Kitty Hawk Wind

AVANGRID

Construction and Operations Plan

Appendix AA - Visual Impact Assessment

September 30, 2022

Submitted by
Kitty Hawk Wind, LLC
1125 NW Couch Street, Suite 600
Portland, Oregon 97209

Submitted to
Bureau of Ocean Energy Management
45600 Woodland Road
Sterling, Virginia 20166

Prepared by
Tetra Tech, Inc.
10 Post Office Square, 11th Floor
Boston, Massachusetts 02109

AVANGRID

Appendix AA – Visual Impact Assessment

Document Reference: KTH- GEN-CON-PLN-AGR-000067_034 Rev 02

Prepared by:	Checked by:	Approved by:
tjd&a **September 30, 2022**	TETRA TECH **September 30, 2022**	Megan E. Higgins **September 30, 2022**

Revision Summary				
Rev	**Date**	**Prepared by**	**Checked by**	**Approved by**
01	01 Nov 2021	Terrence J. DeWan & Associates	Tetra Tech, Inc.	Marcus Cross
02	30 Sep 2022	Terrence J. DeWan & Associates	Tetra Tech, Inc.	Megan Higgins

Description of Revisions			
Rev	**Page**	**Section**	**Description**
01	All	All	Submitted to BOEM
02	All	All	Updated based on BOEM comments and Project name

Visual Impact Assessment
Kitty Hawk North Wind Project
Lease OCS-A 0508

October 27, 2021
Revised September 30, 2022

PREPARED FOR:

Kitty Hawk Wind, LLC
125 High Street, 6th Floor
Boston MA 02110

PREPARED BY:

TJD&A Visual Resource Specialists
121 West Main Street
Yarmouth, ME 04096

tjd&a

Table of Contents

ATTACHMENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND SYMBOLS

ac	acre
BOEM	Bureau of Ocean Energy Management
cm	centimeter
COP	Construction and Operations Plan
CZM	Coastal Zone Management
DSM	Digital Surface Model
DTM	Digital Terrain Model
ESP	Electrical Service Platform
FAA	Federal Aviation Administration
ft	foot / feet
ha	hectares
HDD	Horizontal Directional Drilling
HFOV	Horizontal Field of View
in	inch(es)
km	kilometer(s)
km^2	square kilometers
KOP	Key Observation Point
NC	North Carolina
m	meter(s)
mi	mile(s)
mi^2	square miles
mm	millimeter(s)
nm	nautical mile(s)
NPS	National Park Service
NWR	National Wildlife Refuge
PDE	Project Design Envelope
ROW	Right of Way
SLIA	Seascape/Landscape Impact Assessment
SLVIA	Seascape, Landscape, and Visual Impact Assessment
USCG	United States Coast Guard
VA	Virginia
VFOV	Vertical Field of View
VIA	Visual Impact Assessment
WTG	Wind Turbine Generator(s)

1. Introduction

1.1. Seascape/Landscape Visual Impact Assessment

This Seascape/Landscape Visual Impact Assessment (SLVIA) is a systematic analysis of 1) possible changes to the visible seascape and landscape resulting from the proposed Kitty Hawk North Wind Project (Project), and 2) potential effects of the Project on the viewing public. This process includes a series of interrelated steps that identify and consider the following elements:

- Project components;
- Existing seascape and landscape character;
- Visually sensitive public resources;
- Viewer expectations and sensitivity;
- Project visibility from publicly accessible locations; and
- Aesthetic impacts to the seascape and landscape and its viewers.

To determine the extent of potential Project visibility and visual impact, Kitty Hawk Wind, LLC (the Company) engaged TJD&A Visual Resource Specialists to prepare a SLVIA for the Project. The methodology used to develop the VIA is based on the professional experience of TJD&A in conducting VIAs for large-scale wind and other energy infrastructure projects.

The methodology is informed by the recent publication of the *Assessment of Seascape, Landscape, and Visual Impacts of Offshore Wind Energy Developments on the Outer Continental Shelf of the United States* by Robert Sullivan at the Argonne National Laboratory (Sullivan 2021). This document is referred to in this SLVIA as the Bureau of Ocean Energy Management (BOEM) Guidance Document.

The methodology is also informed by recent publications pertaining to offshore wind energy developments, e.g., *Guidelines to Landscape and Visual Impact Assessment (Third Edition)* by the Landscape Institute and Institute of Environmental Management and Assessment, and *Visual Impact Assessment (VIA) Methodology for Offshore Development* by the Cape Cod Commission (Technical Bulletin #12 – 001).

The material presented in the SLVIA is intended to be used by the Company in their review with public agencies, stakeholders, and the general public, in compliance with applicable regulatory requirements.

1.2. Project Description

At this time, the Company proposes to develop approximately 40 percent of the Lease Area, an area located in the northwest corner closest to shore (19,441 hectares [ha] / 48,040 acres [ac]), referred to as the Wind Development Area. The Project will connect the electrical service platform (ESP) through offshore export cables (within a designated corridor) and onshore export cables to a new onshore substation in Virginia Beach, Virginia. The substation and associated switching station and interconnection lines will be located in the Corporate Landing Business Park, which is owned by the City of Virginia Beach, where the electricity generated by the Project will be transmitted to the electric grid via a new switching station into the existing transmission grid. The offshore components of the Project, including the wind turbine generators (WTGs), ESP, and inter-array cables, will be located in federal waters within the Lease Area. The offshore export cable corridor will traverse both the federal and state

territorial waters of Virginia. Onshore Project components, including the export cable landfall location, onshore export cables, and onshore substation site (housing the onshore substation, switching station, and interconnection lines), will be located in the City of Virginia Beach, Virginia. See Figure 1 and Figure 2 in the following sections.

1.3. Offshore Components

The layout includes up to 69 WTGs and one ESP, located in the northwest corner of the Lease Area, as described above. Offshore export cables will transfer energy from the ESP to the landfall at Sandbridge Beach in Virginia Beach. The WTGs will be lit and marked in accordance with Federal Aviation Administration (FAA) and United States Coast Guard (USCG) requirements for aviation and navigation obstruction lighting. The ESP will be lit and marked in accordance with USCG requirements for navigation obstruction lighting.

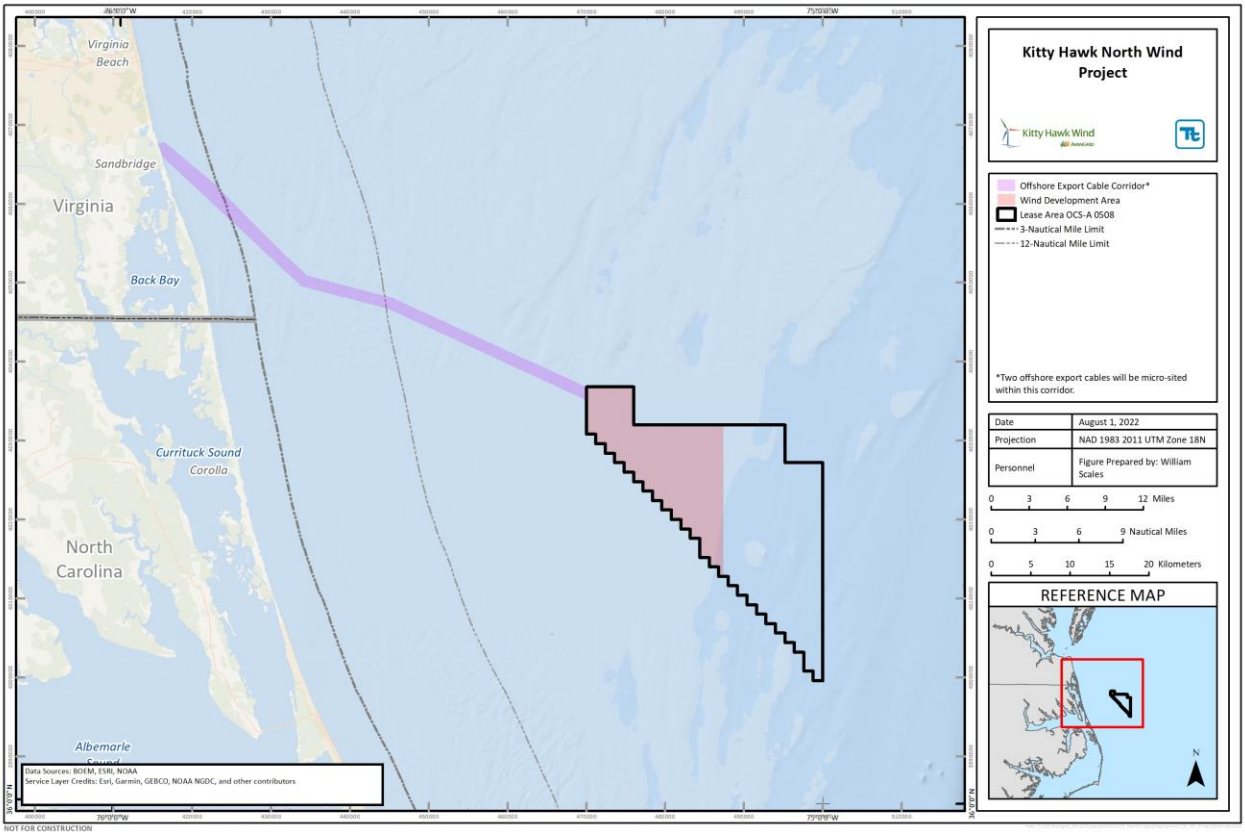


Figure 1. Offshore Project Overview

1.3.1. WTG Layout

The WTG layout will occupy 40 percent of the Lease Area in an area located in the northwest corner closest to shore (19,441 ha [48,040 ac]), referred to as the Wind Development Area. The WTG layout is shown in Figure 2, which includes 69 WTGs and one ESP. The layout (array) is arranged in a grid to allow traversal of the Wind Development Area by commercial, recreational, military, and emergency vessels and helicopters. The closest WTGs will be spaced approximately 1.4 kilometers (km; 0.8 nautical miles [nm] / 0.9 miles [mi]) apart, with rows about 2.2 km (1.2 nm / 1.4 mi) wide.

The inter-array cables will carry the energy produced by the WTGs to the ESP. The inter-array cable system will be comprised of a series of cable “strings” that interconnect a grouping of WTGs to the ESP.

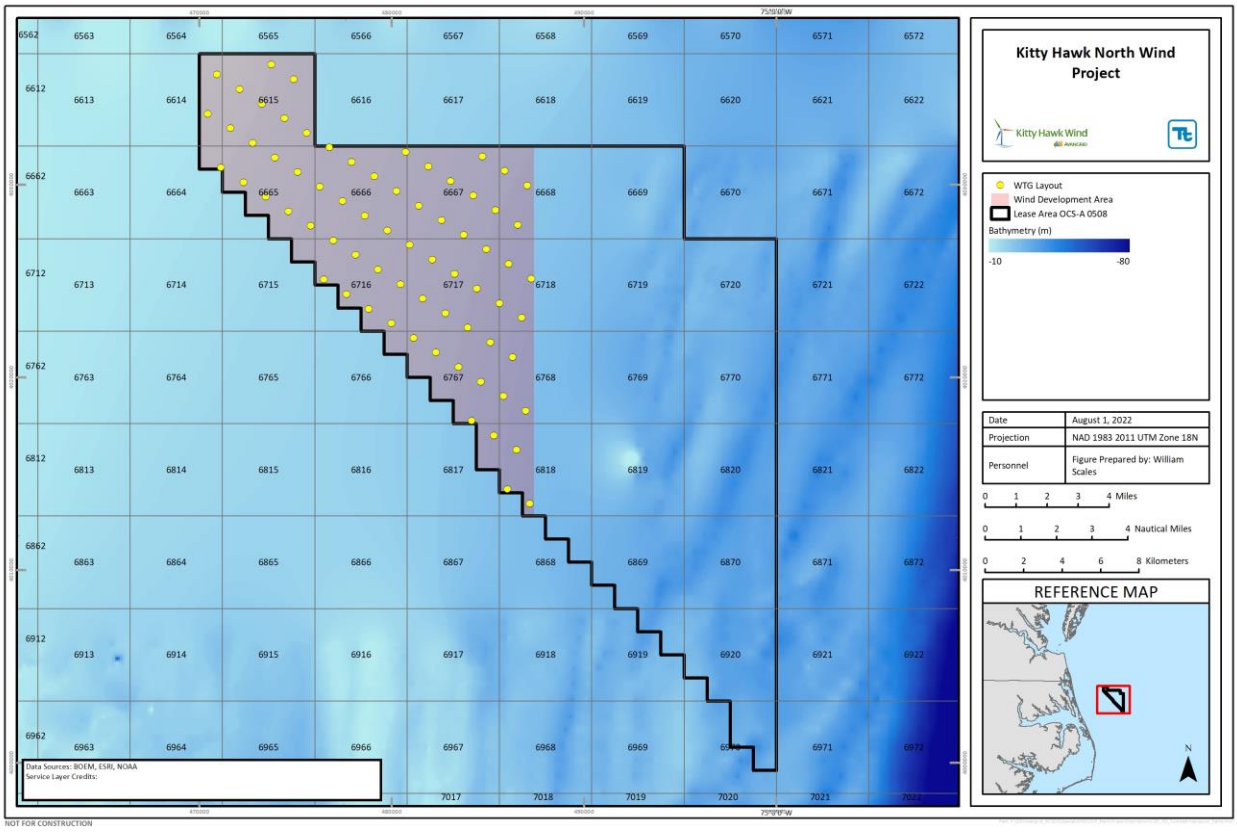


Figure 2. WTG Layout

1.3.2. WTGs

While a range of WTG models from various suppliers will be considered to allow for flexibility within the allowable Project Design Envelope (PDE), all WTGs for the Project are expected to follow the traditional offshore WTG design with three blades and a horizontal rotor axis. Specifically, the blades will be connected to a central hub, forming a rotor which turns a shaft-connected gearbox (if required) and generator. The generator and gearbox will be located within a containing structure known as the nacelle, situated adjacent to the rotor hub. The nacelle will be supported by a tower structure affixed to the foundation. The nacelle will be able to rotate or “yaw” on the vertical axis in order to face the oncoming wind. In addition, the blades also have the functionality to ‘feather’ their pitch along their vertical axis as part of standard operating procedures.

In support of the development of the Project, the Company is evaluating a range of WTG capacities. For the purpose of this assessment, the WTG design envelope has been defined by the parameters that are representative of the WTGs expected to become available in time to be used for the Project, based on ongoing discussions with suppliers.

Figure 3 shows a conceptual rendering of the WTGs with the maximum representative dimensions summarized in Table 1 below.

Table 1. Summary of WTG PDE Parameters

Parameter	Quantities/Dimensions
Total number of WTGs	69
Foundation locations, including ESP	70
Hub height above mean sea level	175 meters (m); 574 feet [ft])
Upper blade tip above mean sea level	317.5 m (1,042 ft)
Lower blade tip above highest astronomical tide	27–33 m (89–108 ft)
Rotor diameter	285 m (935 ft)

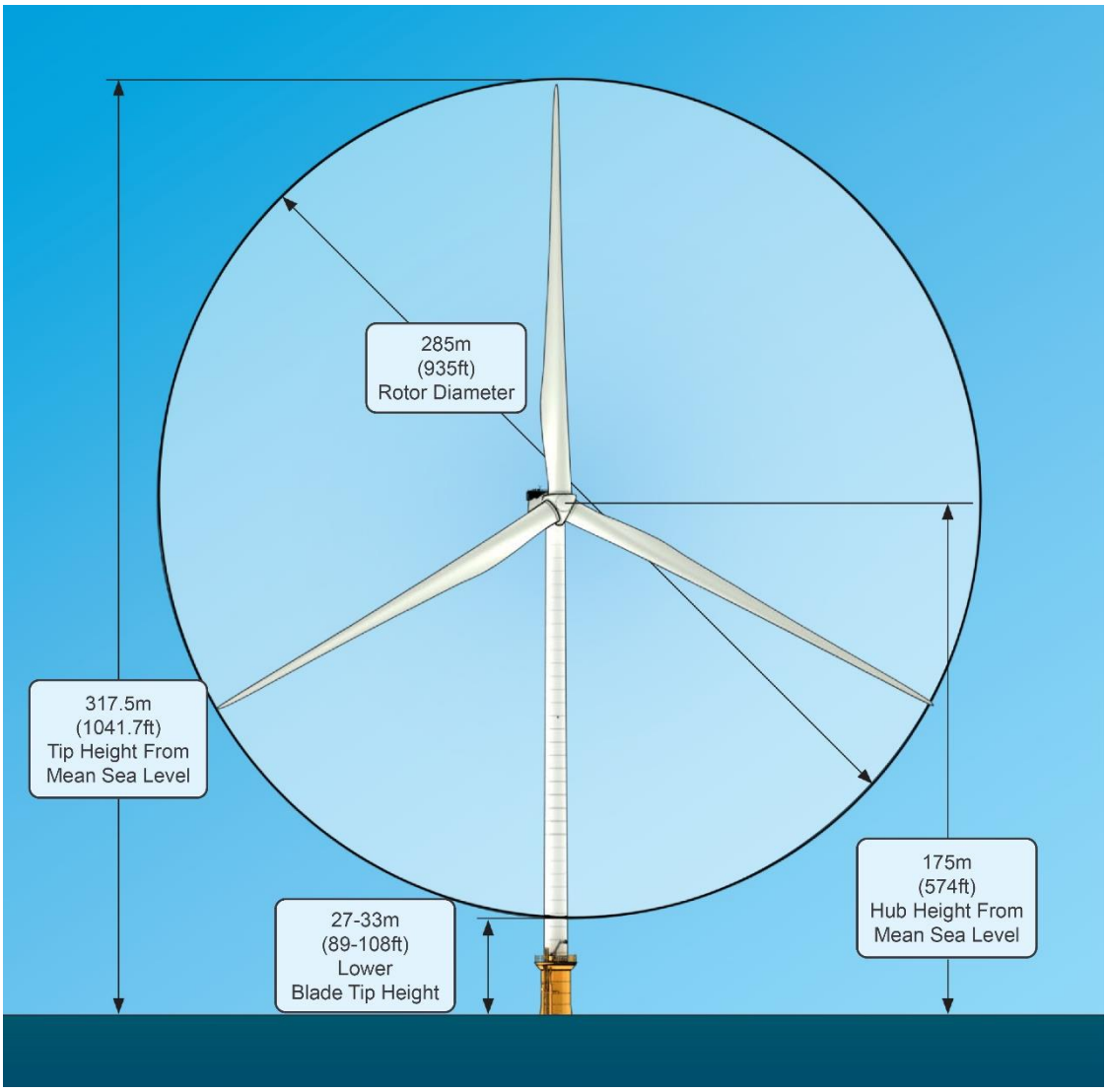


Figure 3. Conceptual Rendering of Maximum WTG Dimensions

1.3.3. Electrical Service Platform

An ESP is an offshore platform containing the electrical components necessary to collect the energy generated by the WTGs (via the inter-array cable system) and step up the voltage for transmission to the Project's onshore substation via the export cable. The purpose of the ESP is to overcome any net effects of the offshore equipment and cables prior to transmitting energy to shore.

To support the Project's maximum design capacity, the Project will require the installation of one ESP. The high-voltage equipment on the ESP is expected to be rated between 66 and 275 kilovolt. The ESP will house equipment for high-voltage transmission, including switchgears, transformers, reactors, and control and monitoring equipment. The ESP will be unstaffed during normal operations but will include facilities and equipment for maintenance personnel and emergency sheltering situations. The maximum design parameters for the ESP includes one platform with a topside height of 50 meters (m) (164 feet [ft]) above the highest astronomical tide. The maximum design parameters of the topside are 80 m (253 ft) in length and 50 m (164 ft) in width.

1.3.4. Offshore Export Cables

The offshore export cables will transfer energy from the ESP to the landfall at Sandbridge Beach in Virginia Beach. The export cable corridor will consist of up to two distinct buried cables, each containing a three-core 275-kilovolt high-voltage alternating-current cable and one fiber optic cable.

1.3.5. Lighting and Marking of Offshore Project Components

The WTGs will have a maximum rotor tip height of 317.5 m (1,042 ft) above mean sea level. The Company will comply with the April 2021 BOEM *Guidelines for Lighting and Marking of Structures Supporting Renewable Energy Development* subject to final design decisions and will work with USCG and BOEM to achieve equivalent levels of safety performance as Aids to Navigation if the 2021 guidance is not practical given final design. BOEM's guidelines are modeled after the FAA's obstruction marking and lighting standards (see Advisory Circular 70/7460-1M) and USCG's recommendations for structure identification, lighting, and sound signal in its *NC, VA, MD, DE, NJ-Atlantic Ocean-Offshore Structure PATON Marking Guidance* (USCG 2020). In accordance with relevant guidance and subject to input from regulators, proposed lighting and marking schemes consist of, but are not limited to, the following:

- All foundation structures will be painted high visibility yellow RAL 1023 up to 15.2 m (50 ft) from Mean Higher High Water.
- Retro-reflective material will be used, visible through a 360-degree arc, and may be applied in at least 0.6-m (2-foot) bands around structures, no less than 9.1 m (30 ft) above Mean Higher High Water.
- Above 15.2 m (50 ft), WTGs will be painted a shade of white between the RAL specifications of Pure White (RAL 9010) and Light Grey (RAL 7035).
- WTGs will be labeled with an alphanumeric marking scheme, determined in coordination with the USCG. Letters will be easily visible using retroreflective material and will be as near to 3 m (10 ft) high as practicable. Lettering will be visible from all directions from the water's surface. The bottom of the alphanumeric characters should be located at least 9.1 m (30 ft) and no more than 15.2 m (50 ft) above Mean Higher High Water.
- Locations of each WTG and the ESP will be provided to the National Oceanic and Atmospheric Administration for inclusion on navigation charts.

- Two synchronized FAA “L-864” red flashing omnidirectional obstruction lights will be placed on the nacelle of each WTG. LED-based red obstruction lights will be visible to pilots using certain night vision goggle systems.
- Mid-level lighting will be placed at or near the halfway point of each WTG tower, consisting of at least three flashing red lights, and synchronized with the nacelle lighting.
- In accordance with USCG and BOEM guidance, lights on Significant Peripheral Structures (e.g., corner WTGs or ESP) will be quick flashing yellow with a nominal range of 9 km (5 nm/5.8 mi). Intermediate Perimeter Structures will flash yellow at 2.5 seconds at a nominal range of 6 km (3 nm/3.4 mi). Inner boundary towers will be marked with flashing yellow lights at 6 or 10 seconds with a nominal range of 4 km (2 nm/2.3 mi). Interior WTGs will be marked with 15-second flashing yellow lights with a nominal range of 2 km (1 nm/1.2 mi). Flash sequences will be synchronized for each structure location. All lighting will be visible to mariners from all directions in the horizontal plane.
- Temporary components preceding the final structure completion will be marked with quick flashing yellow obstruction lights, which will be visible to mariners from all directions in the horizontal plane at a nominal range of 9 km (5 nm/5.8 mi). Other temporary lighting may be utilized for safety purposes as necessary.

1.4. Onshore Components

The offshore export cables will make landfall within a parking lot along Sandbridge Beach, just south of Sandbridge Road in Virginia Beach, Virginia. The ocean to land transition will be installed using horizontal directional drilling (HDD). The onshore export cables will convey the energy produced by the Project from the landfall at Sandbridge Beach to the onshore substation, where the energy will be delivered to the grid. The onshore export cables will consist of underground and/or aboveground components. A single onshore substation and switching station site is located west of the intersection of Corporate Landing Parkway and General Booth Boulevard. The proposed site is located within the Corporate Landing Business Park in a parcel owned by the Virginia Beach Development Authority. The location of the landfall location, substation and switching station site, and the onshore export cable route options are presented in Figure 4 and Figure 5.

1.4.1. Onshore Cable Landfall

The offshore export cables will make landfall within a parking lot along Sandbridge Beach, just south of Sandbridge Road. The ocean to land transition at the landfall will be installed using HDD, which will avoid or minimize impacts to the beach, intertidal zone, and nearshore areas and achieve a burial considerably deeper than any expected erosion. The parking lot near Sandbridge Beach will also serve as the temporary construction staging and operations area.

Figure 4. Onshore Project Overview

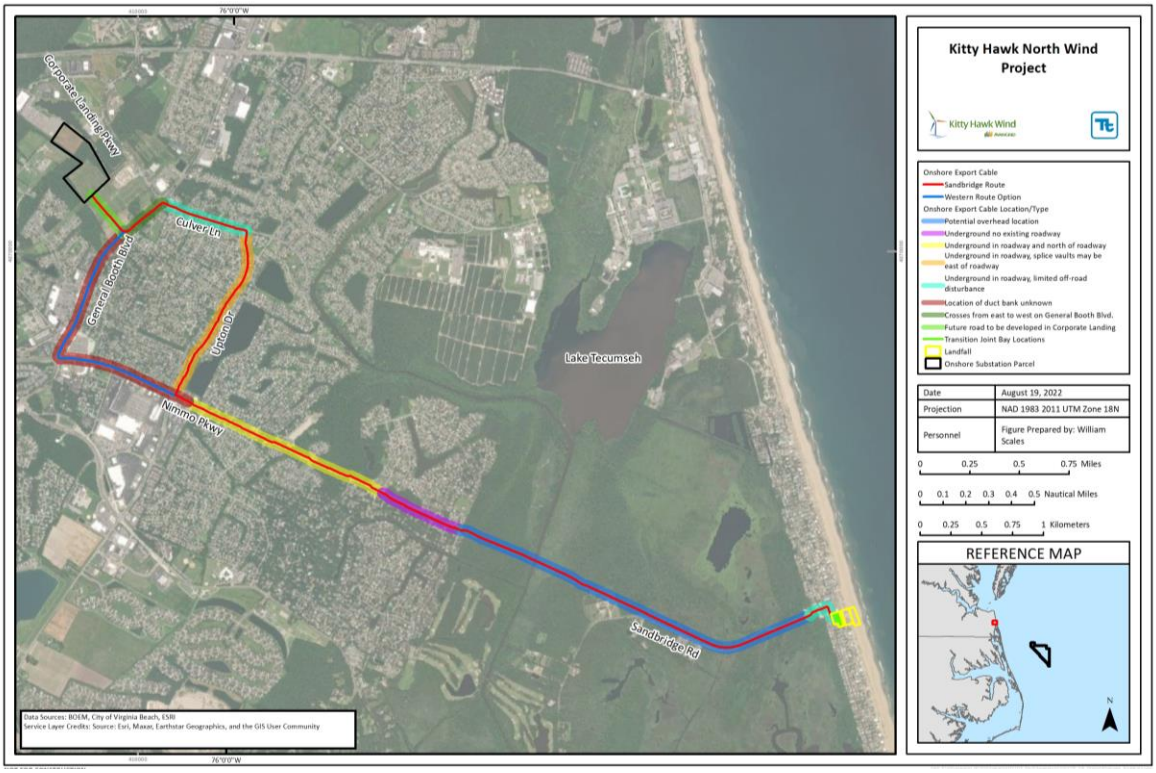


Figure 5. Onshore Export Cable Location and Type

The transition from the onshore export cables to offshore export cables will occur within an underground transition joint bay located directly adjacent to the HDD. After the transition joint bay, the cables will be split into three cable phases and enter the underground duct bank (i.e., an array of plastic conduits encased in concrete).

Following construction, flush-mounted access covers at each transition joint bay onshore will remain aboveground for access, when required. Access to transition joint bays will be restricted to approved personnel. Land surrounding the onshore export cables will be restored to pre-construction conditions. Parking within the lots will be allowed over the top of the underground structures, as the structures will be designed to support the required load rating of the parking facility.

1.4.2. Onshore Export Cables

The onshore export cables will convey the energy produced by the Project from the landfall at Sandbridge Beach to the onshore substation, where the energy will be delivered to the grid. The onshore export cables will consist of underground and/or aboveground components. Multiple onshore export cable routes options are included in the PDE. The route options are identified in Figure 4 and Figure 5 and described below.

From landfall, the Sandbridge route and western route option onshore export cable corridors follow the public ROW for Sandbridge Road west for approximately 1.8 km (1.1 mi), then continues straight northwest along an existing 2.3 km (1.4 mi) utility right-of-way (ROW), crossing Atwoodtown Road and joining Nimmo Parkway. The Sandbridge route option follows Nimmo Parkway for 1.9 km (1.2 mi), turns northeast on Upton Drive for 1.5 km (0.9 mi), then turns west on Culver Lane for approximately 0.7 km (0.4 mi) to General Booth Boulevard. The route then heads southwest on General Booth Boulevard for approximately 0.4 km (0.2 mi) to the onshore substation site. It then turns northwest to cross an empty field to reach the onshore substation site. The western route option follows Nimmo Parkway for 2.9 km (1.8 mi), then turns northeast onto General Booth Boulevard, where it continues for 1.2 km (0.7 mi) and enters the onshore substation site from the southeast.

Preliminary design indicates that the cables may be underground and/or enclosed within City infrastructure. A cross-section of a typical onshore cable is provided in an appendix to the Construction and Operations Plan (COP), Appendix G Conceptual Project Design Drawings.

Alternatively, the onshore export cables may be installed overhead for approximately 3.1 km (1.9 mi) in the portion of the route between Sandbridge Road, next to the water tower, and Atwoodtown Road. The ROW and along the public ROW for Sandbridge Road may be cleared of trees as necessary to support cable installation, up to 46 m (151 ft) in width. Ashville Bridge Creek will be crossed using a trenchless methodology, either aboveground or underground, with a maximum depth of 17 m (56 ft) below ground surface.

If portions of the onshore export cables are installed overhead, new transmission line towers up to 42 m (138 ft) in height would be constructed to support the cables. Final design of the onshore export cables will be informed by technical and engineering requirements, site-specific presence of natural resources, and engagement with federal, state, and local regulatory authorities.

1.4.3. Onshore Substation Site

Energy from the Project will be delivered to the electric grid via a new onshore substation and switching station to be constructed in Virginia Beach. The onshore substation site is located west of the intersection

of Corporate Landing Parkway and General Booth Boulevard. The proposed site is located within the Corporate Landing Business Park in a parcel owned by the Virginia Beach Development Authority.

The area is bordered by a parking lot to the northwest, a stormwater management facility to the north, an overhead high-voltage transmission line and agricultural fields to the south and east, and wooded area to the south and west. A single residential property is bordered by the site and is shielded from the onshore substation by a wooded area.

The onshore substation and switching station will be located immediately adjacent to one another on a shared site. Two transmission structures will connect the electrical infrastructure between the onshore substation and switching station. The transmission structures may reach up to 42 m (138 ft).

The onshore substation site will contain electrical and control equipment, some of which will be enclosed in buildings or walled structures. The indicative height of the tallest electrical component would be 26 m (85 ft), which may be taller than the height of the surrounding trees on the northeast and southwest sides of the site. Lightning masts may reach 29 m (95 ft) in height. The facility will be compliant with Virginia Beach building codes, electrical standards, and environmental regulations.

1.5. Regulatory Framework

The potentially affected areas fall within federal waters of the United States and state waters of Virginia. Prior to TJD&A's involvement, the Project had coordinated with stakeholders that have an interest in visual and related resources. As noted in Appendix B of the COP – Summary of Agency and Stakeholder Engagement – meetings were held between 2018 and 2021 with a wide variety of stakeholders, including BOEM, National Park Service (NPS), North Carolina Historic Preservation Office, Virginia Department of Historic Resources, City of Virginia Beach, representatives from Nansemond Indian Nation, Chickahominy Tribe, Pamunkey Tribe, and others.

