, which at 35th Steet, would involve less than 5 acres of temporary disturbance, with less than 0.5 acre of sediment excavation and the remainder of impacts coming from anchoring and spudding to support installation.

From the landfall locations, the onshore cable routes would be buried below ground across urban development with small remnant patches of coastal habitats. Fringe areas of forest occur among developed lands, which are surrounded by wetlands and coastal waters (see COP Volume II, Figure 2.3.5-1). The transmission lines would be co-located with existing infrastructure (i.e., roads and transmission lines) wherever possible, thereby minimizing potential impacts to terrestrial wildlife habitat. The route would follow local roads west and cross Peck Bay (undeveloped area) at Roosevelt Boulevard Bridge via trenchless technology methods. The cable route continues within the ROW and heads north on U.S. Route 9 (North Shore Road) through the communities of Marmora and Beesley's Point and ending at the substation property at the decommissioned BL England Generating Station. Along Peck Bay, there are saline low marshes dominated by common reed (*Phragmites australis*). The areas around Marmora and Beesley's Point are dominated by urban land use interspersed with mixed forest.

Ocean Wind originally planned to use a portion of the former BL England Generating Station property that was previously used as a golf course; however, in response to comments from Upper Township's town council received during the Ocean Wind 1 Offshore Wind Farm Draft EIS public hearing on July 14, 2022, and in an effort to reduce impacts on areas zoned for recreation and park use, the substation location was shifted to an adjacent portion of the same property which formerly housed coal storage and waste-water storage tank elements of the BL England Generating Station.

Salt marshes and other estuarine and riverine wetlands and open waters of the Tuckahoe River, Great Egg Harbor, and Peck Bay surround Beesley's Point and the BL England Generating Station. The Tuckahoe Wildlife Management Area occurs to the northwest of the BL England area. Coastal wetland sections of the BL England area fall within State-level Important Bird Areas, while some upland sections fall within Continental-level Important Bird Areas, as identified by the National Audubon Society (see COP, Volume III, Appendix H, Figure 4-1).

3.2. OYSTER CREEK AREA

Coastal habitats within the Oyster Creek area include saline low and high marsh, common reed wetlands, scrub-shrub wetlands, vegetated dunes, and barren beach. Uplands include mixed and coniferous forest communities dominated by oaks and pines, and pygmy pine plains. An area of old farmland within the Project vicinity also includes open fields, scattered pines and oaks, open sandy areas, and abandoned orchards. Forested wetlands are primarily Atlantic white cedar swamps dominated by Atlantic white cedar surrounded by hummocks of sphagnum mosses.

Each onshore export cable would be buried below ground across varying amounts of forest, wetlands, and urban land use/land cover, with urban development, located primarily to the east of U.S. Route 9 (see COP Volume II, Figure 2.3.5-2). Forest communities are typically dominated by oaks and pines. The area proposed for the onshore substation was previously disturbed and primarily consists of herbaceous vegetation. Table 2.2.1-2 of the COP provides a list of common plant species occurring in the Oyster Creek area (COP Volume II, Section 2.2.1.1.1).

Portions of the Oyster Creek area include Pinelands National Reserve land; Natural Heritage Priority Sites;[5] Island Beach State Park; Forsythe National Wildlife Refuge land; and Barnegat Light State Park. Coastal wetland sections of the Oyster Creek area fall within state-level Important Bird Areas, while some upland sections fall within Continental-level Important Bird Areas, as identified by the National Audubon Society (see COP, Volume III, Appendix H, Figure 4-4; Ocean Wind 2022).

The proposed offshore export cable would pass under Island Beach State Park via HDD, making landfall on Island Beach State Park within an auxiliary parking lot of Swimming Area #2. HDD installation includes creation of a cofferdam and associated an At Island Beach State Park, choring area, which at Island Beach State Park, would involve less than 12 acres of temporary disturbance, with less than 2 acres of sediment excavation and the remainder of the impacts coming anchoring and spudding to support installation. The HDD would exit the bay side of the Island Beach State Park and cross Barnegat Bay southwest to make landfall near Oyster Creek in either Lacey or Ocean Township at one of the proposed landfalls (see Figure 2-3). Ocean Wind has identified several onshore cable export routes options that are representative of potential conditions and impacts within the Oyster Creek area. The Holtec Property, shown in orange in Figure 2-3, is Ocean Wind's preferred landfall and route for the Oyster Creek onshore export

[5] Table 2.2.1-3 of the COP describes five Natural Heritage Priority Sites within the Oyster Creek area (COP Volume II, Section 2.2.1.1.6); however, only the Island Beach Macrosite would be directly affected by the Proposed Action.

cable; the other landfall sites are secondary options. Following is a summary of each route, from north to south:

- Onshore Export Cable Route—A straightened (shorter) route would make landfall and travel west, taking advantage of previously disturbed areas where possible along the Holtec property. Oyster Creek and Route 9 would be crossed using trenchless technology methods to an existing private road, and the route would continue within the existing private road to the substation parcel.
- Onshore Export Cable Route Option—A route developed earlier would make landfall and travel west across undeveloped land, taking advantage of previously disturbed areas where possible, before following abandoned roadways associated with the existing confined disposal facility and Holtec property. To minimize potential impacts on wetlands and vegetation, the route would follow existing berms, paths, and trails where practical. The route would then follow existing roadways, State Route 9, and a private road to the substation parcel. The crossing of Oyster Creek could be conducted using trenchless technology methods or by an independent utility bridge (existing Route 9 bridge or new construction).
- Bay Parkway Alternative—The route starts at a landfall within Bay Parkway, continues within Bay Parkway to Route 9, continues south on Route 9, and continues west within private land. The route then continues north along an old access road, continues northwest using trenchless technology to the substation access road, and finally continues along the substation access road to the substation.
- Nautilus Drive Alternative—The route starts at a landfall within Nautilus Drive and follows the public ROW to Lighthouse Drive, continues southwest on Lighthouse Drive to Main Street, continues northwest within Main Street to Route 9, and continues north on Route 9. The route then crosses Route 9, crosses through private land, and then northwest using trenchless technology into the substation.
- Marina Alternative—The route starts at a landfall within the Lighthouse Marina and continues northwest within the marina property to Southwind Drive. From Southwest Drive, the route would stay within public ROWs and previously disturbed areas to Letts Landing Road. The route then continues west within Letts Landing Road to Main Street and continues north within Main Street to the west side of Route 9. The route would cross Route 9 on private land and then northwest using trenchless technology into the substation.

4. COVERED SPECIES

This section describes the 13 threatened, endangered, proposed, or candidate species under the jurisdiction of the USFWS that may occur in the Action Area or may be affected by the Proposed Action (Table 4-1). The saltmarsh sparrow (*Ammodramus caudacutus*) has also been included to streamline consultation should this species become listed in the future. There are no critical habitats for these or any other species within the Action Area. Data sources used for the analysis are discussed in Section 4.1. A description of each species and the potential occurrence in the Action Area is provided in Sections 4.2 through 4.15.

Table 4-1 Threatened, Endangered, or Candidate Species That May Occur in the Action Area

Species	Status	Potentially Present in the Action Area?	Habitat(s)
Mammals			
Northern Long-eared Bat (*Myotis septentrionalis*)	T	Yes[1]	Winter: hibernacula in caves and mines; Summer: roost and maternity trees with loose bark or cavities near wetlands/open water; forages in open forests, edges, and around wetlands or water
Tricolored Bat (*Perimyotis subflavus*)	P	Yes[2]	Winter: caves and mines; Spring, Summer, Fall: primarily roost among live and dead leaf clusters of live or recently dead deciduous hardwood trees. May also roost in structures (e.g., barns, bridges). Forages around water and forest edges.
Birds			
Piping Plover (*Charadrius melodus*)	T	Yes[1]	Oceanfront beaches and barrier islands; forages on intertidal beaches, exposed mudflats and sandflats, wrack lines and shorelines
Rufa Red Knot (*Calidris canutus rufa*)	T	Yes[1]	Oceanfront beaches and barrier islands during migration; tidal flats (sand or mud), shoals, sand bars, and unvegetated portions of salt marshes (e.g., pans, blowouts); nests in Canada and migrates to South America
Roseate Tern (Northeastern DPS) (*Sterna dougallii dougallii*)	E	Yes	Open beaches and coastal inlets; protected bays and estuaries; offshore ocean
Eastern Black Rail (*Laterallus jamaicensis jamaicensis*)	T	Yes	Coastal Salt and brackish marshes with dense cover; also found in freshwater marshes and upland areas of those marshes; nests in high marsh areas that only flood during extremely high tides
Saltmarsh Sparrow (*Ammodramus caudacutus*)	NL[3]	Yes	Coastal marshes with sedges, rushes, cordgrass, saltgrass, and other typical plants; sometimes in fresh marshes or fields adjacent to coast
Reptiles			
Bog Turtle (*Glyptemys muhlenbergii*)	T	No	Open, emergent and scrub/shrub wetlands such as marshy meadows, wet pastures, shallow spring-fed fens, sphagnum bogs, and swamps

Species	Status	Potentially Present in the Action Area?	Habitat(s)
Insects			
Monarch Butterfly (*Danaus plexippus*)	NL, C[3]	Yes[1]	Anywhere with milkweed and an abundance of native nectar plants
Flowering Plants			
American Chaffseed (*Schwalbea americana*)	E	Yes	Open, moist pine flatwoods; fire-maintained savannas with regular (1 to 3 years) fire or mowing
Knieskern's Beaked-rush (*Rhynchospora knieskernii*)	T	Yes[1]	Early successional, groundwater-influenced wetlands, often on bog-iron substrates and sometimes maintained by certain human activities
Seabeach Amaranth (*Amaranthus pumilus*)	T	Yes[1]	Sandy beaches, from the toe of the dunes (or other landward limit of the beach) to the mean high water line
Sensitive Joint-vetch (*Aeschynomene virginica*)	T	Yes	Intertidal zone of freshwater to slightly brackish tidal marshes
Swamp Pink (*Helonias bullata*)	T	Yes[1]	Forested wetlands, among hummocks formed by trees, shrubs, and sphagnum moss; requires stable groundwater near the surface

Source: USFWS (2022a); see Appendix A
Status Codes: E = ESA-listed Endangered; T = ESA-listed Threatened; P = Proposed; C = Candidate for ESA-listing; NL = Not Listed
[1] Species is confirmed present in the Action Area based on publicly available data sources.
[2] Species is confirmed present in the Action Area based on project-specific acoustic bat surveys.
[3] Species listed as Candidate and Not Listed are provided no statutory protection under the Endangered Species Act.

As detailed further below, one species is determined to be absent from the Action Area (bog turtle); the remaining 11 species are addressed in Section 5.

4.1. DATA SOURCES FOR ANALYSIS

BOEM used information in the DEIS for the Proposed Action as a starting point for the development of this BA. The DEIS is incorporated into this analysis by reference. Various literature sources were used to supplement the information BOEM has compiled about potential effects to ESA-listed species from other offshore wind projects on the OCS, including peer-reviewed literature, USFWS 5-year reviews, USFWS species status assessments, *Federal Register* publications (i.e., listing rules), recovery plans, recent USFWS biological opinions, Natural Heritage Program reports, New Jersey Fish and Wildlife (NJFW) State Wildlife Action Plan (NJFW 2018), NJFW survey reports and maps, and various websites.

The potential occurrences of ESA-listed species within the Action Area were identified by reviewing the *Federally Listed and Candidate Species Occurrences in New Jersey by County and Municipality* (USFWS 2013). This provided an initial screening, and additional data sources were evaluated for each species. As both proposed onshore substations would be located at existing industrial facilities, previous environmental studies were reviewed to gain an understanding of the history of threatened or endangered species in the vicinity (e.g., EcolScience 2004; AmerGen 2005; U.S. Nuclear Regulatory Commission 2007).

Bird data sources consist of numerous avian survey efforts by various federal and state agencies over many years, as compiled by the New Jersey Department of Environmental Protection (NJDEP) (2010) baseline studies for offshore wind power, the Mid-Atlantic Baseline Study (MABS) project (Williams et al. 2015), and version 2 of the Marine-life Data and Analysis Team (MDAT) marine bird relative density and distribution models (Curtice et al. 2018), as well as eBird (2022) data. Ocean Wind also conducted a red knot habitat assessment for the Onshore project area (Appendix C).

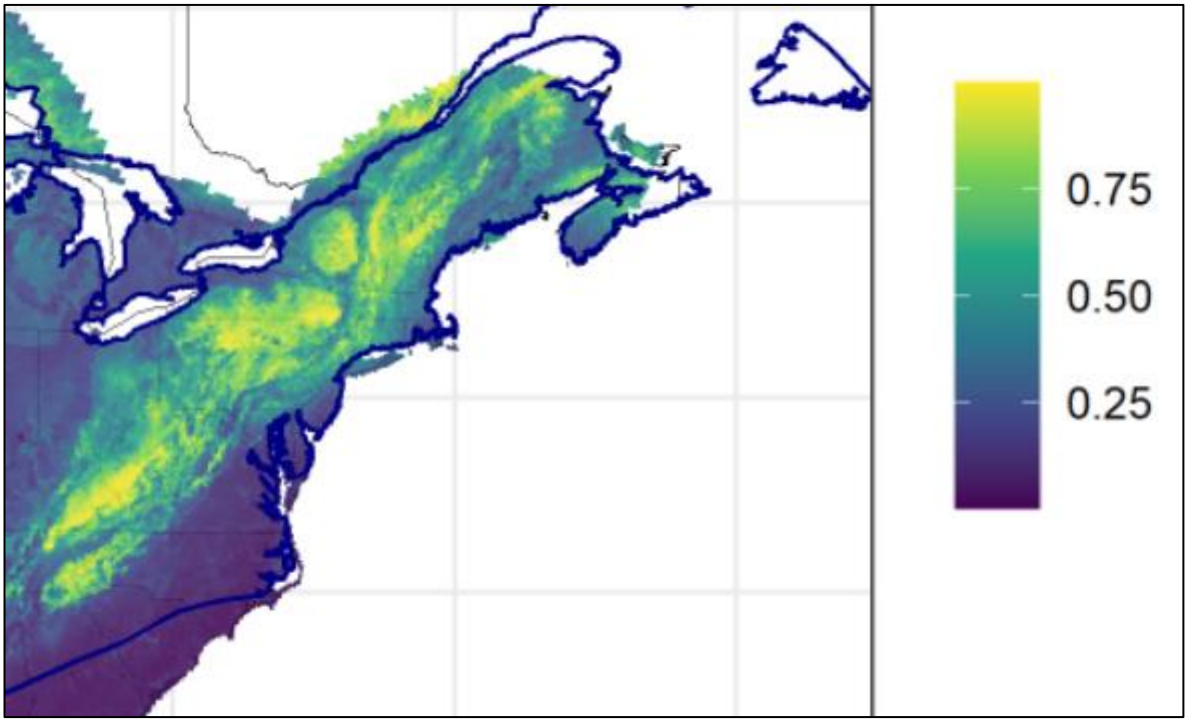
Northern long-eared bat data sources include: USFWS (2020a) list of municipalities with hibernation or maternity occurrence, Conserve Wildlife Foundation of New Jersey northern long-eared bats Mist Netting and Radio Telemetry Study (CWF 2017), Conservation Wildlife Foundation of New Jersey acoustic bat monitoring data (CWF 2014), and acoustic bat surveys conducted by Ocean Wind in 2022 along Ocean Wind's preferred Oyster Creek onshore export cable route (i.e., the Holtec Route) (Johnson and Ostroski 2022) (Appendix E). Additional Atlantic coast offshore bat monitoring studies were reviewed to provide supplemental information on bat distributions in the vicinity of the Action Area, including aerial and boat-based surveys conducted by Hatch et al. (2013), shipboard surveys conducted by NJDEP (2010) baseline studies for offshore wind power, shipboard surveys conducted by University of Maryland from 2009 to 2010 (Sjollema et al. 2014), acoustic monitoring surveys conducted by Smith and McWilliams (2016). BOEM's *Information Synthesis on the Potential for Bat Interactions with Offshore Wind Facilities* report (Pelletier et al. 2013) was also reviewed.

To identify onshore habitats and potential occurrences of ESA-listed plants, the NJDEP (2021) Natural Heritage Grid Map was reviewed. This spatial dataset provides a general portrayal of the geographic locations of rare plant species and rare ecological communities for the entire state without providing sensitive detailed information. In addition, suitable habitat for ESA-listed plants was identified by reviewing the habitat types depicted by the NJFW (2017) Landscape Project. The Landscape Project mapping for the BL England area and Oyster Creek area is provided in the Ocean Wind 1 COP Volume II, Figures 2.2.1-1 and 2.2.1-2, respectively (Ocean Wind 2022). In addition, desktop habitat assessments were performed via review of environmental geographic information system (GIS) data and publicly available aerial photography; these assessments were conducted along Ocean Wind's preferred Oyster Creek onshore export cable route.

4.2. NORTHERN LONG-EARED BAT

4.2.1 SPECIES DESCRIPTION

The northern long-eared bat is distinguished from other *Myotis* species by its long ears. The northern long-eared bat's range includes most of the eastern and midwestern United States and southern Canada (Figure 4-1). The species was once common and has declined by 90% to 100% in most locations due to impacts from white-nose syndrome (WNS), a fungal disease, especially in the Northeast; declines are expected to continue as WNS continues to spread (USFWS 2016a). The species was listed under the ESA as "Threatened" in 2015 (80 FR 17974). Concurrently, the USFWS issued an ESA §4(d) Rule (81 FR 1900) that specifically defines "take" prohibitions; it exempts most incidental take for a variety of commercial and industrial projects within the species range, subject to specific buffers from known roost trees and hibernacula within areas affected by WNS. In March 2022, the USFWS proposed to reclassify the northern long-eared bat from "Threatened" to "Endangered" (87 FR 16442). If the proposed rule is finalized, for which a decision is anticipated by the end of 2022, the 4(d) Rule will cease to apply.



Source: NABat 2019

Figure 4-1 Northern Long-Eared Bat Mean Occupancy Probabilities Predicted in Each North American Bat Monitoring Program Grid Cell in the Eastern Portion of the Modeled Species Range for 2019

The northern long-eared bat overwinters in caves and abandoned mines. Individuals congregate in the vicinity of their hibernacula in August or September and enter hibernacula in October and November. An individual will use the same hibernaculum for multiple years. In spring, the bats leave their hibernacula to roost in trees and forage near the hibernaculum in preparation for migration. Northern long-eared bats are short-distance migrants compared to tree bats. Roost trees are typically greater than or equal to 3 inches (7.6 centimeters [cm]) diameter at breast height, within 1,000 feet (305 meters) of the forest. From mid-May through mid-August, they occupy summer habitat, where they roost under bark and in cavities or crevices of both live and dead trees (Foster and Kurta 1999; Owen et al. 2002; Perry and Thill 2007). Females roost in small maternity colonies and males roost alone (Amelon and Burhans 2006). The Northern long-eared bats switch roosts frequently, typically every two to three days (Carter and Feldhamer 2005; Foster and Kurta 1999; Owen et al. 2002). Northern long-eared bats forage in forests within a few kilometers of their roost sites (Timpone et al. 2010) and is also know to forage in edges, and around ponds, streams, and wetlands. Most foraging for insects is within a few meters above the ground in between the understory and forest canopy (Brack and Whitaker 2001).

Additional information about the northern long-eared bat can be found on the USFWS ECOS species profile and the USFWS (2022b) species information website.

4.2.2 SPECIES OCCURRENCE IN THE ACTION AREA

The occurrence of northern long-eared bat the vicinity of the Oyster Creek and BL England areas is predicted to be relatively low (Figure 4-1). A northern long-eared bat was captured during field work in 2011 at Edwin B. Forsythe National Wildlife Refuge, about 6 miles (10 km) south of the Oyster Creek area (and 30 miles [48 km] north of the BL England area) (Ocean Wind 2022). The USFWS pointed out that there are additional records of northern long-eared bats approximately 7 miles (11 km) north of Oyster Creek (W. Walsh, personal communication, April 11, 2022). There are no known hibernation or maternity occurrences of northern long-eared bat in Upper Township, where the BL England substation is located, or elsewhere in Cape May County (USFWS, 2020a); however, to the north in Egg Harbor Township, Atlantic County, there are known maternity occurrences and roost trees within 0.25 miles (0.4 km) of a known hibernaculum. Although no northern long-eared bats were caught during mist net surveys at Tuckahoe Wildlife Management Area during 2016 and 2017, approximately 6 miles (10 km) northwest of the BL England substation (CWF 2017), the USFWS indicated that there were two captures and a roost located in Cape May County, 8 to 11 miles (12.9 to 17.7 km) from the BL England substation, and an Atlantic County capture within 7 miles of the BL England substation (W. Walsh, personal communication, April 11, 2022). Based on this information, northern long-eared bats could occur near the onshore portion of the Action Area, particularly in less developed areas near the BL England substation; however, its presence is anticipated to be occasional while transiting between other more suitable habitat.

The BL England and Oyster Creek areas contain diverse habitats, including coastal wetlands, forested wetlands, forested uplands, forested lowlands, barrier beaches, and bay island habitats, that could support northern long-eared bats. However, the NJFW (2017) Landscape Project mapping does not identify any habitat patches suitable for the species intersecting the onshore cable landfall sites, the onshore cable routes, and the onshore substation locations. The landings are generally in urban areas, and the onshore export cable would traverse through developed coastal communities that are largely devoid of vegetation except for ornamental landscaping and maintained lawns. In some areas further inland, the onshore export cables would traverse areas of mixed forest communities interspersed with suburban development, which would provide marginal habitat for northern long-eared bat. The proposed BL England substation location is on property which formerly housed coal storage and waste-water storage tank elements of the BL England Generating Station. The BL substation onshore export cable siting area is open, with herbaceous vegetation with scattered pine and oak trees that would provide suitable northern long-eared bat foraging habitat. Ocean Wind conducted acoustic bat surveys in eight locations of potential suitable bat habitat in the onshore project area, including two locations at the Oyster Creek Substation, three locations along a segment of the Oyster Creek onshore export cable route, and three locations around the BL England substation (Appendix E) (Johnson and Ostroski 2022). Over the course of the survey, which took place on various nights between July 13 and August 15, 2022, 3,874 total bat calls were recorded (note that number of bat calls does not equal number of bat individuals). The quantitative analysis of the recorded data indicate the presence of big brown bat, eastern red bat, and little brown bat. A manual review of each call file indicated the presence of big brown bat (3), eastern red bat (388), hoary bat (8), evening bat (1), and tricolored bat (2). The survey did not detect any northern long-eared bats.

The USFWS (2020a) indicates that there are no known hibernation or maternity occurrence of northern long-eared bat in Lacey Township, where the Oyster Creek substation is located;

however, the adjacent townships in Ocean County that would be crossed by the onshore export cable (Berkeley and Ocean Townships) contain known maternity occurrences and roost trees. Berkeley Township, to the north, contains known roost trees within 0.25 miles (0.4 km) of a known hibernaculum. Also, CWF (2017) reported capturing northern long-eared bats in mist nets at Good Luck Point in Berkeley Township, approximately 10 miles (16 km) north of the Oyster Creek substation. Given these occurrences, the three proposed onshore export cable routes would provide suitable habitat for the northern long-eared bat within surrounding coniferous and mixed forests typically dominated by oaks and pines.

There are no records of northern long-eared bats on the OCS off New Jersey. Available survey data and the ecology of the species suggest there is little evidence of use of the offshore environment. Offshore surveys by recorded several observations of migratory tree bats in the nearshore portion of the New Jersey Coast and handful of *Myotis* species were detected, but none were identified as northern long-eared bat (NJDEP 2010). There are records of northern long-eared bat on the coastal islands of Rhode Island and Massachusetts (Dowling et al. 2017; Dowling and O'Dell 2018), indicating that some individuals traveled over open water to the islands, but their occurrence over the ocean is rare. During the offshore construction of the Block Island Wind Farm, bats were monitored with acoustic detectors on boats; no northern long-eared bats were detected among the 1,546 passes of bats (Stantec 2018). In addition, recent data from 3 years of post-construction monitoring around Block Island Wind Farm found relatively low numbers of bats present only during the fall, and no recorded presence of northern long-eared bats (Stantec 2020). Similarly, acoustic detectors on WTGs in the Dominion Energy Coastal Virginia Offshore Wind pilot project off Virginia did not detect northern long-eared bat (Dominion 2022).

Collectively, this information indicates that northern long-eared bat could occur in both the terrestrial components of the action area during non-hibernation periods (May through October). However, project specific acoustic bat surveys in potential suitable habitat did not detect any northern long-eared bats, indicating probable absence of the species in the onshore project area. Any occurrence of northern long-eared bat in the marine component of the action area will likely be very rare and in very small numbers and very likely when winds are below cut in speed for turbines.

4.3. TRICOLORED BAT

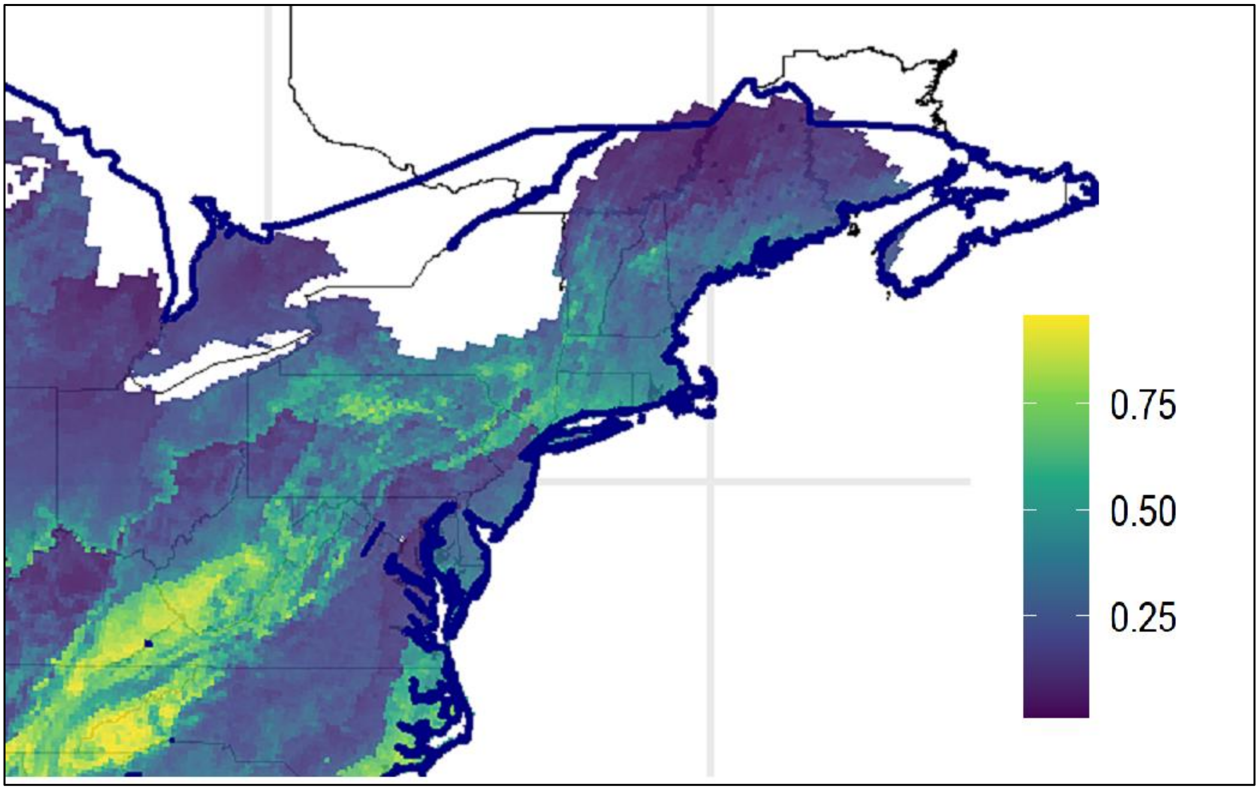
4.3.1 SPECIES DESCRIPTION

The tricolored bat is the only member of its genus. It is a small bat, measuring about 2 inches in body length (up to 3.5 inches including the tail) and weighing up to approximately 8 grams (USFWS Undated). The tricolored bat is distinguished by its unique tricolored fur that appears dark at the base, lighter in the middle and dark at the tip. They often appear yellowish, varying form pale yellow to nearly orange, but may also appear silvery-gray, chocolate brown or black (USFWS undated). Newly flying young are much darker and grayer than adults. The tricolored bat's range in the United States includes most of the eastern and midwestern United States. The species was once common and has declined by 90% to 100% in most locations due to impacts from WNS (USFWS Undated). On September 13, 2022, the USFWS announced a proposal to list the tricolored bat as endangered under ESA.

During the spring, summer and fall - collectively referred to as the non-hibernating seasons - tricolored bats primarily roost among live and dead leaf clusters of live or recently dead deciduous hardwood trees. In the southern and northern portions of the range, tricolored bats will also roost in Spanish moss (*Tillandsia usneoides*) and *Usnea trichodea* lichen, respectively. In addition, tricolored bats have been observed roosting during summer among pine needles, eastern red cedar (*Juniperus virginiana*), within artificial roosts like barns, beneath porch roofs, bridges, concrete bunkers, and rarely within caves. Female tricolored bats exhibit high site fidelity, returning year after year to the same summer roosting locations. Female tricolored bats form maternity colonies and switch roost trees regularly. Males roost singly. During the winter, tricolored bats hibernate in caves and mines; although, in the southern United States, where caves are sparse, tricolored bats often hibernate in road-associated culverts, as well as sometimes in tree cavities and abandoned water wells. Tricolored bats exhibit high site fidelity with many individuals returning year after year to the same hibernaculum. Tricolored bats mate in the fall, hibernate in the winter and emerge in the spring. They then migrate to summer habitat where females form maternity colonies, where young are born. Bats disperse once young can fly, and then return to winter habitats to swarm, mate and hibernate. Tricolored bats exhibit site fidelity to both winter and summer roost habitat. Tricolored bats emerge early in the evening and forage at treetop level or above, but may forage closer to ground later in the evening. This bat species exhibits slow, erratic, fluttery flight, while foraging and are known to forage most commonly over waterways and forest edges.

4.3.2 Species Occurrence in the Action Area

Tricolored bat habitat is very similar to habitats used by the northern long-eared bat (see Section 4.2). The occurrence of tricolored bat the vicinity of the Oyster Creek and BL England areas is predicted to be relatively low (Figure 4-2). The USFWS' Species Status Assessment Report for the tricolored bat indicates that prior to WNS there were several occupied hibernacula in northern New Jersey in the year 2000, but the estimate of the number of current (2019) occupied hibernacula in New Jersey is one (USFWS 2021a). None of the hibernacula are close to the onshore Project Area. No tricolored bats were caught during mist net surveys at Tuckahoe Wildlife Management Area during 2016 and 2017, approximately 6 miles (10 km) northwest of the BL England substation (CWF 2017); however, the project-specific acoustic surveys conducted along Ocean Wind's preferred Oyster Creek onshore export cable route (i.e., the Holtec Route) identified tricolored bat (Johnson and Ostroski 2022) (Appendix E). While the quantitative analysis of the recorded data did not indicate tricolored bat, a manual review of each call file indicated the presence of tricolored bat (only 2 calls out of hundreds of call files). Based on this information, tricolored bat likely occurs in the onshore portion of the Action Area in areas of potentially suitable habitat; however, its presence is anticipated to be minimal.



Source: NABat 2019

Figure 4-2 Tricolored Bat Mean Occupancy Probabilities Predicted in Each North American Bat Monitoring Program Grid Cell in the Eastern Portion of the Modeled Species Range for 2019

There are no records of tricolored bats on the OCS off New Jersey. Available survey data and the ecology of the species suggest there is little evidence of use of the offshore environment. Offshore surveys by recorded several observations of migratory tree bats in the nearshore portion of the New Jersey Coast, but none were identified as tricolored bat (NJDEP 2010). There are records of tricolored bat on Nantucket, Massachusetts (Dowling and O'Dell 2018), indicating that some individuals traveled over open water to the islands, but their occurrence over the ocean is rare. During the offshore construction of the Block Island Wind Farm, bats were monitored with acoustic detectors on boats; no tricolored bats were detected among the 1,546 bat passes (Stantec 2018). Preliminary results of the first year of post-construction monitoring at Block Island Wind Farm indicated low number of tricolored bat calls (33 out of 1,086 calls) (Stantec 2018). In addition, recent data from 3 years of post-construction monitoring around Block Island Wind Farm found relatively low numbers of bats present only during the fall (Stantec 2020); although 80 passes were labeled as tricolored bats, none had characteristics that were diagnostic of the species, and these were more likely to be eastern red bats (Stantec 2020). Acoustic detectors on WTGs in the Dominion Energy Coastal Virginia Offshore Wind pilot project off Virginia has not detected tricolored bat (Dominion 2022).

Collectively, this information indicates that tricolored bat could occur in the terrestrial components of the action area during non-hibernation periods, although presence would be very limited and in very small numbers. Any occurrence of tricolored bat in the offshore component of the action area would be very rare, in very small numbers, and very likely when winds are below cut in speed for turbines.

4.4. PIPING PLOVER

4.4.1 SPECIES DESCRIPTION

The piping plover is a small migratory shorebird that breeds along the Atlantic coast, the Great Lakes, and the Great Plains regions of the United States and winters in coastal habitats of the southeastern United States, coastal Gulf of Mexico, and the Caribbean (Elliot-Smith and Haig 2004; USFWS 1996, 2009). The USFWS listed the Atlantic coast breeding population as "Threatened" in 1986 (50 FR 50726). Critical habitat for wintering piping plovers has been designated along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas (66 FR 36038). Only the Atlantic coast population has the potential to occur within the proposed Action Area during the breeding season, as well as spring and fall migration.

The breeding range of the Atlantic coast population includes the Atlantic coast of North America from Canada to North Carolina. The piping plover breeding season extends from April through August, with piping plovers arriving at breeding locations in mid-March and into April. Post-breeding staging in preparation for migration extends from late July through September (USFWS 1996). Piping plover breeding habitat consists of generally undisturbed, sparsely vegetated, flat, sand dune–beach habitats such as coastal beaches, gently sloping foredunes, sandflats, and washover areas to which they are restricted (USFWS 1996, 2009). Nests sites are shallow, scraped depressions in a variety of substrates situated above the high-tide line (USFWS 1996). Piping plovers forage in the intertidal zone. Foraging habitat includes intertidal portions of ocean beaches, washover areas, mudflats, sandflats, as well as shorelines of coastal ponds, lagoons, and saltmarshes where they feed on beetles, crustaceans, fly larvae, marine worms, and mollusks (USFWS 1996).

While the precise migratory pathways along the Atlantic coast and to the Bahamas are not well known (USFWS 2009; Normandeau 2011), both spring and fall migration routes are believed to follow a narrow strip along the Atlantic coast. Similar to other shorebirds, piping plovers either make nonstop long-distance migratory flights (Normandeau 2011), or offshore migratory "hops" between coastal areas (Loring et al. 2021). Due to the difficulty in detecting piping plovers in the offshore environment during migration, because of the assumed nocturnal and high-elevation migratory flights, there are no definitive observations of this species in offshore environments greater than 3 miles (4.8 km) from the Atlantic coast (Normandeau 2011).

The primary anthropogenic threat to piping plovers is coastal development. Other threats include disturbance by humans, dogs, and vehicles on sandy beaches and dune habitats (Elliott-Smith and Haig 2004; USFWS 2009). The piping plover is among 72 species populations (out of 177 species on the Atlantic OCS) that ranked moderate in its relative vulnerability to collision with offshore wind turbines (Robinson Willmott et al. 2013). Watts (2010) identified the piping plover as among the bird species least able to sustain mortality. However, despite population pressures, there is little risk of near-term extinction of the Atlantic coast population of piping plovers (Plissner and Haig 2000); since that prediction in 2000, the Atlantic coast population has been steadily growing. In fact, the U.S. Atlantic coast population of piping plovers has increased 190% from a low of 790 breeding pairs in 1986 to an estimated 2,289 breeding pairs in 2021

(USFWS 2020d, 2022o). The Action Area is within the New York-New Jersey Recovery Unit. The number of breeding piping plovers in New Jersey in 2021 was 137 pairs (USFWS 2022o).

Additional information about the piping plover can be found on the USFWS ECOS species profile and the USFWS (2022c) species information website.

4.4.2 PIPING PLOVER IN THE ACTION AREA

The piping plover nests along the New Jersey coastline and may be observed in Ocean and Cape May Counties in spring and summer, and during migration in early fall (USFWS 1996). They begin arriving at breeding locations from early-March into April. Egg laying occurs in April and May, and incubation lasts about 27 days. If a next is destroyed early in the season by floods or predators, the pair will re-nest, sometimes several in a season. Chicks are able to fly at 25-35 days and fledge from late June to mid-August (USFWS 1996). Brood rearing can extend through mid or even late August. After juveniles have fledged, adults and subadults stage in and near foraging areas from late July through September and depart for their wintering grounds from August through late October (USFWS 1996, 2019c; Fink et al. 2021).

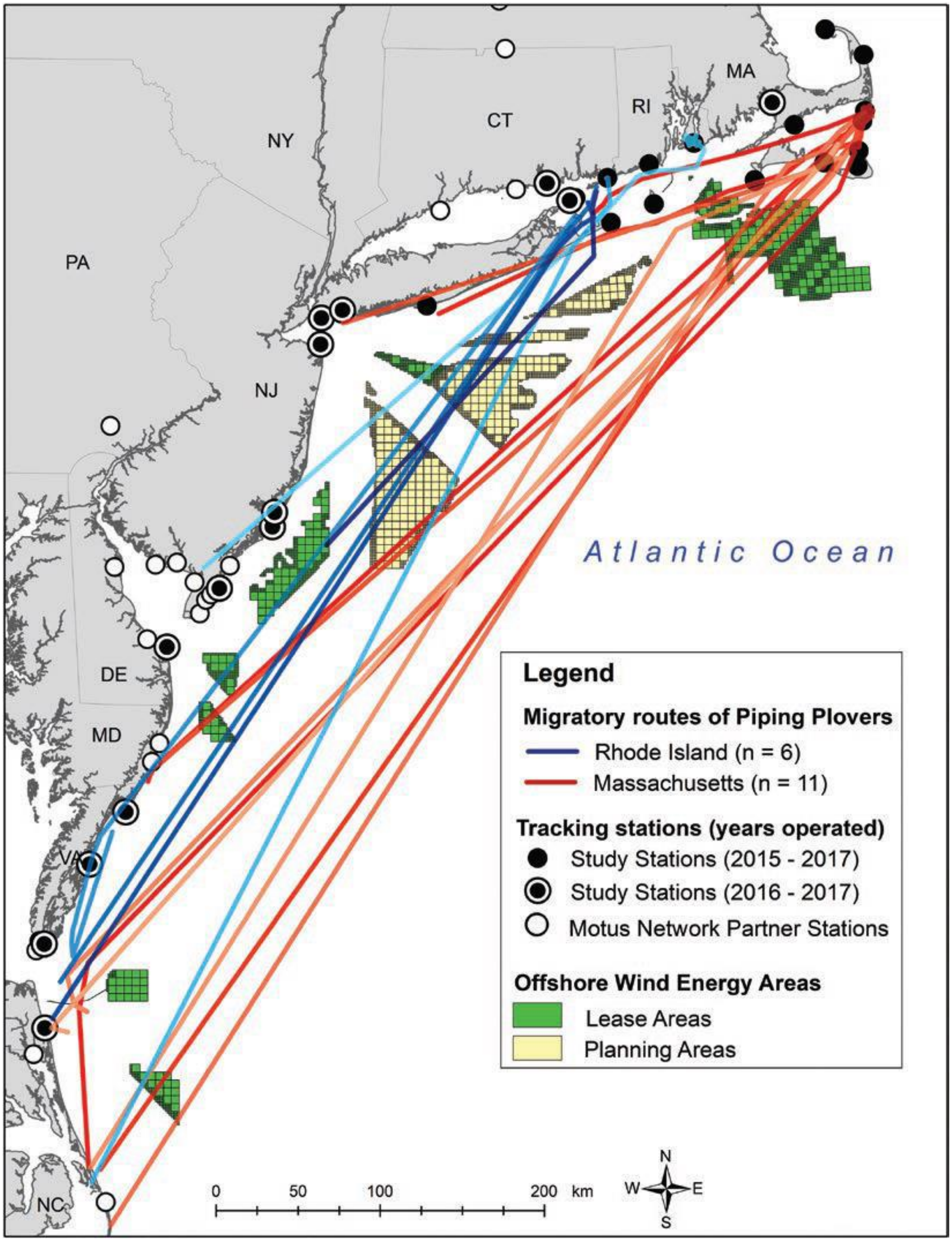
The average number of nesting pairs of piping plovers over the last 30 years in New Jersey is 117 (13.7 SD). Between 2002 and 2018, the number of breeding pairs in Cape May County, where the BL England area is located, declined from 43 pairs to only three pairs (NJFW and CWF 2018). In 2020, the NJFW reported that Cape May County, from Ocean City south to Cape May, had seven pairs of nesting piping plovers out of the 103 pairs in New Jersey. The northern portion of Ocean City beaches contained two of these nesting pairs and has supported, on average from 1987 to 2020, 2.7 pairs of nesting piping plovers. There were no nesting pairs at the central portion of Ocean City beaches in 2020, but this area has supported, on average from 1987 to 2020, 4.3 pairs of nesting piping plovers (NJDEP 2020). The USFWS delineates "active" nests by looking at the past 3 years, which would be 2019, 2020, and 2021. The nearest recorded piping plover nesting activity during that time was approximately 4 miles (6.5 km) away at North Ocean City and 5 miles to the south in the vicinity of Corson's Inlet.

In Cape May County, the vast majority of records of piping plover are at beaches further south, around Cape May Point (eBird 2022). Piping plovers are relatively uncommon on Ocean City beaches; in fact, since 2010, there were only 13 observations in the vicinity of the Project landfall sites in Ocean City, with over 90% of observations occurring on beaches at the northern and southern tips of the island, by Great Egg Harbor Inlet and Corson's Inlet, respectively. These locations have more extensive intertidal beaches and less human disturbance than the Ocean City beaches.

There is no beach or barrier island habitat suitable for piping plover within the onshore Oyster Creek area, and only one record of piping plover is reported in the vicinity of the landfall sites along the Barnegat Bay shoreline (eBird 2022). The USFWS indicated that there are no concerns for piping plover at the Oyster Creek landfall sites (W. Walsh, personal communication, April 11, 2022).

There are numerous observations of piping plovers at Island Beach State Park in the vicinity of where it would be crossed by the offshore export cable. Over the past few years, three or four pairs of piping plovers nested annually in the Northern Natural Area (Gillikins Entrance) of the park (New Jersey State Park Service 2019; NJFW 2020; Bongard 2021). Every so often, one pair of piping plovers nested at the Southern Natural Area (A23 Access) in 2016, 2017, and 2019 (NJFW 2020).

The offshore component of the Action Area lies within the migratory corridor for plovers leaving nesting and staging grounds in New England in the fall, and a small percentage of adult and subadult migrant piping plovers may fly over the offshore component of the Action Area (Figure 4-3). Loring et al. (2019) found that 11% (2 out of 19) of the tagged plovers leaving breeding areas in Massachusetts and Rhode Island during fall migration flew through lease areas off New Jersey. In spring, plovers fitted with transmitters in the Bahamas traveled north close to the New Jersey shore west of the offshore project area (Appendix I in Loring et al. 2019). Most migratory flights were above the turbine height with 15.2% of the Piping Plover flights within the rotor-swept zone (RSZ) (Figure 4-4); for this Project, the RSZ is 36 to 276 meters (Figure 2-6). Therefore, very little, if any, piping plover activity is expected, as relatively few would be flying through or over the Action Area during migration.



Source: Loring et al. 2020
Figure shows individual Piping Plovers tracked across a broader portion of the mid-Atlantic Bight from breeding areas in in Rhode Island (n = 6) and Massachusetts (n = 11)

Figure 4-3 Ocean Modeled Migratory Tracks and Composite Probability Density of Piping Plovers with WEA Exposure in the Mid-Atlantic Bight, 2015 to 2017

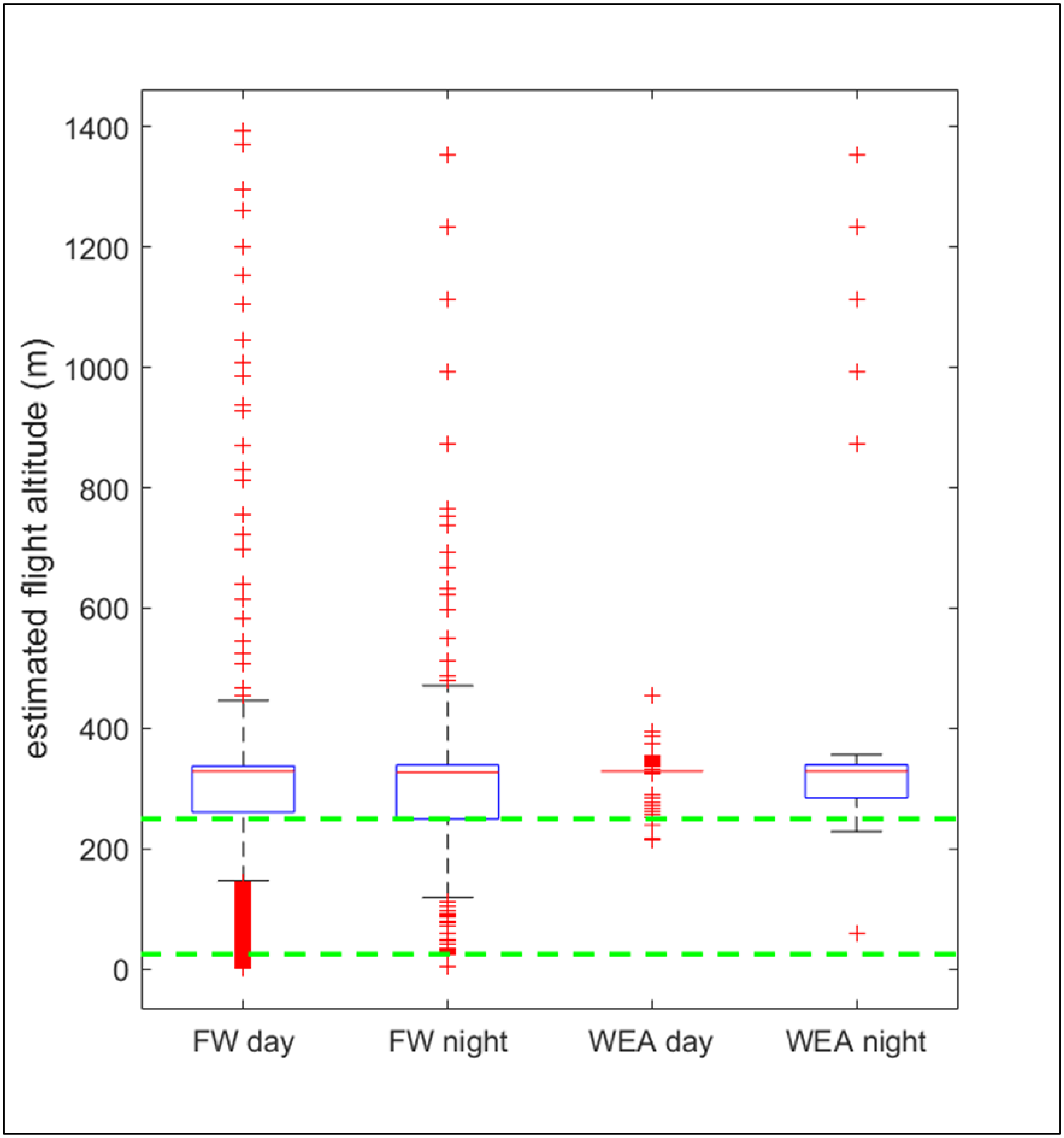


Figure 4-4 Estimated Flight Altitude Ranges (Meters) of Piping Plovers During Exposure to Federal Waters (Altitude When Crossing from State into Federal Waters) and WEAs (Altitude When Flying through WEAs) During Day and Night. The Green-Dashed Lines Represent the Lower and Upper Limits of the RSZ (25-250 meters; Loring et al. 2019).

4.5. RUFA RED KNOT

4.5.1 DESCRIPTION, STATUS, AND HABITAT

The rufa red knot is a medium-sized member of the sandpiper family with one of the longest migrations in the world from its breeding grounds in the Canadian Arctic and wintering habitat along the southeastern Atlantic coast, the Gulf of Mexico and Caribbean, northern Brazil, and Tierra del Fuego at the southern tip of South America in Argentina and Chile (USFWS 2014a). In 2015, the USFWS listed the species as “Threatened” under the ESA in 2015 (79 FR 73706). The USFWS proposed critical habitat for the rufa red knot in 2021 (86 FR 37410).

Over the last 20 years, the Atlantic flyway subspecies (*Calidris canutus rufa*) has declined from an estimated 100,000 – 150,000 birds to 18,000 – 33,000 birds (Niles et al. 2010). The rufa red knot is comprised of three distinct populations in Argentina/Chile (Southern), Northern Brazil, and Southeast U.S./Caribbean and is defined by where they overwinter and their genetics (Verkuil et al. 2022). The best available population estimates in the wintering areas are: 15,500 in Southeast U.S./Caribbean, 31,000 in Northern Brazil and 11,600 in Argentina/Chile – a total of 58,100 birds (see table 6 in USFWS 2020e).

The primary threats to the rufa red knot include: loss of breeding and nonbreeding habitat (including sea level rise, coastal engineering, coastal development, and arctic ecosystem change); likely effects related to disruption of natural predator cycles on breeding grounds; reduced prey availability throughout the nonbreeding range; and increasing frequency and severity of asynchronies (mismatches) in the timing of the birds’ annual migratory cycle relative to favorable food and weather conditions (USFWS 2020e). The rufa red knot is one of 72 species populations (out of 177 species on the Atlantic OCS) ranked “medium” in relative vulnerability to collision with offshore wind turbines (Robinson Willmott et al. 2013).

4.5.2 RUFA RED KNOT IN THE ACTION AREA

Rufa red knots are present in New Jersey during spring (northbound) and fall (southbound) migratory periods. They use key staging and stopover areas to rest and feed, especially Delaware Bay (Niles et al. 2010). Rufa red knots begin arriving at stopover areas along Delaware Bay and the New Jersey coast during the first week of May, and large flocks of rufa red knots occur in these areas from mid-May to early June. The fall migration period is from mid-July through November (NJDEP 2020; USFWS 2021b). On some New Jersey beaches, rufa red knots can persist into early winter and migrate farther south to winter in the Southeast U.S./Caribbean. These birds are considered short-distance migrants, while red knots that winter in South America are designated as long-distance migrants. On their southbound migrations in the fall, the short-distance migrants are expected to fly down the Atlantic coast in a series of short hops to winter on the southeast U.S. coast or the Caribbean, while the long-distance migrants are generally expected to fly directly offshore from coastal New Jersey, across the Atlantic in multi-day offshore flights to their wintering areas in South America. While large concentrations of rufa red knots are found along the southern bay beaches of Cape May County during migration, transient red knots may be found anywhere along New Jersey’s coasts in nearly every month and may move over inland areas during migration (USFWS 2021b). There are also large flocks on the Atlantic Coast of New Jersey from Forsythe Refuge (southern Ocean County) to the southern tip of Cape May. Other spots know to regularly support concentrations include Horseshoe Island, North Brigantine, Avalon, Stone Harbor Point, and Cape May Refuge (Tetra Tech 2017; NJDEP

2022). Migration and wintering habitats include both high-energy ocean- or bay-front beaches with large areas of exposed intertidal sediments, as well as tidal flats in more sheltered bays and lagoons (USFWS 2014a).

According to eBird (2022), there were 948 records of rufa red knot in Cape May County during 2021 and 113 records in Ocean County, accounting for 75% and 9%, respectively, of rufa red knot records in New Jersey for the year. There are dozens of occurrences reported in the vicinity of the BL England area, on both ocean- or bay-front beaches and mudflats in Ocean City. However, lower densities of red knots may be expected in this area due to the presence of predatory peregrine falcons in the vicinity of Ocean City. While the precise locations of falcon eyries are not known, there are recently active nests within the distance (1.86 miles [3 km]) that Watts and Truitt (2021) found peregrines to significantly influence the distribution of foraging red knots during spring migration. These nests are located on Drag Island and Marmora coastal wetlands, to the north and south of BL England, respectively, and on the Ocean City-Longport Bridge (Clark and Wurst 2020, 2021). Additional information on red knot presence and potential habitat in the BL England area can be found in the red knot habitat assessment (Appendix C).

There are no eBird (2022) records of red knots in the Oyster Creek area, but there are dozens of annual observations recorded on Island Beach State Park, largely concentrated in the area south of the Project's HDD crossing. The red knot spring stopover population size at Delaware Bay in 2021 was estimated at 42,271 (95% credible interval: 35,948 to 55,210) (Lyons 2021). Unfortunately, there are no stopover population estimates for red knot near the onshore portions of the Project area. of Swimming Area #2, by where the HDD for the export cable route would make landfall, there are 100 records of red knot observations from 2004 to 2021. About half of the records are of single individuals, most of the remaining observations are of small groups with 10 or fewer, followed by 10 records of groups with 10 to 31 individuals. Also, there are approximately 100 eBird (2022) records on the island to the south of the parking lot of Swimming Area #2 (e.g., Bay Area Access Road, Johnny Allen's Cove Trail, Spizzle Creek Blind Trail, and Winter Anchorage Access Drive). Another 88 records of red knot observations are reported from Sedge Islands from 2004 to 2021. Most (65%) of these observations were recorded during August, September, and October; 19% were recorded in May; 9% were recorded in June, July, and August; and 7% were recorded in November and December (eBird 2022). Additional information on red knot presence and potential habitat in the Oyster Creek area can be found in the red knot habitat assessment (Appendix C).

NJDEP (2010) baseline boat studies did not document any rufa red knots in the offshore portion of the Action Area, and the MABS surveys for all shorebirds (which included rufa red knots) documented very small numbers of shorebirds during all seasons on the OCS in waters similar to those within the Project vicinity. However, migrating individuals may traverse the Ocean Wind 1 Project. Based on the telemetry study by Loring et al. (2018), which tracked red knots tagged in James Bay and the Mingan Islands in Canada, and in Massachusetts and New Jersey, 3 out of 388 tagged rufa red knots crossed the Ocean Wind 1 Lease Area; one from Massachusetts (n = 99) and others were from New Jersey (n = 35; from Stone Harbor Point, Brigantine Natural Area, and Avalon Point). Two of those transits were final migratory departure flights, and one was a flight between stopover areas (Loring et al. 2018).

More recently, BRI and Wildlife Restoration Partners (2022), on behalf of Ocean Wind, conducted a study in tracking short-distance migrants in coastal New Jersey using Global

Positioning System (GPS) telemetry. The team deployed 32 tags on red knots and 17 tags provided location and altitudinal information. Of the 17 individuals with tags that provided data, five made migratory movements within the life of the tags, including four short-distance migrants and one long-distance migrant. The tracks of one short-distance migrant passed through the lease area at 22 meters above the water on its way to Cuba. Overall, the majority of locations collected by satellite tags were associated with relatively low flight height estimates. A wind analysis indicated that the tagged red knots generally initiated migration with favorable tailwinds, that the one long-distance migrant had favorable wind support throughout its offshore movements, and that the short-distance migrants flew in more variable wind conditions.

Another GPS telemetry study by Feigin et al. (2022) investigated the southward migration of long-distance migrants captured at a key stopover location at Brigantine Natural Area in Atlantic County. Sixty red knots were tagged with GPS satellite transmitters and 40 provided reliable locational data. The migration tracks of tagged birds followed the expected migration routes. Some of the birds headed directly offshore from stopover sites in New Jersey on their way to wintering areas in South America (long-distance migrants), and some took a coastal route in which they hugged the shore on their way south to wintering areas in the southeastern United States and Caribbean islands (short-distance migrants). Nearly 38% (15 of the 40 birds that provided tracking data) may have crossed the Atlantic Shores lease area. One knot was recorded within the Atlantic Shores lease area flying at 575 meters above the water while it was assumed that the others crossed the lease area based on straight lines drawn between locations or animal movement models that estimate paths between locations. For the 15 birds that may have crossed the Atlantic Shores lease area, the majority departed during the night, with light winds blowing from the north, little to no precipitation, generally good visibility, and warm temperatures.

The number of birds passing through the Lease Area can be estimated based on what is known about the red knot over wintering populations, how they migrate in spring from nanotag telemetry studies, and how they migrate in fall from GPS telemetry studies. In spring, short-distance migrants overwintering in the Southeast U.S. are joined by others from the Caribbean to travel northward toward Delaware Bay. Some birds may take an inland route while others will travel up the coast. After stopping in Delaware Bay, most will travel inland to breeding areas in Canada while some birds may continue to travel up the coast before turning west to head to breeding areas; these birds are not likely to cross the Lease Area during spring migration. After breeding, these birds fly back and to stage on Atlantic coast beaches working their way south down to their overwintering grounds. Birds south of Delaware may continue to fly south near the coast or depart to the Caribbean. None of the birds from the Southeast U.S./Caribbean wintering population are likely to cross the Lease Area during spring and it is unlikely that birds will cross the Lease Area during fall migration.

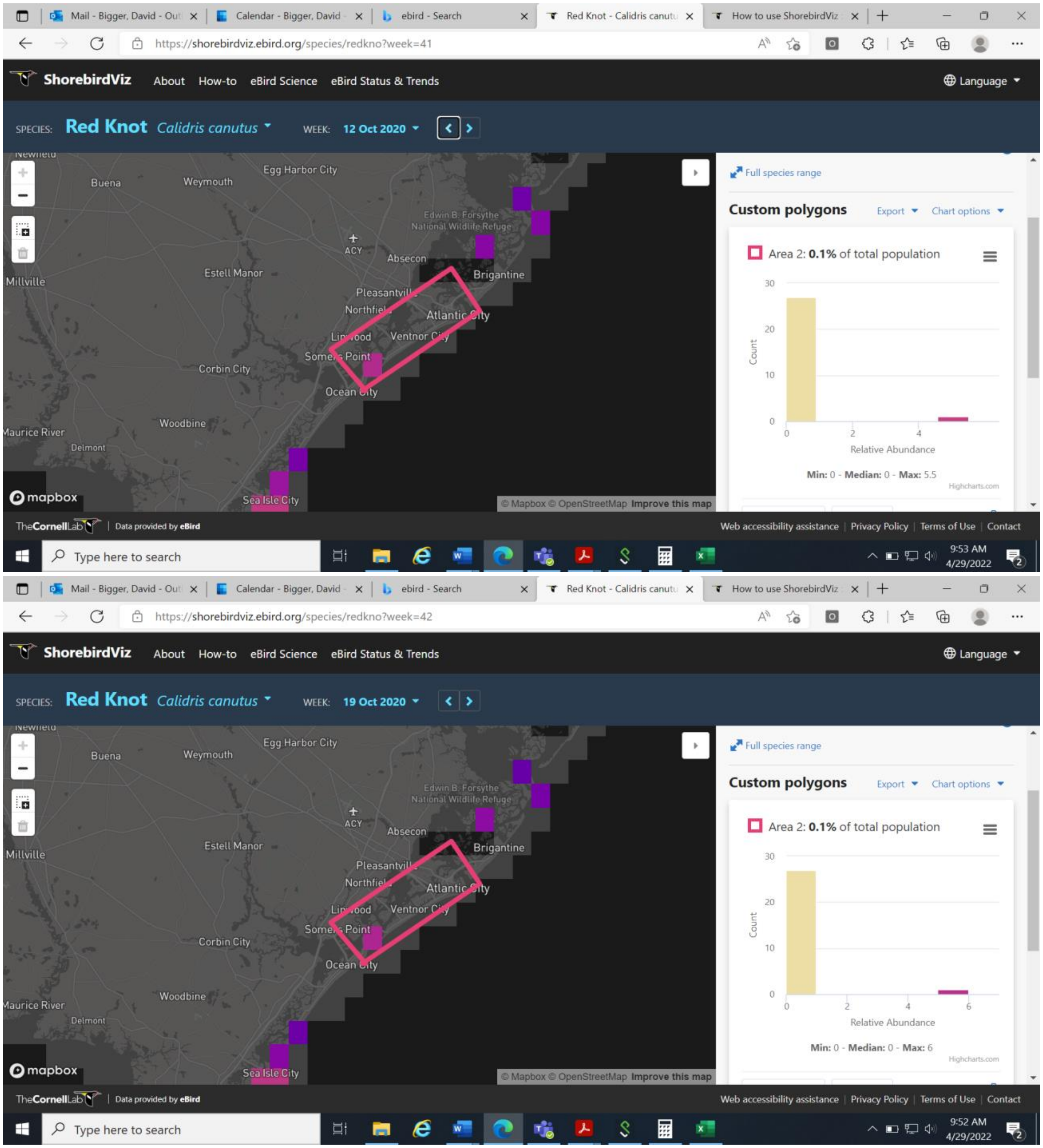
A total of 42,600 knots from the South American wintering populations follow similar routes as the Southeast U.S./Caribbean birds but with some notable exceptions. Birds overwintering in the southern part of South America (Southern) travel northward and are joined by others from Northern Brazil. Birds from both populations then fly offshore heading to North America. Not all birds from these population fly directly to Delaware Bay and as many as 27% (17,522) could bypass the Delaware Bay in spring (USFWS 2021). More recent data appear to support assumption (see Pelton et al. 2022) and is also as revealed by recent telemetry studies using nanotags. In fact, red knots fitted with nanotags at Bahia Lomas, Chile (66.7%, 8 out of 12 fitted with nanotags, Table 4-2) first made landfall south of Delaware Bay. These birds then traveled the shortest route northward either inland or along coast to Delaware Bay. The next largest group (16.6%, 2 out of 12, Table 4-2) first made landfall east of Delaware Bay at Cape May, NJ (south of the Action Area). After stopping in Delaware Bay, most traveled inland to breeding areas in Canada and none traveled further up the coast. Of course, some birds may bypass Delaware Bay. For example, one bird out of 12 flew west into Pennsylvania, and another made landfall at Long Island, NY. No birds were detected at an active station (RTNJ 4233) near the Lease Area capable of detecting birds 10 km offshore. However, it is possible for a small percentage of birds (8.3%) to make landfall anywhere north of Cape May from the New Jersey shore to Maine, thus creating a 1,241 km migration front. The wind farm occupies 20 km (1.6%) of the migration front. Based on this information, the number of birds potentially passing through the wind farm from west to east can be calculated by multiplying the total long-distant migrant population size (42,600 birds) times the proportion that by-passing Delaware Bay (0.083) times the proportion of the migration front that overlaps with the wind farm (0.016). A total of 57 birds could pass through the wind farm in spring (= 42,600 total birds * 0.083 proportion bypass DE Bay * 0.016 proportion of migration front by lease).

Table 4-2 Spring Migration Landfall Sites of Nano-tagged Red Knots from the Bahia Loma Shorebird Project in South America

Tag ID	Land Fall Date	Location
20914	5/05/19	South Carolina
20908	5/18/19	South Carolina
20866	5/17/19	South Carolina
20878	5/22/19	South Carolina
20953	5/18/19	South Carolina
20948	5/19/19	North Carolina
20959	5/23/19	Maryland
15656	5/18/18	Delaware Bay
20883	5/22/19	Cape May, New Jersey
20912	5/15/19	Cape May, New Jersey
15651	5/29/18	Pennsylvania
20958	5/23/19	Long Island, New York

Source: Mackenzie et al. 2017

In fall, red knots leave their breeding grounds in Canada to return to their overwintering grounds. Birds from Southeast U.S. and Caribbean population reach the Atlantic coast and work their way south along the coast to the Southeast U.S. to remain or fly and over winter in the Caribbean. In contrast, birds from the Southern and Northern Brazil populations migrate offshore to their overwintering grounds. The largest staging ground is along the Mingan Archipelago QC, Canada where 9,450 birds use the area (Lyons et al. 2018). A recent telemetry study found that 97% (out 244 tagged birds) departed directly to South America on long-distance migratory routes that would take them beyond U.S. Federal waters (Loring et al. 2018). Thus, out of the 58,100 red knots on the Atlantic (see above), approximately 48,650 (= 58,100 – 9,450) depart to overwintering locations in South America from other locations on the Atlantic coast or work their way down the Atlantic coast (e.g., Cape Cod and areas along the New Jersey shore being considered for critical habitat by USFWS) and are among the Southeast U.S./Caribbean birds. Approximately, one-tenth of a percent of the red knot population stage weekly over a two-week period during fall on the shores across from the proposed Lease Area (Figure 4-5); this location and number of fall staging red knots appear to be consistent with previous shorebird survey efforts (see Tetra Tech 2017). The maximum number of birds staging near the Project in fall is 49 (= 48,650 number of birds on the Atlantic coast * 0.001 proportion of population staging [see Figure 4-5]). Recent telemetry work in the area provides estimates to the percentage of birds that may fly offshore and potentially through the Lease Area. For example, 43% (15 out of 35) of the birds that were captured and fitted with nano-tags in New Jersey were tracked in Federal waters (Loring et al. 2018). Similarly, 38% (15 out of 40) of the satellite tagged birds crossed Atlantic Shores Lease Area (Feigin et al. 2022). None of the 17 tracked short distance migrants passed through the Ocean Wind 1 Lease Area (BRI and Wildlife Restoration Partners 2022). Based on both GPS studies, approximately 12 (26%=100%*15(40+17) per month of these birds could fly through the Lease Area during fall migration. Most importantly, none of the GPS tracked birds near the Lease Area flew within the RSZ; in fact, one bird flew above the RSZ, and the rest flew below the RSZ (Feigin et al. 2022; BRI and Wildlife Restoration Partners 2022).



Source: Fink et al. 2021

Figure 4-5 Red Knot Staging Area Near the Ocean Wind 1 Lease Area. Screen Shots are from Shorebirdviz and Show the Estimated Percent of the Population in the Polygon During the Weeks of October 12 and October 19, 2020.

4.6. ROSEATE TERN

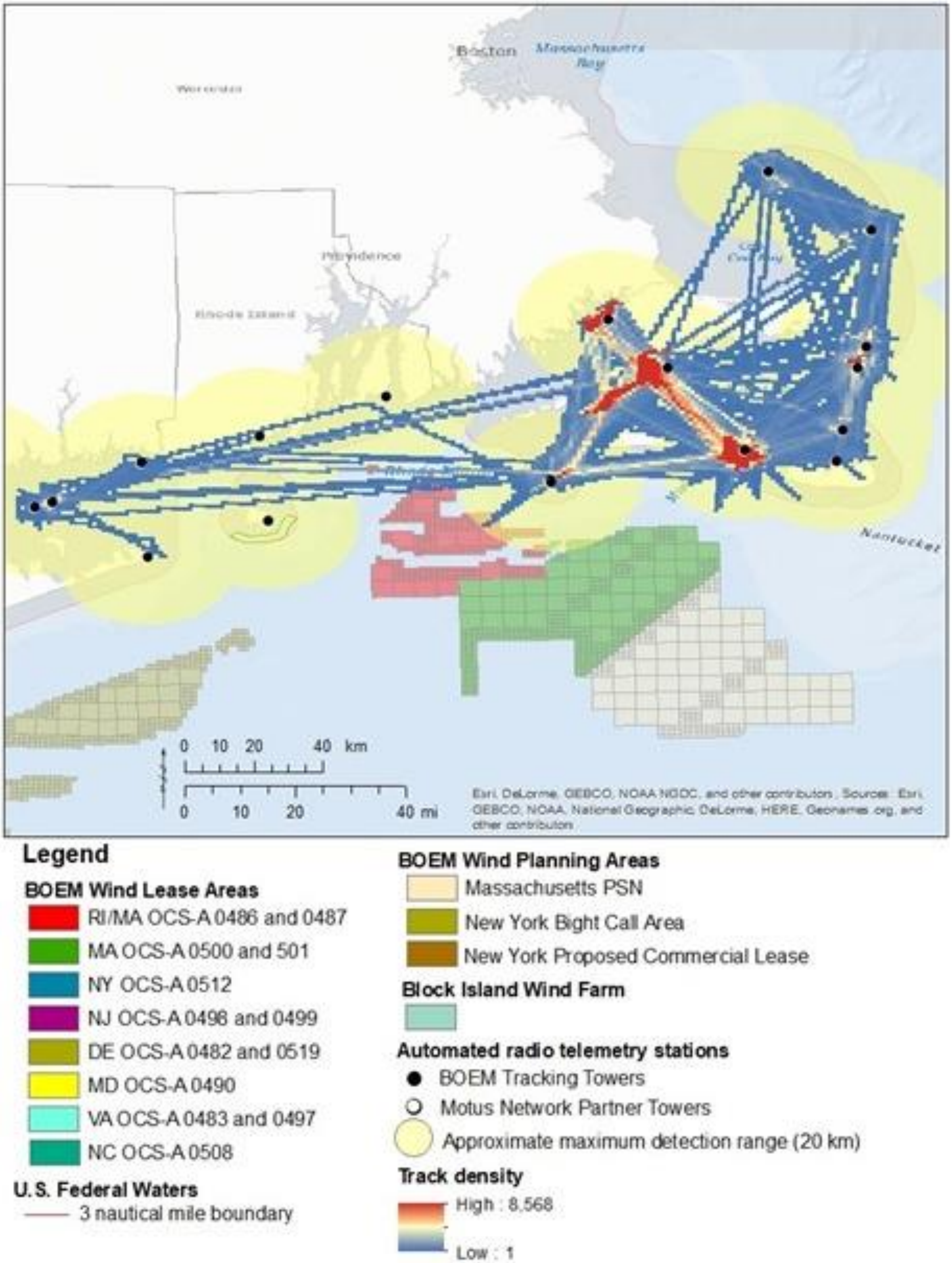
4.6.1 SPECIES DESCRIPTION

The roseate tern is a small, colonial tern, and is one of several similar-appearing terns found in throughout most of the world. The subspecies of roseate tern found in North America (of five recognized in the world) includes several widely separated breeding populations that breed on the northeastern coast of North America, several islands in the Caribbean Sea, and in northwestern Europe. The Northeastern roseate tern population[6] was listed under the ESA as "Endangered" in 1987, while terns in the Caribbean population are listed as "Threatened" (52 FR 42064). The northeast roseate tern population includes birds along the U.S. Atlantic Cost south to North Carolina, the Canadian Atlantic coast north to Quebec, and Bermuda.