There are a variety of federal, state, and local laws, ordinances, and regulations and agency policies and management plans concerning seascape/landscape and visual resource protection and management that may apply to offshore wind projects. The WTGs, ESP, and inter-array cables will be located entirely within federal waters of the United States and are under the jurisdiction of BOEM. The offshore export cables from the ESP to the landfall will be located in both federal waters and the state waters of Virginia.

The following sections outline the local and state regulations relevant to the Project. The Company will work with the various agencies to ensure all Project components are in compliance with the applicable regulations.

1.5.1. State of Virginia: Coastal Zone Management Program

Pursuant to the Coastal Zone Management Act, the National Oceanographic and Atmospheric Administration approved the Virginia Coastal Zone Management (CZM) Program in 1986. Federal activities that are reasonably likely to affect any land or water use or natural resources of Virginia's designated coastal resources management area must be consistent with the enforceable policies of the CZM Program. The Program is networked with several agencies administering the enforceable policies. Virginia also has several advisory policies that were established to serve as a discretionary guide during project planning. As the lead agency for the CZM Program, the Department of Environmental Quality is responsible for coordinating the Commonwealth's review of federal consistency determinations and certifications with cooperating agencies and responding to the appropriate federal agency or applicant.

The federal consistency regulations implement the Coastal Zone Management Act requirement that federal actions that have reasonably foreseeable effects on any land or water use (e.g., scenic and aesthetic enjoyment) or natural resource of the coastal zone must be consistent with the enforceable policies of the Virginia CZM Program before they can occur.

The Company prepared and submitted a federal consistency certification pursuant to the Federal Coastal Zone Management Act and relevant Coastal Zone Management Act regulations to Virginia Department of Environmental Quality as part of the COP submittal.

1.5.2. Virginia Byways

A "Virginia byway" is defined as a road, designated as such by the Commonwealth Transportation Board, having relatively high aesthetic or cultural value, leading to or within areas of historical, natural or recreational significance. In selecting a Virginia byway, the Commonwealth Transportation Board and the Director of the Department of Conservation and Recreation shall give preference to corridors controlled by zoning or otherwise, so as to reasonably protect the aesthetic or cultural value of the highway (Code of Virginia § 33.2-406, VLIS 2009).

The Virginia Department of Transportation partners with the Virginia Department of Conservation and Recreation in evaluating roads for byway designation. Request for designation may be submitted to either Virginia Department of Transportation or Virginia Department of Conservation and Recreation. Anyone may request a byway be designated but the local government(s) must adopt a resolution of support for the designation. A road segment must substantially meet the following criteria to be considered for designation:

- The route provides important scenic values and experiences.
- There is a diversity of experiences, as in transition from one landscape scene to another.
- The route links together or provides access to scenic, historic, recreational, cultural, natural and archeological elements.
- The route bypasses major roads or provides opportunities to leave high-speed routes for variety and leisure in motoring.
- Landscape control or management along the route is feasible.
- The route allows for additional features that will enhance the motorist's experience and improve safety.
- Local government(s) has/have initiated zoning or other land-use controls, so as to reasonably protect the aesthetic and cultural value of the highway.

The Virginia Byways program designates and promotes scenic byways throughout the state. It does not affect land use controls, nor does it limit road improvements. It may limit the placement of outdoor advertising signs (Scenic Virginia 2022).

A section of Sandbridge Road in Virginia Beach (from the shoreline to New Bridge Road) is part of the Green Sea Byway that was designated by the Commonwealth Transportation Board in 2003. The byway extends from Back Bay National Wildlife Refuge (NWR) to Princess Anne Road at the Creeds neighborhood in Virginia Beach and forms a semicircular route around Back Bay.

1.5.3. City of Virginia Beach Zoning Ordinance

Most of the property in Corporate Landing Business Park – including the site for the onshore substation and switching station – is zoned I-1 Light Industrial District. Public utility transformer stations and major transmission lines and towers (fifty thousand [50,000] volts or more) are permitted as a conditional use within this district.

Section 221. Procedural requirements and general standards for conditional uses. This section of the ordinance requires a finding by the City Council that the proposed conditional use consider (among other matters) screening and buffering to assure compatibility with the neighborhood in which is to be located.

Section 1003.a Landscape Screening and Buffering Regulations. This section of the ordinance requires a twenty-five-foot minimum yard with landscape screening along all lot lines if the land in a I-1 District adjoins a residential or apartment district without an intervening street, alley or body of water over twenty-five (25) feet in width. No other uses or structures are permitted in such yards.

1.5.4. City of Virginia Beach Site Plan Ordinance

The City of Virginia Beach Site Plan Ordinance requires a site plan review of most uses permitted by the Zoning Ordinance. As part of the site development plan the ordinance requires a landscape design and land use buffer plan in accordance with the design standards of the Department of Planning. (Section 4.1.B.10). The ordinance also requires transitional buffers between incompatible land uses (Section 5.5). All installations shall be in accordance with applicable codes and the Public Works Design Standards Manual (Section 5.16).

1.5.5. City of Virginia Beach Public Works Design Standards Manual

The Design Standards manual provides the City of Virginia Beach Public Works design standards for construction within existing City of Virginia Beach ROWs, easements, and other City owned property. This manual is a supplement to other City ordinances (such as City Zoning, Site Plan, Subdivision, etc.) referenced within the sections and does not, in any way, waive specific requirements of such ordinances. This manual provides flexibility for items such as design parameters, accepted engineering practices, and operational requirements as long as the goals of longevity, long term economy, functionality, reasonable maintenance, and other sound engineering practices of the system are met. These design standards are also intended to be flexible and adaptable as new materials, equipment, and methods become available.

While the 353-page manual does not specifically describe aesthetic treatments or visual resource protection, per se, it does provide standards for tree protection within public ROWs that may be applicable to the location and installation of the onshore cable route, substation, and switching station.

1.5.6. Corporate Landing Business Park Design Criteria

The onshore substation and switch will be located in Virginia Beach at an approximately 13 ha (32 ac) site in Corporate Landing Business Park. The Business Park was established in 1990 as a planned commercial development on 132 ha (325 ac) of land between General Booth Boulevard and Dam Neck Road. The Business Park has a campus-like setting with high quality buildings set into a manicured landscape. The Business Park is home to a professional offices and major regional corporate headquarters, including GEICO, Groundworks, and Lockheed Martin.

The Virginia Beach Development Authority established Design Criteria to provide guidance on land use, site design, building design, landscaping, lighting, and signage to ensure a unified quality environment.

The Virginia Beach Development Authority maintains the right to approve land uses within the Business Park. Development of property and buildings within Corporate Landing is governed by (but not limited to) the following requirements and restrictions:

- The Virginia Uniform Statewide Building Code;
- The recorded Zoning Proffers of the Virginia Beach Development Authority;
- The City of Virginia Beach Public Works Design Standards and Specifications, as amended; and
- The City of Virginia Beach Zoning and Subdivision Ordinances, as amended.

The Business Park's Design Criteria include provisions for setbacks and lot coverage, grading and drainage, parking, fencing, utilities, planting, lighting, signage, and buildings (design, orientation, materials, and color). Site plans are to be approved by the Virginia Beach Development Authority and the City of Virginia Beach and other public agencies having jurisdiction. The Design Criteria spells out development procedures, application requirements, and the review and approval process,

1.5.7. State of North Carolina: Coastal Zone Management Program

Coastal wind energy activities located within three nautical miles of the North Carolina shoreline are subject to North Carolina's Coastal Management Program, administered by the North Carolina Department of Environmental Quality's Division of Coastal Management. The Company prepared and submitted a federal consistency certification pursuant to the Federal Coastal Zone Management Act and relevant Coastal Zone Management Act regulations to Virginia Department of Environmental Quality as part of the COP submittal. Although no Project components are proposed to be sited in the State of North Carolina or within North Carolina state waters, the Project will be consistent with the enforceable policies of North Carolina's federally-approved coastal zone management program.

1.5.8. Currituck County Land Use Plans

The North Carolina Coastal Area Management Act requires that each of the twenty coastal counties prepare and adopt a land use plan. In 2005 Currituck County adopted the Currituck County Land Use Plan Update, prepared in accordance with the requirements of Coastal Area Management Act and the North Carolina Coastal Resources Commission Land Use Planning Requirements. The Land Use Plan is intended to provide a framework to guide local government officials and private citizens as they make day-to-day and long-term decisions affecting development. The Plan contains information about the physical appearance of Currituck County as it exists today, what directions the County should take in the future and the steps that need to be taken to get there.

In 2021, in the face of shifting demographics, increased growth, and opportunities for new development, Currituck County adopted Imagine Currituck 2040 Vision, which replaces the 2006 County Land Use Plan. While this document provides a comprehensive look a existing conditions and future growth, its jurisdiction only extends out to the three nautical mile limit of state waters, and is, thus, not applicable to the Project.

2. Methodology

The visual impact assessment (VIA) provides a systematic analysis of the visual effects that may be caused by the visible components of the proposed Project. The analysis examines: (1) visual changes to the existing seascape and landscape, and (2) potential effects of the Project on the viewing public.

The VIA methodology uses the following outline to arrive at an assessment of the visual impact of the proposed Project:

- **Study Area Identification**: Determination of theoretical geographic extent of Project visibility based on WTG height, Project location, and curvature of the earth.
- **Computer-Based Viewshed Analysis:** Identification and mapping potential Project visibility, according to computer-based viewshed analyses.
- **Scenic Resource Identification**: Identification and mapping of publicly accessible scenic resources and where viewers may have an elevated sensitivity to visual change.
- **Fieldwork and Site Photography:** Physical documentation of the study area to gain a better understanding of the landscape, seascape, user groups, and areas of potential visibility. Conducted through site visits, personal observations, photography, and written documentation.
- **Character Area Identification**: Classification of the landscape/seascape within the study area into defined when s as part of a comprehensive analysis of potential impacts.
- **Viewer Identification**: Identification of current human use in the open ocean/ seascape/landscape and a characterization of the people who may have views of the Project components.
- **Selecting Key Observation Points (KOPs)**. Selection of individual locations (KOPs) to represent views from various landscape/seascape Character Areas where the Project may be visible. At least one visualization is provided for each representative viewpoint.
- **Visualizations**. Preparation of photosimulations of the Project from KOPs to accurately portray the visual effect that the Project may have on the seascape/landscape.
- **Determination of Visual Impacts to Landscape/Seascape.** Assessment of the visual change to the landscape/seascape Character Areas and the open ocean that will result from the Project.
- **Determination of Visual Impacts to Viewers**. Assessment of the effect that the Project may have on viewers continued use and enjoyment of the seascape/landscape and open ocean at each of the KOPs.
- **Mitigation Measures**. Identification of mitigation measures that have been or will be taken to address the potential visual impact of the Project on the seascape/landscape and open ocean and the viewer groups.
- **Overall Impact Assessment**. The summary analysis of a) the anticipated visual change to the seascape/landscape and open ocean that may be affected by the Project and b) the effect that it may have on viewers.

2.1. Visual Study Areas

The visual study areas represent the areas of theoretical Project visibility, based upon the maximum height of Project components, the location of the Project relative to the observer (distance zones), the effects of curvature of the earth, and topographic variability. It is important to recognize that the study area does not represent places where the Project would necessarily be visible, but rather is a starting point for further investigation through computer-based viewshed analyses, field observations, and visualizations to more accurately define the limits of Project visibility. The study area is used to define the area for fieldwork, scenic resource identification, computer-based viewshed analyses, and landscape character assessment.

There are three individual study areas identified in this VIA: (1) the offshore visual study area, (2) the onshore substation site visual study area, and (3) the onshore export cable route study area.

2.1.1. Offshore Visual Study Area

For the offshore study area, the theoretical limit of Project visibility is based on the proposed WTG hub height (where the FAA-required aviation obstruction lighting would be located) and the screening effect caused by the curvature of the earth. Based on the BOEM Guidance Document, a highly conservative 74 km (40 nm/46 mi) radius around the WTG array was used to define the theoretical limit of Project visibility (study area). The geographic scope of the study area extends from north of False Cape State Park in Virginia Beach, Virginia to the northern end of Cape Hatteras National Seashore south of Nags Head, North Carolina. The total size of the study area is 22,118 square kilometers (km^2; [8,540 square miles (mi^2)]. This includes 1,450 km^2 (560 mi^2) of land area and 20,668 km^2 (7,980 mi^2) of water, including open ocean and sounds. Figure 6 shows the extent of the offshore visual study area with the land area highlighted.

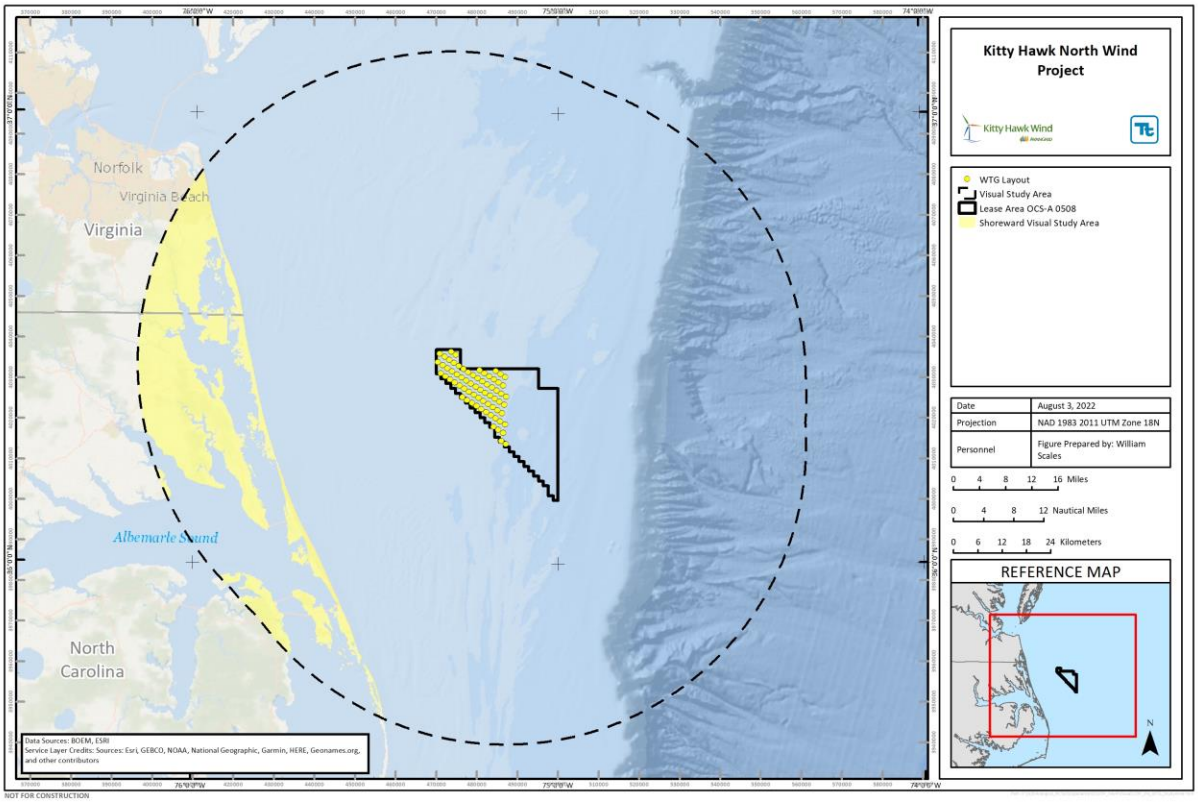


Figure 6. Offshore Visual Study Area and WTG Layout

Due primarily to the curvature of the earth and the screening effects of sand dunes and seaside vegetation, potential visual effects will be concentrated along the shorefront within the Outer Banks with minor visibility in Currituck Sound. The effect of earth curvature is diagrammatically represented in Figure 7 below.

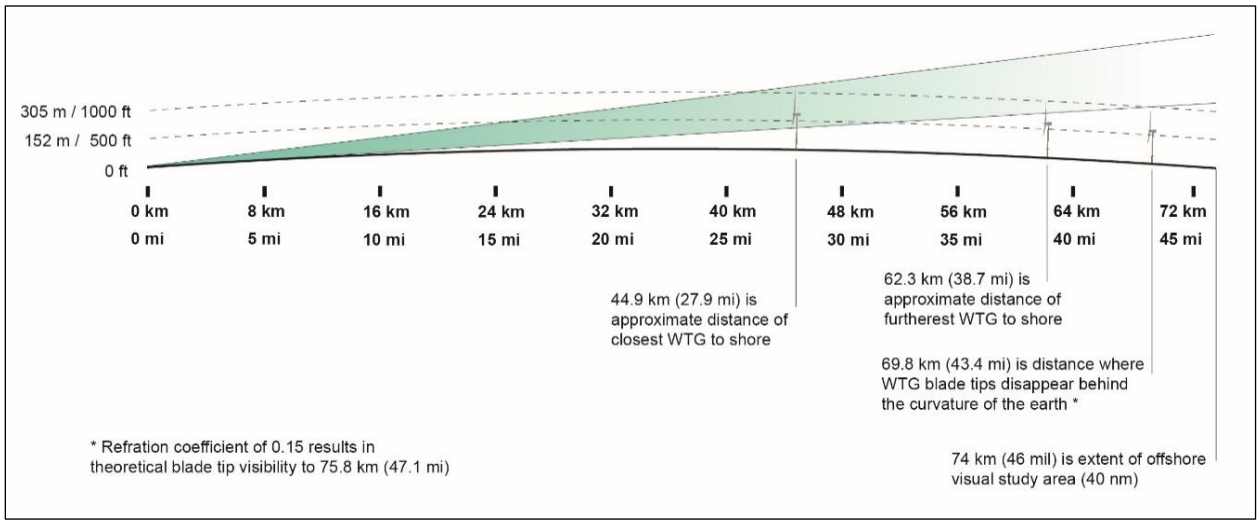


Figure 7. Earth Curvature Diagram

2.1.2. Onshore Substation Site Visual Study Areas

The aboveground infrastructure includes the substation site and may include an aboveground portion of the export cable route. The visual assessment study area for the aboveground infrastructure includes land within a 1.6 km (1 mi) radius around the proposed substation site parcel. This distance is based on field evaluations and consideration of the height and character of the substation components (buildings, transmission structures, and lightning masts), existing conditions in the immediate vicinity of each site, existing vegetation that could screen Project components, and commercial and residential land use patterns in the area surrounding the sites.

The underground infrastructure includes the landfall location and the majority of the export cable route options. The visual study area for underground infrastructure is limited to the land within the utility ROW and the land immediate adjacent to the cable routes.

Based on the guidelines for aboveground and underground onshore infrastructure noted above, the following study areas are used:

- Onshore Substation Site: 1.6 km (1 mi) radius around the parcel.
- Aboveground Export Cable Route Option: 1.6 km (1 mi) radius around the utility ROW.
- Underground Export Cable Route Option: Landscape immediately adjacent to the utility ROW.

2.2. Computer-based Viewshed Analysis

The computer-based viewshed analysis examines potential visibility of offshore and onshore Project components using topographic and surface models of the study area landscape. The analysis is a predictive screening tool used to identify areas where Project components may be potentially visible.

The analysis relies on a Digital Surface Model (DSM) to represent topography and surface features, such as vegetation, buildings, and other structures in the landscape. A diagrammatic cross section of the viewshed analysis is provided in Figure 8**.** The section depicts how various points in the landscape may or may not have views of an offshore WTG based on the surface modeling and vegetative cover.

The viewshed analysis was conducted using ESRI ArcGIS Pro software. The DSM used to represent the landscape in the viewshed analysis are derived from LiDAR point cloud data, which was taken from The National Map produced by the U.S. Geological Survey (USGS)[1]. The point cloud data was processed to create 10-foot square resolution surface raster models. A viewer height of 1.8 m (5.9 ft) above the terrain was assigned to represent the eye level of a typical viewer in the landscape.

In the viewshed analysis, Project components are counted as 'visible' if the computer determines that a single point on the component would be seen from a point on the ground and not blocked by topography, vegetation, or buildings. This analysis also accounts for the variable effect of refraction.

There are shortcomings to computer-based viewshed analysis. It does not determine the degree of visibility based on distance, weather, or other meteorological and oceanic conditions. As an initial screening tool, it is used to determine the geographic extent of Project visibility, identify visually sensitive resources with potential visibility, and select places to conduct field investigations to further our understanding of Project visibility.

[1] The National Map produced by the U.S. Geological Survey is available here: https://viewer.nationalmap.gov/basic/

The viewshed analysis was not completed for the open ocean because there is no surface data available for the ocean and it is understood that the offshore Project components will be visible from all areas of open ocean within the study area east of the Outer Banks.

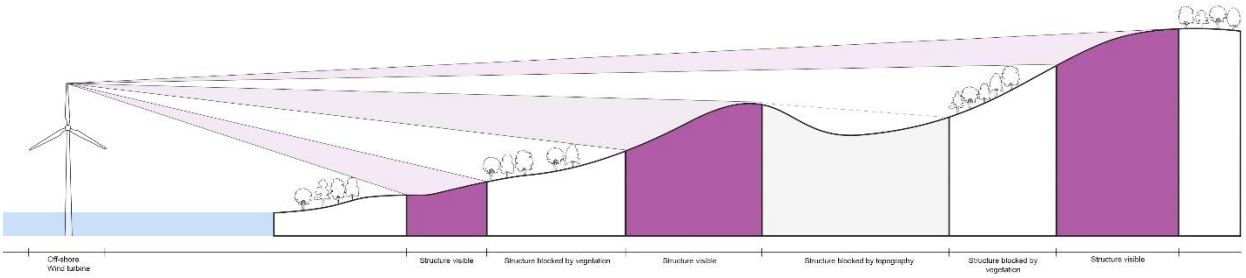


Figure 8. Diagrammatic Viewshed Analysis Cross Section

2.2.1. Offshore Viewshed Analysis

A viewshed analysis was conducted three times, using different parameters: 1) potential visibility of WTG blade tips based on a topographic model analysis; 2) potential visibility of the blade tips based on topographic and surface models; and 3) potential visibility of WTG hubs (and the FAA-required aircraft warning lighting) based on topographic and surface models. The Area of Potential Visual Impact (APVI) is the area in the landscape where WTG hubs may be potentially visible when using both topographic and surface data.

Topographic Model Viewshed Analysis of Blade Tips. This viewshed analysis modeled the potential visibility of the blade tips based only on the digital terrain model (DTM). This analysis presents a worst-case scenario, illustrating potential areas of visibility based on bare-earth conditions, i.e., if there were no intervening vegetation or structures in the landscape. The model also assumes that blades would be visible throughout the study area. While this may be true in theory, the thinness of the blades, especially the blade tips, makes it very difficult for the average observer to recognize at most distances in the far background (i.e., greater than 24 km [15 mi / 13 nm]). The motion of rotating blades may be visible up to a distance of 40 to 48 km (25 to 30 mi / 22 to 26 nm) (Sullivan 2013). Even though this analysis presents an unrealistic representation of potential visibility, it does identify areas where topography alone may block views of the Project. See Map 01 in Attachment 1.

Surface Model Viewshed Analysis of Blade Tips. The second viewshed analysis modeled the potential visibility of the blades based upon both the DTM (topography) and DSM (structures and vegetation). This is a more accurate analysis, as it takes into account features in the landscape beyond topography that would block views of the WTGs. Intervening buildings and vegetation in the relatively flat landscape that is characteristic of the Outer Banks play an important role in screening the Project, making the DSM essential to include in the computer-based analysis. See Map 02 in Attachment 1.

Viewshed Analysis of Hubs. The third viewshed analysis modeled the potential visibility of the hubs and the FAA aviation obstruction lighting, based upon both the DTM (topography) and DSM (structures and vegetation). This is the most realistic depiction of potential Project visibility, since the hubs and the aviation lighting will be more visible than the blades, due to the greater mass of the hub and the color contrast of the lighting.

The viewshed data for the WTG hubs and the blade tips was combined into a single map to illustrate the difference between the areas of potential visibility. Areas with potential visibility of the blades but not the

WTG hubs (and FAA aviation obstruction lighting) are represented in purple; areas where there is potential visibility of both WTG hubs and blade tips are represented in pink. See Map 03 in Attachment 1. Enlargements of this analysis are provided in greater detail to show visibility on the shoreline.

2.2.2. Onshore Viewshed Analysis

A viewshed analysis was conducted for the onshore substation and switching station infrastructure to determine where the Project components may potential be visible within 1.6 km (1 mi) from the substation and switching station parcel (the onshore visual study area).

The viewshed analysis of the onshore substation and switching station is based on the following indicative height assumptions:

- Substation and switching station electrical infrastructure: 26 m (85 ft).
- Substation and switching station lightning masts: 29 m (95 ft).
- Transmission structures located between the substation and switching station: 42 m (138 ft).

The analysis relied upon both the DTM (topography) and DSM (structures and vegetation) within the study area. The full extent of the substation site parcel was cleared from surface data to reflect the potential clearing of trees on the parcel.

2.3. Scenic Resources

Scenic resources are formally designated public places that are visited by the public in part for the observation and enjoyment of their natural or cultural visual qualities. Scenic resources include units of NPS, NWRs, State Parks, conservation areas, historic sites, accessible waterbodies, community parks and beaches, and other areas identified by national, state, or local governments and organizations as having visual or cultural significance.

The states of Virginia and North Carolina do not maintain a specific database of scenic resources. To develop a comprehensive list of resources within the study area, data was collected from a variety of state databases. A total of 283 scenic resources were identified in the offshore study area. A total of 11 scenic resource were identified within the onshore study area; a total of 4 resources were identified in the study area for the onshore export cable routes.

All scenic resources were spatially mapped and are listed in a table in Attachment 2. Scenic Resource Identification. This table identifies the distance between the Project and individual resources and identifies which resources have potential visibility according to the viewshed mapping analysis.

2.4. Field Investigations

Field investigations were conducted within the offshore and onshore study areas to document and photograph existing conditions. The viewshed maps indicated places to document potential views of offshore Project components. Most of the fieldwork was concentrated along the coastline within 64 km (40 mi / 35 nm) of the WTGs, where views of the Project would not be obstructed by topography, vegetation, or structures.

TJD&A professionals conducted fieldwork between June 21 and June 25, 2021. During that time the team visited the substation site and all the KOPs at least once, and in several cases multiple times. Photographs were taken throughout the day from early in the morning to well after dark to capture the varying light conditions found on the Outer Banks. In addition to thoroughly covering the Outer Banks,

the team photographed sites on the western edge of Currituck Sound where viewshed mapping indicated potential visibility. In keeping with the BOEM Guidance Document, field investigations were designed to visit representative sites throughout the study area to gain an appropriate understanding of the Character Areas that may be affected by the Project.

Additional fieldwork was conducted between May 15 and May 20, 2022 in response to data requests by BOEM and to supplement the Project team's understanding of certain KOPs.

2.4.1. Photography

An extensive series of photographs (in jpeg format) were taken throughout the onshore and offshore study areas, using a Nikon D750 (24.3-megapixel, full frame camera, with a 50mm lens) and a Nikon Z6 (24.5-megapixel, full frame). Each camera was equipped with a GPS unit (Solameta GMAX GPS Geotagger) to record latitude and longitude, elevation, and bearing for each image.

Two types of photographs were taken during field visits: 1) context photographs to illustrate site conditions and community character in the vicinity of the KOP; scenic resource; scenic views from and to the resource; vegetation patterns that may affect Project visibility; and noteworthy structures that contribute to the character of the resource or may affect Project visibility; and 2) visualization photographs used to develop computer-generated images representing views of the Project.

For visualization photographs, the Nikon D750 was equipped with 50mm lens that matches the image seen by the human eye. A series of overlapping photographs were taken at each site to create panoramic views to illustrate land uses and activities in the vicinity of the scenic resource and to give a more inclusive view of how viewers see the landscape/seascape. While a 50mm lens mimics what the eye sees, panoramic views are better at depicting the head-moving scanning technique people use when viewing a landscape.

Photographs were all taken with the cameras set at large size/highest quality to allow the resultant imagery and visualizations to be enlarged into poster-size displays for public presentations as necessary.

2.4.2. Data Collection

Field notes were documented in the field on iPads using an ESRI Collector application with a customized fieldwork collection table. As each site was documented, the ESRI Collector application generated a point and unique identification number. Data collected included the latitude/longitude and ID number, scenic resource, weather conditions, Character Area, landscape features, site amenities, user groups, general observations, etc.

While in the field, TJD&A staff had access to a digital ESRI map showing their GPS location, the offshore Project Area, scenic resources, municipal boundaries, aerial imagery, and the viewshed analysis maps, which enabled them to identify their location in relation to the Project and nearby scenic resources. TJD&A staff was also able to see whether they were within the area of potential visibility (per the viewshed analysis), which allowed them to verify the accuracy of the computer-based viewshed analysis.

2.5. Landscape / Seascape Character Areas

The visual study area for the offshore Project components is a vast area composed of a variety of landscape and seascape typologies. The study area landscape was classified into distinct Character Areas according to existing conditions to allow for a more detailed visual assessment of the potential

impact on the landscape. The Character Areas were preliminarily determined from map analysis prior to fieldwork. Field investigations and photography confirmed the location and definition of each of the Character Areas.

Character Areas are discrete geographic areas within the study area with similar physical features, use patterns, identities, ecological characteristics, and proximity to ocean views. The Character Areas provide a more specific description of the existing landscape and provide a framework to systematically analyze potential visual effects throughout the study area. The definition and geographic extent of the Character Areas was based on fieldwork observations and interpretation of aerial imagery.

2.5.1. Character Area Identification

The six Character Areas described in the VIA are classified by the relationship between water and land and are further subdivided into sub-categories:

Seascape Character Areas (SCA) include those places where both the land mass and the dominant waterbody contribute to its identity and physical characteristics. Three distinct areas are recognized as Seascape Character Areas.

- **Developed Beachfronts (SCA).** The beachfront, dune system, and adjacent residential and commercial development located within the developed areas of the Outer Banks. The developed areas adjacent to the beach afford views of the ocean – usually starting on the second floor – by virtue of building design, height, and orientation.
- **Natural Beachfronts (SCA).** Undeveloped dune systems and sandy beaches that are found in protected locations throughout the length of the Outer Banks. Natural beachfronts are often part of a larger Conservation Area and/or public accessways that allow visitor use.
- **Sounds (SCA).** Waterbodies and adjacent shorefront on the west side of the Outer Banks.

Landscape Character Areas (LCA) are similar to SCAs, without the presence of the ocean or sound. Two distinct areas are recognized as Seascape Character Areas.

- **Conservation Areas (LCA).** Designated places of state or national significance that have been established to protect wildlife habitat, scenic areas, or historic resources, while providing an abundance of outdoor recreational opportunities. Portions of these areas are also considered Natural Beachfront where they have frontage on the Atlantic Ocean.
- **Coastal Communities (LCA).** The residential and commercial areas located on the barrier island land masses and set back further from the ocean than the Developed Beachfront.

Open Ocean Character Areas (OCA) is the Open Ocean, with minimal views of any land mass. The boundary between the open ocean and the seascape Character Areas is approximately 5.6 km (3.5 mi) from the shoreline at mean high tide.

2.5.2. Character Area Mapping

The Character Areas were mapped based on the Character Area descriptions provided in the above section. This mapping was completed manually in ArcMap and generated as geospatial file. The Character Area map is provided in Figure 9 and Figure 10.

The geospatial mapping of the Character Areas was used to generate a statistical analysis with the viewshed data to determine the geographic extent of visibility within each Character Area. The total area of potential visibility of the offshore components within each Character Area is provided in Table 17.