The Northeastern roseate tern population breeds on small islands or on sand dunes at the ends of barrier beaches along the Atlantic coast, occurring in mixed colonies with common terns (*Sterna hirundo*). The population is currently restricted to a small number of colonies on predator-free islands from Nova Scotia to Long Island, New York, with over 90% of remaining individuals breeding at just three colony locations (Bird Island and Ram Island in Buzzards Bay, Massachusetts (Figure 4-6) and Great Gull Island in Long Island Sound, New York (Figure 4-7) (Nisbet et al. 2014; Loring et al. 2019; USFWS 2020f). Historically, the Northeastern roseate tern population was known to breed as far south as Virginia, but the species currently does not breed south of Long Island, New York (USFWS 1998). Declines have been attributed largely to low productivity, partially related to predators and habitat loss and degradation, although adult survival is also unusually low for a tern species (USFWS 2010). The historical population size in northeastern North America was estimated at 8,500 pairs in the 1930s. The range-wide breeding population was estimated to be 4,374 breeding pairs at peak period count in 2019, down slightly from 4,593 in 2018. The U.S. roseate tern breeding population has exceeded 4,000 breeding pairs annually since 2016. Canada's total roseate tern population has been below 100 breeding pairs since 2008, hovering between 50 and 65 breeding pairs (see Table 1 in USFWS 2020f). The roseate tern is one of 61 species populations (out of 177 on the Atlantic OCS) ranked "higher" in relative vulnerability to collision with offshore wind turbines (Robinson Willmott et al. 2013). This high ranking is partially driven by the amount of time the species spends foraging on the ocean, and if time on the ocean was restricted to migration, the population would be ranked "medium."

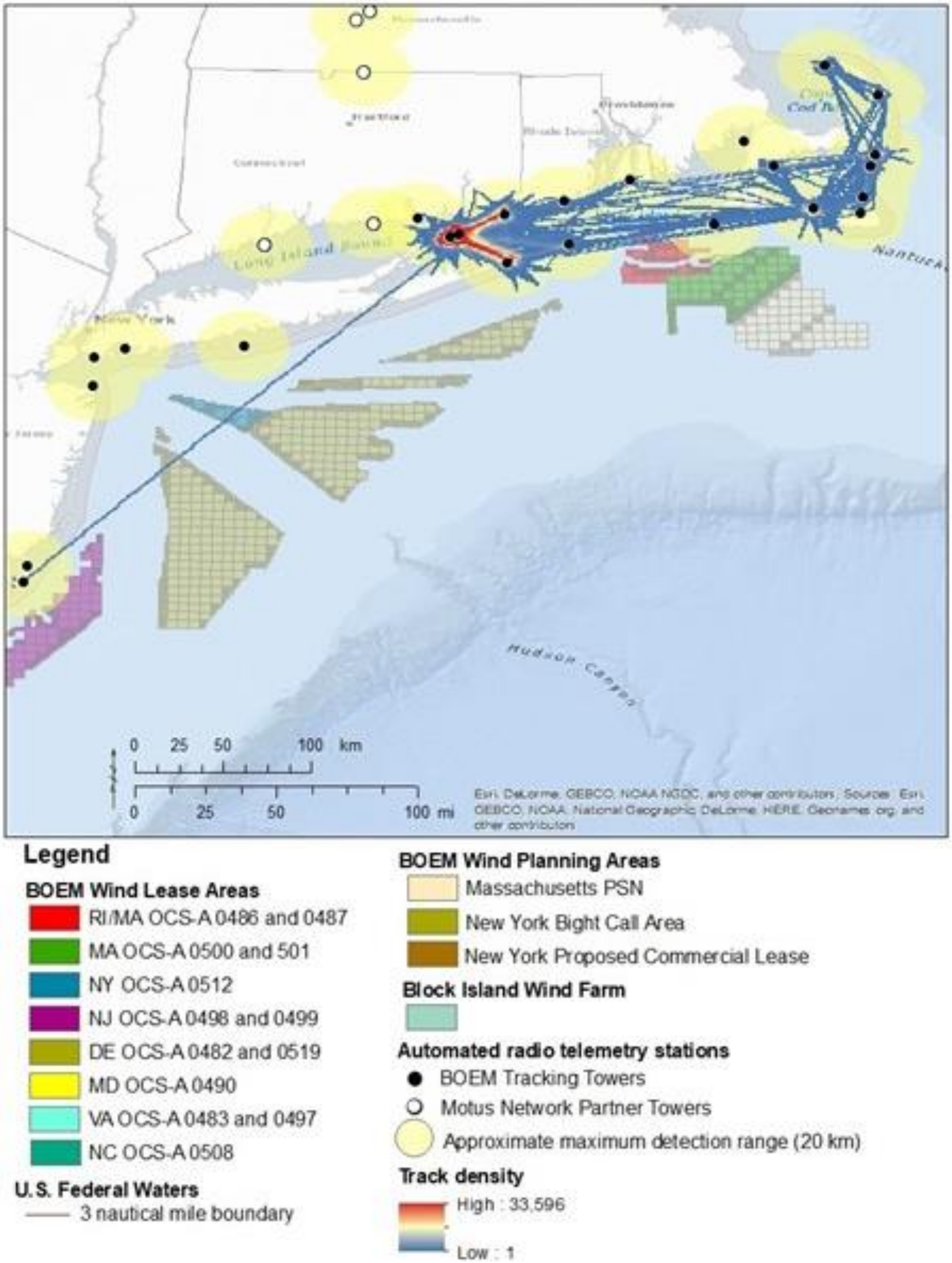
Roseate tern foraging behavior and ecology are well described. Roseate terns dive less than 1.6 feet (0.5 meters) into the water to forage primarily for sand lance (*Ammodytes americanus*) in shallow, warmer inshore waters near shoals, inlets, and rip currents close to shore (Safina 1990; Heinemann 1992; Rock et al. 2007). The sand lance is known to occur off the shore of New Jersey. Roseate tern foraging flights are slow and range from 10 to 39 feet (3 to 12 meters) above the ocean surface. In contrast to common terns, roseate terns are dietary specialists and exhibit strong fidelity to foraging sites and avoidance of clusters of other feeding tern species (Goyert 2015).

[6] This population is also known as the Northwest Atlantic population of the roseate tern and Northeast DPS of the roseate tern. Herewith, the population will be addressed as the Northeastern roseate tern population to distinguish the population from the Caribbean roseate tern population, or the Northeastern Atlantic roseate tern population of Europe.



Source: Loring et al. 2019, Figure 15

Figure 4-6 Modeled Track Densities of Roseate Terns from the Buzzards Bay Colony during Breeding and Post-Breeding Periods in 2016 and 2017



Source: Loring et al. 2019, Figure 14

Figure 4-7 Modeled Track Densities of Roseate Terns from the Great Gull Island Colony during Breeding and Post-Breeding Periods in 2016 and 2017

The Northeastern roseate tern population generally migrates through the Mid-Atlantic to and from their wintering grounds on the northeastern coast of Brazil, arriving at their northwest Atlantic breeding colonies in late April to late May, with nesting occurring between mid-May and late July. During breeding, roseate terns generally stay within about 6 miles (10 km) of the colony, although they may travel 20 to 30 miles (32 to 48 km) from the colony while feeding chicks (USFWS 2010; Burger et al. 2011; Nisbet et al. 2014; Loring et al. 2019). Following the breeding season, adult and hatch-year roseate terns move to post-breeding coastal staging areas from approximately late July to mid-September (USFWS 2010). Foraging activity during the staging period is known to occur up to 10 miles (16 km) from the coast, although most foraging activity occurs much closer to shore (Burger et al. 2011).

Additional information about the Northeastern roseate tern can be found on the USFWS ECOS species profile, the USFWS (2020f) 5-Year Review, and the USFWS (2022e) species information website. No critical habitat has been designated for the roseate tern.

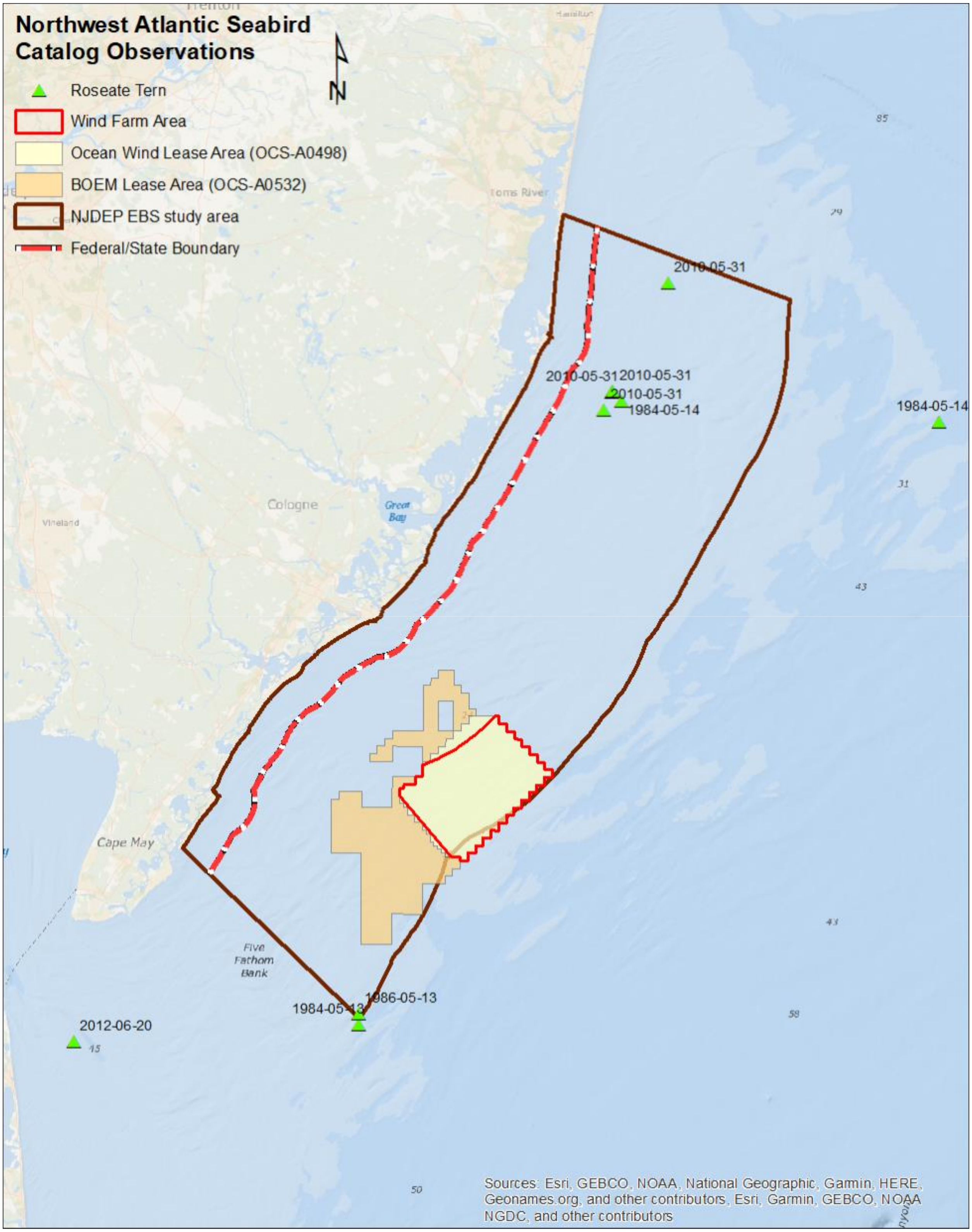
4.6.2 Roseate Terns in the Action Area

Roseate terns have not nested in New Jersey since 1980; therefore, no breeding roseate terns are likely to occur in the Action Area. Roseate terns may only potentially occur in the Action Area from May 1 to September 30 (W. Walsh, personal communication, April 11, 2022), although roseate terns that nest in New York and New England may migrate through ephemerally during spring and fall (Burger et al. 2011; BOEM 2013).

Over the last several decades there was only one record of roseate tern within the BL England area; two roseate terns were among a flock of 50 common terns in the vicinity of the Ocean City-Longport Bridge (eBird 2022). There are no records within the Oyster Creek area, and only two historical records in Barnegat Bay, from 1925 and 1934 (eBird 2022). There are records of approximately 50 observations of roseate terns at Island Beach State Park in the vicinity of offshore export cable; these observations were typically one to three roseate terns among flocks of common terns in June and July, with a few in August (eBird 2022).

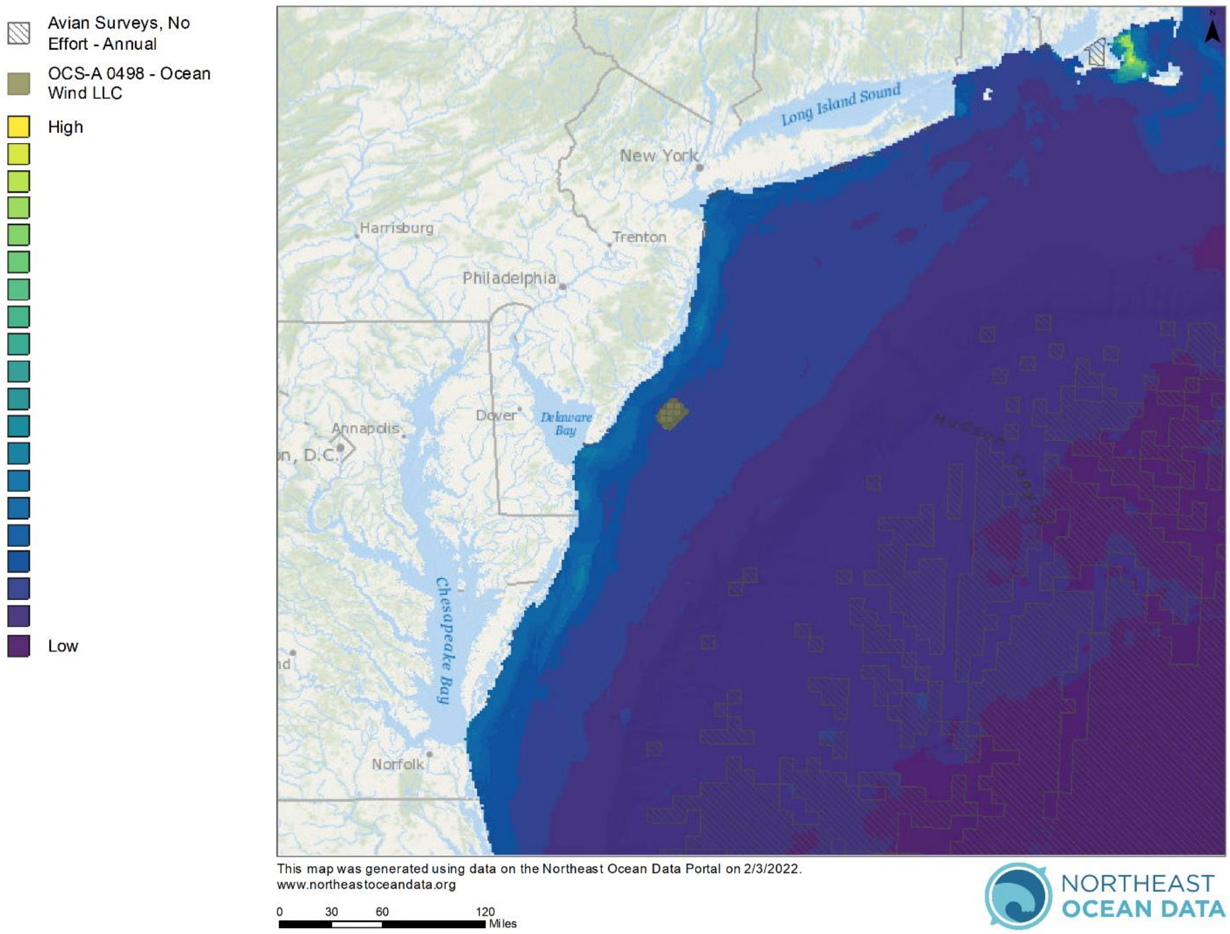
Although roseate tern migration routes are not well described, they appear to migrate primarily well offshore (Burger et al. 2011; Mostello et al. 2014; Nisbet et al. 2014). During fall migration, a study using geolocators revealed that roseate terns from nesting areas at Buzzards Bay and Great Gull Island migrated offshore directly to the West Indies in route to wintering areas in South America (Mostello et al. 2014). More recently, a study using nanotags tracked 145 roseate terns from their primary breeding and staging areas and into North Atlantic waters during the breeding period through post-breeding dispersal; only one animal flew along the coast near the Lease Area (Figure 4-6 and Figure 4-7). The NJDEP (2010) baseline surveys had no observations of roseate terns, and there were only nine observations (15 individuals) of the species were reported in the Northwest Atlantic Seabird Catalog near the NJDEP Environmental Baseline Study area, all during May and June (Figure 4-8). Likewise, the regional MDAT models predict a low relative density of roseate terns in the offshore action area (Figure 4-9 to Figure 4-11). The available information indicates minimal presence of roseate terns in the offshore Action Area during migration.

In conclusion, based on the behavioral and foraging ecology, telemetry data, and survey data, very little, if any, roseate tern activity is expected within marine waters in and around the Lease Area and should birds pass through the area, they will be flying relatively close to the ocean surface during good weather conditions. Although migrants likely just pass straight through, some do stop and small numbers of juveniles and non-breeding adults may also occur along the New Jersey coast during the breeding season (W. Walsh, personal communication, April 11, 2022).



Source: COP, Vol III, Append H, Figure 3-26

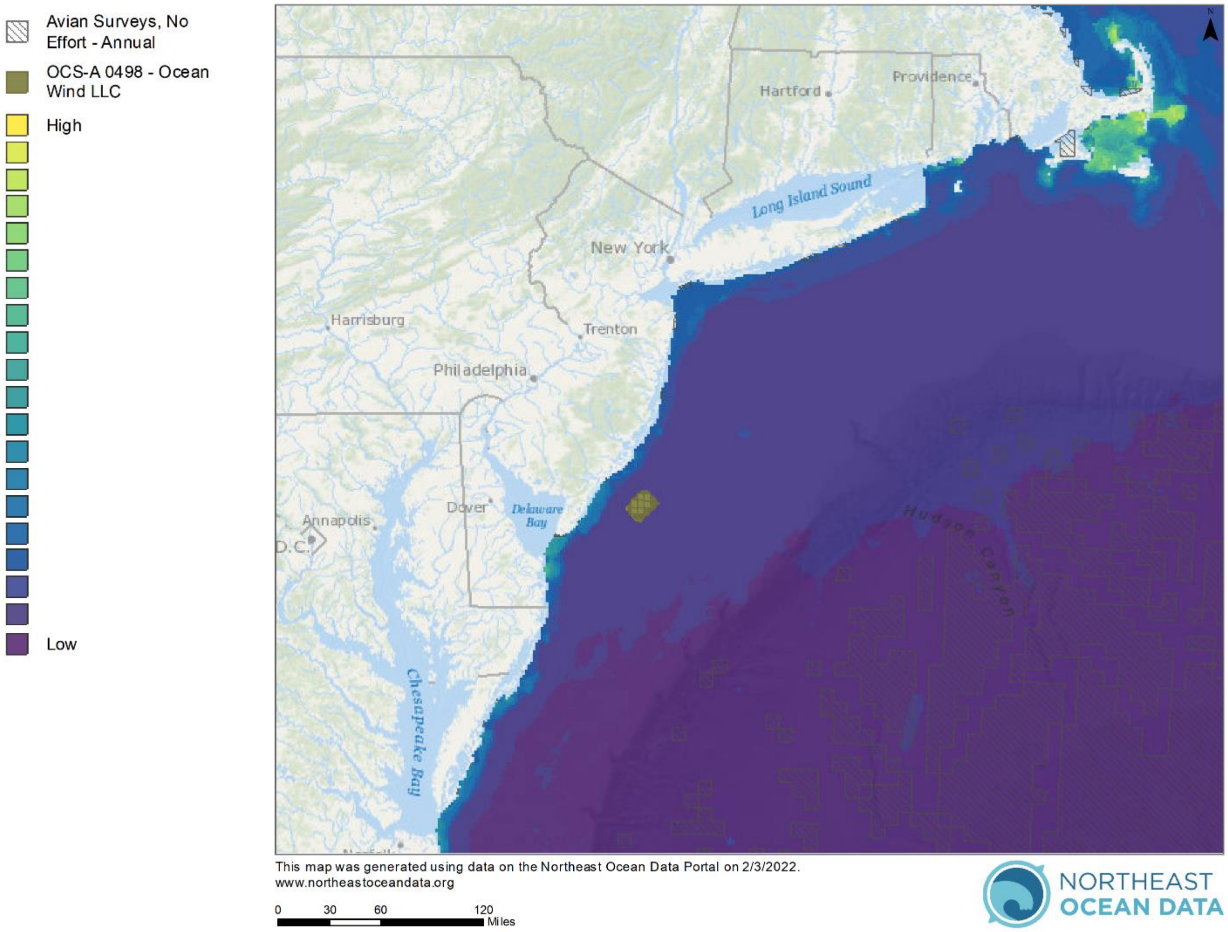
Figure 4-8 Roseate Tern Observations and Dates from the Northwest Seabird Catalog



Source: MARCO 2022

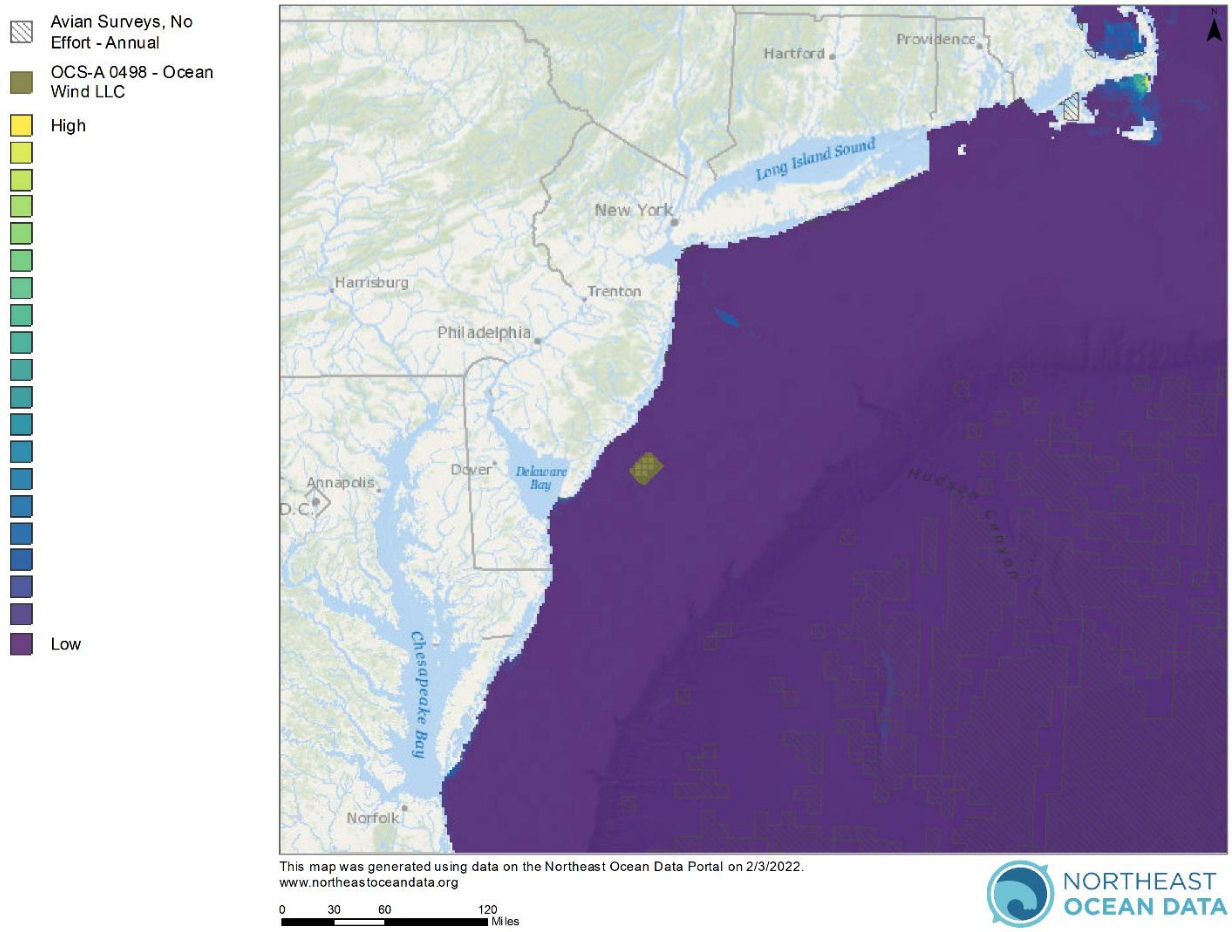
Figure 4-9 Predicted Seasonal (Spring) Relative Density of Roseate Terns, with the Ocean Wind 1 Lease Area Shown for Reference[7]

[7] Note: Abundance model results are the long-term average relative number of individuals per unit area. Source data used to create the models are from January 1978 through October 2016. Model resolution is 2km x 2km grid cells, and models were generated with an original extent of approximately the entire U.S. east coast Exclusive Economic Zone. For more information about the modeling methodology and data sources used, see the *MDAT Technical Report on the Methods and Development of Marine-life Data to Support Regional Ocean Planning and Management* (Curtice et al. 2018).



Source: MARCO 2022

Figure 4-10 Predicted Seasonal (Summer) Relative Density of Roseate Terns, with the Ocean Wind 1 Lease Area Shown for Reference



Source: MARCO 2022

Figure 4-11 Predicted Seasonal (Fall) Relative Density of Roseate Terns, with the Ocean Wind 1 Lease Area Shown for Reference

4.7. EASTERN BLACK RAIL

4.7.1 SPECIES DESCRIPTION

The eastern black rail is a small and secretive marsh bird that inhabits coastal high marshes and freshwater wetlands throughout eastern North America. The subspecies (of four recognized in North America) was listed under the ESA as "Threatened" in 2020 with a 4(d) rule specifying certain prohibitions on and exceptions to allowable "take" under the ESA; the USFWS further determined that the designation of critical habitat for the eastern black rail was not prudent (85 FR 63764).

Adult eastern black rails are generally blackish-gray and finely barred or spotted with white, with a small black bill and noticeably bright red eyes. Males are generally darker in color than females (USFWS 2019b). Because of its nocturnal habits and preference to stay hidden from view among dense marsh grasses, very little is known about the eastern black rail, including its population structure and dynamics (USFWS 2019b).

Eastern black rail habitat includes extensive areas of salt marsh dominated by saltmeadow cordgrass (*Spartina patens*) and saltgrass (*Distichlis spicata*) that attain heights of 18 to 24 inches (46 to 61 cm) and are bent over by wind and rain to form dense recumbent mats that are supported by stems below; this provides the dense cover they prefer (Watts 2016). Eastern black rail habitat within the Action Area consists of tidal salt marshes, mostly along the mainland (western) shorelines of the back bays/sound and occasionally on the lee (i.e., sound) side of coastal barrier islands. Wintering habitat for eastern black rails is thought to be similar to breeding habitat, with a slight shift south. Eastern black rails in New Jersey are migratory; they winter further south, from the Carolinas to Florida and also in the Caribbean and Central America (Eddleman et al. 2020). Migration of eastern black rails is poorly understood (83 FR 50610), but they are assumed to migrate over land and there is no evidence of them making long-distance flights offshore. Peak spring migration occurs in mid-March to early May, and peak fall migration occurs from mid-September through the end of October, but observations and communications tower mortality data indicate that there are no apparent concentrated migration routes in either spring or fall (Watts 2016; USFWS 2019b). Nesting in eastern black rails extends for from mid-May through mid-August (Watts 2021). The periods of greatest concern for eastern black rails are during territory establishment, courtship, nesting, chick-rearing, and a post-breeding molt when adults are flightless. Based on other available data, the dates are: April 1 to April 30 for territory establishment and courtship; May 1 to August 31 for nesting and chick rearing; and August 15 to September 15 for post-breeding molt (W. Walsh, personal communication, April 11, 2022).

According to the listing rule (85 FR 63764), the primary threats to eastern black rail are (1) habitat fragmentation and conversion, resulting in the loss of wetland habitats across the range; (2) sea level rise and tidal flooding; (3) land management practices (i.e., incompatible fire management practices, grazing, and haying/mowing/other mechanical treatment activities); and (4) stochastic events (e.g., extreme flooding, hurricanes). Human disturbance, including birders using excessive playback calls of black rail vocalizations, is also a concern for the species. Additional stressors to the species include oil and chemical spills and other environmental contaminants; disease, specifically West Nile virus; and predation and altered food webs resulting from invasive species (fire ants, feral pigs, nutria, mongoose, and exotic reptiles) introductions (USFWS 2019b). The greatest current threat to black rails in New Jersey is the loss of breeding sites due to ongoing sea level rise (Watts 2016).

Prohibitions under the 4(d) rule include: purposeful "take" of eastern black rail, to include capture, handling, or other activities; incidental take from prescribed burns (unless utilizing best management practices [BMPs]), mowing, haying, and other mechanical treatment activities in the bird's habitat during the nesting or brooding periods; and grazing on public lands that occur in the bird's habitat and do not support the maintenance of dense overhead cover in at least 50% of habitat in any given calendar year. Although the eastern black rail is one of 72 species populations (out of 177 species on the Atlantic OCS) ranked "medium" in relative vulnerability to collision with wind turbines (Robinson Willmott et al. 2013), the potential effects of offshore wind turbines was not listed as one of the nine factors that USFWS (2019b) considered to potentially affect the viability of the eastern black rail.

Additional information about the eastern black rail can be found on the USFWS ECOS species profile, USFWS (2019b) Species Status Assessment Report, and the USFWS (2022f) species information website.

4.7.2 Eastern Black Rail in the Action Area

Eastern black rails that reside in northern latitudes migrate and overwinter at locations further south. The recent breeding range of eastern black rail extends from Virginia up the Atlantic coast to Ocean County, New Jersey. New Jersey has the largest number and longest running record of black rail observations of any state throughout the species' range (Watts 2016). Historic breeding has been confirmed in seven New Jersey counties, including in Ocean and Cape May Counties. Based on a recent (2015-2016) survey, the estimated population for New Jersey is 40 to 60 breeding pairs (Watts 2016). A comparison of available information from survey areas in New Jersey between 1988 and 1992 and again between 2014 and 2016 suggests a steep population decline; occupancy of surveyed sites has declined by more than 60% and the number of rails detected declined by more than 70%. The USFWS assumes the species is present in many areas where they were once detected in the past (W. Walsh, personal communication, April 11, 2022).

Little is known about the migration behavior of eastern black rail (USFWS 2019b, 85 FR 63764). Peak spring migration occurs in mid-April to early May, and peak fall migration occurs from mid-September through the end of October, but observations and communications tower mortality data indicate that there are no apparent concentrated migration routes in either spring or fall (Watts 2015; USFWS 2019b). During the breeding and wintering seasons, eastern black rails have limited ability to fly long distances; and only a portion of the subspecies flies long distances during spring and fall migration (USFWS 2019b). There is no evidence suggesting that they would be expected to occur within the Ocean Wind 1 Lease Area.

A desktop habitat assessment was conducted to identify suitable habitat for eastern black rails within all onshore portions of the project (see Appendix C). In the Oyster Creek area, four wetlands were found to be potentially suitable habitat for eastern black rail (identified as Wetlands J, I, A, and E in the habitat assessment). The wetlands are characterized as both high and low marsh wetland habitat with vegetation that includes smooth cordgrass, saltmeadow cordgrass, and some common reed. However, the proposed project activities would not cross within or be situated adjacent to these four wetlands. In the BL England area, four wetlands were found to be potentially suitable habitat for eastern black rail (identified as Wetlands A, B, C, and

LOI Coastal Wetlands). The vegetation in the four wetlands is dominated by *Spartina* species, with some common reed. However, due to the proximity of the wetlands to roadways and infrastructure, the potential value of these wetlands is diminished. Overall, the assessment found that, based on (1) the predominantly unsuitable habitat in the Oyster Creek area and (2) avoidance of wetlands through HDD installation and co-location of the BL England export cable route within Roosevelt Boulevard, a field habitat assessment was not warranted.

In the BL England area, the proposed onshore export cable would be buried along Roosevelt Boulevard (County Route 623) between Marmora and Ocean City. On the east side of the bridge over Peck Bay/Crook Horn Creek, the cable would run adjacent to and south of a patch of salt marsh habitat for approximately 3,000 feet. According to the Atlantic Coast Joint Venture (ACJV 2020a), this patch contains approximately 30 acres of high marsh, which may be suitable for eastern black rails. On the west side of the Roosevelt Boulevard bridge over Peck Bay/Crook Horn Creek, the cable would run adjacent to and between two patches of salt marsh habitat for approximately 3,500 feet. The salt marsh patch to the north of the road contains approximately 360 acres of high marsh habitat. The salt marsh patch to the south of the road contains approximately 2,750 acres of high marsh habitat (SHARP 2017). These salt marsh patches are all categorized as "reference" marshes, defined as those in near-pristine condition that can act as reference marshes for restoration efforts in New Jersey (ACJV 2020a). In addition, there is a large expanse of salt marsh habitat approximately 500 feet to the west of the proposed BL England substation parcel that contains approximately 2,380 acres of high marsh habitat (SHARP 2017).

In the Oyster Creek area, the preferred landfall (Holtec Property) and route for the Oyster Creek onshore export cable would traverse approximately 2,000 feet of salt marsh habitat but would use previously disturbed areas and follow abandoned roadways through the marsh habitat (see Figure 2-3).

Although suitable habitat exists within the marshes surrounding both the BL England and Oyster Creek areas, there are no reported recent occurrences of eastern black rail in the vicinity of the Action Area (NJDEP 2018, 2019). There are breeding records of eastern black rail along the Delaware Bay shoreline in Cape May County, but precise locations and dates are unknown, and no recent occurrences are reported in the vicinity of the BL England area (eBird 2022).[8] In Ocean County, there are two breeding observations, one in Little Egg Harbor and another in Barnegat Bay in the vicinity of the Oyster Creek area; however, precise locations and dates are unknown (eBird 2022).[7] Watts (2016) reported no confirmed breeding in New Jersey, and recent maps of the species' current range (ACJV 2020b) show that it does not occur north of southern New Jersey, in the vicinity of the BL England area (i.e., Cape May County). However, USFWS (2019b) indicates that both Cape May and Ocean County contain "probable" breeding pairs. They suggest that there are recent occurrences within 4 miles of Oyster Creek and within 2 miles of BL England (W. Walsh, personal communication, April 11, 2022). The NJDEP initiated focused eastern black rail surveys in 2015. In 2015 and 2016, low numbers of eastern black rails were detected across New Jersey, but in recent years, no black rails have been detected at any of the previously surveyed points, even at locations that previously had detections (NJDEP 2018). Although the NJDEP surveys are not comprehensive of all suitable habitat in New Jersey, it would be expected that

[8] Ebird masks the data for eastern black rail because it is such a sensitive species and so highly sought by birders (W. Walsh, personal communication, April 11, 2022).

some detections of black rail would be made if an intact population remained in the state (NJDEP 2019). Nevertheless, detection rates are very low, even using playback in areas known to be occupied; therefore, any suitable marsh habitat within the species' range should be considered potentially occupied (W. Walsh, personal communication, April 11, 2022).

4.8. SALTMARSH SPARROW

4.8.1 Species Description

The saltmarsh sparrow is not federally listed under the ESA; USFWS kicked off the decision-making process in 2019, but switched course and said it would put off reviewing the species for listing under the ESA until 2023. The saltmarsh sparrow is categorized as a Species of Special Concern in New Jersey and is also not yet listed as endangered or threatened in the state. A recent status review by the State of New Jersey recommended a breeding season status upgrade to Threatened (ACJV 2022). This species is not required to be analyzed for ESA Section 7 consultation, but is evaluated here to streamline consultation should this species become listed in the future. Because the saltmarsh sparrow is not listed under the ESA, no critical habitat is designated for the species.

As its name implies, saltmarsh sparrow is an obligate species of tidal marshes. It prefers high marsh habitat, dominated by saltmeadow cordgrass, as well as saltgrass and saltmarsh rush (*Juncus gerardii*), and nests in drier supratidal areas that do not flood as frequently as low marsh. The saltmarsh sparrow breeds along the northeastern coast, from Maine to the Chesapeake Bay, and winters along the southeastern coast, from Maryland and Virginia south to Florida. North of this range, early winter numbers are variable and a few birds sometimes occur in late December in New Jersey, in Cape May and Cumberland counties (Greenlaw et al. 2020).

The breeding season for saltmarsh sparrow in New Jersey begins in early May and lasts until late August (CWF 2022b). Timing of spring departure of few wintering individuals from Virginia north to New Jersey are poorly documented, but one "extreme" date provided by as June 3 in Maryland. In western shore marshes of Chesapeake Bay in Virginia, where the species formerly bred, recent fieldwork indicated that nearly all individuals had departed for breeding grounds in New Jersey by June 10 (Greenlaw et al. 2020).

Available data on population trends for saltmarsh sparrow suggest that loss of coastal marsh habitat over the past century has resulted in population reductions with local extirpations and over 80% of the population disappearing in just the last 25 years. At the observed rate of decline of 9% per year, the population has presumably shrunk from ~60,000 individuals (in 2011/2012) to fewer than 30,000 currently (Hartley and Weldon 2020).

Habitat loss and impacts on habitat quality due to draining, ditching, and pollution of salt marsh habitat have caused some populations of this species to decline. Increased human recreational activities at coastal marshes also threatens this species (CWF 2022b). Sea level rise also threatens the shrink the available saltmarsh sparrow nesting habitat in New Jersey and the high marsh saltmeadow cordgrass is increasingly occupied by the taller smooth cordgrass (*Spartina alterniflora*) (Hartley and Weldon 2020). While nest flooding is the primary limiting factor for saltmarsh sparrows across their breeding range, nest depredation was the greatest cause of nest loss in one study in southern New Jersey (Roberts et al. 2017) and is thought to increase from north to south (Hartley and Weldon 2020).

Additional information regarding the saltmarsh sparrow can be found on the USFWS ECOS species profile and the USFWS (2022g) species information website.

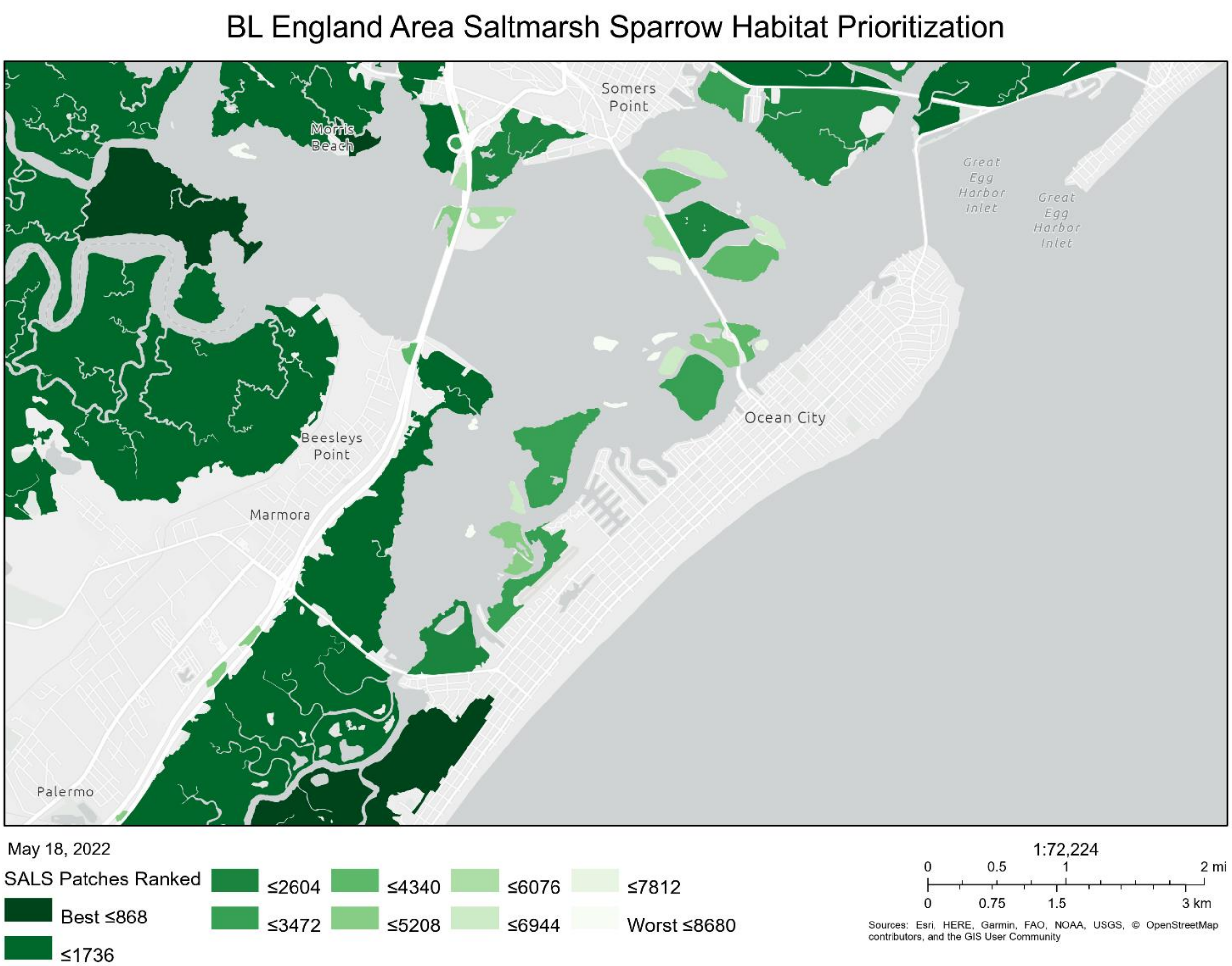
4.8.2 Saltmarsh Sparrow in the Action Area

In 2011/2012, New Jersey contained approximately one-third of all breeding saltmarsh sparrows with a breeding population estimate of 19,900 ± 13,600 (Hartley and Weldon 2020). The New Jersey Saltmarsh Habitat and Avian Research Program reported that New Jersey has the highest abundance in northeast region, at 33% of the northeast regional population (SHARP 2016; ACJV 2022). This proportional population estimate generally agrees with the range-wide population estimate by Wiest et al. (2016) of 53,000 Saltmarsh Sparrows (95% CI = 37,000-69,000). The species has been declining at an alarming rate of 9% per year since the 1990s (ACJV 2020c).

A desktop habitat assessment was conducted to identify suitable habitat for saltmarsh sparrows within all onshore portions of the Project. In the Oyster Creek area, four wetlands were found to be potentially suitable habitat for saltmarsh sparrow (identified as Wetlands J, I, A, and E in the habitat assessment). The wetlands are characterized as both high and low marsh wetland habitat with vegetation that includes smooth cordgrass, saltmeadow cordgrass, and some common reed. However, the proposed project activities would not cross within or be situated adjacent to these four wetlands. In the BL England area, four wetlands were found to be potentially suitable habitat for saltmarsh sparrow (identified as Wetlands A, B, C, and LOI Coastal Wetlands). The vegetation in the four wetlands is dominated by *Spartina* species, with some common reed. However, due to the proximity of the wetlands to roadways and infrastructure, the potential value of these wetlands is diminished. Overall, the assessment found that, based on (1) the predominantly unsuitable habitat in the Oyster Creek area and (2) avoidance of wetlands through HDD installation and co-location of the BL England export cable route within Roosevelt Boulevard, a field habitat assessment was not warranted.

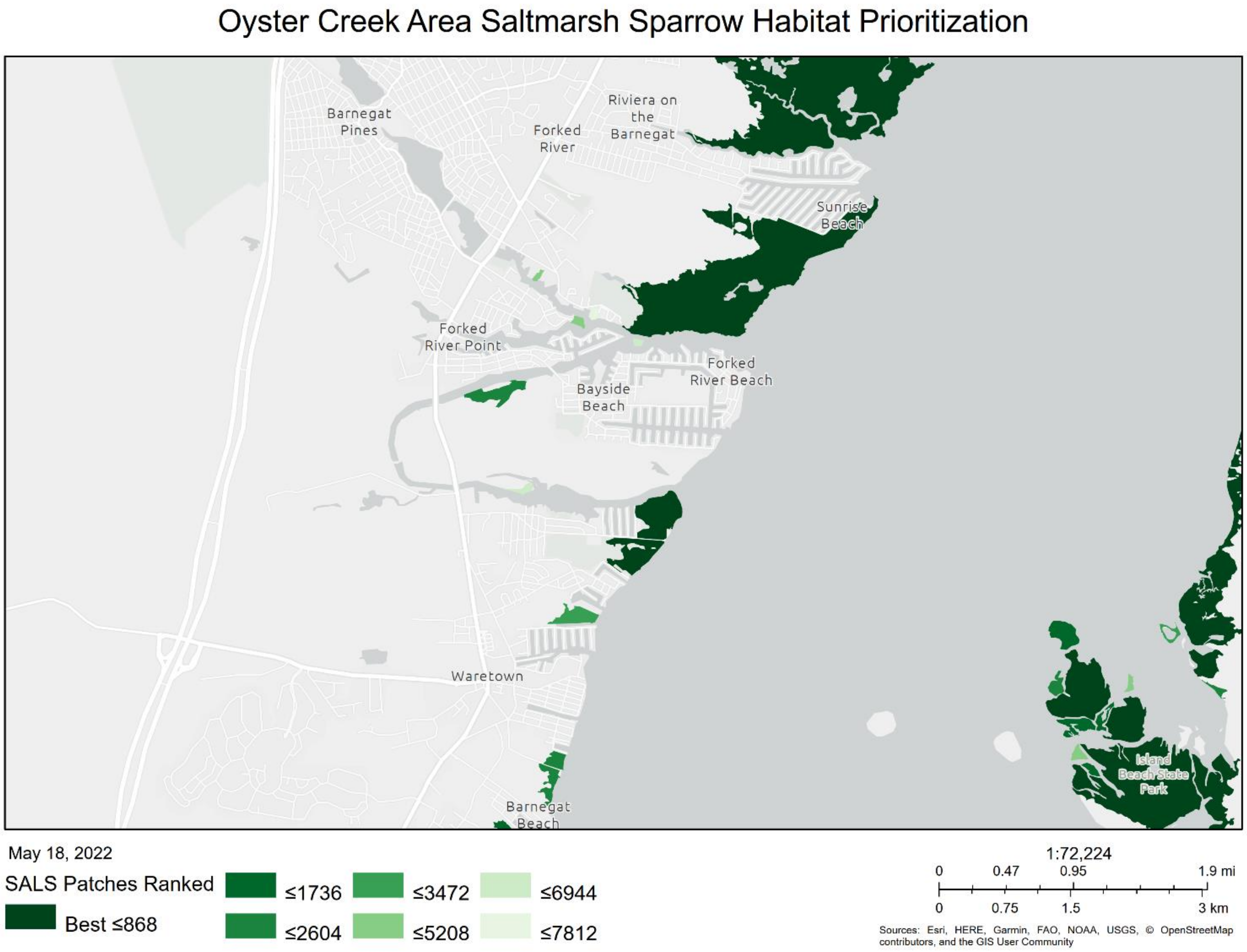
Suitable saltmarsh sparrow habitat in the Action Area occurs within high marsh areas of salt marsh habitat patches as described above for the eastern black rail. In the BL England area, the patch of salt marsh habitat on the east side of the Roosevelt Boulevard bridge, which contains approximately 30 acres of high marsh, is ranked 2,542 out of 8,680 salt marsh habitat patches in the saltmarsh sparrow breeding range for its potential to support the species in the near and long term (Figure 4-12; ACJV 2020a). On the west side of the Roosevelt Boulevard bridge, the patch of salt marsh to the north of the road, which contains approximately 360 acres of high marsh habitat, ranks it as 992 out of 8,680 salt marsh habitat patches in the saltmarsh sparrow breeding range for its potential to support the species (Figure 4-12; ACJV 2020a). The salt marsh patch to the south of the road, which contains approximately 2,750 acres of high marsh habitat, is ranked as 1,267 out of 8,680 salt marsh habitat patches in the saltmarsh sparrow breeding range for its potential to support the species Figure 4-12; ACJV 2020a). The salt marsh habitat approximately 500 feet to the west of the proposed BL England substation parcel, which contains approximately 2,380 acres of high marsh habitat, is ranked as 1,444 out of 8,680 salt marsh habitat patches in the saltmarsh sparrow breeding range for its potential to support the species (Figure 4-12; ACJV 2020a). There are no eBird (2022) observations of saltmarsh sparrow within these areas. The nearest observations are in Great Egg Harbor Bay around Cowpens Island.

In the Oyster Creek area, the Atlantic Coat Joint Venture (ACJV) (2020a) does not identify any priority salt marsh habitat patches in the immediate vicinity of this route. However, approximately 1 mile north of this landfall, to the north of Forked River, there is a high priority patch of salt marsh with confirmed saltmarsh sparrow breeding (Figure 4-13). The ACJV (2020a) ranks this patch as a very high priority (249 out of 8,680) salt marsh habitat patch in the saltmarsh sparrow breeding range for its potential to support the species in the near and long term. The saltmarsh sparrow observations from eBird (2022) in the vicinity of the Oyster Creek area are limited to six recent (2020 and 2021) observations of saltmarsh sparrow at Bay Parkway, where it ends near Sands Point Harbor (Barnegat Bay). There are also several dozen saltmarsh sparrow observations from Island Beach State Park in eBird (2022), although the specific locations are unknown and suitable habitat is limited to a strip of marsh habitat less than 700 feet wide along the bay (western) shoreline.



Source: ACJV 2020a
Notes:
Rankings are based on factors known or likely to affect populations like Phragmites occurrence and predicted ability for marshes to migrate with sea level rise.
Project shapefiles provided to USFWS on April 19, 2022.

Figure 4-12 Prioritized salt marsh patches in the BL England area, from most to least important for saltmarsh sparrow conservation



Source: ACJV 2020a
Notes:
Rankings are based on factors known or likely to affect populations like Phragmites occurrence and predicted ability for marshes to migrate with sea level rise.
Project shapefiles provided to USFWS on April 19, 2022

Figure 4-13 Prioritized salt marsh patches in the Oyster Creek area, from most to least important for saltmarsh sparrow conservation

4.9. BOG TURTLE

4.9.1 SPECIES DESCRIPTION

The bog turtle is one of the smallest turtles in North America and was listed under the ESA as "Threatened" in 1997 (62 FR 59605). The northern population ranges from Maryland and Massachusetts. The bog turtle occupies wetland habitat that is generally spring- or groundwater-fed, open-canopy, herbaceous meadows between drier upland areas and more thickly vegetated, wetter, wooded swamp or marsh. This includes well-drained calcareous fens, sphagnum bogs, and wet grassy pastures with soft, thick, mucky substrates and tussock-forming herbaceous vegetation. Open areas are required for basking and nesting. Emergent wetland areas recently or currently used as pastures are common places to find bog turtles as grazing maintains open areas and keeps the ground soft.

Unlike other turtle species, bog turtle home ranges are small, and the turtles rarely leave the marsh to forage in upland areas. The bog turtle is highly susceptible to habitat loss, degradation, and fragmentation, as well as collection for the wildlife trade (62 FR 59605). Bog turtles were formerly known to occur in 18 counties in New Jersey, but now are found in 13. Most are found within the Delaware and Susquehanna River watersheds (USFWS 2001). Critical habitat has not been designated for this species because identifying site locations could serve to facilitate and exacerbate illegal collection of bog turtles.

Additional information regarding the bog turtle can be found on the USFWS ECOS species profile and the USFWS (2022h) species information website.

4.9.2 BOG TURTLE IN THE ACTION AREA

The bog turtle historically occurred in Cape May County (USFWS 2013, 2020g) but is believed to be extirpated (USFWS 2001); thus, it is not expected to occur in the BL England area. There are extant populations in Ocean County (USFWS 2001, 2020g); however, according to USFWS (2013), there are no known occurrences of bog turtle, either extant or historic, in Berkeley, Lacey, or Ocean Townships, Ocean County, where the Oyster Creek area occurs.

Suitable habitat for the ESA-listed bog turtle does not occur in the BL England or Oyster Creek areas, including the onshore cable landfall sites, export cable routes, or substation area. The proposed landfall sites and cable route corridors are highly developed, and the coastal wetlands boulevard contains brackish water, whereas bog turtles are only present in freshwater wetlands with specific habitats features as described above.

Due to absence of bog turtles and the lack of suitable habitat in the Action Area, the Proposed Action would have ***no effect*** on the bog turtle. Therefore, this BA does not discuss the species any further.

4.10. MONARCH BUTTERFLY

4.10.1 SPECIES DESCRIPTION

The monarch butterfly occurs throughout the United States during the summer months and is a "Candidate" species for federal listing. Monarch butterfly populations east of the Rocky Mountains, which is the largest of all populations, have declined by over 90% in the last three decades (CBD et al. 2014; Xerces 2020). USFWS (2020h) estimated the Eastern North American population's probability of extinction in 60 years under current conditions ranges from 48% to 69%. The USFWS determined in 2020 that listing the monarch butterfly as an endangered or threatened species is warranted but precluded by higher priority actions (85 FR 81813). Candidate species are not required to be analyzed for ESA Section 7 consultation, but the monarch butterfly is evaluated here to streamline consultation should this species become listed in the future. Because the monarch butterfly is not listed under the ESA, no critical habitat is designated for the species.

Monarchs are milkweed (*Asclepias* spp.) specialists. Adults lay eggs, and larva feed almost exclusively on milkweed, while the butterflies feed on nectar from various flowers. East of the Rocky Mountains, most monarch butterflies migrate north in successive generations from overwintering areas in central Mexico to as far north as southern Canada. As they migrate north, monarch butterflies mate and deposit their eggs and die. The offspring typically survive 2 to 5 weeks in the adult stage, moving north generation-by-generation as temperatures warm and plants flower. After three to four generations, the population reaches the northern United States and southern Canada; the final generation makes the return migration in the fall to overwintering sites. Unlike previous generations, the last generation of each year lives for 6 to 9 months over winter and begins the multi-generational migration the following spring. (NJDEP 2017)

Threats identified in the petition to list monarch butterflies include loss and degradation of habitat and loss of milkweed resulting from herbicide application, conversion of grasslands to cropland, loss to development and aggressive roadside management, loss of winter habitats from logging, forest disease, and climate change (CBD et al. 2014). The reduced availability, spatial distribution, and quality of milkweed and nectar plants associated with breeding and use of insecticides are most responsible for their decline (85 FR 81813).

Additional information regarding the monarch butterfly is available on the USFWS ECOS species profile and the USFWS (2022i) species information website.

4.10.2 Monarch Butterfly in the Action Area

Suitable habitat is present within the onshore portion of the Action Area. During the spring, summer, and fall, the species may be found anywhere that milkweed and an abundance of native nectar plants occur. During their southward migration in fall, monarch butterflies rest and refuel at stopover sites like Cape May, New Jersey (Walton and Brower 1996; NJDEP 2017). Daily census counts at Cape May from 1992 to 2019 show that the average number of monarch butterflies counted per hour during 9 census weeks fluctuates from year to year, from a high of 360 in 1999 to a low of 9 in 2004 (New Jersey Audubon 2019).

Due to the presence of suitable habitat and likely occurrence of monarch butterfly within the Action Area, potential effects to the species are discussed in Section 5 of this BA.

4.11. AMERICAN CHAFFSEED

4.11.1 Species Description

American chaffseed (*Schwalbea americana*) is a hemiparasitic herb, a plant that obtains some nourishment from other plants while also gaining some energy via photosynthesis. It was listed under the ESA as "Endangered" in 1992 (57 FR 44703). It occurs in highly diverse communities consisting of grasses, sedges, and savanna dicots. It is mainly found in early successional habitats described as open, moist pine flatwoods, fire-maintained savannas, ecotonal areas between peaty wetlands and dry sandy soils, bog borders, and other open grass-sedge systems. This species is dependent on fire, mowing, or fluctuating water tables to maintain the open to partly open conditions it requires. No critical habitat has been designated for American chaffseed.

There are historic records of American chaffseed across the Atlantic and Gulf Coastal Plains from Massachusetts to Louisiana, and inland states of Tennessee and Kentucky. When American chaffseed was listed in 1992, it was believed to have been extirpated from New York, Massachusetts, Delaware, Connecticut, Maryland, Virginia, Tennessee, Kentucky, Texas, and Mississippi. The current distribution is believed to be limited to 43 populations in Alabama, Florida, Georgia, Louisiana, Massachusetts, New Jersey, North Carolina, and South Carolina (USFWS 2018). The greatest threats to American chaffseed are fire suppression and competition from other plant species in the absence of fire. A fire-return interval of 1 to 3 years is needed to support viable populations, and across its range, the largest, healthiest populations are where there is annual burning. Additional threats include habitat destruction due to land development (USFWS 2018).

Additional information about American chaffseed can be found on the USFWS ECOS species profile and the USFWS (2022j) species information website.

4.11.2 American Chaffseed in the Action Area

There are no known occurrences of American chaffseed, either extant or historic, within the townships where the BL England and Oyster Creek areas occur (USFWS 2013). The Natural Heritage Grid Map indicates that there are no known American chaffseed occurrences within either area (NJDEP 2021). Suitable habitat for American chaffseed (fire-maintained or regularly mowed longleaf pine flatwoods and savannas) is not likely to occur within either the BL England or Oyster Creek areas (USFWS 1995, 2018). Based on habitats present in the onshore project area and American chaffseed being a successional fire-dependent species, the species is not believed to be present in the vicinity of the project. There has been no evidence observed during any site visit of recent fires. Appendix C-4, shows a representative photograph log and locations maps of the onshore project area.

American chaffseed is believed to be extirpated from Point Pleasant Beach Borough. There are potential occurrences in Manchester and Plumsted townships in Ocean County. In Cape May County, there are historic occurrences in Lower and Middle Townships (USFWS 2013). The two known populations in New Jersey occur in Burlington County, one at historic Whitesbog in Brendan T. Byrne State Forest in Pemberton Township; and the another a reintroduced population at Franklin Parker Preserve in Woodland and Tabernacle Townships (USFWS 2018).

Despite the species' likely absence from the Action Area and the lack of suitable habitat, potential effects to American chaffseed are discussed in Section 5 of this BA.

4.12. KNIESKERN'S BEAKED-RUSH

4.12.1 Species Description

Knieskern's beaked-rush (*Rhynchospora knieskernii*) is an obligate sedge that is endemic to the Pinelands region of New Jersey. The species was listed under the ESA as "Threatened" in 1991

(56 FR 32978). The rush occurs in early successional wetland habitats, often on bog-iron substrates adjacent to slow-moving streams in the Pinelands region (NJFW 2018). It is intolerant of shade and competition, especially from woody species, and is sometimes found on relatively bare substrates. This species is also found in abandoned borrow pits, clay pits, ditches, ROWs, and unimproved roads that exhibit similar early successional stages due to water fluctuation or periodic disturbance from vehicles, mowing, or fire.

At the time of listing, there were 34 known extant populations of Knieskern's beaked-rush in five counties in New Jersey; 14 historical populations were presumed extirpated (USFWS 1993). Originally, the primary threat to the species was the loss of wetlands to urban and agricultural development. However, state and federal wetland protection laws have reduced the loss of wetlands over time such that currently, vegetative succession is a major factor threatening Knieskern's beaked-rush (USFWS 1993).

Additional information about Knieskern's beaked-rush be found on the USFWS ECOS species profile and the USFWS (2022k) species information website.

4.12.2 Knieskern's Beaked-Rush in the Action Area

The NJDEP (2021) Natural Heritage Grid Map indicates that there are no known Knieskern's beaked-rush occurrences within either the BL England or Oyster Creek areas. However, there are potential occurrences of Knieskern's beaked-rush in Cape May County, including Upper Township, in the vicinity of where the BL England area occurs (USFWS 2013). However, wetland habitats that would provide suitable habitat for Knieskern's beaked-rush do not occur within the BL England area.

There are extant populations of Knieskern's beaked-rush in Lacey and Berkeley Townships and potential occurrences in Ocean Township, Ocean County, in the vicinity of where the Oyster Creek area occurs. There are also extant or potential occurrences in 18 of 34 other townships/boroughs in Ocean County (USFWS 2013). Wetlands within the Holtec Property and Bay Parkway landfall sites may provide suitable habitat for Knieskern's beaked-rush. The U.S. Nuclear Regulatory Commission (2007 citing USFWS 2005) reported that the species is known to occur within 1.5 miles (2.4 km) of the Oyster Creek Generating Station. There are known Knieskern's beaked-rush in this general vicinity (on the west end of the Oyster Creek area and extending past the parkway) (W. Walsh, personal communication, April 11, 2022). Thus, the species may occur on isolated early successional wetland habitats of the Oyster Creek area.

Due to the presence of suitable habitat within the Oyster Creek area, potential effects to Knieskern's beaked-rush are discussed in Section 5 of this BA. A survey of suitable habitat for Knieskern's beaked rush within the Project area was conducted in July 2021 by qualified biologists following USFWS New Jersey Field Office guidance (Appendix C). No specimens were observed.

4.13. SEABEACH AMARANTH

4.13.1 Species Description

Seabeach amaranth (*Amaranthus pumilus*) is an annual plant found along Atlantic coast beaches and barrier islands. It was listed under the ESA as "Threatened" in 1993 (58 FR 18035). Seabeach amaranth has stems that are fleshy and pinkish-red or red, with small, rounded leaves.

Flowers and fruits are relatively inconspicuous, borne in clusters along the stems. Germination occurs over a relatively long period of time, generally from mid-May and continuing through July. Seabeach amaranth plants typically may grow as large one meter (3.3 feet) in width but a large plant for New Jersey is about one foot (30 cm) wide and a typical plant is 0.13 to 0.33 inches (4 to 10 cm) (W. Walsh, personal communication, April 11, 2022). Flowering begins as early as June, but more typically in July, and continues until the death of the plant in late fall.

Seabeach amaranth habitat consists of overwash flats at the accreting ends of islands that accumulate more sand, and lower developing dunes and upper strands of non-eroding beaches. The plant grows on a nearly pure sand substrate, occasionally with shell fragments mixed in, above the high-tide line and is intolerant of even occasional flooding during its growing season. It occasionally establishes small temporary populations in other habitats, including sound-side beaches, overwash areas in developing dunes, and sand and shell material placed as beach replenishment or dredge spoil. Seabeach amaranth appears to be intolerant of competition and does not occur on well-vegetated sites (USFWS 2019d).

Historically, seabeach amaranth occurred in nine states along the northeast and Mid-Atlantic coast from Massachusetts to South Carolina (excluding Connecticut). Natural populations of seabeach amaranth currently occur in New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, and South Carolina. Populations have also been introduced in most of these states, and in Massachusetts (W. Walsh, personal communication, April 11, 2022). Threats to the species include coastal development, sea level rise, beach stabilization structures, and recreation such as beach driving and pedestrian traffic. Herbivory by webworms, deer, and feral horses may harm seabeach amaranth plants. Tropical storms and nor'easters can inundate or wash away plants before they set seeds (USFWS 2019d).

Additional information about Seabeach amaranth can be found on the USFWS ECOS species profile and the USFWS (2022l) species information website.

4.13.2 Seabeach Amaranth in the Action Area

The Natural Heritage Grid Map indicates that there are no known seabeach amaranth occurrences within either the BL England or Oyster Creek areas (NJDEP 2021). Suitable habitat for seabeach amaranth is present along Ocean City beaches within the upper beach zone, above the high-tide line. There are extant occurrences of seabeach amaranth in Upper and Ocean City Townships, Cape May County, in the vicinity of where the BL England area occurs. There are also extant or potential occurrences in nearly all (11 of 13) other townships/boroughs in Cape May County (USFWS 2013). After making landfall on the mainland in the BL England area, there is no suitable beach habitat for seabeach amaranth along the onshore export cable route. There are no concerns for seabeach amaranth at the BL England substation location or along the onshore cable route (W. Walsh, personal communication, April 11, 2022).

In the vicinity of the Oyster Creek area, there are also no known occurrences of seabeach amaranth, either extant or historic, in Lacey Township, but there are extant occurrences in Berkeley Township, Ocean County (USFWS 2013). There are extant or potential occurrences in approximately 50% (18 of 34) of the other townships/boroughs in Ocean County (USFWS 2013). Suitable habitat for seabeach amaranth is present at Island Beach State Park and along the coastline within the upper beach zone, above the high-tide line. At Island Beach State Park in 2019, there were 1,591 seabeach amaranth plants in 2019, a more than 500% increase from the

2018 total of 307 plants (CWF 2019). However, after making landfall on the mainland in the Oyster Creek area, the onshore export cable route would contain no supporting beach habitat for seabeach amaranth. There are no concerns for seabeach amaranth at the Oyster Creek substation location or along the onshore cable route (W. Walsh, personal communication, April 11, 2022).

Due to the potential presence of seabeach amaranth along the coastline within the upper beach zone within the Action Area, potential effects to seabeach amaranth are discussed in Section 5 of this BA.

4.14. SENSITIVE JOINT-VETCH

4.14.1 Species Description

The sensitive joint-vetch (*Aeschynomene virginica*) is an annual legume that grows to a height of 6 feet (1.8 meters) with yellow, pea-type flowers growing on clusters (racemes) on short, lateral branches. The leaves are touch-sensitive, folding when touched. The sensitive joint-vetch was listed under the ESA as "Threatened" in 1992 (57 FR 21569). The sensitive joint-vetch inhabits the intertidal zone of fresh to slightly salty (brackish) tidal rivers, typically in areas where sediments accumulate and extensive marshes are formed (USFWS 2014b). These tidal marshes are subjected to a cycle of twice-daily flooding that most plants cannot tolerate. Such habitats only occur along stretches of river close enough to the coast to be influenced by the tides, yet far enough upstream that river water is fresh or only slightly brackish. It requires bare or sparsely vegetated substrate and usually grows on riverbanks within 6 feet (1.8 meters) of the low water mark. It can also occur on accreting point bars and in sparsely vegetated microhabitats of tidal marsh interiors. Sensitive joint-vetch is typically found in areas where plant diversity is high and annual species are prevalent. Germination occurs from late May to early June and plants flower from July through September and October.

Threats to sensitive joint-vetch include dredging and filling of marshes, dam construction, shoreline stabilization, commercial and residential development, sedimentation, impoundments, water withdrawal projects, invasive plants, introduced insect pests, pollution, recreational activities, agricultural activities, mining, timber harvest, and salt water intrusion due to sea level rise (USFWS 2014b).

Additional information about sensitive joint-vetch can be found on the USFWS ECOS species profile and the USFWS (2022m) species information website.

4.14.2 Sensitive Joint-Vetch in the Action Area

The Natural Heritage Grid Map indicates that there are no known sensitive joint-vetch occurrences within either the BL England or Oyster Creek areas (NJDEP 2021). There are no known occurrences of sensitive joint-vetch, either extant or historic, in Upper and Ocean City Townships, Cape May County (USFWS 2013), in the vicinity of where the BL England area occurs. Elsewhere in Cape May County, there is one known extirpated occurrence in Cape May City (USFWS 2013). Also, there is a historic occurrence well upstream of BL England along the Great Egg Harbor River. However, wetlands in the BL England site would be too salty to provide suitable habitat, which is supported by a species distribution model that does not predict any sensitive joint-vetch habitat in this area, or anywhere to the east along the cable route (W. Walsh, personal communication, April 11, 2022).

There are no known occurrences of sensitive joint-vetch, either extant or historic, in Lacey or Berkeley Townships, Ocean County, where the Oyster Creek area occurs, or in any other townships/boroughs in Ocean County (USFWS 2013). While the U.S. Nuclear Regulatory Commission (2007 citing USFWS 2005) reported that the species is known to occur within 2.8 miles (4.5 km) of the Oyster Creek Generating Station, Oyster Creek is outside of the USFWS IPaC range for the species, and there are no known occurrences in this part of the state, which is supported by a species distribution model (W. Walsh, personal communication, April 11, 2022).

Despite the species' likely absence from the Action Area and the lack of suitable habitat, potential effects to sensitive joint-vetch are discussed in Section 5 of this BA.

4.15. SWAMP PINK

4.15.1 Species Description

Swamp pink is a perennial, shade-tolerant, obligate wetland plant found in forested freshwater wetlands, such as Atlantic white cedar and red maple swamps (USFWS 2016b). Swamp pink is a member of the lily family with smooth, oblong, dark green leaves that form an evergreen rosette. It was listed under the ESA as "Threatened" in 1988 (53 FR 35076). In spring, some rosettes produce a flowering stalk that can grow over 3 feet (1 meter) tall. The stalk is topped by a 1- to 3-inch (2.5 to 7.6 cm) long cluster of 30 to 50 small, fragrant, pink flowers dotted with pale blue anthers. The evergreen leaves of swamp pink can be seen year-round, and flowering occurs between March and May.