2.6. Key Observation Points

A total of eleven Key Observation Points (KOPs) were used to illustrate the visual change to the landscape/seascape resulting from the Project. The KOPs were selected prior to TJD&A's involvement and had previously been reviewed with BOEM, NPS, North Carolina Historic Preservation Office, Virginia Department of Historic Resources, and Tribes. The photo location for each KOP was based on input from BOEM resource personnel and observations during TJD&A fieldwork.

KOPs were selected to provide representative images from (1) a well-distributed range of scenic resource locations, especially along the beachfronts; (2) varying viewing distances; (3) different viewer elevations; and (4) a variety of Character Areas where there would be Project visibility.

KOPs were selected to illustrate potential effects on (1) representative views encountered throughout the study area (e.g., views from beaches and fishing piers); (2) specific scenic resources that are widely known and visited by the general public (e.g., lighthouses, state parks, and units of the NPS); and (3) the variety of viewer activities that are typically found along the Outer Banks. All locations were publicly accessible, although many required an access fee. No attempt was made to evaluate private residential properties or restricted locations (e.g., military installations).

The following is a list of the KOPs that were selected for visualizations and analysis of the visual effect of the Project. The list is ordered from north to south and includes the Character Areas where they are located.

1. False Cape State Park, Virginia Beach, Virginia (Natural Beachfront)
2. Currituck Beach Lighthouse, Corolla, North Carolina (Conservation Area)
3. Corolla Village Road Beach, Corolla, North Carolina (Developed Beachfront)
4. Southern Beach Access, Corolla, North Carolina (Developed Beachfront)
5. Hillcrest Beach, Southern Shores, North Carolina (Developed Beachfront)
6. Kitty Hawk Pier, Kitty Hawk, North Carolina – (Developed Beachfront)
7. Avalon Fishing Pier, Kill Devil Hills, North Carolina (Developed Beachfront)
8. Wright Brothers National Memorial, Kill Devil Hills, North Carolina (Conservation Area)
9. Jockey's Ridge State Park, Nags Head, North Carolina (Conservation Area)
10. Jennette's Pier, Nags Head, North Carolina (Developed Beachfront)
11. Bodie Island Light Station, Nags Head, North Carolina (Conservation Area)

2.7. Visualizations

Visualizations (also known as photosimulations) combine photographs of existing conditions with computer-generated models of Project components to illustrate how it will appear from the selected KOPs and the surrounding landscape. These are accurate representations of proposed future conditions that consider topography, vegetation, structures/buildings, curvature of the earth, refraction, and other factors to help reviewers understand the visual effect that the Project may have on the landscape/seascape.

A total of 15 visualizations were developed for the 11 identified KOPs to show variations in weather and lighting conditions. A list of all visualizations is provided in Table 19. The visualizations are presented in Attachment 3.

Photography. Photographs were taken at different times of the day / evening / night and under different weather conditions to illustrate the effect that changing light patterns will have on Project visibility. Photographs were all taken with a Nikon 750 (24.3 megapixel) mounted with a 50mm (i.e., normal) lens.

Due to the relatively narrow horizontal field of view (HFOV) that the Project area will be visible over, a single photograph is used to illustrate the visual effect at each KOP.

Panoramas. In addition to "normal" images, each viewpoint also includes a panoramic view that put the visualization into a wider context, showing the landscape/seascape and open ocean that surrounds the Project. The set of images for each KOP also includes an aerial photograph that indicates the location of the photograph used for the visualization and a series of additional photographs of surrounding land uses, points of interest, and people engaged in various activities at the resource.

WTG Orientation. While the wind direction in the vicinity of Cape Hatteras is variable throughout the year, the predominant wind direction is from the southwest, as noted in Figure 15. The central and southern KOPs (V04 to V11) are generally located southwest of the Project, which has a lead of the array oriented northwest to southeast. With the wind from the southwest, most of the WTGs seen from the central southern KOPs appear head-on (i.e., facing into the wind) in the visualizations, thus providing the most conservative view. KOPs V01- V03 at the northern end of the study area are located west of the Project, which means the southwest facing WTGs show the rotor and blades at an angle (not parallel with the shoreline). Additional visualizations are provided for KOP V02 and V03 (Currituck Lighthouse and Corolla Public Beach) with blades oriented to face a westerly wind to illustrate the most conservative view. (A westerly wind simulation from False Cape State Park (V01) was not provided, since project visibility will be negligible at a distance of over 53 km [33 mi /29 nm].) The blades were also rotated by the computer to various positions to represent the random blade patterns that an observer typically might see at any single point in time.

Curvature of the Earth/Refraction. Because the Project is located at distances exceeding 43 km (27 mi / 23 nm) from the Outer Banks, curvature of the earth is a major factor in determining Project visibility. This phenomenon was taken into account to determine how much of the WTGs would be visible above the horizon from each of the viewpoints. A generally accepted value for atmospheric refraction (the bending of light as it passes through the atmosphere) was used to modify the effects of curvature of the earth. This phenomenon recognizes that under certain atmospheric conditions, objects that would normally be below the horizon may be visible. Refraction is a variable phenomenon – dependent upon optical conditions, temperature, and barometric pressure. By taking refraction into account, the visualizations are depicting the worst-case scenario for Project visibility.

Model-Image Alignment. The photographs used for the visualizations were aligned to the 'camera view' in the 3D computer-generated model. The location coordinates of each photograph were set to the location coordinates recorded by the GPS device mounted on the camera. The 'camera view' was set to the 50mm focal length of lens used in the original photograph. The camera height was set by adding five feet to the digital surface terrain to reflect the viewing height of a camera mounted on the tripod. The view direction was set to match the existing photograph by using vertical and horizontal control points where visible in both the image and the aerial photographs. For example, the edge of recognizable landscape features (e.g., fences, lifeguard stands) in the photograph were geolocated and modeled to accurately align the bearing of the photograph with the 3D model. The alignment was done in both Google Earth Pro and Autodesk 3D Studio Max Design (3ds Max) to ensure maximum accuracy.

Rendering. Project components were rendered in 3ds Max, which takes into account the surface materials, sun position and intensity, day of the year, time of day, weather conditions, distance from the observer, and other variables that may affect the appearance and visibility of the Project. For the evening and nighttime visualizations, Project lighting was represented in accordance with the lighting

specifications identified by the FAA. Due to the curvature of the earth, the lighting near the waterline required by the USCG will not be visible and therefore was not included in the visualizations.

Image merging. The rendered image of the Project was overlaid with the existing photograph in Adobe Photoshop and blended to create the final visualization. The final editing removed WTGs or portion of WTGs where buildings, vegetation, or other features in the landscape would block the view. In addition, the portions of WTGs that are not visible below the horizon line (usually the waterline) due to curvature of the earth were removed. Minor adjustments using professional judgement were also made to create a highly realistic image to accurately represent Project visibility.

Viewing Distance. When printed on 11x17 inch (in) paper, the size of a single "normal" image is 9.3 by 13.9 in. The viewer should hold this image approximately 53 centimeters (cm; 21 in) from the eye to replicate the actual view. When viewing the normal image (i.e., not the panorama) on a digital device, the reviewer's eye should be back from the screen approximately 1.5 times the width of the image. For example, if the visualization measures 25 cm (10 in) in width, the eye should be approximately 38 cm (15 in) from the screen.

2.8. Seascape/Landscape Impact Assessment (SLIA) Evaluations

The VIA presents the assessment of potential visual effects of the offshore components in two parts. The first part – Seascape/Landscape Impact Assessment (SLIA) – examines the effects of the Project on the six Character Areas that have been identified within the study area. The second part – Visual Impact Assessment (VIA) – evaluates the possible effect that the Project may have on viewers who live, work, recreate, and enjoy the landscape, seascape, and open ocean of the Outer Banks.

The assessment process was conducted by visual resource professionals (licensed landscape architects) with experience in conducting SLVIAs for large scale infrastructure projects. The reviewers discussed the assessment and agreed upon the determination of overall impacts, using the assessment reports, site photographs, and visualizations.

2.9. Seascape/Landscape Impact Assessment (SLIA) Methodology

Visual impact to seascape and landscape is based on Section 6.4 Evaluation of Impacts in the BOEM Guidance Document. The SLIA consists of two separate but interrelated components: **Resource Sensitivity** and **Magnitude of Visual Impacts.** The methodology below shows how these two components are assessed and then combined to determine the **Overall Impact to the Character Area**.

The tables and matrices are designed to provide guidance for the evaluations. In addition to referencing the tables and matrices, the SLIA is also supported by professional judgement and summary narratives for the viewer evaluations.

2.9.1. Resource Sensitivity

The evaluation of resource sensitivity is derived from an understanding of a) the susceptibility of the Character Area to change and b) the recognized values attached to the scenic resources within the Character Area. A rating (low-high) was assigned to both a Character Area's susceptibility to change and scenic value to form a resource sensitivity rating. Highly scenic Character Areas with a low capacity to absorb change and high scenic value are considered most sensitive to visual change. Likewise, Character Areas with a high capacity to absorb change and low user sensitivity are considered least sensitive to visual change.

Susceptibility to Change. A Character Area's susceptibility to change is a measure of how much visual change a landscape can absorb before the key characteristics of the landscape are altered. Indicators are based on existing development patterns; shoreline complexity; topographic features; expanse of ocean view; landscape distinctiveness; natural patterns; quality of the built environment; and primary use. A Character Area that is more common or highly developed tends to have more capacity for visual change and are rated as low. Likewise, a Character Area that has unique, distinctive, or high quality features may be more impacted through visual change and is rated as high. Table 2 provides guidance on the assessment of a Character Area's susceptibility to change.

Table 2. Character Area Susceptibility to Change

Character Area Susceptibility to Change					
	LOW	**LOW - MEDIUM**	**MEDIUM**	**MEDIUM - HIGH**	**HIGH**
Shoreline or Landform	Very simple/ straight shoreline or landform.	Simple shoreline or landform.	Moderately complex shoreline or landform.	Complex shoreline or landform.	Highly complex shoreline or landform.
Visible Topography	Flat. No variation in elevation, such as a beach, marsh, fields, or open water.	Slight variation in elevation, such as low-lying dunes or small hills. (5-10 feet).	Some elevation variation, such as medium sized dunes, moderate hills (10-20 feet).	Moderate elevation variation, such as very prominent dunes or bluffs (20-40 feet).	Significant elevation changes, such as steep hills, visible mountains (40+ feet).
Expanse of Ocean View	Little or no view of open ocean or sound.	Limited view of open ocean or sound (vista < 90°).	Moderate view of open ocean or sound (vista 90°-180°).	Extensive view of open ocean or sound (vista approx. 180°).	Expansive view of open ocean (vista >180°).
Landscape Distinctiveness	Insignificant: indistinct landscape character. May detract from character of landscape.	Common: commonly found landscape character. A landscape of local importance.	Noteworthy: some-what common landscape character. A landscape of regional importance.	Distinctive: unusual, somewhat distinctive landscape character. A landscape of state-wide importance.	Rare: very unusual, unique, or distinctive landscape character. A landscape of national importance.
Natural Patterns	Few or no natural areas. Highly developed. Man-made structures dominate the landscape.	Small natural or vegetated areas of local significance. May include highly manicured landscapes or small parks. Man-made structures are co-dominant in the landscape.	Moderately sized natural area of regional significance. May include beach and dunes. Man-made structures are widespread but not dominant in the landscape.	Large natural area that is not remote or isolated. State-wide conservation significance. Man-made structures are limited and scattered.	Remote or isolated natural area. Conservation area of national significance. Minimal evidence of man-made development.
Development Patterns	Heavily developed or industrial/commercial development pattern. Large-scale infrastructure or structures may be common or dominant.	Commercial or suburban development patterns. Moderate-scale infrastructure may be common and co-dominant.	Residential and commercial areas of local importance. Moderate scale buildings and infrastructure visible but not dominant. Development may be visible in midground.	Residential villages and downtowns, properties of state or regional importance. May include identified or eligible historic properties. Large-scale infrastructure, if present, is limited and scattered. Development may be visible in background.	High quality-built environment. May include historic properties or districts on the NRHP. Large scale infrastructure is inconspicuous or absent. Development may not be visible.
Primary Use	No recreational activity. Heavy commercial or industrial use. Transportation may be primary use.	Minimal recreational activity. Commercial or industrial use is common.	Recreational activity is present with some commercial or residential use. Recreation is not related to water or shoreline. May include amusement rides, shopping areas.	Recreational activity is predominant the use. Recreation is not directly tied to water or shoreline. May include boardwalks, nature trails, scenic byway.	Water dependent or oriented recreation is the predominant use. May include beaches, jetties, structures and seating oriented toward shoreline.

Scenic Value. The scenic value of a Character Area is based on its recognition as a high quality or unique visual landscape. At the high end of the scenic value spectrum, Character Areas include

resources recognized nationally for their scenic value, such as National Parks or National Seashores. These sites are likely to receive heavy visitation or recreational use, and have high value attached to the site. At the low end of the spectrum are areas without any formal scenic designation. These sites may have low visitation or may not offer recreation amenity to the public. Table 3 provides guidance on the assessment of a Character Area's scenic value.

Table 3. Character Area Scenic Resource Value

Character Area Scenic Resource Value					
	LOW	**LOW - MEDIUM**	**MEDIUM**	**MEDIUM - HIGH**	**HIGH**
Scenic Resource Value	The Character Area does not include sites with formal recognition or designation as a scenic resource. Little or no public amenity or recreational value.	The Character Area includes public sites that may be identified in guidebooks but have no formal designation as a scenic resource.	The Character Area includes sites with local or regional recognition / ownership. May include local parks, central downtowns, community resources, local historic sites, or local conservation land.	The Character Area includes sites with state recognition / ownership. May include State Parks and Recreation Areas, Wildlife Management Areas, or sites identified or eligible for the NHRP or SRHP.	The Character Area includes sites with national recognition for its scenic and/or recreational value. May include National Parks, National Seashores, or sites on the NHRP that derive significance from their landscape setting.

Character Area Sensitivity Rating. The sensitivity of each Character Area is determined by combining sensitivity of the Character Area change with the scenic value of the resources in the Character Area. Table 4 provides guidance in the form of matrix to determine the overall sensitivity of the Character Area.

Table 4. Character Area Sensitivity Matrix

Character Area Sensitivity					
SCENIC VALUE	**SUSCEPTIBILITY TO CHANGE**				
	HIGH	**MEDIUM-HIGH**	**MEDIUM**	**LOW-MEDIUM**	**LOW**
HIGH	HIGH	HIGH	MEDIUM-HIGH	MEDIUM	MEDIUM
MEDIUM-HIGH	HIGH	MEDIUM -HIGH	MEDIUM	MEDIUM	LOW-MEDIUM
MEDIUM	MEDIUM -HIGH	MEDIUM	MEDIUM	LOW-MEDIUM	LOW-MEDIUM
LOW-MEDIUM	MEDIUM	MEDIUM	LOW-MEDIUM	LOW-MEDIUM	LOW
LOW	MEDIUM	LOW-MEDIUM	LOW-MEDIUM	LOW	LOW

2.9.2. Magnitude of Visual Impacts

The evaluation of magnitude of seascape/landscape impacts is based upon a determination of a) the size or scale of the change resulting from the Project, b) the geographic extent of the Project, and c) the duration and reversibility of the Project.

Size or Scale of Change. This evaluation considers the anticipated degree of visual change from the Project on the Character Area. The rating (small to large) is based upon measurable or observable physical factors that contribute to Project visibility from the Character Area. Factors include distance to the nearest WTG, Vertical Field of View (apparent height at arm's length), HFOV covered by the Project, and landscape contrast caused by the Project. This evaluation is based on a general assessment of all KOP visualizations provided from within each Character Area, with the understanding the size and scale of change caused by the Project will vary based on where one is located within the Character Area and may change based on conditions related to lighting, weather, and atmospheric effects. Table 5 provides guidance on the assessment of the size/scale of visual change within a Character Area.

Table 5. Character Area Size/Scale of Visual Change

Character Area Size/Scale of Visual Change					
	SMALL	**SMALL-MEDIUM**	**MEDIUM**	**MEDIUM-LARGE**	**LARGE**
Distance to nearest visible WTG	40+ km (22+ nm / 25+ mi) from observer.	Over 32 to 40 km (17 to 22 nm / 20 to 25 mi) from observer.	Over 24 to 32 km (13 to 17 nm / 15 to 20 mi) from observer.	Over 8 to 24 km (4 to 13 nm / 5 to 15 mi) from observer.	0 to 8 km (4 nm / 5 mi) from observer.
Vertical Field of View (apparent height at arm's length)	WTGs appear to be less than 1/8 inch above the horizon.	WTGs appear to be approximately 1/8 inch but less than ¼ inch above the horizon.	WTGs appear to be approximately ¼ inch but less than ½ inch above the horizon.	WTGs appear to be approximately ½ inch but less than ¾ of an inch above the horizon.	WTGs appear to be ¾ of an inch or greater above the horizon.
Horizontal Field of View	Visible WTGs occupy less than 2º of the horizon.	Visible WTGs occupy 2º to <15º of the horizon.	Visible WTGs occupy 15º to <30º of the horizon.	Visible WTGs occupy 30º to <45º of the horizon.	Visible WTGs occupy more than 45º of the horizon.
Landscape Contrast	**Faint**: Project is indistinct or not obvious within the view, either due to its proximity, massing, width, height, number of structures, duration of view, scale, visibility or contrast with the surrounding seascape.	**Apparent**: Project is visible or evident within the view, either due to its proximity, massing, width, height, number of structures, duration of view, scale, visibility or contrast with the surrounding seascape.	**Conspicuous**: Project is clearly visible and noticeable within the view, either due to its proximity, massing, width, height, number of structures, duration of view, scale, visibility or contrast with the surrounding seascape.	**Prominent**: Project stands out or is striking in the view, either due to its proximity, massing, width, height, number of structures, duration of view, scale, visibility or contrast with the surrounding seascape.	**Dominant**: Project commands or controls the view, either due to its proximity, massing, width, height, number of structures, duration of view, scale, visibility, or contrast with surrounding seascape.

Geographic Extent. This evaluation is based on the extent of potential visibility based on the computer-based viewshed analysis. A Character Area with a high percentage of potential visibility will be rated as large and a Character Area with a small percentage of potential visibility will be rated as low. The viewshed analysis only indicates if a single WTG is theoretically visible from a point in the landscape. It does not account for atmospheric conditions, visual acuity, or provide additional information about the level of visibility. The assessment based on the percentage of potential Project visibility within a Character Area is identified in Table 6.

Table 6. Character Area Geographic Extent of Visibility

Character Area Geographic Extent of Visibility					
	SMALL	**SMALL-MEDIUM**	**MEDIUM**	**MEDIUM-LARGE**	**LARGE**
Percentage of Area with potential visibility	0% - 19% of Character Area has potential visibility	20% - 39% of Character Area has potential visibility	40% - 59% of Character Area has potential visibility	60% - 79% of Character Area has potential visibility	80% - 100% of Character Area has potential visibility

Duration and Reversibility of Impacts. This evaluation gives a rating of poor, fair, or good, based on the length of time the Project will be visible (i.e., a permanent / irreversible visual change would receive a poor rating). The Project is expected to have a service lifetime of greater than 30 years and thus is considered a long-term installation. While the Project represents a major investment in time, knowledge, and resources, it is fully reversible. In all cases, the Project received a fair rating.

Magnitude of Visual Impact Rating. The magnitude of visual impact for Character Area is determined by combining the Size or Scale of Change and the Geographic Extent of potential visibility in the Character Area. The Project's fair rating for the duration and reversibility of impacts is not included in the matrix because is a consistent variable.

Table 7 provides guidance in the form of a matrix to determine the magnitude of visual impact. This matrix is weighted slightly to place a greater impact on the size/scale of change. This was done to temper the reliance on viewshed analysis. The geographic extent may indicate large area of potential visibility, However, if the level of visibility is small, the visual impact remains small as well.

Table 7. Character Area Magnitude of Visual Impact Matrix

Character Area Magnitude of Visual Impact					
SIZE/SCALE OF CHANGE	**GEOGRAPHIC EXTENT**				
	LARGE	**MEDIUM-LARGE**	**MEDIUM**	**SMALL-MEDIUM**	**SMALL**
LARGE	LARGE	LARGE	LARGE	MEDIUM-LARGE	MEDIUM
MEDIUM -LARGE	MEDIUM-LARGE	MEDIUM -LARGE	MEDIUM-LARGE	MEDIUM	MEDIUM
MEDIUM	MEDIUM	MEDIUM	MEDIUM	SMALL- MEDIUM	SMALL- MEDIUM
SMALL- MEDIUM	SMALL-MEDIUM	SMALL-MEDIUM	SMALL-MEDIUM	SMALL-MEDIUM	SMALL
SMALL	SMALL	SMALL	SMALL	SMALL	SMALL

2.9.3. Overall Impact to Character Area

The rating of the overall impact to the Character Area (negligible / minor / moderate / major) is based on the combined evaluation of Resource Sensitivity and Magnitude of Visual Impacts.

Ranges of potential overall impacts are typically given in recognition of the variables associated with assessments of offshore wind projects.

- **Negligible**. Very little or no effect on the Character Area's features or qualities, either because a) there is minimal Project visibility, or b) the Character Area lacks value, or c) the Character Area is not sensitive to visual change.
- **Minor**. The Project would introduce features that may have a noticeable to medium level of visual impact on the Character Area. The Project may have a low to moderate level of visual prominence and would have a small to medium effect on the key features of the Character Area. While Character Area sensitivity/susceptibility/value is generally low, adjustments may be warranted depending upon the nature of the sensitivity.
- **Moderate**. The Project would introduce features that would have a medium to large change to the Character Area. The Project may have a moderate to large level of visual prominence and would have a moderate effect on the key features of the Character Area. While Character Area sensitivity/susceptibility/value is generally medium to low, adjustments may be warranted depending upon the nature of the sensitivity.
- **Major**. The Project would introduce features that have a major level of change to the Character Area. The Project would introduce a dominant visual element that is inconsistent with the key features of the Character Area. While Character Area sensitivity/susceptibility/value is generally medium to high, adjustments may be warranted depending upon the nature of the sensitivity.

Table 8 combines sensitivity and visual impacts in a matrix to determine the overall impact to the Character Area. While this table provides guidance on how to rate the evaluations, the definitions of the ratings above, professional judgment, and summary narratives support the evaluations.

Table 8. Character Area Overall Impact Matrix

Character Area Overall Impact					
RESOURCE SENSITIVITY	**MAGNITUDE OF VISUAL IMPACT**				
	LARGE	**MEDIUM-LARGE**	**MEDIUM**	**SMALL-MEDIUM**	**SMALL**
HIGH	MAJOR	MAJOR	MODERATE	MINOR	NEGLIGIBLE
MEDIUM-HIGH	MAJOR	MAJOR	MODERATE	MINOR	NEGLIGIBLE
MEDIUM	MODERATE	MODERATE	MODERATE	MINOR	NEGLIGIBLE
LOW-MEDIUM	MODERATE	MODERATE	MINOR	MINOR	NEGLIGIBLE
LOW	MODERATE	MODERATE	MINOR	NEGLIGIBLE	NEGLIGIBLE

2.10. Visual Impact Assessment (VIA) Methodology

Visual impact to viewers is based on Section 7.5 Evaluation of Impact Levels in the BOEM Guidance Document. The assessment follows the same evaluation process used in the SLIA but looks at the effect that the Project may have on viewers within the study area. Like the SLIA, the VIA consists of two separate but interrelated components: **Viewer Sensitivity** and **Magnitude of Visual Impacts**. The methodology below shows how these two components are assessed and then combined to determine the **Overall Impact to Viewers**.

The tables and matrices are designed to provide guidance for the evaluations. In addition to referencing the tables and matrices, the VIA is also supported by professional judgement and summary narratives for the viewer evaluations.

2.10.1. Viewer Sensitivity

The evaluation of viewer sensitivity is derived from an understanding of a) the susceptibility of viewers to changes in the landscape/seascape and b) the values attached to the views. A rating (low to high) was assigned to viewers sensitivity. Viewers with a low capacity to absorb change and high values attached to the viewpoint are considered most sensitive to visual change. Likewise, viewers with high tolerance to change and low value viewpoints are considered least sensitive to visual change.

Susceptibility to Change. A viewer's susceptibility to change is based on visitor use patterns at a KOP and the relationship between the viewpoint to the ocean. The indicators are based on the primary recreation or scenic use of the site; the value of the ocean setting to the activity; visitor expectations; the duration of the view; and viewer elevation. Places where visitor activities are dependent on ocean views with high visitor expectation are considered to be highly susceptible to change. Likewise, a place without recreational activity, low viewer expectations, and minimal views of the ocean are likely to absorb substantial visual change and rated as low. Table 9 provides guidance on the assessment of a viewer's susceptibility to change.

Table 9. Viewer Susceptibility to Change

Viewer Susceptibility to Change					
	LOW	**LOW - MEDIUM**	**MEDIUM**	**MEDIUM - HIGH**	**HIGH**
Primary Use	No recreational activity. Heavy commercial or industrial use. Transportation may be primary use.	Minimal recreational activity. Commercial or industrial use is common.	Recreational activity is present with some commercial or residential use. Recreation is not related to water or shoreline. May include amusement rides, shopping areas.	Recreational activity is predominant the use. Recreation is not directly tied to water or shoreline. May include boardwalks, nature trails, scenic byway.	Water dependent or oriented recreation is the predominant use. May include beaches, jetties, structures and seating oriented toward shoreline.
Value of Ocean Setting	No ocean view due to site location or intervening structures or vegetation.	Users are in the vicinity of the ocean, but the view is unrelated to the activity. May include people on their commute or going about their daily business.	Users are in the vicinity of the beachfront, but the ocean view may be an enhancement but not essential to the activity. May include shoppers, amusement park goers, golfers.	Uses are enhanced by the beachfront, but the ocean view is secondary to the activity. May include running, cycling, fishing.	Uses are dependent on ocean or strongly enhanced by water view. May include beachcombing, bird watching, boating, surfing, swimming, sightseeing.
Visitor Expectations	Crowded with people, noisy, busy with continuous distractions, many lights.	Other people are constantly present, noticeable noise, frequent distractions, lights.	Other people are noticeably present, some noise, distractions are present.	Some presence of other people, somewhat quiet, some distraction, minimal lights.	Minimal presence of other people or infrastructure, very quiet, little distraction, night sky visible.
Duration of View	At the site for less than a minute. May include brief glimpse of the ocean from car or boat.	At the site for up to 30± minutes. May include a stop at an overlook or the top of a lighthouse.	At the site for 30 minutes to 2 hours. May include fishing, restaurant dining, boardwalk activities, walking, or biking.	At the site for 2-4 hours. May include golf, recreational fishing, boating, bird watching.	At the site for >4 hours. May include beach going, commercial fishing
Viewer Elevation	Water level.	Elevated ground plane such as a dune, boardwalk, jetty, or bluff.	2-3 story structure.	3-5 story structure or elevated bridges.	>5 story structures, including a high-rise building or lighthouse.

Value Attached to Views. The scenic value of a view is based on the site's recognition as a high quality or unique visual landscape. At the high end of the scenic value spectrum, KOPs may be located within areas recognized nationally for their scenic value, such as National Parks or National Seashores. These sites are likely to receive heavy visitation or recreational use, and have high value attached to the site. At the low end of the spectrum are areas without any formal scenic designation. These sites may have low visitation or may not offer recreation amenity to the public. Table 10 provides guidance on the assessment of a KOP's scenic value.

Table 10. KOP Scenic Resource Value

KOP Scenic Resource Value				
LOW	**LOW - MEDIUM**	**MEDIUM**	**MEDIUM - HIGH**	**HIGH**
A site without formal recognition or designation as a scenic resource. Little or no public amenity or recreational value.	A site that may be identified in guidebooks but have no formal designation as a scenic resource.	A site with local or regional recognition / ownership. May include local parks, central downtowns, community resources, local historic sites, or local conservation land.	A site with state recognition / ownership. May include State Parks and Recreation Areas, Wildlife Management Areas, or sites identified or eligible for the NHRP or SRHP.	A site with national recognition for its scenic and/or recreational value. May include National Parks, National Seashores, or sites on the NHRP that derive significance from their landscape setting.

Viewer Sensitivity Rating. The sensitivity of each viewpoint is determined by combining viewer susceptibility to change with the scenic value of the viewpoint/KOP. Table 11 provides guidance in the form of a matrix to determine the overall sensitivity of the viewer.

Table 11. Viewer Sensitivity Matrix

Viewer Sensitivity					
SCENIC VALUE	**SUSCEPTIBILITY TO CHANGE**				
	HIGH	**MEDIUM-HIGH**	**MEDIUM**	**LOW-MEDIUM**	**LOW**
HIGH	HIGH	HIGH	MEDIUM-HIGH	MEDIUM	MEDIUM
MEDIUM-HIGH	HIGH	MEDIUM -HIGH	MEDIUM	MEDIUM	LOW-MEDIUM
MEDIUM	MEDIUM -HIGH	MEDIUM	MEDIUM	LOW-MEDIUM	LOW-MEDIUM
LOW-MEDIUM	MEDIUM	MEDIUM	LOW-MEDIUM	LOW-MEDIUM	LOW
LOW	MEDIUM	LOW-MEDIUM	LOW-MEDIUM	LOW	LOW

2.10.2. Magnitude of Visual Impact

The evaluation of magnitude of impact on the viewer is based upon a determination of a) the size or scale of the change resulting from the Project, b) the geographic extent of the Project, and c) the duration and reversibility of the Project.

Size or Scale of Change. This evaluation considers the anticipated degree of visual change from the Project at the KOP. The rating (small to large) is based upon measurable or observable physical factors that contribute to Project visibility. Factors include distance to the nearest WTG, Vertical Field of View (apparent height at arm's length), HFOV covered by the Project, curvature of the earth, landscape contrast, and the level of visual alteration caused by the Project. Table 12 provides guidance on the assessment of the size/scale of visual change from the KOP.

Table 12. KOP Size/Scale of Visual Change

KOP Size/Scale of Visual Change					
	SMALL	**SMALL-MEDIUM**	**MEDIUM**	**MEDIUM-LARGE**	**LARGE**
Distance to nearest visible WTG	40+ km (22+ nm / 25+ mi) from observer.	Over 32 to 40 km (17 to 22 nm / 20 to 25 mi) from observer.	Over 24 to 32 km (13 to 17 nm / 15 to 20 mi) from observer.	Over 8 to 24 km (4 to 13 nm / 5 to 15 mi) from observer.	0 to 8 km (4 nm / 5 mi) from observer.
Vertical Field of View (apparent height at arm's length)	WTGs appear to be less than $^{1}/_{8}$ inch above the horizon.	WTGs appear to be approximately $^{1}/_{8}$ inch but less than ¼ inch above the horizon.	WTGs appear to be approximately ¼ inch but less than ½ inch above the horizon.	WTGs appear to be approximately ½ inch but less than ¾ of an inch above the horizon.	WTGs appear to be ¾ of an inch or greater above the horizon.
Horizontal Field of View	Visible WTGs occupy less than 2º of the horizon.	Visible WTGs occupy 2º to <15º of the horizon.	Visible WTGs occupy 15º to <30º of the horizon.	Visible WTGs occupy 30º to <45º of the horizon.	Visible WTGs occupy more than 45º of the horizon.
Curvature of the Earth	Nacelles may be visible at or near the horizon. Blades may be faintly visible. Blade movement may not be detectable.		A portion of the base plus the nacelle and blades will be visible.	Majority of the WTG is visible from sea level; USCG navigational lights may be visible.	
Color Contrast/ Atmospheric Perspective	WTGs appear as various shades of gray, often blending into background sky.		WTGs appear as varying shades of white to gray, depending on light.	WTGs appear bright white, especially in full sun.	
Landscape Contrast	**Faint**: Project is indistinct or not obvious within the view, either due to its proximity, massing, width, height, number of structures, duration of view, scale, visibility, or contrast with the surrounding seascape.	**Apparent**: Project is visible or evident within the view, either due to its proximity, massing, width, height, number of structures, duration of view, scale, visibility, or contrast with the surrounding seascape.	**Conspicuous**: Project is clearly visible and noticeable within the view, either due to its proximity, massing, width, height, number of structures, duration of view, scale, visibility, or contrast with the surrounding seascape.	**Prominent**: Project stands out or is striking in the view, either due to its proximity, massing, width, height, number of structures, duration of view, scale, visibility, or contrast with the surrounding seascape.	**Dominant**: Project commands or controls the view, either due to its proximity, massing, width, height, number of structures, duration of view, scale, visibility, or contrast with surrounding seascape.