Swamp pink is an obligate wetland species that occurs in a variety of palustrine forested wetlands, including swampy forested wetlands bordering meandering streamlets, headwater wetlands, sphagnous Atlantic white cedar swamps, and spring seepage areas. Specific hydrologic requirements limit its occurrence to areas with lateral groundwater movement that are perennially saturated, but not inundated. The species also requires a water table at or near the surface, with only slight fluctuations in water levels throughout the year. Swamp pink often grows on hummocks formed by trees, shrubs, and sphagnum moss. Swamp pink is a shade-tolerant plant and has been found growing in wetlands with canopy closure varying between 20% and 100%. Growth in sites with minimal canopy closure is less vigorous due in part to competition from other species. Over half of the known populations of swamp pink occur in New Jersey.

The primary threat to swamp pink today is deer herbivory (W. Walsh, personal communication, April 11, 2022); other threats include the indirect effects of off-site activities and development, such as pollution, introduction of invasive species, and subtle changes in groundwater and surface water hydrology. Hydrologic changes include increased sedimentation from off-site construction; groundwater withdrawals or diversion of surface water; reduced infiltration (recharge) of groundwater; increases in erosion; increases in the frequency, duration, and volume of flooding caused by direct discharges to wetlands (such as stormwater outfalls); and increased runoff from upstream development. Other threats to this species include direct destruction of habitat from wetland clearing, draining, and filling; collection; trampling; and climate change.

Additional information about swamp pink can be found on the USFWS ECOS species profile and the USFWS (2022n) species information website.

4.15.2 Swamp Pink in the Action Area

The Natural Heritage Grid Map indicates that there are no known swamp pink occurrences within either the BL England or Oyster Creek areas (NJDEP 2021). However, there are potential occurrences of swamp pink in Upper Township, Cape May County, in the vicinity of where the BL England area occurs. Elsewhere in Cape May County, there are extant or potential occurrences Dennis, Lower, and Middle townships, and Woodbine Borough (USFWS 2013). A known extant occurrence in Upper Township is approximately 7.5 miles (12 km) away and a closer occurrence in Egg Harbor Township, Atlantic County, is approximately 3 miles (4.8 km) away (W. Walsh, personal communication, April 11, 2022). Swamp pink is unlikely to occur within the BL England area because the proposed landfall sites, onshore export cable route, and substation area do not intersect suitable forested wetland habitat. However, there could be potentially suitable forested habitat within forested wetlands adjacent to the southern and eastern boundaries of the BL England substation parcel (W. Walsh, personal communication, April 11, 2022).

There are extant populations of swamp pink in Ocean and Lacey Township, Ocean County, where the Oyster Creek area occurs (USFWS 2013; W. Walsh, personal communication, April 11, 2022). There are also extant or potential occurrences in approximately 50% (18 of 34) of the other townships/boroughs in Ocean County. Wetlands within the Holtec Property and Bay Parkway landfall sites may provide suitable habitat for swamp pink. In addition, suitable habitat for swamp pink may exist within the wetlands adjacent to the southern boundary of the Oyster Creek substation parcel, which are identified as Atlantic white cedar swamps in the NJDEP mapping (W. Walsh, personal communication, April 11, 2022).

Due to the presence of suitable habitat within the Oyster Creek area, potential effects to swamp pink are discussed in Section 5 of this BA. A survey of suitable habitat for swamp pink (i.e., forested wetlands) within the Project area was conducted in April 2021 by qualified biologists following USFWS New Jersey Field Office guidance (Appendix C). No specimens were observed.

5. EFFECTS OF PROPOSED ACTION

This section analyzes the potential direct and indirect effects of the Proposed Action on 13 of 14 species identified above in Section 4 (excluding bog turtle) and summarizes the species or habitat that are likely to be adversely affected by the action (50 CFR § 402.12). This BA incorporates information by reference found in previous assessments of project-related impacts on these same species resulting from actions associated with the construction and O&M of offshore wind facilities that have been completed by BOEM, which includes BAs (BOEM 2016, 2018, 2020, 2021a) and other environmental assessments (BOEM 2012, 2013). In addition to this analysis, the Ocean Wind 1 COP, Volume III, Appendix H provides an "Assessment of the Potential Effects of the Ocean Wind Offshore Wind Farm on Birds & Bats," which is available on BOEM's website.

The potential stressors of the Proposed Action that have the potential to affect ESA-listed species under USFWS jurisdiction are summarized in Table 5-1.

Table 5-1 Stressors of the Proposed Action on ESA-Listed Species and their Anticipated Level of Effect

Species	Stressor	Level of Effect
Northern Long-eared Bat, Tricolored Bat	Collision Risk	Discountable
	Onshore Habitat Disturbance	Insignificant
	Noise Effects	Insignificant
	Vessel and Construction Vehicle Effects	Discountable
	Lighting Effects	Discountable
	Electromagnetic Fields Effects	Discountable
Piping Plover, Rufa Red Knot, Roseate Tern	Collision Risk	Insignificant
	Onshore Habitat Disturbance Effects	Insignificant
	Aquatic Habitat Disturbance Effects	Discountable
	Noise Effects	Discountable
	Lighting Effects	Insignificant
Eastern Black Rail, Saltmarsh Sparrow	Collision Risk	Discountable
	Onshore Habitat Disturbance Effects	Insignificant
	Aquatic Habitat Disturbance Effects	Discountable
	Noise Effects	Discountable
	Lighting Effects	Insignificant
Monarch Butterfly	Collision Risk	Discountable
	Onshore Habitat Disturbance Effects	Insignificant
American Chaffseed	Onshore Habitat Disturbance Effects	Discountable
Knieskern's Beaked-Rush	Onshore Habitat Disturbance Effects	Insignificant
Seabeach Amaranth	Onshore Habitat Disturbance Effects	Insignificant
Sensitive Joint-Vetch	Onshore Habitat Disturbance Effects	Discountable
Swamp Pink	Onshore Habitat Disturbance Effects	Insignificant

5.1. NORTHERN LONG-EARED BAT AND TRICOLORED BAT

Potential stressors of the Proposed Action with potential effects on northern long-eared bat and tricolored bat include:

- Collision Risk
- Onshore Habitat Disturbance
- Noise
- Vessel and Construction Vehicle Traffic
- Lighting
- Electromagnetic Fields

5.1.1 COLLISION RISK

Bat fatalities occur from collisions with onshore wind turbines. However, cave-hibernating bats such as the northern long-eared bat are less likely to be killed by wind turbines than are migratory tree bats (AWWI 2018), and northern long-eared bats are unlikely to occur over the open ocean. Although there are records of *Myotis* and other bats occurring offshore in the Mid-Atlantic (Sjollema et al. 2014; Solick and Newman 2021), there are no records of northern long-eared bats or tricolored bats from offshore surveys in New Jersey. There have been limited studies of the movements of northern long-eared bat near the ocean, but all evidence to date suggests that the species does not forage offshore (Dowling et al. 2017). During the offshore construction of the Block Island Wind Farm, bats were monitored with acoustic detectors on boats; no northern long-eared bats were detected and a small number of tricolored bats were detected (see Section 4.3.2) among the 1,546 passes of bats (Stantec 2018). During post-construction monitoring from August 2017 to January 2018, no northern long-eared bats or tricolored bats were detected out of the 1,086 passes recorded by bat acoustic detectors mounted on two turbines 3 miles from shore. During the post-construction surveys, 99% of bat passes occurred when wind speeds were less 6.4 feet per second (ft/s) (5 meters per second [m/s]) (33% when there was no wind); likewise, almost 80% of the passes occurred when wind speeds were less than 6.4 feet per second (5 m/s) (Stantec 2018).

Collectively, this information indicates that occurrence of northern long-eared bats and tricolored bats in the offshore portions of the Action Area is likely to be very rare, in very small numbers, and only likely when winds are below the cut-in speed of WTGs. If northern long-eared bats and tricolored bats were to migrate over water, movements would likely occur in close proximity to the mainland and not 15 miles (24 km) offshore where Project WTGs are proposed. Also, bats are agile fliers, so collision risks associated with the OSS, stationary construction vessels, and even moving project vessels would be discountable. Therefore, the species' exposure to construction vessels during construction or maintenance activities, or to operating WTGs is expected to be insignificant if exposure were to occur at all.

5.1.2 ONSHORE HABITAT DISTURBANCE EFFECTS

Forest and woodland habitats within and adjacent to the proposed onshore export cables and substations could provide roosting areas for the northern long-eared bat and tricolored bat. Ocean Wind has not evaluated the BL England and Oyster Creek areas for potential roost trees; but acoustic bat surveys have been performed along Ocean Wind's preferred Oyster Creek onshore export cable route (i.e., the Holtec Route) (Johnson and Ostroski 2022) (Appendix E). No northern long-eared bats were detected during the survey and there was minimal tricolored bat detection. The Proposed Action could affect the northern long-eared bat and tricolored bat via habitat disturbance required to construct the onshore Project components, including limited cutting of trees that could eliminate suitable foraging and roosting habitat. Impacts on herbaceous communities would result from excavation, rutting, compaction, mixing of topsoil and subsoil, and potential alteration of habitat. Additional habitat disturbance is anticipated during clearing and construction from the use of heavy equipment to clear surface material, dig the trench, install the duct bank, and lay the transmission line, followed by reburial and resurfacing. These activities would take place during daylight hours and, in the case of vegetation clearing in potentially suitable habitat, would occur during winter months to the extent possible when northern long-eared bats and tricolored bat are not present in the Action Area.

When the Oyster Creek onshore export cable is installed, a corridor up to 5.3 miles (8.5 km) long and 40 feet (12 meters) wide may be temporarily disturbed, totaling around 25 acres (10 hectares) of temporary ground disturbance and approximately 4 acres (1.6 hectares) of permanent habitat conversion. The BL England onshore export cable would temporarily disturb a corridor up to 8 miles (12.9 km) long and 20 feet (6 meters) wide and result in approximately 20 acres (8 hectares) of ground disturbance and 3 acres (1.2 hectares) of permanent habitat conversion. As described in Section 3, the upland portion of the BL England onshore cable route corridors would be constructed adjacent to and largely within residential and commercial areas and existing road and transmission ROWs, thereby minimizing potential impacts to suitable northern long-eared bat habitat. However, the Oyster Creek routes traverse more natural areas. Most of the cables would be placed under existing road or rail ROWs to minimize property and habitat impacts. Habitats disturbed during trench placement would be reseeded with native vegetation. Although constructing the onshore cables and substations would eliminate suitable foraging and roosting habitat for northern long-eared bat, the area of affected forest would be insignificant relative to availability of forest habitat within the surrounding landscape. It may also result in increasing the "edge effect," which could improve foraging opportunities for northern long-eared bats and tricolored bat.

The Proposed Action would also require several acres of clearing to construct the BL England substation and small numbers of scattered trees to construct the Oyster Creek substation. The total area permanently affected would be up to 13 acres (5.3 hectares) for the BL England substation site and up to 31.5 acres (12.7 hectares) for the Oyster Creek substation. This would include areas for the substation equipment and buildings, energy storage and stormwater management and landscaping. However, the proposed substation sites represent a small percentage of suitable habitat in the vicinity; thus, potential effects on habitat availability would be insignificant. Project O&M activities that include tree clearing could affect the northern long-eared bat and tricolored bat.

Approximately 12.6 acres of tree clearing would be required to construct the Oyster Creek substation (Table 5-2). However, the substation area is previously disturbed and sparsely vegetated, is characterized as upland meadow early-successional forest with some patches of emergent wetlands and small scattered trees, and is not suitable northern long-eared bat or tricolored bat roosting habitat. The Oyster Creek onshore cable route does include tree clearing in some forested areas characterized as mixed pine barrens/oak-dominated forest. An estimated 4.1 acres would be permanently cleared and 10.3 acres temporarily cleared for the Oyster Creek onshore cable route (Table 5-2). However, these forested areas are predominantly previously disturbed farmland and are composed primarily of successional stage pitch pine and small mixed oaks typical of coastal New Jersey and are generally not suitable northern long-eared bat or tricolored bat roosting habitat, with few trees at least 3 inches in diameter.

The BL England substation is on previously disturbed land that formerly housed coal storage and waste-water storage tank elements of the BL England Generating Station. The adjacent BL England onshore export cable siting area is predominantly upland meadow, as it occupies much of a former golf course that continues to be mowed regularly, but there are areas of upland forest with a moderate to dense tree canopy with a mix of pines and hardwoods. Forested areas within the siting area feature a moderate to dense tree canopy with a mix of coniferous and deciduous species, and an open shrub and sapling layer. Trees are generally small (6 to 10 inches in diameter) with the exception of a few larger pitch pines and red maples. Dominant tree species are red maple, pitch pine, Eastern red cedar, black tupelo, sweetgum, and white pine. Construction of the substation would not require permanent or temporary tree clearing (Table 5-2). The BL England onshore export cable route is mostly within paved roadways but would require 0.7 acre of permanent and 0.5 acre of temporary tree clearing near the proposed substation in the onshore export siting area.

Table 5-2 Estimated Areas of Tree Clearing (Acres)

	Permanent Tree Clearing[1]	Temporary Tree Clearing[1,2]	Total Tree Clearing
Oyster Creek			
Oyster Creek export cable	4.1	10.3	14.4
Oyster Creek substation	12.6	0	12.6
Oyster Creek Total	16.7	10.3	27.0
BL England			
BL England export cable	0.7	0.5	1.2
BL England Substation	0	0	0
BL England Total	0.7	0.5	1.2

Source:
Notes: The areas in the table are based on the proposed limits of disturbance and canopy coverage from aerial photography. Once tree surveys are concluded, these areas will be refined.
[1] Some areas within the limit of disturbance will be cleared of trees permanently, however, much of this area is not forested.
[2] Temporary tree clearing may be required for construction laydown and access, and will be allowed to naturally revegetate or be replanted.

Tree clearing is not expected to occur during the roosting season at the Island Beach State Park crossing. Forested areas within the Island Beach State Park area are dense upland maritime forest dominated by red cedar and American holly. A very dense growth of catbrier was present throughout the forested areas, and poison ivy was also common. An estimated 1 acre of forested areas would be temporarily cleared for construction.

The only structure planned for demolition during the construction and O&M phase of the Project is the row club adjacent to the Roosevelt Boulevard bridge over Peck Bay along the BL England route. Northern long-eared bats and tricolored bats are not anticipated to be in this area.

Tree removal for the proposed Project would be consistent with the activities analyzed in the USFWS (2016a) Programmatic Biological Opinion on the Final 4(d) Rule, as: (1) there would be no impacts on known occupied hibernation sites, (2) no trees would be removed within 0.25 mile (0.4 km) of a known occupied hibernation site, and (3) no trees would be removed within 150 feet (45.7 meters) of a known occupied maternity roost tree between June 1 and July 31. Although the 4(d) rule would no longer apply if the northern long-eared bat were to be uplisted under the ESA as "Endangered," Ocean Wind has proposed to avoid potential impacts by conducting tree clearing during the winter months, to the extent practicable. If tree clearing is required in areas with trees suitable for bat roosting during the period when northern long-eared bats or tricolored bats may be present, avoidance and minimization measures would be developed in coordination with the USFWS and NJDEP. Thus, cutting of any maternity roost trees would be avoided, and appropriate buffers would be provided, if necessary. Ocean Wind conducted acoustic surveys in potential northern long-eared bat and tricolored bat habitat where tree clearing may occur during roosting time periods. This included the BL England and Oyster Creek substation areas as well as along the Oyster Creek onshore cable route. The surveys did not detect northern long-eared bat but did detect minimal presence of tricolored bat. Based on the results of the acoustic surveys, Ocean Wind will conduct an additional pre-construction tree survey along the Oyster Creek onshore cable route to identify potential roosting habitat (i.e., trees at least 3 inches in diameter with exfoliating bark, cracks, crevices or hollows; snags; and dead trees). If potential roosting habitat exists, Ocean Wind will prepare a replanting plan to enhance roosting habitat in coordination with USFWS and NJDEP. With these measures in place, the effects from onshore habitat disturbance on northern long-eared bat and tricolored bat would be insignificant.

5.1.3 Noise Effects

Onshore construction would produce noise in excess of ambient conditions in the Action Area due to vehicles and heavy equipment used to construct the cable landfall adjacent to the nearshore zone, the onshore export cables, and the substations. Although Ocean Wind has not performed noise studies within the onshore portions of the Action Area, concurrent use of the loudest construction equipment sources could reach noise levels of 80 to 90 decibels or more and exceed ambient conditions particularly in terrestrial portions of the Action Area. However, construction noise of these levels would attenuate to ambient levels within approximately 1,000 feet (305 meters) of the source.

Northern long-eared and tricolored bats may be exposed to noise levels, or noise and vibration levels at an intensity that they may not have experienced in the past, depending on the proximity of their roost sites to the proposed landfall sites, onshore cable route corridors, and substations. The increased noise and vibrations could affect individual bats that are unaccustomed to such disturbance while roosting, thereby reducing the suitability of habitat adjacent to the Project footprint. Although it is difficult to predict the degree to which northern long-eared and tricolored bats could be disturbed by construction noise and vibrations, it is reasonable to assume that any effect could result in bats selecting roost trees further from the disturbance. Alternative roost sites are generally available in the immediate vicinity of suitable northern long-eared bat and tricolored bat habitat.

The majority of noise effects would be temporary and generated solely during Project construction. Ocean Wind would comply with the Final 4(d) Rule requirements for avoiding adverse effects on northern long-eared bats, including conducting tree removal, vegetation clearing, and other major noise-producing activities in proximity to potential bat habitat during winter months, to the extent practicable, when the species would not be present. Therefore, construction and operational noise effects on northern long-eared bats and tricolored bats would be insignificant.

5.1.4 Vessel and Construction Vehicle Effects

Vehicle collision risk for northern long-eared bat would vary depending on time of year, location of roads and travel pathways in relation to roosting and foraging areas, the characteristics of individuals' flight, traffic volume, and whether young bats are dispersing. USFWS (2016a) noted that it is difficult to determine whether roads pose a greater risk for bats colliding with vehicles or a greater likelihood of deterring bat activity, thus decreasing risk of collision. In most cases, USFWS (2016a) expects that wider roads pose less collision risk because there is a lower likelihood of bats crossing them. The road ROWs within which the Project's onshore export cables would be located include county and state roads with relatively high traffic volumes and limited habitat; thus, northern long-eared bats would be unlikely to frequent the area and be exposed to potential collisions with vehicles. In addition, most vehicle activity would occur during daylight hours, when the northern long-eared bat is less active. There is no information on vessel collision risk for northern long-eared bat and tricolored bat, but due to their unlikely occurrence in offshore areas, no effects are anticipated. Accordingly, BOEM finds the likelihood of northern long-eared bat and tricolored bat collisions with project vehicles and vessels to be extremely unlikely and, therefore, discountable.

5.1.5 Lighting Effects

Northern long-eared and tricolored bats may be attracted to insect prey drawn by facility lighting around the onshore substation(s), but this would not represent a substantial behavioral alteration given the baseline levels of artificial lighting present in the BL England and Oyster Creek areas. Based on the limited area of effect relative to available habitat, the effects of lighting on northern long-eared bat and tricolored bat are likely to be discountable.

5.1.6 Electromagnetic Fields Effects

The Project's transmission cables would produce an induced magnetic field in the immediate proximity of the cable path. Bats use the earth's magnetic field for spatial orientation during migration and foraging, calibrating their magnetic compass against visual cues like the sky's polarization pattern and the location of the sun on the horizon (Greif et al. 2014; Holland et al. 2010). The available evidence indicates that bats are sensitive to magnetic fields at least as low as 100 milligauss (Tian et al. 2015). Assuming this level of sensitivity, electromagnetic fields from the onshore export cable would potentially be detectable to northern long-eared bats occurring within 0 to 4 feet (1.2 meters) of the duct bank centerline adjacent to roads. Based on likely species occurrence within and in proximity to the Action Area, it is possible that individual northern long-eared bats and tricolored bats would encounter detectable electromagnetic levels from the onshore export cables and substations over the lifetime of the Project. The offshore transmission cable would be buried at the landfall sites, so induced electromagnetic fields on beach and shoreline habitats would be effectively unmeasurable. The potential significance of this exposure must be considered relative to existing conditions within the Action Area, which is characterized by high baseline levels of electromagnetic fields. The electromagnetic fields added by the Project would be discountable by comparison.

Given this context discussed above, potential electromagnetic field effects on northern long-eared bats and tricolored bats are likely insignificant. As discussed above, bats experience baseline electromagnetic fields from existing sources that are much higher than those likely to result from the proposed Project. In addition, bats have the documented ability to calibrate their magnetic compass to localized field variations using other environmental cues (Greif et al. 2014; Holland et al. 2010; Tian et al. 2015). Northern long-eared bats persist in areas despite the presence of electromagnetic sources, indicating that the species can also adapt to the comparatively minimal electromagnetic field effects of the proposed Project without significant physiological or behavioral consequences.

5.1.7 AVOIDANCE AND MINIMIZATION MEASURES

The Ocean Wind 1 COP, Volume II, Table 1.1-2 provides a list of APMs to avoid and minimize, impacts, and to perform monitoring of potential impacts (Ocean Wind 2022). Two APMs are specifically focused on bats (see Section 2.4, Table 2-2):

- BAT-01: Onshore, the Project will avoid potential impacts by conducting tree clearing during the winter months, to the extent practicable.
- BAT-02: If tree clearing is required in areas with trees suitable for bat roosting during the period when northern long-eared bats may be present, develop avoidance and minimization measures in coordination with USFWS and NJDEP and conduct pre-construction habitat surveys.

Ocean Wind has proposed numerous other APMs, 25 of which would also serve to conserve northern long-eared bats and tricolored bats and their habitat. These APMs are identified in Section 2.4, Table 2-2. In addition, Ocean Wind proposes to perform acoustic monitoring of bat presence for 2 years post-construction, which would identify the need for future avoidance and minimization measures. Further detail is provided in Appendix B, the Avian and Bat Post-Construction Monitoring Framework (COP Volume III, Appendix AB; Ocean Wind 2022). The scope of monitoring is designed to meet federal requirements (30 CFR 585.626(b)(15) and 585.622(b)) and is scaled to the size and risk profile of the Project with a focus on species of conservation concern. In addition, Ocean Wind may be required modify its revegetation APM (GEN-13) to enhance bat habitat in coordination with the USFWS and NJDEP (see Section 2.4, Table 2-3).

5.2. BIRDS (PIPING PLOVER, RUFA RED KNOT, ROSEATE TERN, EASTERN BLACK RAIL, AND SALTMARSH SPARROW)

Potential stressors of the Proposed Action with potential effects on ESA-listed birds include:

- Collision Risk
- Airborne Noise
- Vessel Traffic
- Construction Vehicle Traffic

- Underwater Noise
- Seabed and Water Column Disturbance
- Lighting

5.2.1 COLLISION RISK

This section discusses the potential for impacts on federally listed species resulting from collisions with WTGs, offshore substations, and construction and maintenance vessels, OSS, and construction/maintenance vessels associated with the Proposed Action. These species are agile flyers and rarely collide with stationary structures such as bridges, communication towers, lighthouses, light poles, or moving vessels (e.g., boats). Birds will avoid colliding with fixed structures, such as WTG and OSS foundations, and vessels. As such, the likelihood of collisions with fixed structures or vessels associated with the Proposed Action to be insignificant and discountable.

The primary hazard posed to ESA-listed birds from offshore wind energy development would be collision mortality (Everaert and Stienen 2007; Furness et al. 2013; Robinson Willmott et al. 2013). This section focuses on the collision risk from turbines for the piping plover, rufa red knot, roseate tern, eastern black rail, and saltmarsh sparrow; it uses the most relevant information about known occurrences and species' interactions with offshore wind on the Atlantic OCS.

5.2.1.1. Piping Plover

BOEM used the Band Model (Band 2012) to estimate the risk of piping plover collision with the proposed WTGs in the Ocean Wind 1 Lease Area. A snapshot of the Band model input parameters used to estimate piping plover collision risk for the Project are presented in Appendix D. Radio telemetry studies of piping plover migratory behavior in the vicinity of the action area indicate that piping plover could fly through the Ocean Wind 1 Project. Loring et al. (2019) found that 11% (2 out of 19) of tagged plovers leaving breeding areas in Massachusetts and Rhode Island during fall migration flew through the New Jersey WEA. Extrapolating that percentage to recent population size[9] an estimated 1,148 piping plovers could have migrated through the WEA in 2021, 444 adults in spring and 704 adults and subadults in fall.

Most of the model inputs (e.g., migration passage, proportion flying in the RSZ, turbine specifications, and facility dimensions) were obtained or calculated from the COP.

Turbine avoidance rate of 95.01% was used for piping plover (Cook 2021). A total of 98 operating turbines was used in the model. Developer provided turbine data including monthly wind availability, average revolutions per minute (rpm) for a turbine operating at the site, and pitch. The flight height distribution was derived from the midpoints of 2,756 10-minute observations of 62 piping plovers flying nonstop over federal waters (Loring et al 2019). Given that the flight height distribution is known for this species, fatalities estimated are based on calculations from the extended model (Option 3).

To further inform this ESA consultation, BOEM used the Stochastic Collision Risk Assessment for Movement (SCRAM) to estimate the likelihood of "take" or fatality due to collision with a

[9] Based on a breeding population abundance of 2,020 pairs in Canada, Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, and New Jersey an abundance-weighted mean productivity of 1.17 chicks fledged per pair (USFWS 2022o), equating to 4,040 adults in spring and 6,403 adults and subadults in fall.

rotating turbine blade – more specifically, to estimate the relative likelihood of the take of one individual in a year and during the 35-year operation period of the wind farm. SCRAM uses bird passage rates based on modeled flight paths of birds fitted with nanotag transmitters (Gilbert et al 2022). The use of tracking data is representative of bird movements, because the locations are recorded day and night for weeks and even months regardless of weather conditions. The wind farm and turbine operational inputs were similar to those used in the analysis using the Band model, and the developer also provided estimates of wind speed and monthly turbine down time. The analysis included two scenarios one for turbines with a 22 m air gap the water and lowest point of the blade and the other scenario with a 36 m air gap. As recommended, the model was run for 1,000 iterations using Option 3 (Gilbert et al 2022). The threshold number of collisions was set at one – this represents a take of one or more individuals.

The estimated annual mortality using the Band model was zero (Appendix D). The probability of at least one take from the SCRAM model for both scenarios was < 0.001, thus a single collision during fall migration is extremely unlikely – in other words, a once in a thousand-year event (Appendix D). The probability of a collision event during the 35-year operational period is also very small 0.034 (= 1- $(1\text{-}0.001)^{35 \text{ years}}$).

Based on the results from both models, the chance of a fatality due to collision is extremely unlikely, and thus the estimated annual number of fatalities for migrating piping plover is **zero**. Likewise, the estimated number of fatalities during the 35-year operations term is also **zero**. Therefore, based on the above findings, the likelihood of collision fatalities resulting from the Proposed Action would be too small to be measured or evaluated (**insignificant**) and unlikely to occur (**discountable**), and the proposed action is not likely to adversely affect to piping plovers.

5.2.1.2. Rufa Red Knot

Despite the presence of many onshore wind turbines along the red knot's overland migration route (Diffendorfer et al. 2017), there are no records of red knot colliding with turbines built through roughly 2013 (78 FR 60024). The rufa red knot offshore occurrence is almost exclusively during spring and fall migrations. Based on the best available information on rufa red knot migration (see Section 4.5.2), 57 red knots could pass through the Lease Area during spring migration, and 36 red knots could pass through during fall migration. The distance from shore to the Lease Area would preclude use by foraging red knots because their local movements at stopover areas (e.g., commuting flights between foraging locations related to tidal changes) generally occur within 3 miles (4.8 km) of the shore (Burger et al. 2011); this is confirmed by recent telemetry work confirm this (Loring et al 2018, BRI and Wildlife Restoration Partners 2022, Feigin et al. 2022); thus, rufa red knot exposure to the Project's WTGs would be limited to migrating individuals.

Although there is antidotal evidence of rufa red knots flying at great heights during migration, in the range of 3,281 to 9,843 feet (1,000 to 3,000 meters) (78 FR 60024; Burger et al. 2011; USFWS 2014a), recent telemetry studies suggest that red knot fly much lower (Loring et al 2018; BRI and Wildlife Restoration Partners 2022; Feigin et al. 2022). Loring and others (2018) derived flight height estimates using data collected from red knots fitted with nanotags; these estimates were subject to large error bounds (typically 328 to 656 feet [100 to 200 meters]) and should be interpreted with caution. However, more recent telemetry studies near the Project using GPS satellite tags yielded more precise results and found that none of the red knots near the Lease Area flew within the RSZ, but instead mostly flew below the RSZ (BRI and Wildlife

Restoration Partners 2022; Feigin et al. 2022). Therefore, the flight height data suggest that it is unlikely that migrating red knots would collide based on how high red knots fly with respect to the Project's spinning turbine blades. In addition, red knots migrate through federal waters of the Atlantic OCS primarily during clear skies with little to no precipitation and a tailwind blowing in their direction of travel (Loring et al. 2018; BRI and Wildlife Restoration Partners 2022; Feigin et al. 2022) and thus using their excellent eyesight can easily avoid the turbines.

BOEM used the Band Model (Band 2012) to estimate the risk of rufa red knot collision with operating WTGs in the Lease Area. The input parameters and results are presented in Appendix D. The flight height distribution was derived from the midpoints of 379 10-minute observations of 51 red knots flying nonstop over federal waters (Loring et al. 2018); approximately 50% flew within the rotor RSZ.[10] Turbine avoidance rate of 95.01% was used for piping plover (Cook 2021). A total of 98 operating turbines was used in the model. The developer provided turbine data including monthly wind availability, average rpm for a turbine operating at the site, and pitch. Given that the flight height distribution is known for this species, fatalities estimated are based on calculations from the extended model (Option 3).

To further inform this ESA consultation, BOEM used SCRAM to estimate the likelihood of "take" or fatality due to collision with a rotating turbine blade – more specifically, to estimate the relative likelihood of the take of one individual in a year and during the 35-year operation period of the wind farm. SCRAM uses bird passage rates based on modeled flight paths of birds fitted with nanotag transmitters (Gilbert et al 2022). The use of tracking data is representative of bird movements, because the locations are recorded day and night for weeks and even months regardless of weather conditions. The wind farm and turbine operational inputs were similar to those used in the analysis using the Band model, and the developer also provided estimates of wind speed and monthly turbine down time. The analysis included two scenarios one for turbines with a 22 m air gap between the water and lowest point of the blade and the other scenario with a 36 m air gap. As recommended, the model was run for 1,000 iterations using Option 3 (Gilbert et al 2022). The threshold number of collisions was set at one – this represents a take of one or more individuals.

The estimated annual mortality using the Band model was zero (Appendix D). The probability of at least one take from the SCRAM model for both scenarios was < 0.001, thus a single collision during fall migration is extremely unlikely – in other words, a once in a thousand-year event (Appendix D). The probability of a collision event during the 35-year operational period is also very small 0.034 ($= 1- (1-0.001)^{35 \text{ years}}$).

Based on the results from both models, the chance of a fatality due to collision is extremely unlikely, and thus the estimated annual number of fatalities for migrating red knot is **zero**. Likewise, the estimated number of fatalities during the 35-year operations term is also **zero**. Therefore, based on the above findings, the likelihood of collision fatalities resulting from the Proposed Action would be too small to be measured or evaluated (**insignificant**) and unlikely to occur (**discountable**), and the proposed action is not likely to adversely affect to red knots and is well below the less than 1-percent chance of a red knot population decline that was used by USFWS to conclude that take as defined under the Endangered Species Act as killing or injuring,

[10] The flight height distribution derived from GPS tracked red knots from the BRI and Wildlife Restoration Partners (2022) and Feigin and others (2022) studies was not available at this time.

of red knots is not likely resulting from permitted fishing activities (e.g., U.S. Fish and Wildlife Service Evaluation of the Atlantic States Marine Fisheries Commission Horseshoe Crab-Red Knot Adaptive Resource Management Revision | FWS.gov).

5.2.1.3. Roseate Tern

Roseate terns are unlikely to collide with turbines in the proposed Project for several reasons. First, there are no known nesting roseate terns in New Jersey, and the Action Area is not within the range of foraging roseate terns that nest in New York and New England. Relatively few roseate terns are predicted to occur near the offshore Action Area according to the MDAT models (Winship et al. 2018). Only small numbers of juveniles and non-breeding adults may occur along the New Jersey coast during the breeding season (W. Walsh, personal communication, April 11, 2022). Second, the few individuals present are unlikely to traverse the Lease Area for foraging because it is 15 miles offshore when they can forage in shallow water near the shore. Third, the offshore migratory routes used by the northeast roseate tern population are farther offshore than the Lease Area. Geolocator data from six roseate terns tagged at Bird Island, Massachusetts, suggest that southbound migration flight paths are transoceanic until reaching the Caribbean, where terns may stopover for a period of time (Mostello et al. 2014). However, it is possible that some roseate terns may occur in the Action Area ephemerally during spring and fall migration (Burger et al. 2011). For example, a telemetry study that tracked 150 roseate terns on their breeding grounds in New York and New England where only one was detected in coastal New Jersey during mid-August of 2016 (Figure 4-10). Fourth, the species typically migrates under high-visibility conditions, below turbine cut-in speed and would be able to see and avoid the WTGs from considerable distance without significantly modifying their flight path. Finally, roseate terns typically fly below the RSZ, which minimizes their exposure to potential collision (Figure 5-1); for this Project, the RSZ is 36 to 276 meters (Figure 2-6).

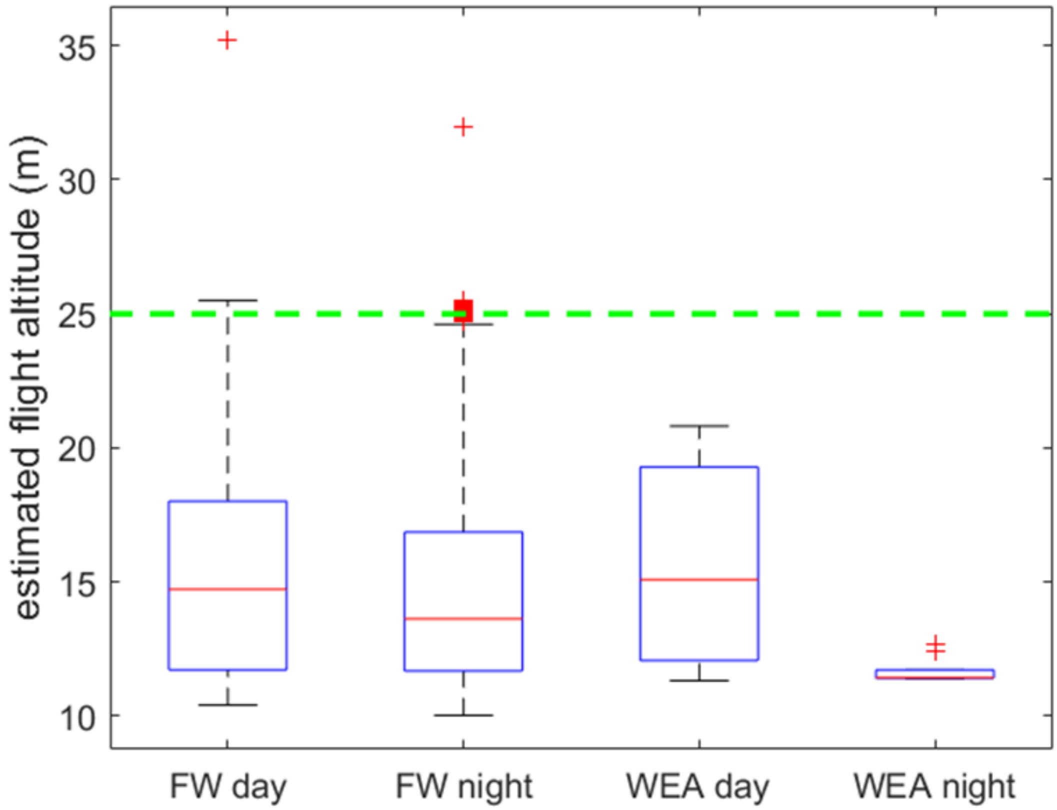


Figure 5-1 Estimated Flight Altitude Ranges (Meters) of Roseate Terns During Exposure to Federal Waters (Altitude on Transition From State to Federal Waters) and WEAs (Altitude When Flying through WEAs) During Day and Night. The Green-Dashed Line Represents the Lower Limit of the RSZ (25 meters) from Loring et al (2019).

Based on the evidence above, the risk of roseate terns colliding with the proposed Project WTGs is considered highly unlikely because very few individuals could be present in the Action Area and for only a very short time period (including those migrating through). Roseate terns are low-flying and are agile fliers that can easily avoid wind turbines and fly below the RSZ of offshore turbines. The likelihood of injury or mortality from rotor collision is discountable under even the most conservative behavioral assumption. Any associated behavioral effects are likely to be insignificant because this species would be able to detect and avoid the WTGs from distance with only a minimal change in course. In conclusion, the collision risk for roseate terns would be insignificant.

To further inform this ESA consultation, BOEM used SCRAM to estimate the likelihood of “take” or fatality due to collision with a rotating turbine blade – more specifically, to estimate the relative likelihood of the take of one individual in a year and during the 35-year operation period of the wind farm. SCRAM uses bird passage rates based on modeled flight paths of birds fitted with nanotag transmitters (Gilbert et al 2022). The use of tracking data is representative of bird movements, because the locations are recorded day and night for weeks and even months regardless of weather conditions. The wind farm and turbine operational inputs were similar to those used in the analysis using the Band model, and the developer also provided estimates of wind speed and monthly turbine down time. The analysis included two scenarios one for turbines with a 22 m air gap between the water and lowest point of the blade and the other scenario with a 36 m air gap. As recommended, the model was run for 1,000 iterations using Option 3 (Gilbert et al 2022). The threshold number of collisions was set at one – this represents a take of one or more individuals.

The probability of at least one take from the SCRAM model for both scenarios was < 0.001, thus a single collision during fall migration is extremely unlikely – in other words, a once in a thousand-year event (Appendix D). The probability of a collision event during the 35-year operational period is also very small 0.034 (= 1- $(1\text{-}0.001)^{35 \text{ years}}$).

Based above information and the results from SCRAM, the chance of a fatality due to collision is extremely unlikely, and thus the estimated annual number of fatalities for migrating roseate tern is **zero**. Likewise, the estimated number of fatalities during the 35-year operations term is also **zero**. Therefore, based on the above findings, the likelihood of collision fatalities resulting from the Proposed Action would be too small to be measured or evaluated (**insignificant**) and unlikely to occur (**discountable**), and the proposed action is not likely to adversely affect to roseate tern.

5.2.1.4. Eastern Black Rail

There could be 40 to 60 breeding pairs of eastern black rail in New Jersey (Watt 2016); however, NJDEP (2018, 2019) has found no occurrences of eastern black rail during focused surveys since 2015 and 2016. Black rails are absent from nearshore (0 to 3.1 miles [5 km]) and in offshore environments (Watts 2010). There is no evidence of the species migrating or otherwise occurring within the Ocean Wind 1 Lease Area. Migration routes follow the distribution of available habitat and also include stopover habitat in wet prairies, wet meadows, or hay fields during migration (USFWS 2020c). Due to the possible presence of relatively few eastern black rails in New Jersey, the extremely low likelihood of occurrence on the Atlantic OCS 15 miles (24 km) from land, the collision risk to the eastern black rail is discountable.

5.2.1.5. Saltmarsh Sparrow

Saltmarsh sparrows are thought to migrate at night, traveling along coastline in relatively short-distance hops among its preferred habitat of coastal salt marshes (Greenlaw et al. 2020). There is no evidence that saltmarsh sparrow migrate over the open ocean; therefore, they are extremely unlikely to occur 15 miles (24 km) from land within the Ocean Wind 1 Lease Area, and thus the potential collision risk to the saltmarsh sparrow from the Proposed Action is discountable.

5.2.2 Onshore Habitat Disturbance Effects

Ground disturbance and noise from construction equipment could affect ESA-listed birds if they were to occur in the vicinity of the offshore export cable landfall site, the onshore cable routes, or the onshore substation locations. Landfall would require up to 2 acres of workspace to accommodate two HDD exit pits and workspace, and additional workspace would be required for storage and staging. Most landfall options occur in developed areas; however, some clearing of vegetation may be required for the landfall sites in the Oyster Creek area. Onshore export cable installation includes the onshore components that connect the offshore export cable to the onshore substations.

The BL England onshore cable would require a limit of disturbance up to 20 feet (6 meters) wide, and the Oyster Creek onshore cable would require a limit of disturbance up to 40 feet (12 meters) wide. Minimal surface disturbance would occur at the beaches, dunes, and tidal marsh habitats where the offshore export cables would make landfall because HDD methods would be used to install the export cable underground. There would also be no routine project entry or intrusion into any beach or dune habitat following construction. The Project would not route overhead power lines within 500 feet of any beach or dune. The total acreage of disturbance was discussed above in Section 5.1.2. Beach and dune habitats surround the proposed landfall sites in the BL England area and where the proposed offshore export cable would go under Island Beach State Park before making landfall in the Oyster Creek area. These habitats are potentially occupied by nesting or migrating piping plover, migrating red knots, and migrating roseate terns. Noise or human traffic associated with construction and HDD at the landfall sites could thus disturb individuals of any three species if performed at times of year that the birds are typically present.

Piping plovers, which could nest on nearby beaches, would be especially sensitive to disturbance. The presence of people is stressful for adults and chicks, forcing them to spend significantly less time foraging, which may result in decreased overall reproductive success (Burger 1990). Excessive disturbance may cause piping plovers to desert the nest, exposing eggs or chicks to the summer sun and predators. Interrupted feedings may stress juvenile birds during critical periods in their development, and foot and vehicle traffic may crush eggs or chicks (USFWS 1996). Although no Project activities would occur within a beach or dune, the USFWS (2019c) reports that activities within 1 mile (1.6 km) of a beach, dune, or intertidal area may affect piping plovers. These activities include any permanent or temporary increases in disturbance between March 15 to August 31, including but not limited to, major construction work and operation of low-flying aircraft (less than 2,000 feet [610 meters] above ground level). Helicopters would not be used during construction or O&M of the Project and, as such, no disturbance from low-flying aircraft would occur as a result of the Project. As detailed below, Ocean Wind would implement APMs to avoid affecting federally listed birds, which includes pre-construction surveys for raptor nests, wading bird colonies, seabird nests, and shorebird nests during nesting periods with a focus on listed species or species identified of special concern by the federal or state government. Based on the findings of the survey, Ocean Wind would use best practices determined in coordination with the USFWS and the state to minimize any potential disturbance to ESA-listed birds. Ocean Wind also proposes to develop an avian species monitoring plan developed and coordinated with the NJDEP and USFWS and implemented as required. This would likely include the most recent occurrence information on piping plover, rufa red knot, roseate tern, eastern black rail, and saltmarsh sparrow in the Action Area. The framework for this plan was provided in the Ocean Wind 1 COP Volume III, Appendix AB (see Appendix B). In conclusion, by avoiding beach and dune habitats through HDD, implementing avoidance and minimization measures, and prohibiting routine project entry or intrusion into any beach or dune habitat following construction, the offshore export cable landfall would have little to no impact on ESA-listed birds.

Ocean City beaches, particularly on the northern end, have been known to support only small numbers of migrating red knots since 2009 (City of Ocean City 2016). Furthermore, no disturbance (temporary or permanent) to beaches or dunes would occur by activities associated with the Project, because Project infrastructure installation would be subsurface and there would be no routine project entry or intrusion into any beach or dune habitat following construction. Island Beach State Park beach is not considered a concentration area for red knots, but the species is known to occasionally use Island Beach State Park during migration (Island Beach

State Park 2017). No disturbance (temporary or permanent) to the Island Beach State Park beach would occur as a result of the Project because Project infrastructure installation would be subsurface. Ocean Wind conducted a red knot habitat and impact assessment for BL England (Appendix C) that concluded that while there is significant red knot activity during their fall migration to the south of the proposed cable construction sites, it is likely that use of the Ocean City beach area by red knots is primarily occasional foraging along the intertidal beach, molting in the known concentration areas, or brief migration stopovers. Based on the proposed construction methods, activities and timing, disturbance to red knots will be minimal and limited to noise disturbance, and no red not habitat would be impacted. A similar conclusion was reached for the Oyster Creek area. As described in Sections 4.6.2 and 4.7.2, the proposed onshore export cable in the BL England area would travel in proximity to large areas of high marsh habitat that could be suitable for eastern black rail and saltmarsh sparrow. However, based on the desktop habitat assessment (Appendix C), it is unlikely the Project would affect eastern black rail or saltmarsh sparrow habitat. It is unknown if the habitat is occupied, as there have been no documented occurrences in either eBird (2022) or survey points in the Wiest et al. (2016) database (provided in ACJV 2020a). However, the proposed Project would have no direct impacts on high marsh habitat in the BL England area; there would be 0.35 acre of short-term (< 3 years) disturbance to *Phragmites*-dominated wetlands and 0.15 acre of low marsh habitat. Ocean Wind has proposed to coordinate with the NJDEP and USFWS to identify unique or protected habitat or known habitat for threatened or endangered and candidate species and avoid these areas to the extent practicable (APM TCHF-01; see Section 2.4, Table 2-2).

In the Oyster Creek area, the onshore export cable construction could cause short-term disturbance to 9.68 acres of tidal wetlands, including 2.54 acres of high marsh habitat. Wetlands in the Oyster Creek area containing high marsh and potentially suitable for eastern black rail and saltmarsh sparrow are limited to areas adjacent to Barnegat Bay. Similar to the BL England area, the presence of both eastern black rail and saltmarsh sparrow is unknown in the Oyster Creek area. In addition, the Proposed Action includes two crossings of Island Beach State Park, where the offshore export cable would make landfall for a short distance and then enter Barnegat Bay. Both options would cross wetlands, including a small amount of high marsh (south crossing only), but the southerly crossing would avoid wetland impacts due to the proposed use of HDD that would avoid wetlands. Following construction, wetland impact areas would be restored to pre-existing conditions, and herbaceous vegetation would become reestablished. Furthermore, construction would be expected to generally occur in previously disturbed habitats, and no individual fitness or population-level impacts on birds would be expected to occur. As such, onshore habitat disturbance effects associated with Proposed Action would be discountable.

The onshore substation locations are upland sites with maintained lawn and trees, and thus provide no habitat capable of supporting ESA-listed birds. Permanent and temporary workspace for substation construction would be sited to avoid wetlands to the extent practicable. Potential effects due to noise could occur, as described above, but no suitable habitat for ESA-listed birds occurs within or adjacent to the proposed BL England and Oyster Creek substation locations. Therefore, onshore substation construction is not expected to have insignificant effects on the piping plover, rufa red knot, roseate tern, eastern black rail, or saltmarsh sparrow.

5.2.3 AQUATIC HABITAT DISTURBANCE EFFECTS

Roseate tern may potentially be affected by the construction and O&M of the proposed Project. Potential stressors for this species include short-term seabed and water column disturbance and underwater noise that could alter forage fish behavior and potentially affect foraging efficiency.

Disturbance to foraging roseate terns during their migration from July to mid-September could occur as a result of offshore export cable installation. Roseate terns migrating offshore may feed during the day, often with other seabirds above predatory fish driving small fish toward the surface, or where prey is concentrated along thermoclines where ocean currents meet (Gochfeld and Burger 2020). Offshore cable installation would occur using a mechanical cutter, mechanical plow (optional jet assist), or jet-plow. Due to the transient nature of sediment disturbance along the offshore cable route, it is estimated that it will take fewer than 24 hours for the total suspended sediment concentration to return to ambient level. The overall sediment deposition would be limited within a small area near the cable route of approximately 19 miles (31 km) of cable installation. Impacts to nearshore benthic habitats in waters less than 165 feet (50 meters) could destroy sand lace habitat, as this important prey species burrows within sandy substrate, and sand lance eggs develop on and within the substrate (USFWS 2020f). The area affected would be negligible relative to the amount of suitable shallow sandy substrates, however. Increased turbidity during cable-laying activities has the potential to also affect sand lance (USFWS 2008). Given the nature of the construction techniques, indirect impacts such as increased turbidity would be short term in duration and localized in nature and would not directly affect terns because the activity would be underwater. Water quality effects and disturbance resulting from the installation of offshore export cables are not expected due to the short-term duration of disturbance and water column sedimentation from submarine cable construction activities (USFWS 2008). It is estimated that water turbidity conditions would return to normal within a few hours of cable installation. Also, this disturbance is not expected to be different from typical construction equipment (barges or dredges) and cable installation, which are not believed to adversely affect roseate terns (USFWS 2008). Any adverse effects on roseate terns resulting from installation of the offshore export cables would be temporary and insignificant.

Seafloor and benthic habitat disturbance resulting from the installation of the offshore export cables would not affect piping plovers, rufa red knots, eastern black rails, or saltmarsh sparrows as these species are strictly terrestrial foragers and do not use aquatic habitats for foraging. There could be potential for indirect effects on rufa red knots and piping plover from cable emplacement due to benthic habitats being temporarily disturbed and some organisms important to their foraging being crushed or buried; however, the USFWS (2014a) did not identify this as a threat and there is no information about the impacts of dredging on horseshoe crab populations. Thus, although there could be minor impacts on benthic invertebrate prey availability in intertidal substrates, the impacts from dredging for cable installation be negligible. For these same reasons, offshore cable installation would have insignificant temporary impacts on aquatic invertebrate prey important to the eastern black rail and saltmarsh sparrow within marsh habitats.

5.2.4 NOISE EFFECTS

ESA-listed bird species present within the Action Area may be exposed to periodic construction noise exceeding ambient levels due to construction of offshore wind turbine monopile foundations, temporary cofferdam placement and HDD at the onshore landfall site, and construction vessel/vehicle operation. Combined with the visual disturbance created by construction activity, this exposure could theoretically lead to behavioral effects, including potential avoidance of the affected area. There are currently no established in-air noise exposure thresholds for the ESA-listed birds analyzed in this BA, so potential species effects are evaluated based on extent and magnitude of effects relative to baseline ambient conditions and the likelihood of species exposure.

Project construction vehicle use would not significantly alter baseline noise levels, and no vehicle use would occur on or in proximity to shoreline or marsh habitats known or potentially used by ESA-listed birds. ESA-listed birds in proximity to the offshore export cable landfall sites may be able to detect noise and visual disturbance created by construction and maintenance vehicles and associated activity, but that disturbance is likely insignificant relative to existing baseline conditions. Species responses may range from escape behavior to mild annoyance. The pile-driving noise impacts would be short term (4 hours per pile). Vessel and construction noise could disturb offshore bird species, but they would likely acclimate to the noise or move away, potentially resulting in a temporary loss of habitat (BOEM 2012). Construction and maintenance vehicle activity would also not significantly increase or alter the existing levels of disturbance within onshore areas; therefore, any noise-related effects on ESA-listed bird species in the vicinity would be temporary and discountable.

Installation of offshore WTG and OSS foundations using an impact pile driver would produce the loudest airborne noise effects associated with the proposed Project. The area potentially affected by pile driving at any given time would be limited to the effect radius around the pile being installed. The effect radius depends on the sea-surface and atmospheric parameters and mitigation to attenuate the noise. Rufa red knot and piping plover would only be exposed to impact hammer noise if monopile installation occurs during the migratory period. Roseate terns are most likely to be exposed during the summer post-breeding foraging period and fall migration. Based on observed flight behavior, migrating birds would be able to detect and avoid noise-producing activities at a considerable distance with a minimal shift in flight path. Individual birds may hear project construction noise, including pile driving, but would be able to limit exposure without significantly altering behavior. This conclusion is supported by the fact that these species are periodically exposed to elevated baseline noise levels from sources like large ships without apparent harm. Once construction is completed, the WTGs would produce operational airborne noise in the offshore marine environment. The frequency and sound level generated from operating WTGs depends on WTG size, wind speed and rotation, foundation type, water depth, seafloor characteristics, and wave conditions. BOEM (2019) noted that the level of noise appeared to be significantly influenced by natural ambient noise, suggesting the airborne noise from WTG operation would likely be less than 65 decibels equivalent continuous sound pressure level at 164 feet (50 meters) from a WTG tower, and even this level of noise appears to be significantly influenced by natural ambient noise. This level is not much greater than ambient noise in a large city and would thus be unlikely to affect birds in the vicinity of WTGs. Based on the above discussion, noise impacts on birds from operating WTGs are expected to be discountable.

5.2.5 Lighting Effects

Under poor visibility conditions (fog and rain), some migrating birds may become disoriented and circle lighted communication towers instead of continuing on their migratory path, greatly increasing their risk of collision (Hüppop et al. 2006). Tower lighting would have the greatest impact on bird species during evening hours, when nocturnal migration occurs. In accordance with BOEM lighting guidelines (2021b) and FAA obstruction marking standards, the turbine nacelle would be equipped with two synchronized red flashing FAA model L-864 aviation obstruction lights on the highest point of each nacelle and up to four FAA model L-810 red flashing lights at mid-mast level, adding up to 588 new red flashing lights to the offshore environment where none currently exist. Further details about the proposed Project lighting are provided in the Ocean Wind 1 COP Volume I, Chapter 7, Section 7.4 (Ocean Wind 2022). However, red flashing aviation obstruction lights are commonly used at land-based wind facilities without any observed increase in avian mortality compared with unlit turbine towers (Kerlinger et al. 2010; Orr et al. 2013). Additionally, marine navigation lighting would consist of multiple flashing yellow lights on each WTG and on the corners of each OSS. All WTGs will be equipped with three yellow flashing navigation lanterns, compliant with the requirements for visible spread from 360 degrees as stated in the document “Guidelines for Providing Information on Lighting and Marking of Structures Supporting Renewable Energy Development, BOEM April 28, 2021” as well as USCG Private Aids to Navigation guidance. Significant Peripheral Structures (SPS) (e.g., corner WTGs) have an operational range of 5 nm and will all flash in unison. SPSs have a quick-flash characteristic of 60 flashes per minute (0.5 second on/0.5 second off). Intermediate Perimeter Structures (perimeter WTGs) have an operational range of 3 nm and will all flash in unison, though at a difference sequence from SPSs. Intermediate Perimeter Structures have a flash characteristic of 12 flashes per minute (1.0 second on/1.5 seconds off). Interior WTGs have an operational range of 2 nm and will flash at a sequence different from that of the SPSs and Intermediate Perimeter Structures. Lights would be mounted on the platform, which is roughly 60 feet above sea surface. Shielding of lights may adversely affect navigation and is subject to USCG approval. At this time, Ocean Wind does not propose shielding of the obstruction lighting. However, the lighting will fulfill the requirements given in the document “Guidelines for Providing Information on Lighting and Marking of Structures Supporting Renewable Energy Development, BOEM April 28, 2021.” Research on the effects of lighting on birds indicates that solid-steady burning bright lights can attract nocturnal migrants and some seabirds (e.g., shearwaters). However, at terrestrial wind projects, flashing red aviation hazard lights have been demonstrated to have the same attraction response as non-lit turbines and, in general, birds are expected to have a much lower response to flashing lights (COP Volume III, Appendix H; Ocean Wind 2022). Similarly, nocturnally migrating birds over the North Sea were less attracted to blinking lights (red, yellow, green, blue, and white) in the offshore environment than to steady burning lights blinking light is to be preferred over continuous light (Rebke et al. 2019).

Ocean Wind would also include an ADLS on WTGs to mitigate nighttime visual impacts by automatically turning the aviation obstruction lights on and off in response to the presence of aircraft are near the turbines. The use of ADLS would dramatically reduce the amount of time the obstruction lights are on and would have less impact on birds at night than the standard continuous, medium-intensity red strobe light aircraft warning systems. Based on Ocean Wind’s ADLS Efficacy Analysis that looked at historic air traffic data from the FAA, ADLS-controlled obstruction lights would be activated for a total of 1 hours and 19 minutes and 17 seconds over a one-year period. While the activation time ranged from 40 seconds (January) to 23 minutes and 40 seconds (February), for most months of the year the activation time would be less than 10 minutes. In addition, during construction, vessel lighting may attract birds. However, risk of increased collision due to attraction to lighting during nighttime construction activities is considered to be temporary (Fox et al. 2006) and potential effects on ESA-listed birds would be insignificant. Ocean Wind would also reduce potential for bird collision with offshore construction equipment by (1) minimizing the number of lights, (2) using low-intensity lights, (3) avoiding white lights, and (4) as appropriate, using strobe lights rather than steady burning lights, in accordance with applicable FAA, BOEM, and USCG safety lighting requirements, to the extent practicable.

5.2.6 AVOIDANCE AND MINIMIZATION MEASURES

Six APMs are specifically focused on birds (see Section 2.4, Table 2-2):

- BIRD-01: Evaluate avian use by conducting pre-construction surveys for raptor nests, wading bird colonies, seabird nests, and shorebird nests during nesting periods. (Focus being listed species or species identified of special concern by the federal or state government).
- BIRD-02: An avian species monitoring plan for ESA-listed species and/or other priority species or groups will be developed and coordinated with NJDEP and USFWS and implemented as required. The framework for this plan was provided in the Ocean Wind 1 COP Volume III, Appendix AB (see Appendix B). Monitoring objectives and associated methods are summarized below in Table 5-3.
- BIRD-03: Cut trees and vegetation, when possible, during the winter months when most migratory birds are not present at the site.
- BIRD-04: Use lighting technology that minimizes impacts on avian and bat species to the extent practicable.
- BIRD-06: Provide wind turbine air gaps (minimum blade tip elevation to the sea surface) to minimize collision risk to marine birds which fly close to ocean surface.
- BIRD-07: Ocean Wind has sited WTGs and OSS in the eastern portion of the original Lease Area, outside the migratory pathway, to reduce exposure to birds.

Table 5-3 Ocean Wind Avian and Bat Post-Construction Monitoring Objectives, General Approaches to be Used, and Types of Data Generated (see Appendix B, Table 1)

Target Taxa	Monitoring Objective	Approach	Duration	Data Output
Bats	Monitor occurrence of bats	Acoustics	2 years	Presence; temporal and weather patterns
Birds	Monitor use by ESA-listed birds	Radio-tags	Up to 3 years	Presence; temporal and weather patterns
Birds	Monitor use by nocturnal migratory birds	Radar	1–2 years	Flux rates and flight heights of nocturnally migrating birds
Birds	Monitor movement of marine birds around the turbines	Radar	1–2 years	Avoidance rates of marine birds
Bats & Birds	Document mortality	Incidental observations	Project lifetime	Incidence, identification

- Of Ocean Wind's proposed APMs (see Section 2.4, Table 2-2), there are 22 other measures that would also serve to conserve ESA-listed birds and their habitat. In addition, Ocean Wind may be required to implement 12 additional BOEM measures to avoid and minimize impacts to birds (see Section 2.4, Table 2-3).

5.3. MONARCH BUTTERFLY

Potential stressors of the Proposed Action with potential effects on monarch butterfly include:

- Collision Risk
- Onshore Habitat Disturbance

5.3.1 COLLISION RISK

There have been reports of monarch butterflies on offshore oil platforms and ships at sea, suggesting that the species may fly over open water, but the species is generally reluctant to cross over water (Brower 1995). Although monarchs are far-ranging fliers, they are easily blown off course, likely by storms, into offshore waters. This would be a small proportion of the overall migratory population, and large numbers of monarch butterflies do not fly over the Atlantic OCS.

There is limited information about butterfly mortalities caused by collisions with wind turbines, especially for monarch butterflies in the offshore environment. Some studies have investigated the density of insect splatter on onshore wind turbine blades and concluded that there was a negligible effect on insects (Gipe 1995), while others have suggested that the impacts of wind turbines on insect populations, in general, may be significant (Trieb et al. 2018; Voigt 2021). Monarch butterfly migration is well studied, and the species has been recorded to fly at heights over 10,000 feet (3,048 meters) above ground elevation, taking advantage of favorable winds and moving downwind at high elevation (Monarch Joint Venture 2014). Thus, while their flight patterns could occasionally put them within the blade heights of the Project WTGs, monarch butterflies would not be unlikely to occur within the RSZ of the Project during migration. They are also believed to generally be capable of avoiding turbines due to their high-altitude migration (Monarch Joint Venture 2021). Because migration is the only time period when monarch butterflies could occur offshore, there is little to no evidence to suggest that collision with wind turbines on the Atlantic OCS poses a threat to the species. Furthermore, very few monarch butterflies are expected to occur within the Atlantic OCS, so potential effects on individuals would be insignificant. Also, potential risk of monarch butterfly collision with other Project components is not expected, except for construction vehicle, which is discussed below.

5.3.2 ONSHORE HABITAT DISTURBANCE EFFECTS

Potential effects to the monarch butterfly could occur during Project construction in the vicinity of areas where milkweed and other native nectar plants are present. While adult monarch butterflies have the mobility to avoid construction equipment, larval stages could be vulnerable to being crushed by construction equipment, particularly during land clearing and ground excavation. Some adult monarch butterflies could also be affected by vehicle collisions (McKenna et al. 2001; Kantola et al. 2019). Also, there is evidence that monarch caterpillars exposed to highway noise for short periods had elevated heart rates, a sign that they may experience stress along loud roadsides (Davis et al. 2018).

Although Project construction and O&M would potentially affect a small number of monarch butterflies, impacts are anticipated to be limited to behavioral avoidance of construction activity. Collision with Project vehicles and equipment is unlikely because the Project would not cause a noticeable increase in traffic. Suitable habitat is not widespread in the Action Area and the Proposed Action would not cause an increase in noise to the extent that it would adversely affect monarch butterflies. If any adult butterflies were disturbed by Project activities, they would likely utilize adjacent habitat and repopulate these areas once construction ceases. Based on this information, potential effects on monarch butterflies from construction vehicles would be unlikely, or insignificant if they were to occur.

Pre-construction habitat surveys proposed for ESA-listed plants would also document locations where milkweed and other native nectar plants are abundant so they can be avoided if feasible. Temporarily disturbed monarch butterfly habitat would be restored to pre-existing contours (maintaining natural surface drainage patterns) and allow vegetation to become reestablished once construction activities are completed, to the extent practicable (APM GEN-13; see Section 2.4, Table 2-2). An additional measure may require Ocean Wind to enhance monarch butterfly habitat in coordination with the USFWS and NJDEP. If suitable habitat monarch butterfly habitat is present where substation construction would occur, the small permanent loss of habitat would be considered insignificant. Also, construction of the onshore export cable route would convert some shrub or forested habitats to herbaceous plant communities, potentially resulting in a beneficial effect to monarch butterfly by creating suitable habitat for milkweed to become established. Ocean Wind does not propose to use herbicides for ROW maintenance.

5.3.3 AVOIDANCE AND MINIMIZATION MEASURES

No APMs are specifically focused on the monarch butterfly, but 21 measures would serve to reduce potential Project effects on the species (see Section 2.4, Table 2-2). In addition, Ocean Wind may be required to implement four additional BOEM measures to avoid and minimize impacts to monarch butterfly (see Section 2.4, Table 2-3).

5.4. PLANTS (AMERICAN CHAFFSEED, SEABEACH AMARANTH, KNIESKERN’S BEAKED-RUSH, SENSITIVE JOINT-VETCH, AND SWAMP PINK)

Potential stressors of the Proposed Action with potential effects on ESA-listed plants include:

- Onshore Habitat Disturbance

5.4.1 ONSHORE HABITAT DISTURBANCE EFFECTS

ESA-listed plants would be potentially affected by only the onshore Project components where they would intersect coastal beaches and wetlands. The proposed BL England and Oyster Creek substation sites are generally within upland habitats that do not provide suitable habitat for seabeach amaranth, Knieskern’s beaked-rush, or swamp pink. As detailed in Section 4.11 and 4.14, there is no potential for American chaffseed or sensitive joint-vetch to occur within the Action Area, respectively. The site proposed for the BL England substation is open, with herbaceous vegetation and interspersed trees; the site proposed for the Oyster Creek substation was previously disturbed and also consists of herbaceous vegetation. Therefore, the onshore substation construction is expected to have no direct effects on ESA-listed plants.

Impacts to seabeach amaranth plants, which are known to occur on open beaches and vegetated dunes within the Action Area, would be avoided by using HDD for transition of the export cables from offshore to onshore and by avoiding routing project entry or intrusion in these habitats following construction. Ocean Wind would implement measures to avoid and minimize impacts, including site-specific habitat surveys prior to construction, and coordinate with the NJDEP and USFWS to identify unique or protected habitat or known habitat for threatened or endangered and candidate species and avoid these areas to the extent practicable. In addition, Island Beach State Park and Ocean City have beach management plans that provide a framework for protecting federally and state-listed plant species that occur along the beach habitats (Island Beach State Park 2017; City of Ocean City 2016). Ocean Wind would coordinate with the local beach management entities and comply with any requirements of the beach management plans. Therefore, onshore export cable construction and O&M is not expected to affect suitable habitat for seabeach amaranth and any Project effects on the species would be insignificant.

Disturbance from Project vehicles and equipment could be beneficial to the persistence of American chaffseed if the species were to occur within the Action Area. However, a high fire frequency (1-to-2-year fire-return interval) plays a critical role in the growth and reproduction of American chaffseed populations. In the absence of fire, the plants will fail to reproduce and experience lower recruitment overall (Kirkman et al. 1998). As previously stated, based on habitats present in the onshore project area and American chaffsee being a successional fire-dependent species, the species is not believed to be present in the vicinity of the project. There has been no evidence observed during any site visit of recent fires. Appendix C-4, shows a representative photograph log and locations maps of the onshore project area. Therefore, due to these very specific habitat requirements, American chaffseed is very unlikely to occur in the Action Area and the potential effects of Project construction and O&M would be discountable.

As described above, wetlands within the Holtec Property and Bay Parkway landfall sites in the Oyster Creek area may provide suitable habitat for Knieskern's beaked-rush and swamp pink. As previously mentioned in Sections 4.12.2 and 4.15.2, a survey of suitable habitat for Knieskern's beaked rush and swamp pink within the Project area was conducted in 2021 by qualified biologists following USFWS New Jersey Field Office guidance (Appendix C). No specimens were observed. Suitable habitat for Knieskern's beaked-rush could be affected by excavation, rutting, compaction, and mixing of topsoil and subsoil during installation of the onshore export cable (See Appendix C-2a for disturbance area). . However, this would be avoided because an additional measure may require Ocean Wind to conduct site-specific habitat surveys prior to construction to determine the location and extent of ESA-listed plants and develop avoidance and minimization measures in coordination with the USFWS and NJDEP (see Table 2-3). Trenchless technology options may be employed along portions of the onshore export cable routes to avoid impacts on wetlands, and thereby ESA-listed plants that may be present within the wetlands. Temporarily affected habitats would be restored to pre-existing conditions following completion of construction and are expected to become reestablished within 1 to 3 years following construction. The majority of forested wetlands (swamp pink habitat) within the onshore project area are within the Holtect Property near the oyster creek export cable route. The export cable route will be within the upland dirt trail and not within forested wetlands. Because project disturbance will be outside of forested wetlands, swamp pink habitat is not anticipated to be directly impacted by the project (see Appendix C-3). Therefore, the potential effects on Knieskern's beaked-rush and swamp pink from habitat disturbance during onshore export cable construction and O&M is expected to be insignificant.

The Project could indirectly affect wetland habitats suitable for Knieskern's beaked-rush and swamp pink due to erosion caused by construction and O&M activities (e.g., removal of vegetation and soil disturbance) that could cause sedimentation and degradation of downstream water quality. The level of effect would depend on where plants may be found relative to the anticipated areas of habitat degradation. However, such impacts are not anticipated to be significant due to the limited wetland habitat that would be disturbed and the implementation of erosion and sediment control measures during construction. It is not anticipated that disturbances associated with the proposed Project would result in significant hydrologic or ecologic impacts to wetland habitats.

In summary, the proposed Project would not measurably affect the quantity or quality of habitat available to ESA-listed plant species. No suitable habitat for American chaffseed or sensitive joint-vetch occurs near the proposed Project infrastructure and potential impacts to beach habitat suitable for seabeach amaranth would be insignificant. In addition, the potential effects of the Proposed Action on wetland habitats where Knieskern's beaked-rush and swamp pink could occur would be insignificant.

5.4.2 AVOIDANCE AND MINIMIZATION MEASURES

While Ocean Wind does not propose any APMs specifically focused on ESA-listed plants, 18 measures would serve to reduce potential Project effects on the species (see Section 2.4, Table 2-2). In addition, Ocean Wind may be required to implement four additional BOEM measures to avoid and minimize impacts to plants. (see Section 2.4, Table 2-3).

6. EFFECTS DETERMINATIONS

BOEM has concluded that the construction and O&M of the proposed Project would have ***no effect*** to the bog turtle or American chaffseed. BOEM concluded the Project may affect all remaining 10 ESA-listed threatened or endangered species under USFWS jurisdiction that may occur in the Action Area; however, the Proposed Action is ***not likely to adversely affect*** them. For the proposed tricolored bat, Section 7 requires BOEM to consult under a conference consultation if the proposed action would jeopardize the continued existence of the species. Based on the analysis, the proposed action would not jeopardize the continued existence of the species. Should the tricolored bat get listed at some point during the consultation process, BOEM would make a *not likely to adversely affect* determination for tricolored bat. These effect determinations are summarized by species in Table 6-1, and the supporting rationale is summarized further below. There is no designated critical habitat for these species in the action area; therefore, the Proposed Action will have no effect on critical habitat.

Table 6-1 Effect Determination Summary for Threatened, Endangered, or Candidate Species That May Occur in the Action Area

Species	Status	Effect Determination
Northern Long-eared Bat (*Myotis septentrionalis*)	T	***Not likely to adversely affect***
Tricolored Bat (*Perimyotis subflavus*)	P	***Would not jeopardize the continued existence***
Piping Plover (*Charadrius melodus*)	T	***Not likely to adversely affect***
Rufa Red Knot (*Calidris canutus rufa*)	T	***Not likely to adversely affect***
Roseate Tern (*Sterna dougallii dougallii*)	E	***Not likely to adversely affect***
Eastern Black Rail (*Laterallus jamaicensis jamaicensis*)	T	***Not likely to adversely affect***
Saltmarsh Sparrow (*Ammodramus caudacutus*)	NL	***Not likely to adversely affect***
Bog Turtle (*Glyptemys muhlenbergii*)	T	***No Effect***
Monarch Butterfly (*Danaus plexippus*)	NL, C	***Not likely to adversely affect***
American chaffseed (*Schwalbea americana*)	E	***No Effect***
Knieskern's Beaked-rush (*Rhynchospora knieskernii*)	T	***Not likely to adversely affect***
Seabeach Amaranth (*Amaranthus pumilus*)	T	***Not likely to adversely affect***
Sensitive Joint-vetch (*Aeschynomene virginica*)	T	***Not likely to adversely affect***
Swamp Pink (*Helonias bullata*)	T	***Not likely to adversely affect***

Status Codes: E = ESA-listed Endangered; T = ESA-listed Threatened; C = Candidate for ESA-listing; NL = Not Listed

6.1. NORTHERN LONG-EARED BAT

Given that the northern long-eared bat and tricolored bat have been documented in the vicinity of the BL England and Oyster Creek areas, the proposed Project may affect these species during installation of the onshore export cables and substation. However, impacts would be avoided by pre-construction surveys and avoidance measures that conform with the USFWS (2016a) 4(d) Rule for the northern long-eared bat. Incidental take of northern long-eared bat due to the proposed Project would thus be excepted from take prohibitions in Section 9 of the ESA. However, the species may be uplisted under the ESA to "Endangered" and the existing 4(d) Rule would no longer be applicable. Regardless, the Project's effects on northern long-eared bat and tricolored bat habitat would be insignificant because if tree clearing is required in areas with trees suitable for bat roosting during the period when the bats may be present, Ocean Wind would develop avoidance and minimization measures in coordination with the USFWS and NJDEP and conduct pre-construction habitat surveys. Ocean Wind would avoid potential impacts by conducting tree clearing during the winter months, to the extent practicable. There is also little to no risk that northern long-eared bats and tricolored bats would collide with wind turbines because the species is not expected to occur within the offshore components of the Action Area. Furthermore, potential effects would be avoided through the implementation of Ocean Wind's APMs (see Section 2.4, Table 2-2). An additional measure may require Ocean Wind to modify its revegetation APM (GEN-13) to enhance bat habitat in coordination with the USFWS and NJDEP. For these reasons, BOEM anticipates that the Proposed Action is ***not likely to adversely affect*** the northern long-eared bat and ***would not jeopardize the continued existence*** of the tricolored bat. Should the tricolored bat become listed during the consultation process, the Proposed Action would *not likely adversely affect* the species.

6.2. BIRDS (PIPING PLOVER, RUFA RED KNOT, ROSEATE TERN, EASTERN BLACK RAIL, AND SALTMARSH SPARROW)

Based on the analysis in Section 5, the construction and O&M of the proposed onshore facilities may affect eastern black rails, piping plovers, rufa red knots, or roseate terns. Any effects would be minor and insignificant based on the fact that: (1) these species do not have a high risk of collision with offshore wind turbines and are rarely expected to occur within the RSZ; (2) impacts to potential habitat in onshore areas would be temporary and insignificant, (3) all suitable nesting or foraging habitat in areas proposed to be disturbed would be surveyed and species monitoring plans would be developed, (4) most affected habitat already experiences relatively high levels of existing disturbance; and (5) potential impact would be localized and short-term in nature, including noise. Furthermore, potential effect would be further avoided or minimized by the proposed monitoring and APMs (see Section 2.4, Table 2-2). An additional measure may require Ocean Wind to implement seasonal restrictions for ESA-listed birds where necessary, in coordination with the USFWS and NJDEP. Therefore, BOEM anticipates that the Proposed Action is ***not likely to adversely affect*** the piping plover, rufa red knot, roseate tern, eastern black rail, or saltmarsh sparrow.

6.3. MONARCH BUTTERFLY

Based on the developed urban and suburban character of the majority of the Action Area, the monarch butterfly's specific habitat preferences, and considering avoidance measures and post-construction habitat restoration, the potential effects on monarch butterfly would be insignificant.

Furthermore, potential effect would be further avoided or minimized by the APMs (see Section 2.4, Table 2-2). An additional measure may require Ocean Wind to modify its revegetation APM (GEN-13) to enhance monarch butterfly habitat in coordination with the USFWS and NJDEP. Therefore, BOEM anticipates that, while the Proposed Action may affect the monarch butterfly, it is ***not likely to adversely affect*** this species.

6.4. PLANTS (AMERICAN CHAFFSEED, SEABEACH AMARANTH, KNIESKERN'S BEAKED-RUSH, SENSITIVE JOINT-VETCH, AND SWAMP PINK)

There is only one known population of American chaffseed in New Jersey and no known historic occurrences of American chaffseed within the townships intersected by the Action Area. Suitable habitat for American chaffseed, which includes sites that are mowed or burned every 1 to 3 years, does not likely occur within the Action Area. Thus, the Proposed Action would have ***no effect*** on American chaffseed.

Given that most of the onshore habitats affected are already disturbed, HDD would avoid disturbance to beaches and dunes, and there would be no routine project entry or intrusion into any beach or dune habitat following construction, there would be no measurable effect on beach shoreline habitats potentially occupied by seabeach amaranth. In addition, 2018 onshore field surveys did not find any seabeach amaranth, and there is no suitable habitat at the location of the onshore Project component substations because they are currently developed. Ocean Wind also proposed APMs to avoid or minimize potential impacts (see Section 2.4, Table 2-2). An additional measure may require Ocean Wind to conduct pre-construction habitat surveys for ESA-listed plants and develop avoidance and minimization measures in coordination with the USFWS and NJDEP. Thus, the Proposed Action may affect, but is ***not likely to adversely affect*** seabeach amaranth.

Project facilities would be co-located with existing developed areas, which would limit disturbance to ESA-listed species and their habitats. Based on analysis of undeveloped habitats that may be disturbed, and considering the proposed pre-construction survey for ESA-listed plants and other avoidance and minimization measures (see Section 2.4, Table 2-2), BOEM anticipates that the Proposed Action may affect, but is ***not likely to adversely affect*** Knieskern's beaked-rush, sensitive joint-vetch, and swamp pink.

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Appendix A. USFWS Information for Planning and Consultation (IPaC) Species Reports

Appendix A-1 IPaC Species List for the Ocean Wind Onshore Action Area

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Jersey Ecological Services Field Office
4 E. Jimmie Leeds Road, Suite 4
Galloway, NJ 08205
Phone: (609) 646-9310 Fax: (609) 646-0352
http://www.fws.gov/northeast/njfieldoffice/Endangered/consultation.html

In Reply Refer To: May 27, 2022
Project Code: 2022-0048115
Project Name: Ocean Wind - Onshore Action Area

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

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

If the enclosed list indicates that any listed species may be present in your action area, please visit the New Jersey Field Office consultation web page as the next step in evaluating potential project impacts: http://www.fws.gov/northeast/njfieldoffice/Endangered/consultation.html

On the New Jersey Field Office consultation web page you will find:

- habitat descriptions, survey protocols, and recommended best management practices for listed species;
- recommended procedures for submitting information to this office; and
- links to other Federal and State agencies, the Section 7 Consultation Handbook, the Service's wind energy guidelines, communication tower recommendations, the National Bald Eagle Management Guidelines, and other resources and recommendations for protecting wildlife resources.

The enclosed list may change as new information about listed species becomes available. As per Federal regulations at 50 CFR 402.12(e), the enclosed list is only valid for 90 days. Please return to the ECOS-IPaC website at regular intervals during project planning and implementation to obtain an updated species list. When using ECOS-IPaC, be careful about drawing the boundary of your Project Location. Remember that your action area under the ESA is not limited to just the footprint of the project. The action area also includes all areas that may be indirectly

affected through impacts such as noise, visual disturbance, erosion, sedimentation, hydrologic change, chemical exposure, reduced availability or access to food resources, barriers to movement, increased human intrusions or access, and all areas affected by reasonably forseeable future that would not occur without ("but for") the project that is currently being proposed.

Additionally, please note that on March 23, 2022, the Service published a proposal to reclassify the northern long-eared bat (NLEB) as endangered under the Endangered Species Act. The U.S. District Court for the District of Columbia has ordered the Service to complete a new final listing determination for the NLEB by November 2022 (Case 1:15-cv-00477, March 1, 2021). The bat, currently listed as threatened, faces extinction due to the range-wide impacts of white-nose syndrome (WNS), a deadly fungal disease affecting cave-dwelling bats across the continent. The proposed reclassification, if finalized, would remove the current 4(d) rule for the NLEB, as these rules may be applied only to threatened species. Depending on the type of effects a project has on NLEB, the change in the species' status may trigger the need to re-initiate consultation for any actions that are not completed and for which the Federal action agency retains discretion once the new listing determination becomes effective (anticipated to occur by December 30, 2022). If your project may result in incidental take of NLEB after the new listing goes into effect this will first need to addressed in an updated consultation that includes an Incidental Take Statement. If your project may require re-initiation of consultation, please contact our office for additional guidance.

We appreciate your concern for threatened and endangered species. The Service encourages Federal and non-Federal project proponents to consider listed, proposed, and candidate species early in the planning process. Feel free to contact this office if you would like more information or assistance evaluating potential project impacts to federally listed species or other wildlife resources. Please include the Consultation Tracking Number in the header of this letter with any correspondence about your project.

Attachment(s):

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

Official Species List

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

This species list is provided by:

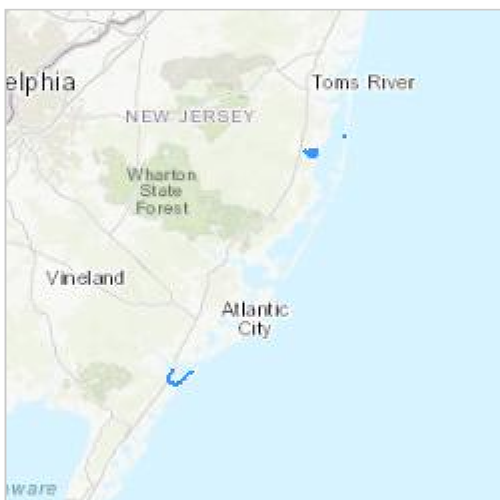
New Jersey Ecological Services Field Office
4 E. Jimmie Leeds Road, Suite 4
Galloway, NJ 08205
(609) 646-9310

Project Summary

Project Code:	2022-0048115
Event Code:	None
Project Name:	Ocean Wind - Onshore Action Area
Project Type:	Power Gen - Wind - Offshore
Project Description:	BOEM is considering the approval of the construction, operations and maintenance, and eventual decommissioning of a proposed offshore wind energy facility off the coast of New Jersey, and associated submarine and upland cable interconnecting the wind facility to two existing interconnection points, one at the Oyster Creek substation in Lacey Township, Ocean County, New Jersey, and another at B.L. England substation in Upper Township, Cape May County, New Jersey. Onshore support facilities would be located at existing waterfront industrial or commercial sites within New Jersey and Virginia. The proposed project would be approximately 1,100-megawatyd in scale and sited approximately 15 miles (13 nautical miles) southeast of Atlantic City, New Jersey, within the area of BOEM Renewable Energy Lease Number OCS-A 0498.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@39.80722555,-74.20396697751437,14z



Counties: Cape May and Ocean counties, New Jersey

Endangered Species Act Species

There is a total of 10 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 2 of these species should be considered only under certain conditions.

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

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

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

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: ▪ The specified area occurs within the range of the northern long-eared bat. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Birds

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

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: ▪ The monarch is a candidate species and not yet listed or proposed for listing. There are generally no section 7 requirements for candidate species (FAQ found here: https://www.fws.gov/savethemonarch/FAQ-Section7.html). Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

Flowering Plants

NAME	STATUS
American Chaffseed *Schwalbea americana* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1286	Endangered
Knieskern's Beaked-rush *Rhynchospora knieskernii* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3280	Threatened
Seabeach Amaranth *Amaranthus pumilus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8549	Threatened
Sensitive Joint-vetch *Aeschynomene virginica* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/855	Threatened
Swamp Pink *Helonias bullata* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4333	Threatened

Critical habitats

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

USFWS National Wildlife Refuge Lands And Fish Hatcheries

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

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

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

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

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

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

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

NAME	BREEDING SEASON
American Oystercatcher *Haematopus palliatus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8935	Breeds Apr 15 to Aug 31
Audubon's Shearwater *Puffinus lherminieri* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 1 to Aug 5

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Aug 31
Black Guillemot *Cepphus grylle* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds May 15 to Sep 10
Black Scoter *Melanitta nigra* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Black Skimmer *Rynchops niger* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5234	Breeds May 20 to Sep 15
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Black-legged Kittiwake *Rissa tridactyla* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Blue-winged Warbler *Vermivora pinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 1 to Jun 30
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Brown Pelican *Pelecanus occidentalis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Jan 15 to Sep 30
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 10

NAME	BREEDING SEASON
Cerulean Warbler *Dendroica cerulea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/2974	Breeds Apr 29 to Jul 20
Common Eider *Somateria mollissima* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Jun 1 to Sep 30
Common Loon *gavia immer* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/4464	Breeds Apr 15 to Oct 31
Cory's Shearwater *Calonectris diomedea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Double-crested Cormorant *phalacrocorax auritus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/3478	Breeds Apr 20 to Aug 31
Dovekie *Alle alle* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/6041	Breeds elsewhere
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Aug 20
Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds elsewhere
Great Shearwater *Puffinus gravis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Gull-billed Tern *Gelochelidon nilotica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9501	Breeds May 1 to Jul 31

NAME	BREEDING SEASON
Hudsonian Godwit *Limosa haemastica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Kentucky Warbler *Oporornis formosus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Long-eared Owl *asio otus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3631	Breeds Mar 1 to Jul 15
Long-tailed Duck *Clangula hyemalis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/7238	Breeds elsewhere
Manx Shearwater *Puffinus puffinus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 15 to Oct 31
Pomarine Jaeger *Stercorarius pomarinus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Prairie Warbler *Dendroica discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Purple Sandpiper *Calidris maritima* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Razorbill *Alca torda* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Jun 15 to Sep 10

NAME	BREEDING SEASON
Red-breasted Merganser *Mergus serrator* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Red-necked Phalarope *Phalaropus lobatus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Red-throated Loon *Gavia stellata* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Ring-billed Gull *Larus delawarensis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Roseate Tern *Sterna dougallii* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds May 10 to Aug 31
Royal Tern *Thalasseus maximus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Apr 15 to Aug 31
Ruddy Turnstone *Arenaria interpres morinella* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Short-billed Dowitcher *Limnodromus griseus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Surf Scoter *Melanitta perspicillata* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere

NAME	BREEDING SEASON
Thick-billed Murre *Uria lomvia* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Apr 15 to Aug 15
White-winged Scoter *Melanitta fusca* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Willet *Tringa semipalmata* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 5
Wilson's Storm-petrel *Oceanites oceanicus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability Of Presence Summary

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

Probability of Presence (■)

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

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

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum

probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

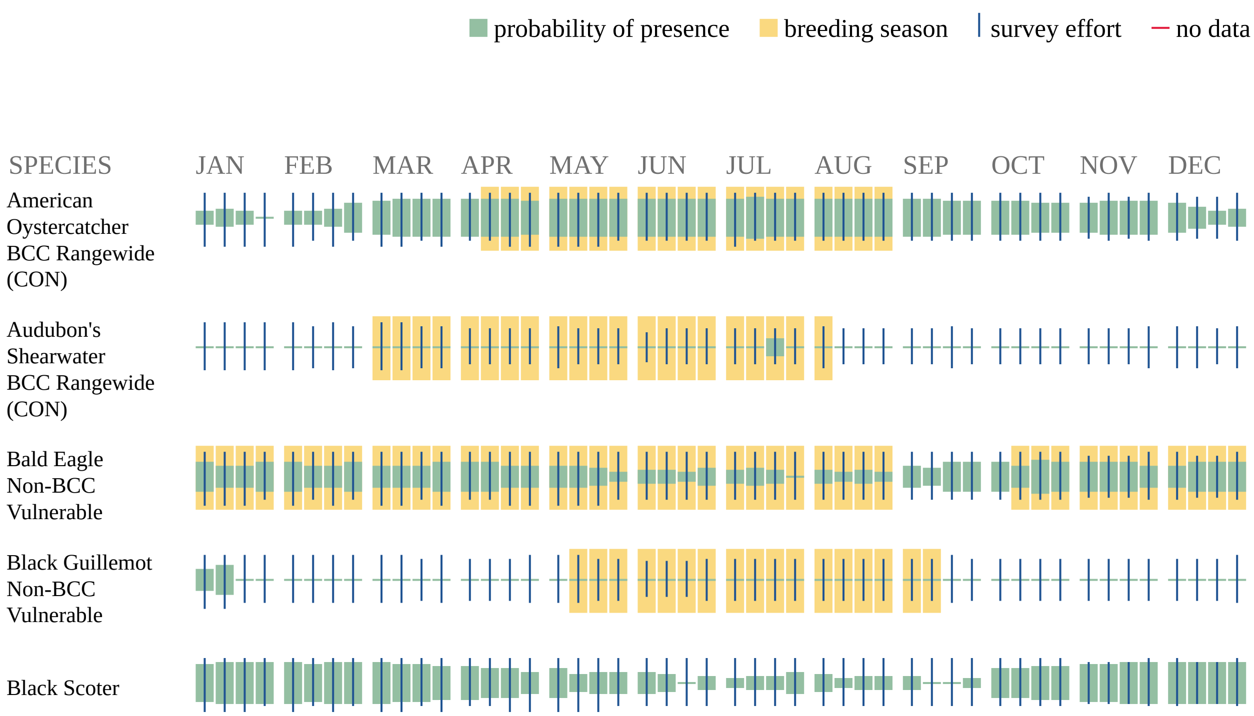
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

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

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

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

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



Non-BCC
Vulnerable

Black Skimmer
BCC Rangewide
(CON)

Black-billed
Cuckoo
BCC Rangewide
(CON)

Black-legged
Kittiwake
Non-BCC
Vulnerable

Blue-winged
Warbler
BCC - BCR

Bobolink
BCC Rangewide
(CON)

Brown Pelican
Non-BCC
Vulnerable

Canada Warbler
BCC Rangewide
(CON)

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

Cerulean Warbler
BCC Rangewide
(CON)

Common Eider
Non-BCC
Vulnerable

Common Loon
Non-BCC
Vulnerable

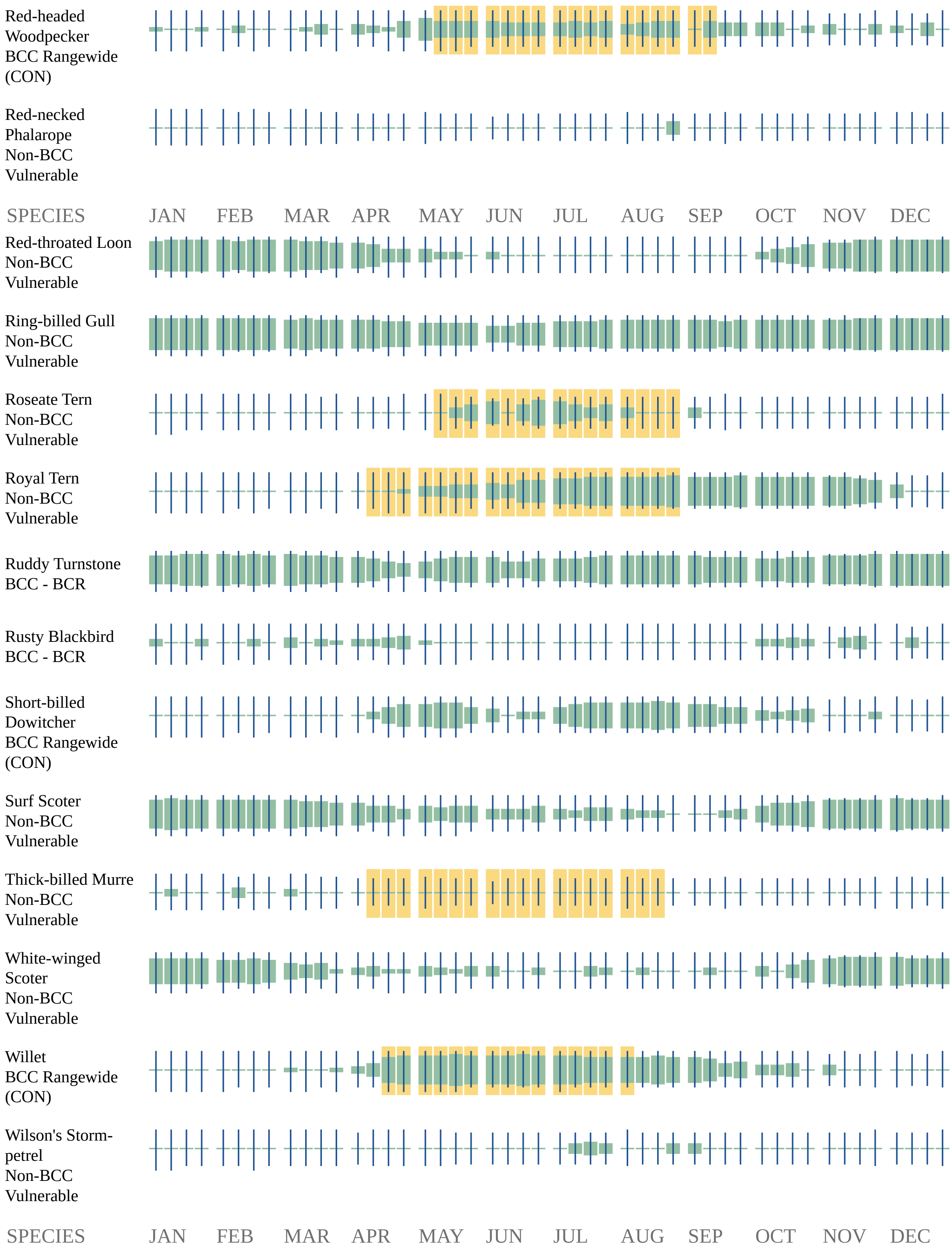
Cory's Shearwater
BCC Rangewide
(CON)

Double-crested
Cormorant
Non-BCC
Vulnerable

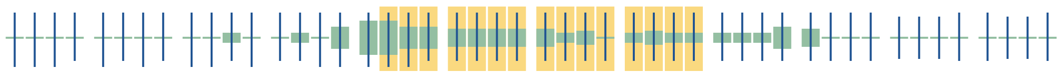
Dovekie
Non-BCC
Vulnerable

Eastern Whip-poor-
will
BCC Rangewide
(CON)


Golden Eagle
Non-BCC
Vulnerable
Great Shearwater
Non-BCC
Vulnerable
Gull-billed Tern
BCC Rangewide
(CON)
Hudsonian Godwit
BCC Rangewide
(CON)
Kentucky Warbler
BCC Rangewide
(CON)
SPECIES
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
Lesser Yellowlegs
BCC Rangewide
(CON)
Long-eared Owl
BCC Rangewide
(CON)
Long-tailed Duck
Non-BCC
Vulnerable
Manx Shearwater
BCC Rangewide
(CON)
Pomarine Jaeger
Non-BCC
Vulnerable
Prairie Warbler
BCC Rangewide
(CON)
Prothonotary
Warbler
BCC Rangewide
(CON)
Purple Sandpiper
BCC Rangewide
(CON)
Razorbill
Non-BCC
Vulnerable
Red-breasted
Merganser
Non-BCC
Vulnerable


Red-headed Woodpecker
BCC Rangewide (CON)
Red-necked Phalarope
Non-BCC Vulnerable
SPECIES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
Red-throated Loon
Non-BCC Vulnerable
Ring-billed Gull
Non-BCC Vulnerable
Roseate Tern
Non-BCC Vulnerable
Royal Tern
Non-BCC Vulnerable
Ruddy Turnstone
BCC - BCR
Rusty Blackbird
BCC - BCR
Short-billed Dowitcher
BCC Rangewide (CON)
Surf Scoter
Non-BCC Vulnerable
Thick-billed Murre
Non-BCC Vulnerable
White-winged Scoter
Non-BCC Vulnerable
Willet
BCC Rangewide (CON)
Wilson's Storm-petrel
Non-BCC Vulnerable
SPECIES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Wood Thrush
BCC Rangewide
(CON)



Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

Migratory Birds FAQ

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

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

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

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

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

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

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

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

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

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

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

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

Details about birds that are potentially affected by offshore projects

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

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

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

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

Coastal Barriers

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

UNIT	NAME	TYPE	ESTABLISHMENT DATE	FLOOD INSURANCE DATE
NJ-05P	Island Beach	Otherwise Protected Area	N/A	11/16/1991

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

WETLAND INFORMATION WAS NOT AVAILABLE WHEN THIS SPECIES LIST WAS GENERATED. PLEASE VISIT HTTPS://WWW.FWS.GOV/WETLANDS/DATA/MAPPER.HTML OR CONTACT THE FIELD OFFICE FOR FURTHER INFORMATION.

IPaC User Contact Information

Agency:	WSP
Name:	Phil Baigas
Address:	412 Mount Kemble Avenue
City:	Morristown
State:	NJ
Zip:	07962-1946
Email	phillip.baigas@wsp.com
Phone:	9704040172

Appendix A-2 IPaC Species List of the Ocean Wind Offshore Action Area

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Jersey Ecological Services Field Office
4 E. Jimmie Leeds Road, Suite 4
Galloway, NJ 08205
Phone: (609) 646-9310 Fax: (609) 646-0352
http://www.fws.gov/northeast/njfieldoffice/Endangered/consultation.html

In Reply Refer To: May 25, 2022
Project Code: 2022-0047448
Project Name: Ocean Wind - Offshore Export Cable

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

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq*.).

If the enclosed list indicates that any listed species may be present in your action area, please visit the New Jersey Field Office consultation web page as the next step in evaluating potential project impacts: http://www.fws.gov/northeast/njfieldoffice/Endangered/consultation.html

On the New Jersey Field Office consultation web page you will find:

- habitat descriptions, survey protocols, and recommended best management practices for listed species;
- recommended procedures for submitting information to this office; and
- links to other Federal and State agencies, the Section 7 Consultation Handbook, the Service's wind energy guidelines, communication tower recommendations, the National Bald Eagle Management Guidelines, and other resources and recommendations for protecting wildlife resources.

The enclosed list may change as new information about listed species becomes available. As per Federal regulations at 50 CFR 402.12(e), the enclosed list is only valid for 90 days. Please return to the ECOS-IPaC website at regular intervals during project planning and implementation to obtain an updated species list. When using ECOS-IPaC, be careful about drawing the boundary of your Project Location. Remember that your action area under the ESA is not limited to just the footprint of the project. The action area also includes all areas that may be indirectly

affected through impacts such as noise, visual disturbance, erosion, sedimentation, hydrologic change, chemical exposure, reduced availability or access to food resources, barriers to movement, increased human intrusions or access, and all areas affected by reasonably forseeable future that would not occur without ("but for") the project that is currently being proposed.

Additionally, please note that on March 23, 2022, the Service published a proposal to reclassify the northern long-eared bat (NLEB) as endangered under the Endangered Species Act. The U.S. District Court for the District of Columbia has ordered the Service to complete a new final listing determination for the NLEB by November 2022 (Case 1:15-cv-00477, March 1, 2021). The bat, currently listed as threatened, faces extinction due to the range-wide impacts of white-nose syndrome (WNS), a deadly fungal disease affecting cave-dwelling bats across the continent. The proposed reclassification, if finalized, would remove the current 4(d) rule for the NLEB, as these rules may be applied only to threatened species. Depending on the type of effects a project has on NLEB, the change in the species' status may trigger the need to re-initiate consultation for any actions that are not completed and for which the Federal action agency retains discretion once the new listing determination becomes effective (anticipated to occur by December 30, 2022). If your project may result in incidental take of NLEB after the new listing goes into effect this will first need to addressed in an updated consultation that includes an Incidental Take Statement. If your project may require re-initiation of consultation, please contact our office for additional guidance.

We appreciate your concern for threatened and endangered species. The Service encourages Federal and non-Federal project proponents to consider listed, proposed, and candidate species early in the planning process. Feel free to contact this office if you would like more information or assistance evaluating potential project impacts to federally listed species or other wildlife resources. Please include the Consultation Tracking Number in the header of this letter with any correspondence about your project.

Attachment(s):

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

Official Species List

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

This species list is provided by:

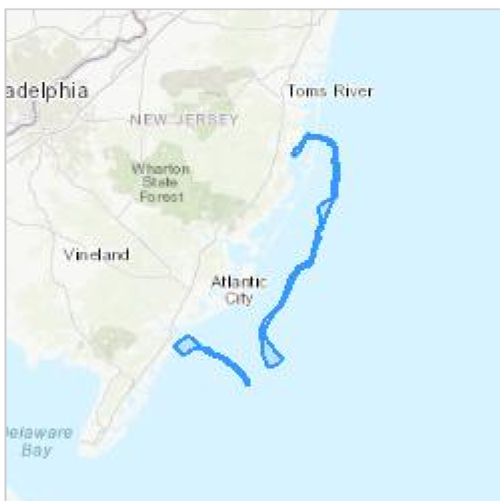
New Jersey Ecological Services Field Office
4 E. Jimmie Leeds Road, Suite 4
Galloway, NJ 08205
(609) 646-9310

Project Summary

Project Code:	2022-0047448
Event Code:	None
Project Name:	Ocean Wind - Offshore Export Cable
Project Type:	Power Gen - Wind - Offshore
Project Description:	BOEM is considering the approval of the construction, operations and maintenance, and eventual decommissioning of a proposed offshore wind energy facility off the coast of New Jersey, and associated submarine and upland cable interconnecting the wind facility to two existing interconnection points, one at the Oyster Creek substation in Lacey Township, Ocean County, New Jersey, and another at B.L. England substation in Upper Township, Cape May County, New Jersey. Onshore support facilities would be located at existing waterfront industrial or commercial sites within New Jersey and Virginia. The proposed project would be approximately 1,100-megawatyd in scale and sited approximately 15 miles (13 nautical miles) southeast of Atlantic City, New Jersey, within the area of BOEM Renewable Energy Lease Number OCS-A 0498.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@39.209636,-74.42351525751846,14z



Counties: Cape May and Ocean counties, New Jersey

Endangered Species Act Species

There is a total of 7 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 1 of these species should be considered only under certain conditions.

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

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

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

Birds

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

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: ▪ The monarch is a candidate species and not yet listed or proposed for listing. There are generally no section 7 requirements for candidate species (FAQ found here: https://www.fws.gov/savethemonarch/FAQ-Section7.html). Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

Flowering Plants

NAME	STATUS
American Chaffseed *Schwalbea americana* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1286	Endangered
Seabeach Amaranth *Amaranthus pumilus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8549	Threatened
Swamp Pink *Helonias bullata* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4333	Threatened

Critical habitats

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

USFWS National Wildlife Refuge Lands And Fish Hatcheries

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

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

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

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

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

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

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

NAME	BREEDING SEASON
American Oystercatcher *Haematopus palliatus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8935	Breeds Apr 15 to Aug 31
Audubon's Shearwater *Puffinus lherminieri* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 1 to Aug 5

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Aug 31
Black Guillemot *Cepphus grylle* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds May 15 to Sep 10
Black Scoter *Melanitta nigra* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Black Skimmer *Rynchops niger* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5234	Breeds May 20 to Sep 15
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Black-legged Kittiwake *Rissa tridactyla* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Blue-winged Warbler *Vermivora pinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds May 1 to Jun 30
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Brown Pelican *Pelecanus occidentalis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Jan 15 to Sep 30
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 10

NAME	BREEDING SEASON
Cerulean Warbler *Dendroica cerulea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/2974	Breeds Apr 29 to Jul 20
Common Eider *Somateria mollissima* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Jun 1 to Sep 30
Common Loon *gavia immer* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/4464	Breeds Apr 15 to Oct 31
Cory's Shearwater *Calonectris diomedea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Double-crested Cormorant *phalacrocorax auritus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/3478	Breeds Apr 20 to Aug 31
Dovekie *Alle alle* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/6041	Breeds elsewhere
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Aug 20
Great Shearwater *Puffinus gravis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Gull-billed Tern *Gelochelidon nilotica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9501	Breeds May 1 to Jul 31
Hudsonian Godwit *Limosa haemastica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere

NAME	BREEDING SEASON
Kentucky Warbler *Oporornis formosus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Long-tailed Duck *Clangula hyemalis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/7238	Breeds elsewhere
Manx Shearwater *Puffinus puffinus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 15 to Oct 31
Pomarine Jaeger *Stercorarius pomarinus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Prairie Warbler *Dendroica discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Purple Sandpiper *Calidris maritima* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Razorbill *Alca torda* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Jun 15 to Sep 10
Red-breasted Merganser *Mergus serrator* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10

NAME	BREEDING SEASON
Red-necked Phalarope *Phalaropus lobatus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Red-throated Loon *Gavia stellata* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Ring-billed Gull *Larus delawarensis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Roseate Tern *Sterna dougallii* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds May 10 to Aug 31
Royal Tern *Thalasseus maximus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Apr 15 to Aug 31
Ruddy Turnstone *Arenaria interpres morinella* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Short-billed Dowitcher *Limnodromus griseus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Surf Scoter *Melanitta perspicillata* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Thick-billed Murre *Uria lomvia* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Apr 15 to Aug 15

NAME	BREEDING SEASON
White-winged Scoter *Melanitta fusca* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Willet *Tringa semipalmata* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 5
Wilson's Storm-petrel *Oceanites oceanicus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability Of Presence Summary

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

Probability of Presence (■)

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

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

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

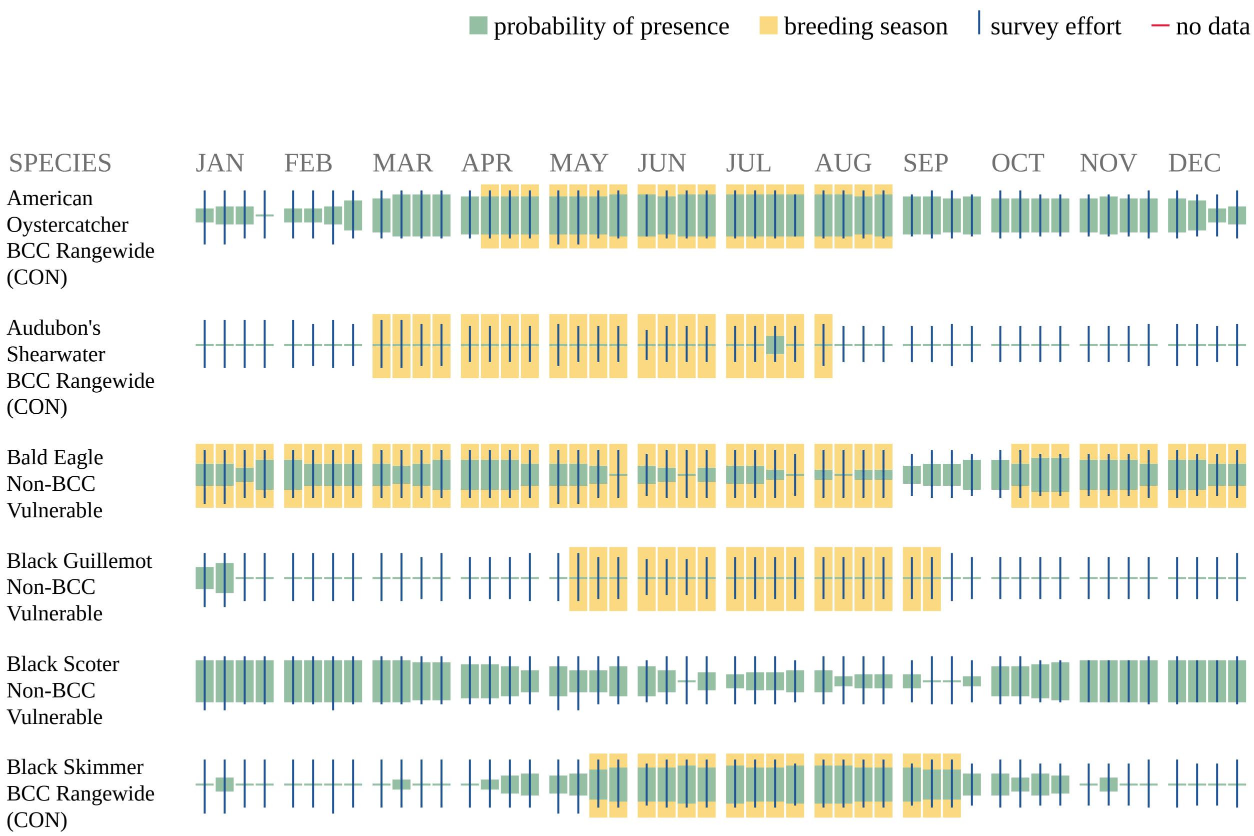
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

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

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

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

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



Black-billed Cuckoo
BCC Rangewide (CON)

Black-legged Kittiwake
Non-BCC Vulnerable

Blue-winged Warbler
BCC - BCR

Bobolink
BCC Rangewide (CON)

Brown Pelican
Non-BCC Vulnerable

Canada Warbler
BCC Rangewide (CON)

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

Cerulean Warbler
BCC Rangewide (CON)

Common Eider
Non-BCC Vulnerable

Common Loon
Non-BCC Vulnerable

Cory's Shearwater
BCC Rangewide (CON)

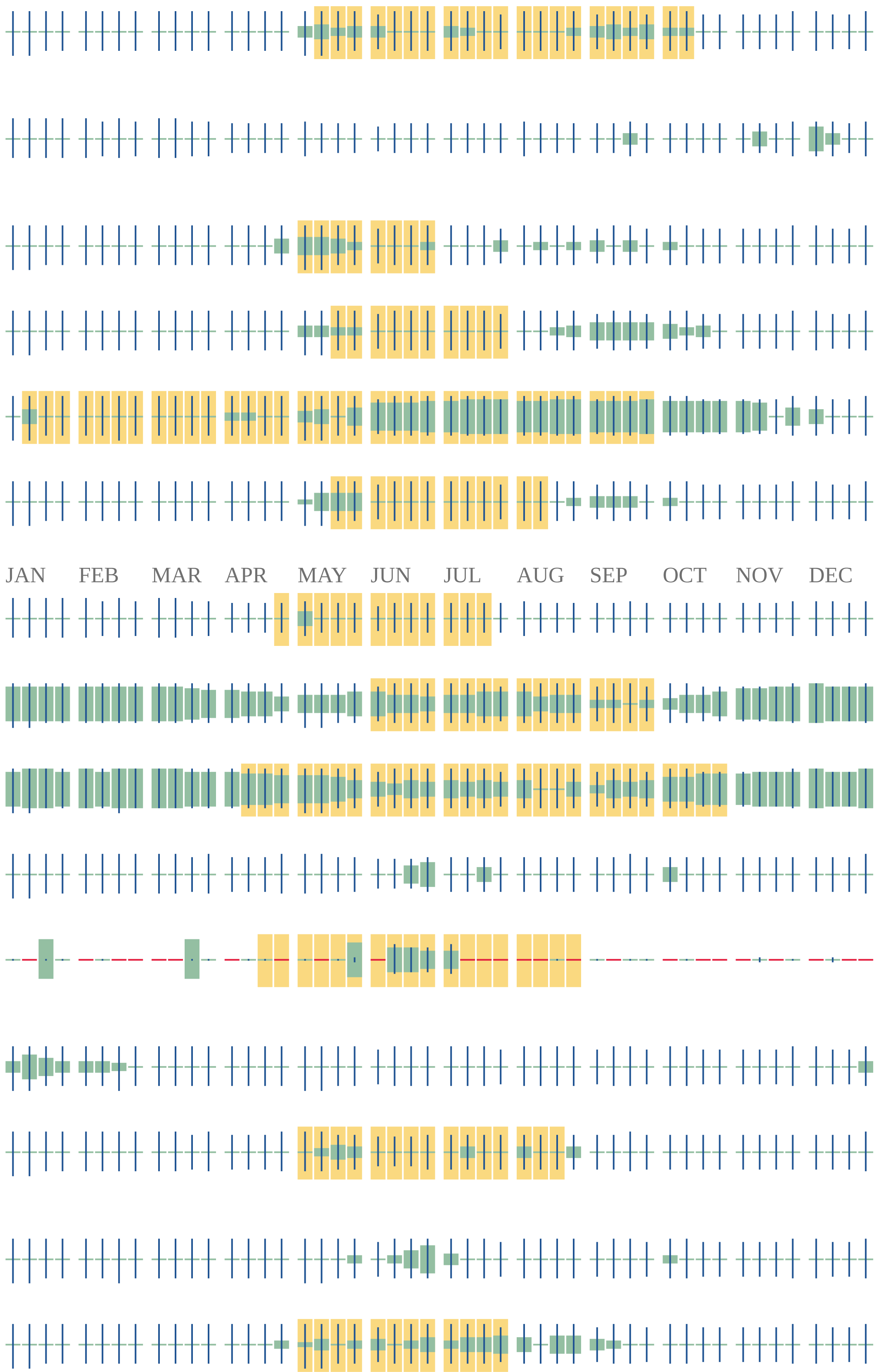
Double-crested Cormorant
Non-BCC Vulnerable

Dovekie
Non-BCC Vulnerable

Eastern Whip-poor-will
BCC Rangewide (CON)

Great Shearwater
Non-BCC Vulnerable

Gull-billed Tern



BCC Rangewide
(CON)

Hudsonian Godwit
BCC Rangewide
(CON)

Kentucky Warbler
BCC Rangewide
(CON)

Lesser Yellowlegs
BCC Rangewide
(CON)

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

Long-tailed Duck
Non-BCC
Vulnerable

Manx Shearwater
BCC Rangewide
(CON)

Pomarine Jaeger
Non-BCC
Vulnerable

Prairie Warbler
BCC Rangewide
(CON)

Prothonotary
Warbler
BCC Rangewide
(CON)

Purple Sandpiper
BCC Rangewide
(CON)

Razorbill
Non-BCC
Vulnerable

Red-breasted
Merganser
Non-BCC
Vulnerable

Red-headed
Woodpecker
BCC Rangewide
(CON)

Red-necked
Phalarope
Non-BCC
Vulnerable

Red-throated Loon
Non-BCC
Vulnerable

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

Migratory Birds FAQ

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

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

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

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

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

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

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

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

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

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

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

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

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

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

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

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

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no

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

Coastal Barriers

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

UNIT	NAME	TYPE	ESTABLISHMENT DATE	FLOOD INSURANCE DATE
NJ-05P	Island Beach	Otherwise Protected Area	N/A	11/16/1991

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

WETLAND INFORMATION WAS NOT AVAILABLE WHEN THIS SPECIES LIST WAS GENERATED. PLEASE VISIT HTTPS://WWW.FWS.GOV/WETLANDS/DATA/MAPPER.HTML OR CONTACT THE FIELD OFFICE FOR FURTHER INFORMATION.

IPaC User Contact Information

Agency: WSP
Name: Phil Baigas
Address: 412 Mount Kemble Avenue
City: Morristown
State: NJ
Zip: 07962-1946
Email phillip.baigas@wsp.com
Phone: 9704040172

Lead Agency Contact Information

Lead Agency: Bureau of Ocean Energy Management

Appendix A-3 IPaC Species List Ocean Wind Offshore Wind Farm

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Jersey Ecological Services Field Office
4 E. Jimmie Leeds Road, Suite 4
Galloway, NJ 08205
Phone: (609) 646-9310 Fax: (609) 646-0352
http://www.fws.gov/northeast/njfieldoffice/Endangered/consultation.html

In Reply Refer To:
Project Code: 2022-0047451
Project Name: Ocean Wind - Lease Area

May 25, 2022

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

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

If the enclosed list indicates that any listed species may be present in your action area, please visit the New Jersey Field Office consultation web page as the next step in evaluating potential project impacts: http://www.fws.gov/northeast/njfieldoffice/Endangered/consultation.html

On the New Jersey Field Office consultation web page you will find:

- habitat descriptions, survey protocols, and recommended best management practices for listed species;
- recommended procedures for submitting information to this office; and
- links to other Federal and State agencies, the Section 7 Consultation Handbook, the Service's wind energy guidelines, communication tower recommendations, the National Bald Eagle Management Guidelines, and other resources and recommendations for protecting wildlife resources.

The enclosed list may change as new information about listed species becomes available. As per Federal regulations at 50 CFR 402.12(e), the enclosed list is only valid for 90 days. Please return to the ECOS-IPaC website at regular intervals during project planning and implementation to obtain an updated species list. When using ECOS-IPaC, be careful about drawing the boundary of your Project Location. Remember that your action area under the ESA is not limited to just the footprint of the project. The action area also includes all areas that may be indirectly

affected through impacts such as noise, visual disturbance, erosion, sedimentation, hydrologic change, chemical exposure, reduced availability or access to food resources, barriers to movement, increased human intrusions or access, and all areas affected by reasonably forseeable future that would not occur without ("but for") the project that is currently being proposed.

Additionally, please note that on March 23, 2022, the Service published a proposal to reclassify the northern long-eared bat (NLEB) as endangered under the Endangered Species Act. The U.S. District Court for the District of Columbia has ordered the Service to complete a new final listing determination for the NLEB by November 2022 (Case 1:15-cv-00477, March 1, 2021).   The bat, currently listed as threatened, faces extinction due to the range-wide impacts of white-nose syndrome (WNS), a deadly fungal disease affecting cave-dwelling bats across the continent. The proposed reclassification, if finalized, would remove the current 4(d) rule for the NLEB, as these rules may be applied only to threatened species. Depending on the type of effects a project has on NLEB, the change in the species' status may trigger the need to re-initiate consultation for any actions that are not completed and for which the Federal action agency retains discretion once the new listing determination becomes effective (anticipated to occur by December 30, 2022). If your project may result in incidental take of NLEB after the new listing goes into effect this will first need to addressed in an updated consultation that includes an Incidental Take Statement. If your project may require re-initiation of consultation, please contact our office for additional guidance.

We appreciate your concern for threatened and endangered species. The Service encourages Federal and non-Federal project proponents to consider listed, proposed, and candidate species early in the planning process. Feel free to contact this office if you would like more information or assistance evaluating potential project impacts to federally listed species or other wildlife resources. Please include the Consultation Tracking Number in the header of this letter with any correspondence about your project.

Attachment(s):

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

Official Species List

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

This species list is provided by:

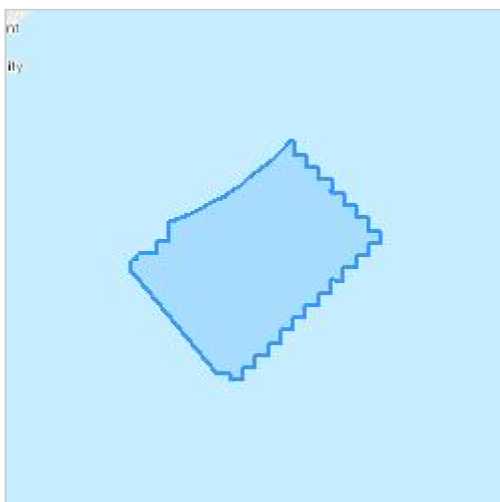
New Jersey Ecological Services Field Office
4 E. Jimmie Leeds Road, Suite 4
Galloway, NJ 08205
(609) 646-9310

Project Summary

Project Code:	2022-0047451
Event Code:	None
Project Name:	Ocean Wind - Lease Area
Project Type:	Power Gen - Wind - Offshore
Project Description:	BOEM is considering the approval of the construction, operations and maintenance, and eventual decommissioning of a proposed offshore wind energy facility off the coast of New Jersey, and associated submarine and upland cable interconnecting the wind facility to two existing interconnection points, one at the Oyster Creek substation in Lacey Township, Ocean County, New Jersey, and another at B.L. England substation in Upper Township, Cape May County, New Jersey. Onshore support facilities would be located at existing waterfront industrial or commercial sites within New Jersey and Virginia. The proposed project would be approximately 1,100-megawatyd in scale and sited approximately 15 miles (13 nautical miles) southeast of Atlantic City, New Jersey, within the area of BOEM Renewable Energy Lease Number OCS-A 0498.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@39.11801295,-74.2504188272276,14z



Counties:

Endangered Species Act Species

There is a total of 2 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 2 of these species should be considered only under certain conditions.

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

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

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

Birds

NAME	STATUS
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. The location of the critical habitat is not available. This species only needs to be considered under the following conditions: ▪ This activity area is within a piping plover migration area, and adjacent to habitat for this species. Consultation is ONLY needed for wind, oil, gas, and other energy development. No other activity types in this area are expected to affect this species. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. This species only needs to be considered under the following conditions: ▪ This activity area is within a red knot migration area, and adjacent to habitat for this species. Consultation is ONLY needed for wind, oil, gas, and other energy development. No other activity types are expected to affect red knots in this area. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened

Critical habitats

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

USFWS National Wildlife Refuge Lands And Fish Hatcheries

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

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

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

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

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

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

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

NAME	BREEDING SEASON
Black-legged Kittiwake *Rissa tridactyla* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Common Loon *gavia immer* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/4464	Breeds Apr 15 to Oct 31

NAME	BREEDING SEASON
Cory's Shearwater *Calonectris diomedea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Double-crested Cormorant *phalacrocorax auritus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/3478	Breeds Apr 20 to Aug 31
Razorbill *Alca torda* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Jun 15 to Sep 10
Red-throated Loon *Gavia stellata* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Ring-billed Gull *Larus delawarensis* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Wilson's Storm-petrel *Oceanites oceanicus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere

Probability Of Presence Summary

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

Probability of Presence ( )

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

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

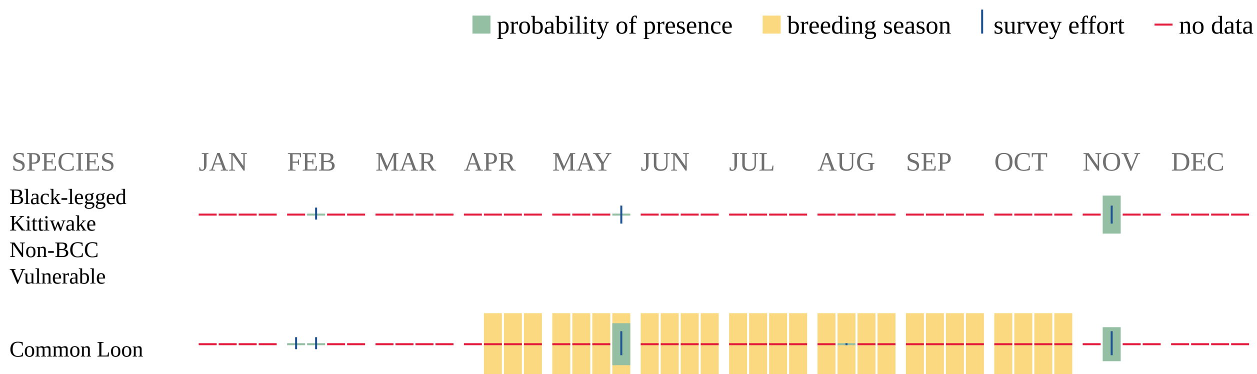
1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability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

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

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

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

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



Non-BCC
Vulnerable

Cory's Shearwater
BCC Rangewide
(CON)

Double-crested
Cormorant
Non-BCC
Vulnerable

Razorbill
Non-BCC
Vulnerable

Red-throated Loon
Non-BCC
Vulnerable

Ring-billed Gull
Non-BCC
Vulnerable

Wilson's Storm-
petrel
Non-BCC
Vulnerable

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

Migratory Birds FAQ

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

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

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

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
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Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

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

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

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

Details about birds that are potentially affected by offshore projects

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

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

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

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

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

THERE ARE NO WETLANDS WITHIN YOUR PROJECT AREA.

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Appendix B. Avian and Bat Post-Construction Monitoring Framework (Ocean Wind COP Volume III, Appendix AB)

Appendix AB - Avian and Bat Post-Construction Monitoring Framework

Avian and Bat Post-Construction Monitoring Framework

Introduction

Ocean Wind, LLC (Ocean Wind) is proposing the approximately 1,100 MW Ocean Wind Offshore Wind Farm Project (OCW01) located in the Bureau of Ocean Energy Management (BOEM) Renewable Energy Lease Area OCS-A 0498 (Lease Area). Offshore, the Project will consist of up to 98 wind turbine generators (WTGs), up to three offshore alternating current (AC) substations, array cables linking the individual turbines to the offshore substations, substation interconnector cables linking the substations to each other, and offshore export cables. This OCW01 Avian and Bat Post-Construction Monitoring Framework (hereafter the "Framework") focuses solely on the offshore footprint of the Project within the Lease Area, and does not apply to the offshore export cable, cable landfall, or onshore portions of the Project.

Ocean Wind has developed this Framework to outline an approach to post-construction monitoring that supports advancement of the understanding of bird and bat interactions with offshore wind farms. The scope of monitoring is designed to meet federal requirements [30 CFR 585.626(b)(15) and 585.633(b)] and is scaled to the size and risk profile of the Project with a focus on species of conservation concern.

The intent of the Framework is to outline overarching monitoring objectives, proposed monitoring elements, and reporting requirements. A detailed Avian and Bat Post-Construction Monitoring Plan (Monitoring Plan), based on this Framework, will be developed in coordination with BOEM, USFWS, and other relevant regulatory agencies. Where feasible, monitoring conducted at the OCW01 will be coordinated with monitoring at other offshore wind projects in the Mid-Atlantic Region to facilitate integrated analyses across a broader geographic area.

Monitoring objectives and associated methods are summarized in Table 1. Technical approaches were selected based on offshore logistical constraints, their ability to address monitoring objectives, and their effectiveness in the marine environment. Emerging technologies, such as multi-sensor radar/camera collision detection systems, are not proposed under this Framework because they have not yet been broadly deployed offshore or demonstrated to effectively reduce uncertainties related to potential impacts on birds and bats.

Table 1. Monitoring objectives, general approaches to be used, and types of data generated.

Taxa	Monitoring Objective	Approach	Duration	Data Output
Bats	Monitor occurrence of bats	Acoustics	2 years	Presence; temporal & weather patterns
Birds	Monitor use by ESA listed birds	Radio-tags	up to 3 years	Presence; temporal & weather patterns
Birds	Monitor use by nocturnal migratory birds	Radar	1–2 years	Flux rates and flight heights of nocturnally migrating birds
Birds	Monitor movement of marine birds around the turbines	Radar	1–2 years	Avoidance rates of marine birds
Both	Document mortality	Incidental observations	Project lifetime	Incidence, identification

Bat Acoustic Monitoring

The presence of bats in the marine environment has been documented in the U.S. (Hatch et al. 2013, Solick and Newman 2021). However, there remains uncertainty regarding the extent to which bats occur offshore, particularly within offshore wind farms. Acoustic detectors are commonly used to study bat presence, which can improve the understanding of movements and migration (Johnson et al. 2011). Ocean Wind will conduct bat acoustic monitoring to assess bat activity at the OCW01, targeting key data gaps related to species presence/composition, temporal patterns of activity, and relationship with weather and atmospheric conditions.

Acoustic monitoring of bat presence will be conducted for two years post-construction. Ultrasonic bat detector stations will be installed on the offshore substation, wind turbine platforms, and/or buoys in the early spring or late winter (March), and removed in the late fall or early winter (December) after migration, or the most appropriate period as determined in cooperation with BOEM, USFWS, and other relevant regulatory agencies. The detectors will record calls of both cave-hibernating bats, including the northern long-eared bat (*Myotis septentrionalis*), and migratory tree bats; the resulting information can be used to identify bats to species. All acoustic data recorded will be processed with approved software to filter out poor quality data and identify the presence of bat calls. Where information is insufficient to make a species identification, calls will be classified to one of two phonic groups: low frequency bats (LoF), or high frequency bats (HiF). The HiF group includes both migratory tree bats and cave hibernating bats. Since HiFi include the ESA-listed northern long-eared bat, they will then be manually vetted by an experienced acoustician to the highest resolution possible (e.g., species or genus).

All bat calls detected and identified will be analyzed to understand relationships with time of day, season, and weather/atmospheric conditions. The results will provide information on bat presence offshore and the conditions under which they may occur near offshore wind turbines.

Motus Tracking Network and Use by ESA-listed Birds Study

Tracking studies indicate that at least some individual ESA-listed Piping Plovers (*Charadrius melodus*) and Red Knots (*Calidris canutus rufa*) pass through the New Jersey Wind Energy Area within which the OCW01 is located (Loring et al. 2018, 2019). Roseate Terns (*Sterna dougallii*) have not been detected in the Wind Energy Area, but the birds are expected to pass through the region during migration. However, due to limited coverage of onshore automated telemetry receiving stations and low probability of detecting tags (hereafter, Motus receivers and tags) in the offshore environment (Loring et al. 2019), there remains uncertainty related to offshore movements of ESA-listed birds during migration. OCW01 will install offshore Motus receiver stations and contribute funding to radio-tagging efforts to address this data gap. The exact species being studied will be determined in consultation with federal agencies and will be dependent on existing, ongoing field efforts. The Motus receivers will also provide opportunistic presence/absence data on other species carrying Motus tags, such as migratory songbirds and bats.

Movements of radio-tagged ESA-listed birds in the vicinity of the OCW01 will be monitored for up to three years post-construction, during the spring, summer, and fall. Motus receivers will be installed within the wind farm to determine the presence/absence of ESA-listed species. The specific number and location of offshore receiver stations will be selected to optimize study design goals, and will be determined using a design tool currently being developed through a New York State Energy Research and Development Authority (NYSERDA) funded project[3]. In addition, existing Motus receiver stations at up to two onshore locations near the OCW01 (e.g., Brigantine, Holgate) will be refurbished to confirm the presence and movements of radio-tagged ESA-species in areas adjacent to OCW01 (refurbishment needs will be discussed with USFWS). Funding for up to 150 Motus tags per year will be provided to researchers working with ESA-listed birds for up to three consecutive years. Ocean Wind will also consider contributing to existing GPS based tracking efforts for ESA-listed birds.

[3] https://www.briloon.org/renewable/automatedvhfguidance

ESA-listed bird presence/absence in the wind farm will be analyzed by comparing detections within the wind farm to coastal receiver towers. All detections will be analyzed to understand relationships with time of day, season, and weather.

Radar Monitoring: Nocturnal Migrants Flux and Flight Heights

Nocturnal migrants, including songbirds and shorebirds, are documented to fly offshore (Adams et al. 2015, Loring et al. 2021). Since nocturnal migration events are episodic and cannot be detected during daytime surveys, there is uncertainty on the timing and intensity of migration offshore. Radar, oriented vertically, has been used at offshore wind farms in Europe to study nocturnal migration events (Hill et al. 2014). Ocean Wind is considering conducting a one-to-two-year radar study to record the passage rates (flux) of migrants and their flight heights. Since radar approaches to monitoring birds are actively evolving, a specific system and methods will be determined closer to when the projects begin operating. The results could be related to time of year and weather conditions, to increase the understanding on when nocturnal migrants may have higher collision risk.

Radar Monitoring: Marine Bird Avoidance

Marine birds, particularly loons, sea ducks, auks, and the Northern Gannet (*Morus bassanus*), have been documented to avoid offshore wind farms, potentially leading to displacement from habitat (Goodale and Milman 2016). However, there remains uncertainty on how birds will respond to larger more widely spaced turbines, like those proposed for OCW01. Based on methods used by Desholm and Kahlert (2005) and Skov et al. (2018), Ocean Wind is considering conducting a one-to-two-year radar study to collect data on macro (and potentially meso) avoidance rates. The radar would run continuously and could be paired with observers to collect data at times when birds vulnerable to displacement are present. These data on macro-avoidance would support understanding of both displacement and collision vulnerability.

Documentation of Dead and Injured Birds and Bats

Ocean Wind, or its designated operator, will implement a reporting system to document dead or injured birds or bats found incidentally on vessels and project structures during construction, operation, and decommissioning. The location will be marked using GPS, an Incident Reporting Form will be filled out, and digital photographs taken. Any animals detected that could be ESA-listed, will have their identity confirmed by consulting biologists, and a report will be submitted to the designated staff at Ocean Wind who will then report it to BOEM, USFWS, and other relevant regulatory agencies. Carcasses with federal or research bands or tags will be reported to the U.S. Geological Survey (USGS) Bird Band Laboratory, BOEM, and USFWS.

Adaptive Monitoring

Adaptive monitoring is an important principle underlying Ocean Wind's post-construction monitoring Framework. Over the course of monitoring, Ocean Wind will work with BOEM, USFWS, and other relevant regulatory agencies, to determine the need for adjustments to monitoring approaches, consideration of new monitoring technologies, and/or additional periods of monitoring, based on an ongoing assessment of monitoring results. Potential triggers for adaptive monitoring may include, but not be limited to, equipment failure, an unexpected impact to birds or bats identified through monitoring, or new opportunities to collaborate with other projects in the region. The Monitoring Plan will include a series of potential adaptive monitoring actions, developed in coordination with BOEM, USFWS, and other relevant regulatory agencies, to be considered as appropriate.

Reporting

Ocean Wind will submit an annual report to BOEM and USFWS summarizing post-construction monitoring activities, preliminary results as available, and any proposed changes in the monitoring program. Ocean Wind will participate in an annual meeting with BOEM and USFWS to discuss the report.

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Appendix C. Habitat Assessments

Appendix C-1 Eastern Black Rail and Saltmarsh Sparrow Habitat Assessment

Ocean Wind 1:
Eastern Black Rail and Saltmarsh Sparrow Habitat Assessment

August 2022
Revised October 2022

Submitted by:

Biodiversity Research Institute
HDR Engineering, Inc

Summary

- To address comments from USFWS on Ocean Wind 1's Biological Assessment, BRI and HDR were tasked with identifying and assessing potential impacts to suitable habitat for Eastern Black Rail and Saltmarsh Sparrow within the Ocean Wind 1 onshore action areas, including Oyster Creek and BL England.
- BRI and HDR assessed 44 wetland areas based on size, location, and habitat for potential suitable habitat for Eastern Black Rails and Saltmarsh Sparrows.
- BRI and HDR also reviewed potential impacts to the assessed wetland areas from proposed onshore activities.
- Within the Oyster Creek Wetland Review Area (OC WRA), the majority of habitat was determined to be unsuitable for either avian species.
- While nearly half of the wetland areas within the BL England Wetland Review Area (BLE WRA) could be suitable habitat for Saltmarsh Sparrows and Eastern Black Rails, proposed onshore activities would entirely avoid disturbing these areas.
- BRI and HDR conclude that further studies to assess suitable habitat for Eastern Black Rails and Saltmarsh Sparrows in the Oyster Creek and BL England areas are not necessary.

Background

Eastern Black Rail

The Eastern Black Rail (*Laterallus jamaicensis jamaicensis*) is a secretive marsh bird found irregularly along the southeastern coast of the United States from Connecticut to Florida. Eastern Black Rails occupy a fairly narrow habitat niche consisting of brackish and freshwater wetlands characterized by very shallow water and dense emergent vegetation (USFWS 2020), including saltmeadow cordgrass (*Spartina patens*), bulrushes, sedges, and cattails. Wherever found, they require high stem density, canopy coverage, and perennially shallow water for foraging and nesting (Atlantic Coast Joint Venture 2020; Eddleman et al. 2020).

No observations of Eastern Black Rails were documented in the vicinity of either the Oyster Creek or BL England onshore development areas during surveys in 2018 and 2019 conducted by the New Jersey Department of Environmental Protection (NJDEP 2018, 2019). However, an area of habitat within the BL England onshore development area was identified as possible suitable habitat for the species (Atlantic Coast Joint Venture (ACJV) 2020). Given the low detection rate of Eastern Black Rails, even when using playbacks in areas known to be occupied by the species, as well as the risk of disturbing them, the U.S. Fish and Wildlife Service (USFWS) does not have a recommended presence/absence survey protocol for Eastern Black Rails. Instead, USFWS assumes that the species may occupy any suitable habitat within its range.

Saltmarsh Sparrow

The Saltmarsh Sparrow (*Ammospiza caudacuta*) is an obligate marsh bird with a breeding and wintering range between Maine and Florida. Similar to Eastern Black Rails, the species has narrow habitat preferences and requires high marsh vegetation with dense layers of thatch for nest construction (Hartley and Weldon 2020). The Saltmarsh Sparrow also requires emergent wetland vegetation; however, the Saltmarsh Sparrow is only found in saltmarshes. In recent years, Saltmarsh Sparrows have not been documented through eBird observations near the BL England area, and few sightings of the species have been reported in the vicinity of the potential cable routes for Oyster Creek (eBird 2022). However, while habitat around Oyster Creek is generally not considered priority marsh habitat for Saltmarsh Sparrows, one patch of salt marsh habitat surrounding BL England area has a relatively high likelihood of supporting the species (patch is ranked 992 of 8680 salt marsh habitat patches, ACJV 2020).

Habitat and Wetland Delineation Report Review

Methods

Based on wetland delineation reports and supporting materials provided by HDR Engineering, Inc. (HDR), Biodiversity Research Institute (BRI) and HDR determined that 35 wetland areas were delineated in the OC WRA, which consists of preferred and alternative landfall and cable route locations (Appendix A, Figures 1-2). In the BLE WRA, which consists of only the preferred landfall and cable route locations (Appendix A, Figures 3-4), 9 wetland areas were delineated.

BRI and HDR each independently reviewed the reports and supplemental materials, which provided information on the vegetative community, soil, and hydrology of each wetland area, to describe the habitat type of each area and assess its suitability for Eastern Black Rail and Saltmarsh Sparrow occupancy. Specifically, BRI and HDR assessed such as variables as hydrology indicators, dominant vegetation, hydric soil indicators, size, and the Cowardin classification system (Cowardin et al. 1979). Habitat was considered suitable for rails and sparrows only if emergent vegetation was dominant and if such emergent vegetation was not predominately common reed (*Phragmites australis*), which is known to severely degrade habitat because of its ability to convert wetlands into dense monocultures. The result is unsuitable habitat for both Eastern Black Rail (USFWS 2020) and Saltmarsh Sparrow (Hartley and Weldon 2020). In addition to assessing habitat suitability, BRI and HDR also reviewed the location of each wetland area in the context of proposed onshore construction activities to assess potential level of disturbance.

Results

In their assessment of the 44 wetland areas, BRI and HDR identified 26 areas as emergent habitat, 13 areas as forested, 2 areas as scrub shrub, and 3 areas as a mix of two or more wetland types as defined by the Cowardin classification system. In the OC WRA, 4 of the 35 areas potentially provide suitable habitat for Saltmarsh Sparrow and Eastern Black Rail (Appendix A, Table 1). These areas include Wetlands J, I (south of Bay Parkway), A (adjacent to Lighthouse Dr.) and E (adjacent to Marina). The areas were characterized as both high and low marsh wetland habitat with vegetation that includes smooth cordgrass (*Spartina alterniflora*), saltmeadow cordgrass, and some common reed. However, because proposed project activities in Oyster Creek would not cross within or be situated adjacent to these four areas, no impacts to the wetland areas are anticipated.

In the BLE WRA, 4 of the 9 wetland areas were characterized as emergent wetland habitat and considered potentially suitable for the two avian species (Appendix A, Table 2). These areas include Wetlands A (south of Roosevelt Blvd.), B (north of Roosevelt Blvd.), and C (north and south of Roosevelt Blvd.), and LOI Coastal Wetlands (2019). The vegetation in these four areas is dominated by *Spartina* species, with some common reed. However, due to the proximity of three of the wetland areas to roadways and infrastructure, the potential value of these wetlands to Saltmarsh Sparrows and Eastern Black Rails is diminished. Furthermore, proposed activities in the BL England area not expected to impact the four emergent wetland areas, as the export cable would pass under them using horizontal directional drilling (HDD), and entry and exit pits would be located entirely within previously disturbed areas. In addition, the BL England substation is sited away from these wetland sites.

Conclusion

Based on the results of this habitat suitability assessment for Eastern Black Rail and Saltmarsh Sparrow, the OC WRA was characterized by predominantly unsuitable habitat for both Eastern Black Rails and Saltmarsh Sparrows, with an apparent absence of Eastern Black Rails, and limited Saltmarsh Sparrow observations. Similarly, neither avian species has been detected in the BL England area in recent years (eBird 2022, NJDEP 2018, 2019), although a greater proportion of the wetland areas delineated in the BLE WRA consisted of potentially suitable habitat for the two avian species.

Across both the WRAs, those wetland areas that might contain suitable habitat for Eastern Black Rails and Saltmarsh Sparrows would not be impacted by onshore construction, operations or maintenance activities associated with the Ocean Wind 1 project, as activities would either entirely avoid suitable habitat, or involve methods that would avoid disturbing the areas, such as HDD. Thus, it is unlikely that either species would be impacted by onshore construction or operation within the Oyster Creek or BL England areas.

As such, based on known habitat requirements of Eastern Black Rail and Saltmarsh Sparrow, documentation of species presence/absence, and the reports and supporting materials provided by HDR, BRI and HDR conclude that a field habitat suitability study for either species is not necessary for the Ocean Wind 1 onshore action area. BRI and HDR also conclude that the conservation measures proposed by USFWS in its 1 July 2022 letter for Eastern Black Rails and Saltmarsh Sparrows in the Oyster Creek and BL England areas would not be necessary.

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Appendix A

Table 1. Assessment of Eastern Black Rail and Saltmarsh suitable habitat in and proposed project impacts to each wetland area delineated in Oyster Creek Wetland Review Area.