Geographic Extent. This evaluation is based on the extent of potential visibility from the KOP. This includes any visual obstructions between the KOP and the Project, the angle of view toward the Project relative to the primary view axis, and the area in the vicinity of the KOP with potential Project visibility. KOPs with unobstructed, central views toward the Project and where the Project is seen over a wide associated area are considered to have a large geographic extent. Alternatively, KOPs where the Project is outside the primary view axis or where there are obstructions to the view are rated as small. Table 13 provides guidance on the assessment of the geographic extent of Project visibility from the KOP.

Table 13. KOP Geographic Extent of Visibility

KOP Geographic Extent of Visibility					
	SMALL	**SMALL-MEDIUM**	**MEDIUM**	**MEDIUM-LARGE**	**LARGE**
Visual Obstructions	Most of the Project is blocked by visual obstructions.	The Project is partially blocked by visual obstruction.	There are some visual obstructions that limit Project visibility.	The Project is visible with minimal visual obstructions.	The Project is visible with no visual obstructions.
View angle in relation to the primary view axis	The Project appears well outside the primary view axis (usually at the outer limit of the HFOV).	The Project is located off the primary view axis, causing the viewer to turn away from the primary view to identify the Project. There may not be a well-defined central view axis due to the nature of the KOP (e.g., 360° lighthouse view).			The most prominent components of the Project are centrally located in line with the primary view axis.

Duration and Reversibility of Impacts. This evaluation gives a rating of poor, fair, or good, based on the length of time the Project will be visible (i.e., a permanent / irreversible visual change would receive a poor rating). The Project is expected to have a service lifetime of greater than 30 years and thus is considered a long-term installation. While the Project represents a major investment in time, knowledge, and resources, it is fully reversible. In all cases, the Project received a fair rating.

Magnitude of Visual Impact Rating. The magnitude of visual impact to the viewer is determined by combining the Size or Scale of Change and the Geographic Extent of potential visibility from the KOP. The Project's fair rating for the duration and reversibility of impacts is not included in the matrix because is a consistent variable.

Table 14 combines sensitivity and visual impacts in a matrix to determine the magnitude of visual impact at the KOP. This matrix is weighted slightly to place a greater impact on the size/scale of change. This was done to temper the importance of ocean views and the reliance on viewshed analysis. The KOP may have clear ocean views toward the Project and the viewshed map may show a large area of visibility around the KOP. However, if the level of Project visibility is small, the visual impact remains small as well.

Table 14. KOP Magnitude of Visual Impact Matrix

KOP Magnitude of Visual Impact					
SIZE/SCALE OF CHANGE	**GEOGRAPHIC EXTENT**				
	LARGE	**MEDIUM-LARGE**	**MEDIUM**	**SMALL-MEDIUM**	**SMALL**
LARGE	LARGE	LARGE	LARGE	MEDIUM-LARGE	MEDIUM
MEDIUM-LARGE	MEDIUM-LARGE	MEDIUM -LARGE	MEDIUM-LARGE	MEDIUM	MEDIUM
MEDIUM	MEDIUM	MEDIUM	MEDIUM	SMALL- MEDIUM	SMALL- MEDIUM
SMALL-MEDIUM	SMALL-MEDIUM	SMALL-MEDIUM	SMALL-MEDIUM	SMALL-MEDIUM	SMALL
SMALL	SMALL	SMALL	SMALL	SMALL	SMALL

2.10.3. Overall Impact To Viewer

The rating of the overall impact to the viewer (negligible / minor / moderate / major) is based on the combined evaluation of Viewer Sensitivity and Magnitude of Visual Impacts. Ranges of potential overall impacts are typically given in recognition of the variables associated with assessments of offshore wind projects.

- **Negligible**. Very little or no effect on the viewer visual experience, either because a) there is minimal Project visibility, or b) the value of the view is low, or c) viewers are relatively insensitive to visual change.
- **Minor**. Project would introduce features that may have a noticeable to medium level of change to the character of the view. The Project may have a low to moderate level of visual prominence but not hold the viewer's attention and would have a small to medium effect on viewer experience. While viewer sensitivity/susceptibility/value is generally low, adjustments may be warranted depending upon the nature of the sensitivity.
- **Moderate**. Project would introduce features that may have a medium to large change to the character of the view. The Project may have a moderate to large level of visual prominence and would attract and hold the viewer's attention and would have a moderate effect on the viewer's visual experience. While viewer sensitivity/susceptibility/value is generally medium to low, adjustments may be warranted depending upon the nature of the sensitivity.
- **Major**. Project would introduce features that would have a major level of change to the character of the view. The Project would attract, hold, and dominate the viewer's attention and would have a moderate to major effect on the viewer's visual experience. While viewer sensitivity/susceptibility/value is generally medium to high, adjustments may be warranted depending upon the nature of the sensitivity.

Table 15 combines sensitivity and visual impacts to determine the overall impact on viewers at the KOP. While this table provides guidance on how to rate the evaluations, the definitions of the ratings above, professional judgment, and summary narratives support the evaluations.

Table 15. Overall Impact to Viewers Matrix

Overall Impact to Viewers					
RESOURCE SENSITIVITY	**MAGNITUDE OF VISUAL IMPACT**				
	LARGE	**MEDIUM-LARGE**	**MEDIUM**	**SMALL-MEDIUM**	**SMALL**
HIGH	MAJOR	MAJOR	MODERATE	MINOR	NEGLIGIBLE
MEDIUM-HIGH	MAJOR	MAJOR	MODERATE	MINOR	NEGLIGIBLE
MEDIUM	MODERATE	MODERATE	MODERATE	MINOR	NEGLIGIBLE
LOW-MEDIUM	MODERATE	MODERATE	MINOR	MINOR	NEGLIGIBLE
LOW	MODERATE	MODERATE	MINOR	NEGLIGIBLE	NEGLIGIBLE

2.11. Onshore Visual Assessment

The onshore infrastructure includes the onshore substation, switching station, and the export cables, which may be located underground or aboveground from the landfall to the onshore substation. The visual assessment includes land within a 1.6 km (1 mi) radius around the proposed onshore substation site parcel and 1.6 km (1 mi) on either side of the potential aboveground export cable route. These distances are based on field evaluations and consideration of the height and character of the onshore substation and switching station components (buildings, transmission structures, and lightning masts), the height of transmission structures that may be used, existing vegetation and site conditions in the immediate vicinity of the onshore substation and the transmission route, and commercial and residential land use patterns in the surrounding areas.

A viewshed analysis was completed for the onshore substation and switching station infrastructure. The data used in the onshore viewshed analysis reflects heights of onshore substation and switching station electrical equipment (26 m [85 ft]), onshore substation and switching station lighting masts (29 m [95 ft]), and transmission structures between the substation and switching station (42 m [138 ft]). The computer-based viewshed analysis relied on both topographic and surface model viewshed data.

The visual study area for underground onshore export cable route is limited to the land within the utility and road ROW where it may be located, and land immediate adjacent to the onshore export cable routes. The underground onshore export cable routes and landfall have no aboveground infrastructure that would show up in the viewshed map. It is not possible to develop a computer-based viewshed analysis for these components of the Project.

3. Offshore Visual Assessment

3.1. Geographic Extent of Visibility

The computer-based viewshed analysis, which was used to determine the limits of potential visibility, is presented through a series of maps in Attachment 1. Map 03 shows the areas with potential visibility of WTG blades and hubs. Map 03A – Map 03H show enlargement areas along the shoreline. Table 16 provides a statistical summary of the potential area of visibility based on the three computer-based viewshed analysis conducted.

The viewshed analysis shows the vast majority of the potential visibility is limited to the beachfront. It indicates that there would be virtually no Project views in the majority of the Coastal Communities within the study area, primarily due to the presence of the dunes and beachfront development. Visibility within the sounds is limited to blade tips only.

While there is potential visibility along the shoreline for the complete length of the shoreline, the distance from the Project at the far extents of the study area suggest that visibility will be very faint due to visual acuity and atmospheric conditions. Visualizations provide realistic views from Character Areas that may have potential views of the Project.

Table 16. Study Area Viewshed Analysis Statistics

Study Area	Total Study Area		DTM and DSM Surface Data				DTM Only Data	
			Viewshed		Viewshed		Viewshed Area	
	mi^2	km^2	mi^2	km^2	mi^2	km^2	mi^2	km^2
Land Area	560	1,450	4.5	11.7	10.2	26.4	370.2	959.0
Ocean Area	7,380	19,114	7,380	19,114	7,380	19,114	7,380	19,114
Water Area West of Outer Banks (Sounds)	600	1,554	102.9	266.3	195.4	505.6	595.6	1,541.0
Total Area	**8,540**	**22,118**	**107**	**278**	**206**	**532**	**966**	**2,500**
Percentage of land area with potential visibility			**< 0.01%**		**0.02%**		**0.66%**	

Table 17 provides a statistical summary of the potential area of visibility within each Character Area. The viewshed analysis data used in this analysis was based on both DTM and DSM Surface Data.

Table 17. Character Area Viewshed Analysis Statistics

Character Area	Total Character Area		Viewshed Area WTG Hubs			Viewshed Area WTG Blade Tips		
	acres	hectares	acres	hectares	% of Character Area	acres	hectares	% of Character Area
Conservation Areas	123,172	49,846	1,131	458	**0.9%**	2,815	1,139	**2.3%**
Natural Beachfronts	60	24	15	6	**25.0%**	47	19	**78.3%**
Sounds	390,887	158,186	3.5	1	**0.001%**	50,922	20,607	**13.0%**
Developed Beachfronts	2,740	1,109	1,641	664	**59.9%**	1,875	759	**68.4%**
Coastal Communities	258,587	104,647	103	42	**0.04%**	1,596	646	**0.6%**
Open Ocean	4,809,306	1,946,259	4,800,334	1,942,628	**99.8%**	4,809,306	1,946,259	**100.0%**

3.2. Scenic Resources

Scenic Resources are locations (vantage points, linear features, or scenic areas) that are accessible to and visited by the general public in part for the use, observation, enjoyment, and appreciation of their natural or cultural scenic qualities. Scenic resources include units of NPS, NWRs, State Parks, conservation areas, historic areas and sites, accessible waterbodies, community parks, and other areas identified by national, state, or local governments and organizations as having scenic or cultural significance. Many of these locations are focused on water resources (marshlands, sounds, the ocean), which are typically regarded as indicators of scenic quality. These are places where viewers may have a heightened sensitivity to visual change in the landscape or seascape.

Resources were identified through the existing State databases from North Carolina and Virginia. A total of 283 Scenic Resources were identified within the offshore study area. The viewshed mapping analysis determined that 71 resources were located within the area of potential visibility. Table 18 summarizes the scenic resources identified in the study area and the number with potential visibility of the offshore Project components. A complete inventory of scenic resources and corresponding maps are presented in Attachment 2.

Table 18. Scenic Resource Summary

Type of Resource	Resources in Offshore Visual Study Area	Resources with Potential Visibility of WTG Blades
CONSERVATION LANDS		
National Park Service Properties	4	2
National Wildlife Refuge	5	5
Other Federal Lands	3	2
State Parks	2	2
State Historic & Cultural Areas	7	1
State Recreation & Conservation Areas	18	8
Other State Conservation Lands	2	0
Local Parks and Recreation Areas	77	4
Private / Military Conservation Lands	19	7
HISTORIC RESOURCES		
NRHP Listed Site	23	6
NRHP Listed District	8	4
NRHP Eligible Site	5	4
WATER RESOURCES		
Water Bodies	9	4
Water Access Points	23	5
Scenic Rivers	3	0
Water Trails	2	2
TRAILS	73	15
TOTAL	**283**	**71**

3.2.1. Conservation Areas

Conservation Areas are publicly accessible places designated by federal, state, or local governments and non-governmental organizations in part for their ecological, recreation, and scenic values. The 137 conservation areas identified in the study area were included in publicly available state databases. Conservation Areas are classified in eight categories based on government designation, ownership, use, or management.

National Parks Service Properties

The NPS manages a variety of natural and cultural resources that are maintained for public visitation, enjoyment, and education. While there are no national parks located within the study area, the properties managed by the NPS include: Cape Hatteras National Seashore, Bodie Island Roadside Ponds and Marshes Registered Heritage Area, Bodie Island Lighthouse Pond Registered Heritage Area, Fort Raleigh Maritime Forest Registered Heritage Area, Fort Raleigh National Historic Site, and the Wright Brothers National Memorial.

National Wildlife Refuges (NWR)

National Wildlife Refuges (NWR) are federal lands and waters designated for the conservation of wildlife, fish, and plant species. These are public lands protected and managed by the U.S. Fish and Wildlife Service. Public access for a variety of outdoor recreational opportunities is allowed and regulated in NWRs. Activities include hunting, fishing, wildlife viewing, interpretation, environmental education, and photography. Four NWRs are located in the study area: Back Bay NWR, Mackay Island NWR, Pea Island NWR, and Currituck NWR.

State Parks

State Parks are state-owned conservation areas. These resources are publicly accessible during their regular hours of operation and offer a variety of recreational opportunities for the public. There are two State Parks in the study area: Jockey's Ridge State Park in North Carolina and False Cape State Park in Virginia.

State Historic and Cultural Areas

Historic and Cultural Conservation Areas are lands managed by The North Carolina Department of Natural and Cultural Resources, Division of State Historic Sites and Properties. The properties range in size and programmatic activities for the public. In the case of a historic site, the conservation area may include the land or property around a historic resource. Examples of state managed historic and cultural sites included in the study area include Roanoke Island Festival Park, Island Farm State Historic Site, Roanoke Island Festival Park, and Currituck Beach Lighthouse Keepers Residence State Historic Site. There are no state managed historic and cultural sites identified in Virginia.

State Recreation and Conservation Areas

State recreation and conservation areas include various state lands maintained for wildlife conservation, coastal management, public access, and recreation. These state managed conservation lands range in levels of accessibility, as some conservation areas favor wildlife and coastal preservation over public recreation. In North Carolina, lands such as the Oregon Inlet/Roanoke Sound Islands Registered Heritage Area and Northwest River Marsh Game Land are managed by North Carolina Wildlife Resources Commission. The Kitty Hawk Woods Coastal Reserve is one of several properties managed by the North Carolina Division of Environmental Quality, Division of Coastal Management. In Virginia, North Landing River State Natural Area Preserve is managed by the Virginia Department of Conservation

and Recreation. The Princess Anne Wildlife Management Area is managed by the Virginia Department of Wildlife Resources.

Local Parks, Conservation, and Recreation Areas

Local parks, conservation, and recreation areas are places owned and managed by a municipality or county. They are generally publicly accessible and include a wide range of uses, including athletic fields, boat launches, woodlots, general open spaces, and small preserves. These areas are typically located inland or on the western side of the Outer Banks, facing away from the ocean. Examples of these parks include Sandy Run Park in Kitty Hawk, North Carolina; Nags Head Woods Registered Heritage Area in Nags Head, North Carolina; and Munden Point Park in Virginia Beach, Virginia.

Private Conservation Lands

Private Conservation Lands are identified in the state database of conservation lands. The properties are owned or have easements held by a variety of non-governmental organizations such as The Conservation Fund, National Audubon Society, The Nature Conservancy, and North Carolina Coastal Land Trust. While the databases indicate that many of these lands are publicly accessible, use restrictions and public access status for each site they have not been identified in this VIA.

3.2.2. Historic Resources

Historic resources are sites that have been identified for their historic value. Sites may be listed on or eligible for the National Register of Historic Places (NRHP), based on their historic significance in American history, architecture, archeology, engineering, or culture. The 36 historic resources identified in the study area were included in publicly available state databases (this includes both onshore and offshore study areas, as the onshore study area is located within the offshore study area). See Appendix Z to the COP, Historic Resources Visual Effects Assessment for additional information on historic sites.

National Register of Historic Places (NRHP)

Listed resources may be individual sites or historic districts on the NRHP, which is administered by the National Parks Service. Listed historic sites may derive their historic significance from their place in American history, architecture, archeology, engineering, or culture. Examples NRHP sites in the study area include Currituck Beach Lighthouse, the Wright Brothers National Memorial, Bodie Island Light Station, and Nags Head Beach Cottages Historic District.

Eligible Historic Resources

This category includes historic properties and districts that have been determined eligible for listing on the NRHP by the North Carolina State Historic Preservation Office or Virginia Department of Historic Resources and may be approved for listing on the Register in the future. Eligible historic sites included village historic districts, municipal buildings, hotels, churches, private clubs, private homes, and lifesaving stations.

3.2.3. Water Resources

The water resources in the study area are limited to the Atlantic Ocean (east of the barrier island), the sounds (ocean to brackish water west of the barrier islands), and rivers that drain into the sounds. Due to the coastal nature of the Outer Banks, there are no large freshwater lakes or ponds within the study area. The 37 water resources identified in the study area were included in publicly available state databases.

Water Access Points

Boat launch locations are also included in the water resources because they show where public access to the water is directed. There are ten water access points located on the sounds (west of the barrier islands and east of the mainland). There are no identified water access points directly on the Open Ocean.

Scenic River

North Landing River is a designated scenic river in the state of Virginia that drains into Currituck Sound in Virginia. This is the only designated scenic water resource in the study area. The river was designated as scenic in 1988. It flows 43 km (26.7 mi) from North Landing Road in Virginia Beach to the Virginia-North Carolina border.

Paddling Trail

The South East Coast Saltwater Paddling Trail (SECT) is a water trail stretching over 1,288 km (800 mi) from the Chesapeake Bay to the Georgia-Florida border. This trail provides paddlers with the opportunity to experience an unbroken trail through tidal marshes and rivers in four states. This trail runs the length of the study area in the sounds west of the barrier islands, starting at North Landing River in the north.

3.2.4. Land-Based Trails

Trails are important resources because they indicate the route and location of recreational activity. Trails may host walking, trail running, hiking, and some motorized activity. In the study area there are trails located within conservation areas as well as trail routes identified on existing roadways. In addition, many people use the beaches that run the length of the study area for walking, biking, dog-walking, and other linear activities.

Identified trails in conservation areas are found in Back Bay NWR and False Cape State Park in Virginia. The trail routes within these two conservation areas are accessible only by the trail system within the park.

The Mountains-to-Sea Trail is a footpath stretching almost 1,931 km (1,200 mi) across North Carolina from Clingmans Dome in the Great Smoky Mountains to Jockey's Ridge State Park on the Outer Banks. Within the study area, this trail route runs along the beach and roadways in the area south of Jockey's Ridge State Park.

3.3. Character Area Identification

The following section provides an overview of the physical characteristics and viewer activities for each of the Character Areas identified within the study area. It also lists a representative sampling of noteworthy scenic resources and other attractions that may have views of the Project. Figure 9 and Figure 10 show the Character Areas mapped within the offshore visual study area. The geospatial mapping of the Character Areas was used to complete the statistical viewshed analysis to determine the geographic extent of potential visibility. This statistical analysis is presented in Table 17.

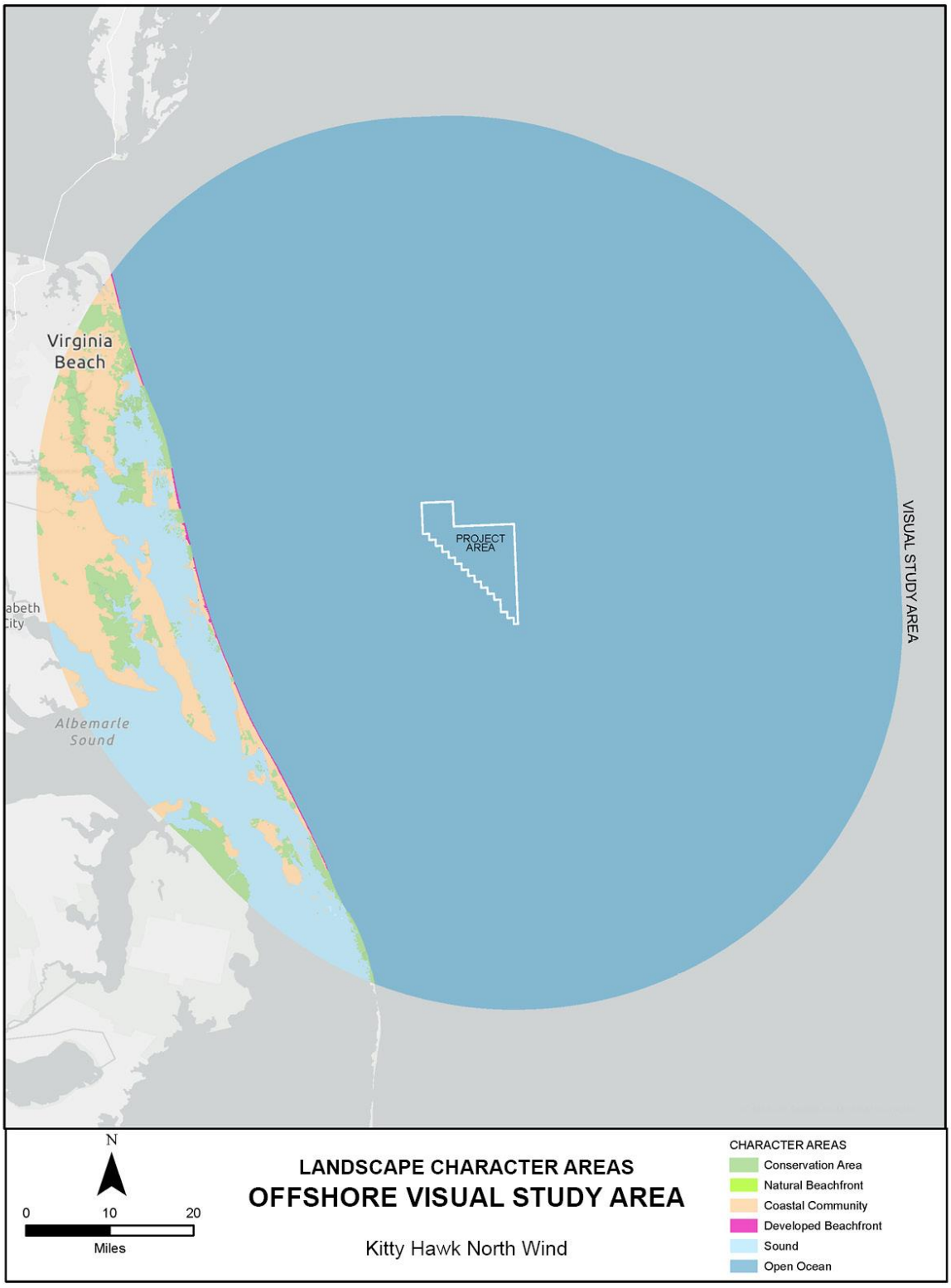


Figure 9. Character Area Location Map (Offshore Visual Study Area)

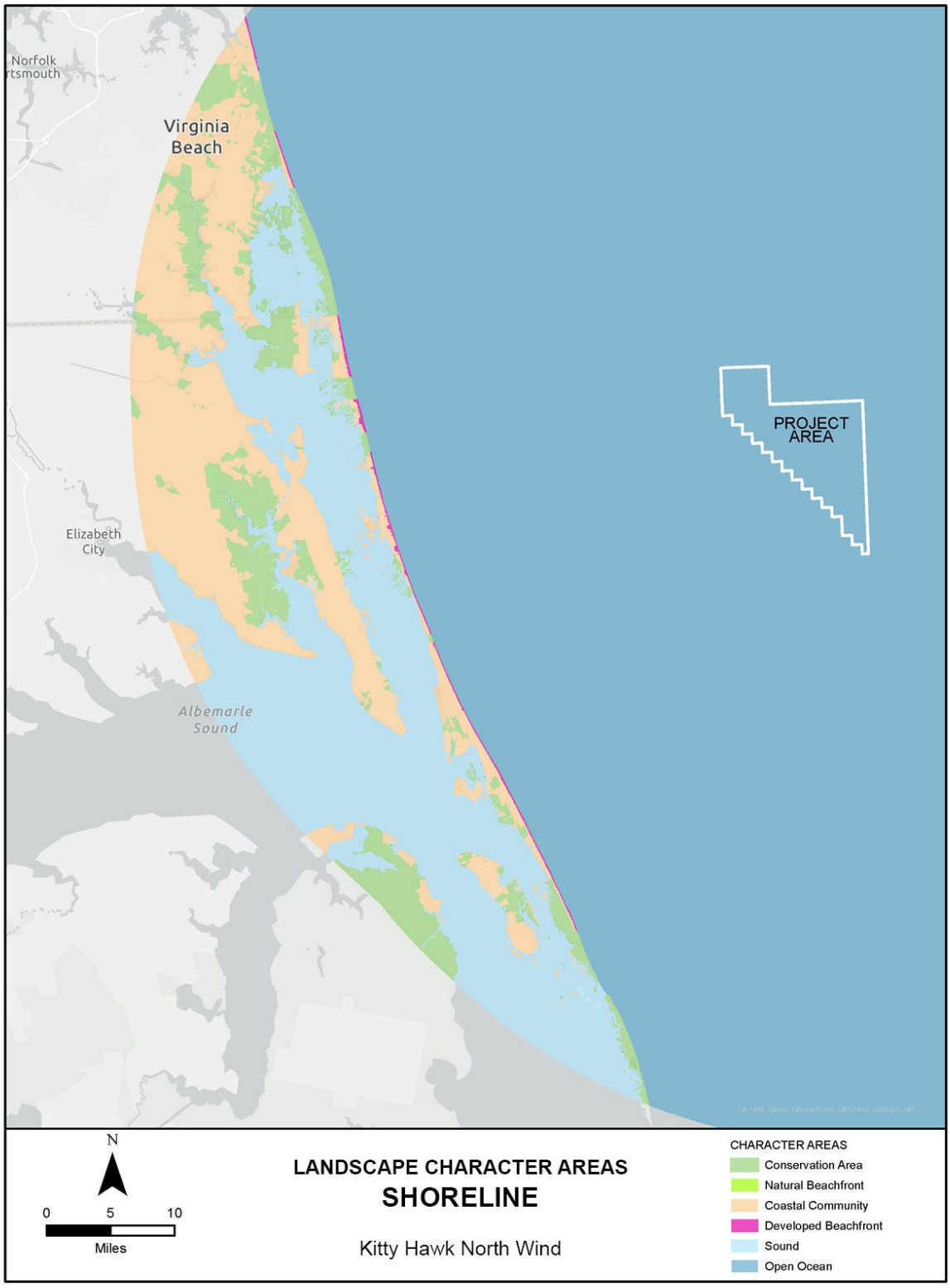


Figure 10. Character Area Location Map (Shoreline)

Section 3.10 evaluates the potential effect that the Project may have on the seascape/landscape Character Areas. **Section 3.11** presents a detailed evaluation of the potential effect on viewers for each of the 11 KOPs. See Attachment 4 for a selection of photographs that illustrate the physical characteristics and viewer activities found within each of the Character Areas.

3.3.1. Open Ocean

Physical Characteristics. At 19,114 km^2 (7,380 m^2), the open ocean is the largest Character Area within the study area that would be affected by the Project. By definition, the Open Ocean Character Area starts at approximately 5.6 km (3 nm / 3.5 mi) from the shoreline, corresponding to the apparent horizon to a person standing at the edge of the ocean at mean high tide. Elevated viewpoints within the study area (e.g., lighthouses, observation decks atop dunes, and multi-story buildings) allow views into the open ocean.

The ocean environment is dynamic and constantly changing, based on seasonality, phases of the moon (tidal conditions), weather patterns, and distance to the shoreline. As a waterbody, the ocean can present many faces, from relatively flatwater and rhythmic swells to whitecaps and towering waves. The color of the water can change dramatically as a function of lighting conditions, sun angle, the presence or absence of clouds, and precipitation. At the present time (and for recorded history within the study area) there are no permanent structures on the open ocean. While the ocean surface is constantly changing, its extent and permanency are also constants.

Where visible, the open ocean contributes to the scenic value of both the seascape and landscape Character Areas as the major component of the background viewing zone. From the seascape and landscape Character Areas, the ocean presents an unbroken horizontal line that many find relaxing, especially when coupled with the rhythmic pattern of waves crashing on the sand beaches.

The HFOV for viewpoints further back from the edge of the water is decreased by vegetation, sand dunes, and structures. The open nature of the ocean allows observers to see approaching storms, watch the moon rise over the water, and enjoy panoramic sunrises and sunsets.

Viewer Activities. The type and intensity of activities on the ocean vary based on proximity to the shoreline. Recreational boating and fishing commonly occur in the foreground and midground viewing distances (i.e., up to 8 km [4 nm / 5 mi] from the shoreline), while commercial vessels – cruise ships, cargo vessels, tow/tug vessels, tankers, military vessels, larger fishing vessels, and recreational vessels – are found at greater distances. There is a regular but low level of passenger vessels in the vicinity of the Project. For example, Carnival Cruise Lines has about 12 cruises a year (on two separate vessels) that leave their Norfolk base for Caribbean cruises. Passenger vessels account for approximately two percent of the maritime traffic around the 18.5 km (10 nm / 11.5 mi) Wind Development Area that was evaluated in the Socioeconomic Resources Chapter of the COP. Recreational vessels account for approximately four percent of the maritime traffic.[2]

During evening and nighttime hours the lights from fishing and ocean-going vessels are commonly seen from the shoreline.

[2] See Kitty Hawk North COP Chapter 7 Socioeconomic Resources (particularly Section 7.2 Commercial and Recreational Fishing and Section 7.3 Marine Transportation and Navigation) for more detailed information on offshore commercial and recreational activities.

The size of the open ocean allows unlimited opportunities for Project observation. Under clear conditions, the Project will be visible to varying degrees throughout the study area.

3.3.2. Developed Beachfronts

Physical Characteristics. The miles of sandy beaches that face the ocean are a defining characteristic of the Outer Banks. In the early twentieth century, the topography throughout the barrier islands was flat, with only a few natural dunes. As the Outer Banks started to develop, residents became increasingly concerned with the westward migration of the islands and the constant threat of hurricanes and high storm surges. As part of FDR's New Deal, the Civilian Conservation Corps undertook an 8-year effort to create the system of planted dunes to protect the island's resources. The vast majority of these dunes are still in existence and are constantly being monitored and repaired following the major storms that are part of the typical weather pattern on the Outer Banks.

The Developed Beachfront is generally limited to the beachfront, dune system, and those structures adjacent to the dune system that rise high enough to capture views of the water. For the most part, this is a relatively narrow, but intensively developed band of real estate that is common throughout the study area. It is also where most of the land-based Project views will occur since the dunes and the development effectively screen Project views from most of the adjacent Coastal Communities. As noted below, the development is interrupted in several noteworthy locations by Conservation Areas and a few parcels of undeveloped land.