Oyster Creek Preferred Alternative			
Oyster Creek East of Route 9			
Wetland ID	**Habitat Suitability**	**Habitat Type/Description**	**Proposed Project Activities within Wetlands**
Oyster Creek Wetland A **Figure 1**	No	EMERGENT - Coastal wetland located within Holtec Property adjacent to Barnegat Bay consists of common reed monoculture with small pockets of open water and man-made ditched areas	***Proposed activities include HDD landfall workspace and matted laydown areas and export cable route to be buried by open trench.***
Oyster Creek Wetland B **Figure 1**	No	FORESTED - Freshwater forested wetland located to the north of the dirt trail within the Holtec Property and dominated by red maple, common reed, sensitive fern, and highbush blueberry. Hydrology is driven by adjacent manmade ditches.	The proposed export cable route will abut the wetland to the south and fall within the wetland buffer. ***There are no anticipated direct impacts to these forested wetlands.***
Oyster Creek Wetland C **Figure 1**	No	FORESTED - Freshwater forested wetland located to the south of the dirt trail within the Holtec Property and dominated by red maple, common reed, sensitive fern, and highbush blueberry. Hydrology is driven by adjacent manmade ditches.	The proposed export cable route will abut the wetland to the north and fall within the wetland buffer. ***There are no anticipated direct impacts to these forested wetlands.***
Oyster Creek Wetland E **Figure 1**	No	EMERGENT - Freshwater scrub/shrub wetland dominated by red maple and common reed with hydrology driven by adjacent manmade ditches.	The proposed export cable route will abut the wetland to the north and fall within the wetland buffer. ***There are no anticipated direct impacts to these forested wetlands.***
Oyster Creek Wetland G2 **Figure 1**	No	FORESTED - Freshwater forested wetland located to the north of the dirt trail within the Holtec Property and dominated by red maple and highbush blueberry. Hydrology is driven by adjacent manmade ditches.	The proposed export cable route will abut the wetland to the south and fall within the wetland buffer. ***There are no anticipated direct impacts to these forested wetlands.***
Oyster Creek Wetland M **Figure 1**	No	FORESTED - Freshwater forested wetland located on the eastern side of Route 9 and abuts the delineated Oyster Creek Tributary. Dominated by red maple and black tupelo trees, highbush blueberry shrubs, and shallow sedge and spotted touch-me-not in the herb stratum	The proposed export cable route will pass approximately 200 feet to the north. ***There are no anticipated direct impacts to these forested wetlands.***

Wetland ID	Habitat Suitability	Habitat Type/Description	Proposed Project Activities within Wetlands
Oyster Creek Wetland N **Figure 1**	No	FORESTED - Freshwater forested wetland located on the eastern side of Route 9 and abuts the delineated Oyster Creek Tributary. Dominated by red maple and black tupelo trees, highbush blueberry shrubs, and shallow sedge in the herb stratum	The proposed export cable route will pass approximately 100 feet to the north and fall within the wetland buffer. ***There are no anticipated direct impacts to these forested wetlands.***
Wetland A (South of Oyster Creek Discharge Channel) **Figure 1**	No	FORESTED - Freshwater forested and emergent wetland located on the eastern side of Route 9 south of the bridge that crosses Oyster Creek. Dominant species observed include Red maple and Eastern red cedar in the tree stratum, Northern bayberry in the shrub stratum, and fall panic grass in the herb stratum.	The proposed export cable route will pass under Oyster Creek Discharge Channel via HDD approximately 500 feet to the northwest and ***no impacts to this wetland are anticipated***.
Wetland E (South of Oyster Creek Discharge Channel) **Figure 1**	No	FORESTED - Freshwater forested wetland dominated by Atlantic white cedar, coastal sweet-pepperbush, southern arrow-wood, highbush blueberry, cinnamon fern, and Eastern poison ivy.	The proposed export cable route will pass under Oyster Creek Discharge Channel via HDD approximately 800 feet to the northwest and ***no impacts to this wetland are anticipated***.
Wetland A (Island Beach State Park) **Figure 2**	No	SCRUB SHRUB - Small freshwater wetland within roadside depression driven by roadside runoff. Dominant vegetation includes red maple, arrowwood, highbush blueberry, common reed, and catbriar.	***Wetland impacts are not anticipated*** within this area as export cable route construction will pass approximately 100 feet to the south of this wetland.
Wetland B (Island Beach State Park) **Figure 2**	No	EMERGENT - Common reed monoculture located west of Shore Road between the road and the western shoreline of Island Beach State Park at Barnegat Bay.	***Temporary impacts are anticipated*** within a small portion of this wetland at the shoreline where the export cable will be installed via open cut trenching.
Wetland C (Island Beach State Park) **Figure 2**	No	SCRUB SHRUB - Small isolated freshwater wetlands dominated by highbush blueberry and common reed.	Export cable will pass immediately to the south of this area but ***no impacts are anticipated to the wetland itself, wetland buffer area could be impacted temporarily***.
Wetland E (Island Beach State Park) **Figure 2**	No	EMERGENT - Isolated Wetland dominated by common reed with hydrology driven by road and parking lot runoff	Export cable route will pass this wetland to the east within the parking lot. ***No wetland impacts anticipated.***

Wetland ID	Habitat Suitability	Habitat Type/Description	Proposed Project Activities within Wetlands
Wetland F (Island Beach State Park) **Figure 2**	No	EMERGENT - Isolated Wetland dominated by common reed with hydrology driven by road and parking lot runoff	Export cable route will pass this wetland to the east within the parking lot. ***No wetland impacts anticipated.***
Wetland G (Island Beach State Park) **Figure 2**	No	EMERGENT - Isolated Wetland dominated by common reed with hydrology driven by road and parking lot runoff	Export cable route will pass this wetland to the east within the parking lot. ***No wetland impacts anticipated.***
Oyster Creek West of Route 9			
Wetland K **Figure 1**	No	EMERGENT - Emergent wetland dominated by panic grass within a stormwater detention/recharge basin.	The proposed export cable route will pass under Oyster Creek Discharge Channel via HDD approximately 1000 feet to the south and ***no impacts to this wetland are anticipated***.
Wetland L **Figure 1**	No	MIXED - Palustrine emergent, shrub/scrub, open water, and forested wetland; dominated by black tupelo and red maple in the tree stratum, highbush blueberry in the shrub stratum, and water shield and common reed in the herb stratum. Atlantic white cedars (*Chamaecyparis thyoides*) are present in the northerly portion of Wetland L and there is a shallow ponded area in the southern portion of Wetland L.	The proposed export cable route will pass under Oyster Creek Discharge Channel via HDD approximately 500 feet to the south and ***no impacts to this wetland are anticipated***.
Wetland B (South of Oyster Creek Discharge Channel) **Figure 1**	No	EMERGENT - Small emergent wetland dominated by common reed with hydrology likely driven by runoff from adjacent access road.	The proposed export cable route will pass under Oyster Creek Discharge Channel via HDD approximately 100 feet to the north and ***no impacts to this wetland are anticipated***.
Wetland C (South of Oyster Creek Discharge Channel) **Figure 1**	No	EMERGENT - Small emergent wetland dominated by common reed and some red maple and sweet coastal pepperbush. Hydrology likely driven by runoff from adjacent access road.	The proposed export cable route will pass under Oyster Creek Discharge Channel via HDD approximately 100 feet to the north and ***no impacts to this wetland are anticipated***.
Wetland D (South of Oyster Creek Discharge Channel) **Figure 1**	No	EMERGENT - Small emergent wetland dominated by common reed with hydrology likely driven by runoff from adjacent access road.	The proposed export cable route HDD will surface within the access road approximately 50 feet to the north of this wetland and then continue to the west within the access road. ***No impacts to this wetland are anticipated***.

Wetland ID	Habitat Suitability	Habitat Type/Description	Proposed Project Activities within Wetlands
Wetland H2 **Figure 1**	No	FORESTED - Atlantic white cedar dominated wetland.	The proposed cable route will pass approximately 50 feet to the north of this wetland and within the access road. ***No impacts to this wetland are anticipated.***
Wetland I **Figure 1**	No	FORESTED - Atlantic white cedar dominated wetland.	The proposed cable route will pass approximately 50 feet to the north of this wetland and within the access road. ***No impacts to this wetland are anticipated.***
Wetland H1 **Figure 1**	No	EMERGENT - Emergent wetland dominated by common reed with hydrology likely driven soil compaction from previous land use.	***This wetland will be filled*** as a result of the construction of the Oyster Creek Substation
Wetland G1 **Figure 1**	No	EMERGENT - Emergent wetland dominated by common reed with hydrology likely driven soil compaction from previous land use.	***This wetland will be filled*** as a result of the construction of the Oyster Creek Substation
LOI Wetland A-B, C-D, E-F, M and N **Figure 1**	No	EMERGENT - Small freshwater wetlands delineated as part of an LOI issued in 2017 by the NJDEP. Wetlands are dominated by common reed with some Atlantic white cedar	***Wetland impacts are not anticipated*** within this area as construction of the Oyster Creek Substation avoids these wetlands. Some development within these wetland buffers is anticipated.
Oyster Creek Export Cable Route Alternatives Evaluated			
Wetland C (South of Wetland I) **Figure 1**	No	FORESTED - Atlantic white cedar dominated wetland.	Area was evaluated as part of potential export cable route alternative. Project will not cross within or adjacent to this area and ***no impacts to wetland are anticipated.***
Wetland D (South of Wetlands I and H2) **Figure 1**	No	FORESTED - Atlantic white cedar dominated wetland.	Area was evaluated as part of potential export cable route alternative. Project will not cross within or adjacent to this area and ***no impacts to wetland are anticipated.***
Wetland B (South of Wetlands I and H2) **Figure 1**	No	FORESTED - Atlantic white cedar dominated wetland.	Area was evaluated as part of potential export cable route alternative. Project will not cross within or adjacent to this area and ***no impacts to wetland are anticipated.***

Wetland ID	Habitat Suitability	Habitat Type/Description	Proposed Project Activities within Wetlands
LOI Wetland (NJDEP 2018) **Figure 1**	No	FORESTED - Freshwater forested wetland dominated by Atlantic White Cedar that was part of an LOI issued by the NJDEP in 2018.	Area was evaluated as part of potential export cable route alternative. Project will not cross within or adjacent to this area and ***no impacts to wetland are anticipated.***
Wetland J **Figure 1**	Yes	EMERGENT - Coastal low marsh wetlands immediately adjacent and north of Bay Parkway dominated by Spartina alterniflora, Spartina patens with some common reed.	Area was evaluated as part of potential export cable route alternative. Project will not cross within or adjacent to this area and ***no impacts to wetland are anticipated.***
Wetland I (South of Bay Parkway) **Figure 1**	Yes	EMERGENT - Coastal low marsh wetlands immediately adjacent and south of Bay Parkway dominated by Spartina alterniflora, Spartina patens with some common reed.	Area was evaluated as part of potential export cable route alternative. Project will not cross within or adjacent to this area and ***no impacts to wetland are anticipated.***
Wetland A (Adjacent to Lighthouse Drive) **Figure 1**	Yes	EMERGENT - Very small coastal high marsh wetland adjacent to sandy beach area with Spartina patens and groundseltree	Area was evaluated as part of potential export cable route alternative. Project will not cross within or adjacent to this area and ***no impacts to wetland are anticipated.***
Wetland E (Adjacent to Marina) **Figure 1**	Yes	EMERGENT - Saline low and high marsh coastal wetlands south of marine and hydrologically Barnegat Bay. Vegetation consists mostly of saltmarsh and saltmeadow cordgrass with some common reed in low marsh areas and groundseltree and marsh elder (Jesuit's bark) in the high marsh area.	Area was evaluated as part of potential export cable route alternative. Project will not cross within or adjacent to this area and ***no impacts to wetland are anticipated.***
Wetland F (Adjacent to Lighthouse Drive) **Figure 1**	No	EMERGENT - Drainage swale dominated by phragmites with hydrology driven by runoff from adjacent paved surfaces	Area was evaluated as part of potential export cable route alternative. Project will not cross within or adjacent to this area and ***no impacts to wetland are anticipated.***
Lighthouse Drive Wetland **Figure 1**	No	EMERGENT - Phragmites dominated wetland and open water area associated with local street drainage	Area was evaluated as part of potential export cable route alternative. Project will not cross within or adjacent to this area and ***no impacts to wetland are anticipated.***

Table 2. Assessment of Eastern Black Rail and Saltmarsh suitable habitat in and proposed project impacts to each wetland area delineated in the BL England Wetland Review Area.

BL England Preferred Alternative			
Wetland ID	**Habitat Suitability**	**Habitat Type/Description**	**Proposed Project Activities within Wetlands**
Wetland A (South of Roosevelt Boulevard) **Figure 4**	Yes	EMERGENT - Coastal wetland located south of Roosevelt Boulevard within Upper Township that extends from the Garden State Parkway southeast to the Roosevelt Boulevard Bridge crossing at Crook Horn Creek. Wetland is dominated by Spartina sp. with some common reed. Suitable habitat with diminished value due to proximity to roadway and development.	***No impacts anticipated to this wetland***. Export cable route will pass under Crook Horn Creek to the south of Roosevelt Boulevard Bridge. Entry/Exit pits will be entirely within previously disturbed areas of the Roosevelt Boulevard right of way. Export cable will then be installed within the Roosevelt Boulevard right of way northwest to North Shore Road (Old Route 9).
Wetland B (North of Roosevelt Boulevard **Figure 4**	Yes	EMERGENT - Coastal wetland located north of Roosevelt Boulevard within Upper Township that extends from the Garden State Parkway southeast to the Roosevelt Boulevard Bridge crossing at Crook Horn Creek. Wetland is dominated by Spartina sp. with some common reed. Suitable habitat with diminished value due to proximity to roadway and development.	***No impacts anticipated to this wetland***. Export cable route will pass under Crook Horn Creek to the south of Roosevelt Boulevard Bridge. Entry/Exit pits will be entirely within previously disturbed areas of the Roosevelt Boulevard right of way. Export cable will then be installed within the Roosevelt Boulevard right of way northwest to North Shore Road (Old Route 9).
Wetland C (North and south of Roosevelt Boulevard) **Figure 4**	Yes	EMERGENT - Coastal wetland located mostly north of south of Roosevelt Boulevard within Ocean City that extends from the Garden State Parkway northwest from 34th Street to the Roosevelt Boulevard Bridge and wraps around under the bridge to the south at the crossing of Crook Horn Creek. Wetland is dominated by Spartina sp. with some common reed. Suitable habitat with diminished value due to proximity to roadway and development.	***No impacts anticipated to this wetland***. Export cable route will pass under Crook Horn Creek to the south of Roosevelt Boulevard Bridge. Entry/Exit pits will be entirely within previously disturbed areas of the Roosevelt Boulevard right of way. Export cable will then be installed within the Roosevelt Boulevard right of way.
Wetland Verification Area A **Figure 3**	No	MIXED - Small freshwater wetland area within the BL England substation parcel verified by NJDEP during site visit with Ocean Wind in November 2021. Area is partially maintained/mowed meadow from former golf course with red maple and sweet gum.	This wetland will be filled as a result of the construction of the BL England Substation
Wetland Verification Area B **Figure 3**	No	EMERGENT - Small freshwater wetland area within the BL England substation parcel verified by NJDEP during site visit with Ocean Wind in November 2021. Area is partially maintained/mowed meadow from former golf course with red maple and sweet gum.	This wetland will be filled as a result of the construction of the BL England Substation
Wetland Verification Area C **Figure 3**	No	EMERGENT - Extremely small (<200SF) pocket wetland consisting of hydrophytic sedges and rushes and confirmed by NJDEP representative during field verification	This wetland will be filled as a result of the construction of the BL England Substation
Wetland Verification Area D **Figure 3**	No	EMERGENT - Small freshwater wetland swale with very low habitat value. Consists of maintained/mowed hydrophytic grasses within an area with a dilapidated drainage system.	This wetland will be partially filled as a result of the construction of the BL England Substation and incorporated into the station's drainage plan

Wetland ID	Habitat Suitability	Habitat Type/Description	Proposed Project Activities within Wetlands
LOI Freshwater Wetlands (2019) **Figure 3**	No	MIXED - Freshwater wetlands east of rail line from previously approved LOI issued in 2019 and confirmed by NJDEP during field verification in November 2021. Wetlands consist of forested, scrub shrub and emergent wetlands, with some associated with former golf course features such as water hazards and sand traps, of which are dominated by common reed monocultures. Forested and scrub shrub wetland areas are dominated by red maple and sweet gum with highbush blueberry in the understory shrub stratums.	***Area will remain undisturbed*** as the BL England substation site will be developed adjacent and/or away from these wetland features.
LOI Coastal Wetlands (2019) **Figure 3**	Yes	EMERGENT - Saline low and high marsh coastal wetlands west of rail line and hydrologically connected to Tuckahoe River. Vegetation consists mostly of saltmarsh and saltmeadow cordgrass with some common reed in low marsh areas and groundseltree and marsh elder (Jesuit's bark) in the high marsh area.	***Area will remain undisturbed*** as the BL England substation site will be developed away from these wetland features.

Figure 1. Wetland areas delineated and reviewed in Oyster Creek Wetland Review Area.

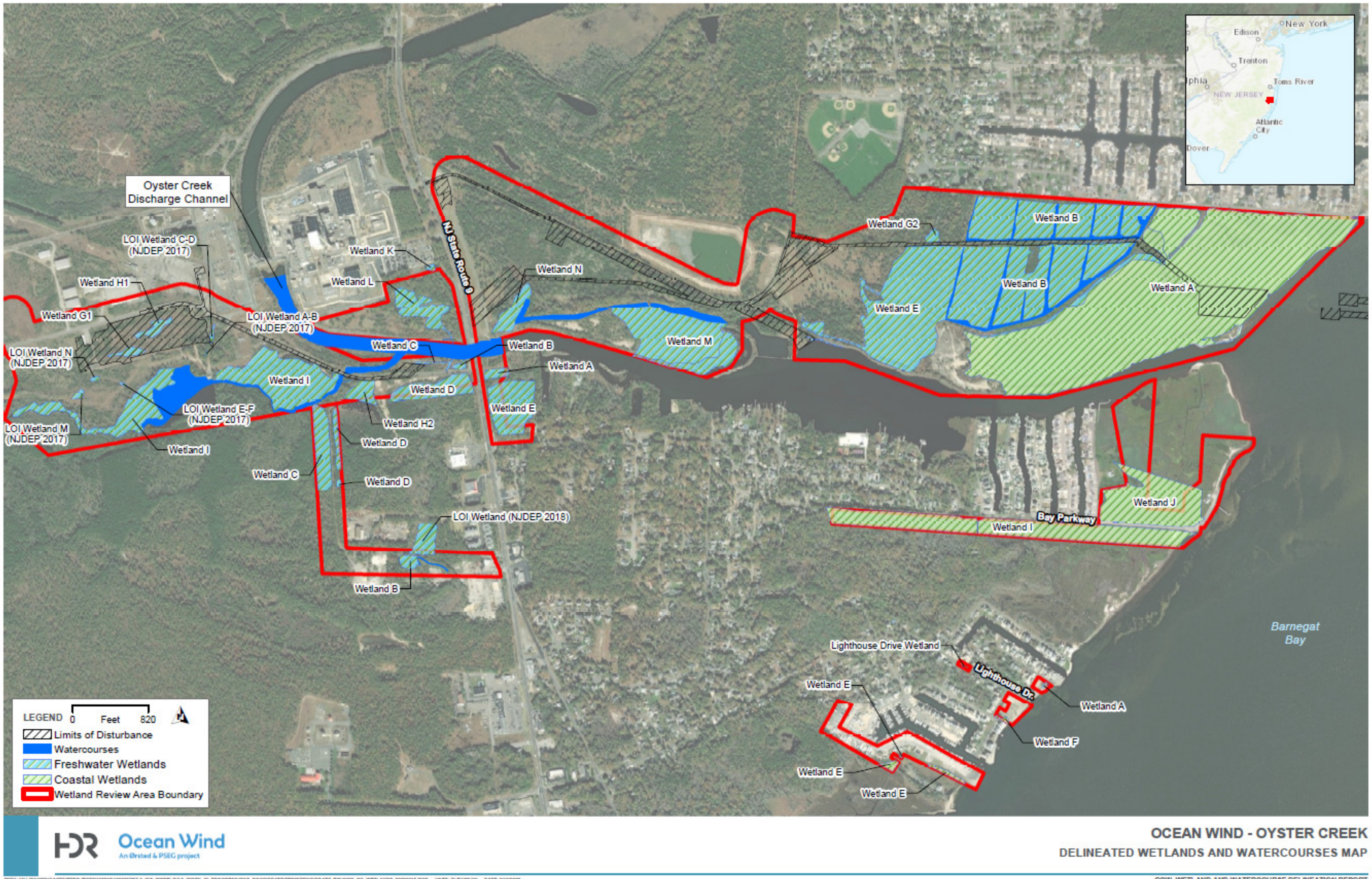


Figure 2. Wetland areas delineated and reviewed in Island Beach State Part in Oyster Creek Wetland Review Area.

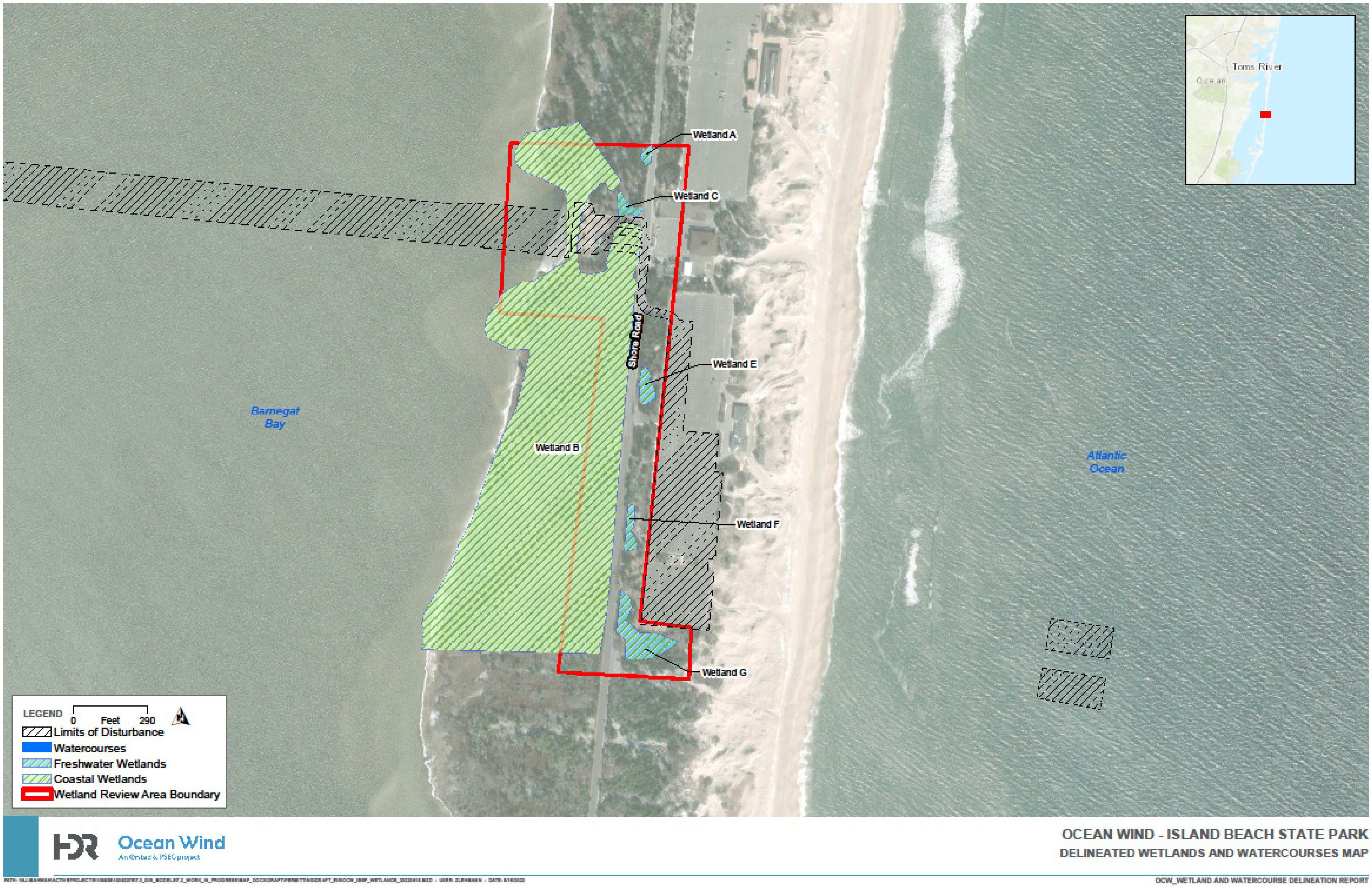
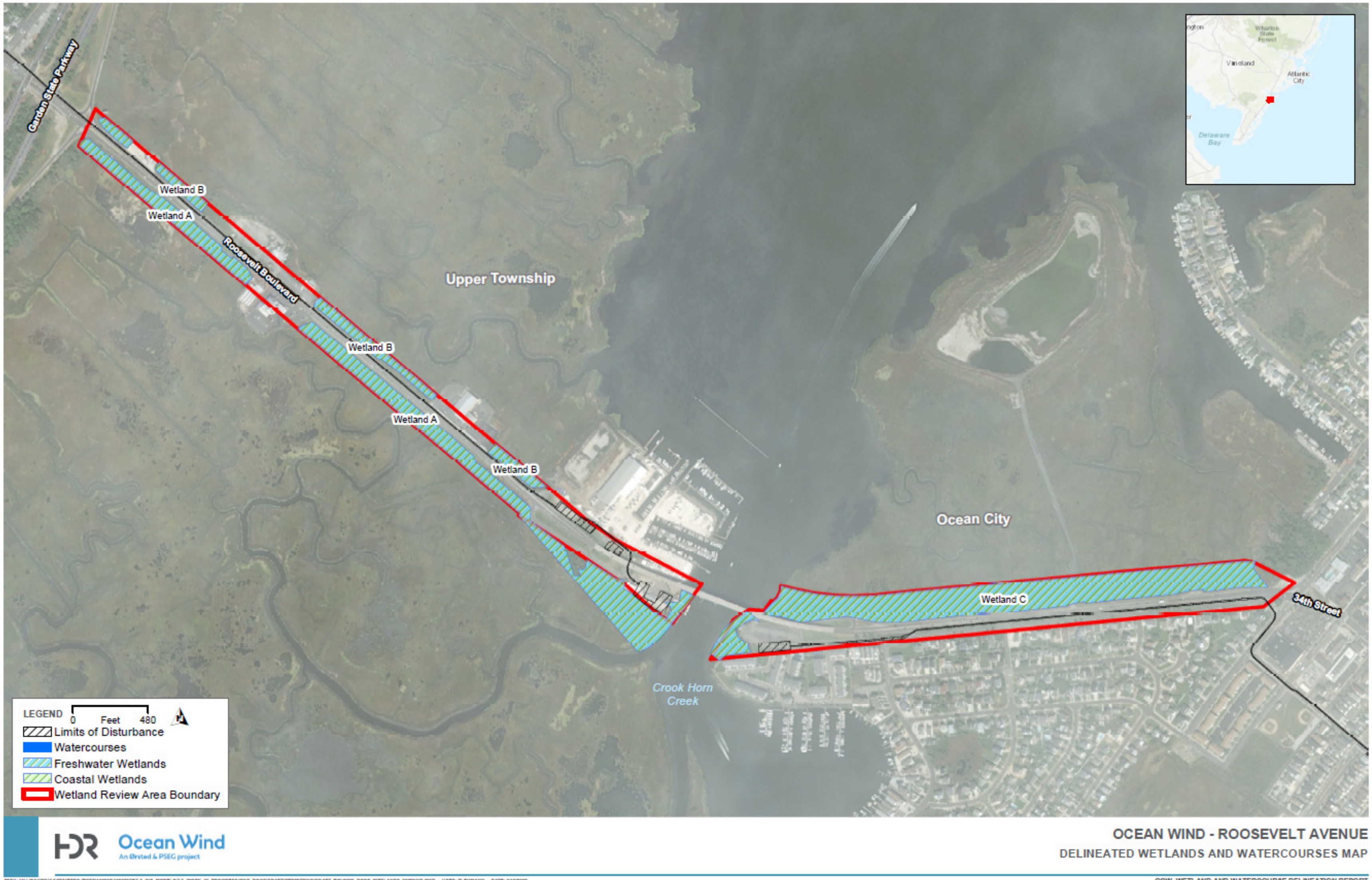


Figure 3. Wetland areas delineated and reviewed in BL England Wetland Review Area.

Figure 4. Wetland areas delineated and reviewed along Roosevelt Avenue in BL England Wetland Review Area.



Ocean Wind 1:
Eastern Black Rail and Saltmarsh Sparrow Habitat Assessment

August 2022

Submitted by:

Merra Howe and Sarah Dodgin
Biodiversity Research Institute

Eastern Black Rail

The Eastern Black Rail (*Laterallus jamaicensis jamaicensis*) is a secretive marsh bird found irregularly along the southeastern coast of the United States from Connecticut to Florida. Eastern Black Rails occupy brackish and freshwater marshes dominated by emergent species including *Spartina patens*, bulrushes, sedges, and cattails. Wherever found, they require high stem density, canopy coverage, and perennially shallow water for foraging and nesting (Atlantic Coast Joint Venture 2020; Eddleman et al. 2020).

No observations of Eastern Black Rails were documented in the vicinity of either the Oyster Creek or BL England onshore development areas during surveys in 2018 and 2019 conducted by the New Jersey Department of Environmental Protection (NJDEP 2018, 2019). However, an area of habitat within the BL England onshore development area was identified as possible suitable habitat for the species (Atlantic Coast Joint Venture (ACJV) 2020). Given the low detection rate of Eastern Black Rails, even when using playbacks in areas known to be occupied by the species, as well as the risk of disturbing them, the U.S. Fish and Wildlife Service (USFWS) does not have a recommended presence/absence survey protocol for Eastern Black Rails. Instead, USFWS assumes that the species may occupy any suitable habitat within its range. See further discussion below.

Saltmarsh Sparrow

The Saltmarsh Sparrow (*Ammospiza caudacuta*) is an obligate marsh bird with a breeding and wintering range between Maine and Florida. Similar to Eastern Black Rails, the species uses the relatively dryer high marsh platform to avoid tidal flooding. In recent years, Saltmarsh Sparrows have not been documented through eBird observations near the BL England area, and few sightings of the species have been reported in the vicinity of the potential cable routes for Oyster Creek (eBird 2022). However, while habitat around Oyster Creek is generally not considered priority marsh habitat for Saltmarsh Sparrows, one patch of salt marsh habitat surrounding BL England area has a relatively high likelihood of supporting the species (patch is ranked 992 of 8680 salt marsh habitat patches, ACJV 2020). See further discussion below.

Habitat and Wetland Delineation Report Review

After review of the Wetland Delineation Report (Report) and supporting materials provided by HDR Engineering, Inc. (HDR), Biodiversity Research Institute (BRI) has determined there are no wetlands containing suitable habitat for Eastern Black Rail and/or Saltmarsh Sparrow within the Oyster Creek Wetland Review Area (OC WRA) and that there are two wetlands containing potentially suitable Eastern

Black Rail and/or Saltmarsh Sparrow habitat within the BL England Wetland Review Area (BLE WRA). The Report characterizes the vegetative community, soil, and hydrology of 24 wetlands delineated within the OC WRA and seven wetlands in the BLE WRA. Palustrine forested, palustrine scrub/shrub, palustrine emergent wetlands, and various combinations of all three wetland habitat types were identified throughout as defined by the Cowardin classification system (Cowardin et al. 1979). Only wetlands where emergent vegetation was dominant were considered by BRI when reviewing the suitability of Eastern Black Rail and Saltmarsh Sparrow habitat.

Eastern Black Rails and Saltmarsh Sparrows have narrow habitat preferences: Eastern Black Rails preferring wetlands characterized by very shallow water and dense emergent vegetation (USFWS 2020), and Saltmarsh Sparrows requiring high marsh vegetation with dense layers of thatch for nest construction (Hartley and Weldon 2020). Both species require emergent wetland vegetation; however, the Saltmarsh Sparrow is only found in saltmarshes, whereas Eastern Black Rails are found in both fresh and saline wetlands. Of the sixteen emergent wetlands delineated in both WRAs, fourteen were dominated by the invasive common reed (*Phragmites australis*). Although common reed is an emergent plant, it is often the dominant species wherever found and is considered to severely degrade habitat because of its ability to convert wetlands into dense monocultures. The result is unsuitable habitat for both Eastern Black Rail (USFWS 2020) and Saltmarsh Sparrow (Hartley and Weldon 2020).

Two emergent wetlands along Roosevelt Boulevard delineated within the BL England WRA (Wetland A and Wetland C) are dominated by salt meadow grass (*Spartina patens*), an obligate salt marsh species. *Spartina patens* is often the dominant species in the high marsh platform, which is defined by a slight elevation increase, typically above mean high water. This allows the grasses to be flooded less frequently than the low marsh, which is characterized by smooth cordgrass (*Spartina alterniflora*). Saltmarsh Sparrows utilize both environments for foraging, but quality high marsh habitat is crucial for reproductive success. Wetlands A and C are located in a developed area at the tip of a larger salt marsh complex identified as a Reference Marsh by ACJV (2022). Reference Marshes are "in near-pristine condition and can act as reference marshes for restoration efforts in the state." Reference Marshes are located near or adjacent to Priority Marshes which have been identified for ongoing Saltmarsh Sparrow habitat restoration planning and action. Wetlands A and C are approximately 10 miles north of an abutting Priority Marsh. Only Wetland C, however, is crossed by a 94-m segment of the BL England Onshore Export Cable Route; however, since HDD will be used, disturbance to Wetland C will be avoided. The Cable Route proximal to Wetland A is entirely co-located with Roosevelt Boulevard (Figure 1).

Figure 1: Wetlands A and C delineated up to the edge of the Wetland Review Area. An approximately 94-m segment of the BL England Onshore Export Cable crosses Wetland C. Wetlands A and C delineated by HDR.

Conclusion

Based on the results of this desktop habitat suitability assessment, the Oyster Creek Wetland Review area was characterized by predominately unsuitable habitat for both Eastern Black Rails and Saltmarsh Sparrows, with an apparent absence of Eastern Black Rails, and limited Saltmarsh Sparrow observations. Thus, it is unlikely that either species would be impacted by onshore operations within the Oyster Creek Wetland Review Area. As such, based on known habitat requirements, documentation of presence/absence, and the Wetland Delineation Report provided by HDR, BRI concludes that a field habitat suitability study for either species is not necessary for this onshore action area. BRI also concludes that the conservation measures proposed by USFWS in its 1 July 2022 letter for Eastern Black Rails and Saltmarsh Sparrows in the Oyster Creek Area would not be necessary.

Wetland A provides potentially high-quality habitat for both species. However, if the BL England Onshore Export Cable Route remains entirely co-located with Roosevelt Boulevard and that disturbance to Wetland A is not necessary, then BRI concludes that a field habitat suitability study for either species is not necessary for this onshore action area. BRI also concludes that the conservation measures proposed by USFWS in its 1 July 2022 letter for Eastern Black Rails and Saltmarsh Sparrows in the BL England Wetland Review area at Wetland A would not be necessary.

The vegetative composition of Wetland C provides potentially high-quality habitat for both species, and a segment of the BL England Onshore Export Cable Route crosses the marsh. However, since HDD will be used, disturbance of Wetland C will be avoided. Thus, BRI concludes that a field habitat suitability study for either species is not necessary for Wetland C and further conservation measures would not need to be considered.

Qualifications

Sarah Dodgin (WPIT) has three years of wetland delineation experience and has extensive knowledge of Atlantic Coast salt marsh ecology as a former Biologist with the National Wildlife Refuge System. She is trained to use the U.S. Army Corps of Engineers Wetland Delineation Manual and the Northcentral and Northeast Regional Supplement for routine and complex delineations.

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Appendix C-2 Knieskern’s Beaked Rush Survey

Knieskern's Beaked Rush Field Survey

Date: Wednesday, August 18, 2021

Project: Ocean Wind Offshore Windfarm – Oyster Creek Project

Subject: Knieskern's Beaked Rush Survey and Results

Knieskern's Beaked Rush Survey – Based on correspondence with the United States Fish and Wildlife (USFWS) dated 12 March 2021 and the New Jersey Natural Heritage Program (NJNHP), HDR conducted a Knieskern's beaked rush (*Rhynchospora knieskernii*) survey on 28 July 2021 on Block 100, Lot 1.06 ("the Holtec Property") in Lacey Township, Ocean County, NJ owned by Holtec International. HDR also surveyed portions of previously delineated Wetlands D and K west of Route 9 for Knieskern's beaked rush. Knieskern's beaked rush is federally-listed as a threatened species by USFWS and as a state-listed endangered species by the NJNHP. The species is described as requiring groundwater-influenced, constantly fluctuating, successional habitats. The USFWS recommended conducting Knieskern's beaked rush surveys along ditches, recently disturbed wetland areas, and in emergent wetlands along the Oyster Creek Export Cable Route that may be directly or indirectly impacted by the proposed project.

The field survey was timed to coincide with the fruiting period (July – September) for the Knieskern's beaked rush. The field survey was conducted by two HDR scientists, Mr. Zachary Lehmann, an ISA-certified arborist, and Mr. Stephen Seymour, PWS, both of whom have previously conducted the April 2021 swamp pink survey on the site and other rare plant surveys within New Jersey. The survey followed the protocol outlined in the USFWS New Jersey field office guidance. The crew spent five hours on the site searching for Knieskern's beaked rush. Figure 1 depicts the previously mapped wetlands by wetland type, and illustrates (in red) the walking routes for the Knieskern's beaked rush survey. A photolog is also attached; photograph numbers are cited in the text.

Prior wetland delineations were conducted on the site by HDR in June 2019 and June 2021; both Mr. Lehmann and Mr. Seymour participated in those surveys. Portions of Wetlands B, C, D, E K, and M were studied for the presence of Knieskern's beaked rush in July 2021. Tidally influenced portions of Wetland A south of the main berm were not assessed due to the species being restricted to freshwater habitats. Knieskern's beaked rush is listed an obligate (OBL) freshwater wetland species in New Jersey by the "National List of Plant Species That Occur in Wetlands" (2018).

The Holtec Property was extensively ditched (Photograph 1) in the past (1950's) for agriculture and livestock, presumably to lower the water table on the site. The smaller ditches generally run north to south; two larger ditches run west to east. The ditches are eight to 15 feet in width, and appear to be permanently flooded with a very deep organic substrate. No discernable flow was evident in the ditches except where the flow was constricted by culverts running through the berms in two locations. Several weathered concrete headwalls and discarded cast iron pipes remain on the site from the farming operation. Upland ridges of sidecast soil run parallel to the ditches; these ridges are typically 20 feet wide and up to four feet above the surrounding ground elevation. Several soil berms previously used as roadways/access are also present. With the exception of the sidecast soils and the berms the site is essentially level. Vegetative succession has been taking place on the site for over 30 years, resulting in a mix of young, forested wetlands, upland meadows, and extensive non-tidal and tidal emergent wetlands connected by the ditches. There are no flowing freshwater streams entering the parcel that could transport Knieskern's beaked rush seeds into the parcel. A description of each surveyed area is as follows:

Wetland B/C - The emergent wetlands on the Holtec Property are identified by the National Wetlands Inventory (NWI) as "PEM1B" (Palustrine emergent, persistent vegetation, seasonally saturated) wetlands. The forested wetlands are identified as "PF01Bd" (Palustrine Forested, Broad-Leaved Deciduous Vegetation, Seasonally Saturated, Partially Drained/Ditched)) by the NWI and generally consists of fringes (Photograph 2) adjacent to the historic ditches. The herbaceous community is generally sparse and consists of tussock sedge (*Carex stricta*), swamp loosestrife (*Decodon verticillus*), sensitive (*Onoclea sensibilis*) and cinnamon fern (*Osmunda cinnamomea*), and sphagnum moss (*Sphagnum sp.*). Extensive and dense patches of common reed (*Phragmites communis*) are also present. Edges of the historic ditches in areas that lacked a tree canopy or with a sparse tree canopy were surveyed for the potential presence of Knieskern's beak rush. No specimens of Knieskern's beaked rush were found.

Wetland D – is an emergent wetland south of Discharge Drive west of Route 9. Wetland D is identified by NWI as "PSS1Eh" (Palustrine scrub-shrub, broad-leaved deciduous vegetation, seasonally flooded/saturated, diked/impounded). Dominant vegetation consisted of common reed (*Phragmites communis*), Atlantic white cedar saplings (*Chamaecyparis thyoides*) and pepperbush (*Clethra alnifolia*). Numerous spatulate-leaved sundew (*Drosera intermedia*) plants were also found in this wetland when delineated in 2019; these areas had been overrun by common reed when studied in July 2021. No specimens of Knieskern's beaked rush were found.

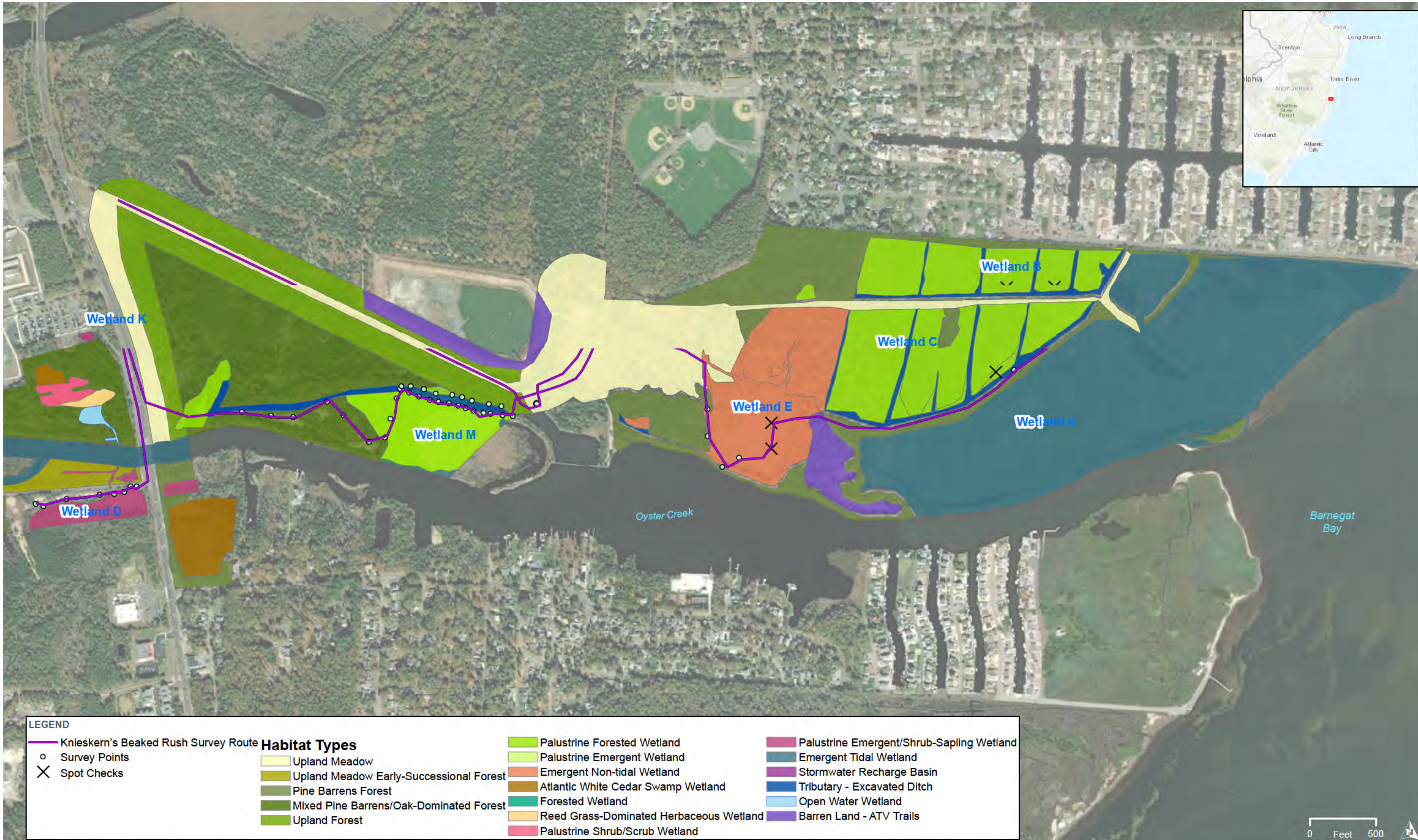
Wetland E – Wetland E is a 23.46-acre palustrine scrub/shrub wetland that receives surface runoff from Watercourses E and F based on Cowardin et al. (1979). Wetland E is identified as "E2EM1P" (Estuarine, Intertidal, Emergent/Persistent Vegetation, Irregularly Flooded) and "PEM1B" (Palustrine, Emergent, Persistent Vegetation, Seasonally Saturated) by NWI. It is dominated by red maple (*Acer rubrum*) trees and highbush blueberry shrubs (*Vaccinium corymbosum*). The herbaceous community is generally sparse and consists of tussock sedge, swamp loosestrife, sensitive and cinnamon fern, and sphagnum moss. Small areas of common reed are also present. No specimens of Knieskern's beaked rush were found.

Wetland K – is a stormwater detention basin 0.13 acres in size west of Route 9 that features a sparse herbaceous layer. It is not mapped by NWI. Dominant vegetation consisted of a 2.5 to 3 foot tall growth of fall panicum (*Panicum virginicum*) and panic grass (*Panicum sp.*). No specimens of Knieskern's beaked rush were found.

Wetland M – is a primarily forested wetland east of Route 9. Wetland M is identified by NWI as "PFO1B" (Palustrine, forested, broad-leaved deciduous, seasonally saturated), "PSS1B" (Palustrine, scrub-shrub, broad-leaved deciduous, seasonally saturated), and "E2EM1P" (Estuarine, intertidal, emergent, persistent, irregularly flooded). Open canopy areas bordering a wide excavated ditch (Watercourse 1) were surveyed. Dominant herbaceous vegetation in the open areas consisted of lurid sedge (*Carex lurida*) and jewelweed (*Impatiens capensis*). Dense patches of Japanese stilt grass (*Microstegium vimineum*) were also present in portions of the wetland and within a dirt access path. No specimens of Knieskern's beaked rush were found.

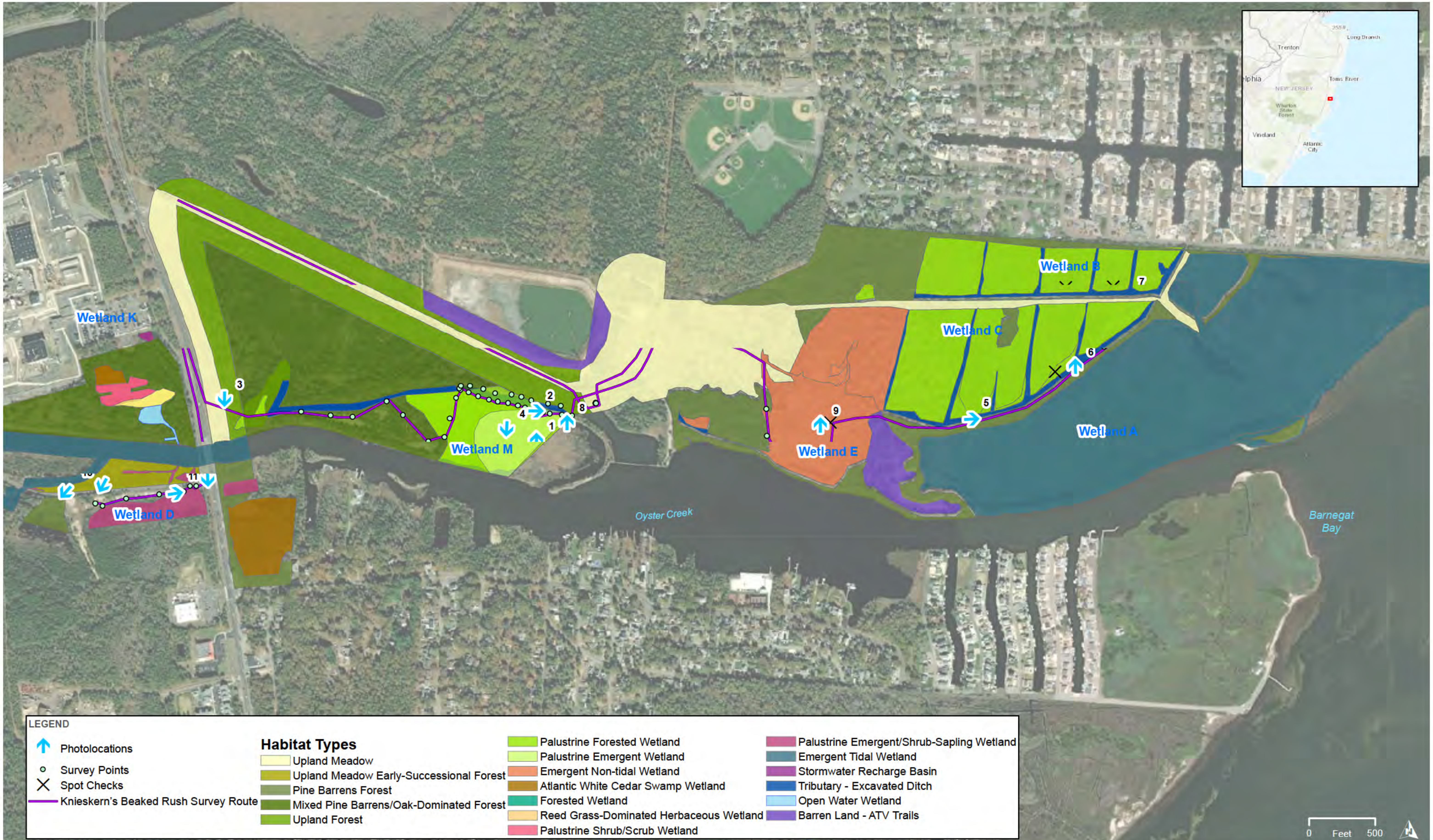
A map depicting the areas studied for the survey is attached; short opportunistic walks into other wetland areas and areas along the historic ditches were also conducted. Other potential habitat types (recent burns, bog-iron deposits, gravel and clay pits, road cuts, utility and railroad rights-of-way, cleared home sites, eroded areas, cleared edges of Atlantic white cedar swamps, wheel ruts, and muddy swales) listed by NJNHP are not present on the site.

In summary, the most likely habitats were studied at the proper time of year, and no Knieskern's beaked rush plants were observed.



OCEAN WIND - OYSTER CREEK LANDING
KNIESKERN'S BEAKED RUSH SURVEY ROUTE
FIGURE 1

PATH: \\MAHPI FILE01\ACTIVEPROJECTS\109939\10092078\7.0_GIS_MODELS\7.2_WORK_IN_PROGRESS\MAP_DOCS\DRAFT\BIOLOGICAL_ASSESSMENTS\KNIESKERNS_RUSH_SURVEY\OCW_KNIESKERNS_RUSH_SURVEY_FIELD_2022 01 21.MXD USER: JLANGE DATE: 1/21/2022



OCEAN WIND - OYSTER CREEK LANDING
KNIESKERN'S BEAKED RUSH SURVEY ROUTE PHOTOLOCATION MAP

PATH: \\MAHPI FILE01\ACTIVEPROJECTS\109939\10092078\7.0_GIS_MODELS\7.2_WORK_IN_PROGRESS\MAP_DOCS\DRAFT\BIOLOGICAL_ASSESSMENTS\KNIESKERNS_RUSH_SURVEY\OCW_KNIESKERNS_RUSH_SURVEY_PHOTOLOCATIONS_2022 01 21.MXD USER: JLANGE DATE: 1/23/2022

Photo 1: Clearing associated with all-terrain vehicle traffic north of canal east of Route 9. No depressed or temporarily wet areas suitable for Knieskern's beaked rush.

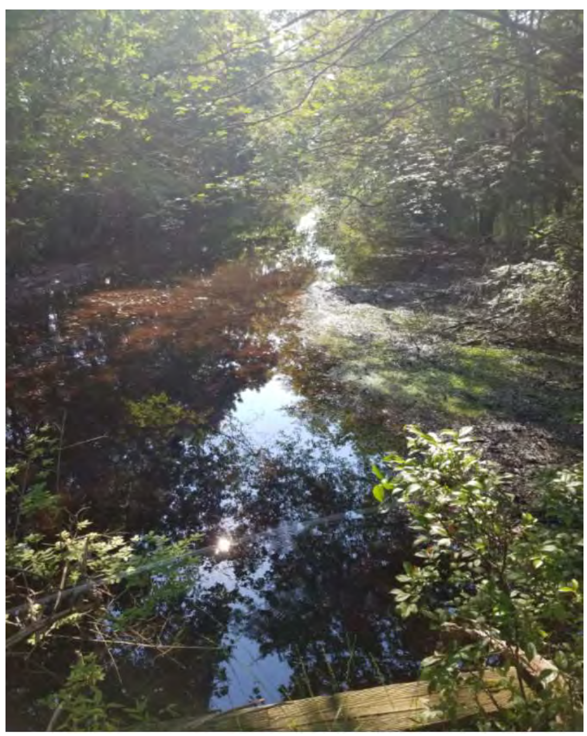


Photo 2: Excavated ditch (Watercourse 1) viewing downstream/east of crossing by Wetland M (to right of photo). No evidence of tidal influence.

Photo 3: Interior of Wetland M (red maple-dominated forested wetland) viewing west. Dominant vegetation is lurid sedge, stilt grass, and jewelweed.

Photo 4: Concrete outfall pipe from the Confined Disposal Facility east of Route 9. Pipe widens to a six-foot wide splash pad; area immediately below splash pad is flooded at high tide.

Photo 5: Overgrown/shaded ditch south of main access path east of Route 9.

Photo 6: Overgrown/shaded ditch north of main access path east of Route 9.

Photo 7: Overgrown/shaded ditch north of main access path east of Route 9.

Photo 8: Open ditch south of main access path east of Route 9.

Ocean Wind Offshore Windfarm	**Knieskern's Beaked Rush Survey Photography**	DATE:	11/18/21	**PHOTO**
		CREATED BY:	JC	**7 and 8**
		REVIEWED BY:	DB	
		JOB NO:	10092078	

Photo 9: Reed grass-dominated herbaceous wetland area bordering ditch north of the canal on the east side.

Photo 10: Wetland K (Detention Basin) viewing east. Vegetation dominated by fall panicum and panic grass.

Ocean Wind Offshore Windfarm	**Knieskern's Beaked Rush Survey Photography**	DATE:	11/18/21	**PHOTO**
		CREATED BY:	JC	**9 and 10**
		REVIEWED BY:	DB	
		JOB NO:	10092078	

Photo 11: Wetland D south of Discharge Drive – cleared area and reed grass-dominated herbaceous wetland.

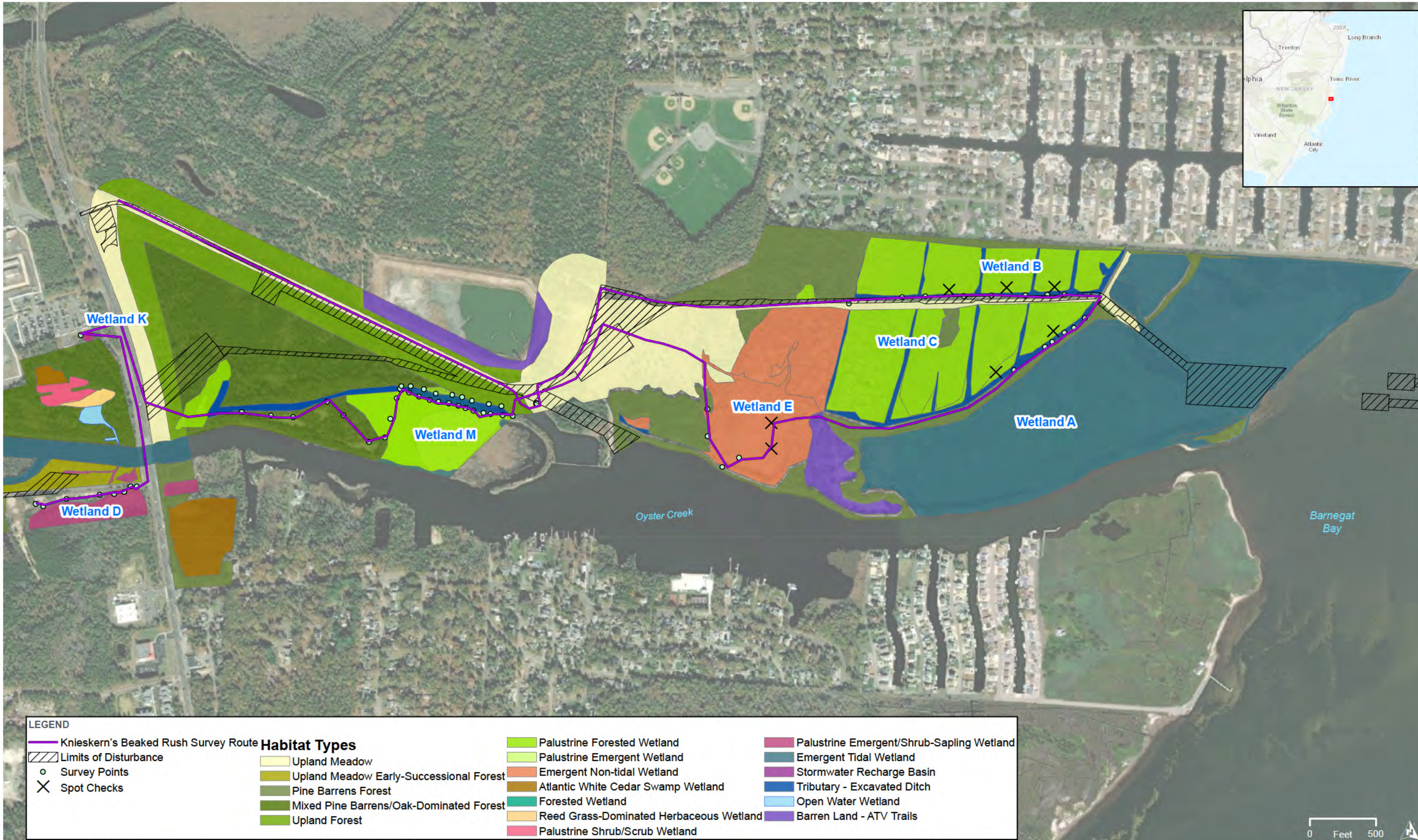
Photo 12: Wetland D – flooded herbaceous and scrub/shrub wetland south of Discharge Drive. No habitat for Knieskern's beaked rush. Dominant vegetation is Atlantic white cedar, white water lily, leatherleaf, and sphagnum moss.

Ocean Wind Offshore Windfarm	**Knieskern's Beaked Rush Survey Photography**	DATE:	11/18/21	**PHOTO**
		CREATED BY:	JC	**11 and 12**
		REVIEWED BY:	DB	
		JOB NO:	10092078	

Photo 13: Wetland D – flooded herbaceous and scrub/shrub wetland south of Discharge Drive. No habitat for Knieskern's beaked rush.

Photo 14: Wetland D – dense reed grass patches south of Route 9/Discharge Drive intersection. Area was an open herbaceous wetland when delineated in 2019.

Appendix C-2a Knieskern's Beaked Rush Disturbance Area Map



OCEAN WIND - OYSTER CREEK LANDING
KNIESKERN'S BEAKED RUSH SURVEY ROUTE
FIGURE 1

PATH: \\NJ MAHWAH\ACTIVEPROJECTS\109939\10092078\7.0_GIS_MODELS\7.2_WORK_IN_PROGRESS\MAP_DOCS\DRAFT\BIOLOGICAL_ASSESSMENTS\KNIESKERNS_RUSH_SURVEY\OCW_KNIESKERNS_RUSH_SURVEY_FIELD_2022 01 21.MXD USER: ZLEHMANN DATE: 10/4/2022

Appendix C-3 Swamp Pink Survey

Swamp Pink Survey – Based on correspondence with the United States Fish and Wildlife (USFWS) and the New Jersey Natural Heritage Program (NJNHP), HDR conducted a swamp pink (*Helonias bullata*) survey on 28 April 2021 on Block 100, Lot 1.06 ("the Finiger's Farm Parcel") in Lacey Township, Ocean County, NJ owned by Holtec International. Swamp pink is federally listed as a threatened species by USFWS and as a state listed endangered species by the NJNHP. The USFWS recommended conducting swamp pink surveys in forested wetlands along the Oyster Creek Export Cable Route that may be directly or indirectly impacted by the proposed project. The field survey was conducted by two HDR scientists, Mr. Zachary Lehmann, and Mr. Stephen Seymour, PWS, both of whom have previously conducted swamp pink and other rare plant surveys within New Jersey. The survey followed the protocol outlined in the USFWS New Jersey field office guidance. The crew spent six hours on the site searching appropriate habitats for swamp pink. Figure 1 depicts the previously mapped wetlands by wetland type, and illustrates (in red) the walking routes for the swamp pink survey. A photolog is also attached; photograph numbers are cited in the text.

A prior wetland delineation was conducted on the site by HDR in June 2019; no swamp pink plants were observed. Both Mr. Lehmann and Mr. Seymour participated in those surveys Wetlands A, C, D, E, and F were studied for the presence of swamp pink in April 2021. Tidally influenced portions of Wetland A south of the main berm were not assessed due to the species being restricted to freshwater habitats. Swamp pink is listed an obligate freshwater wetland species by the "National List of Plant Species That Occur in Wetlands" (2016).

The Finiger's Farm parcel site was extensively ditched (Photograph 1) in the past (1950's) for a salt hay farm, presumably to lower the water table on the site. The smaller ditches generally run north to south; two larger ditches run west to east. The ditches are eight to 15 feet in width, and appear to be permanently flooded with a very deep organic substrate. No discernable flow was evident in the ditches except where the flow was constricted by culverts running through the berms in two locations. Several weathered concrete headwalls and discarded cast iron pipes remain on the site from the farming operation. Upland ridges of sidecast soil run parallel to the ditches; these ridges are typically 20 feet wide and up to four feet above the surrounding ground elevation. Several soil berms previously used as roadways/access are also present. With the exception of the sidecast soils and the berms the site is essentially level. Vegetative succession has been taking place on the site for over 30 years, resulting in a mix of young forest, upland meadows, and extensive non-tidal and tidal emergent wetlands connected by the ditches. There are no flowing freshwater streams entering the parcel that could transport swamp pink seeds into the parcel.

The forested wetlands on the Finiger's Farm parcel are identified as "PF01Bd" (Palustrine Forested, Broad-Leaved Deciduous Vegetation, Seasonally Saturated, Partially Drained/Ditched)) by NWI and generally consists of fringes (Photograph 2) adjacent to the dug ditches. The sparse tree canopy consists of red maple (*Acer rubrum*), black gum (*Nyassa sylvatica*), and American holly (*Ilex opaca*). The shrub layer is very dense and consists of Northern bayberry (*Myrica pensylvanicum*), sweet pepperbush (*Clethra alnifolia*), highbush blueberry (*Vaccinium corymbosum*), arrow-wood (*Viburnum dentatum*), and palustrine rose (*Rosa palustris*). The herbaceous layer is generally sparse and consists of tussock sedge (*Carex stricta;* Photograph 3), swamp loosestrife (*Decodon verticillus*), sensitive (*Onoclea sensibilis*) and cinnamon fern (*Osmunda cinnamomea*), and sphagnum moss (*Sphagnum sp.*). Some patches of common reed (*Phragmites communis;* Photograph 4) are present where the tree canopy is sparse.

The field survey was timed to coincide with the blooming period for the swamp pink. The survey focused on the limited acreage of forested (red maple-dominated) wetlands on the parcel, though some herbaceous and shrub/scrub wetlands were also evaluated. The map depicting the routes walked for the survey is attached; short opportunistic walks into other wetland areas and small wet pockets were also conducted. As the shrub (highbush blueberry and Northern bayberry) layer had not fully leafed out yet, visibility was excellent, and the crew was able to assess the fringe of forested wetlands bordering the ditches. No swamp pink plants were observed.

Previously (2020) delineated Wetlands A and E east of Route 9 and south of the Oyster Creek channel were also examined for the presence of swamp pink. Wetland E is a very dense Atlantic white cedar swamp with limited ground cover due to the tree canopy shading. No swamp pink habitat was present in either Wetland A or E.

No swamp pink plants were observed. As cited above, the type of habitat and prior site disturbance would greatly limit the potential for swamp pink to occur on the site.

SWAMP PINK CERTIFICATION

Signed statement certifying that the proposed activities will not result in any direct or indirect adverse impact to swamp pink (*Helonias bullata*) or its documented habitat. The project consultants completed a species-specific assessment of potentially suitable habitat following USFWS guidelines on the site on 28 April 2021 and found no specimens of swamp pink.

I hereby certify that swamp pink is absent from wetlands that are located on or within the immediate vicinity of proposed project as located in Lacey and Ocean Townships in Ocean County and Ocean City and Upper Township in Cape May County, New Jersey. Therefore the proposed project that is the subject of this NJDEP Freshwater Wetlands, Flood Hazard Area, Waterfront Development, Coastal Wetlands and CAFRA Individual Permit, regulations will not result in direct or indirect adverse impacts to swamp pink and/or its documented habitat.

Applicant

Signature: Stephen M. Seymour Date 11/22/21

OCEAN WIND - OYSTER CREEK LANDING

SWAMP PINK SURVEY MAP

FIGURE 1

PATH: \\MAHPI FILE01\ACTIVEPROJECTS\109939\10092078\7.0_GIS_MODELS\7.2_WORK_IN_PROGRESS\MAP_DOCS\DRAFT\PERMITTING\SURVEYS\OCW_SWAMPPINKSURVEY_OC_20210503.MXD USER: ZLEHMANN DATE: 5/3/2021

Photo Log for the Swamp Pink Survey at Oyster Creek Site – 28 April 2021

Figure 1 – Flooded Pocket on Eastern Side of Main Berm

Figure 2 – Forested/Flooded Area North of the Sand Pit

Figure 3 – Tussock Sedge-dominated Pocket North of the Sand Pit

Figure 4 – Formerly Inundated Pocket Dominated by Common Reed and Red Maple Saplings

Photo 5 – Forested pocket dominated by red maple, sweetgum, and holly.

Photo 6 – Ditch with common reed – viewing west.

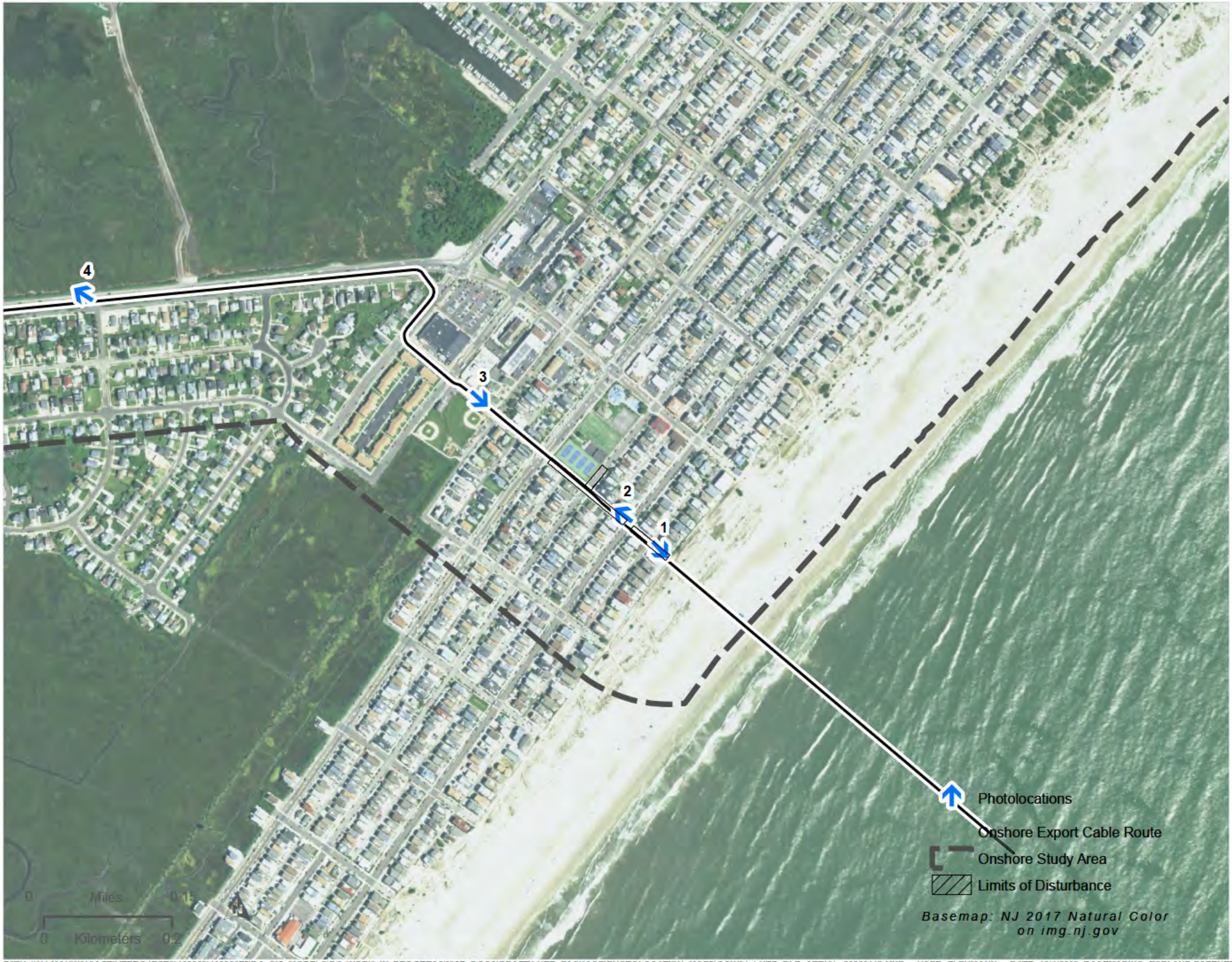
Photo 7 – Wetland E (Atlantic white cedar swamp) viewing east.

Photo 8 – Wet meadow/red maple habitat between the two easternmost ditches, viewing northwest.