In response to the ever-present threat of storm surges, most new construction along the Outer Banks is elevated, with garages on the ground level and living space starting on the second floor. Developed Beachfront homes and hotels are typically designed and sited to capture views to the ocean. The structures behind (or in some cases on) the dunes appear to rise above the dunes, often in what appears to be unbroken blocks of development interrupted only by access stairs down to the beach.

Several of the communities within the study area (e.g., Nags Head and Southern Shores) have enacted design guidelines administered by architectural review boards to guide community growth and protect property values.

While the vast majority of development has occurred in the late twentieth century and the first part of this current century, there are some notable historic remnants of earlier settlements and vacation communities. Old Nags Head Place in Nags Head is a late eighteenth century cottage community built on the beachfront to take advantage of the prevailing southwest breezes. Beach Cottage Row Historic District was added to the NRHP in 1977.

Public development within many of the Developed Beachfronts include parking lots, changing areas, restrooms, lifeguard stations, stairways and ramps over the dunes, and accessible surfaces over the sand. Several of the beaches have included other recreational/scenic amenities, such as observation platforms, shade structures, volleyball courts, environmental signage, and interpretive displays that create greater opportunities for beach visitors. While there is no charge to use the beaches on the Outer Banks, some parking areas associated with the beach require membership in local civic organizations. Parking can be an issue in many locations, especially on warm days that draw heavy visitor use.

Several fishing piers are located within the Developed Beachfronts, extending boardwalks a considerable distance over the water. The piers generally have fish-cleaning facilities, seating facing the water, and lighting for nighttime fishing. These are privately owned facilities that charge a small fee for fishing as

well as casual sight-seeing. Restaurants, event spaces, and other facilities are incorporated in some of the piers to capitalize on the location and the views to the Open Ocean.

Noteworthy Scenic Resources, KOPs, and Other Attractions

- **Public Beaches**: Most communities have multiple public access points with parking, restrooms, and walkways over the dunes. For example, see Corolla Village Road Beach (KOP 3) and Southern Beach Access (KOP 4) in Corolla, Hillcrest Beach (KOP 5) in Southern Shores, Kitty Hawk Pier (KOP 6) in Kitty Hawk, and Jennette's Pier (KOP 10) in Nags Head.
- **Fishing Piers**: Fishing is a popular activity throughout the Outer Banks: Kitty Hawk Pier (KOP 6) in Kitty Hawk, Avalon Fishing Pier (KOP 7) in Kill Devil Hills, and Jennette's Pier (KOP 10) in Nags Head.
- **Historic Resources**: Beach Cottage Row Historic District in Nags Head.

Viewer Activities. Swimming, surfing, beachcombing, relaxing on the beach, ocean kayaking, ocean fishing, stargazing/moon watching, hunting crabs with flashlights, volleyball, jogging, beach walking, photography, and birdwatching are among the many activities commonly observed along the beaches of the Outer Banks.

3.3.3. Natural Beachfronts

Physical Characteristics. This area is defined by an undeveloped dune system and sandy beach. While the dunes may be punctuated by boardwalks, ramps, or footpaths, the defining characteristics are coastal vegetation and the lack of residential or other development on the landward side of the dunes. In some areas, public accessways allow visitor use and (in some locations) vehicle use on the beach. The character of the Natural Beachfront is heavily influenced by the Open Ocean and the Conservation Areas that flank this Character Area.

Ecological zonation along the Natural Beachfront has resulted from both natural processes (winds and wind-driven sand, severe storms and surges, dune migration) and human activities (construction and vegetative stabilization of the dune system). Vegetative cover on the dunes is variable, depending upon the exposure to wind and wave action, and to some extent human activity. Shrub thickets in back of the dunes provide a variety of vegetative cover and wildlife habitat. Further inland, maritime forests are the dominant cover, characterized by live oaks and loblolly pines.

Most of the Natural Beachfronts are places of state and national significance, set aside for recreation as well as habitat preservation. The primary purpose of Currituck NWR is to preserve, protect and maintain healthy and viable populations of migratory birds, wildlife, fish, and plants. Access is limited to foot traffic or 4WD vehicles. False Cape State Park features hiking, interpretive displays, and camping (both in the live oak maritime forest as well as on the beach). Cape Hatteras National Seashore contains over 112 km (70 mi) of beach, starting at the southern end of the study area and extending to the southern end of Ocracoke Island.

Noteworthy Scenic Resources, KOPs, and Other Attractions

- **NPS Units:** Cape Hatteras National Seashore: Coquina Beach (see KOP 11)
- **State Parks:** False Cape State Park (KOP 1), Virginia Beach, Virginia
- **Wildlife Preserves:** Back Bay NWR (see KOP 1), Virginia Beach, Virginia; Currituck NWR, north of Corolla, North Carolina.

- **False Cape State Park (KOP 1).** The 1,749 ha (4,321 ac) State Park in Virginia is a highly sensitive environment known for its undeveloped nature, the restrictions on visitor use, the length of the shoreland and the amount of land that is preserved, and the opportunity to experience a landscape that has not changed in recent years.
- **Cape Hatteras National Seashore (KOP 11).** Cape Hatteras National Seashore is a highly sensitive visual environment known for its undeveloped nature, iconic historic resources, and memorable seascapes. Bodie Island Light Station is the northernmost of the three lighthouses within the National Seashore. Coquina Beach, near the light station, features a large parking area, changing rooms, and pathways over the dunes to the beach.

Viewer Activities. While recreational use of the Natural Beachfronts may be somewhat similar to those activities found in the Developed Beachfront, the visitor experience is heightened by the absence of nearby development, the opportunity to see wildlife, and fewer visitors. Access restrictions limit the number of visitors as a way to preserve the scenic integrity of the place and maintain a balance with the natural environment. False Cape State Park, for example, requires that visitors either walk or bike in from Back Bay NWR, a distance of several kilometers. Once there, however, viewers can experience the northern Outer Banks as it existed a century or more ago. This is especially true after sunset, when the night skies are less obstructed by light pollution.

Activities enjoyed in the Natural Beachfront include swimming, surfing, beachcombing, exploring lighthouses and other historic resources, relaxing on the beach, ocean kayaking, ocean fishing, stargazing/moon watching, hunting crabs with flashlights, volleyball, jogging, kite flying, beach walking, wildlife photography, birdwatching, driving on the beach, camping on the beach, and hunting in designated areas. Coquina Beach allows vehicle access onto the beach (low air pressure in tires required), which makes it attractive for people who want easy access for fishing and beach-going.

3.3.4. Conservation Areas

Physical Characteristics. Conservation areas on the Outer Banks have been established to preserve and protect places of important historic, ecological, and recreational interest. The landscape character of each Conservation Area is unique unto itself. The importance of the open ocean in characterizing conservation areas is variable and dependent on the proximity of each conservation area to the coastline. Bodie Island Light Station, Wright Brothers National Memorial, Currituck Lighthouse and Historic Corolla Park are designed and managed landscapes, known for their cultural history. Cape Hatteras National Seashore, False Cape State Park, and Jockey's Ridge State Park are natural landscape systems known for their ecological processes.

Noteworthy Scenic Resources

- **National Park Service Units:** Cape Hatteras National Seashore: Bodie Island Light Station (KOP 11), Nags Head; Wright Brothers National Memorial (KOP 8), Kill Devil Hills.
- **State Parks:** False Cape State Park (KOP 1), Virginia Beach, Virginia.
- **Wildlife Preserves:** Back Bay NWR (see KOP 1), Virginia Beach, Virginia; Currituck NWR, north of Corolla, North Carolina.
- **Conservation Lands:** Nags Head Woods Preserve (The Nature Conservancy), Kill Devil Hills; Kitty Hawk Woods, Kitty Hawk (a portion is a designated State Nature Preserve).

- **Historic Sites:** Currituck Beach? Lighthouse (KOP 2) and Historic Corolla Park (no Project views).

Noteworthy Scenic Resources, KOPs, and Other Attractions

- **False Cape State Park** (KOP 1). See description under 3.3 Natural Beachfronts.
- **The Currituck Beach Lighthouse** (KOP 2) is the most northern lighthouse on the Outer Banks and the state of North Carolina. It also has the distinction of being the only North Carolina lighthouse with an unpainted brick exterior, which makes it stand out among the other black and white lighthouses along the Outer Banks. The Lighthouse also serves as a focal point for the adjacent Historic Corolla Park 16 ha (39 ac) and is one of the main attractions on the Outer Banks. Currituck Beach Lighthouse is one of two lighthouses within the study area, the other being Bodie Island Light Station in Cape Hatteras National Seashore. The lighthouse was completed in 1875 and is privately owned by Outer Banks Conservationists, which completed a major renovation of the structure and grounds in the 1980s. The 49 m (162 ft) tall structure is open to the public (for a small fee), affording a panoramic view of the northern Outer Banks from its observation deck.
- **Wright Brothers National Memorial** (KOP 8), the site of the first manned flight in 1903, is one of the most important scenic and historic sites in the northern Outer Banks, attracting large numbers of visitors throughout the year. The Memorial hosted 277,963 visits in 2020, which was down over 30 percent from 2019 due to the pandemic (the visitor center was closed from March 17 to September 2, 2020). During a typical year, the Memorial receives well over 400,000 visitors per year.
- **Jockey's Ridge State Park** (KOP 9) is the site of the largest natural active sand dune system in the eastern United States, with dunes upwards of 18 m (60 ft) in height. The Park is one of the most popular scenic and natural attractions on the northern Outer Banks, drawing visitors for its memorable landscape, constant winds, recreational opportunities, and views to the surrounding seascape and sounds.
- **Bodie Island Light Station** (KOP 11), part of Cape Hatteras National Seashore, is on the NRHP and one of the major visitor attractions in Cape Hatteras National Seashore.

Viewer Activities. Viewer activities are highly diverse and vary by the individual site. These areas, especially the Wright Brothers National Memorial and Cape Hatteras National Seashore, are growing in popularity and attract large numbers of visitors. Activities include hiking, lighthouse climbing, photography, wildlife observation, hang gliding, kite flying, biking, nature study, fishing, hunting (limited), camping, tram tours (at False Cape State Park), historic trails, and interpretive learning.

3.3.5. Coastal Communities

Physical Characteristics. Between the Developed Beachfront and the Sound on the west side of the Outer Banks are residential and commercial areas that provide housing, commercial, institutional, and other services for the general population and visitors to the Outer Banks. Defining features include the road network (major north-south arterial, local public roads, private road), housing (single family homes of all sizes, multi-family units, hotels and motels), paved walking/biking trails paralleling major roads, commercial developments (village scale and highway commercial), and a considerable amount of utility infrastructure (communication towers, water towers, small-scale wind generators, and high visible overhead transmission line corridor). Topography is generally flat, which limits the ability to see objects

beyond the midground. The open ocean may be visible at times from within the Coastal Communities, but open ocean views are limited to some street corridors elevated viewpoints. Some communities have enacted design guidelines while other appear to have a more hands-off approach to siting and design.

Noteworthy Scenic Resources. Scenic resources within the Coastal Communities are limited to historic sites and districts.

Viewer Activities. Residents and visitors engaged in recreational and community activities in the Coastal Communities outside of the Developed Beachfront and Conservation Areas will not have views of the Project.

3.3.6. Sounds

Physical Characteristics. Sounds are the water areas and adjacent shorefront on the west side of the Outer Banks. Currituck Sound is a 396 km^2 (153 mi^2) estuary on the west side of the northern Outer Banks, extending from the Virginia border south to Southern Shores, a distance of about 48 km (30 mi). Albemarle Sound borders the southern part of the study area from Kitty Hawk to Nags Head and is one of the largest estuaries in the state. In Virginia, Back Bay is separated from Currituck Sound by Knotts Island on the west side of False Cape State Park. With the exception of where the sounds meets the ocean water, the character of the open ocean has little influence on the characteristics of the sounds.

Noteworthy Scenic Resources. The sounds themselves are scenic resources, offering opportunities for a variety of outdoor recreation pursuits in a highly scenic location.

Viewer Activities: Boating, fishing, swimming, wildlife observation.

3.4. Visualizations

The visualizations show the portions of the Project that will be seen throughout the study area at varying distances. Figure 11 shows the location of all identified KOPs and Table 19 summarizes the visualizations developed for each of the 11 KOPs. A total of 17 simulation images were developed to show variation in weather conditions and lighting. The visualizations are provided in Attachment 3.

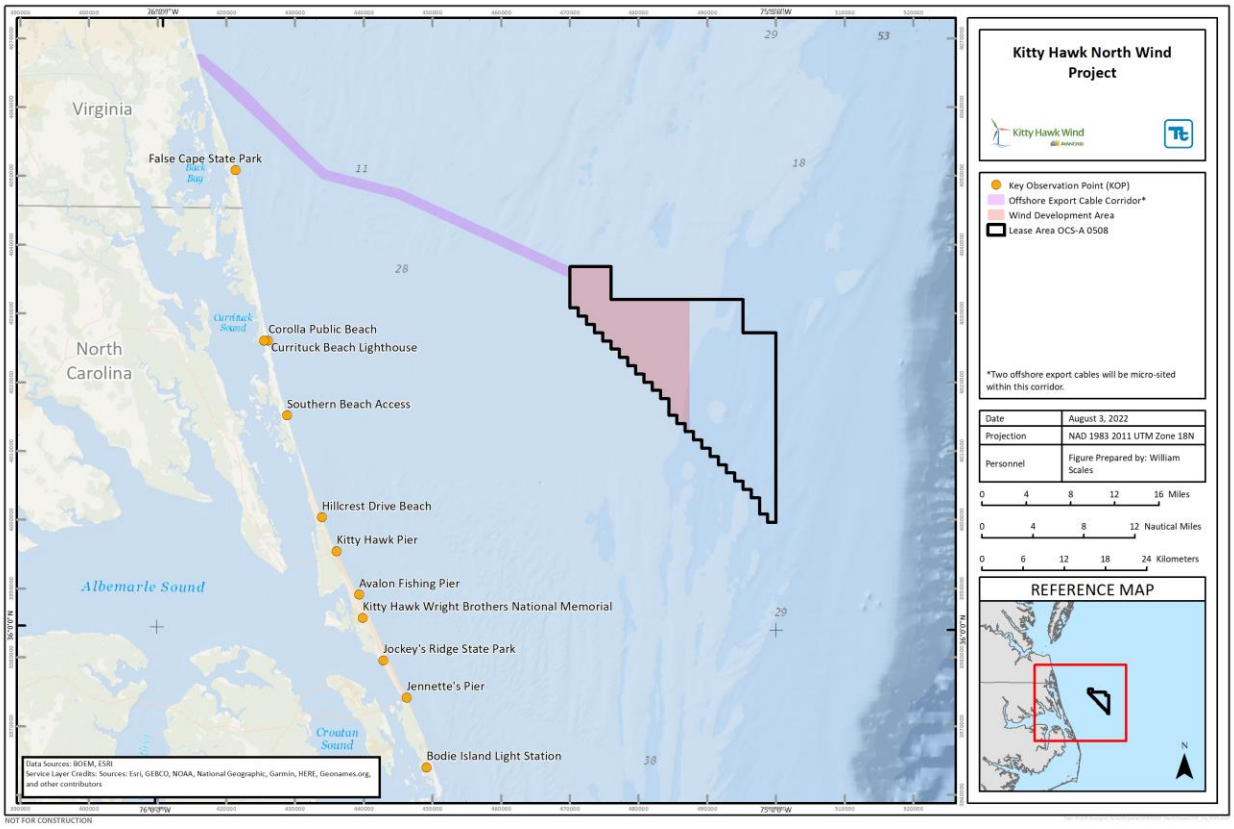


Figure 11. Key Observation Points

Table 19. KOP Visualizations

ID	Location	Distance to Nearest WTG	Viewing Elevation	HFOV	Location Description	Character Area
1	False Cape State Park, Virginia	53.4km (28.8 nm / 33.2 mi)	3.1 m (10.2 ft)	13.0°	Remote State Park along the southern Virginia coast.	Natural Beachfront
2	Currituck Beach Lighthouse, Corolla, North Carolina	45.6 km (24.6 nm / 28.3 mi)	47.5 m (155.8 ft)	23.6°	Historic 1873 lighthouse 49.4 m (162.1 ft) tall, highest point in visible range	Conservation Area
3	Corolla Public Beach (Day), Corolla, North Carolina	45 km (24.3 nm / 28.0 mi)	3.7 m (12.1 ft)	23.9°	Adjacent to densely settled residential waterfront area, nearby KOP 2, identified in BOEM 2012	Developed Beachfront
3A	Corolla Public Beach (Dusk), Corolla, North Carolina	45 km (24.3 nm / 28.0 mi)	3.0 m (9.8 ft)	23.9°	Adjacent to densely settled residential waterfront area, nearby KOP 2, identified in BOEM 2012	Developed Beachfront
4	Southern Beach Access (Day), Corolla, North Carolina	45.1 km (24.3 nm / 28.0 mi)	8.4 m (27.6 ft)	27.7°	Southernmost public beach access in Corolla	Developed Beachfront
4A	Southern Beach Access (Night), Corolla, North Carolina	45.1 km (24.3 nm / 28.0 mi)	4.2 m (13.8 ft)	27.7°	Southernmost public beach access in Corolla	Developed Beachfront
5	Hillcrest Drive Beach (Day), Southern Shores, North Carolina	48.1 km (25.9 nm / 29.9 mi)	5.2 m (17.1 ft)	29.9°	Public beach in residential area, identified in BOEM 2012	Developed Beachfront
5A	Hillcrest Drive Beach (Overcast Dusk), Southern Shores, North Carolina	48.1 km (25.9 nm / 29.9 mi)	5.2 m (17.1 ft)	29.9°	Public beach in residential area, identified in BOEM 2012	Developed Beachfront
5B	Hillcrest Drive Beach (Clear Dusk), Southern Shores, North Carolina	48.1 km (25.9 nm / 29.9 mi)	5.2 m (17.1 ft)	29.9°	Public beach in residential area, identified in BOEM 2012	Developed Beachfront
5C	Hillcrest Drive Beach (Night), Southern Shores, North Carolina	48.1 km (25.9 nm / 29.9 mi)	5.2 m (17.1 ft)	29.9°	Public beach in residential area, identified in BOEM 2012	Developed Beachfront

ID	Location	Distance to Nearest WTG	Viewing Elevation	HFOV	Location Description	Character Area
6	Kitty Hawk Pier (Overcast), Kitty Hawk, North Carolina	49.9 km (26.9 nm / 31.0 mi)	7.5 m (24.6 ft)	29.7°	End of hotel pier with ocean view	Developed Beachfront
6A	Kitty Hawk Pier (Clear), Kitty Hawk, North Carolina	49.9 km (26.9 nm / 31.0 mi)	7.5 m (24.6 ft)	29.7°	End of hotel pier with ocean view	Developed Beachfront
7	Avalon Fishing Pier, Kill Devil Hills, North Carolina	51.7 km (27.9 nm / 32.1 mi)	7.3 m (24.0 ft)	28.9°	Popular pier with large parking lot in residential area of Kill Devil Hills	Developed Beachfront
8	Wright Brothers National Memorial, Kill Devil Hills, North Carolina	53.8 km (29,0 nm / 33.4 mi)	28.5 m (93.5 ft)	27.8°	National Memorial and popular tourist site with elevated views	Conservation Area
9	Jockey's Ridge State Park, Nags Head, North Carolina	55.3 km (29.9 nm / 34.4 mi)	21.8 m (71.5 ft)	26.1°	State park and popular tourist site with elevated dunes	Conservation Area
10	Jennette's Pier, Nags Head, North Carolina	56.4 km (30.4 nm / 35.0 mi)	13.6 m (44.6 ft)	24.3°	Event space on second level of Jennette's Pier	Developed Beachfront
11	Bodie Island Light Station Bodie Island, North Carolina	62.3 km (33.6 nm / 38.7 mi)	41.1 m (134.8 ft)	20.7°	Historic lighthouse part of Cape Hatteras National Seashore	Conservation Area

Table Notes:

- Elevation: The camera height above mean sea level (MSL).
- Nearest: The horizontal distance from the KOP to the closest WTG.
- HFOV (Horizontal Field of View): The horizontal angle over which the WTGs might be visible under optimal weather conditions.

3.5. Viewer Groups

Viewer groups describe the various types of viewers who live, work, visit, and/or recreate in the study area and who may be affected by the offshore components of the Project. The identification of viewer groups helps to understand variations in potential sensitivity to visual change. The way in which viewers interact with the seascape/landscape affects their perception and awareness of their surroundings. Three categories of viewer groups who may be affected by the Project are recognized: Year-round Residents, Visitors (seasonal residents / tourists), and Mariners. Since there are no views of the Project from public roadways, motorists and through travelers are not considered.

3.5.1. Year-Round Residents

Year-round residents live and work in the study area throughout most of the year. They are the ones who most frequently use and interact with the study area – from their homes, roadways, places of employment, and those amenities necessary to their daily lives. Seven communities comprise most of the study area: Virginia Beach in Virginia, and Corolla (unincorporated), Duck, Southern Shores, Kitty Hawk, Kill Devil Hills, and Nags Head in North Carolina. According to 2019 census data and other sources, the year-round population of the northern Outer Banks in North Carolina is estimated to be approximately 17,500. Corolla is not an incorporated town and its population is estimated at 500.

Seascape/landscape viewing, appreciation, and expectation is highly variable based on the individual. It is dependent on a resident's place of residence, type of work, commuting pattern, and recreational activities. With the exception of homes facing the ocean, residential properties are typically organized in recognizable neighborhoods with views focused on the immediate surroundings. This user group is likely to experience the seascape/landscape a) from stationary viewpoints over prolonged periods of time from their homes or work; b) while moving through the landscape during commuting or day-to-day travels within the community; and c) during time spent pursuing outdoor recreational activities within the study area.

Year-round residents have the greatest level of familiarity with the landscape as a whole. While residents with properties on the immediate shoreline will have a greater level of sensitivity to visual change, it is likely that all year-round residents are familiar with views of the coastline and will be sensitive to visual change in the seascape/landscape.

As noted in the descriptions for each of the Character Areas, residents and visitors enjoy a wide range of recreational activities within the study area. Some of the more popular activities occurring within sight of the Project include fishing (offshore from boats, from fishing piers, and on the beach), swimming, surfing, beachcombing, relaxing, kayaking, volleyball, jogging and beach walking, photography, birdwatching, camping, beach driving, visiting historic sites (lighthouses and Wright Brothers Memorial). Context photographs included in the VIA illustrate most of these activities and give an indication of their relative popularity.

3.5.2. Visitors

Visitors to the study area include tourists, seasonal residents, and vacationers. During summer months the population can swell to over 50,000, as people are attracted by the recreational opportunities of the barrier islands, scenic resources, and milder temperatures. This influx in summer visitors places considerable pressure on the scenic and recreational resources of the northern Outer Banks as well as the local road networks. This seasonal user group is most likely to participate in outdoor recreational activities such as beach combing, boating, fishing, walking/hiking, golfing, cycling, surfing, and wildlife

viewing. This group is also likely to take advantage of the many commercial attractions along the highways: restaurants, shopping, bike and beach gear rentals.

A 2006 year-long survey of visitors to the Outer Banks provides an overview of visitor use patterns and satisfaction levels. While not particularly current, it does provide a baseline for describing how people react to the seascape/landscape of the northern Outer Banks. A total of 5,290 people were surveyed, with the majority during the summer months. The following are some of the key findings of the survey:

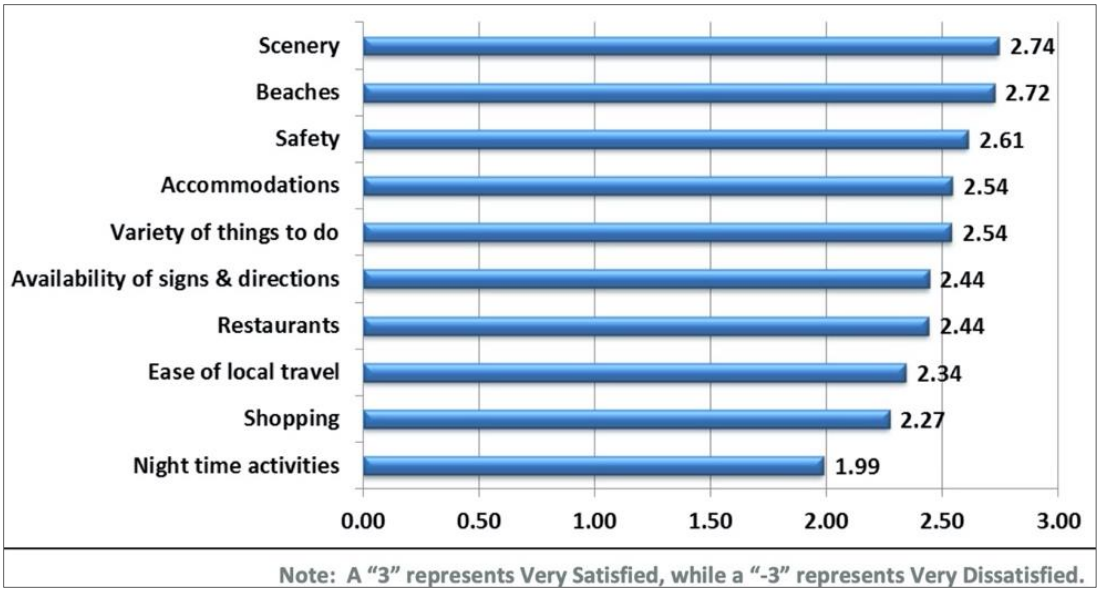
- Overall, beaches, accommodations, historic landmarks and scenic areas or drives were primary motivators for visitation.
- Most visitors came from Washington D.C., Philadelphia, Pennsylvania, and Norfolk- Portsmouth-Newport News, Virginia.
- First-time visitors were more likely to visit the Outer Banks during the off season.
- The most popular overnight destinations were Nags Head, Kill Devil Hills, and Kitty Hawk.
- The types of accommodations used varied by season. Those traveling in the off season were far more likely to use hotel / motel accommodations rather than rental properties.
- Most visitors to the Outer Banks were very satisfied. Spring visitors reported the highest levels of satisfaction, while winter visitors were the least satisfied.[3]

In 2014, the Outer Banks Visitors Bureau, recognizing the need for objective, current data about visitors to the Outer Banks, commissioned a one-year survey of visitors. The intent of the latest survey is to provide insights into who is visiting the Outer Banks, why they visit, what they did while visiting, what they spent, and how they evaluate their experience. Some of the key findings, based upon qualified responses from 11,183 visitors, include:

- Visitor satisfaction during their stay is very high and has been sustained at that level from the Outer Banks' previous survey in 2006. (See Figure 12 below).
- Although still very positive, upper income level visitors are less satisfied with restaurant and night-time activity options than other age groups.
- The majority of visitors (64 percent) are repeat visitors, and the average repeat visitor is making their sixth trip to the Outer Banks.
- More than 93 percent of visitors are in the Outer Banks for pleasure/vacation.
- 95 percent of visitors stay for one or more nights; only five percent come for the day only.
- The average duration of stay for those visitors who stay overnight is 5.8 nights.
- The average party size is 5.4, varying from a high of 6.6 in the summer months to a low of 3.4 in the winter.[4]

[3] https://assets.simpleviewinc.com/simpleview/image/upload/v1/clients/outerbanks/2005_2006_year_long_visitor_profile_54ac9971-3bff-4693-bd45-493f12d06e09.pdf

[4] https://www.nagsheadnc.gov/DocumentCenter/View/2104/The-Outer-Banks-Visitors-Bureau-Visitors-Survey-



Source: Outer Banks Visitors Bureau 2014-2015 Visitor Survey

Figure 12. Satisfaction with Experiences During Stay in the Outer Banks

Visitors were asked what activities they participated in during their stay in the Outer Banks. The top three activities were beach, scenic drives, and lighthouses (see Figure 13 below).

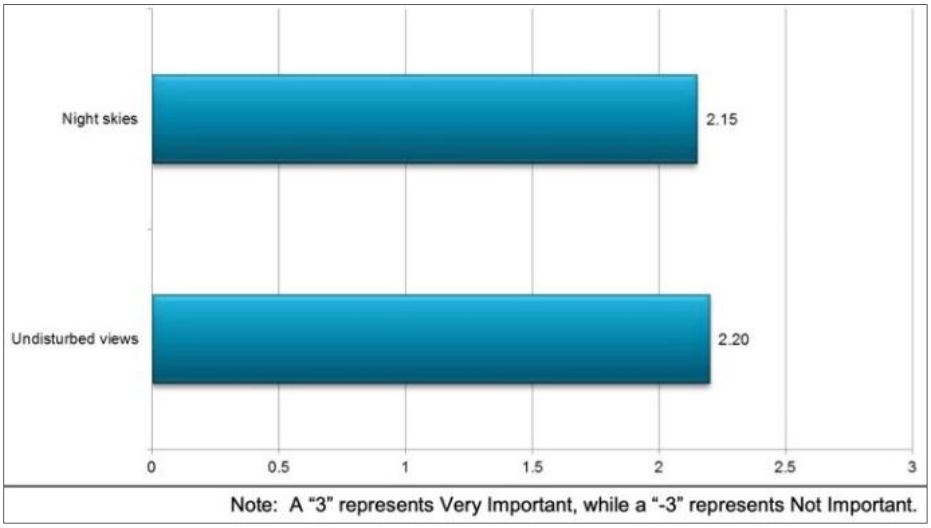
Activity/ Attraction	# of Respondents	% of Total Respondents
Beach	9,682	87.7%
Scenic drives	7,621	69.1%
Lighthouses	7,311	66.3%
Dining at restaurants unique to the area	5,773	52.3%
National parks	5,436	49.3%
Museums / historic sites	5,278	47.8%
Shopping	5,106	46.3%
Ferry	2,748	24.9%
Fishing from beach or pier	2,378	21.6%
Wildlife preserve/ bird watching	2,361	21.4%
Hiking	2,234	20.2%
Beach/off-road driving	1,772	16.1%
Kite flying	1,544	14.0%
Biking	1,330	12.1%
Kayaking/canoeing	1,007	9.1%
Art gallery	789	7.2%

Activity/ Attraction	# of Respondents	% of Total Respondents
Water sports	776	7.0%
Charter/boat fishing	671	6.1%
Golf	656	5.9%
Surfing	542	4.9%
Camping	523	4.7%
Festival or other special event	515	4.7%
Study /educational tour	442	4.0%
Theater performance	427	3.9%
Concert or musical performance	257	2.3%
Parasailing	246	2.2%
Wedding	238	2.2%
Tennis	185	1.7%
Hang gliding	146	1.3%
Competitive sports event	126	1.1%
Kite boarding	88	0.8%
Scuba diving	61	0.1%

Source: Outer Banks Visitors Bureau 2014-2015 Visitor Survey

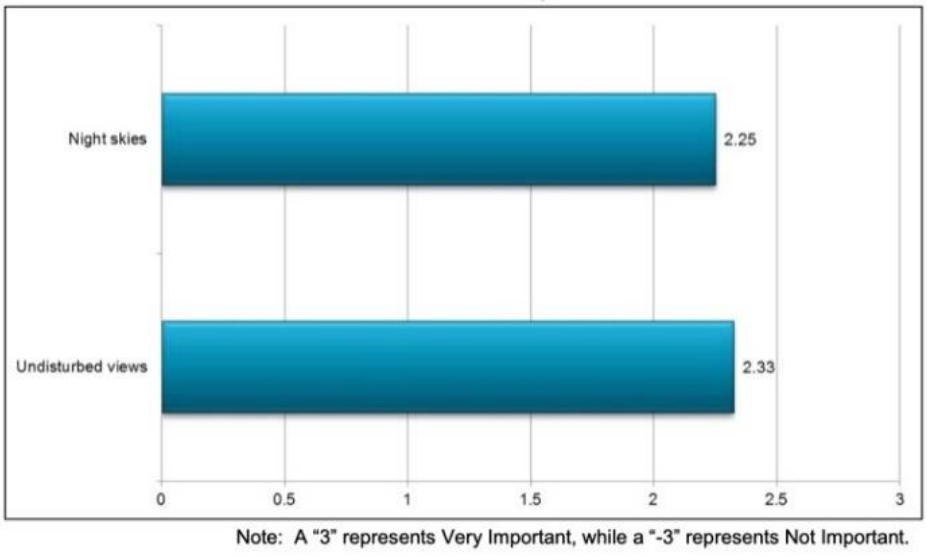
Figure 13. Activities During Stay on Outer Banks

The Outer Banks Visitor Bureau was also interested in whether undisturbed views and night skies were important to visitors. To explore this, two questions were asked: "How unique are the undisturbed views and night skies at the Outer Banks?" and "How important are the undisturbed views and night skies?" Visitors were given a scale of -3 (not unique, not important) to 3 (very unique, very important). The results demonstrate that visitors do feel the Outer Banks views are unique (Figure 14) and that this is important to them (Figure 15).