Appendix C-4 American Chaffseed Photo Log and Location Maps

Ocean Wind
An Ørsted & PSEG project

BL England


4
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Photolocations
Onshore Export Cable Route
Onshore Study Area
Limits of Disturbance
Basemap: NJ 2017 Natural Color on img.nj.gov
0 Miles 0.15
0 Kilometers 0.2

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BL England
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Photolocations
Onshore Interconnection Point
Onshore Export Cable Route
Onshore Study Area
Potential Onshore Substation Parcel
Limits of Disturbance
Basemap: NJ 2017 Natural Color on img.nj.gov
0 Miles 0.15
0 Kilometers 0.15

Photo 1: Viewing southeast toward beach from 35th Street beach access footpath in Ocean City

Photo 2: Viewing west northwest at the proposed transition joint bay HDD landing area of 35th Street from the beach access area

Ocean Wind Offshore Windfarm	**Photograph Log: BL England Export Cable Route**	DATE:	11/18/21	**PHOTO**
		CREATED BY:	DV	
		REVIEWED BY:	DB	**1 and 2**
		JOB NO:	10092078	

Photo 3: Viewing southeast along 35th Street at the proposed export cable route alignment in Ocean City

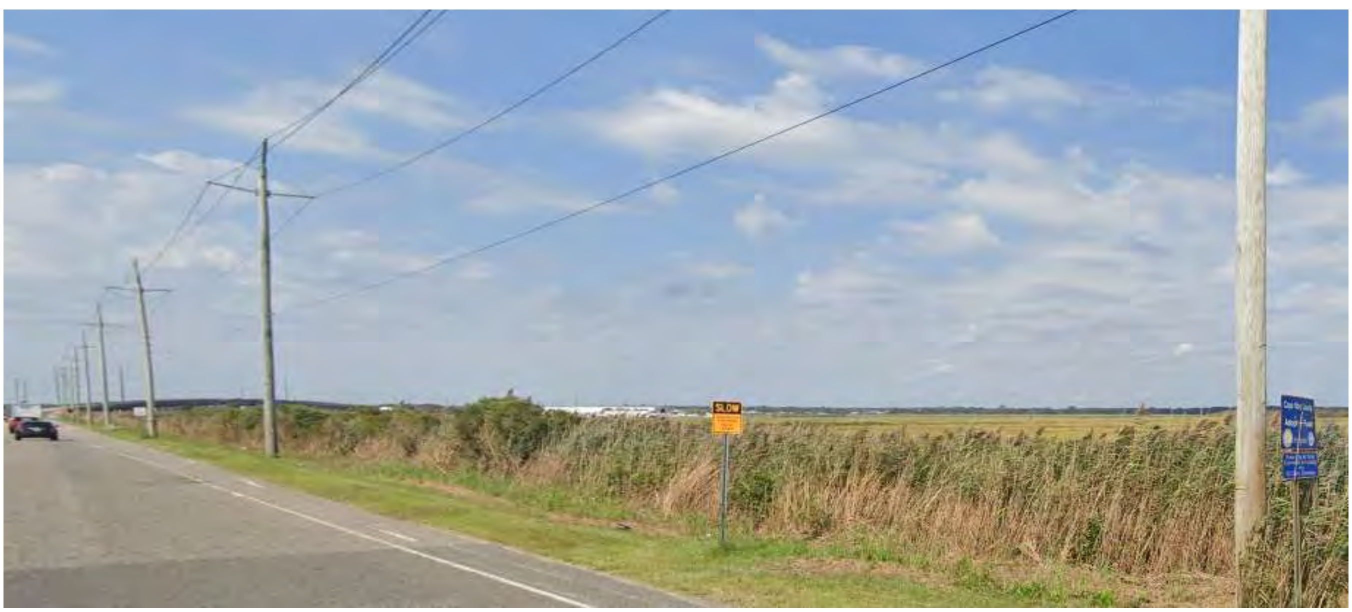

Photo 4: Viewing north along Roosevelt Blvd at proposed export cable route alignment within Ocean City, delineated coastal wetlands adjacent to road.

Ocean Wind Offshore Windfarm	**Photograph Log: BL England Export Cable Route**	DATE:	11/18/21	**PHOTO**
		CREATED BY:	DV	**3 and 4**
		REVIEWED BY:	DB	
		JOB NO:	10092078	

Photo 5: Picture viewing northwest at delineated coastal wetlands adjacent to the Roosevelt Blvd right of way

Photo 6: Viewing south from Roosevelt Blvd at adjacent mapped coastal wetlands

Ocean Wind Offshore Windfarm	**Photograph Log: BL England Export Cable Route**	DATE:	11/18/21	**PHOTO**
		CREATED BY:	DV	**9 and 10**
		REVIEWED BY:	DB	
		JOB NO:	10092078	

Photo 7: Viewing southeast along Roosevelt Blvd from mapped coastal wetlands

Photo 8: Viewing southeast at the delineated wetlands under Roosevelt Blvd Bridge, proposed area of HDD entry put in the distance within the roadway right of way

Ocean Wind Offshore Windfarm	**Photograph Log: BL England Export Cable Route**	DATE:	11/18/21	**PHOTO**
		CREATED BY:	DV	
		REVIEWED BY:	DB	**9 and 10**
		JOB NO:	10092078	

Photo 9: Viewing northwest at the proposed HDD crossing area of Crook Horn Creek, marina in background, public fishing access in foreground right.

Photo 10: Viewing north at All Seasons Marina, proposed location of HDD exit pit west of Crook Horn Creek

Ocean Wind Offshore Windfarm	**Photograph Log: BL England Export Cable Route**	DATE:	11/18/21	**PHOTO**
		CREATED BY:	DV	**5 and 6**
		REVIEWED BY:	DB	
		JOB NO:	10092078	

Photo 11: Picture viewing north of proposed substation area at BL England.

Photo 12: Viewing north at the proposed onshore substation area at former golf course within the BL England Generating Station property

Ocean Wind Offshore Windfarm	**Photograph Log: BL England Export Cable Route**	DATE:	11/18/21	**PHOTO**
		CREATED BY:	DV	**11 and 12**
		REVIEWED BY:	DB	
		JOB NO:	10092078	

Photo 13: Viewing northwest at the proposed onshore substation area at former golf course within the BL England Generating Station property, delineated freshwater scrub/shrub wetland on right

Photo 14: Viewing northwest from near access road at the proposed onshore substation area at former golf course within the BL England Generating Station property

Ocean Wind Offshore Windfarm	**Photograph Log: BL England Export Cable Route**	DATE:	11/18/21	**PHOTO**
		CREATED BY:	DV	**13 and 14**
		REVIEWED BY:	DB	
		JOB NO:	10092078	

Photo 15: Viewing southeast from access road at the proposed onshore substation area at former golf course within the BL England Generating Station property

Photo 16: Viewing north at delineated emergent freshwater and scrub/shrub wetland area near southern portion of proposed onshore substation

Ocean Wind Offshore Windfarm	**Photograph Log: BL England Export Cable Route**	DATE:	11/18/21	**PHOTO**	
		CREATED BY:	DV	**15 and16**	
		REVIEWED BY:	DB		
		JOB NO:	10092078		

Ocean Wind
An Ørsted & PSEG project

Oyster Creek

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Photolocations
Inshore Export Cable Route
Limits of Disturbance
Basemap: NJ 2017 Natural Color on img.nj.gov
0 Miles 0.15
0 Kilometers 0.15
N

Photo 1: View facing east toward Barnegat Bay from delineated coastal wetlands

Photo 2: View facing north, upland of wetland area delineated along Oyster Creek.

Ocean Wind Offshore Windfarm	**Photograph Log: Oyster Creek Export Cable Route**	DATE:	11/18/21	**PHOTO**
		CREATED BY:	DV	**1 and 2**
		REVIEWED BY:	DB	
		JOB NO:	10092078	

Photo 3: Main access road coming to the Holtec Farm Property in Lacey Township, proposed export cable alignment on right.

Photo 4: Photos taken viewing south from Holtec Farm Property access road in the general direction of the proposed export cable alignment

Ocean Wind Offshore Windfarm	**Photograph Log: Oyster Creek Export Cable Route**	DATE:	11/18/21	**PHOTO**
		CREATED BY:	DV	**3 and 4**
		REVIEWED BY:	DB	
		JOB NO:	10092078	

Photo 5: Dirt access road on Holtec Farm Property, proposed cable alignment. Project may require widening and clearing in areas.

Photo 6: Photo facing north at the approximate area of HDD cable landfall at the Holtec Farm Property along Barnegat Bay shoreline near the mouth of Oyster Creek.

Photo 7: Picture viewing southeast torward Barnegat Bay within the area of the proposed export cable alignment, delineated coastal wetlands on both sides.

Photo 8: Viewing east along proposed export cable route within dirt trail on Holtec Farm Property; delineated freshwater wetlands on either side of path

Ocean Wind Offshore Windfarm	**Photograph Log: Oyster Creek Export Cable Route**	DATE:	11/18/21	**PHOTO**
		CREATED BY:	DV	**9 and 10**
		REVIEWED BY:	DB	
		JOB NO:	10092078	


Photo 9: Picture viewing northwest in the area of the proposed HDD crossing of Oyster Creek, delineated wetlands on left.


Photo 10: Viewing west along the access road to the Oyster Creek proposed onshore substation.

Ocean Wind Offshore Windfarm	**Photograph Log: Oyster Creek Export Cable Route**	DATE:	11/18/21	**PHOTO**
		CREATED BY:	DV	**9 and 10**
		REVIEWED BY:	DB	
		JOB NO:	10092078	

Photo 11: Picture viewing north of proposed substation area at Oyster Creek.

Photo 12: Viewing west along the access road to the Oyster Creek proposed onshore substation. Substation area on left.

Ocean Wind Offshore Windfarm	**Photograph Log: Oyster Creek Export Cable Route**	DATE:	11/18/21	**PHOTO**
		CREATED BY:	DV	**11 and 12**
		REVIEWED BY:	DB	
		JOB NO:	10092078	

Photo 13: Viewing northwest at the proposed transition joint bay area at HDD landfall at Island Beach State Park

Photo 14: Viewing south at Island Beach State Park Swimming Area 2 parking lot in the proposed area of export cable alignment.

Ocean Wind Offshore Windfarm	**Photograph Log: Oyster Creek Export Cable Route**	DATE:	11/18/21	**PHOTO**
		CREATED BY:	DV	**13 and 14**
		REVIEWED BY:	DB	
		JOB NO:	10092078	

Photo 15: Viewing northeast in the proposed joint bay area of the Island Beach State Park maintenance/storage yard

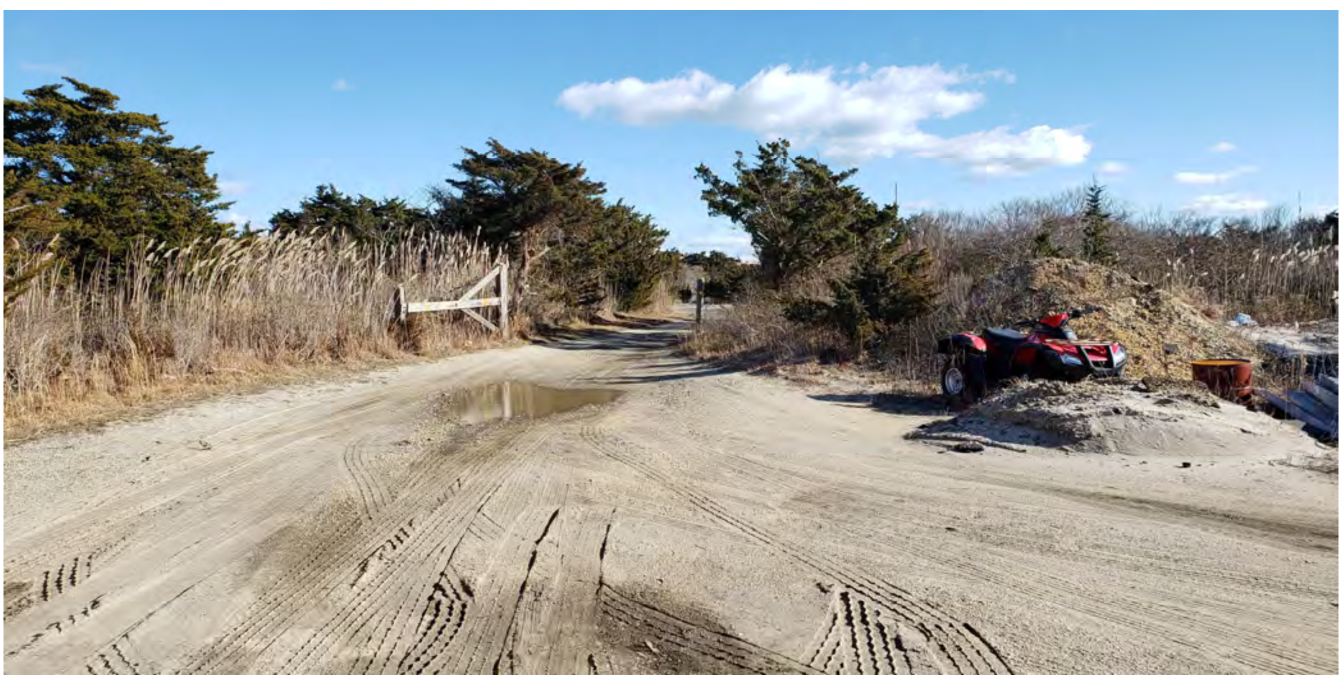


Photo 16: Viewing east in the proposed joint bay area of the Island Beach State Park maintenance/storage yard

Ocean Wind Offshore Windfarm	**Photograph Log: Oyster Creek Export Cable Route**	DATE:	11/18/21	**PHOTO**
		CREATED BY:	DV	**15 and16**
		REVIEWED BY:	DB	
		JOB NO:	10092078	

Photo 17: Viewing west at the area of the proposed open cut cable landfall along the western shoreline of Island Beach State Park in the area of the historic channel

Photo 18: Viewing east at the western shoreline of Island Beach State Park from the historic channel.

Ocean Wind Offshore Windfarm	**Photograph Log: Oyster Creek Export Cable Route**	DATE:	11/18/21	**PHOTO**
		CREATED BY:	DV	**17 and 18**
		REVIEWED BY:	DB	
		JOB NO:	10092078	

Photo 19: Viewing west into Barnegat Bay from Island Beach State Park at the proposed export cable route.

Photo 20: Viewing west into Barnegat Bay from Island Beach State Park at the proposed export cable route.

Photo 21: Viewing east at Atlantic Ocean from Island Beach State Park dune beach access path, area of HDD exit pit in the distance

Photo 22: Viewing east down the beach access path through dunes from the southern auxiliary lot at Island Beach State Park Swimming Area 2

Ocean Wind Offshore Windfarm	**Photograph Log: Oyster Creek Export Cable Route**	DATE:	11/18/21	**PHOTO**
		CREATED BY:	DV	**21 and 22**
		REVIEWED BY:	DB	
		JOB NO:	10092078	

Appendix C-5 Red Knot Habitat Assessment

Ocean Wind 1:
Red Knot (*Calidris canutus rufa*) Habitat Assessment

November 2022

Submitted by:

Wildlife Research Partnerships LLC, Greenwich, NJ
Biodiversity Research Institute, Portland, ME
HDR Engineering, Inc

Table of Contents

List of Figures

1. Summary

Ocean Wind 1, LLC (OCW01), a joint venture of Ørsted Wind Power North America, LLC (Ørsted) and Public Service Enterprise Group Renewable Generation LLC (PSEG), received a request from the Bureau of Ocean Energy Management (BOEM) to provide additional information on potential suitable habitat for Red Knots (*Calidris canutus rufa*) in areas that may be impacted by proposed OCW01 Onshore Facilities. This request was based on comments from U.S. Fish and Wildlife Service (USFWS) on OCW01's Biological Assessment. In response, OCW01 funded a research project in partnership with Wildlife Restoration Partnerships (WRP), the Biodiversity Research Institute (BRI), and HDR Engineering, Inc, to develop mapped products that display suitable habitat for Red Knots in the BL England and Oyster Creek Areas (Appendix 1). OCW01 funded WRP and BRI previously to conduct tracking studies with the use of satellite telemetry to assess Red Knot exposure to the proposed OCW01 offshore wind project.

For this project, WRP and BRI created habitat suitability maps for the BL England and Oyster Creek Areas. These were overlaid with layers of OCW01 onshore components (e.g., cable routes) and Red Knot detections, including the previously collected satellite data as well as other historic resightings, to determine overlap between suitable habitat, Red Knot use areas, and potential areas of disturbance. This assessment provides detailed information on potential disturbance to Red Knots during their north and south bound migrations at stopover points along the Atlantic Coast of New Jersey.

The assessment found the following:

- BL England: While there is significant Red Knot activity during their fall migration to the south of the proposed cable construction sites, it is likely that use of the Ocean City beach area by Red Knots is primarily for occasional foraging along the intertidal beach, molting in the known concentration areas, or brief migration stopovers. Additionally, based on the proposed construction methods, activities and timing, disturbance to Red Knots will be minimal and limited to noise disturbance, and no Red Knot habitat will be impacted.
- Oyster Creek: Historic iNaturalist data at this site shows Red Knot use in the area, but this use is minimal. Based on the proposed construction methods, activities and timing, disturbance to Red Knots will be minimal at this site and limited to noise disturbance. Additionally, no Red Knot habitat will be impacted.

In summary, this assessment found there will be no impact to Red Knot habitat at these sites, and any disturbance will be limited to minimal noise disturbance only during the time of landfall activities.

2. Introduction

Each year, Red Knots (*Calidris canutus rufa; hereafter referred to as Red Knot*) migrate up to 32,000 km from their Arctic breeding grounds to wintering areas from the Gulf of Mexico to South America (Morrison et al. 2004). Breeding success largely depends on the condition and arrival time of shorebirds at their breeding grounds. For this reason, the Red Knot relies heavily on a few critical stopover locations on the northbound return flight, especially Delaware Bay (Niles et al. 2010). Previously, it was believed that arrival and departure time from southbound stopover sites were less strict, as the need to migrate south was less constrained by timing. However, recent work conducted by Wildlife Restoration Partnerships (WRP), in partnership with the U.S. Fish and Wildlife Service (USFWS), has found that Red Knots face the same timing restrictions during their fall migration. It is critical that Red Knots arrive at their long-distance wintering location before the raptor migration, to avoid predation, and prior to molt. The continued existence of undisturbed foraging opportunities at these stopover sites is a key element in their survival and recovery.

Each May to early June, Red Knots and other northbound shorebirds stop in the Delaware Bay Estuary to feed, almost exclusively, on horseshoe crab eggs (Clark et al. 1993, Tsipoura and Burger 1999). Their timing coincides with peak horseshoe crab (*Limulus polyphemus*) spawning season, the largest spawning event in the world. During a few weeks in May, Red Knots gain critical body fat reserves for a successful migration to their breeding grounds (Baker et al. 2004, Duijins et al. 2017). However, overharvesting of horseshoe crabs in the late 1990's led to a decline in egg availability, and, consequently, shorebird populations dramatically declined (Baker *et al.* 2004, Morrison et al. 2007, Niles *et al.* 2007, 2009). The decline eventually led to USFWS listing the Red Knot as Threatened in 2015 (USFWS 2016).

The Atlantic Coast of New Jersey has been identified as one of the major stopover locations for Red Knots and other shorebirds during their southbound migrations (Harrington et al. 2010). Although total numbers of Red Knots using these sites have dropped dramatically from around 10,000 Red Knots in 1990 to about 1,000 in 2008, this drop off is largely accredited to the overall decline in Red Knots since their population crash in 2003 (Harrington et al. 2010).

On the Atlantic Outer Continental Shelf (OCS), a total of 7,073 km^2 is presently under lease agreement for development of commercial-scale offshore wind energy facilities, and an additional 11,235 km^2 is in the planning stages for potential lease (BOEM 2019). While broad patterns in migration routes and behavior of Red Knots have been documented by tracking and banding studies (Burger et al. 2012, Loring et al. 2018, Niles et al. 2010), fine-scale information on the specific routes, altitudes, timing, and environmental conditions associated with flights over the Atlantic OCS have not been fully understood until recently.

Recent advances in light-weight satellite tracking technology have made it possible to collect high-resolution, three-dimensional movement data of small-bodied shorebirds in offshore environments and can be used to improve estimates of exposure to offshore wind development. For this reason, OCW01 funded a multi-year study using Argos satellite tags with GPS sensors deployed on southbound birds staging in New Jersey. The project was initiated in 2021, in collaboration with WRP, BRI and the USFWS. Our team deployed a total of 60 tags on Red Knots.

The tags also provided data on coastal habitat use during fall migration in the vicinity of OCW01 cable landfall sites and onshore cable routes. For this reason, WRP and BRI have been contracted to assess these plans and generate habitat suitability maps for Red Knots at the proposed sites and evaluate any potential impacts to this species.

2.1. Habitat Needs

During their southbound migration, Red Knots stop at key sites for a number of reasons. Long distance migrants (Red Knots over wintering in South America) utilize these important stopovers primarily to develop fat reserves for the next leg of their migration. During this time, they have only a short period of time to double in weight before needing to continue their migration. Their timing is restricted by the need to leave the stopover site before the raptor migration, where they would be easy prey at such large weights. Short distant migrants (Red Knots over wintering in the Caribbean or southern Florida) also use these stopovers to gain weight, but they spend more time in these areas before continuing their migration to their wintering grounds. At the stopover sites, like the Atlantic Coast of New Jersey, short distant migrants will molt their flight feathers, so they gain weight slowly, then hop down the coast until they reach their wintering grounds. By keeping their weights lower, they can stay in the stopover areas longer and do not suffer the same intense timing restrictions of the long-distance migrants, but they increase their risk for predation.

During their stopover period, Red Knots feed on small gem clams within the intertidal zone during low tide along the Atlantic Coast of New Jersey, or feed on clams and mussel spat in the saltmarsh behind the shore. At high tide the birds roost in the saltmarshes within the back bays of the New Jersey coast. From the satellite tag data and historic data, we know Red Knots use a multitude of microsites throughout the larger New Jersey stopover, shifting from one beach or marsh area to another. For this reason, it is important to properly assess the full construction path as well as timing of the work for each export route.

2.2. Proposed route plans

See Appendix 1 with Site Photos.

2.2.1. BL England Export Route

Offshore cables would be directed into Ocean City via horizontal directional drilling (HDD) to avoid impacts to the beach. Cables would run from offshore under the beach and street until reaching a transition joint bay near 35th street and West Avenue. Cable work would be conducted under paved road in an urban area from 35th street to Roosevelt Boulevard. Where Roosevelt Boulevard crosses over Crook Horn Creek, HDD would run the cable from the east side of the creek to the west in an area just to the south of the bridge. Once crossing the Creek, cable would return under the roadway and follow Roosevelt Blvd and to North Shore Road, continuing north until reaching Clay Avenue. The cable would then follow Clay Avenue until reaching its destination at the planned substation at BL England power plant. See Figure 2 for an overview of the full preferred route.

2.2.2. Oyster Creek Export Route

Offshore cables would be directed into Island Beach State Park via HDD to avoid impacts to the beach. Cables would make landfall at the parking lot (labeled Ocean Swimming Parking Area #2 on Google Maps) on Central Avenue (Shore Road). After a short onshore route to the north for approximately 1,400 feet, the Cables would then be run west via open cut from Central Ave to an already existing maintenance area bordering Barnegat Bay. Cables would then be run across Barnegat Bay via jetting installation technology and dredging/open cut until landfall just north of Oyster Creek. From landfall until crossing Oyster Creek at Route 9, cables would be run via traditional duct bank installation. Cables would cross Oyster Creek at Route 9 via HDD, then follow the access road to the Oyster Creek power plant via duct bank installation until reaching the substation. See Figure 8 for an overview of the full preferred route.

2.2.3. Alternative routes

BL England Cable Export Route: The BL England route options at 5th Street and 13th Street would be made under the beach using HDD to avoid impacts to the beach. HDD workspace and the cable routes would be within paved road ROW (5th Street, 13th Street, and West Avenue) through highly developed urban areas until they converge with the preferred route at 35th Street. See Figure 7 for an overview map of the alternative route.

Oyster Creek Export Route: The Oyster Creek route option on Bay Parkway is surrounded by tidal marsh wetlands. While identified as a potential alternative, this route is not practicable and unlikely to be pursued as compared to the other alternatives due to the presence of wetland and submerged aquatic vegetation and permitting constraints. The remaining Oyster Creek route options would make landfall within disturbed gravel areas at parking lots and a marina. Once on land, route options would follow public roads to Route 9. East of Route 9, the route option would follow a private paved roadway west and north to an HDD site adjacent to Oyster Creek. The cable would be installed under Oyster Creek and associated freshwater wetlands using HDD, then would converge with the existing preferred route within the paved access road to the substation site. See Figure 13 for an overview map of the alternative route.

3. Methods

At both sites our team conducted site visits and took aerial drone photos as well as on the ground photos of both proposed export routes. Next, our team gathered all pertinent data of Red Knot use in the proposed areas for the cable export routes including historic sightings as well as satellite tag data. Then, to properly assess any potential impacts to both Red Knots and key Red Knot habitat along the Atlantic coast of New Jersey, WRP generated habitat suitability maps along the proposed cable routes. Mapping products were broken out into four sections along the proposed route at key areas as well as one overview map of full cable route. We also generated one overview map for the proposed alternative routes.

GIS analysis for maps was performed in QGIS Desktop software (version 3.28.0). OpenStreetMap's 'OSM Standard' basemap was used in the final map products, released under Creative Commons Attribution-ShareAlike 2.0 Generic (CC BY-SA 2.0) (© OpenStreetMap contributors). All maps were then overlayed with Red Knot presence point data from satellite tags, eBird[1] sightings, as well as iNaturalist sightings. Then three other layers were added to the maps, potential Red Knot habitat, Red Knot high movement areas, and disturbance level layers.

3.1. Shapefiles

Preferred and alternative cable route shapefiles, limits of disturbance shapefiles, and BL England component shapefiles were provided to WRP by HDR, detailed below.

Preferred cable routes:
- OCW01_COP_Offshore_and_Inshore_Export_Cable_Route_20221027
- OCW01_COP_Onshore_Export_Cable_Route_20221027

Alternative cable routes:
- OCW01_COP_Offshore_and_Inshore_Export_Cable_Options_20221027

[1] https://ebird.org/home

- OCW01_COP_Onshore_Export_Cable_Options_20221027

Limits of disturbance:
- OCW01_Limits_of_Disturbance
- Note: The BL England area of this shapefile was modified in order to reflect updated spatial extents of the substation planning area (represented in 'BL England components').

BL England components:
- OCW01_COP_BLE_InterconnectionCableRoute
- OCW01_COP_BLE_OnshoreExportCableSitingArea
- OCW01_COP_BLE_PotentialOnshoreSubstationArea

3.2. Red Knot sighting data

Red Knot satellite point data was downloaded as a .csv file via Argos website. Points with location class 1, 2, and 3 were filtered from the raw data and downloaded, as they contain the highest quality location accuracy among the available data (3: <250m, 2: 250-500m, 1: 500-1500m). The satellite ping data covered a temporal range of 10-21-2021 until 10-21-2022. The .csv file was then imported into QGIS using the 'Longitude' and 'Latitude' fields as XY coordinates, respectively. eBird data was collected and downloaded as a .csv file via a data request from eBird's public database using the following parameters:

1) Species: Red Knot – *Calidris canutus*;
2) Region: New Jersey, United States (US);
3) Date range: Jan 2017 to Dec 2022 and;
4) All other parameters used default settings.

The .csv file was then imported into QGIS using the 'LONGITUDE' and 'LATITUDE' fields as XY coordinates, respectively. iNaturalist data was downloaded as a .csv file from iNaturalist's public database using the following parameters: 1) Quality grade: Research, 2) Place: New Jersey, 3) Taxon: Red Knot, 4) All other parameters used default settings.

3.3. Habitat/Movement/Disturbance Layers

The Potential Red Knot Habitat layer was created through visual assessment of 2019 NAIP imagery in order to digitize areas of sandy beach that can potentially serve as habitat for Red Knots.

The High Red Knot Movement Area was designated in the area of Ocean City beach that shows significant Red Knot activity, as indicated by successive satellite pings. The extent was hand-drawn and serves to demonstrate that there is definitive evidence that Red Knots use this area for extended periods of time.

The Disturbance Level layer was determined by a visual comparison of the planned cable routes and construction work with Red Knot presence and habitat data. In areas marked as "Potential Disturbance," there is potential knot habitat, there has been documented presence of Red Knot in the immediate area, and there is the possibility that there could be a noise disturbance to Red Knots as construction is underway. In areas marked as "No Disturbance", there has been no documented presence of knots in the immediate area and/or there is no feasible habitat for knots to be present.

Timing of proposed construction activity was provided to WRP by HDR (Figure 1). White boxes with text describing the timing of each construction activity based on information from a site photolog were placed on the maps. This information is current as of October 4, 2022.

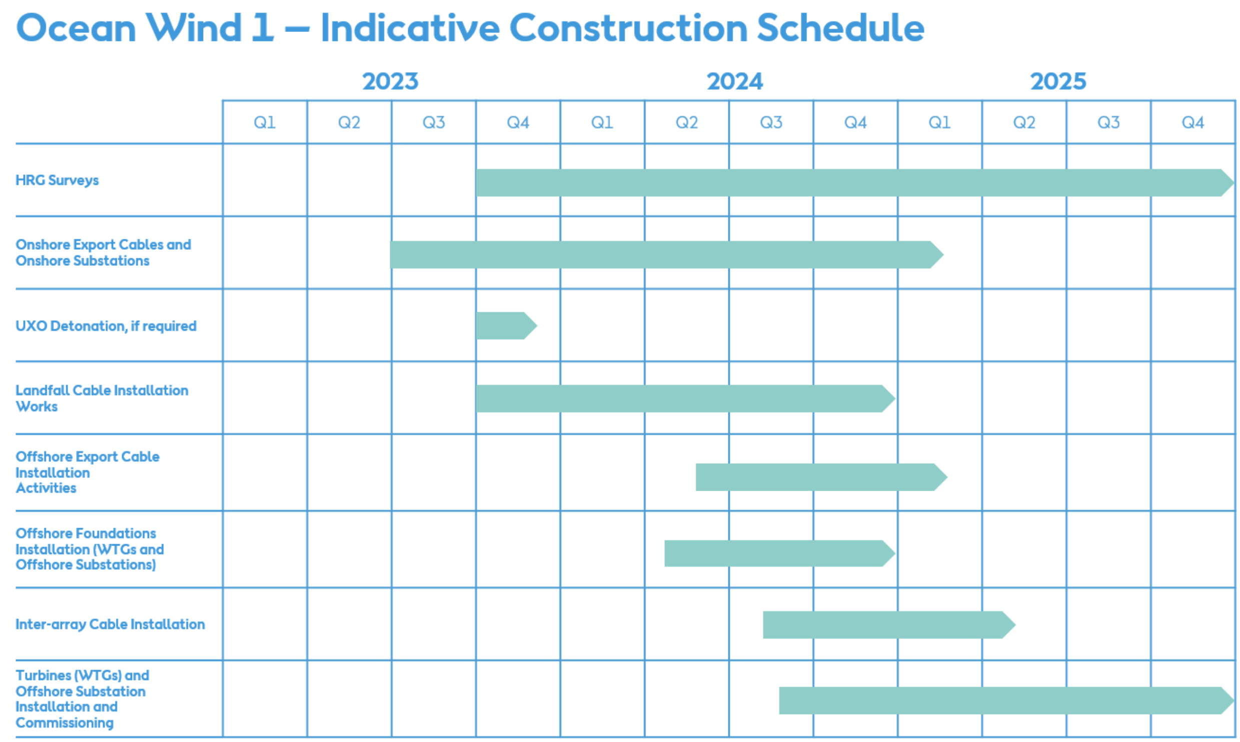


Figure 1. OCW01 Construction Schedule

4. Results

Photos were collected along each proposed cable route during our site visit. The BL England export route has had documented Red Knot use along Ocean City beach, as seen with historic sightings and the satellite tag data. Red Knots have also been known to use the back bays behind Ocean City beach. During the site visit our team took note of the specific route locations. Along the BL England route one of the locations for HDD activities is adjacent to Red Knot habitat but the location where activities will occur is not Red Knot habitat (Appendix 1: BL England photos 2 & 3). The rest of the BL England route is also not Red Knot habitat. At the Oyster Creek export route site photos were taken as well. The beach habitat along the route has been noted historically as Red Knot habitat (resightings data) but is not used frequently by Red Knots. The rest of the cable export route is not Red Knot habitat (Appendix 1: Oyster Creek photos).

Resulting mapped products were broken out into four sections to show closer detail along the route with one larger overview map for both sites. Additionally, alternative route overview maps were generated to show potential alternative routes.

4.1. BL England Export Route

For the BL England Cable route, Figure *2* shows an overview of the full preferred route, Figure *3*–Figure *6* show zoomed in sections along the route, and Figure *7* shows an overview map of the alternative route. In Figure *2* and Figure *3*, satellite tag point data as well as eBird and iNaturalist sightings data can be seen on the maps. There is significant Red Knot activity during the fall migration to the south of the proposed cable construction sites, primarily shown with satellite tag points (Figure *2*). While these point locations clearly point to Red Knot use of the Ocean City Beach, our coastwide ground and aerial surveys found no knots on the Ocean City Beach. It is likely that use of the Ocean City beach area is primarily for occasional foraging along the intertidal beach by knots building weight or molting in the known concentration areas or used by birds briefly during migration.

4.2. Oyster Creek Export Route

For the Oyster Creek export route, Figure *8* shows an overview of the full preferred route, Figure *9*–Figure *12* show zoomed in sections along that route and Figure *13* shows an overview map of the alternative route. Along this route we did not have any satellite tag detections. Figure *9* shows iNaturalist data at this site which represents a number of recorded Red Knot sightings for "Island Beach State Park," but the sightings do not contain accurate location coordinates. This point does not represent a specific sighting location. The beach habitat at this site shown in Figure *9* and Figure *10* is listed as potential Red Knot habitat.

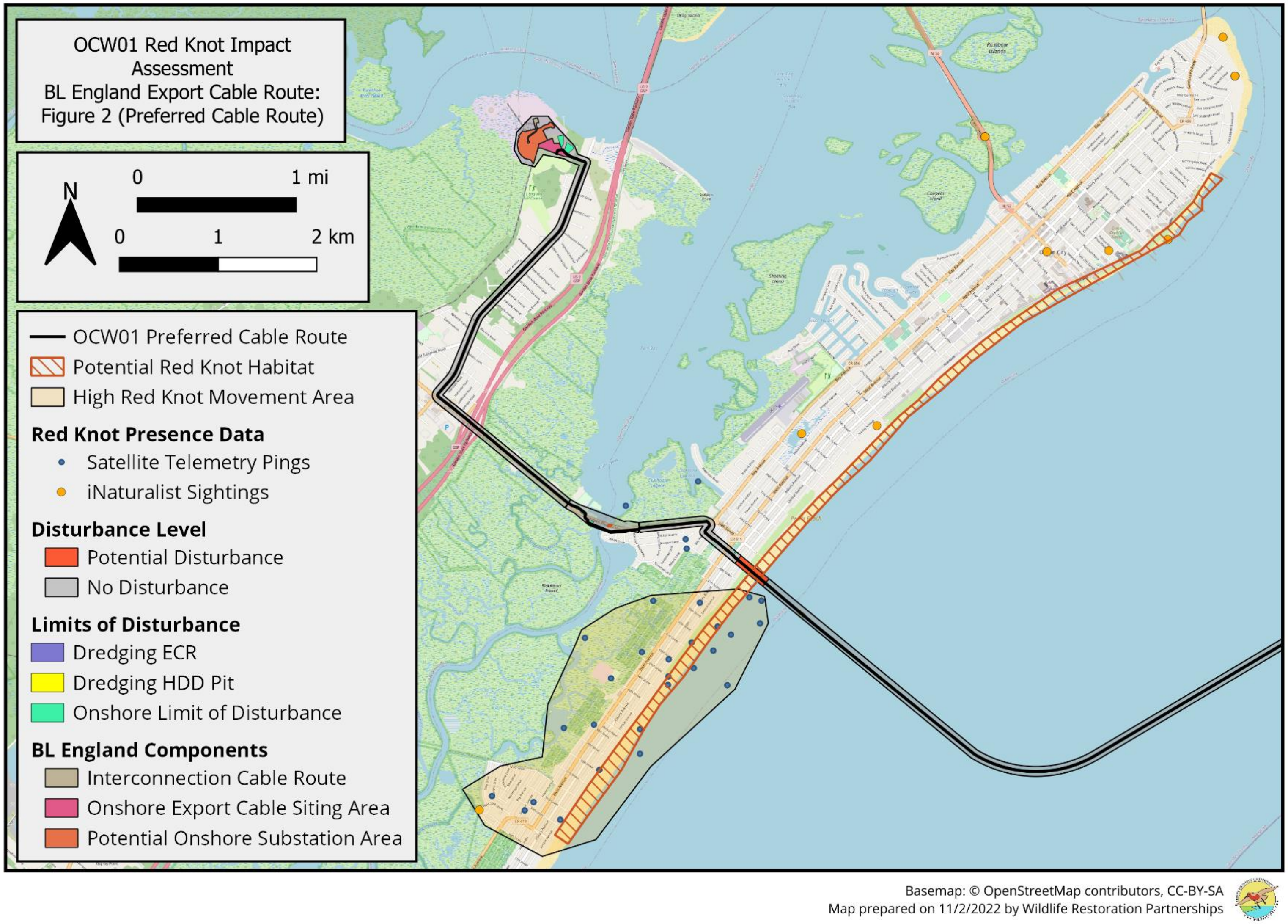


Figure 2. BL England cable route showing full overview map of proposed project.

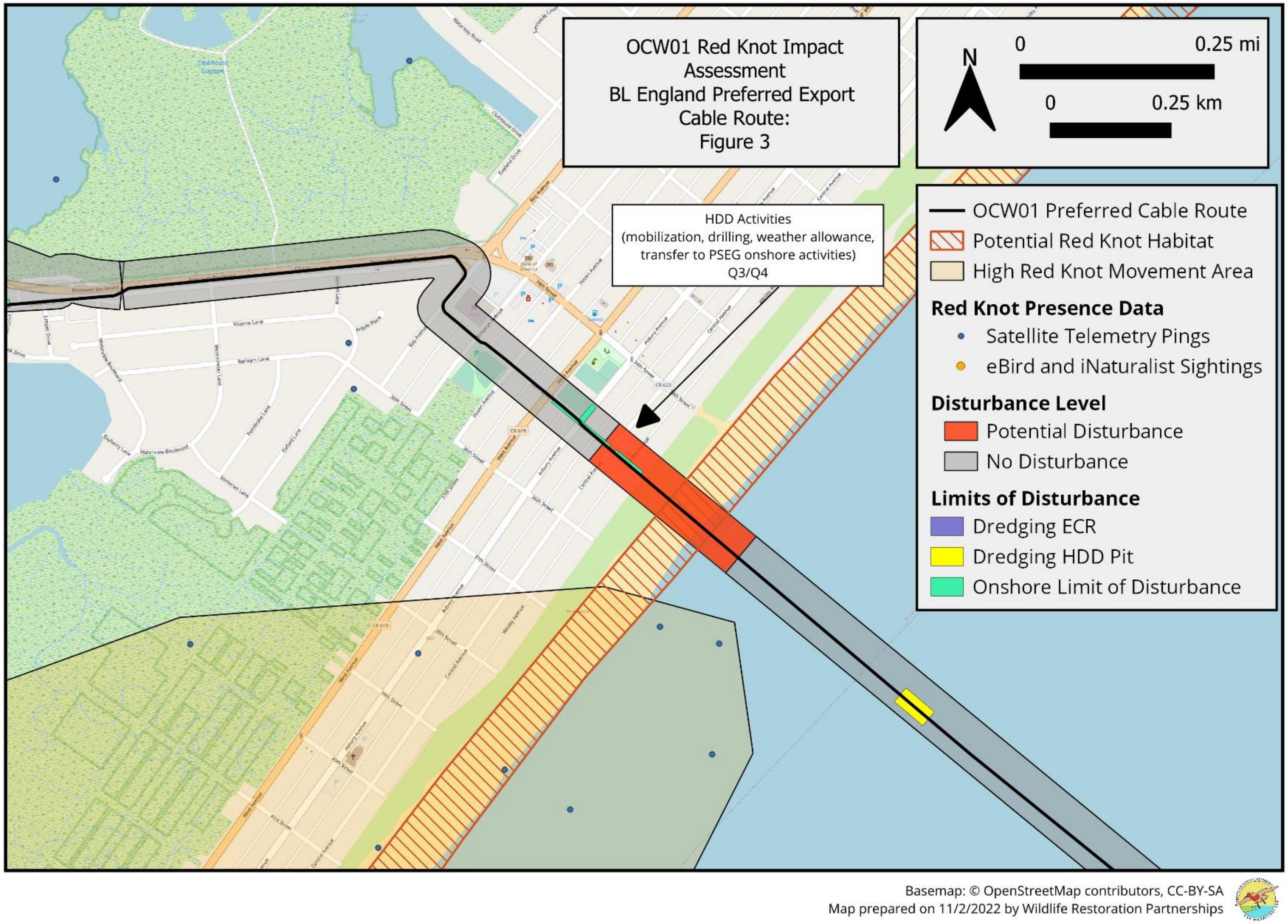


Figure 3. BL England cable route from dredging HDD pit to first site of onshore activities.

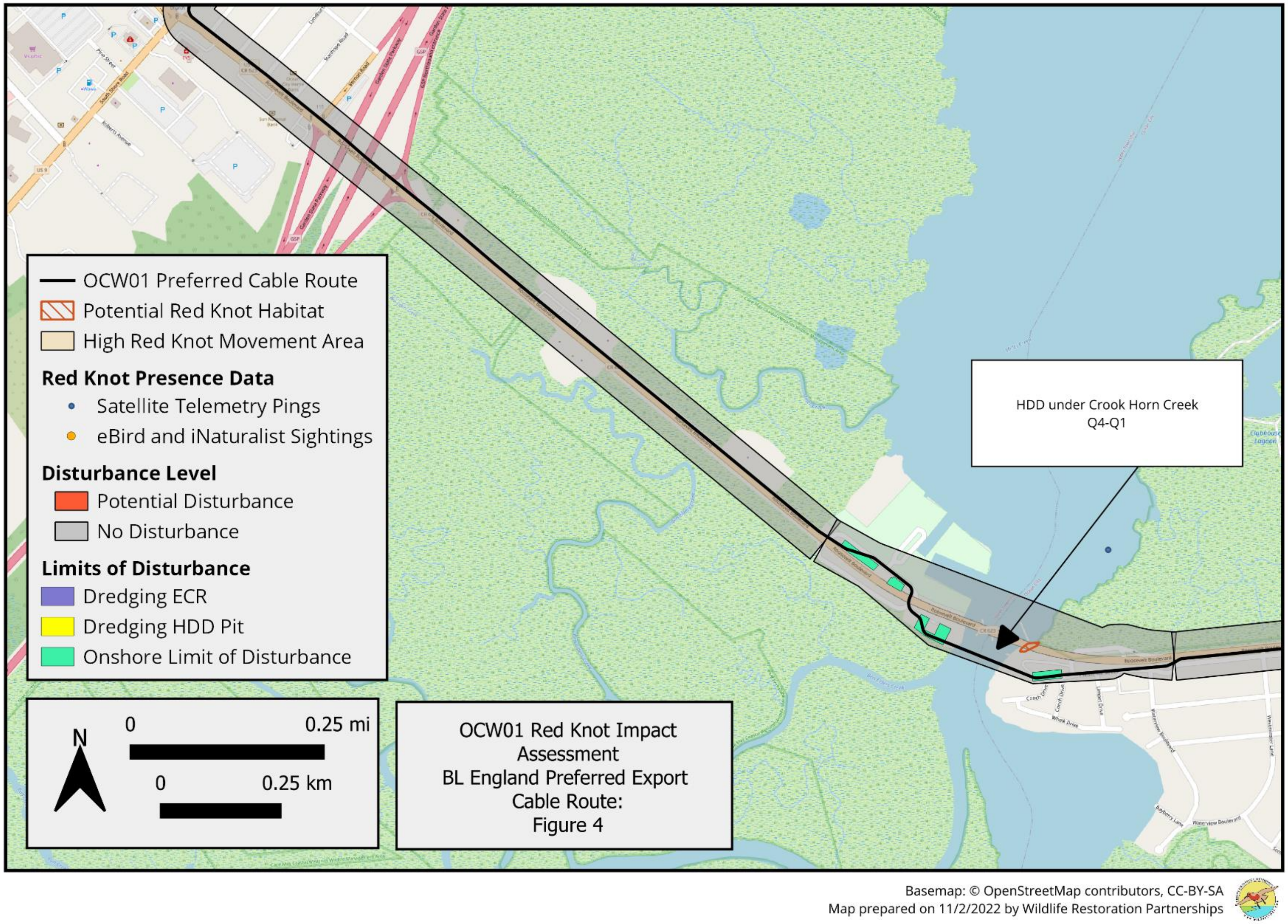


Figure 4. BL England cable route at second HDD activity site at Crook Horn Creek.

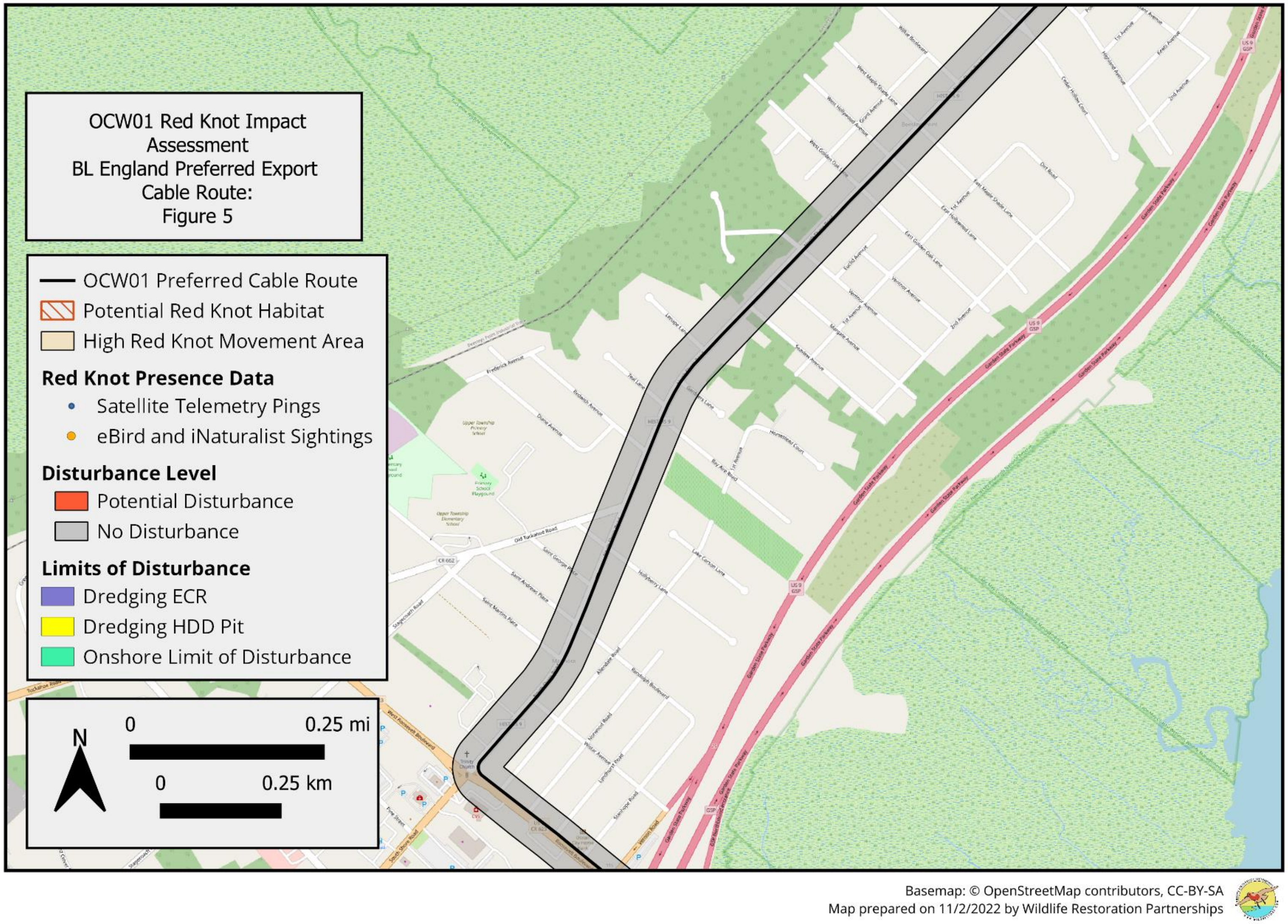


Figure 5. BL England cable route showing export cable along roadway.

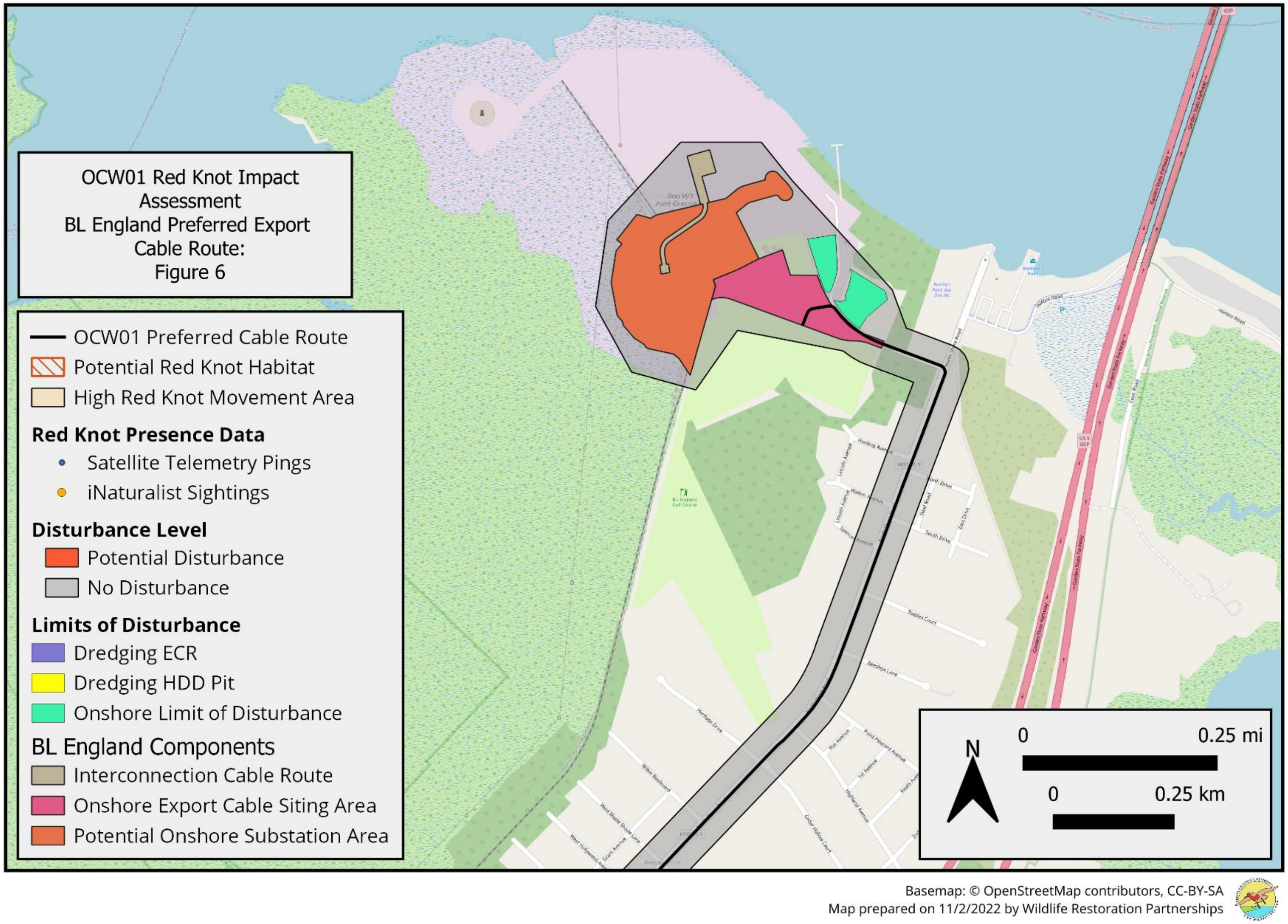


Figure 6. BL England cable route showing onshore export siting area and potential onshore substation area.

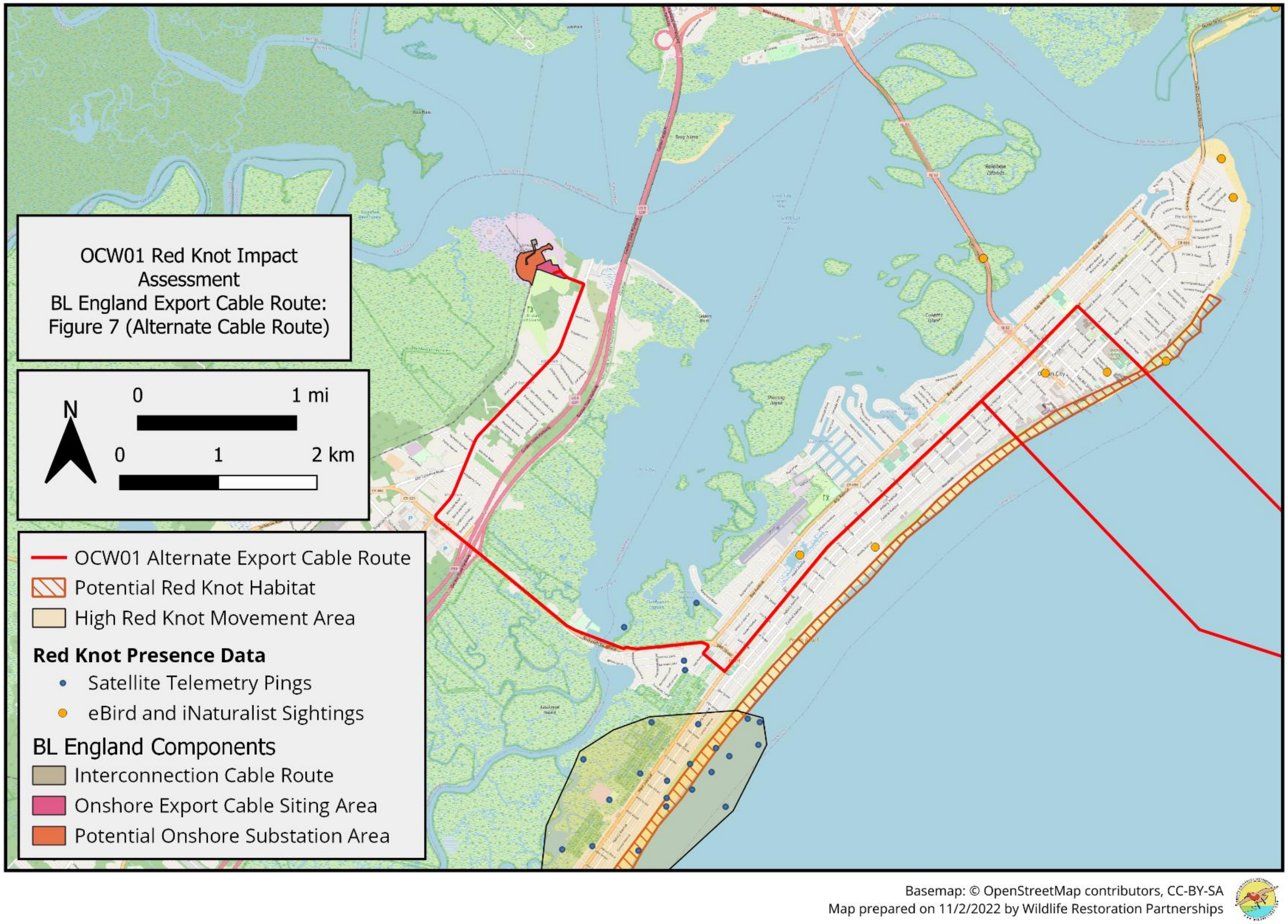


Figure 7. BL England cable route showing overview map of proposed alternative route for project.

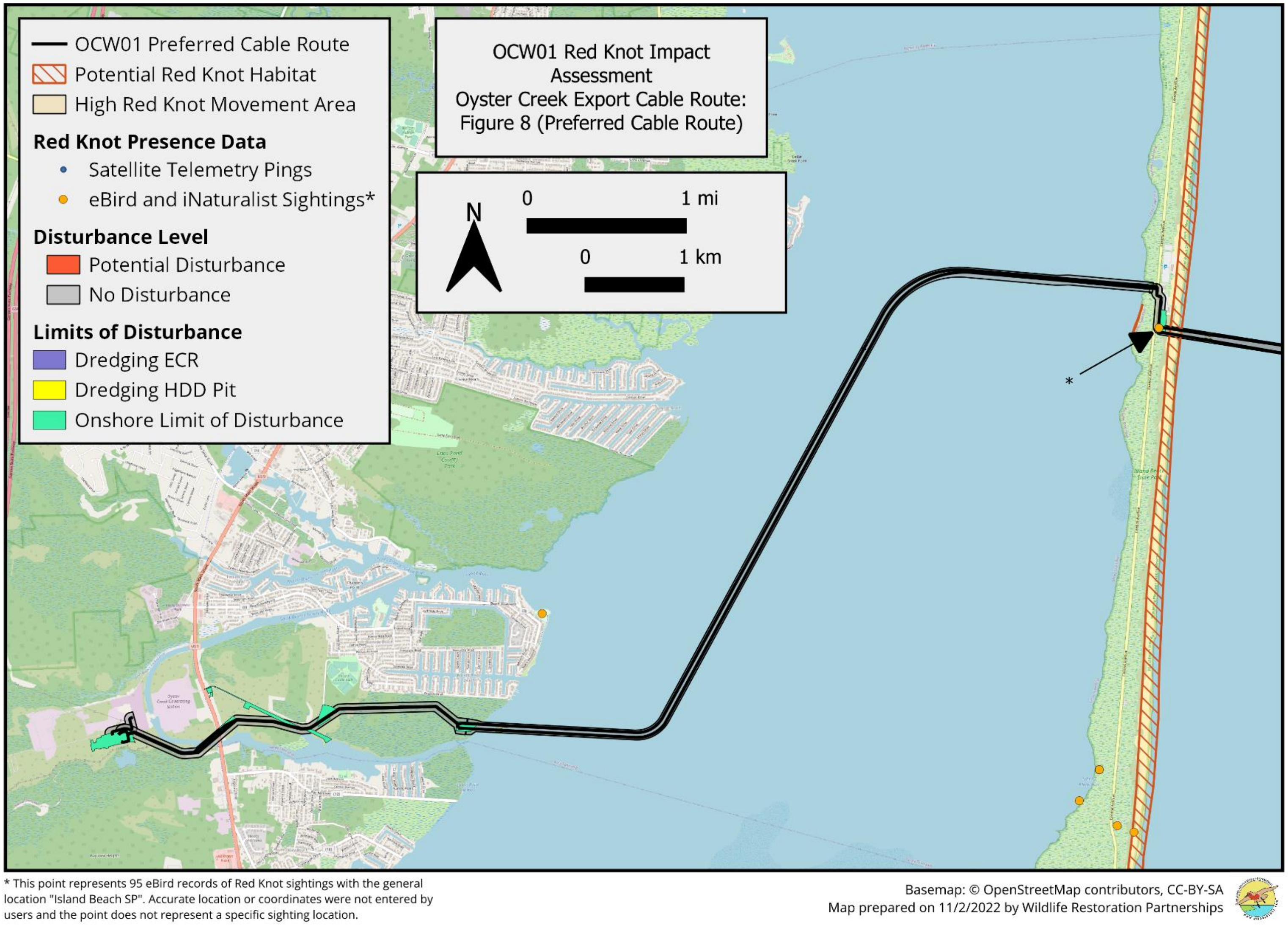
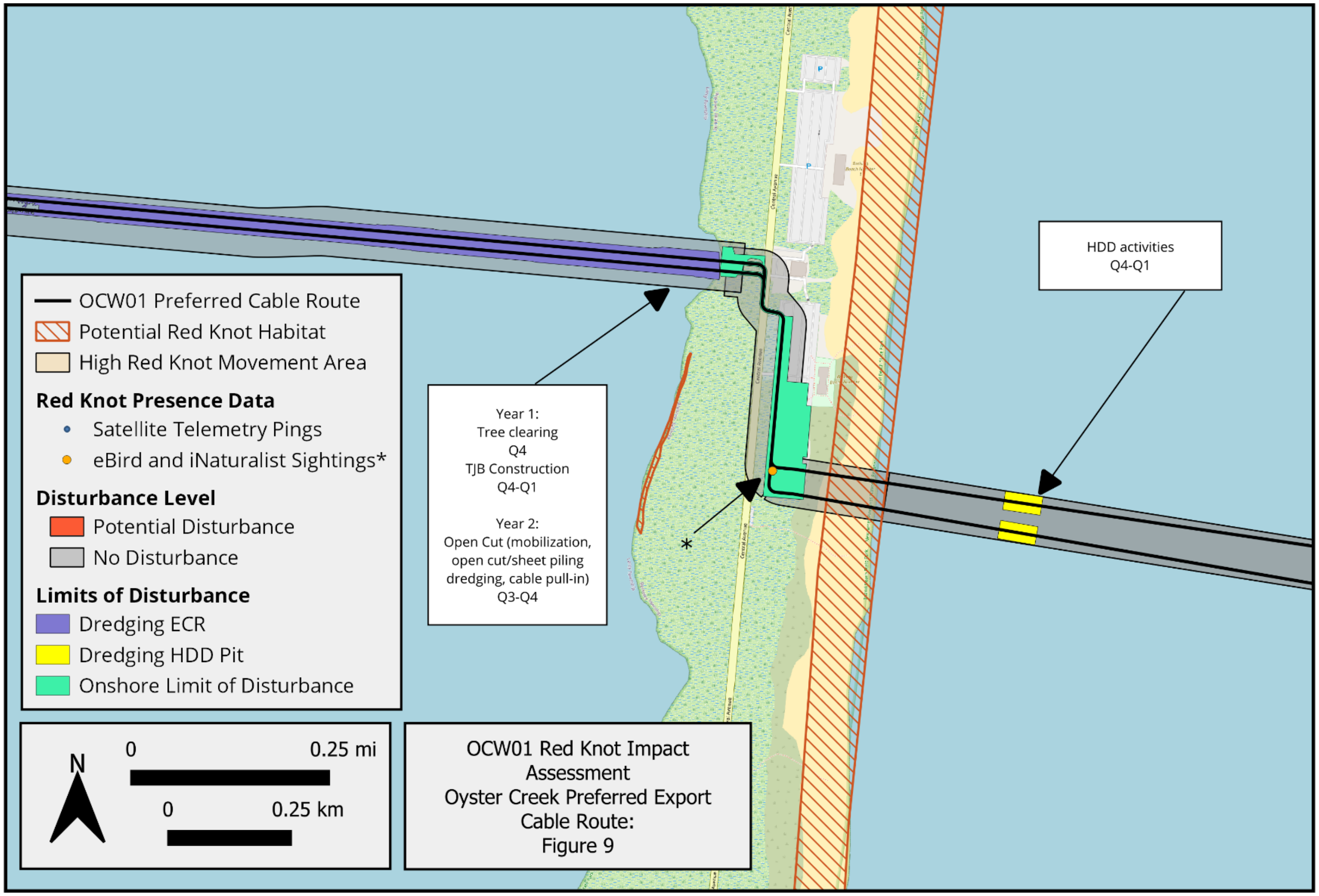


Figure 8. Oyster Creek export route showing full proposed cable route for project.



* This point represents 95 eBird records of Red Knot sightings with the general location "Island Beach SP". Accurate location or coordinates were not entered by users and the point does not represent a specific sighting location.

Basemap: © OpenStreetMap contributors, CC-BY-SA
Map prepared on 11/2/2022 by Wildlife Restoration Partnerships

Figure 9. Oyster Creek export route showing HDD dredging pit through first site of HDD onshore activities.

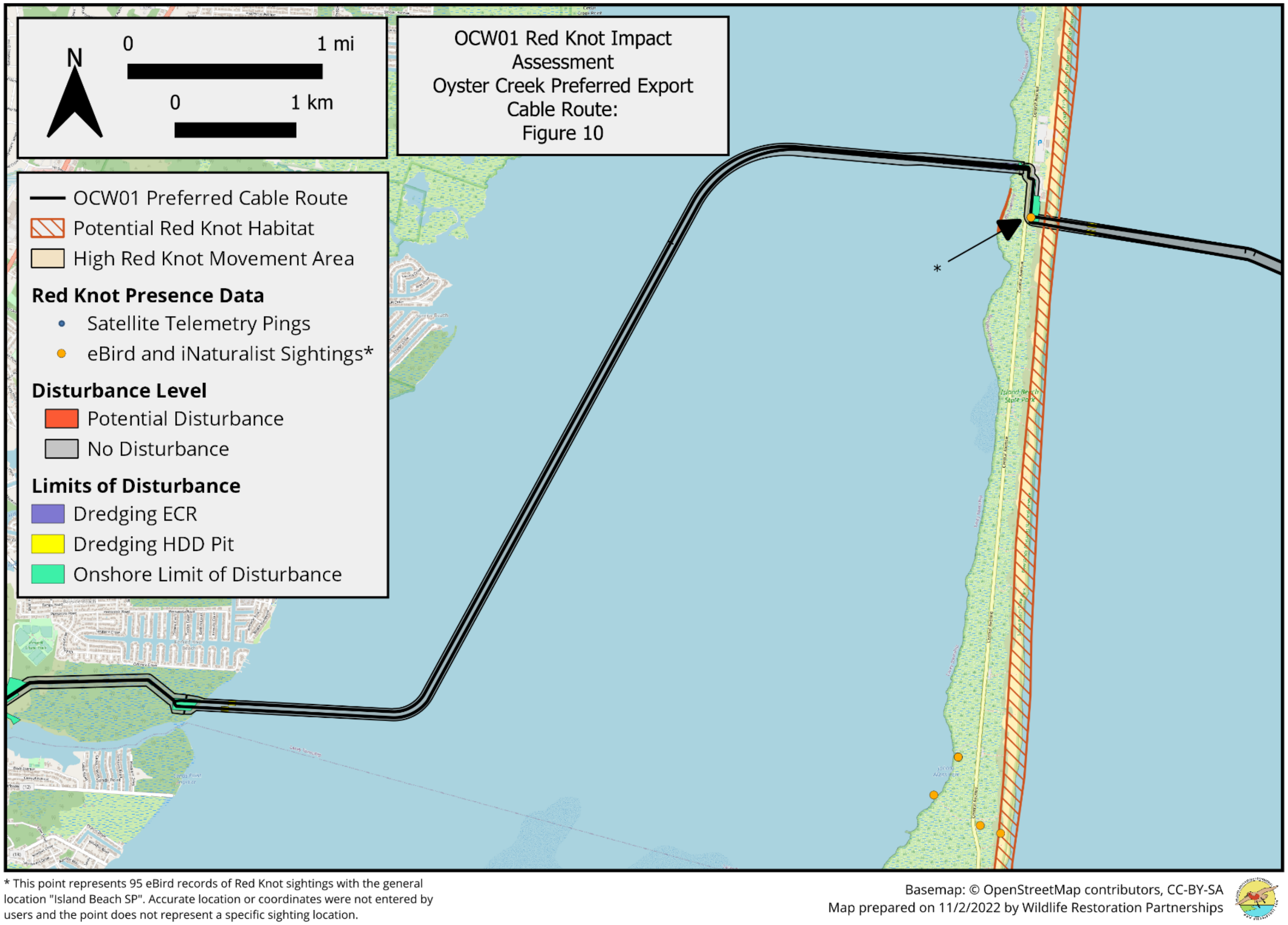


Figure 10. Oyster Creek export route showing HDD dredging pit through first site of HDD onshore activities and export cable route from Island Beach State Park to second onshore HDD activity site.