Source: Outer Banks Visitors Bureau 2014-2015 Visitor Survey

Figure 14. Evaluation of the Uniqueness of Night Skies and Undisturbed Views



Source: Outer Banks Visitors Bureau 2014-2015 Visitor Survey

Figure 15. Evaluation of the Importance of Night Skies and Undisturbed Views

National Park Visitors. Despite the limits on travel due to the pandemic, Cape Hatteras National Seashore and the Wright Brothers National Memorial had the highest number of visitors on record in January of 2021. This is in keeping with a recent pattern where visitor records for January have been broken in each of the past three years. In 2020 the National Seashore had over 2.6 million visitors, the highest number in 17 years and a 1.49 percent increase over 2019. Note that these numbers are for the whole of the National Seashore, which extends southward to Ocracoke Island. Approximately 15 percent of the National Seashore is within the study area.[5]

Visitorship at Wright Brothers National Memorial was down over 30 percent in 2020 (to 277,963) when it was closed from March 17, 2020 to September 5, 2020 due to the pandemic. However, park visitation increased by 31 percent in the last four months of 2020 when compared to the last four months of 2019.[6]

3.5.3. Mariners

Mariners include those boating, fishing, sightseeing, or transiting in the Atlantic Ocean. This viewer group may be offshore for commercial or recreational purposes as part of their daily work, recreation, or employment on fishing boats, cargo vessels, or other large transit ships.

The commercial component of this group is typically focused on the task at hand, more engaged with their primary activity of fishing or navigation and less concerned with the aesthetic quality of the seascape/ landscape. On the other hand, people on sightseeing boats and cruises are focused on the scenic qualities of the beaches, the open ocean, and the visible seascape. While charter fishing boat passengers are focused on the waters in the immediate foreground, being on the open ocean with 360° views certainly enhances the experience.

Sensitivity to visual change in this user group varies. Commercial mariners may be accustomed to the presence of large-scale vessels and other types of industrial infrastructure and have less sensitivity to visual change. People who fish offshore, either on their own boats or on charter boats, may be more likely to consider and appreciate the seascape views. This group has the potential to have foreground views of the Project by electing to navigate out to and through the WTG array. The Block Island Wind Farm in Rhode Island has generated considerable interest from tourists, which has led to charter boat tours to the five-WTG array located five km (2.7 nm / 3 mi) from the island.[7]

3.6. Viewer Activities

As noted in the descriptions for each of the Character Areas, residents and visitors enjoy a wide range of recreational activities within the study area. Some of the more popular activities occurring within sight of the Project include fishing (offshore from boats, from fishing piers, and on the beach), swimming, surfing, beachcombing, relaxing, kayaking, volleyball, jogging and beach walking, photography, birdwatching, camping, beach driving, and visiting historic sites (lighthouses and Wright Brothers Memorial). Context

[5] USDI, National Park Service. Recreation Visits by Month: Cape Hatteras National Seashore. https://irma.nps.gov/STATS/SSRSReports/Park%20Specific%20Reports/Recreation%20Visitors%20By%20Month%20(1979%20-%20Last%20Calendar%20Year)?Park=WRBR

[6] USDI, National Park Service. Recreation Visits by Month: Wright Brothers National Memorial. https://irma.nps.gov/STATS/SSRSReports/Park%20Specific%20Reports/Recreation%20Visitors%20By%20Month%20(1979%20-%20Last%20Calendar%20Year)?Park=WRBR

[7] BOEM. 2018. Analysis of the Effects of the Block Island Wind Farm (BIWF) on Rhode Island Recreation and Tourism Activities. United States Department of the Interior Office of Renewable Energy Programs, Bureau of Ocean Energy Management. University of Rhode Island. OCS Study BOEM 2018-068. December 2018.

photographs included in the VIA illustrate most of these activities and give an indication of their relative popularity.

As a resort location, viewers spend considerable amounts of time on the beach, swimming, walking, relaxing, and fishing. Other activities are much more focused on the object of interest (e.g., climbing lighthouses, experiencing the dunes at Jockey's Ridge State Park, walking up Kill Devil Hill to visit the Wright Brothers Memorial).

Limitations are placed on visitors at several locations. Reservations are required to climb the Bodie Island Light Station. Some of the beach parking areas are for members of community associations. Fishing piers require day passes to use the piers. Many of the beaches – while open to the public – are associated with gated resort communities that restrict access to members. False Cape State Park requires visitors to walk or bike into the park as a means to preserve the experience and protect sensitive wildlife habitat. The State Park also offers scheduled tram tours through the park to accommodate a greater number of visitors.

While most of the activities involve considerable numbers of participants, there are opportunities for fewer people or more isolated experiences. The beaches on the National Seashore generally have less visitors than the town beaches to the north. Camping on the beach at False Cape State Park (less than 30 potential sites) is tightly controlled and limited by the rangers. Throughout most of the study area, during the early morning and late evening hours fewer people are on the beach, walking, jogging, exercising, and fishing.

There are a few places within the study area where it is possible to experience an almost totally natural landscape. These include False Cape State Park in Virginia and Currituck NWR at the northern end of the Outer Banks. These places, along with portions of the National Seashore, are remnants of what the original landscape looked like before human settlement. While these places are remote, they are clearly not wilderness areas, as evidenced by ongoing management activities, ranger patrols, trail systems, and other visitor facilities.

Perhaps the group that is most sensitive to changes are residents of the Developed Beachfront who look east to the Atlantic Ocean. Most of the residences in this Character Area – and the northern Outer Banks as a whole – have been built or elevated to capture the views to the water (and to avoid surges during hurricanes and other severe storm events). Structures typically contain balconies, decks, and upper floors that provide 180-degree views of the beach and the ocean.

Most of the activities that occur within sight of the Project are influenced to varying degrees by the surrounding natural and cultural landscape. Some activities – such as relaxing on the beach, exercising, and beach walking – involve direct viewing of the seascape and the dynamic quality of the ocean, with participants sensitive to changes to that view. Other activities – such as fishing, kayaking, beach volleyball – may be enhanced by the setting but participants may not be as sensitive to changes in the Open Ocean.

3.7. Nature of Impact

The offshore component of the Project consists of up to 69 WTGs, each with a total height of 317 m (1,042 ft) above sea level (measured to the top of the blade path). In addition, there will be one offshore ESP in a location within the array that minimizes its visibility. The top of the nacelles, where the FAA-required aviation obstruction lighting will be located, will be 183 m (602 ft) above sea level. The WTGs

will be arranged in a grid pattern, with individual WTGs spaced 1.4 km (0.8 nm / 0.9 mi) apart, separated by rows 2.2 km (1.2 nm / 1.4 mi) in width.

Project visibility will be a function of many factors:

- Horizontal distance from the observation point to the Project.
- Height of the viewer above sea level.
- WTG height (both the hub height and the tip of an upright blade).
- Color and reflectivity of the WTGs.
- Contrast with background sky.
- Curvature of the earth
- Atmospheric perspective: the effect of distance and haze on the appearance of distant objects, as contrast and color saturation decrease[8].
- Refraction (which may vary, depending upon weather conditions, temperature, and barometric pressure).
- Meteorological conditions (haze, fog, rain).
- Lighting conditions (based on seasonal, cloud cover, time-of-day).
- Artificial lighting (or the absence of lighting) in the vicinity of the observation point.
- Intervening vegetation and topography (mostly sand dunes) between observation points and the ocean.
- Community development patterns that may block views (primarily single-family homes and multi-story buildings).
- Visual acuity and concentration of the observer.

As seen in the visualizations, the blades of the WTGs and many of the nacelles will be minimally visible from the shoreline and the KOPs, primarily due to the effect of distance and the curvature of the earth.

3.8. Visibility

The Project ranged in distance to the shoreline from 45.5 km (24.6 nm / 28.3 mi) to 62.2 km (33.6 nm / 38.7 mi). The average distance from the shoreline to the nearest WTG is 54.4 km (29.4 nm / 33.8 mi); at that distance the WTG would have 166 m (545 ft) of its total height above water and would theoretically be visible to a viewer on land. Based upon a determination of curvature of the earth and atmospheric refraction, 151 m (496 ft) of the WTG would be hidden from a shoreline viewpoint 10 feet above sea level. If the WTG were visible under optimal viewing conditions, its relative size (apparent height measured at 61 cm (2 ft) from an observer's eye) would be approximately 1.9 mm (0.075 in). This is slightly greater than the thickness of a nickel. The vertical field of view (VFOV) would be considerably less than 1°. As shown in the visualizations the tops of the nacelles (where the FAA obstruction lighting would be located)

[8] http://www.arthints.com/what-is-atmospheric-perspective/

closest to an observer would appear to be slightly above the horizon to an observer at 3 m (10 ft) above MSL.

The theoretical limit of visibility is a function of many factors, some measurable (i.e., distance from the observer to the offshore WTG, the elevation of the observer, the height of the WTG, curvature of the earth) and some variable (i.e., atmospheric refraction, weather and atmospheric conditions, lighting, and visual acuity of the observer). The Viewshed Analysis presented in Attachment 1 illustrate the theoretical area that may have views of the Project, based upon the measurable factors. However, actual Project visibility will be considerably less, due to the number of variables that affect an observer's ability to detect objects at great distances.

At their widest point near the nacelle, the WTG blades have a width of approximately 10 m (33 ft) tapering to approximately 2 m (7 ft) at the tip. The maximum resolution of the human eye is approximately 28 seconds of an arc, which is equivalent to being able to distinguish an object 136 mm (5.3 in) in width at a distance of 1 km (0.54 nm / 0.62 mi) (Deering 1998). Under ideal conditions, the human eye should be able to resolve an object 6 m (20 ft) in width at 45 km (24 nm / 28 mi). At these distances the majority of the blade will be at or beyond the limits of visual acuity, especially when the WTGs are oriented in a direction parallel to the observer's view.

To address the issue of visibility of offshore wind projects, BOEM sponsored a study by Argonne National Laboratory's Environmental Science Division (EVS) and the University of Arkansas Center for Advanced Spatial Technology (CAST) to assess the visibility of existing offshore wind facilities in the United Kingdom.[9] The study was designed to identify the maximum distances at which offshore wind WTGs could be seen in both daytime and nighttime views and assess the effect of distance on the visual contrasts associated with these facilities.

Results showed that under favorable viewing conditions, offshore wind projects with 25 to 100 WTGs were visible to the unaided eye at distances greater than 42 km (23 nm / 26 mi), with blade movement visible up to 39 km (21 nm / 24 mi). At night, aviation hazard navigation lighting was visible at distances greater than 39 km (21 nm / 24 mi). The observed wind facilities were judged to be a major focus of visual attention at distances up to 16 km (9 nm / 10 mi); were noticeable to casual observers at distances of almost 29 km (16 nm / 18 mi); and were visible with extended or concentrated viewing at distances beyond 40 km (22 nm / 25 mi).

However, the Sullivan study was performed in 2013 with WTGs that had a blade tip height of less than half of what is being proposed by the Kitty Hawk North Wind Project. To account for contemporary WTGs, the distances and visual effects observed by Sullivan et al. should be increased proportionately with the increased WTG dimensions. Thus, under optimal weather and viewing conditions, the closest WTGs could be a major focus of visual attention at distances up to 32 km (17 nm / 20 mi). WTGs may be noticeable to casual observers – under optimal weather and viewing conditions – at distances up to up to 48 km (26 nm / 30 mi). Beyond that point, WTGs would only be visible under optimal weather and viewing conditions to an observer with concentrated attention to the horizon. Given the greater height and larger blades proposed for this Project, it is highly probable that blade movement may be apparent during clear viewing conditions and periods of high color contrast.

[9] Sullivan, Robert G. Assessment of Seascape, Landscape, and Visual Impacts of Offshore Wind Energy Developments on the Outer Continental Shelf of the United States. OCS Study BOEM 2021-032. Argonne National Laboratory, Lemont, IL. April 2021.

While the visualizations for this Project show WTG blades, from a practical viewpoint they would be minimally visible under normal viewing conditions at distances in excess of 45 km (24 nm / 28 mi) and may not be visible at all under hazy conditions due to atmospheric perspective.

In December 2017 the New York State Energy Research and Development Authority commissioned a Visibility Threshold Study as part of the New York State Offshore Wind Master Plan. The purpose of the study was to evaluate the visibility of a hypothetical offshore wind project at varying distances under a variety of meteorological conditions. The WTGs modeled for this study had a maximum height of 187 m (614 ft) above the water. Photosimulations were prepared to determine the degree of visibility under various distances from the shoreline, at three different times of the day, and under three different sky/cloud conditions. Clear sky weather conditions in the New York study area occur approximately 17 percent of the time, which is considerably less than similar conditions on the Outer Banks, where clear conditions occur between 25 and 35 percent of the time (see Figure 17).

Based upon the analysis of the data, the New York study resulted in several conclusions that may be applicable to the Outer Banks:

- At a distance of over 40 km (25 mi), under clear or partly cloudy conditions, it is likely that a viewer would not notice those portions of the WTG extending above the horizon without being prompted.
- The exception may be under very specific lighting conditions involving dark clouds on the horizon and intense morning or evening sunlight on the WTGs. Blade movement, which is nearly impossible to discern at distances in excess of 40 km (25 mi), may be detectable and draw the viewer's eye under these lighting conditions.
- For the study conditions in New York, it is expected that offshore wind WTGs of a magnitude somewhat less than those being proposed for the Outer Banks would have a minimal visual impact at 32 km (20 mi) from shore and negligible impact beyond 40 km (25 mi). This is particularly true for overcast conditions.[10]

Table 20 below summarizes the physical and atmospheric factors that determine Project visibility: distance from viewer to the Project, VFOV, HFOV, Curvature of the Earth, and Color Contrasts. The first four factors are measurable; the last is variable and plays an important role in determining Project visibility.

The aviation obstruction lighting, on the other hand, would be visible on those WTGs where the top of the nacelle appears above the horizon. Nighttime visualizations are included in the VIA to illustrate the line of FAA aviation obstruction lights that would be visible just above the horizon. In addition to these factors, visibility (or noticeability) will be influenced by the location of Project elements relative to the central view axis at each viewpoint. Viewers at the shoreline generally have a continuous HFOV of 180º. The central axis of the view is typically 90º from the beach, i.e., the focal point of the beach-goers view is at a right angle to the linear beach. Project elements within the central axis will act as focal points on the unbroken horizon. Project elements will be less noticeable where they are outside the central axis and in a position that causes viewers to turn their heads to observe them.

[10] Environmental Design & Research. New York State Offshore Wind Master Plan Visibility Threshold Study. Prepared for New York State Energy Research and Development Authority. Syracuse, NY. December 2017.

Table 20. Factors Affecting Project Visibility

FACTORS AFFECTING PROJECT VISIBILTY					
	SMALL	**SMALL-MEDIUM**	**MEDIUM**	**MEDIUM-LARGE**	**LARGE**
Distance to nearest visible WTG	40+ km (22+ nm / 25+ mi) from observer.	Over 32 to 40 km (17 to 22 nm / 20 to 25 mi) from observer.	Over 24 to 32 km (13 to 17 nm / 15 to 20 mi) from observer.	Over 8 to 24 km (4 to 13 nm / 5 to 15 mi) from observer.	0 to 8 km (4 nm / 5 mi) from observer.
Vertical Field of View (apparent height at arm's length)	WTGs appear to be less than $^1/_8$ inch above the horizon.	WTGs appear to be approximately $^1/_8$ inch but less than ¼ inch above the horizon.	WTGs appear to be approximately ¼ inch but less than ½ inch above the horizon.	WTGs appear to be approximately ½ inch but less than ¾ of an inch above the horizon.	WTGs appear to be ¾ of an inch or greater above the horizon.
Horizontal Field of View	Visible WTGs occupy less than 2º of the horizon.	Visible WTGs occupy 2º to <15º of the horizon.	Visible WTGs occupy 15º to <30º of the horizon.	Visible WTGs occupy 30º to <45º of the horizon.	Visible WTGs occupy more than 45º of the horizon.
Curvature of the Earth	Nacelles are visible at or near the horizon. Blades may be faintly visible. Blade movement may not be detectable.		A portion of the base plus the nacelle and blades will be visible.	Majority of the WTG is visible from sea level; USCG navigational lights are visible at water level	
Color Contrast/ Atmospheric Perspective	WTGs appear as various shades of gray, often blending into background sky.		WTGs appear as varying shades of white to gray, depending on light	WTGs appear bright white, especially in full sun	

3.8.1. Variability in Lighting

Many of the visualizations are based on photographs taken under ideal weather conditions (i.e., blue skies, few clouds, no obvious precipitation or atmospheric haze). The WTGs in these visualizations appear bright white, with distinct outlines resulting from maximum color contrast. (See, for example, the day-time visualizations at V01 through V05.)

While these images provide the reviewer with the most conservative view of the Project (i.e., the worst-case scenario), they do not portray the range of conditions and color contrast that will affect Project visibility. Based upon the experience of Sullivan[11] and TJD&A, WTG visibility can be highly variable throughout the year or even in a typical day, depending upon many factors. Sun direction and sun angle, atmospheric conditions, haze, cloud cover, and precipitation can all affect color contrast and therefore Project visibility,

Back-lit WTGs, especially when seen against a light-colored sky, can appear dark, while front-lit WTGs, seen in the evening hours against darker skies, can appear bright white. Clouds passing overhead can cast a dark shadow on the WTGs, which may render them almost invisible under certain conditions. Atmospheric perspective – the combined effect of haze and distance – can affect color contrasts, especially at greater distances from the observer.

[11] Sullivan, R.G., L.B. Kirchler, J. Cothren, S.L. Winters. 2013. Offshore Wind Turbine Visibility and Visual Impact Threshold Distances. Environmental Practice. Volume 14, Number 1. Pp. 33-49.

The timelapse video provided for the Project illustrates the effect on changing lighting conditions on WTG visibility. The location of the video – at KOP 5 Hillcrest Drive Beach Access in Southern Shores – is 48.1 km (26 nm / 29.9 mi) southwest of the Project. At sunrise the WTGs will be backlit against a light sky, rendering them dark and relatively obvious. As the sun rises and changes position from mid-morning to mid-afternoon, the WTGs will become less obvious and may become invisible to the average observer due to the lack of contrast with the sky. From mid-afternoon to early evening, the sun becomes lower and the WTGs become front-lit, which increases their color contrast and visibility. In the last hour before sunset the color contrast intensifies to a bright white. Depending upon cloud conditions, sunset may produce the most contrast with the light hitting the sides of the WTGs horizontally against a darkening sky.

3.9. Meteorological Factors

Variations in weather conditions and atmospheric conditions may impact visibility of the Project. Appendix L – Climatic Conditions Report, an appendix to the COP, provides a detailed description of coastal atmospheric conditions that may affect Project visibility.

3.9.1. Southern Atlantic Setting

The climate of the offshore Atlantic Ocean and adjacent land areas has influenced a number of variables, including the temperatures of the surface waters, water currents, and the winds blowing across the ocean and related waters. Because of the ocean's great capacity for retaining heat, maritime climates are moderate and are generally free of extreme seasonal variations. The oceans are the major source of the atmospheric moisture that is obtained through evaporation. Ocean currents contribute to climatic control by transporting warm and cold waters between regions. Adjacent land areas are affected by the winds that are cooled or warmed when blowing over these currents, while such winds also transport moisture to adjacent land areas.

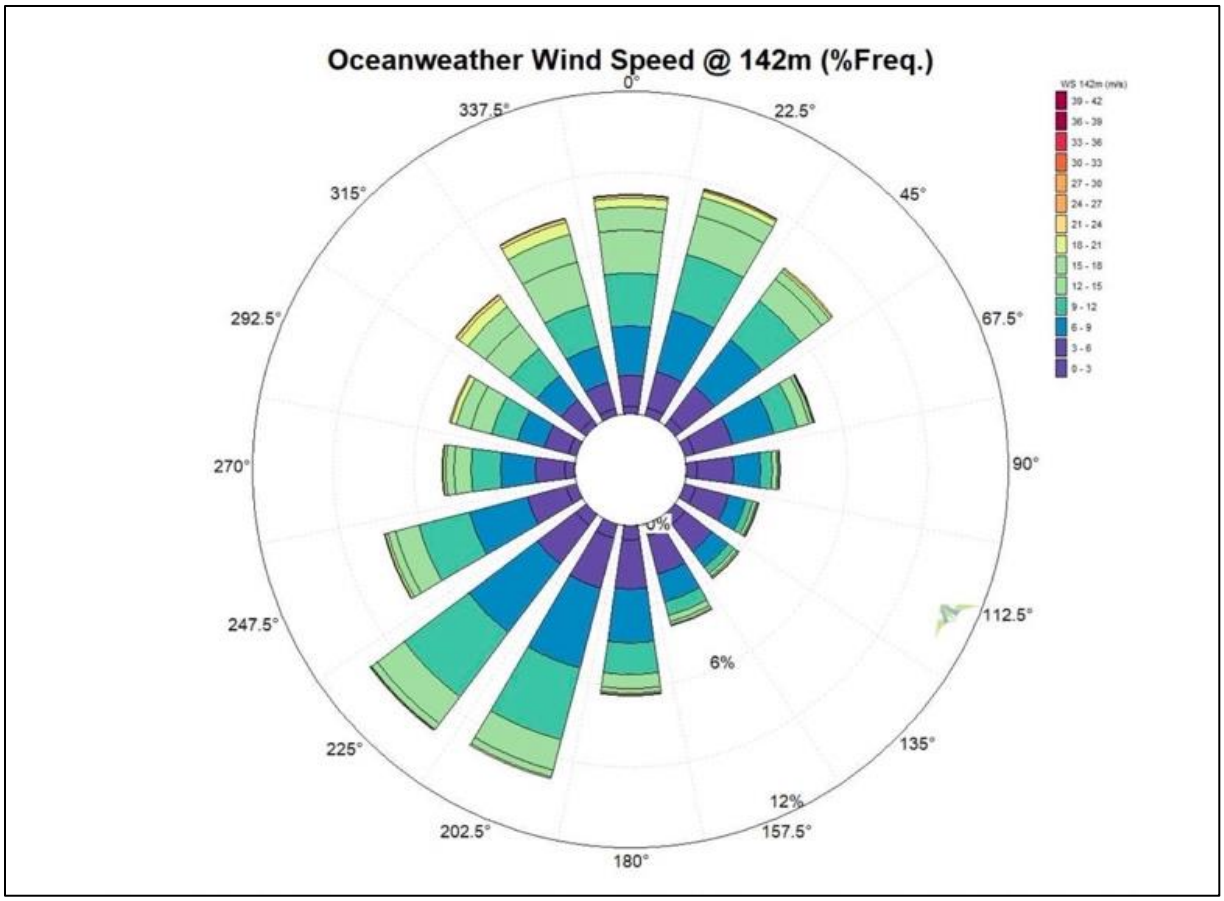


Figure 16. Wind Frequency Rose of Hub Height Wind Speed, from COP Appendix L

While the wind direction in the vicinity of Cape Hatteras is variable throughout the year, the predominant wind direction is from the southwest and from the north to northeast. This is graphically illustrated in Figure 16 (from Figure 6-6 from Appendix L of the COP – Climatic Conditions Report, dated July 26, 2021, prepared by the Company). Average wind speeds range from 5.4 to 6.4 meters per second (12.1 to 14.4 miles per hour) and exhibit smaller monthly variations than along the mid and north Atlantic Coasts.

In the south Atlantic coastal areas, precipitation is frequent and abundant throughout the year, but tends to peak in the summer months. Rainfall in the warmer months is usually associated with convective cloud systems that produce showers and thunderstorms. Winter rains are associated with the passage of frontal systems through the area. Fog occurs occasionally in cooler months as a result of warm, moist air blowing over cool land or water surfaces. Poorest visibility conditions occur from November through April. Periods of air stagnation, industrial pollution and agricultural burning can also impact visibility.[12]

3.9.2. Precipitation

Rain will typically reduce visibility, depending upon the intensity of the event and the size of the rain drops. Precipitation records from three sites from north to south were examined in detail: Naval Air

[12] BOEM. Final Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, by the Minerals Management Service, US Department of the Interior. October 1, 2007.

Station Oceana (KNTU) near Virginia Beach, Virginia, Manteo, North Carolina (KMQI), and Cape Hatteras, North Carolina (KHSE).

Naval Air Station Oceana (KNTU) presents a small seasonal variability with precipitation amounts generally between 90 and 130 mm per month. The variability of precipitation is noteworthy, particularly during the late summer and early autumn months when tropical storms can occur. The interannual precipitation can vary from ~715 mm to ~1500 mm (28 and 59 in).

Manteo, North Carolina (KMQI) presents a small seasonal variability with precipitation amounts generally between 90 and 130 mm (3.5 and 5.1 in) per month. The variability of precipitation is noteworthy, particularly during the late summer and early autumn months when tropical storms can occur. The interannual precipitation can vary from ~700 mm to ~1550 mm (28 and 61 in).

Cape Hatteras, North Carolina (KHSE) presents a small seasonal variability with precipitation amounts generally between 100 and 150 mm (3.9 and 5.9 in) per month. The variability of precipitation is noteworthy, particularly during the late summer and early autumn months when tropical storms can occur. The interannual precipitation can vary from ~750 mm to ~2300 mm (30 and 91 in).

Figure 17 shows the monthly statistics for rainfall from Cape Hatteras, North Carolina. On average, there are about six days per month with measurable precipitation. The inter-annual variability is large, the number of rainy days varying from 54 to 107 days per year.

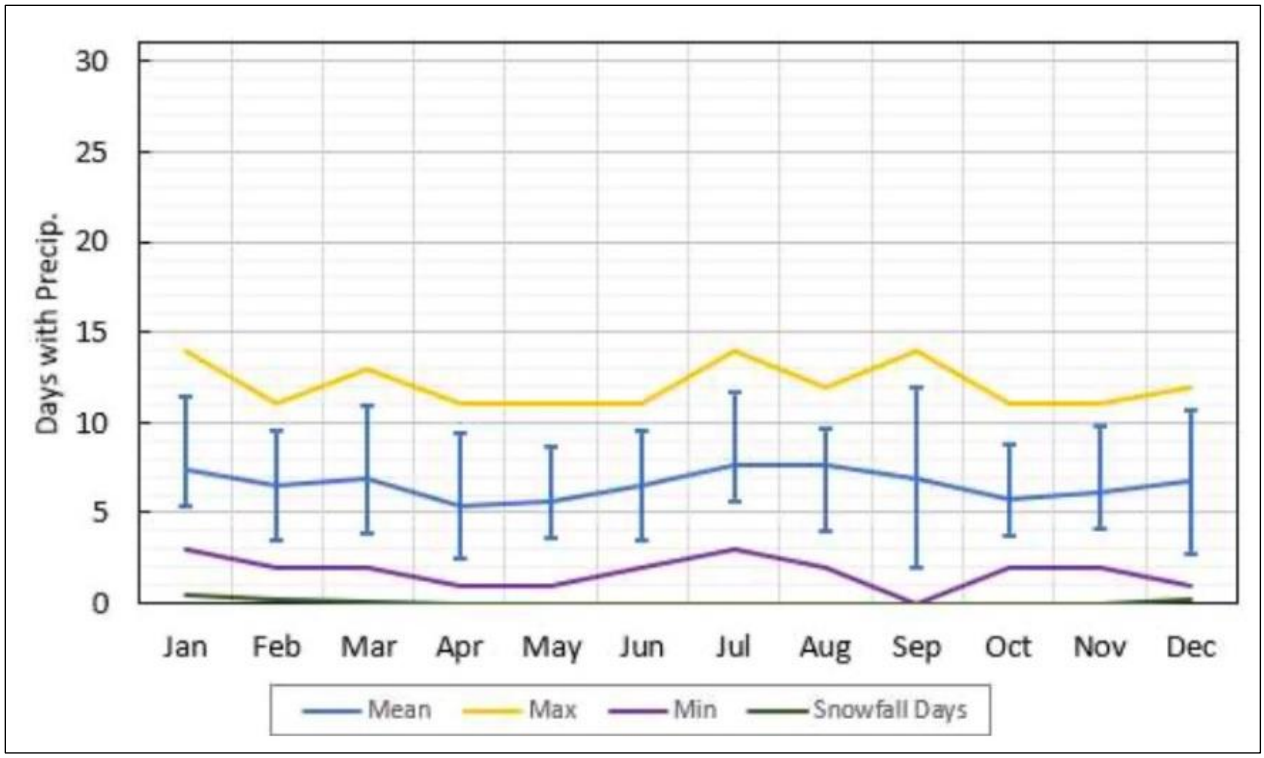


Figure 17. Monthly Precipitation Statistics, Cape Hatteras

3.9.3. Ocean Visibility

As described in the Appendix L to the COP, Climatic Conditions Report, there is generally little in the way of visibility records at offshore measurement platforms. Those buoys instrumented with visibility sensors do not have a long or continuous period of records. Buoy 44014 was instrumented with sensors to measure visibility, however there was only a total of 3.5 years of usable data recovered. The data from Buoy 44014 shows the mean distance of visibility ranges monthly throughout the year between 19.2 km (11 mi) in September to 28.9 km (17 mi) in July. See Appendix L to the COP, Climatic Conditions Report: Table 10-7: Monthly frequency statistics of Visibility from Buoy 44014.

The data also shows the likelihood of poor visibility at various times of day over the course of a year. The lowest probability of poor visibility occurs in June, July, and August, with probabilities of poor visibility 1-2 percent of the time. The probability of poor visibility increases during the winter months. December has the highest probability of poor visibility 10 percent of the time. See Appendix L to the COP, Climatic Conditions Report: Table 10-8: Probability of poor visibility versus time of day/month (Buoy 44014).

The United States Coastal Pilot (NOAA) provides a variety of information in narrative form to navigators of coastal and offshore waters of the United States. The following information is a generalized description of factors that may affect visibility in the area between Cape Henry, Virginia Beach, Virginia and Key West, Florida. Visibilities are generally good throughout the year, particularly offshore south of Charleston, South Carolina. Fog is the principal restriction to visibility. Onshore and along the coast this is often a radiation type fog, which forms shortly after sunset on cool, calm, clear nights. These fogs generally do not extend any great distance seaward but may seriously restrict harbor activities. They often burn off during the morning hours. Sea fogs occasionally drift onshore on hot summer days, persisting for many hours in a shallow layer along the coast. Foggy conditions vary widely at coastal locations depending upon exposure. In general, the number of days that visibility fall to 0.4 km (0.22 nm / 0.25 mi) or less ranges from 20 to 40 days annually, north of Cape Canaveral, Florida. These conditions are most likely from October through April.