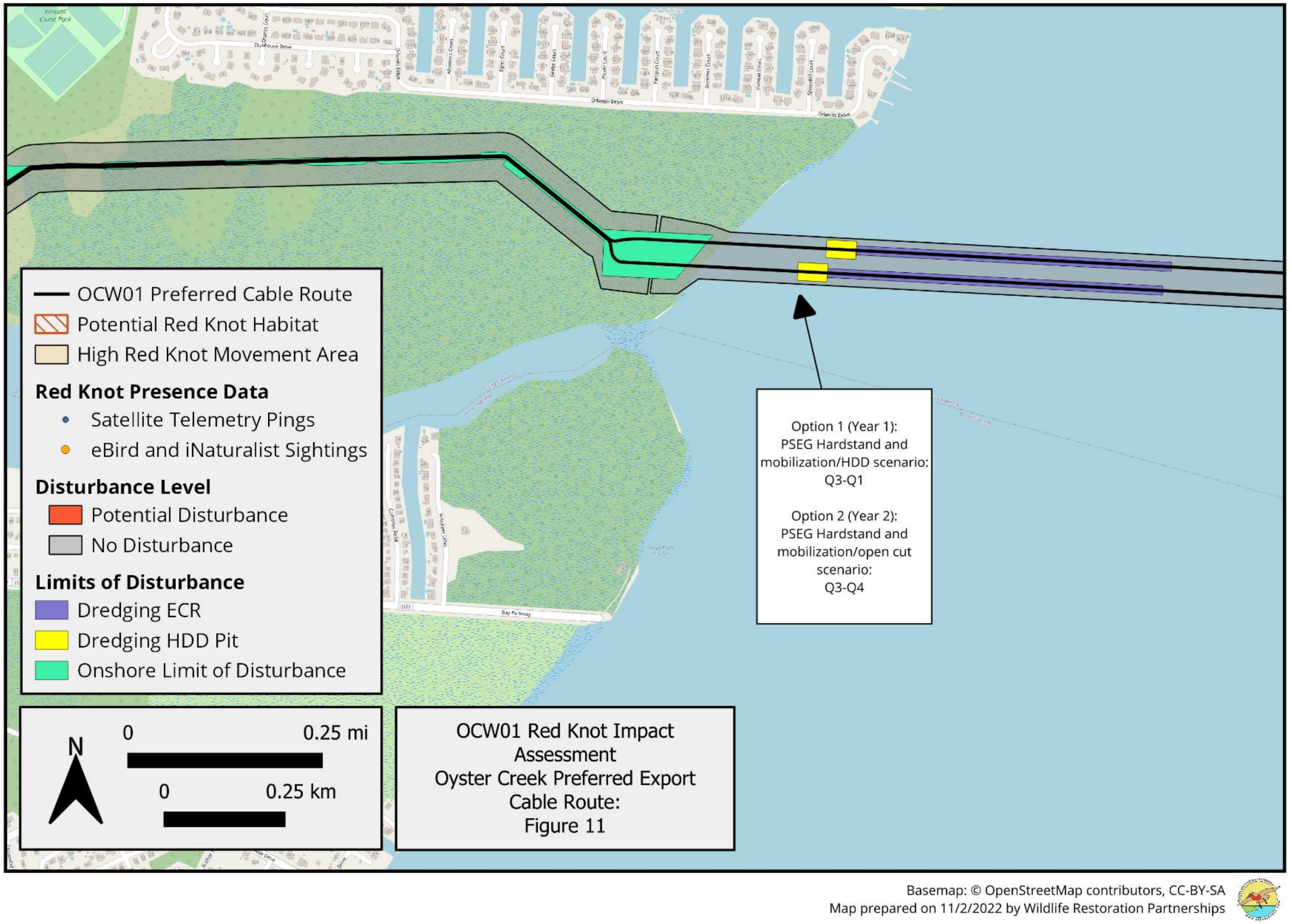
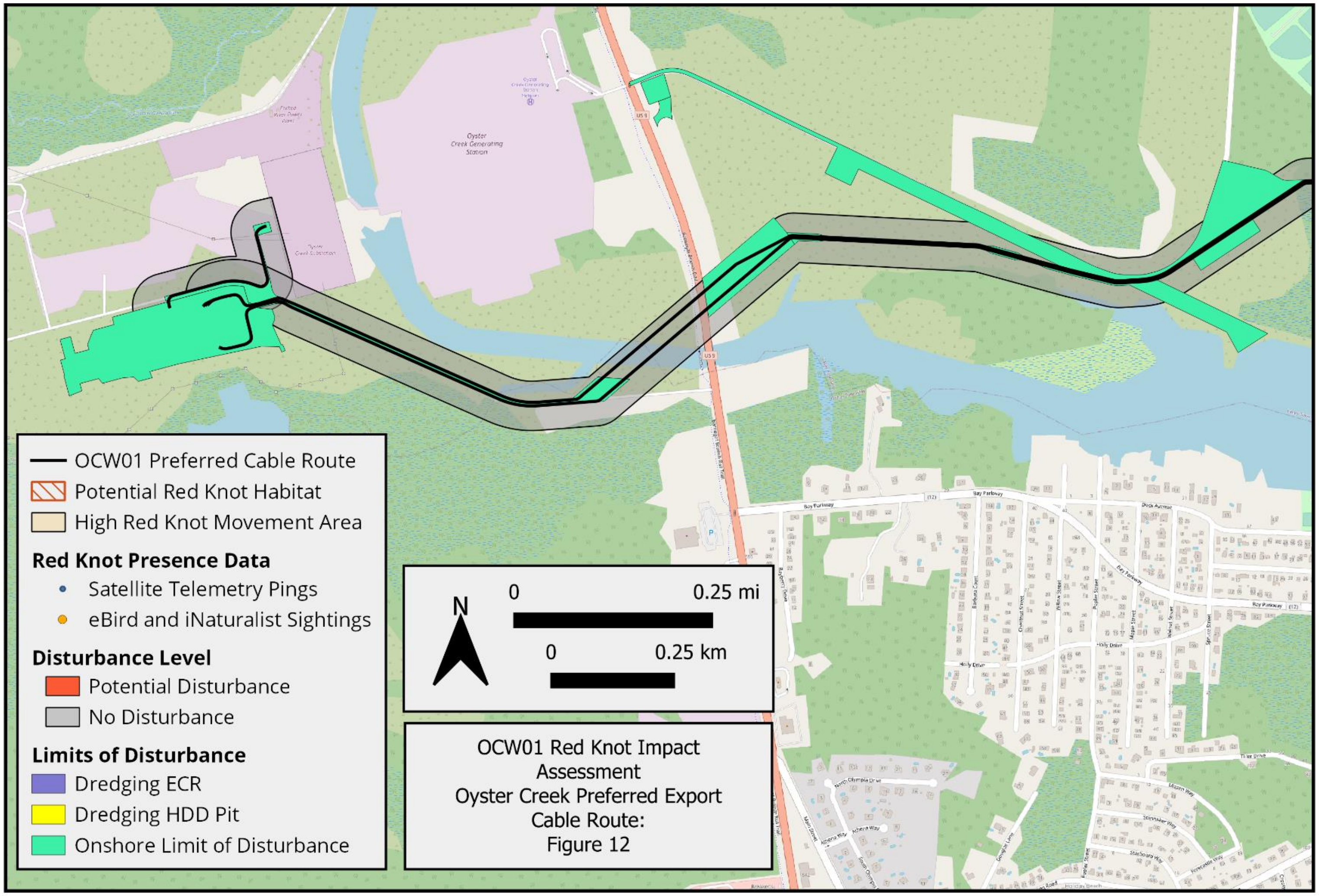


Figure 11. Oyster Creek export route showing area of second HDD onshore activities.



Basemap: © OpenStreetMap contributors, CC-BY-SA
Map prepared on 11/2/2022 by Wildlife Restoration Partnerships

Figure 12. Oyster Creek export route showing export cable route along Oyster Creek.

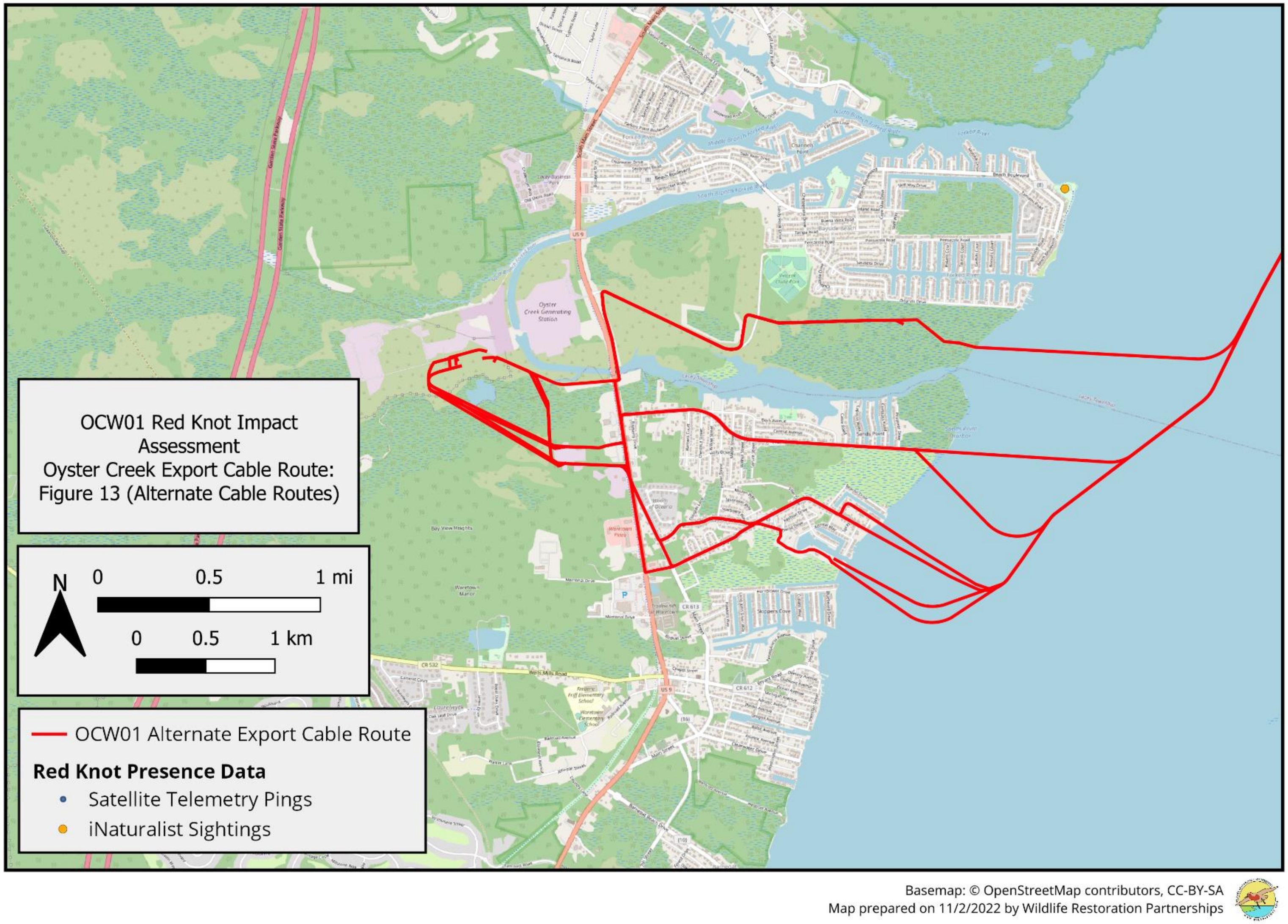


Figure 13. Oyster Creek export route showing full proposed alternative cable route for project.

5. Discussion

Construction activities in potential Red Knot habitat and high Red Knot movement areas are constrained by regulatory time of year restrictions, and such construction in this area is expected to occur in fall and winter months, minimizing impacts to Red Knots.

5.1. BL England Export Route

Satellite tag points show Red Knot use of the Ocean City Beach near the BL England Project site during proposed construction (Q3-Q2), though disturbance to Red Knots will be minimal. All cables will be routed under the beach, generating no impact to the Red Knot habitat along the shoreline. Potential disturbance at this site will be limited to noise disturbance from HDD activities (as labeled on the map). This disturbance will be insignificant as it will be along the road behind beach and dune habitat and during late fall/winter months when Red Knot numbers in New Jersey are lower. Moreover, the site is part of Ocean City's high use recreational beach. While recreational use of this beach subsides in the fall, significant and regular use during peak months (July – mid September) diminishes habitat quality for Red Knots significantly, making this a lower priority site for them on their southbound migration (Burger et al. 2012). Additionally, while there is one Red Knot sighting in marsh habitat next to the onshore facilities under Crook Horn Creek (Figure 4), this marsh habitat will not be affected by construction activities. Therefore, construction in this section of the site will have little/no impacts on Red Knots. All other sites along this cable route are unlikely to have any impacts on Red Knots and are not Red Knot habitat (Figures 5 & 6).

Satellite tag point data as well as eBird and iNaturalist sightings data can be seen on the maps (Figure *3* through Figure *6*). Disturbance will be minimal and limited to noise only from HDD activities. While this is a high Red Knot use area, we believe any impacts will be minimal due to the nature of the activities. All cables will be routed under any potential Red Knot habitat, HDD activities are restricted to times of low Red Knot use of the Atlantic Coast, and noise from machinery is not within immediate red knot habitat.

5.2. Oyster Creek Export Route

Based on proposed construction activities and schedule (fall-winter) there will not be an impact on red knot habitat along the Oyster Creek route. Any potential disturbance would be limited to noise disturbance which would be minimal based on location for onshore activities and very low Red Knot sightings in the area. Moreover, Island Beach State Park is an important recreational beach during the summer and early fall tourist seasons. Additionally, the NJ Division of Parks and Forestry allows motor vehicle traffic on the Island beach site from September 15 until the spring, making it unusable by knots for most of the early fall through winter seasons.

At the Oyster Creek site general iNaturalist data can be seen at the site (Figure *4*). Any potential disturbance again would be limited to noise disturbance; however, there are very few Red Knot sightings in this area. This area is not a high use red knot area. Any potential impact will be minimal as crossing this area would occur in the winter outside of the seasonal habitat use.

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Tsipoura, N. & J. Burger. 1999. Shorebird diet during spring migration stop-over on Delaware Bay. Condor 101: 635–644.

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7. Appendix 1 Site Photos:

7.1. Site 1 BL England

Site photo 1: Ocean City Beach

Site photo 2&3: HDD onshore activities adjacent to overpass at Crook Horn Creek


NO
BOAT OR
TRAILER
PARKING
NO OVERNIGHT
PARKING
NO PRIVATE BOAT

7.2. Site 2 Oyster Creek

Site Photo 1&2: Island Beach State Park Beach

Site photo 3: HDD onshore activities in parking lot behind beach and dune at Island Beach State Park

Site photo 4: Second onshore HDD activity location for cable export route.

Appendix D. Collision Risk Model Inputs

Appendix D-1 Collision Risk Model Inputs for Piping Plover

COLLISION RISK ASSESSMENT
Sheet 1 - Input data

(light green)	used in overall collision risk sheet
(yellow-green)	used in migrant collision risk sheet
(orange)	used in single transit collision risk sheet or extended model
(lavender)	used in available hours sheet
(pale yellow)	used in large array correction sheet
(pink)	not used in calculation but stated for reference

Bird data	Units	Value	Data sources	Source
Species name		**Piping plover**		
Bird length	m	0.18		Gilbert et al 2022, Table A12
Wingspan	m	0.38		Gilbert et al 2022, Table A12
Flight speed	m/sec	9.3		Gilbert et al 2022, Table A12
Nocturnal activity factor (1-5)		4		Loring et al 2019, Fig 66; value = 4
Flight type, flapping or gliding		flapping		

Bird survey data	Units	Value	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daytime bird density	birds/sq km													
Proportion at rotor height	%													
Proportion of flights upwind	%	8.6%												

Birds on migration data	Units	Value	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Source
Migration passages	birds				148	148	148			704					Adult & fledgings derived from USFWS 2022, P.Loring et al 2019
Width of migration corridor	km	97													Length of NJ WEA
Proportion at rotor height	%	15%													Loring et al 2019, Table 26
Proportion of flights upwind	%	8.6%													Loring et al 2019, Fig 72

Windfarm data	Units	Value	Data sources	Source
Name of windfarm site		**Ocean Wind**		
Latitude	degrees	39.00		
Number of turbines		98		COP, Table 4.4-1
Width of windfarm	km	20		Measured from COP Figure 4.1-2
Tidal offset	m	1		

Turbine data	Units	Value	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Source
Turbine model		**GE Haliade X 12 MW**													https://oceanwind.com/about-the-project
No of blades		3													https://www.ge.com/renewableenergy/wind-energy/offshore-wind/haliade-x-offshore-turbine
Rotation speed	rpm	6.7													average rpm for site, K. Perry email 10/5/22
Rotor radius	m	120													COP, Table 4.4-1
Hub height	m	156													COP, Table 4.4-1
Monthly proportion of time operational	%		91%	92%	91%	92%	91%	90%	87%	86%	87%	90%	90%	91%	MonWindAvail - AverDownTime, calc from K. Perry email 10/5/22
Max blade width	m	5.770													Gaertner et al 2020
Pitch	degrees	3.4													K. Perry email 10/5/22

Avoidance rates used in presenting results			Data sources (if applicable)
	95.01%	X	Cook 2021, Table A2 "All Gulls and Terns" Extended Band (2012) model
	98.00%		
	99.00%		
	99.50%		

COLLISION RISK ASSESSMENT (BIRDS ON MIGRATION)

Sheet 2 - Overall collision risk

All data input on Sheet 1:
no data entry needed on this sheet!
other than to choose option for final tables

(green)	from Sheet 1 - input data
(purple)	from Sheet 6 - available hours
(orange)	from Sheet 3 - single transit collision risk
(yellow)	from survey data
(light blue)	calculated field

Bird details:

Species		Piping plover
Flight speed	m/sec	9.3
Flight type		flapping

Windfarm data:

			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	year average
Number of turbines		98													
Rotor radius	m	120													
Minimum height of rotor	m	156													
Total rotor frontal area	sq m	4433416													
Proportion of time operational	%		91%	92%	91%	92%	91%	90%	87%	86%	87%	90%	90%	91%	89.8%
Stage A - flight activity															**per annum**
Migration passages			0	0	148	148	148	0	0	704	0	0	0	0	**1148**
Migrant flux density	birds/ km		0	0	1.5258	1.5258	1.525773	0	0	7.257732	0	0	0	0	
Proportion at rotor height	%	15%													
Flux factor			0	0	28	28	28	0	0	134	0	0	0	0	
Option 1 -Basic model - Stages B, C and D															
Potential bird transits through rotors			0	0	4	4	4	0	0	20	0	0	0	0	**33**
Collision risk for single rotor transit	(from sheet 3)	3.1%													
Collisions for entire windfarm, allowing for non-op time, assuming no avoidance	birds per month or year		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**
Option 2-Basic model using proportion from flight distribution			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**2**
Option 3-Extended model using flight height distribution															
Proportion at rotor height	(from sheet 4)	34.0%													
Potential bird transits through rotors	Flux integral	0.3738	0	0	11	11	11	0	0	50	0	0	0	0	**82**
Collisions assuming no avoidance	Collision integral	0.01462	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**3**
Average collision risk for single rotor transit		3.9%													
Stage E - applying avoidance rates															
Using which of above options?	**Option 3**	0.00%	0	0	0	0	0	0	0	2	0	0	0	0	**3**
Collisions assuming avoidance rate	birds per month or year	95.01%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		98.00%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		99.00%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		99.50%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Collisions after applying large array correction		95.01%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		98.00%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		99.00%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		99.50%	0	0	0	0	0	0	0	0	0	0	0	0	**0**

Summary of simulation results from SCRAM: a stochastic collision risk assessment for movement data

12 October 2022

SCRAM was developed by Biodiversity Research Institute, the University of Rhode Island, and the U.S. Fish and Wildlife Service with funding from the Bureau of Ocean Energy Management.

SCRAM run details

```
## SCRAM - the Stochastic Collision Risk Assessment for Movement version
## Version: 0.91.1 - Lyrical Brachycarpus
## Iterations: 1000
## Model option: Option 3: slower but more accurate assessment
## Project: Ocean Wind 1
## Modeler: David Bigger
## The model run was started at: Wed Oct 12 15:03:28 2022 EDT
## The model run was completed at: Wed Oct 12 15:47:47 2022 EDT
## Run 1: the probability of exceeding specified threshold (1) is < 0.001.
## Run 2: the probability of exceeding specified threshold (1) is < 0.001.
```

Model inputs used for this analysis

Table 1: Species input parameters (mean and 95 perc. range).

Species	Turbine model	Avoidance	Wing span	Body length	Speed
Piping Plover	**Haliade-X 22m air gap**	0.93 (0.92, 0.94)	0.38 (0.38, 0.38)	0.18 (0.17, 0.18)	11.96 (2.84, 21.25)
Piping Plover	**Haliade-X 36m gap**	0.93 (0.92, 0.94)	0.38 (0.38, 0.38)	0.18 (0.17, 0.18)	11.96 (2.84, 21.25)

Table 2: Species monthly (Jan-Jun) population estimates ± SD and assumptions/limitations as specified by the USFWS using the most recent data.

Species	Jan	Feb	Mar	Apr	May	Jun
Piping Plover	0 ± 0	0 ± 0	4578 ± 0	4578 ± 0	4578 ± 0	4578 ± 0

Table 3: Species monthly (Jul-Dec) population estimates ± SD and assumptions/limitations as specified by the USFWS using the most recent data.

Species	Jul	Aug	Sep	Oct	Nov	Dec
Piping Plover	4578 ± 0	7423 ± 0	7423 ± 0	7423 ± 0	0 ± 0	0 ± 0

Population data assumptions/limitations:
1) Entire Atlantic coast population could be present in area during months listed.
2) Occurrence through October to include birds stopping over in mid-Atlantic (e.g. North Carolina). Number of birds still present in Atlantic likely lower.
3) Estimate of HY fledges, uses the 20-year (2002 - 2021) average productivity (unweighted).

Table 4: Wind farm input parameters (mean and 95 perc. range).

Species	Turbine model	Num. turbines	Rotor radius	Hub height (m)	Blade width (m)	Wind speed (mps)
Piping Plover	**Haliade-X 22m air gap**	98 (98, 98)	107 (107, 107)	129 (129, 129)	5.77 (5.77, 5.77)	7.9 (7, 8.72)
Piping Plover	**Haliade-X 36m gap**	98 (98, 98)	107 (107, 107)	143 (143, 143)	5.77 (5.77, 5.77)	7.91 (7.09, 8.74)

Table 5: Wind farm input parameters (mean and 95 perc. range).

Species	Turbine model	Prop. upwind	Rotor speed (rpm)	Pitch (radians)	Farm width (km)	Lat.	Long.
Piping Plover	Haliade-X 22m air gap	1 (1, 1)	3.88 (3.44, 4.28)	0.06 (0.02, 0.1)	20 (20, 20)	39.22	-74.32
Piping Plover	Haliade-X 36m gap	1 (1, 1)	3.88 (3.48, 4.29)	0.06 (0.02, 0.11)	20 (20, 20)	39.22	-74.32

Table 6: Monthly wind farm operational data (mean and 95 perc. range) is given for each wind farm specification.

Species	Turbine model	Jan Op.	Feb Op.	Mar Op.	Apr Op.	May Op.	Jun Op.
Piping Plover	Haliade-X 36m gap	91.4 (87.9, 94.7)	92.4 (88.9, 95.9)	91.5 (87.6, 95.3)	91.8 (89.7, 93.9)	90.8 (87.2, 94.4)	89.6 (85.8, 93.6)
Piping Plover	Haliade-X 22m air gap	91.4 (88.3, 94.7)	92.6 (88.8, 96.1)	91.5 (87.7, 95.4)	91.8 (89.6, 93.9)	90.7 (87, 94.3)	89.5 (85.5, 93.6)

Table 7: Monthly wind farm operational data (mean and 95 perc. range) is given for each wind farm specification.

Species	Turbine model	Jul Op.	Aug Op.	Sep Op.	Oct Op.	Nov Op.	Dec Op.
Piping Plover	Haliade-X 36m gap	87.6 (83.2, 91.8)	86 (79.5, 92.5)	87.8 (82.3, 93.2)	90 (85.9, 94.5)	90.3 (85.7, 94.9)	91.3 (88.1, 94.5)
Piping Plover	Haliade-X 22m air gap	87.6 (83, 92)	86 (79.1, 92.4)	87.8 (82.4, 93.1)	90 (85.8, 94.3)	90.3 (85.9, 94.8)	91.4 (88.1, 94.5)

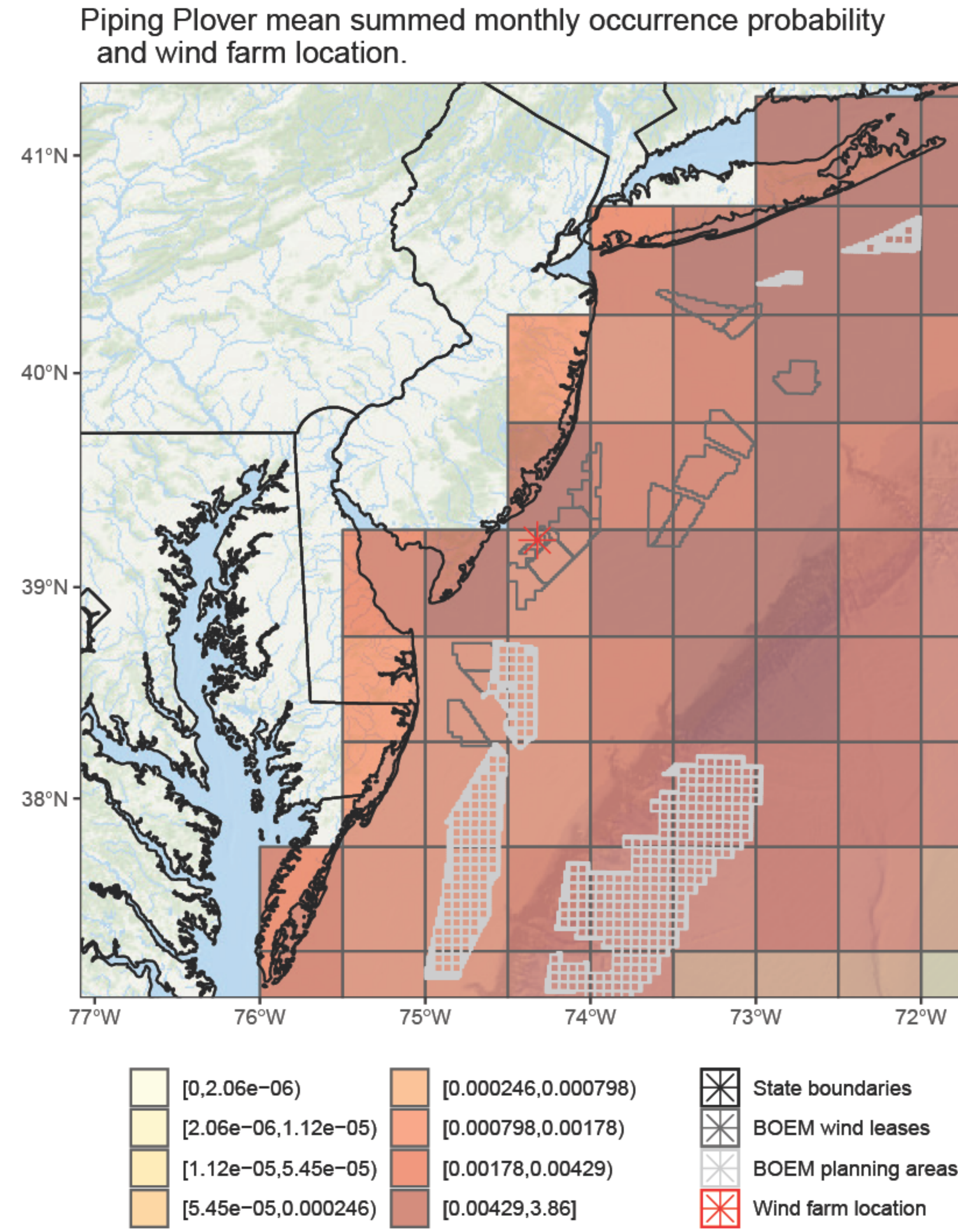

Figure 1: A map of the species occurrence probabities and wind farm location.

Results for the SCRAM simulation

Table 8: The predicted mean and 95 perc. prediction intervals of the number of collisions per month and the total summed monthly number of collisions and 95 perc. prediction interval. Results are not shown for months that do not have movement data.

Species	Turbine model	month	Mean number of collisions	Lower pred. interval	Upper pred. interval
Piping Plover	**Haliade-X 22m air gap**	Jan			
Piping Plover	**Haliade-X 22m air gap**	Feb			
Piping Plover	**Haliade-X 22m air gap**	Mar			
Piping Plover	**Haliade-X 22m air gap**	Apr			
Piping Plover	**Haliade-X 22m air gap**	May	0.001	0	0.001
Piping Plover	**Haliade-X 22m air gap**	Jun	0.001	0	0.001
Piping Plover	**Haliade-X 22m air gap**	Jul	0.001	0	0.001
Piping Plover	**Haliade-X 22m air gap**	Aug	0.001	0	0.001
Piping Plover	**Haliade-X 22m air gap**	Sep	0.001	0	0.001
Piping Plover	**Haliade-X 22m air gap**	Oct			
Piping Plover	**Haliade-X 22m air gap**	Nov			
Piping Plover	**Haliade-X 22m air gap**	Dec			
Piping Plover	**Haliade-X 22m air gap**	annual	0.004	0	0.005
Piping Plover	**Haliade-X 36m gap**	Jan			
Piping Plover	**Haliade-X 36m gap**	Feb			
Piping Plover	**Haliade-X 36m gap**	Mar			
Piping Plover	**Haliade-X 36m gap**	Apr			
Piping Plover	**Haliade-X 36m gap**	May	0.001	0	0.001
Piping Plover	**Haliade-X 36m gap**	Jun	0.001	0	0.001
Piping Plover	**Haliade-X 36m gap**	Jul	0.001	0	0.001
Piping Plover	**Haliade-X 36m gap**	Aug	0.001	0	0.001
Piping Plover	**Haliade-X 36m gap**	Sep	0.001	0	0.001
Piping Plover	**Haliade-X 36m gap**	Oct			
Piping Plover	**Haliade-X 36m gap**	Nov			
Piping Plover	**Haliade-X**	Dec			

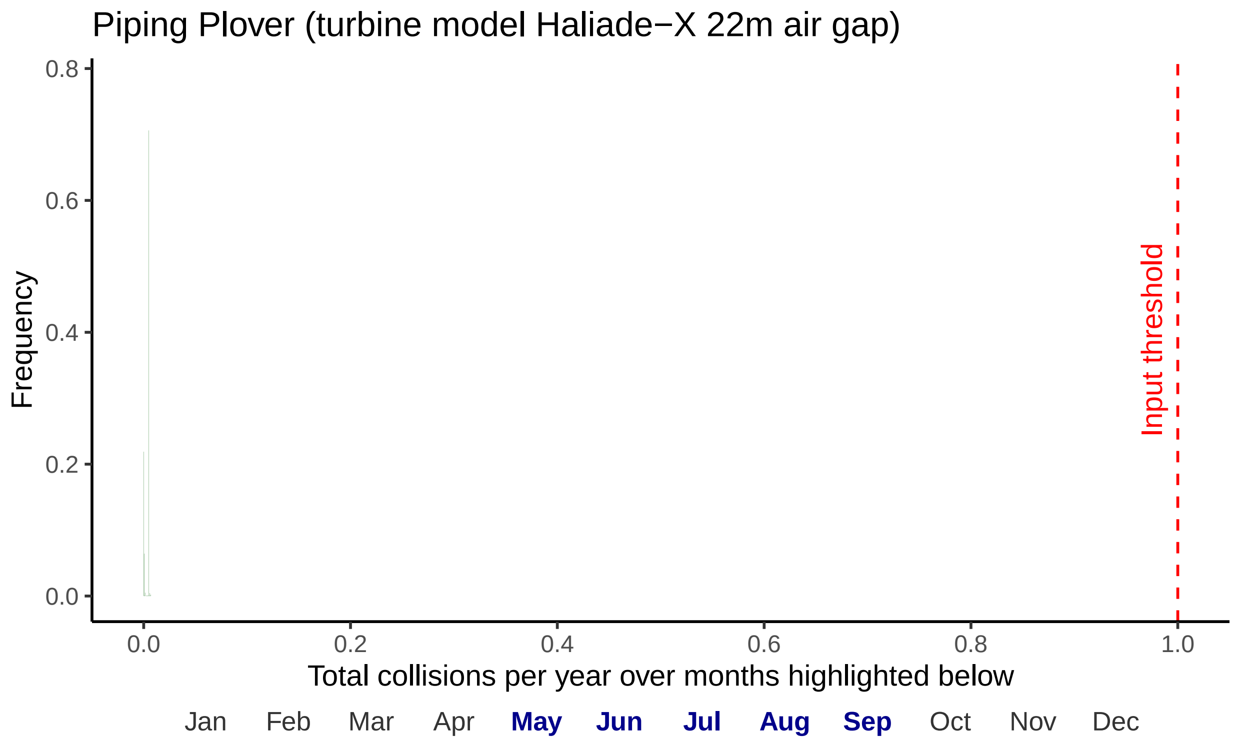

Figure 2: A frequency histogram of the total number of collisions per year. The heights of the bars show the relative frequency of each value. Months for which movement data were provided or available are shown in bold; only bold months are shown in histogram of annual collisions.

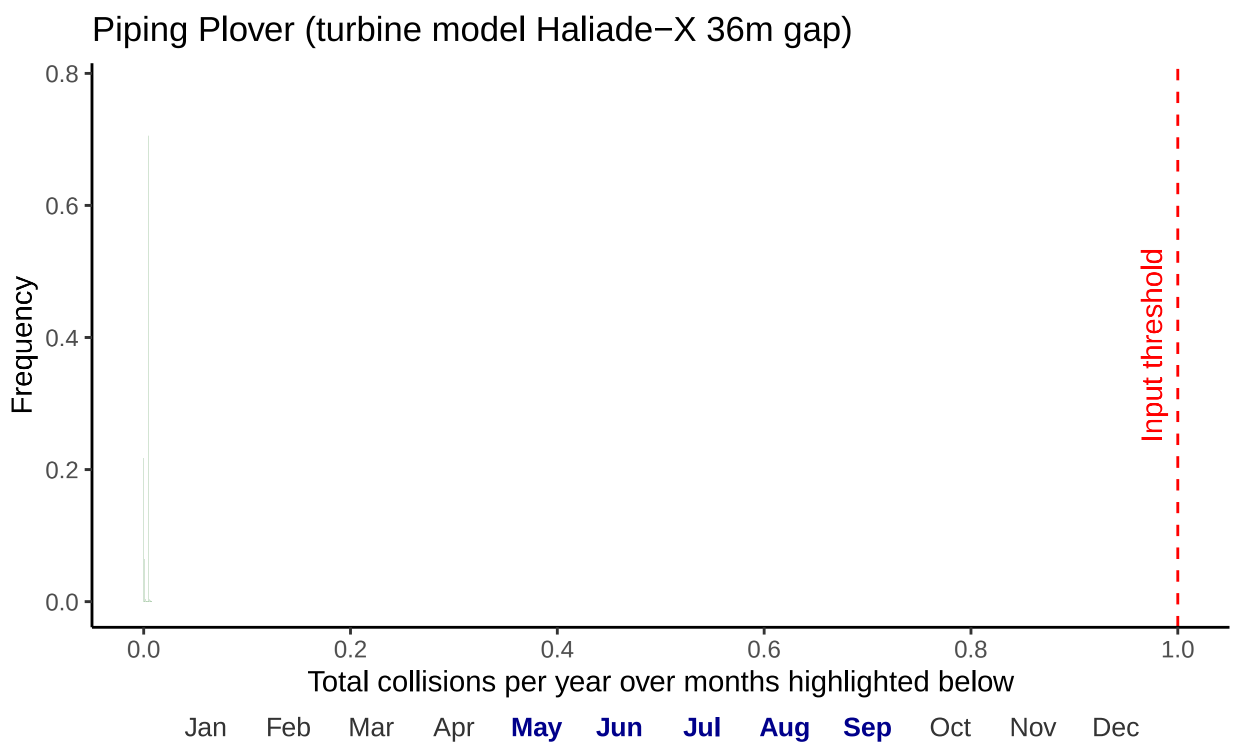

Figure 3: A frequency histogram of the total number of collisions per year. The heights of the bars show the relative frequency of each value. Months for which movement data were provided or available are shown in bold; only bold months are shown in histogram of annual collisions.

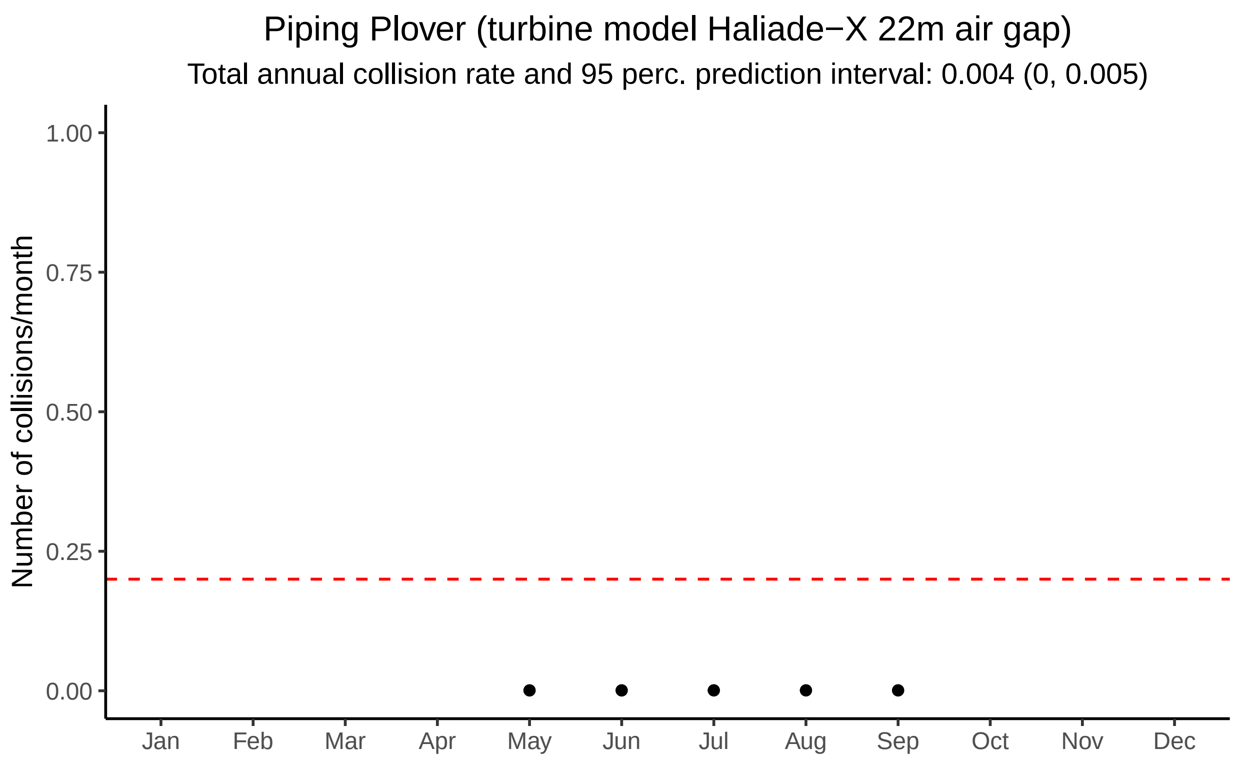

Figure 4: The predicted mean and 95 perc. prediction intervals of the number of collisions per month. Results are not shown for months that do not have movement data. Total annual collision rate and 95 perc. prediction interval are given at top. The threshold is shown divided by the number of months that movement data were available.

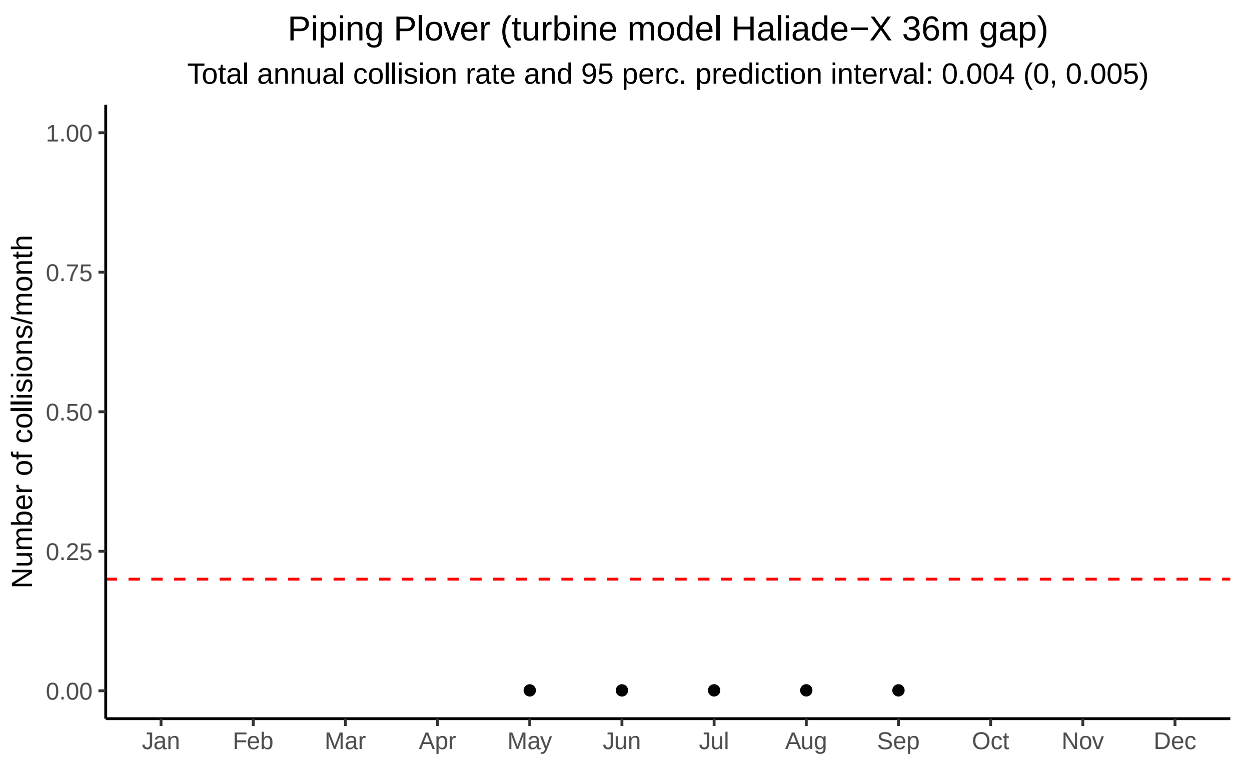

Figure 5: The predicted mean and 95 perc. prediction intervals of the number of collisions per month. Results are not shown for months that do not have movement data. Total annual collision rate and 95 perc. prediction interval are given at top. The threshold is shown divided by the number of months that movement data were available.

Appendix D-2 Collision Risk Model Inputs for Red Knot

COLLISION RISK ASSESSMENT
Sheet 1 - Input data

Legend	
used in overall collision risk sheet	used in available hours sheet
used in migrant collision risk sheet	used in large array correction sheet
used in single transit collision risk sheet or extended model	not used in calculation but stated for reference

Bird data	**Units**	**Value**	**Data sources**	**Source**
Species name		**RedKnot**		
Bird length	m	0.24		Gilbert et al 2022, Table A12
Wingspan	m	0.50		Gilbert et al 2022, Table A12
Flight speed	m/sec	20.1		Gilbert et al 2022, Table A12
Nocturnal activity factor (1-5)		5		Table A-8, Robinson Willmott et al., 2013; Loring et al 2018
Flight type, flapping or gliding		flapping		

Data sources

Bird survey data			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daytime bird density	birds/sq km													
Proportion at rotor height	%													
Proportion of flights upwind	%	34.6%												

Data sources

Birds on migration data			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Source
Migration passages	birds						57		13	13	13				see BA section 5.2.1.2
Width of migration corridor	km	20													assume all pass through turbine project area
Proportion at rotor height	%	0%													Feigin et al., 2022, Table A
Proportion of flights upwind	%	34.6%													Loring et al 2018, Fig. 14

Windfarm data	**Units**	**Value**	**Data sources**	**Source**
Name of windfarm site		**Ocean Wind**		
Latitude	degrees	39.00		
Number of turbines		98		COP, Table 4.4-1
Width of windfarm	km	20		Measured from COP Figure 4.1-2
Tidal offset	m	1		

Turbine data	**Units**	**Value**	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Source
Turbine model		**GE Haliade X 12 MW**													https://oceanwind.com/about-the-project
No of blades		3													https://www.ge.com/renewableenergy/wind-energy/offshore-wind/haliade-x-offshore-turbine
Rotation speed	rpm	6.7													average rpm for site, K. Perry email 10/5/22
Rotor radius	m	120													COP, Table 4.4-1
Hub height	m	156													COP, Table 4.4-1
Monthly proportion of time operational	%		94%	94%	92%	91%	88%	89%	86%	85%	87%	91%	93%	94%	MonWindAvail - AverDownTime, calc from K. Perry email 10/5/22
Max blade width	m	5.770													Gaertner et al 2020
Pitch	degrees	3.4													K. Perry email 10/5/22

Avoidance rates used in presenting results			**Data sources (if applicable)**
	95.01%	X	Cook 2021, Table A2 “All Gulls and Terns” Extended Band (2012) model
	98.00%		
	99.00%		
	99.50%		

COLLISION RISK ASSESSMENT (BIRDS ON MIGRATION)

Sheet 2 - Overall collision risk

All data input on Sheet 1:
no data entry needed on this sheet!
other than to choose option for final tables

(light green)	from Sheet 1 - input data
(lavender)	from Sheet 6 - available hours
(orange)	from Sheet 3 - single transit collision risk
(yellow)	from survey data
(light cyan)	calculated field

Bird details:

Species		RedKnot
Flight speed	m/sec	20.1
Flight type		flapping

Windfarm data:

Number of turbines		98
Rotor radius	m	120
Minimum height of rotor	m	156
Total rotor frontal area	sq m	4433416

			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**year average**
Proportion of time operational	%		94%	94%	92%	91%	88%	89%	86%	85%	87%	91%	93%	94%	90.3%
Stage A - flight activity															**per annum**
Migration passages			0	0	0	0	57	0	13	13	13	0	0	0	**96**
Migrant flux density	birds/ km		0	0	0	0	2.85	0	0.65	0.65	0.65	0	0	0	
Proportion at rotor height	%	0%													
Flux factor			0	0	0	0	53	0	12	12	12	0	0	0	
Option 1 -Basic model - Stages B, C and D															
Potential bird transits through rotors			0	0	0	0	0	0	0	0	0	0	0	0	**0**
Collision risk for single rotor transit	(from sheet 3)	3.3%													
Collisions for entire windfarm, allowing for non-op time, assuming no avoidance	birds per month or year		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0
Option 2-Basic model using proportion from flight distribution			**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**
Option 3-Extended model using flight height distribution															
Proportion at rotor height	(from sheet 4)	18.0%													
Potential bird transits through rotors	Flux integral	0.1845	0	0	0	0	10	0	2	2	2	0	0	0	**16**
Collisions assuming no avoidance	Collision integral	0.00836	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
Average collision risk for single rotor transit		4.5%													
Stage E - applying avoidance rates															
Using which of above options?	**Option 3**	0.00%	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Collisions assuming avoidance rate	birds per month or year	95.01%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		98.00%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		99.00%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		99.50%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Collisions after applying large array correction		95.01%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		98.00%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		99.00%	0	0	0	0	0	0	0	0	0	0	0	0	**0**
		99.50%	0	0	0	0	0	0	0	0	0	0	0	0	**0**

Summary of simulation results from SCRAM: a stochastic collision risk assessment for movement data

12 October 2022

SCRAM was developed by Biodiversity Research Institute, the University of Rhode Island, and the U.S. Fish and Wildlife Service with funding from the Bureau of Ocean Energy Management.

SCRAM run details

```
## SCRAM - the Stochastic Collision Risk Assessment for Movement version
## Version: 0.91.1 - Lyrical Brachycarpus
## Iterations: 1000
## Model option: Option 3: slower but more accurate assessment
## Project: Ocean Wind 1
## Modeler: David Bigger
## The model run was started at: Wed Oct 12 16:16:33 2022 EDT
## The model run was completed at: Wed Oct 12 17:00:59 2022 EDT
## Run 1: the probability of exceeding specified threshold (1) is < 0.001.
## Run 2: the probability of exceeding specified threshold (1) is < 0.001.
```

Model inputs used for this analysis

Table 1: Species input parameters (mean and 95 perc. range).

Species	Turbine model	Avoidance	Wing span	Body length	Speed
Red Knot	**HalX 22m**	0.93 (0.92, 0.94)	0.49 (0.45, 0.54)	0.24 (0.23, 0.25)	20.19 (16.45, 23.7)
Red Knot	**HalX 36m**	0.93 (0.92, 0.94)	0.49 (0.45, 0.54)	0.24 (0.23, 0.25)	20.19 (16.45, 23.7)

Table 2: Species monthly (Jan-Jun) population estimates ± SD and assumptions/limitations as specified by the USFWS using the most recent data.

Species	Jan	Feb	Mar	Apr	May	Jun
Red Knot	10400 ± 0	10400 ± 0	10400 ± 0	10400 ± 0	59200 ± 0	59200 ± 0

Table 3: Species monthly (Jul-Dec) population estimates ± SD and assumptions/limitations as specified by the USFWS using the most recent data.

Species	Jul	Aug	Sep	Oct	Nov	Dec
Red Knot	59200 ± 0	59200 ± 0	72520 ± 0	54720 ± 0	41400 ± 0	10400 ± 0

Population data assumptions/limitations:
1) All pass through in spring - #s consistent w/Lyons et al super-population estimate for 2020 in DE Bay: 40,444 (95 perc. credible interval: 33,627–49,966).
2) Winter population estimates represent the total # of adults and sub-adults (in general).
3) Southern and northern wintering birds could be present during July - Sept.
4) Only northern wintering birds could be present during Oct - Nov.
5) Only southeast US and Caribbean birds could be present during Dec.
6) Birds from western Gulf population are excluded from totals in Atlantic region due to lack of information on extent to which they use the Atlantic region.
7) Numbers do not include HY birds in fall.
8) Dec number coming from Lyons et al 2017. Just includes SE US Birds, not Caribbean.
9) Issues with double counting addressed because birds may be present in different areas of Atlantic region for weeks to months.

Table 4: Wind farm input parameters (mean and 95 perc. range).

Species	Turbine model	Num. turbines	Rotor radius	Hub height (m)	Blade width (m)	Wind speed (mps)
Red Knot	**HalX 22m**	98 (98, 98)	107 (107, 107)	129 (129, 129)	5.77 (5.77, 5.77)	7.89 (7.06, 8.73)
Red Knot	**HalX 36m**	98 (98, 98)	107 (107, 107)	143 (143, 143)	5.77 (5.77, 5.77)	7.9 (7.11, 8.72)

Table 5: Wind farm input parameters (mean and 95 perc. range).

Species	Turbine model	Prop. upwind	Rotor speed (rpm)	Pitch (radians)	Farm width (km)	Lat.	Long.
Red Knot	**HalX 22m**	1 (1, 1)	3.87 (3.46, 4.29)	0.06 (0.01, 0.1)	20 (20, 20)	39.22	-74.32
Red Knot	**HalX 36m**	1 (1, 1)	3.88 (3.49, 4.28)	0.06 (0.02, 0.11)	20 (20, 20)	39.22	-74.32

Table 6: Monthly wind farm operational data (mean and 95 perc. range) is given for each wind farm specification.

Species	Turbine model	Jan Op.	Feb Op.	Mar Op.	Apr Op.	May Op.	Jun Op.
Red Knot	**HalX 36m**	91.5 (88.3, 94.6)	92.6 (89, 96.3)	91.6 (87.6, 95.2)	91.8 (89.5, 93.9)	90.7 (87.2, 94.5)	89.6 (85.7, 93.5)
Red Knot	**HalX 22m**	91.4 (88.1, 94.5)	92.6 (89.1, 96.2)	91.5 (87.7, 95.1)	91.7 (89.6, 93.7)	90.8 (87, 94.9)	89.6 (85.4, 93.8)

Table 7: Monthly wind farm operational data (mean and 95 perc. range) is given for each wind farm specification.

Species	Turbine model	Jul Op.	Aug Op.	Sep Op.	Oct Op.	Nov Op.	Dec Op.
Red Knot	**HalX 36m**	87.8 (83.3, 92.1)	86.2 (80.1, 92.4)	87.7 (81.9, 93.2)	89.9 (85.6, 94.1)	90.3 (85.6, 94.9)	91.4 (88, 94.4)
Red Knot	**HalX 22m**	87.7 (83.3, 92.2)	86 (79.8, 91.8)	87.8 (82.4, 93.2)	90 (85.8, 94.2)	90.3 (86, 94.8)	91.4 (88.1, 94.8)

Results for the SCRAM simulation

Table 8: The predicted mean and 95 perc. prediction intervals of the number of collisions per month and the total summed monthly number of collisions and 95 perc. prediction interval. Results are not shown for months that do not have movement data.

Species	Turbine model	month	Mean number of collisions	Lower pred. interval	Upper pred. interval
Red Knot	**HalX 22m**	Jan			
Red Knot	**HalX 22m**	Feb			
Red Knot	**HalX 22m**	Mar			
Red Knot	**HalX 22m**	Apr			
Red Knot	**HalX 22m**	May			
Red Knot	**HalX 22m**	Jun			
Red Knot	**HalX 22m**	Jul			
Red Knot	**HalX 22m**	Aug	0.001	0	0.003
Red Knot	**HalX 22m**	Sep	0.001	0	0.011
Red Knot	**HalX 22m**	Oct	0.001	0	0.001
Red Knot	**HalX 22m**	Nov	0.003	0	0.009
Red Knot	**HalX 22m**	Dec			
Red Knot	**HalX 22m**	annual	0.006	0.003	0.015
Red Knot	**HalX 36m**	Jan			
Red Knot	**HalX 36m**	Feb			
Red Knot	**HalX 36m**	Mar			
Red Knot	**HalX 36m**	Apr			
Red Knot	**HalX 36m**	May			
Red Knot	**HalX 36m**	Jun			
Red Knot	**HalX 36m**	Jul			
Red Knot	**HalX 36m**	Aug	0.001	0	0.004
Red Knot	**HalX 36m**	Sep	0.001	0	0.012
Red Knot	**HalX 36m**	Oct	0.001	0	0.001
Red Knot	**HalX 36m**	Nov	0.003	0	0.01
Red Knot	**HalX 36m**	Dec			
Red Knot	**HalX 36m**	annual	0.006	0.004	0.016

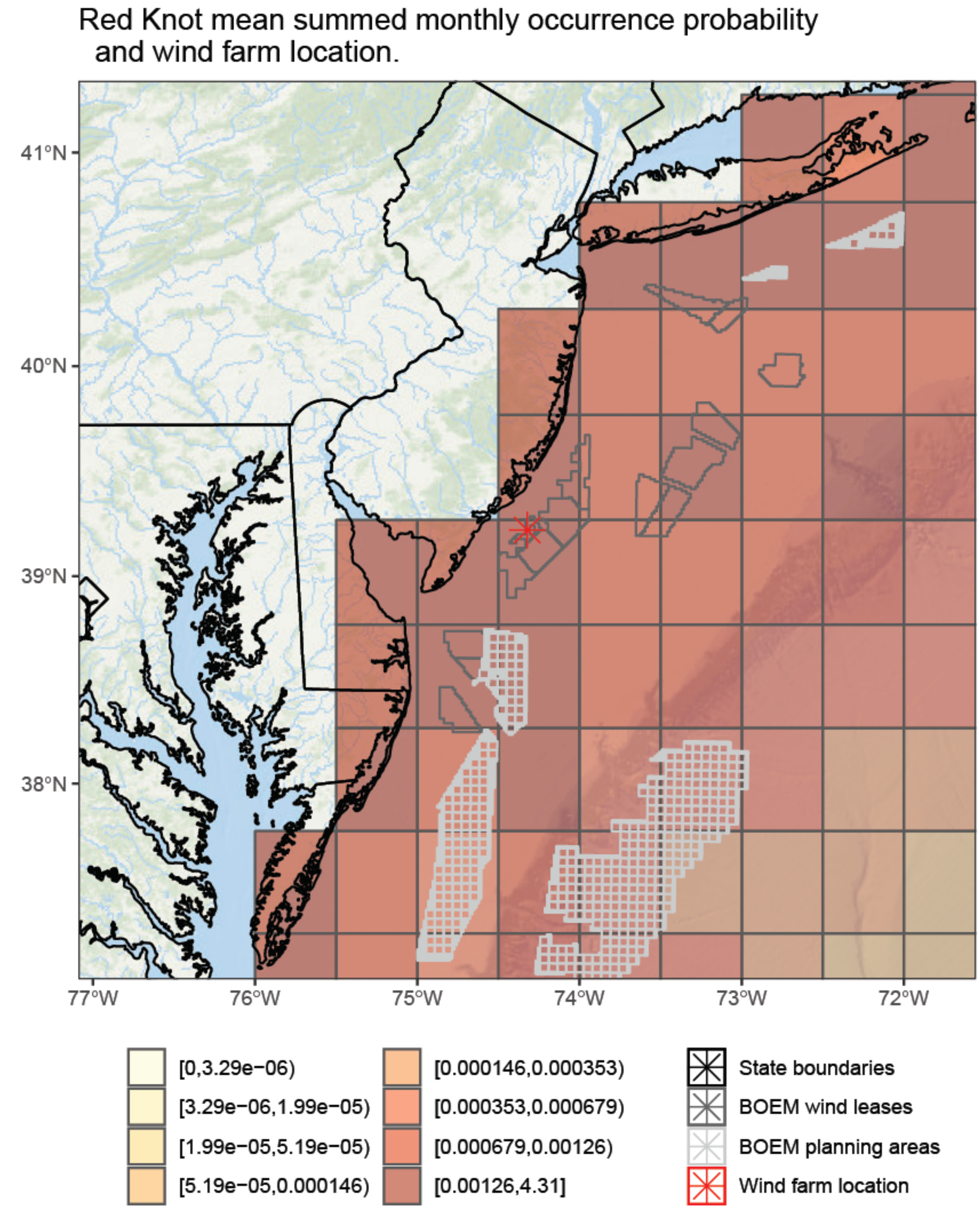

Figure 1: A map of the species occurrence probabities and wind farm location.

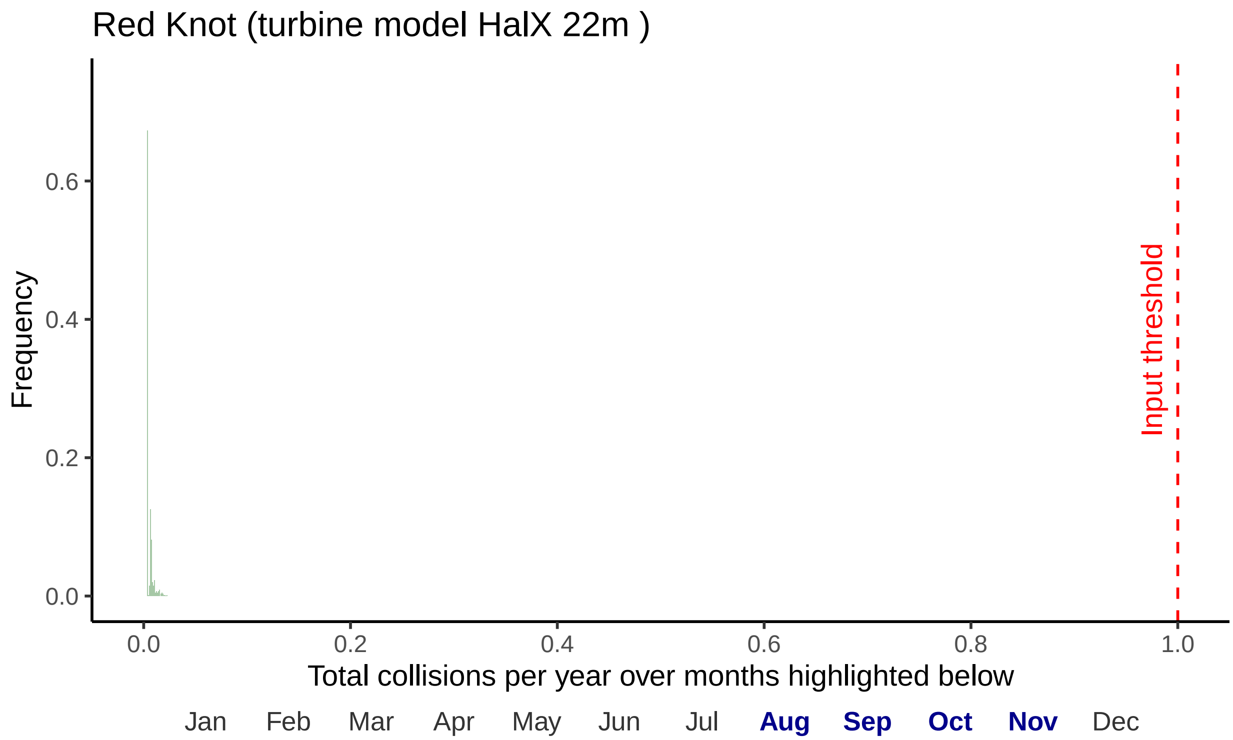

Figure 2: A frequency histogram of the total number of collisions per year. The heights of the bars show the relative frequency of each value. Months for which movement data were provided or available are shown in bold; only bold months are shown in histogram of annual collisions.

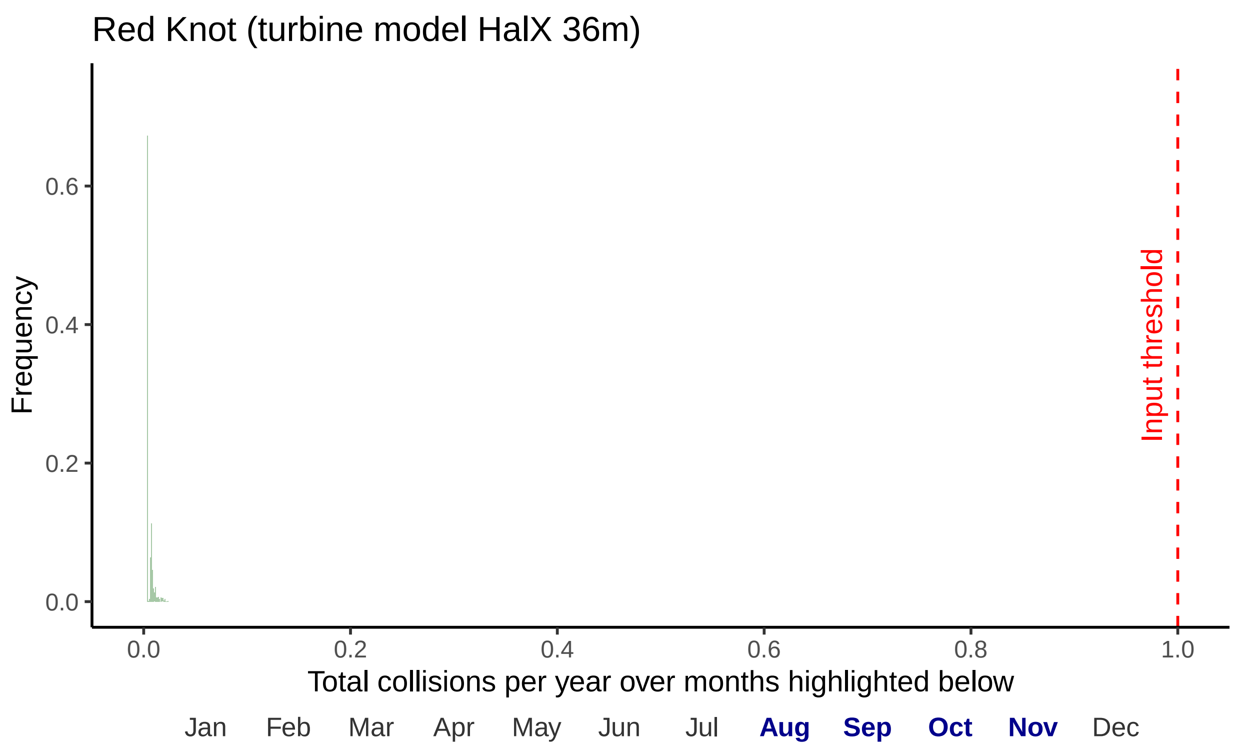

Figure 3: A frequency histogram of the total number of collisions per year. The heights of the bars show the relative frequency of each value. Months for which movement data were provided or available are shown in bold; only bold months are shown in histogram of annual collisions.

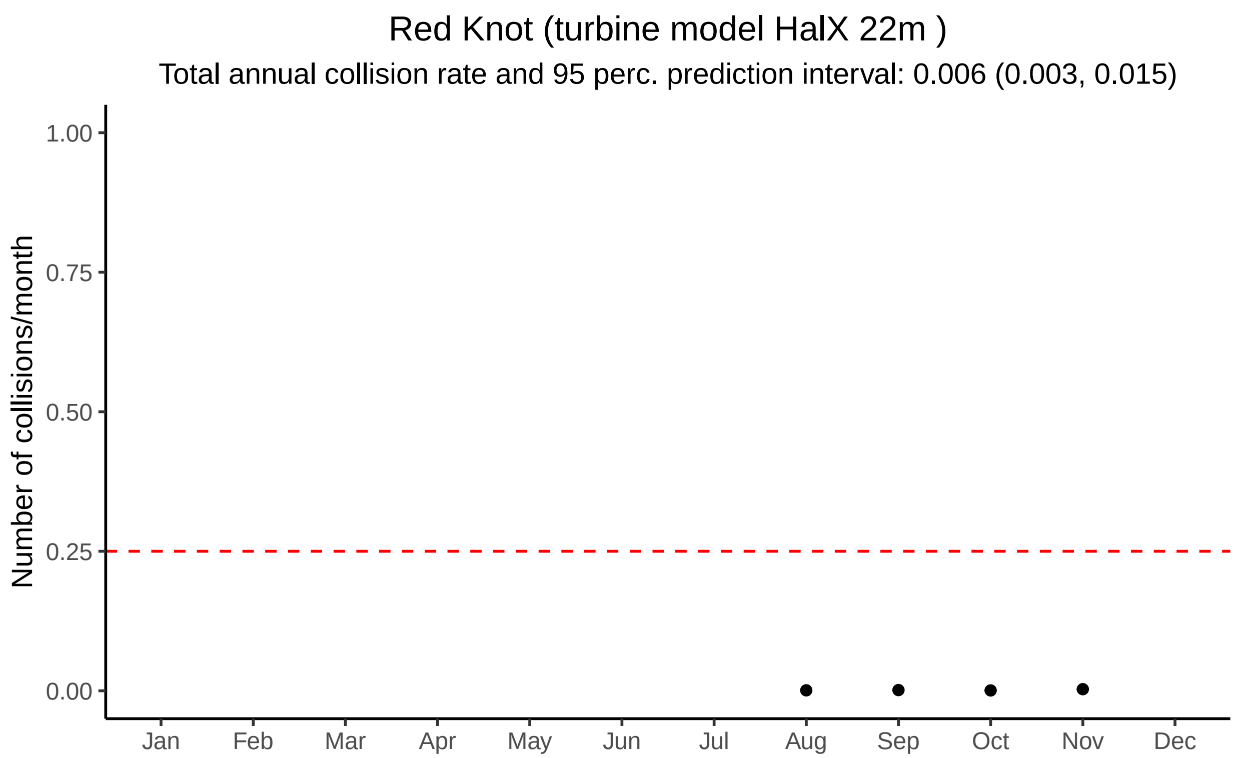

Figure 4: The predicted mean and 95 perc. prediction intervals of the number of collisions per month. Results are not shown for months that do not have movement data. Total annual collision rate and 95 perc. prediction interval are given at top. The threshold is shown divided by the number of months that movement data were available.

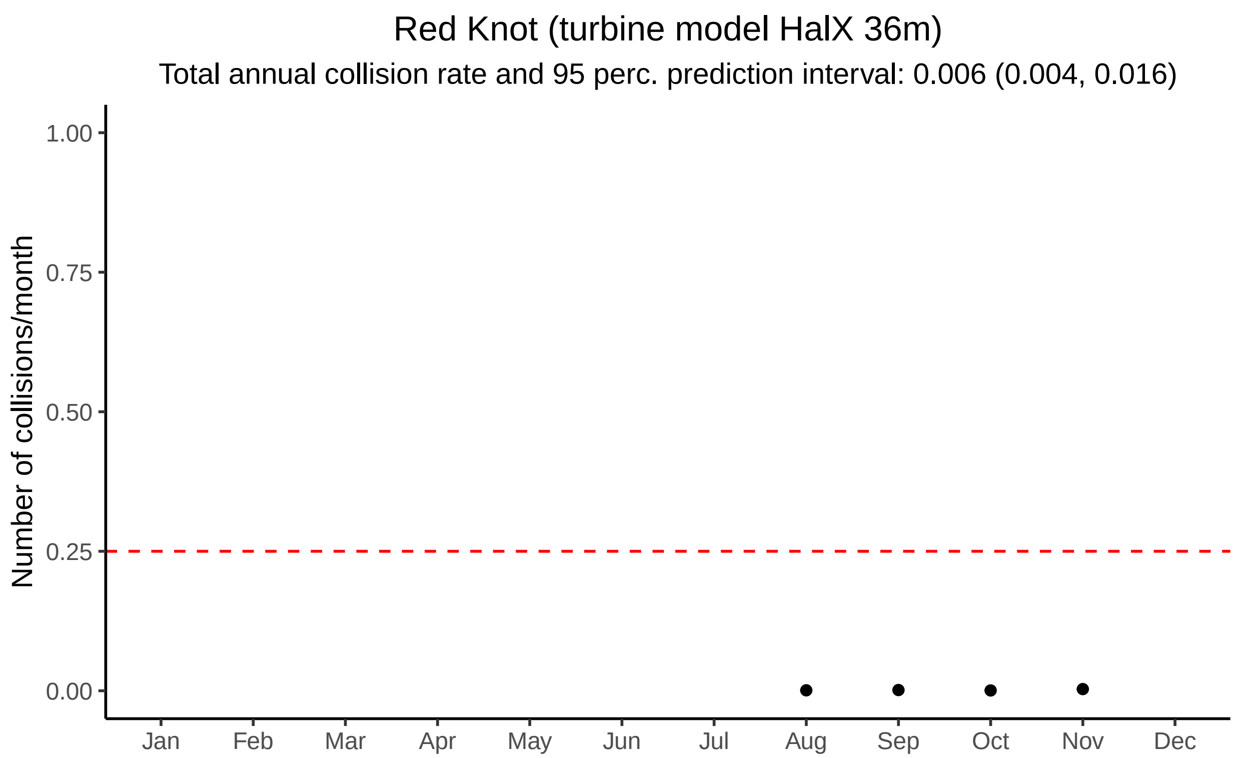

Figure 5: The predicted mean and 95 perc. prediction intervals of the number of collisions per month. Results are not shown for months that do not have movement data. Total annual collision rate and 95 perc. prediction interval are given at top. The threshold is shown divided by the number of months that movement data were available.