West of the Gulf Stream, sea fog may occur over cooler waters when warm air is brought in from the south. These conditions are most likely over coastal waters from Norfolk, Virginia to Charleston, South Carolina during January, February, and March. During these months visibilities drop below 0.8 km (0.4 nm / 0.5 mi) on 1 to 5 percent of all ship observations. Conditions are worse from Cape Henry to Cape Hatteras. In addition to fog, precipitation occasionally reduces visibility over both land and water while haze and smoke sometimes restricts visibility over land.[13]

[13] https://nauticalcharts.noaa.gov/publications/coast-pilot/files/xml2html.php?xml=cp4/CPB4_C03_WEB.xml

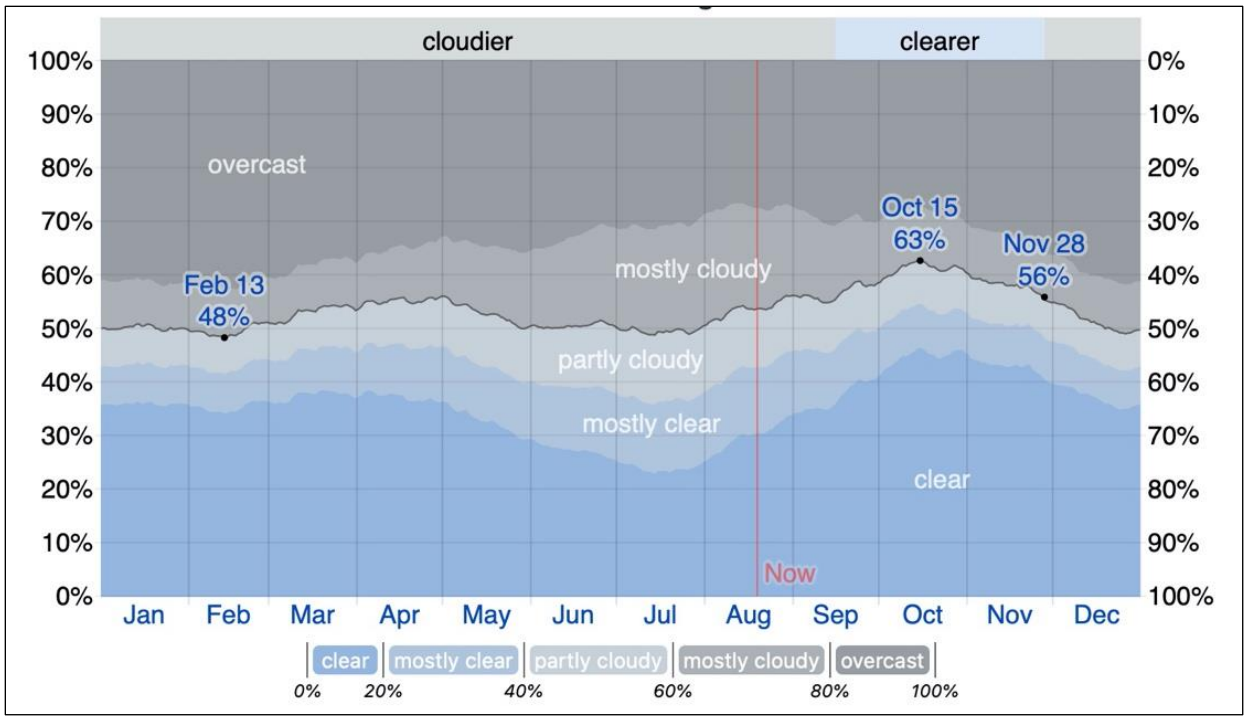


Figure 18. Cloud Cover Averages, Kitty Hawk, North Carolina

Cloud cover can affect the contrast between the sky and the color of a WTG. Sunny blue-sky days will typically have more contrast with the white WTGs than cloudy days with a grey-white sky. Sky cover is constantly changing and relatively evenly split between clear days, partly cloudy days, and cloudy days. Figure 18 shows the percentage of time in Kitty Hawk, North Carolina spent in each cloud cover band, categorized by the percent of the sky covered by clouds: Clear: 0-20 percent; Mostly Clear: 20-40 percent; Partly Cloudy: 40-60 percent; Mostly Cloudy: 60-80 percent; and Overcast: 80-100 percent.[14]

3.10. Seascape/Landscape Impact Assessment (SLIA)

The following section – based on Section 6 Seascape and Landscape Impact Assessment in the BOEM Guidance Document – evaluates the potential impacts of the Project on the Ocean Character Area (OCA) as well as each of the seascape/landscape Character Areas (SCA/LCA) within the study area.

3.10.1. Open Ocean

Definition: The offshore component of the Atlantic Ocean where the Project will be located, generally out of view of the shorefront.

Potential Project Visibility: The offshore components of the Project (i.e., WTGs, ESP, support vessels) will be visible from the Open Ocean and is the largest of the Character Areas that may be affected by the Project. Because there are no major fixed objects in the Open Ocean, any substantial vertical change, such as the WTGs and associated ESP, will be highly visible and act as a focal point in an otherwise horizontal seascape. The Open Ocean is also the least populated Character Area, by virtue of its

[14] Weather Spark. Average Weather in Kitty Hawk, North Carolina. https://weatherspark.com/y/22643/Average-Weather-in-Kitty-Hawk-North-Carolina-United-States-Year-Round Accessed August 18, 2021.

extensive size and types of user groups. Visibility will be a function of vessel heading, weather condition, and proximity to the Project components.

Resource Sensitivity: Low to Medium

- **Susceptibility to Change**: **Low to High**. The Open Ocean is a blank slate; any activity or permanent change will be noticeable and will contrast with the color, form, line, texture, and scale of the ocean.
- **Scenic Value**: **Low to High**. The Open Ocean is distinctive for many reasons: the lack of visible development, the 360° views, the distance that viewers can see in all directions, the presence of ocean-going vessels and fishing boats, and the changes in appearance and temperament that can and do occur over the course of a day. On the other hand, beyond the point where the shoreline is visible, the Open Ocean lacks scale, reference points, defining edges, vegetation, or other features that an observer can relate to.

Magnitude of Impacts: Small to Large

- **Size or Scale of Change**: **Variable.** The Project will add a group of vertical human-made objects to a horizontal seascape that currently has no visible development. The degree of change will be a function of the viewers' distance from the Project. From the outer limit of the study area 74 km (40 nm / 46 mi) the HFOV and VFOV are relatively small (less than 15° and less than 1° respectively). As the viewer approaches the Project, the HFOV will increase along with the VFOV. If viewers continue to a point within the WTG array, they will be surrounded by WTGs and their height will approach a 90° VFOV.
- **Geographic Extent**. **Large.** As seen in the viewshed map the Project will be visible from 100 percent of the Open Ocean Character Area.
- **Duration and Reversibility of Impacts**. **Fair.** The Project is expected to have a service lifetime of greater than 30 years and thus is considered a long-term installation. While the Project represents a major investment in time, knowledge, and resources, it is fully reversible.

Overall Impact to the Open Ocean: **Major to Negligible**. The Project's effect on the Open Ocean will be highly variable due to the nature and extent of the ocean environment and the unlimited number of viewpoints where the Project may be visible. Within the foreground viewing distance the Project will act as a focal point, with large-scale industrial structures unlike any vessel that would typically be part of the ocean view. From greater distances, the effect will be reduced as the apparent height (VFOV) and the extent of the horizon occupied by the Project (HFOV) diminishes.

The contrast in color between the WTGs and the background sky will also play a major role in Project visibility on the Open Ocean. As described in Section 3.8.1, backlit conditions against a lighter sky will create strong color contrast, especially in the early morning or late afternoon. Similarly, considerable color contrast will occur when the WTGs are front-lit and viewed against a darkening sky. During mid-day, when the sun as at its highest, the WTGs may be less visible. Observer position will play a major role in WTG lighting and color contrast. To someone in the ocean east of the Project, the early sun will make the WTGs front lit as seen against the lighter sky, resulting in less color contrast than a position between the shoreline and the Project (as described above).

It is highly probable that views of the Project elements under the most conservative conditions within 21 km (11 nm / 13 mi) would constitute a major scenic impact. As observers approach the Project the open ocean would become increasingly dominated by the scale and horizontal extent of the WTGs. For

mariners approaching from the southwest, at approximately 7.2 km (8.3 nm / 4.5 mi) the WTGs would occupy their entire 124º field of view. Moderate impacts would occur between 21 and 35 km (11 and 19 nm / 13 and 22 mi); and minor impacts would occur between 35 and 45 km (19 and 24 nm / 22 and 28 mi). At distances beyond 45 km (24 nm / 28 mi) the effect would typically be negligible.

3.10.2. Developed Beachfronts

Definition: The beachfront, dune system, and adjacent residential and commercial development located within the developed areas of the Outer Banks. Developed Beachfronts also include the numerous fishing piers that are found at regular intervals within the study area.

Potential Project Visibility. Portions of the Project will be visible from most of the Developed Beachfront at distances ranging from 43 km (23 nm / 27 mi) to 63 km (34 nm / 39 mi). Visibility may include the nacelles of the WTGs closest to the Outer Banks or just the blades, depending upon the distance from the viewer.

Resource Sensitivity: Low to Medium

- **Susceptibility to Change**: **Low**. The beaches in the study area along the Outer Banks are typically adjacent to residential development, often with the upper floors visible over the dunes to the west. On the beach the view eastward is toward the unbroken horizon of the Atlantic Ocean, where viewers can expect to see vessel traffic (military, cargo, fishing, sightseeing) during daytime and nighttime. Views to the north and south are primarily of the beaches, framed by the dunes and residential development, occasionally broken by fishing piers extending out into the ocean. Residents (owners and renters) of homes that back up to the beach as well as those further inland with upper-level views will have a heightened level of sensitivity to any type of development that would alter their accustomed view.
- **Scenic Value**: **Medium.** Wide sandy beaches with easy access characterize the seascape of the northern Outer Banks communities and are an important element in the recreation and tourist-based economy of the area. The fishing piers are commercial establishments set in mixed residential/commercial parts of the community. While they afford distinct elevated views of the ocean, their main value is the opportunity for saltwater fishing in a unique setting.

Magnitude of Seascape/Landscape Impacts: Medium

- **Size or Scale of Change: Small**. The Project will result in a cluster of human-made objects to an otherwise undisturbed ocean view. The degree of change will be relatively small, given the context of the beaches where resort development is typically part of the seascape. The Project will be seen over HFOVs of 23° to 30° throughout the Developed Beachfront, which will affect 12 percent to 16 percent of the 180° view from the beach. At distances ranging from 45 to 56 km (24 to 30 nm / 28 to 35 mi) to the nearest WTG, the VFOV will be less than 1°; blade movement should not be detectable to the average viewer. Under perfect weather conditions and bright sunlight, the WTGs may be faintly visible, as seen in the visualizations for the beaches and fishing piers (KOPs 3, 4, 5, 6, 7, 10).
- **Geographic Extent**: **Large**. The Project will be seen throughout the length of the beachfront coastal area running north/south. WTG visibility west of the beaches is limited by the height of the dunes, established vegetation, and residential and other development that extends up to and often includes the dunes. The viewshed analysis indicates that 68 percent of the Developed Beachfront Character Area will have potential visibility of the Project.

- **Duration and Reversibility of Impacts: Fair**. The Project is expected to have a service lifetime of greater than 30 years and thus is considered a long-term installation. While the Project represents a major investment in time, knowledge, and resources, it is fully reversible.

Overall Impact to Seascape/Landscape: Negligible. The Developed Beachfront, with its wide sandy beaches and encroaching residential development, is the focal point for viewer activity on the Outer Banks. Due to the effects of distance (45 to 56 km [28 to 35 mi] to the nearest WTG), curvature of the earth, and atmospheric perspective, the Project will be barely visible, if it is seen at all. The Project will not have a great effect on the character or key characteristics of the Developed Beachfront.

As noted in Section 3.8.1, lighting conditions throughout the day can vary widely, resulting in different levels of color contrast between the WTGs and the background sky conditions. At sunrise on a clear day along the Developed Beachfront, Project WTGs will be backlit against a light sky, rendering them dark and relatively obvious. As the sun rises and changes position from mid-morning to mid-afternoon, the WTGs will become less obvious and may become barely visible to the average observer due to the lack of contrast with the sky. From mid-afternoon to early evening, the sun becomes lower and the WTGs become front-lit, which increases their color contrast and visibility. In the last hour before sunset the color contrast intensifies to a bright white.

3.10.3. Natural Beachfronts

Definition: Undeveloped dune systems and sandy beaches that are found in protected locations throughout the length of the Outer Banks.

Potential Project Visibility: Portions of the Project will be visible from most of the Natural Beachfront at distances ranging from 45 km (24 nm / 28 mi) to over 77 km (42 nm / 48 mi). Visibility may include the nacelles of the WTGs closest to the Outer Banks or just the blades, depending upon the distance from the viewer.

Resource Sensitivity: High

- **Susceptibility to Change**: **High**. The Natural Beachfronts are recognized for their relatively undisturbed dune systems, with minimal permanent human-caused activity along the beach. The undeveloped nature of the beachfronts is unusual within the East Coast region of the United States. Signage, trails, and most other infrastructure, where present, is low-key and in keeping with the aesthetics of the resource. Human activity in the form of driving on the beach, fishing, and beachgoing leave ephemeral traces in the sand. Any changes in the ocean environment would be noticeable by virtue of the contrast that may be presented to the Natural Beachfront in color, form, line, and scale.
- **Scenic Value**: **High**. Natural beachfronts are distinctive for their lack of visible development along the shoreline, the restrictions on visitor use, the length of the shoreland, the amount of land that is preserved, and the opportunity to experience a landscape that has not changed in recent years.

Magnitude of Seascape/Landscape Impacts: Medium

- **Size or Scale of Change**: **Small.** The Project will add a group of vertical human-made objects to a horizontal seascape that currently has no visible permanent development. The degree of change will be relatively small: from the beach at False Cape State Park the WTGs will be seen over a HFOV of 13.0°, which is just over 7 percent of the 180° view experienced from the beach. At a distance of over 53 km (29 nm / 33 mi) to the nearest WTG, the VFOV will be less than 1°.

As seen in the visualization from the State Park, the Project will be at the outer limits of visibility, due to the distance from the shorefront and the effects of atmospheric perspective.

- **Geographic Extent**: **Large.** The Project will be theoretically visible from the entire shoreline of the Natural Beachfront. In False Cape State Park, for example, this included 9 km (4.9 nm / 5.7 mi) of beach. The viewshed map shows that the Project may also be visible from the tops of individual dunes behind the beachfront. However, the dunes are fragile natural environments with limited accessibility. The Project will not be visible from the vast majority of the land areas west of the dunes. The viewshed analysis indicates that 78 percent of the Natural Beachfront Character Area will have potential visibility of the Project.
- **Duration and Reversibility of Impacts: Fair.** The Project is expected to have a service lifetime of greater than 30 years and thus is considered a long-term installation. While the Project represents a major investment in time, knowledge, and resources, it is fully reversible.

Overall Impact to Seascape/Landscape: **Negligible**. The Natural Beachfronts are highly sensitive seascapes recognized for their undeveloped nature. At a distance of over 45 km (24 nm / 28 mi), the Project will be difficult to see due to the minimal level of contrast in color and the effects of atmospheric perspective. The Project should have a negligible effect on the inherent natural character or key characteristics of the Natural Beachfronts.

As noted in Section 3.8.1, lighting conditions throughout the day can vary widely, resulting in different levels of color contrast between the WTGs and the background sky conditions. At sunrise on a clear day along the Natural Beachfronts, Project WTGs will be backlit against a light sky, rendering them dark and relatively obvious. As the sun rises and changes position from mid-morning to mid-afternoon, the WTGs will become less obvious and may become barely visible to the average observer due to the lack of contrast with the sky. From mid-afternoon to early evening, the sun becomes lower and the WTGs become front-lit, which increases their color contrast and visibility. In the last hour before sunset the color contrast intensifies to a bright white.

3.10.4. Conservation Areas

Definition: Designated places of state or national significance that are located in whole or in large part outside of the Natural Beachfront. These are noteworthy places that have been established to protect wildlife habitat, scenic areas, or historic resources, while providing an abundance of outdoor recreational opportunities.

Potential Project Visibility: The Project will have very limited visibility within the Conservation Areas, primarily due to lack of topography, preserved woodlands, and distance from the open ocean. The exceptions will be views from elevated viewpoints, most notably the historic lighthouses (Currituck and Bodie Island) and sand dunes (Wright Brothers National Memorial and Jockey's Ridge State Park).

Resource Sensitivity: High

Susceptibility to Change: **Low to High**. The susceptibility of Conservation Areas to visual change is greatly dependent upon existing conditions and the character of the facility. False Cape State Park, for example, is recognized for its relatively untouched natural condition, with only minor evidence of human-caused changes throughout the park. Any changes would be noticeable by virtue of the contrast that may be presented in color, form, line, and scale.

More typical are the Conservation Areas in the southern part of the study area, where the conserved landscape is surrounded by intense coastal development, with highly visible roads, buildings, and utility infrastructure within the viewshed.

Scenic Value: **High**. Conservation areas are distinctive for many reasons: recognition at the state or national level (National Seashore, State Park), lack of visible development along the shoreline (False Cape State Park), the iconic natural of the landscape itself, and the relatively high number of people who enjoy the resource.

Magnitude of Seascape/Landscape Impacts: Small

- **Size or Scale of Change**. **Small.** The Project will add a group of vertical human-made objects to a seascape that currently has no visible development. Throughout the study area the degree of change will be relatively small, ranging from a HFOV of 13.0° at False Cape State Park (just over 7 percent of the 180° view) to a HFOV of 26.1° at Jockey's Ridge State Park (7.3 percent of the 360° view from the dune nearest the Project). In all these areas the VFOV will be less than 1°. The visualizations show that the Project will be at the outer limits of visibility, due to the distance from the Outer Banks and the effects of atmospheric perspective on visibility.
- **Geographic Extent**. **Small.** The Project will be theoretically visible from the entire shoreline of the study area, including the Conservation Areas. The extent of Project visibility is offset by the small apparent size of the WTGs due to the effect of distance and atmospheric perspective. The viewshed analysis indicates that approximately 2 percent of the Conservation Areas Character Area will have potential visibility of the Project.

  At False Cape State Park the Project will be visible from approximately 9 km (4.9 nm / 5.7 mi) of shoreline and, to a limited degree, from to tops of individual dunes behind the beachfront. However, the dunes are fragile natural environments with limited accessibility. The Project will not be visible from the vast majority of the 1,789 ha (4,321 ac) park.

  From Jockey's Ridge State Park, the WTGs will be seen from the ever-shifting tops of the sand dunes, which account for approximately 0.5 percent of the park.

  At the Wright Brothers National Memorial, the only point of Project visibility is from the top of the monument to the Wright Brothers at the top of Kill Devil Hill, which represents less than 0.01 percent of the Memorial's land area.
- **Duration and Reversibility of Impacts**. **Fair.** The Project is expected to have a service lifetime of greater than 30 years and thus is considered a long-term installation. While the Project represents a major investment in time, knowledge, and resources, it is fully reversible.

Overall Impact to Seascape/Landscape: **Negligible**. Conservation Areas are highly sensitive and important environments known for the quality of their scenery as well as their historic, recreational, and natural resources. However, at a distance of over 53 km (29 nm / 33 mi), the Project will be difficult to see due to the minimal level of contrast in color. The Project should have a negligible to minor effect on the inherent natural character or key characteristics of the Conservation Areas.

As noted in Section 3.8.1, lighting conditions throughout the day can vary widely, resulting in different levels of color contrast between the WTGs and the background sky conditions. At sunrise on a clear day in the Conservation Areas, Project WTGs will be backlit against a light sky, rendering them dark and relatively obvious. As the sun rises and changes position from mid-morning to mid-afternoon, the WTGs

will become less obvious and may become barely visible to the average observer due to the lack of contrast with the sky. From mid-afternoon to early evening, the sun becomes lower and the WTGs become front-lit, which increases their color contrast and visibility. In the last hour before sunset the color contrast intensifies to a bright white.

3.10.5. Coastal Communities

Definition: The residential and commercial areas located on the barrier island land masses and set back further from the ocean than the Developed Beachfront.

Potential Project Visibility: There is virtually no Project visibility from most locations within the Coastal Communities, due to the vegetated dunes, Developed Beachfront structures, and intervening vegetation. Any Project visibility would be seen in the context of coastal resort development.

Resource Sensitivity: Low

- **Susceptibility to Change: Low.** Coastal Communities are the prevalent and most visible form of development on the northern Outer Banks.
- **Scenic Value: Low.** The landscape of the Coastal Communities is characterized by dense resort development, gridded road patterns, and major utility corridors set against the backdrop of the natural landscape of the Outer Banks.

Magnitude of Seascape/Landscape Impacts: Small

- **Size or Scale of Change**. **None.** The Project will not be visible from those areas identified as Coastal Communities, i.e., the residential and commercial areas outside of the Developed Beachfront that have no or very limited views of the ocean.
- **Geographic Extent**. **None.** The viewshed analysis indicates that less than 1 percent of the Coastal Communities Character Area will have potential visibility of the Project. The areas of visibility may be elevated viewpoints or hillsides embedded in the communities (such as lighthouses and tall sand dunes). However, these individual features are isolated occurrences and usually located in Conservation Areas.
- **Duration and Reversibility of Impacts**. **Fair.** The Project is expected to have a service lifetime of greater than 30 years and thus is considered a long-term installation. While the Project represents a major investment in time, knowledge, and resources, it is fully reversible.

Overall Impact to the Coastal Communities: **None**. There will be no impact to the Coastal Communities due to lack of Project visibility.

3.10.6. Sounds

Definition: Waterbodies and adjacent shorefront on the west side of the Outer Banks.

Potential Project Visibility: The viewshed analysis (Attachment 1) indicates that blade tips may be visible from certain parts of Currituck Sound. The Project will not be visible from Albemarle Sound to the south.

Resource Sensitivity: Low

- **Susceptibility to Change**: **Low**. Community development on the sound (west) side of the barrier islands is oriented in a westerly direction toward the marshes and open waters of Currituck Sound. The Project would thus be screened by intervening topography and the buildings in the

Coastal Communities. If the Project were visible to the communities on the west side of Currituck Sound, it would be seen in the context of the existing development on the Outer Banks.

- **Scenic Value**: **Medium**. The sounds are notable features within the seascape of the study area. Their undulating shorelines are largely natural, with marsh vegetation and habitats particularly suitable for waterfowl. Much of the Sounds have remained untouched and are preserved through conservation efforts and wildlife refuge designations. The primary value of the sounds – i.e., as destinations for hunting and fishing – is derived from the variety of habitats, the marshy islands, the dense thickets of maritime forests that form the interface between land and water.[15]

Magnitude of Seascape/Landscape Impacts: Small

- **Size or Scale of Change**. **Small.** The Sounds occupy the outer limits of the study area, at distances of 56 to 64 km (30 to 35 nm / 35 to 40 mi) from the Project. At these distances, the blades would theoretically be visible, but the average viewer would have a difficult time discerning them on the horizon due to the lack of color contrast and diminutive size. Blade movement would not be apparent.
- **Geographic Extent**. **Small.** The viewshed analysis indicates that up to 13 percent of the Sounds Character Area will have potential visibility of the WTG blade tips, while potential visibility of the WTG hubs is less than 1 percent. Portions of the Project (primarily blade tips) will be theoretically visible from portions of Currituck Sound. The Project will not be visible from Albemarle Sound.
- **Duration and Reversibility of Impacts**. **Fair.** The Project is expected to have a service lifetime of greater than 30 years and thus is considered a long-term installation. While the Project represents a major investment in time, knowledge, and resources, it is fully reversible.

Overall Impact to Seascape/Landscape: **Negligible**. At distances of over 53 km (29 nm / 33 mi), the blade tips would be very difficult to discern from water or land and would not be recognizable by the average viewer. Research by Robert Sullivan and others has determined that blade motion is not visible beyond 43 km (23.2 nm / 26.5 mi), or if it was, the effect would be negligible.[16] There should be no measurable Project visibility from the Sounds, because of community orientation, distance, minimal color contrast, relative apparent size of the WTGs, and the screening presence of the vegetated dunes and development on the Outer Banks. The Project should have a negligible effect on the inherent natural character or key characteristics of Currituck Sound. The Project will not be visible from Albemarle Sound.

3.11. Visual Impacts Assessment (VIA)

The following section – based on Section 7.5 Evaluation of Impact Levels in the BOEM Guidance Document – presents a detailed evaluation of the potential effect on viewers for each of the eleven KOPs.

3.11.1. False Cape State Park

Viewer Sensitivity: High

- **Susceptibility to Change: High.** In terms of numbers of viewers, False Cape State Park has very low visitor use. Getting to the park on foot or bike requires pre-planning and good physical conditioning. Reaching the ocean from the various trails that wind through the park is an important component of the visitor experience. The state park is also accessible by regularly

[15] https://www.outerbanks.com/currituck-sound.html
[16] Sullivan, Robert G. Assessment of Seascape, Landscape, and Visual Impacts of Offshore Wind Energy Developments on the Outer Continental Shelf of the United States. OCS Study BOEM 2021-032. Argonne National Laboratory, Lemont, IL. April 2021.

scheduled tram tours, which are limited to the main roadway through the park. Once there, visitors can experience one of the few remaining undeveloped shorelines in Virginia. From the KOP, and virtually all the oceanfront within the park, viewer attention is likely to be focused on the shorefront, which is the most dynamic component of the State Park.

- **Value Attached to Views**: **High**. Unlike the majority of the scenic resources on the Outer Banks within the study area, False Cape State Park is remote, undeveloped, and challenging. This is a unique landscape by virtue of its natural attributes and limitations. The interpretation at the State Park focuses on the relationship between the dunes, the wind, the vegetation, and the ocean. To the adventurous, primitive camping on the shoreline is an experience worth the 8 to 14 km (5 to 9 mi) walk or bike ride to get to the park.

  The location of the KOP is typical of landscape/seascape that characterizes False Cape State Park, with a relatively wide sand beach, gentle grading leading to the water, simple north-south oriented shoreline, 180º view of the ocean, and clear demarcation at the edge of the rolling frontal dunes that rise 4 to 7 m (13 to 23 ft) above the beach. On the beach the view eastward is toward the unbroken horizon of the Atlantic Ocean. The KOP was selected for its proximity to both the Barbour Hill Trail and one of the park's primitive beachfront camping areas.

Magnitude of Visual Impacts: Small

- **Size or Scale of Change: Small**. As seen in the visualization, the WTGs will appear as faint objects on the horizon, with minimal contrast in color due to the effects of atmospheric perspective and distance. The Project will occupy a relatively small amount of the seaward view, with the WTGs appearing at or slightly above the horizon. At distances exceeding 53 km (29 nm / 33 mi), the movement of the WTG blades will not be apparent. The FAA aviation obstruction lighting may be visible to people camping on the beach, where they will also see the lights from ocean-going vessels in the offshore shipping lane.
- **Geographic Extent: Small-Medium.** The Project will be visible to the right of center and occupy a HFOV of approximately 13°, which is just over 7 percent of the 180° view that is characteristic of the shoreline. The primary view axis from the beach front faces northeast, and the Project is located to the southeast of the KOP. WTGs will be visible throughout the Natural Beachfront False Cape State Park. Within the park, Project views are limited to the beachfront and the tops of some of the dunes approaching the beach. Other than the shorefront and an occasional glimpse from atop the dunes leading to the water, the Project will not be visible to viewers in the interior of the park.
- **Duration and Reversibility of Impacts: Fair.** The Project is expected to have a service lifetime of greater than 30 years and thus is considered a long-term installation. While the Project represents a major investment in time, knowledge, and resources, it is fully reversible.

Overall Impact to Viewers: Minor to Negligible. The State Park is a unique natural environment that draws a limited number of visitors to experience a shorefront virtually untouched by human development. The addition of the WTGs to the seascape may alter some visitors' experience, especially those who spend concentrated time on the beachfront enjoying the unbroken horizon, the solitude of the place, and the opportunities to explore. The Project would only be visible from the beachfront and the tops of the dunes. The Project would be screened from most of the Park by the dunes and associated vegetation.

As noted in Section 3.8.1, lighting conditions throughout the day can vary widely, resulting in different levels of color contrast between the WTGs and the background sky conditions. At sunrise on a clear day

in False Cape State Park, Project WTGs will be side lit against the early morning sky, making them appear darker than the sky. As the sun rises and changes position from mid-morning to mid-afternoon, the WTGs will become less obvious and may become barely visible to the average observer due to the lack of contrast with the sky. The WTGs in visualization V01 are light gray, due to the effects of distance, atmospheric perspective, and the angle of lighting. From mid-afternoon to early evening, the sun becomes lower the WTGs ultimately become front-lit during the summer months, which will increase their color contrast and make them more visible to Park visitors, especially in the last hour before sunset.

The one aspect of the Project that may be objectionable to some viewers is the nighttime appearance of the FAA aviation obstruction lighting. Campers have the option of pitching their tents in designated sites in the maritime forests in the interior of the Park or selecting a site at the base of the dunes on the ocean. On clear nights, the Project's FAA aircraft detection lighting will be visible on the horizon over a horizontal field of view of 13º. The degree of visibility will be a function of weather conditions: under hazy or cloudy conditions the individual lights may not be distinctly visible or may be seen as a dull glow. The synchronized flashing of the visible lights will be noticeable, but – at the closest distance of over 53 km (29 nm / 33 mi) – will not dominate the night sky. Due to the curvature of the earth, not all of the WTG lights will be visible; to a person standing at the edge of the beach, up to 14 of the aviation obstruction lights may be visible under optimal viewing conditions.

Due to the lack of contrast, relatively small size of the Project elements, and the distance from the observer, the Project should have a very minor to negligible effect on the viewer experience.

3.11.2. Currituck Beach Lighthouse

Viewer Sensitivity: High

- **Susceptibility to Change: Medium-High.** The Currituck Beach Lighthouse is on the National Register of Historic Places and located adjacent to Historic Corolla Park. The landscape immediately surrounding the lighthouse acts as an oasis, affording visitors with a connection to historic times and a reprieve from the intense development nearby. The 16-ha (39-ac) Historic Corolla Park (also referred to as Currituck Heritage Park) is one of the biggest attractions in the northern Outer Banks. In addition to the Currituck Beach Lighthouse, Historic Corolla Park also features the historic Whalehead (a 1,950 square meter [21,000 square foot] hunt club built in the late 1920's, now open to the public) and the Outer Banks Center for Wildlife Education.

  There are three distinct landscape patterns visible from the observation deck: a) the manicured grounds of the Historic Corolla Park, b) the largely undisturbed salt marshes of Currituck Sound, and c) medium-high density residential communities, featuring large seasonal homes on relatively small lots. Much of the foreground in the easterly view from the lighthouse's observation deck (i.e., toward the Project) is dominated by the intense coastal development that is characteristic of much of the Outer Banks. Visitors to the lighthouse will have driven along Route 12, which is characterized by intense coastal development and seasonal traffic congestion. Viewer expectation is colored by the development in the immediate foreground of the easterly view toward the Project.

- **Value Attached to Views**: **High**. The lighthouse is on the NRHP and adjacent to Historic Corolla Park. Both are major visitor attractions throughout the year for people interested in history and the landscape of the Outer Banks. The elevated nature of the view (45 m / 148 ft above sea level) affords viewers with a unique perspective of the larger landscape and seascape.