Appendix D-3 Collision Risk Model Inputs for Roseate Tern

Summary of simulation results from SCRAM: a stochastic collision risk assessment for movement data

12 October 2022

SCRAM was developed by Biodiversity Research Institute, the University of Rhode Island, and the U.S. Fish and Wildlife Service with funding from the Bureau of Ocean Energy Management.

SCRAM run details

```
## SCRAM - the Stochastic Collision Risk Assessment for Movement version
## Version: 0.91.1 - Lyrical Brachycarpus
## Iterations: 1000
## Model option: Option 3: slower but more accurate assessment
## Project: Ocean Wind 1
## Modeler: David Bigger
## The model run was started at: Wed Oct 12 17:07:15 2022 EDT
## The model run was completed at: Wed Oct 12 17:51:26 2022 EDT
## Run 1: the probability of exceeding specified threshold (1) is < 0.001.
## Run 2: the probability of exceeding specified threshold (1) is < 0.001.
```

Model inputs used for this analysis

Table 1: Species input parameters (mean and 95 perc. range).

Species	Turbine model	Avoidance	Wing span	Body length	Speed
Roseate Tern	HalX 22m	0.93 (0.92, 0.94)	0.76 (0.72, 0.8)	0.37 (0.33, 0.41)	13.16 (3.47, 21.8)
Roseate Tern	HalX 36m	0.93 (0.92, 0.94)	0.76 (0.72, 0.8)	0.37 (0.33, 0.41)	13.16 (3.47, 21.8)

Table 2: Species monthly (Jan-Jun) population estimates ± SD and assumptions/limitations as specified by the USFWS using the most recent data.

Species	Jan	Feb	Mar	Apr	May	Jun
Roseate Tern	0 ± 0	0 ± 0	0 ± 0	10916 ± 0	10916 ± 0	10916 ± 0

Table 3: Species monthly (Jul-Dec) population estimates ± SD and assumptions/limitations as specified by the USFWS using the most recent data.

Species	Jul	Aug	Sep	Oct	Nov	Dec
Roseate Tern	16251 ± 0	16251 ± 0	16251 ± 0	16251 ± 0	0 ± 0	0 ± 0

Population data assumptions/limitations:
1) Entire NW Atlantic pop could be present in area during months listed.
2) Average of most recent (2018 and 2019) productivity data from three largest colonies (representing >90 perc. of population) representative of entire population.
3) Fledging and post-breeding dispersal period occurs from July through Sept.
4) Numbers of non-breeding adults are not included.
5) Does not include non-breeding 1 and 2 year old birds that return but do not breed.
6) From Gochfeld and Burger (2020): Northeastern birds first arrive at Nantucket and Martha's Vineyard, MA, in large flocks, then disperse north as well as west. They arrive 26 Apr-20 May at Bird I., MA (Nisbet 1980, Nisbet 1981b, Nisbet 1989b), slightly later at Falkner I., CT, and Great Gull I., NY.
7) From Gochfeld and Burger (2020): Apparently all birds migrate directly from the staging area around Cape Cod across the w. North Atlantic to the West Indies (Nisbet 1984, C. Mostello). Very small numbers occur at sea off N. Carolina from late Aug to late Sep, with a peak in early Sep; the latest date was 28 Oct (D. Lee).

Table 4: Wind farm input parameters (mean and 95 perc. range).

Species	Turbine model	Num. turbines	Rotor radius	Hub height (m)	Blade width (m)	Wind speed (mps)
Roseate Tern	HalX 22m	98 (98, 98)	107 (107, 107)	129 (129, 129)	5.77 (5.77, 5.77)	7.87 (7.03, 8.67)
Roseate Tern	HalX 36m	98 (98, 98)	107 (107, 107)	143 (143, 143)	5.77 (5.77, 5.77)	7.91 (7.07, 8.69)

Table 5: Wind farm input parameters (mean and 95 perc. range).

Species	**Turbine model**	**Prop. upwind**	**Rotor speed (rpm)**	**Pitch (radians)**	**Farm width (km)**	**Lat.**	**Long.**
Roseate Tern	**HalX 22m**	1 (1, 1)	3.86 (3.45, 4.26)	0.06 (0.02, 0.1)	20 (20, 20)	39.22	-74.32
Roseate Tern	**HalX 36m**	1 (1, 1)	3.88 (3.47, 4.27)	0.06 (0.02, 0.1)	20 (20, 20)	39.22	-74.32

Table 6: Monthly wind farm operational data (mean and 95 perc. range) is given for each wind farm specification.

Species	**Turbine model**	**Jan Op.**	**Feb Op.**	**Mar Op.**	**Apr Op.**	**May Op.**	**Jun Op.**
Roseate Tern	**HalX 36m**	91.5 (88.2, 94.5)	92.5 (88.8, 96.2)	91.4 (88, 95.4)	91.8 (89.8, 93.8)	90.7 (87, 94.4)	89.5 (85.2, 93.6)
Roseate Tern	**HalX 22m**	91.4 (88.2, 94.3)	92.5 (88.9, 96.2)	91.5 (87.8, 95.3)	91.7 (89.6, 93.9)	90.7 (87.1, 94.6)	89.7 (85.8, 94)

Table 7: Monthly wind farm operational data (mean and 95 perc. range) is given for each wind farm specification.

Species	**Turbine model**	**Jul Op.**	**Aug Op.**	**Sep Op.**	**Oct Op.**	**Nov Op.**	**Dec Op.**
Roseate Tern	**HalX 36m**	87.6 (83.5, 91.7)	86.2 (80, 92.3)	87.5 (81.8, 92.9)	89.9 (86.1, 94.1)	90.2 (85.8, 94.9)	91.4 (88.3, 94.5)
Roseate Tern	**HalX 22m**	87.6 (83.4, 91.8)	85.9 (79.6, 92.1)	87.7 (82.2, 93)	90 (85.7, 94.2)	90.2 (86.1, 94.8)	91.4 (88, 94.6)

Results for the SCRAM simulation

Table 8: The predicted mean and 95 perc. prediction intervals of the number of collisions per month and the total summed monthly number of collisions and 95 perc. prediction interval. Results are not shown for months that do not have movement data.

Species	Turbine model	month	Mean number of collisions	Lower pred. interval	Upper pred. interval
Roseate Tern	HalX 22m	Jan			
Roseate Tern	HalX 22m	Feb			
Roseate Tern	HalX 22m	Mar			
Roseate Tern	HalX 22m	Apr			
Roseate Tern	HalX 22m	May			
Roseate Tern	HalX 22m	Jun	0.001	0.001	0.001
Roseate Tern	HalX 22m	Jul	0.001	0.001	0.001
Roseate Tern	HalX 22m	Aug	0.001	0.001	0.001
Roseate Tern	HalX 22m	Sep	0.001	0.001	0.001
Roseate Tern	HalX 22m	Oct			
Roseate Tern	HalX 22m	Nov			
Roseate Tern	HalX 22m	Dec			
Roseate Tern	HalX 22m	annual	0.004	0.004	0.004
Roseate Tern	HalX 36m	Jan			
Roseate Tern	HalX 36m	Feb			
Roseate Tern	HalX 36m	Mar			
Roseate Tern	HalX 36m	Apr			
Roseate Tern	HalX 36m	May			
Roseate Tern	HalX 36m	Jun	0.001	0.001	0.001
Roseate Tern	HalX 36m	Jul	0.001	0.001	0.001
Roseate Tern	HalX 36m	Aug	0.001	0.001	0.001
Roseate Tern	HalX 36m	Sep	0.001	0.001	0.001
Roseate Tern	HalX 36m	Oct			
Roseate Tern	HalX 36m	Nov			
Roseate Tern	HalX 36m	Dec			
Roseate Tern	HalX 36m	annual	0.004	0.004	0.004

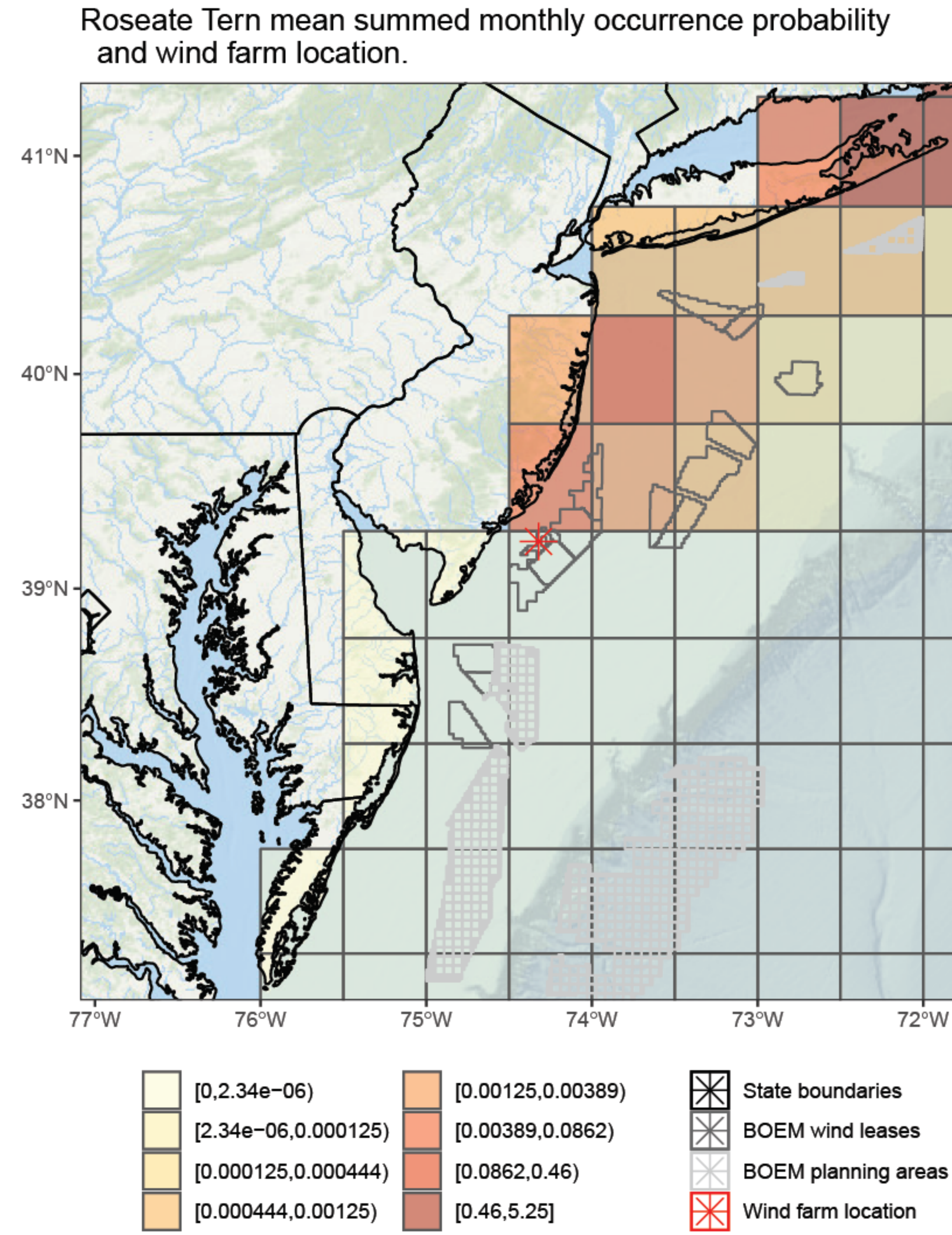

Figure 1: A map of the species occurrence probabities and wind farm location.

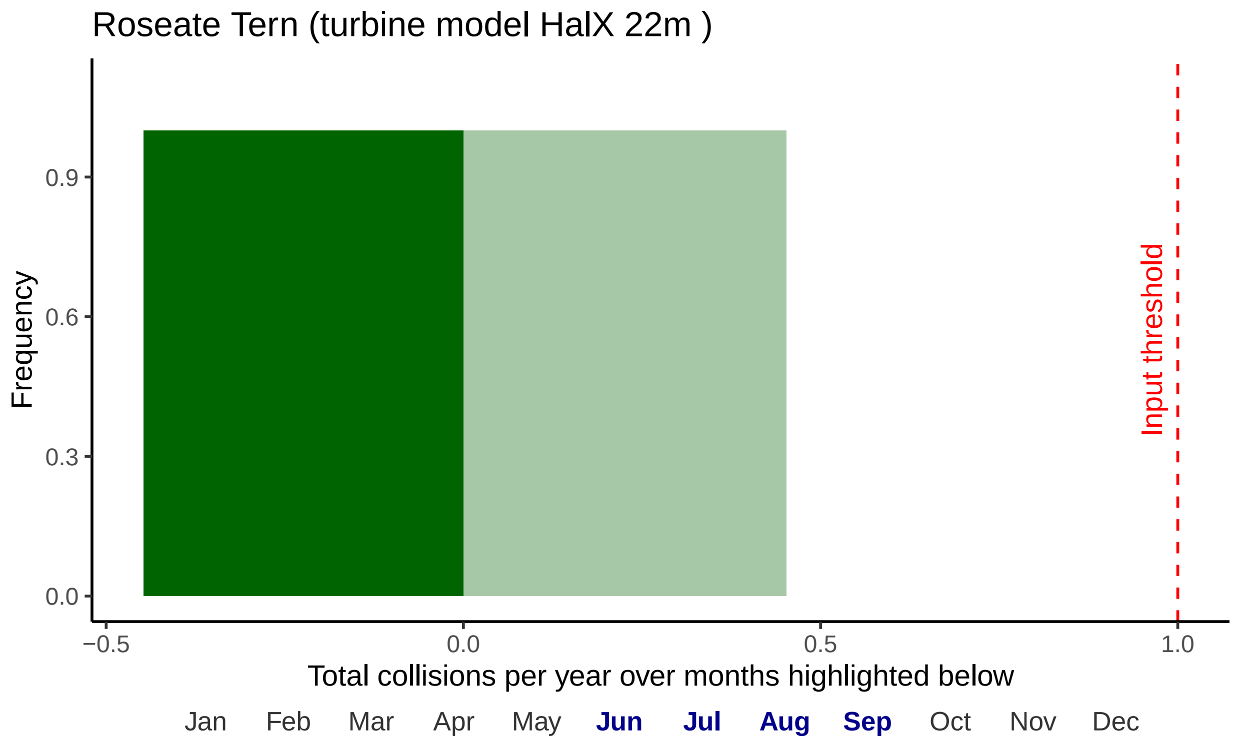

Figure 2: A frequency histogram of the total number of collisions per year. The heights of the bars show the relative frequency of each value. Months for which movement data were provided or available are shown in bold; only bold months are shown in histogram of annual collisions.

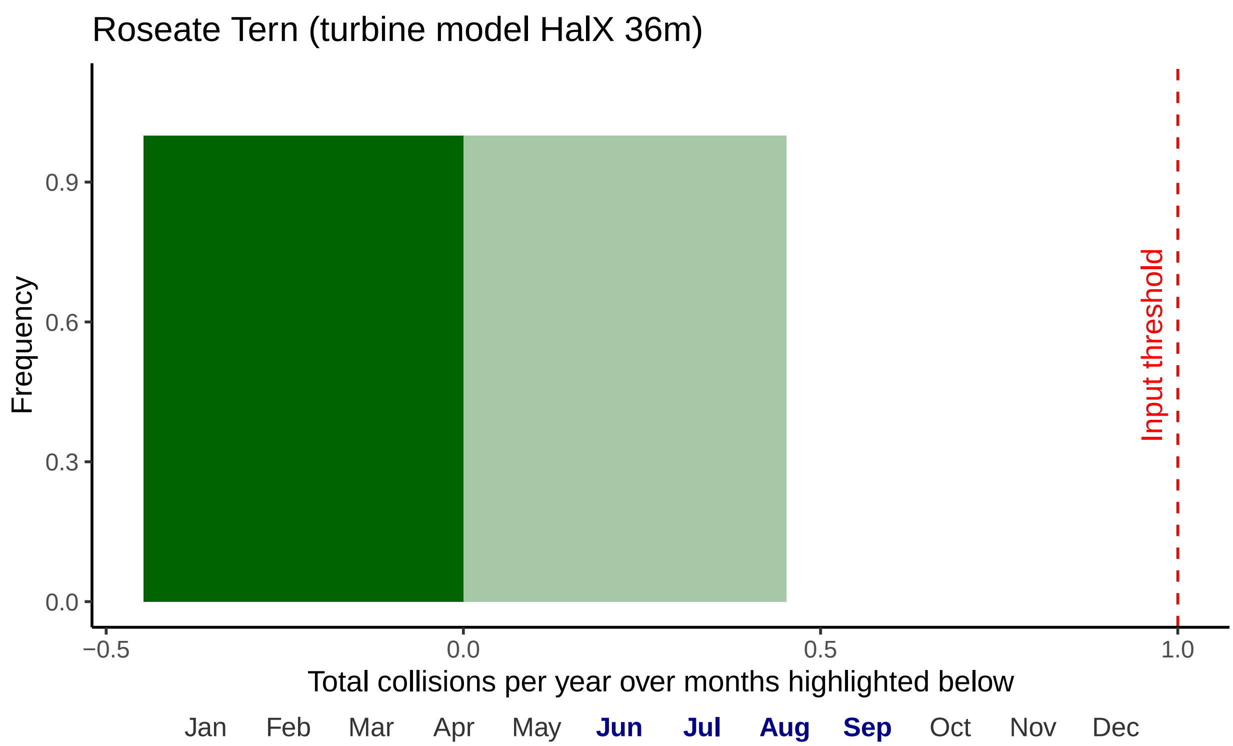

Figure 3: A frequency histogram of the total number of collisions per year. The heights of the bars show the relative frequency of each value. Months for which movement data were provided or available are shown in bold; only bold months are shown in histogram of annual collisions.

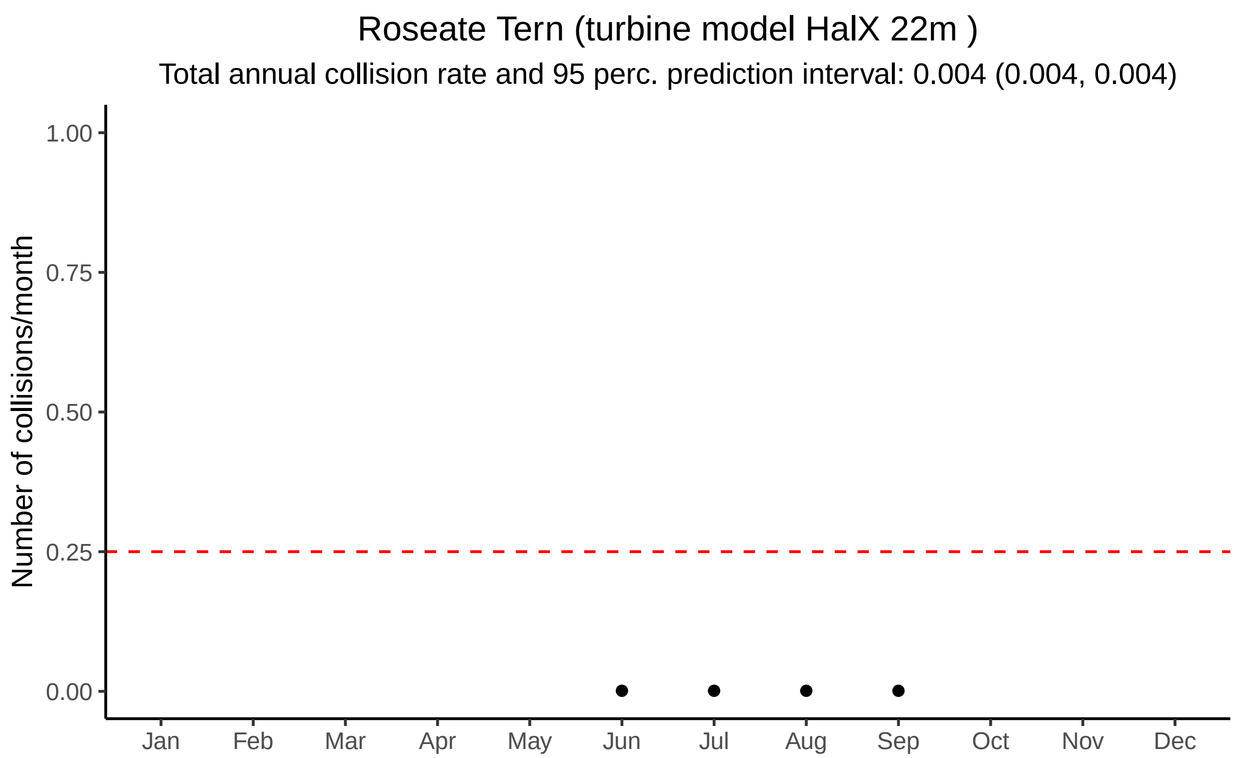

Figure 4: The predicted mean and 95 perc. prediction intervals of the number of collisions per month. Results are not shown for months that do not have movement data. Total annual collision rate and 95 perc. prediction interval are given at top. The threshold is shown divided by the number of months that movement data were available.

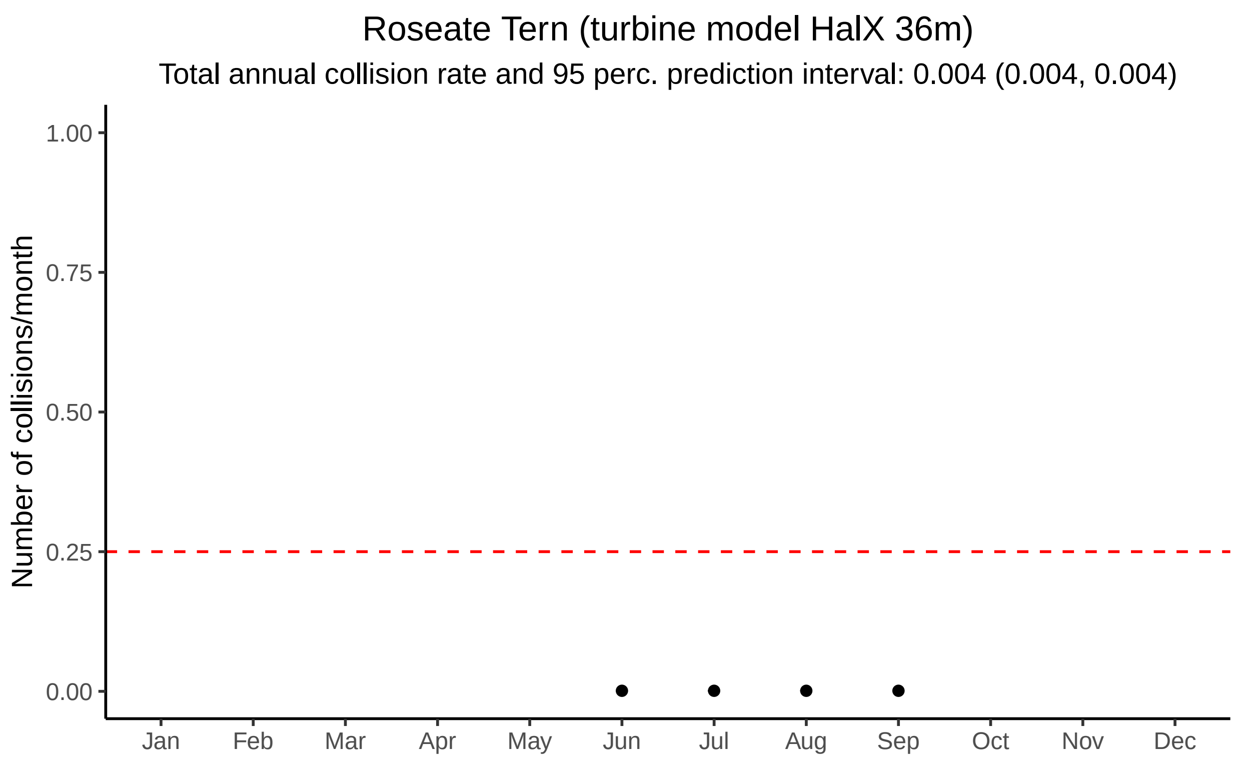

Figure 5: The predicted mean and 95 perc. prediction intervals of the number of collisions per month. Results are not shown for months that do not have movement data. Total annual collision rate and 95 perc. prediction interval are given at top. The threshold is shown divided by the number of months that movement data were available.

Appendix E Acoustic Bat Survey Report

Acoustic Bat Surveying at Oyster Creek in Waretown, Ocean Township, Ocean County, NJ and B.L. England in Marmora, Upper Township, Cape May County, NJ

Prepared By:
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100 South Cass Street, Middletown, DE 19709

Prepared For:
Ocean Wind LLC.

Summer 2022

1. Objectives

The following acoustic survey was completed to provide a summary of bat species, including any federally listed Threatened and Endangered (T&E) bat species present within the proposed Ocean Wind 1 project area. This acoustic survey serves as a follow up to the Bat habitat assessment conducted as part of the Ocean Wind 1 Construction and Operations Plan (COP) development at the Onshore Substations and along the Onshore Export Cable Route located in Ocean and Cape May Counties, NJ.

2. Introduction

Bat acoustic surveying was conducted at three New Jersey locations in accordance with the 2022 United States Fish and Wildlife Service (USFWS) Range-wide Indiana Bat & Northern long-eared Bat Survey Guidelines (King et al. 2022). These surveys utilized Pettersson D500x full-spectrum bat detectors with external cabled directional microphones. All recorded Wav files were evaluated by John Chenger at Bat Conservation and Management to obtain Maximum Likelihood Estimates (MLEs) using USFWS-approved automated acoustic bat identification software programs (Kaleidoscope Pro, Bats of North America 4.2.0/A:-1 and SonoBat3 NE).

3. Materials and Methods

Acoustic surveys were initiated in July and concluded by August 15 in order to meet the summer survey season window in accordance with USFWS guidelines (King et al. 2022). Surveys were conducted at three New Jersey locations using three Petterson D 500X detectors. The Oyster Creek substation (SS) and B.L. England (BLE) locations were surveyed using non-linear guidelines, while the proposed Oyster Creek cable route (CR) was surveyed using linear guidelines (King et al. 2022). Two days prior to the beginning of the survey window, all three detectors were deployed approximately 12m (40ft) from a known *Eptesicus fuscus* (Big brown bat) roosting site. Full-spectrum recordings were uploaded to SonoBat and reviewed to confirmed the presence of bat calls. Upon deployment, a “snap test” was used to confirm secure microphone connections and detector sensitivity.

Acoustic detectors were placed in the most suitable habitat sites within the project locations, including forest edges, water edges, small clearings, and forested corridors. For each acoustic survey site, the dates, start and end times, site coordinates, microphone direction, and weather data were recorded. Detector were programed to run from dusk until dawn based on the uploaded GPS coordinates at each site (Appendices, A and C). Once triggered, recordings would last for five seconds with no downtime scheduled in between recordings (Appendix B). Representative photographs of each acoustic survey site were taken (Appendix D). A brief description of each site where a detector was deployed was recorded and can be found in Table 1. The directional microphones were attached to the top of extendable painter’s poles with rubber bands and zip ties. On average, the microphones were elevated approximately three meters (12ft) to minimize ground interference. Microphones were not inhibited by any weatherproofing, however, a PVC capsule was used to protect the connection point between the microphone and microphone cable. In habitat areas with high insect clutter or canopied corridors, microphones were deployed with a directional cone to improve recording quality. For more information on microphone deployments, see Appendix C. Detectors were housed in weatherproof boxes and placed at the base of the painter's poles. Signs stating the purpose of the equipment ("scientific monitoring") and contact information were put on the boxes. If weather conditions, such as persistent rain (more than 30 minutes), strong sustained winds (greater than an average of 14.5kph [nine miles per hour] for more than 30 minutes), or cold temperatures (below 10°C [50°F] for more than 30 minutes), occurred during the first five hours of a survey night, that location was surveyed for additional nights as needed.

Table 1. Brief descriptions of the sites where the detectors were deployed for all events at all three survey locations, the Oyster Creek substation (SS), the proposed Oyster Creek cable route (CR), and B.L. England (BLE). Descriptions include nearby vegetation, substrate, human-made structures, roads, power lines, etc.

Location	Event	Site	Site Descriptions
SS	1 & 2	1	NW section of a small stand of short, coniferous trees (~0.06km², 0.04mi²). Many sandy clearings with tall grasses. Many power lines in the surrounding area. Close to decommissioned Forked River Power plant buildings and warehouses. Slightly S of paved roads (~0.03km, 0.02mi). NW of pond (~0.26km, 0.16mi). Microphone pointing E.
		2	NE section of the same stand of trees as Site 1. Slightly S of paved roads (~0.05km, 0.03mi). N of pond (~0.16km, 0.10mi). Microphone pointing W.
CR	1	1	Many short coniferous trees with a few, sporadic, taller coniferous trees. Sandy/grassy corridor (dirt road) with prickly pear cactuses. A lot of ground mosses. SW of quarry (~0.15km, 0.09mi). N of small stream connected to Oyster Creek (~0.04km, 0.02mi). Slightly S of paved road (~0.06km, 0.04mi). Microphone pointing W.
		3	On edge of thick, shrubby forest with medium-height, coniferous and deciduous trees. Blueberry bushes and ferns. Pointed down a grassy, sandy, gravel road right next to marsh. S of large housing development (~0.12km, 0.07mi). Slightly W of marsh pond (~0.02km, 0.01mi). W of Barnegat Bay (~0.52km, 0.32mi). N of Oyster Creek (~0.40km, 0.25mi). Microphone pointing SE.
	2	2	A clearing (relative to surrounding area) with tall, sporadic, deciduous trees and minimal ground cover. Right next to dirt road. N of Oyster Creek (~0.45km, 0.23mi). S of large housing development (~0.18km, 0.11mi). SE of Vincent Clune Park (~0.25km, 0.16mi). W of marsh (~0.73km, 0.45mi). Microphone pointing E down dirt road.
BLE	1	1	NE section of decomissioned B.L. England Golf Course. Long, wide open, grassy clearings interspersed with small stands of mostly tall deciduous trees. Occasional coniferous trees. Close to Great Egg Harbor (~0.22km, 0.14mi). Adjacent to decomissioned B.L. England Generating Station with loud construction. A lot of loud insect clutter. On high ground at N end of easternmost grassy clearing. W of paved road (~0.06km, 0.04mi). N of power lines (~0.09km, 0.06mi). Microphone pointing SW toward power lines.
		2	SW section of the same decomissioned golf course as Site 1. Next to a lone, medium-height, deciduous tree in the middle of second westernmost grassy clearing. SW of paved road (~0.19km, 0.12mi). NE of very small wetland area (~0.05km, 0.03mi). S of power lines (~0.09km, 0.06mi). Microphone pointing NW toward power lines.
		3	SE section of the same decomissioned golf course as Site 1. Of the three sites, farthest from construction. S end of second easternmost grassy clearing. SW of paved road (~0.13km, 0.08mi). W of very small wetland area (~0.02km, 0.01mi). Different wetland area than that by Site 2. NW of large housing development (~0.07km, 0.04mi). Microphone pointing NW.

3.1 Oyster Creek Substation (SS)

The SS location is in Waretown, Ocean Township, Ocean County, New Jersey on the grounds of the decommissioned Fork River Power Plant. This location was surveyed using non-linear guidelines (King et al. 2022). Due to limited property access and power lines, two detectors were placed approximately 230m (755ft) apart on the northern half of the proposed tree-clearing area (Figure 1, Appendix C). Surveying took place for four consecutive nights during two separate events for a total of 16 detector nights. The first event began on July 13 at 20:45 and ended on July 17 at 5:19, surveying the nights of July 13, 14, 15, and 16. The second event began on July 21 at 20:40 and ended on July 25 at 5:25, surveying the nights of July 21, 22, 23, and 24. For both events, both microphones were angled slightly downward to attempt to avoid power line interference with call quality. The weather was mostly clear, dry, and slightly breezy on all nights. For more information on weather, see Appendix A.

Figure 1. Google Earth map depicting bat detector sites and microphone directions at the Oyster Creek substation (SS) location in Ocean County, New Jersey on the nights of July 13 to 16 and 21 to 24, 2022.

3.2 Proposed Oyster Creek Cable Route (CR)

The CR location is in Waretown, Ocean Township, Ocean County, New Jersey. Of the three survey locations, the CR location was the only one that required linear surveying. This location had three detectors positioned approximately 0.80km (0.50mi) apart. Detectors were placed in the most suitable habitat available in a way to maximize coverage of the proposed tree-clearing route (Figure 2, Appendix C). Surveying took place for six consecutive nights at Sites 1 and 3 during the first event and five consecutive nights at Site 2 during the second event. The first event began on July 26 at 20:36 and ended on August 1 at 5:31, surveying the nights of July 26, 27, 28, 29, 30, and 31. Data collected on the night of July 31 were not used due to poor weather conditions. The second event began on August 3 at 20:31 and ended on August 8 at 5:41, surveying the nights of August 3, 4, 5, 6, and 7. Therefore, this location had a total of 15 detector nights. During the first five nights of the first event, the weather was cloudy, dry, and slightly breezy. The weather was clear, dry, and windy on all nights of event 2. For more information on weather, see Appendix A.

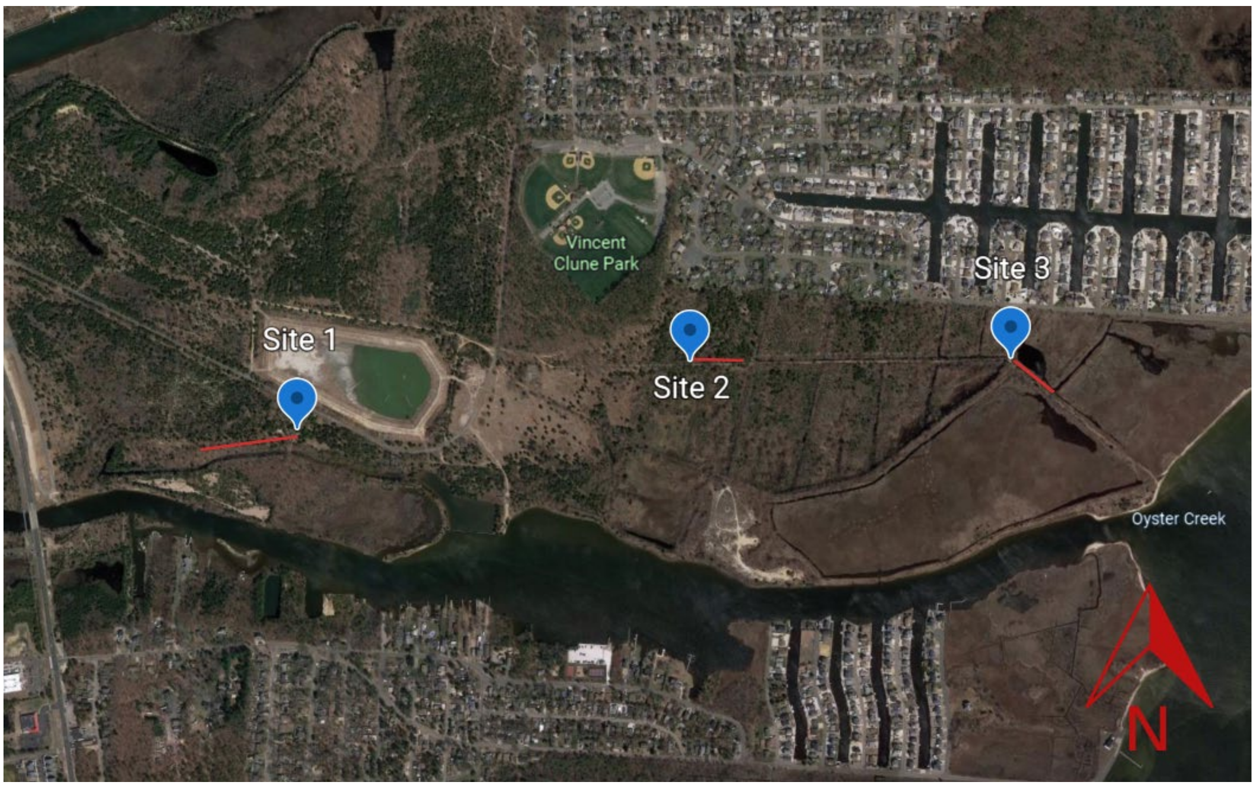

Figure 2. Google Earth map depicting bat detector sites and microphone directions at the proposed Oyster Creek cable route (CR) location in Ocean County, New Jersey on the nights of July 26 to 31 and August 3 to 7, 2022.

3.3 B.L. England (BLE)

The BLE location is in Marmora, Upper Township, Cape May County on the grounds of the decommissioned B.L. England Golf Course and B.L. England Generating Station. There is minimal proposed tree-clearing at the BLE location, but there are multiple cable route options. For this reason, this location was surveyed using non-linear guidelines (King et al. 2022). Detectors were placed in the most suitable habitat that allowed for maximum range of coverage (Figure 3, Appendix C). A preliminary deployment attempt at Sites 1 and 2 resulted in an excess of "noise" data files and battery depletion. Due to construction and insect clutter, trigger sensitivity was adjusted to a medium level. In an attempt to avoid the noise recordings from the nearby construction site, as well as overhead powerlines, Site 2 was adjusted to approximately 180m (591ft) from the Sites 1 and 3. Surveying took place for five consecutive nights for a total of 15 detector nights. Surveying began on August 11 at 20:19 for sites 1 and 3 and 20:23 for site 2. Surveying ended on August 16 at 5:48 for Sites 1 and 3 and 5:45 for Site 2, covering the nights of August 11, 12, 13, 14, and 15. The weather was mostly clear, dry, and breezy on all nights. For more information on weather, see Appendix A.

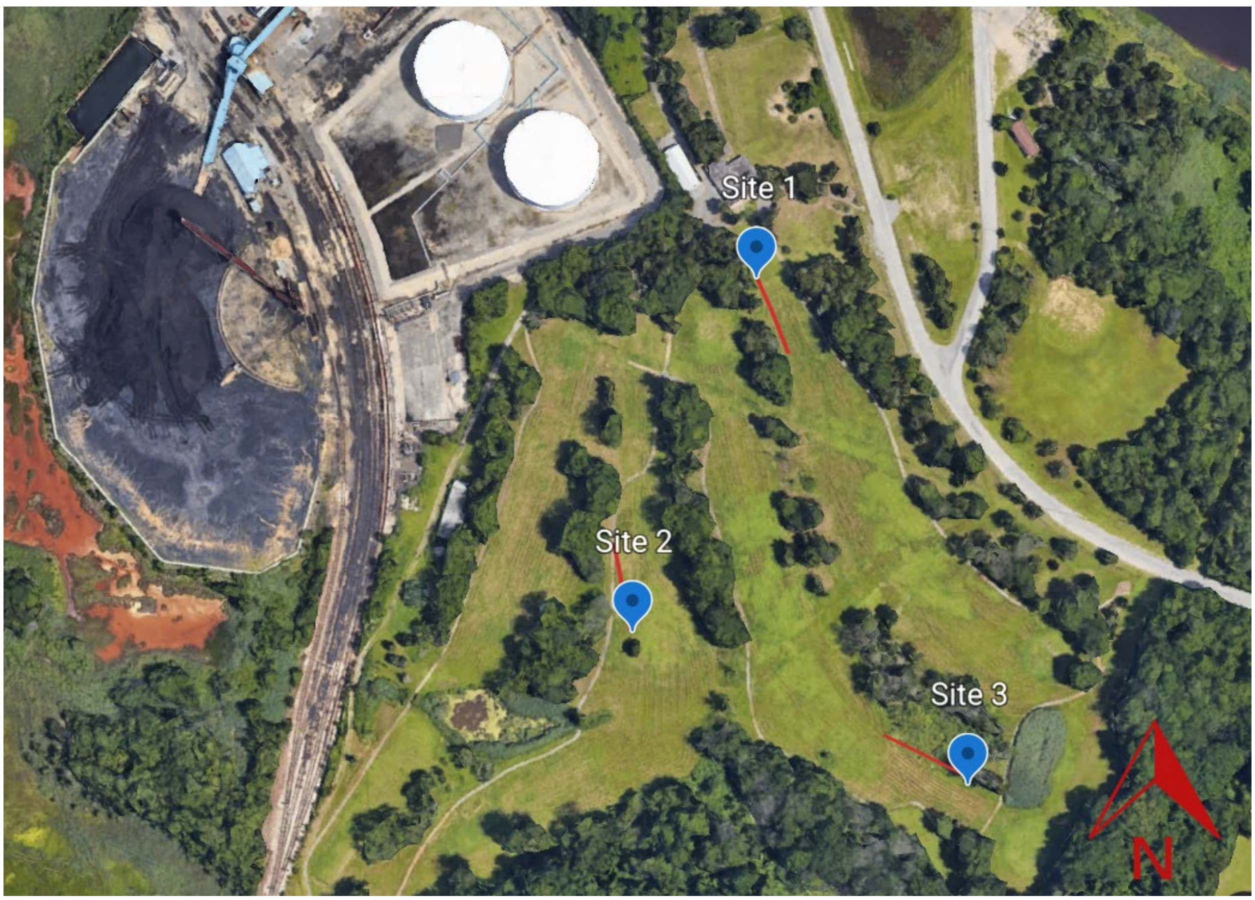

Figure 3. Google Earth map depicting bat detector sites and microphone directions at the B.L. England location in Cape May County, New Jersey on the nights of August 11 to 15, 2022.

4. Analysis

Acoustic data was first filtered and classified using Kaleidoscope Pro, Bats of North America 4.2.0/A:-1 (Table 2). Species presence was also cross-validated using SonoBat 3 with the Northeast regional classifier (Table 3). During the qualitative full-spectrum analysis, a subset of files of each species from each site was manually reviewed to confirm presence. Additionally, all calls automatically classified by either software program as a species in the *Myotis* genus was manually reviewed. During the manual review, calls lacking sufficient detail to be confidently identified at the species level were classified as either "HF-UID," indicating the presence of a species that makes high frequency calls, "LF-UID," indicating the presence of a species that makes low frequency calls, or "2bat," indicating the presence of two individual bats simultaneously. A change in call patterns when an individual bat encounters another, make these "2bat" calls difficult to identify to a species level. The manual review also determined that the majority of mis-classified files were calls from the repertoire of the *Lasiurus borealis* (Eastern red bat). These most often are some phase of an Eastern red bat approach, but sometimes were simple search calls as well. There were no "search phase" calls with descending tails, as would be required for *myotis* search calls. Additionally, those call sequences often showed varied characteristic frequencies as would be expected from an Eastern red bat rather than any myotis species.

5. Results

Over the course of the survey, which took place on various nights between July 13 and August 15, 3,874 total bat calls were recorded. A quantitative analysis of the recorded data revealed a MLE of < 0.05 for the presence of *Eptesicus fuscus* (Big brown bat), *Lasiurus borealis* (Eastern red bat), and *Myotis lucifugus* (Little brown bat; Table 4). Upon manual review of 510 call files, it was determined that there were no *Myotis* species present in the dataset (Table 5).

Table 2. Summary of bat calls recorded from July 13 to August 15, 2022 on all survey nights at all detector sites at all three survey locations, the Oyster Creek substation (SS), the proposed Oyster Creek cable route (CR), and B.L. England (BLE), as classified by Kaleidoscope Pro, Bats of North America 4.2.0/A:-1.

Common Name				Big brown bat	Eastern red bat	Hoary bat	Silver-haired bat	Eastern small-footed bat	Little brown bat	Northern long-eared bat	Indiana bat	Evening bat	Tricolored bat	Total
Scientific Name				Eptesicus fuscus	Lasiurus borealis	Lasiurus cinereus	Lasionycteris noctivagans	Myotis leibii	Myotis lucifugus	Myotis septentrionalis	Myotis sodalis	Nycticeius humeralis	Perimyotis subflavus	
Location	Event	Site	Date											
SS	1	1	13-Jul	1	0	0	5	0	0	0	0	0	0	6
			14-Jul	3	0	2	0	0	0	0	0	0	0	5
			15-Jul	0	0	1	1	0	0	0	0	0	0	2
			16-Jul	0	2	2	2	0	0	0	0	1	0	7
		2	13-Jul	2	2	1	2	0	0	0	0	0	0	7
			14-Jul	1	0	0	1	0	0	0	0	0	0	2
			15-Jul	0	0	1	1	0	0	0	0	0	0	2
			16-Jul	3	0	1	2	0	0	0	0	0	0	6
	2	1	21-Jul	1	0	1	1	0	0	0	0	0	0	3
			22-Jul	4	1	1	3	0	0	0	0	0	0	9
			23-Jul	10	1	0	7	0	0	0	0	0	0	18
			24-Jul	5	0	1	2	0	0	0	0	0	0	8
		2	21-Jul	2	0	0	1	0	0	0	0	1	0	4
			22-Jul	3	0	2	0	0	0	0	0	0	0	5
			23-Jul	1	0	1	1	0	0	0	0	0	0	3
			24-Jul	1	0	3	1	0	0	0	0	0	0	5
CR	1	1	26-Jul	32	16	1	10	0	1	0	1	1	2	64
			27-Jul	29	5	6	10	0	0	0	0	2	0	52
			28-Jul	19	1	0	4	0	2	0	0	0	0	26
			29-Jul	13	7	3	5	0	1	0	0	2	0	31
			30-Jul	7	4	2	2	0	2	0	0	0	0	17
		3	26-Jul	3	0	3	10	0	0	0	0	1	0	17
			27-Jul	31	0	5	59	0	1	0	0	0	0	96
			28-Jul	33	2	2	15	0	0	0	0	1	0	53
			29-Jul	17	1	3	24	0	3	0	0	0	0	48
			30-Jul	7	1	0	1	0	1	0	0	1	0	11
	2	2	3-Aug	44	68	2	6	0	35	0	2	31	3	191
			4-Aug	221	44	10	18	1	27	0	2	17	6	346
			5-Aug	62	44	1	5	0	35	0	1	18	0	166
			6-Aug	194	73	5	8	0	110	1	5	23	4	423
			7-Aug	47	76	0	2	0	95	0	3	23	1	247
BLE	1	1	11-Aug	171	30	1	1	0	20	1	1	4	2	231
			12-Aug	44	4	1	0	0	5	0	1	1	1	57
			13-Aug	25	6	0	0	0	2	0	0	2	0	35
			14-Aug	379	3	0	0	0	1	0	0	0	0	383
			15-Aug	356	6	0	0	0	4	1	0	2	0	369
		2	11-Aug	104	5	3	6	0	5	0	0	3	4	130
			12-Aug	15	2	7	3	0	2	0	0	2	2	33
			13-Aug	4	2	0	0	0	1	0	0	2	0	9
			14-Aug	18	3	0	0	0	1	1	0	3	0	26
			15-Aug	48	0	0	0	0	1	0	0	0	0	49
		3	11-Aug	231	18	3	3	0	6	0	1	3	2	267
			12-Aug	41	8	7	2	0	3	1	0	2	3	67
			13-Aug	20	5	3	0	0	4	0	0	3	1	36
			14-Aug	85	18	0	5	0	5	1	0	8	2	124
			15-Aug	146	17	0	11	0	0	1	0	2	1	178
			Total	2483	475	85	240	1	373	7	17	159	34	3874

Table 3. Summary of bat calls recorded from July 13 to August 15, 2022 on all survey nights at all detector sites at all three survey locations, the Oyster Creek substation (SS), the proposed Oyster Creek cable route (CR), and B.L. England (BLE), as classified by SonoBat 3 with the Northeast regional classifier.

Common Name				HF-UID*	Big brown bat	Eastern red bat	Hoary bat	Silver-haired bat	Little brown bat	Indiana bat	Evening bat	Tricolored bat	Total
Scientific Name					Eptesicus fuscus	Lasiurus borealis	Lasiurus cinereus	Lasionycteris noctivagans	Myotis lucifugus	Myotis sodalis	Nycticeius humeralis	Perimyotis subflavus	
Location	Event	Site	Date										
SS	1	1	13-Jul	0	2	0	0	4	0	0	0	0	6
			14-Jul	0	4	0	1	0	0	0	0	0	5
			15-Jul	0	2	0	0	0	0	0	0	0	2
			16-Jul	0	1	2	0	2	0	0	0	0	5
		2	13-Jul	0	3	2	1	0	0	0	0	0	6
			14-Jul	0	2	0	0	0	0	0	0	0	2
			15-Jul	0	1	0	0	0	0	0	0	0	1
			16-Jul	0	4	0	0	1	0	0	0	0	5
	2	1	21-Jul	0	3	0	0	0	0	0	0	0	3
			22-Jul	0	5	0	0	1	0	0	0	0	6
			23-Jul	0	14	0	0	0	0	0	0	0	14
			24-Jul	0	7	0	0	1	0	0	0	0	8
		2	21-Jul	0	2	1	0	1	0	0	0	0	4
			22-Jul	0	4	0	0	1	0	0	0	0	5
			23-Jul	0	3	0	0	0	0	0	0	0	3
			24-Jul	0	3	0	0	0	0	0	0	0	3
CR	1	1	26-Jul	0	35	13	0	5	0	0	1	0	54
			27-Jul	0	37	4	0	3	0	0	0	0	44
			28-Jul	0	18	2	0	1	0	0	0	0	21
			29-Jul	0	15	5	2	0	0	0	0	0	22
			30-Jul	0	8	3	1	0	0	0	0	0	12
		3	26-Jul	0	5	0	1	3	0	0	0	0	9
			27-Jul	0	21	1	0	24	0	0	0	0	46
			28-Jul	0	30	1	2	2	0	0	0	0	35
			29-Jul	0	14	1	1	9	0	0	0	0	25
			30-Jul	0	6	1	0	1	0	0	0	0	8
	2	2	3-Aug	1	41	81	3	4	0	0	0	0	130
			4-Aug	0	209	49	1	5	1	1	1	2	269
			5-Aug	0	60	69	1	0	1	0	0	0	131
			6-Aug	2	172	67	1	1	1	1	2	0	247
			7-Aug	5	44	118	1	0	2	0	0	0	170
BLE	1	1	11-Aug	1	173	35	1	1	1	1	0	0	213
			12-Aug	0	42	4	0	0	0	0	0	0	46
			13-Aug	0	25	4	0	0	0	0	1	0	30
			14-Aug	0	376	2	0	1	0	0	0	0	379
			15-Aug	0	356	4	0	0	0	0	0	0	360
		2	11-Aug	0	108	9	2	3	0	0	0	0	122
			12-Aug	0	17	1	6	1	0	0	0	0	25
			13-Aug	0	4	2	0	0	0	0	0	0	6
			14-Aug	0	17	5	0	0	0	0	0	0	22
			15-Aug	0	48	0	0	0	0	0	0	0	48
		3	11-Aug	0	229	19	3	1	0	0	0	0	252
			12-Aug	0	45	5	4	0	0	0	0	0	54
			13-Aug	0	19	5	2	0	0	0	0	0	26
			14-Aug	0	85	15	0	3	0	0	0	0	103
			15-Aug	0	148	12	0	1	0	0	0	0	161
Total				9	2467	542	34	80	6	3	5	2	3148

*These calls were made by species with high frequency calls, but lack sufficient detail to be identified at the species level.

Table 4. Summary of Maximum Likelihood Estimates (MLEs) calculated by Kaleidoscope Pro, Bats of North America 4.2.0/A:-1, from July 13 to August 15, 2022 on all survey nights at all detector sites at all three survey locations, the Oyster Creek substation (SS), the proposed Oyster Creek cable route (CR), and B.L. England (BLE).

Common Name				Big brown bat	Eastern red bat	Hoary bat	Silver-haired bat	Eastern small-footed bat	Little brown bat	Northern long-eared bat	Indiana bat	Evening bat	Tricolored bat
Scientific Name				Eptesicus fuscus	Lasiurus borealis	Lasiurus cinereus	Lasionycteris noctivagans	Myotis leibii	Myotis lucifugus	Myotis septentrionalis	Myotis sodalis	Nycticeius humeralis	Perimyotis subflavus
Location	Event	Site	Date										
SS	1	1	13-Jul	0.98	1.00	1.00	**2.94E-03**	1.00	1.00	1.00	1.00	1.00	1.00
			14-Jul	**0.01**	1.00	0.13	1.00	1.00	1.00	1.00	1.00	1.00	1.00
			15-Jul	1.00	1.00	0.18	0.61	1.00	1.00	1.00	1.00	1.00	1.00
			16-Jul	1.00	0.08	**0.03**	0.38	1.00	1.00	1.00	1.00	1.00	1.00
		2	13-Jul	0.24	**0.03**	0.53	0.50	1.00	1.00	1.00	1.00	1.00	1.00
			14-Jul	0.47	1.00	1.00	0.61	1.00	1.00	1.00	1.00	1.00	1.00
			15-Jul	1.00	1.00	0.18	0.61	1.00	1.00	1.00	1.00	1.00	1.00
			16-Jul	0.06	1.00	0.64	0.66	1.00	1.00	1.00	1.00	1.00	1.00
	2	1	21-Jul	0.52	1.00	0.33	0.80	1.00	1.00	1.00	1.00	1.00	1.00
			22-Jul	**0.03**	0.18	0.76	0.43	1.00	1.00	1.00	1.00	1.00	1.00
			23-Jul	**8.30E-05**	0.18	1.00	0.11	1.00	1.00	1.00	1.00	1.00	1.00
			24-Jul	**2.45E-03**	1.00	0.79	0.89	1.00	1.00	1.00	1.00	1.00	1.00
		2	21-Jul	0.11	1.00	1.00	0.84	1.00	1.00	1.00	1.00	0.39	1.00
			22-Jul	**0.01**	1.00	0.13	1.00	1.00	1.00	1.00	1.00	1.00	1.00
			23-Jul	0.52	1.00	0.33	0.80	1.00	1.00	1.00	1.00	1.00	1.00
			24-Jul	0.64	1.00	**4.62E-03**	0.98	1.00	1.00	1.00	1.00	1.00	1.00
CR	1	1	26-Jul	**0.00**	**0.00**	1.00	0.75	1.00	1.00	1.00	0.55	1.00	1.00
			27-Jul	**0.00**	**1.18E-03**	0.21	0.77	1.00	1.00	1.00	1.00	1.00	1.00
			28-Jul	**0.00**	0.42	1.00	1.00	1.00	0.08	1.00	1.00	1.00	1.00
			29-Jul	**1.00E-07**	**2.06E-05**	0.39	0.80	1.00	1.00	1.00	1.00	1.00	1.00
			30-Jul	**1.02E-04**	**1.89E-03**	0.40	1.00	1.00	0.37	1.00	1.00	1.00	1.00
		3	26-Jul	0.69	1.00	0.12	**3.07E-04**	1.00	1.00	1.00	1.00	0.39	1.00
			27-Jul	**2.60E-06**	1.00	0.99	**0.00**	1.00	0.12	1.00	1.00	1.00	1.00
			28-Jul	**0.00**	0.08	1.00	0.14	1.00	1.00	1.00	1.00	1.00	1.00
			29-Jul	**5.95E-05**	0.55	0.90	**4.00E-07**	1.00	**0.01**	1.00	1.00	1.00	1.00
			30-Jul	**1.79E-05**	0.42	1.00	1.00	1.00	0.58	1.00	1.00	0.95	1.00
	2	2	3-Aug	**0.00**	**0.00**	1.00	1.00	1.00	**5.50E-06**	1.00	1.00	1.00	1.00
			4-Aug	**0.00**	**0.00**	1.00	1.00	1.00	**1.00E-05**	1.00	1.00	1.00	1.00
			5-Aug	**0.00**	**0.00**	1.00	1.00	1.00	**0.00**	1.00	1.00	1.00	1.00
			6-Aug	**0.00**	**0.00**	1.00	1.00	1.00	**0.00**	1.00	1.00	1.00	1.00
			7-Aug	**0.00**	**0.00**	1.00	1.00	1.00	**0.00**	1.00	1.00	1.00	1.00
BLE	1	1	11-Aug	**0.00**	**0.00**	1.00	1.00	1.00	**1.50E-06**	1.00	1.00	1.00	1.00
			12-Aug	**0.00**	**6.34E-03**	1.00	1.00	1.00	**1.29E-02**	1.00	0.97	1.00	1.00
			13-Aug	**0.00**	**1.76E-04**	1.00	1.00	1.00	0.74	1.00	1.00	1.00	1.00
			14-Aug	**0.00**	**6.93E-03**	1.00	1.00	1.00	0.76	1.00	1.00	1.00	1.00
			15-Aug	**0.00**	**3.91E-04**	1.00	1.00	1.00	0.11	0.67	1.00	1.00	1.00
		2	11-Aug	**0.00**	**2.18E-03**	1.00	1.00	1.00	0.10	1.00	1.00	1.00	0.35
			12-Aug	**0.00**	0.13	**4.18E-03**	1.00	1.00	0.50	1.00	1.00	0.98	0.58
			13-Aug	**8.20E-04**	0.15	1.00	1.00	1.00	0.81	1.00	1.00	0.91	1.00
			14-Aug	**0.00**	0.05	1.00	1.00	1.00	0.91	0.27	1.00	0.86	1.00
			15-Aug	**0.00**	1.00	1.00	1.00	1.00	0.12	1.00	1.00	1.00	1.00
		3	11-Aug	**0.00**	**0.00**	1.00	1.00	1.00	0.25	1.00	0.99	1.00	1.00
			12-Aug	**0.00**	**3.10E-06**	0.25	1.00	1.00	0.60	0.53	1.00	1.00	0.82
			13-Aug	**0.00**	**1.55E-03**	0.65	1.00	1.00	0.18	1.00	1.00	1.00	1.00
			14-Aug	**0.00**	**0.00**	1.00	1.00	1.00	0.73	0.68	1.00	1.00	1.00
			15-Aug	**0.00**	**0.00**	1.00	1.00	1.00	1.00	0.28	1.00	1.00	1.00
			Overall	**0.00**	**0.00**	1.00	1.00	1.00	**0.00**	1.00	1.00	1.00	1.00

Note: Maximum Likelihood Estimates (MLE's) interpretation – values <0.05 indicate there is 95% confidence that the species is present. **Bold** values indicate significance.

Table 5. Summary of bat calls recorded from July 13 to August 15, 2022 on all survey nights at all detector sites at all three survey locations, the Oyster Creek substation (SS), the proposed Oyster Creek cable route (CR), and B.L. England (BLE), as manually classified by John Chenger at Bat Conservation and Management.

Common Name				2bat[1]	HF-UID[2]	LF-UID[3]	Noise[4]	Big brown bat	Eastern red bat	Hoary bat	Evening bat	Tricolored bat	Total
Scientific Name								Eptesicus fuscus	Lasiurus borealis	Lasiurus cinereus	Nycticeius humeralis	Perimyotis subflavus	
Location	Event	Site	Date										
SS	1	1	13-Jul	0	0	0	0	0	0	0	0	0	0
			14-Jul	0	0	0	0	0	0	1	0	0	1
			15-Jul	0	0	0	0	0	0	0	0	0	0
			16-Jul	0	0	0	0	0	1	0	0	0	1
		2	13-Jul	0	0	0	0	0	0	1	0	0	1
			14-Jul	0	0	0	0	0	0	0	0	0	0
			15-Jul	0	0	0	0	0	0	0	0	0	0
			16-Jul	0	0	0	0	0	0	0	0	0	0
	2	1	21-Jul	0	0	0	0	0	0	0	0	0	0
			22-Jul	0	0	0	0	0	0	0	0	0	0
			23-Jul	0	0	0	0	0	0	0	0	0	0
			24-Jul	0	0	0	0	0	0	0	0	0	0
		2	21-Jul	0	0	0	0	0	1	0	0	0	1
			22-Jul	0	0	0	0	0	0	0	0	0	0
			23-Jul	0	0	0	0	0	0	0	0	0	0
			24-Jul	0	0	0	0	0	0	0	0	0	0
CR	1	1	26-Jul	1	1	0	0	0	3	0	0	0	5
			27-Jul	0	0	0	0	0	0	0	0	0	0
			28-Jul	0	0	0	0	0	2	0	0	0	2
			29-Jul	0	0	0	0	0	1	1	0	0	2
			30-Jul	0	0	0	0	0	2	1	0	0	3
		3	26-Jul	0	0	0	0	0	0	1	0	0	1
			27-Jul	0	0	0	0	0	1	0	0	0	1
			28-Jul	1	0	0	0	0	0	0	0	0	1
			29-Jul	0	0	0	0	0	3	0	0	0	3
			30-Jul	0	0	0	0	0	1	0	0	0	1
	2	2	3-Aug	2	6	0	0	3	33	1	0	0	45
			4-Aug	8	4	0	0	0	27	0	0	2	41
			5-Aug	2	0	0	0	0	34	0	0	0	36
			6-Aug	6	17	1	0	0	101	0	0	0	125
			7-Aug	2	7	0	0	0	92	0	0	0	101
BLE	1	1	11-Aug	5	3	1	0	0	20	1	0	0	30
			12-Aug	0	4	1	0	0	4	0	0	0	9
			13-Aug	0	1	0	0	0	2	0	1	0	4
			14-Aug	0	0	0	0	0	1	0	0	0	1
			15-Aug	3	3	0	0	0	2	0	0	0	8
		2	11-Aug	1	4	1	0	0	7	0	0	0	13
			12-Aug	1	2	0	0	0	4	1	0	0	8
			13-Aug	1	0	0	0	0	2	0	0	0	3
			14-Aug	0	0	0	0	0	5	0	0	0	5
			15-Aug	0	0	0	0	0	1	0	0	0	1
		3	11-Aug	3	1	0	0	0	8	0	0	0	12
			12-Aug	0	1	0	0	0	9	0	0	0	10
			13-Aug	0	0	2	0	0	8	0	0	0	10
			14-Aug	2	3	0	0	0	11	0	0	0	16
			15-Aug	1	1	3	2	0	2	0	0	0	9
			Total	39	58	9	2	3	388	8	1	2	510

[1]The manual review determined two or more individual bats were present simultaneously. Bat call patterns change when an individual bat encounters another, making them difficult to identify to a species level.
[2]The manual review determined that these calls were made by species with high frequency calls, but lack sufficient detail to be identified at the species level.
[3] The manual review determined that these calls were made by species with low frequency calls, but lack sufficient detail to be identified at the species level.
[4]Kaleidoscope Pro, Bats of North America 4.2.0/A:-1 identified these data as bat calls. Through manual review, these data were determined to be only miscellaneous noise, not actual bat calls.

APPENDIX A: WEATHER

Descriptions of the weather, including temperature, wind, rain, and average cloud cover from July 13 to August 15, 2022 for each night of each event at each site for all three survey locations, the Oyster Creek substation (SS), the proposed Oyster Creek cable route (CR), and B.L. England (BLE).

Location	Event	Date	Temp (ºF)	Temp (ºC)	Wind (mph)*	Wind (kph)*	Rain	Avg. Cloud Cover (%)
SS	1	13-Jul	71	22	<10	<16	dry	8
		14-Jul	71	22	15	24	dry	26
		15-Jul	68	20	<10	<16	dry	65
		16-Jul	70	21	<10	<16	dry	72
	2	21-Jul	75	24	<10	<16	dry	0
		22-Jul	75	24	<10	<16	dry	3
		23-Jul	74	23	<10	<16	drizzle	0
		24-Jul	74	23	<10	<16	dry	0
CR	1	26-Jul	69	21	<10	<16	dry	67
		27-Jul	70	21	<10	<16	dry	58
		28-Jul	74	23	<10	<16	dry	10
		29-Jul	74	23	<10	<16	0.06in/0.15cm	58
		30-Jul	71	22	<10	<16	dry	19
	2	3-Aug	70	21	12	12	dry	0
		4-Aug	71	22	<10	<16	dry	21
		5-Aug	73	23	<10	<16	dry	6
		6-Aug	72	22	10-15	16-24	dry	0
		7-Aug	75	24	10-15	16-24	dry	3
BLE	1	11-Aug	71	22	<10	<16	0.02in/0.05cm	15
		12-Aug	60	16	15-20	24-32	dry	0
		13-Aug	57	14	10-15	16-24	dry	0
		14-Aug	60	16	<10	<16	dry	8
		15-Aug	71	22	15-20	24-32	dry	0

*Ranges include gust speeds. Wind was not sustained at these speeds all night.

APPENDIX B: EQUIPMENT SETTINGS

Petterson D 500X bat detector settings for each event at each site for all three survey locations, the Oyster Creek substation (SS), the proposed Oyster Creek cable route (CR), and B.L. England (BLE).

Location	Event	Site	UTC Time Zone	Sample Freq (kHz)	Pretrig	Rec Len (sec)	HP Filter	Auto Rec	T. Sens	Input Gain	Trig Lev	Interval
SS	1	1	-04	500	OFF	5	YES	YES	MED	45	160	0
		2	-04	500	OFF	5	YES	YES	MED	45	160	0
	2	1	-04	500	OFF	5	YES	YES	MED	45	160	0
		2	-04	500	OFF	5	YES	YES	MED	45	160	0
CR	1	1	-04	500	OFF	5	YES	YES	MED	45	160	0
		3	-04	500	OFF	5	YES	YES	MED	45	160	0
	2	2	-04	500	OFF	5	YES	YES	MED	45	160	0
BLE	1	1	-04	500	OFF	5	YES	YES	LOW	45	160	0
		2	-04	500	OFF	5	YES	YES	LOW	45	160	0
		3	-04	500	OFF	5	YES	YES	LOW	45	160	0

APPENDIX C: DEPLOYMENT DETAILS

Descriptions of detector deployments, including GPS coordinates, dates, and times for each event at each site for all three survey locations, the Oyster Creek substation (SS), the proposed Oyster Creek cable route (CR), and B.L. England (BLE).

Location	Event	Site	Latitude (DMS)	Longitude (DMS)	Deployment Date	Deployment Time	Recovery Date	Recovery Time	# Nights Deployed	# Nights Used	Daily Start Time	Daily End Time
SS	1	1	39º48'42" N	74º12'48" W	13-Jul	11:05	17-Jul	10:30	4	4	20:45	5:19
		2	39º48'43" N	74º12'38" W	13-Jul	11:46	17-Jul	10:15	4	4	20:45	5:19
	2	1	39º48'42" N	74º12'48" W	21-Jul	9:00	25-Jul	10:00	4	4	20:40	5:25
		2	39º48'43" N	74º12'38" W	21-Jul	9:15	25-Jul	10:20	4	4	20:40	5:25
CR	1	1	39º48'46" N	74º11'33" W	26-Jul	14:09	1-Aug	10:14	6	5*	20:36	5:31
		3	39º48'52" N	74º10'26" W	26-Jul	12:31	1-Aug	9:53	6	5*	20:36	5:31
	2	2	39º48'51" N	74º10'54" W	3-Aug	8:54	8-Aug	10:15	5	5	20:31	5:41
BLE	1	1	39º17'15" N	74º37'59" W	11-Aug	9:21	16-Aug	10:30	5	5	20:19	5:48
		2	39º17'10" N	74º38'02" W	11-Aug	9:47	16-Aug	10:11	5	5	20:23	5:45
		3	39º17'07" N	74º37'55" W	11-Aug	10:07	16-Aug	10:00	5	5	20:19	5:48

Descriptions of microphone deployments, including height off the ground, horizontal orientation, vertical orientation, and weather a directional cone or weatherproofing was used for each event at each site for all three survey locations, the Oyster Creek substation (SS), the proposed Oyster Creek cable route (CR), and B.L. England (BLE).

Location	Event	Site	~Height (m)	~Height (ft)	Horizontal Orientation	Vertical Orientation*	Directional Cone	Weatherproofing
SS	1	1	3.7	12.0	E	80º	no	no
		2	3.7	12.0	W	80º	no	no
	2	1	3.7	12.0	E	90º	no	no
		2	3.7	12.0	W	90º	no	no
CR	1	1	3.7	12.0	W	90º	no	no
		3	3.7	12.0	SE	90º	yes	no
	2	2	3.7	12.0	E	90º	yes	no
BLE	1	1	3.7	12.0	SE	90º	yes	no
		2	3.7	12.0	N	90º	yes	no
		3	3.0	10.0	W	100º	yes	no

*The vertical orientation angles are in relationship to the painter's pole on top of which the microphone was attached. The pole was sticking straight up out of the ground, therefore, 90º indicates the microphone was completely parallel to the ground, <90° indicates it was pointed down, and >90° indicates it was pointed up.

APPENDIX D: PHOTOGRAPHIC RECORDS

Photo 1. View of bat detector and microphone deployment at Site 1 at the Oyster Creek substation (SS) location.

Photo 2. A view of habitat in the direction of microphone orientation at Site 1 at the Oyster Creek substation (SS) location.

Photo 3. A view of ground coverage in the direction of microphone orientation at Site 2 at the Oyster Creek substation (SS) location

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Photo 5. View of habitat corridor in the direction of microphone orientation at Site 1 at the proposed Oyster Creek cable route (CR) location.

Photo 6. View of bat detector and microphone deployment at Site 1 at the Oyster Creek cable route (CR) location.

Photo 7. View from bat detector showing microphone orientation down forested corridor at Site 2 at the Oyster Creek cable route (CR) location.

Photo 8. View of bat detector and microphone deployment at Site 3 at the Oyster Creek cable route (CR) location.

Photo 9. View of habitat in orientation with microphone deployment at Site 3 at the Oyster Creek cable route (CR) location.

Photo 10. Bat detector and microphone deployment at Site 1 at the B.L. England (BLE) location.

Photo 11. Bat detector and microphone deployment at Site 2 at the B.L. England (BLE) location.

Photo 12. Bat detector and microphone deployment at Site 3 at the B.L. England (BLE) location.

Works Cited

King, Andrew, et al. *Range-Wide Indiana Bat & Northern Long-Eared Bat Survey Guidelines*. U.S. Fish and Wildlife Service, 29 Mar. 2022, https://www.fws.gov/sites/default/files/documents/USFWS_Range-wide_IBat_%26_NLEB_Survey_Guidelines_2022.03.29.pdf.