The lighthouse's observation deck will be the only place within the Historic Corolla Park where the Project will be visible, due to its elevated position above the landscape and seascape. At the ground level, visitors are much more aware of the immediate foreground, the historic features of the Historic Corolla Park, and the views westerly toward Currituck Sound. Views from the residential development comprise the foreground of the easterly view (toward the Project) are the subject of KOP 3: Corolla Public Beach.

Magnitude of Visual Impacts: Small

- **Size or Scale of Change: Small.** The visualization from the lighthouse demonstrates that the WTGs will appear as a cluster of small objects on the horizon, with slight contrasts in color due to the effects of atmospheric perspective and distance. Due to the elevated viewer position, less of the WTGs will be blocked by the curvature of the earth, making them appear somewhat larger than the view from the beach. From the observation deck the Project will occupy a relatively small amount of the 360° view, with the WTGs appearing at or slightly above the horizon. Under perfect weather conditions and bright sunlight, the WTGs may be faintly visible, as seen in the visualization. At distances exceeding 37 km (20 nm / 23 mi), the movement of the WTG blades will not be apparent. While the FAA aviation obstruction lighting may be visible from the lighthouse, it is generally not open to the public during evening and nighttime hours.
- **Geographic Extent: Small.** The Project will be visible due east of the lighthouse and will be seen over a HFOV of approximately 27.8°, which is 7.7 percent of the 360° view from the observation deck. The only point within the lighthouse grounds where the Project will be visible is from the observation deck. Dunes and intermittent vegetation combine to block views of the WTGs from the lighthouse grounds and the adjacent Currituck Historic Area.
- **Duration and Reversibility of Impacts: Fair.** The Project is expected to have a service lifetime of greater than 30 years and thus is considered a long-term installation. While the Project represents a major investment in time, knowledge, and resources, it is fully reversible.

Overall Impact to Viewers: Minor to Negligible. The lighthouse is an iconic part of the Outer Banks landscape/ seascape, surrounding by a designated historic area as well as dense coastal development. At a distance of over 45 km (24 nm / 28 mi) the Project will be a minor element in the seascape/open ocean, if it is visible at all during the 5-10 minutes that the typical viewer spends at the observation deck. The appearance of the WTGs will be a function of lighting conditions and will vary from light gray to dark gray, depending on the direction of the sun and time of day.

As noted in Section 3.8.1, lighting conditions throughout the day can vary widely, resulting in different levels of color contrast between the WTGs and the background sky conditions. At sunrise on a clear day, Project WTGs will be side lit against the early morning sky, making them appear darker than the sky. However, the lighthouse does not open to the public until 9AM. As the sun rises and changes position from mid-morning to mid-afternoon, the WTGs will become less obvious and may become barely visible to the average observer due to the lack of contrast with the sky. From mid-afternoon to early evening, as the sun becomes lower the WTGs ultimately become front-lit during the summer months, which will increase their color contrast and make them more visible to lighthouse visitors. The WTGs in visualization V02 (based on a photograph taken at 4:33 PM) are white, showing the most conservative view of the Project. While the color contrast may intensify as the sun continues to set, the lighthouse closes to the public at 5PM. Therefore, the presence of the FAA obstruction lighting would not affect visitor experience.

The WTGs will not have an immeasurable effect on the character or key characteristics of the resource. The presence of the WTGs, if they are visible at a distance of over 37 km (20 nm / 23 mi), will have a minor to negligible effect on the viewer experience from the lighthouse.

3.11.3. Corolla Village Road Beach

Viewer Sensitivity: Medium

- **Susceptibility to Change: Medium.** The predominant visual characteristics of the beach at the end of Corolla Village Road are typical of most of the beaches along the Outer Banks: relatively wide expanse of sand, easy grade leading to the water, simple north-south oriented shoreline, 180º view of the ocean, and sharp demarcation at the edge of the frontal dunes that rise 4 to 7 m (13 to 23 ft) in height. While the KOP was selected due to its location at a prominent access point, the location is representative of the northern end of the Outer Banks.

  On the beach the view eastward is toward the unbroken horizon of the Atlantic Ocean. People are drawn to the beach for a variety of reasons, chief among them is to relax while watching the waves hitting the shoreline. Other activities, such as surfing, swimming, kayaking, beach volleyball, and fishing, are less dependent upon seaside views.

  The beach is adjacent to Corolla Light, a 97 ha (240 ac) resort village that borders the south side of Corolla Village Road and the accessway to the beach. High-density residential development – primarily the upper floors of large seasonal homes that are characteristic of much of the northern Outer Banks – is visible from the parking area, the accessway, and the beach. Residents (owners and renters) of homes with views of the ocean will have a heightened level of sensitivity to any type of change that would alter their accustomed view.

- **Value Attached to Views**: Medium-High. The Corolla Village Road Beach is one of several municipal access points in Corolla providing parking, access stairs/ramps, lifeguards, changing/bathrooms, and other amenities. The beach is relatively wide, typical of the Outer Banks, affording ample room for beachgoers to recreate and enjoy the view. The parking area – which is not visible from the beach – is one of the larger ones along the Outer Banks, providing free parking for 50-75 cars. Access points are found at regular intervals, so there is little opportunity for solitude. The beach and related infrastructure provide an attractive local setting to enjoy the seascape, with a sizeable changing/bathroom facility, interpretive signage, and other facilities.

Magnitude of Visual Impacts: Small

- **Size or Scale of Change: Small.** The visualization from the beach shows that the WTGs will appear as cluster of small human-made objects on the horizon, with slight contrasts in color due to the effects of atmospheric perspective and distance. The Project will occupy a relatively small amount of the 180° view, with the WTGs appearing at or slightly above the horizon. At distances exceeding 45 km (24 nm / 28 mi), the movement of the blades will not be apparent. The FAA aviation obstruction lighting may be visible as clusters of red points to people on the beach at night, where they may also see the lights from commercial fishing boats and ocean-going vessels in the offshore shipping lane. The VFOV will be less than 1°; blade movement should not be detectable to the average viewer. Under perfect weather conditions and bright sunlight, the WTGs may be faintly visible, as seen in the visualization

- **Geographic Extent: Medium.** The Project will be theoretically visible to all beachgoers and occupants of the homes within the Developed Beachfront, starting at the point where the access routes cross over the dunes. The WTGs will be seen over a HFOV of 23.9°, which is slightly more than 13 percent of the 180° view from the beach. The Project is located due east of the KOP, near the primary view axis from the KOP (primary view is east-northeast). As seen in the visualization, the apparent size of the WTGs is very small.
- **Duration and Reversibility of Impacts: Fair.** The Project is expected to have a service lifetime of greater than 30 years and thus is considered a long-term installation. While the Project represents a major investment in time, knowledge, and resources, it is fully reversible.

Overall Impact to Viewers: Minor to Negligible. The Corolla Village Road Beach is typical of most of the sandy shoreline of the northern Outer Banks, with a strong offshore horizon and coastal development encroaching on the dunes. The Project will be a minor visual element in the seascape and will not have a great effect on the character or key characteristics of the resource, or the activities that viewers enjoy at the beach.

People engaged in activities that involve direct viewing of the seascape – such as relaxing on the beach – may be sensitive to the presence of the Project, since it will represent a change to the constancy of the horizontal view of the ocean. Similarly, people in the homes overlooking the beach may likewise be sensitive to the addition to the seascape. However, given the distance to the Project, coupled with the effects of atmospheric perspective (which greatly diminishes color contrast), curvature of the earth, and limits of visual acuity, it is unlikely that blade movement or even the blades would be visible to the casual viewer.

As noted in Section 3.8.1, lighting conditions throughout the day can vary widely, resulting in different levels of color contrast between the WTGs and the background sky conditions. At sunrise on a clear day at the beach, most of the Project WTGs will be backlit against the early morning sky, making them appear darker than the sky. As the sun rises and changes position from mid-morning to mid-afternoon, the WTGs will become less obvious and may become barely visible to the average observer due to the lack of contrast with the sky. From mid-afternoon to early evening, the sun becomes lower the WTGs ultimately become front-lit during the summer months, which will increase their color contrast and make them more visible to beachgoers, especially in the last hour before sunset. The WTGs in visualization V03 (based on a photograph taken at 5:18 PM) are white, since they are front lit by the setting sun.

Where WTG hubs may be visible, they would appear at or just above the horizon. The Project components may be faintly visible under ideal weather conditions; under cloudy or hazy conditions the Project may not be visible at all. With the limited visibility resulting from these cumulative factors, the Project should have a minor to negligible effect on viewer activities that involve direct seascape viewing.

The one aspect of the Project that may be objectionable to some viewers is the nighttime appearance of the FAA aviation obstruction lighting, which will be seen as small points of lights just above the horizon. While the curvature of the earth diminishes the visibility of the WTG blades, the nacelles and the aviation obstruction lights would still be visible. As seen in the accompanying video, the intensity of the warning lights diminishes as a function of distance from the observer. Viewers on the beach at night also see the lights from the homes facing the beach as well as offshore fishing boats and ocean-going vessels.

People who swim in the ocean, fish, kayak, walk/run on the beach, and engage in other similar activities are generally focused on features within their immediate foreground and should not be sensitive to the faint change in the seascape caused by the Project.

3.11.4. Southern Beach Access

Viewer Sensitivity: Medium.

- **Susceptibility to Change: Medium.** Similar to the beach at the end of Corolla Village Road in Corolla, the predominant visual characteristics of the Southern Beach access are relatively wide expanse of sand, easy grade leading to the water, simple north-south oriented shoreline, 180º view of the ocean, and sharp demarcation at the edge of the frontal dunes that rise 4 to 7m (13 to 23 ft) in height. While the KOP was selected due to its location at a prominent access point, the location is typical of the landscape/seascape at the northern end of the Outer Banks.

  On the beach the view eastward is toward the unbroken horizon of the Atlantic Ocean. People use the beach for swimming, sunbathing, and relaxing, activities that are enhanced by the presence of ocean waves. In addition, people on the beach engage in surfing, kayaking, beach volleyball, and fishing, which are less dependent upon seaward views.

  The Southern Beach Access is adjacent to two private resort communities. Residential development – primarily the upper floors of large seasonal homes, multi-family houses, and private recreation facilities – are visible from the parking area, the access routes, and the beach. Residents (owners and renters) of homes that back up to the beach as well as those further inland with upper-level views will have a heightened level of sensitivity to any type of development that would alter their accustomed view.

- **Value Attached to Views: Medium-High.** The beach and related infrastructure provide an attractive local setting to enjoy the surrounding landscape and the seascape. The Southern Beach Access is the southernmost of 15 public beach access points in Corolla and one of six with lifeguard stations. The beach area is highly developed, with free parking for 30 cars, bathhouse, changing rooms, snack bar, access stairs/ramps, lifeguards, shuttle stop, and other amenities. The beach affords ample room for beachgoers to enjoy the view. Access to the beach is limited by the size of the parking lot on one hand and increased by shuttle services to nearby residential communities. From the parking area, beachgoers walk approximately 260 m (850 ft) to the beach. Access points are found at regular intervals along the beach so there is little opportunity for solitude.

Magnitude of Visual Impacts: Small

- **Size or Scale of Change: Small.** The beach is at the end of a public road (Yaupon Lane) and surrounded by private recreation facilities and large seasonal homes overlooking the ocean. The landscape/seascape is characteristic of much of the newer development along the Outer Banks, with the upper floor of large seasonal homes visible over the dunes. On the beach the view eastward is toward the unbroken horizon of the Atlantic Ocean. The visualization from the Southern Beach Access shows that the WTGs will appear as a cluster of small objects on the horizon, with slight contrasts in color due to the effects of atmospheric perspective and distance. The Project will occupy a relatively small amount of the 180° view, with the WTGs appearing at or slightly above the horizon. At distances exceeding 11 km (28 mi), the movement of the blades will not be apparent. The FAA aviation obstruction lighting may be visible as clusters of red points to people on the beach at night, where they may also see the lights from commercial fishing boats and ocean-going vessels in the offshore shipping lane.

- **Geographic Extent: Medium-Large.** The Project will be seen throughout the length of the beachfront coastal area, starting at the point where the access routes cross over the dunes. The

Project will not be seen from the drop-off area or parking lot and will only come into view atop the dune backing up to the beach. The Project will be theoretically visible to all beachgoers and occupants of the homes within the Developed Beachfront. The WTGs will be seen over a HFOV of 27.7°, which is slightly more than 15 percent of the 180° view from the beach. The Project is in line with the primary view axis from the beach (northeast of the KOP). As seen in the visualization, the apparent size of the WTGs is very small.

- **Duration and Reversibility of Impacts: Fair.** The Project is expected to have a service lifetime of greater than 30 years and thus is considered a long-term installation. While the Project represents a major investment in time, knowledge, and resources, it is fully reversible.

Overall Impact to Viewers: Minor to Negligible. The Southern Beach Access in Corolla is typical of most of the sandy shoreline of the northern Outer Banks, with a strong offshore horizon and coastal development encroaching on the dunes. The Project will be a minor visual element in the seascape and will not have a great effect on the character or key characteristics of the resource, or the activities that viewers enjoy at the beach.

People engaged in activities that involve direct viewing of the seascape – such as relaxing on the beach – may be sensitive to the presence of the Project, since it will represent a change to the constancy of the horizontal view of the ocean. Similarly, people in the homes overlooking the beach may likewise be sensitive to the addition to the seascape. However, given the distance to the Project, coupled with the effects of atmospheric perspective (which greatly diminishes color contrast), curvature of the earth, and limits of visual acuity, it is unlikely that blade movement or even the blades would be visible to the casual viewer.

As noted in Section 3.8.1, lighting conditions throughout the day can vary widely, resulting in different levels of color contrast between the WTGs and the background sky conditions. At sunrise on a clear day at the beach, most of the Project WTGs will be backlit against the early morning sky, making them appear darker than the sky. As the sun rises and changes position from mid-morning to mid-afternoon, the WTGs will become less obvious and may become barely visible to the average observer due to the lack of contrast with the sky. From mid-afternoon to early evening, as the sun becomes lower the WTGs ultimately become front-lit during the summer months, which will increase their color contrast and make them more visible to beachgoers, especially in the last hour before sunset. The WTGs in visualization V04 (based on a photograph taken at 3:50 PM) are white, since they are front lit by the afternoon sun.

Where WTG hubs may be visible, they would appear at or just above the horizon. The Project components may be faintly visible under ideal weather conditions; under cloudy or hazy conditions the Project may not be visible at all. With the limited visibility resulting from these cumulative factors, the Project should have a minor to negligible effect on viewer activities that involve direct seascape viewing.

The one aspect of the Project that may be objectionable to some viewers is the nighttime appearance of the FAA aviation obstruction lighting, which will be seen as small points of lights just above the horizon. While the curvature of the earth diminishes the visibility of the WTG blades, the nacelles and the aviation warning lights would still be visible. As seen in the accompanying video, the intensity of the warning lights diminishes as a function of distance from the observer. Viewers on the beach at night also see the lights from the homes facing the beach as well as offshore fishing boats and ocean-going vessels.

People who swim in the ocean, fish, kayak, walk/run on the beach, and engage in other similar activities are generally focused on features within their immediate foreground and should not be sensitive to the faint change in the seascape caused by the Project.

3.11.5. Hillcrest Beach

Viewer Sensitivity: Medium

- **Susceptibility to Change: Medium.** The Hillcrest Beach Access is privately owned and maintained by the Southern Shores Civic Association. The beach is set within a community of oceanfront homes that appear somewhat smaller than those further north in Corolla. While the KOP was selected due to its location at a prominent access point, the landscape/seascape is representative of this section of the Outer Banks. The developed beachfront is characteristic of much of the newer development along the Outer Banks, with the upper floor of seasonal homes visible over the dunes.

  On the beach the view eastward is toward the unbroken horizon of the Atlantic Ocean. As seen in the context photos that accompany the visualizations, viewers use this beach and water access point in Southern Shores in a manner similar to most other beaches in the Outer Banks: wading, swimming, sunbathing, watching the waves, and other activities in full view of the ocean. In addition, people on the beach engage in surfing, kayaking, beach volleyball, and fishing, which are less dependent upon views to the open ocean. Residents (owners and renters) of homes that back up to the beach as well as those further inland with upper-level views will have a heightened level of sensitivity to any type of development that would alter their accustomed view. Since the homes near the access point seem somewhat smaller than those further north, the beach experience is less dominated by development.

- **Value Attached to Views**: **Medium-High**. The beach area is highly developed, with parking for 66 cars, bathhouse, access stairs/ramps, lifeguards, volleyball court, an observation platform overlooking the dunes, interpretive displays, and other amenities. A 0.4 km (0.25 mi) boardwalk connects the beach with Route 12, the main north-south road in Southern Shores. The beach is relatively wide, typical of the Outer Banks, affording ample room for beachgoers to enjoy the view. The beach and related infrastructure, especially the elevated observation structure, provide an attractive local setting to enjoy the seascape. Membership in the Southern Shores Civic Association is required to park on the beach, and thus it may not be as attractive a draw as the more public beaches in neighboring communities. The bicycle/pedestrian connection from Route 12 provides an incentive for local residents to use the facilities.

Magnitude of Visual Impacts: Small

- **Size or Scale of Change: Small.** The Project will result in a grouping of human-made objects that will be seen in an otherwise undisturbed ocean view. The degree of change will be relatively small, given the context of the beach and the residential development within view. The visualization from the beach shows that the WTGs will appear as a line of small, somewhat indistinct objects. Color contrasts will be minimal, due to the effects of atmospheric perspective and distance. The Project will occupy a relatively small amount of the 180° view, with the WTGs appearing at or slightly above the horizon. At distances exceeding 45 km (24 nm / 28 mi), the movement of the blades will not be apparent. The FAA aviation obstruction lighting may be visible as clusters of red points to people on the beach at night, where they may also see the lights from commercial fishing boats and ocean-going vessels in the offshore shipping lane.

- **Geographic Extent: Medium.** The Project will be seen throughout the length of the beachfront coastal area, starting at the point where the access routes cross over the dunes. The Project will not be seen from the parking lot and will only come into view atop the dune backing up to the beach. The Project will be theoretically visible to all beachgoers and occupants of the homes

within the Developed Beachfront. The WTGs will be seen over a HFOV of 29.9°, which is 16.6 percent of the 180° view from the beach. The Project is in line with the primary view axis from the beach (northeast of the KOP). As seen in the visualization, the apparent size of the WTGs is very small.

- **Duration and Reversibility of Impacts: Fair.** The Project is expected to have a service lifetime of greater than 30 years and thus is considered a long-term installation. While the Project represents a major investment in time, knowledge, and resources, it is fully reversible.

Overall Impact to Viewers: Minor to Negligible. The Hillcrest Beach Access in Southern Shores is typical of most of the beaches of the northern Outer Banks, with a strong offshore horizon and coastal development encroaching on the dunes. The Project will be a minor visual element in the seascape and will not have a great effect on the character or key characteristics of the resource, or the activities that viewers enjoy at the beach.

People relaxing on the beach and watching the oncoming waves may be sensitive to the presence of the Project, since it will represent a change to the constancy of the horizontal view of the ocean. Similarly, people in the homes overlooking the beach may likewise be sensitive to the addition to the seascape. However, given the distance to the Project, coupled with the effects of atmospheric perspective (which greatly diminishes color contrast), curvature of the earth, and limits of visual acuity, it is unlikely that blade movement or even the blades would be visible to the casual viewer.

As noted in Section 3.8.1, lighting conditions throughout the day can vary widely, resulting in different levels of color contrast between the WTGs and the background sky conditions. At sunrise on a clear day at the beach, the Project WTGs will be backlit against the early morning sky, making them appear darker than the sky. As the sun rises and changes position from mid-morning to mid-afternoon, the WTGs will become less obvious and may become barely visible to the average observer due to the lack of contrast with the sky. From mid-afternoon to early evening, as the sun becomes lower the WTGs ultimately become front-lit during the summer months, which will increase their color contrast and make them more visible to beachgoers, especially in the last hour before sunset.

Four visualizations were developed from this KOP to demonstrate the variability in lighting and weather conditions (V05, V05a, V05b, and V05c). The WTGs in visualization V05 (based on a photograph taken at 3:05 PM under clear conditions are white, since they are front lit by the afternoon sun. A comparison of two simulations show the contrast in weather conditions at dusk (V05a and V05b). They WTGs appear white based on the reflectivity of the evening sun under clear conditions (V05b) and darker in overcast conditions where the sun is blocked by cloud cover (V05a).

Where WTG hubs may be visible, they would appear at or just above the horizon. The Project components may be faintly visible under ideal weather conditions; under cloudy or hazy conditions the Project may not be visible at all. With the limited visibility resulting from these cumulative factors, the Project should have a minor to negligible effect on viewer activities that involve direct seascape viewing.

The one aspect of the Project that may be objectionable to some viewers is the nighttime appearance of the FAA aviation obstruction lighting, which will be seen as small points of lights just above the horizon. While the curvature of the earth diminishes the visibility of the WTG blades, the nacelles and the aviation warning lights would still be visible. As seen in the accompanying video, the intensity of the warning lights diminishes as a function of distance from the observer. Viewers on the beach at night also see the lights from the homes facing the beach as well as offshore fishing boats and ocean-going vessels. See V05c for a representation of Project visibility at night.

People who swim in the ocean, fish, kayak, walk/run on the beach, and engage in other similar activities are generally focused on features within their immediate foreground and should not be sensitive to the faint change in the seascape caused by the Project.

3.11.6. Kitty Hawk Pier

Viewer Sensitivity: Medium

- **Susceptibility to Change: Medium.** Kitty Hawk Pier is a commercial establishment, providing a place for ocean fishing and viewing, and a unique indoor function facility adjacent to the Hilton Gardens Inn, which owns the pier. The pier is set in a mixed commercial/resort residential part of Kitty Hawk. Viewer attention is concentrated on the fishing activity on the pier, beach activity and waves immediately below, or on the more distant horizon.

  The wooden pier is set in a mixed commercial / residential part of Kitty Hawk, where viewers are accustomed to extensive levels of development and busy roadways. Nearby uses include single family homes at the edge of the dunes, three-story multi-family vacation homes, highway commercial, and a five-story hotel. Access in the vicinity of the hotel is limited to guests. The elevated view from the pier is similar to views from the surrounding roads, walkways, and first floor of nearby buildings, affording a slightly greater viewing distance into the open ocean than seen at the beachfront. The wooden pilings and pier substructure interrupts views from the beach in the area adjacent to the pier, while also providing much-needed shade for beachgoers. The pier can be a dominant or co-dominant part of the view from surrounding properties.

- **Value Attached to Views: Medium.** The pier – and the accompanying Pier House – is a recognized destination on the Outer Banks, primarily known for its setting over the ocean and adjacent beach. While the pier is opened to the general public, it can be closed to public use when the Pier House is used for weddings and other private, social functions. Fishing off the pier required a purchased pass. The pier affords visitors at 360° view of the Outer Banks from a point 76 m (250 ft) offshore.

  While the ocean view is a major attraction to the surrounding community, the oceanfront dunes limit visual contact to the developed beachfront, specifically the beach, the pier, and the upper floors of multi-story buildings.

Magnitude of Visual Impacts: Small

- **Size or Scale of Change: Small.** The visualization from the pier shows the WTGs appearing as a faint cluster of small objects on the horizon, with slight contrasts in color due to the effects of atmospheric perspective and distance. The Project will occupy a relatively small amount of the view, with the WTGs appearing at or slightly above the horizon. At a distance of nearly 50 km (27 nm / 31 mi), the movement of the blades will not be apparent. Floodlights on the pier (which closes to the public at 10PM) will make it difficult to achieve the necessary level of darkness around the viewer to make the FAA aviation obstruction lighting visible at night. From the beach in the vicinity of the pier the WTGs will appear slightly smaller due to the lower viewing location and the effects of earth curvature. At some locations under and/or near the pier, views of the Project may be partially screened by the wooden pilings.

- **Geographic Extent: Medium.** The Project will be visible northeast of the pier and will be seen over a HFOV of approximately 29.7°, which is 8.3 percent of the 360° view that is possible from the end of the pier. The Project is in line with the primary view axis from the pier (northeast of the

KOP). The visualization from the pier shows the Project appearing as a faint cluster of small objects on the horizon, with slight contrasts in color due to the effects of atmospheric perspective and distance. The Project will be visible throughout the length of the pier and along the adjacent beach, where the WTGs will appear as very small objects in a relatively tight cluster on the open ocean.

- **Duration and Reversibility of Impacts: Fair.** The Project is expected to have a service lifetime of greater than 30 years and thus is considered a long-term installation. While the Project represents a major investment in time, knowledge, and resources, it is fully reversible.

Overall Impact to Viewers: Minor to Negligible. Kitty Hawk Pier is an established commercial part of the Outer Banks seascape, extending a considerable distance into the Atlantic Ocean past the Pier House. At a distance of close to 50 km (27 nm / 31 mi), the Project may be noticeable from the pier, where it will be seen as a relatively minor element in the expansive seascape. There should be no effect on the character or key characteristics of the pier resulting from the Project.

The primary motivation for viewers on the pier is fishing and watching the ocean. People who are there to fish are generally focused on features within their immediate foreground and should not be sensitive to the change in the seascape caused by the Project.

Viewers who are there to watch the waves, the surfers and swimmers, and other offshore activity may be sensitive to the introduction of the Project since it will represent a change to the horizontal view of the ocean. However, given the distance to the Project, coupled with the effects of atmospheric perspective (which greatly diminishes color contrast), curvature of the earth, and limits of visual acuity, it is unlikely that blade movement or even the blades would be visible to the casual viewer.

As noted in Section 3.8.1, lighting conditions throughout the day can vary widely, resulting in different levels of color contrast between the WTGs and the background sky conditions. At sunrise on a clear day on the pier and at the surrounding beach, most of the Project WTGs will be backlit against the early morning sky, making them appear darker than the sky. As the sun rises and changes position from mid-morning to mid-afternoon, the WTGs will become less obvious and may become barely visible to the average observer due to the lack of contrast with the sky. From mid-afternoon to early evening, the sun becomes lower the WTGs ultimately become front-lit during the summer months, which will increase their color contrast and make them more visible to people on the pier and the beachgoers, especially in the last hour before sunset.

Two visualizations were developed from this KOP to demonstrate the impact of lighting and weather conditions. In V06, the WTGs appear dark against the overcast afternoon sky (3:49pm) and in V06a, the WTGs appear white in clear evening conditions (6:53pm).Where WTG hubs may be visible, they would appear at or just above the horizon. The Project components may be faintly visible under ideal weather conditions; under cloudy or hazy conditions the Project may not be visible at all. With the limited visibility resulting from these cumulative factors, the Project should have a minor to negligible effect on viewer activities that involve direct seascape viewing.

The FAA aviation obstruction lighting on the WTGs should be scarcely visible due to the pedestrian scale yard lights that provide illumination for nighttime fishing (the Kitty Hawk Pier closes at 10PM nightly).

3.11.7. Avalon Fishing Pier

Viewer Sensitivity: Medium

- **Susceptibility to Change: Medium.** Avalon Pier features access for ocean fishing and ocean-watching, as well as a fishing shop, a neighborhood bar, and a two-story restaurant, set in a relatively modest residential community. Viewer attention is concentrated on the social activity at the bar/restaurant, fishing activity on the pier, beach activity and waves immediately below, or on the more distant horizon. The Avalon beach is a well-known surfing location along the Outer Banks.

  The wooden pier is set in a mixed residential / tourist commercial part of Kill Devil Hills. Nearby uses include relatively small single-family homes, several three-story vacation homes, tourist-oriented commercial, and a private parking lot for beach access. The elevated view from the pier is similar to views from the surrounding street and first floor of nearby buildings, affording a slightly greater viewing distance into the open ocean than seen at the beachfront. The wooden pilings and pier substructure interrupts views from the beach in the area immediately adjacent to the pier, while also providing much-needed shade for beachgoers. The pier can be a dominant or co-dominant part of the view from surrounding properties.

- **Value Attached to Views: Medium.** The pier affords visitors at 360° view of the Outer Banks from a point 213 m (700 ft) offshore. The pier is a local attraction known for its character and presence in Kill Devil Hills. The pier is privately owned and requires a purchased pass for either fishing or sightseeing. Benches as well as fishing stations are provided along the length of the pier.

  While the ocean view is a major attraction to the surrounding community, the oceanfront dunes limit visual contact to the developed beachfront, specifically the beach, the pier, and the upper floors of multi-story buildings.

Magnitude of Visual Impacts: Small

- **Size or Scale of Change: Small.** The visualization from the pier shows the WTGs appearing as a faint cluster of small objects on the horizon, with slight contrasts in color due to the effects of atmospheric perspective and distance. The Project will occupy a relatively small amount of the view, with the WTGs appearing at or slightly above the horizon. At a distance of over 51 km (28 nm / 32 mi), the movement of the blades will not be apparent. Lights on the pier (which closes at midnight) will make it difficult to achieve the necessary level of darkness around the viewer to see the FAA aviation obstruction lighting on the WTGs. From the beach in the vicinity of the pier the WTGs will appear slightly smaller due to the lower viewing location and the effects of earth curvature. At some locations under and/or near the pier, views of the Project may be partially screened by the wooden pilings.

- **Geographic Extent: Medium.** The Project will be visible northeast of the pier and will be seen over a HFOV of approximately 28.9°, which is 8.0 percent of the 360° view that is possible from the end of the pier. The Project is in line with the primary view axis from the pier (northeast of the KOP). The visualization from the pier shows the Project appearing as a faint cluster of small objects on the horizon, with slight contrasts in color due to the effects of atmospheric perspective and distance. While the Project will be visible throughout the length of the pier and along the adjacent beach, the WTGs will appear as very small objects in a relatively tight cluster on the open ocean.

- **Duration and Reversibility of Impacts: Fair.** The Project is expected to have a service lifetime of greater than 30 years and thus is considered a long-term installation. While the Project represents a major investment in time, knowledge, and resources, it is fully reversible.

Overall Impact to Viewers: Minor to Negligible. The pier is an established part of the Outer Banks seascape, extending a considerable distance into the Atlantic Ocean. At a distance of over 52 km (28 nm / 32 mi), the Project may be noticeable from the pier, where it will be seen as a relatively minor element in the open ocean. There should be no effect on the character or key characteristics of the pier resulting from the Project.

The primary motivation for viewers on the pier is fishing, eating/drinking, and watching the ocean. People who are there to fish are generally focused on features within their immediate foreground and should not be sensitive to the change in the seascape caused by the Project. Likewise, the restaurant and bar are social spaces that are enhanced by the location over the ocean and the proximity to the local residential community. The limited visibility of the Project should have no effect on the quality of the oceanfront dining/drinking experience.

Viewers who are there to watch the waves, the surfers and swimmers, and other offshore activity may be sensitive to the introduction of the Project since it will represent a change to the horizontal view of the ocean. However, given the distance to the Project, coupled with the effects of atmospheric perspective (which greatly diminishes color contrast), curvature of the earth, and limits of visual acuity, it is unlikely that blade movement or even the blades would be visible to the casual viewer.

As noted in Section 3.8.1, lighting conditions throughout the day can vary widely, resulting in different levels of color contrast between the WTGs and the background sky conditions. At sunrise on a clear day on the pier and at the surrounding beach, most of the Project WTGs will be backlit against the early morning sky, making them appear darker than the sky. As the sun rises and changes position from mid-morning to mid-afternoon, the WTGs will become less obvious and may become barely visible to the average observer due to the lack of contrast with the sky. From mid-afternoon to early evening, the sun becomes lower the WTGs ultimately become front-lit during the summer months, which will increase their color contrast and make them more visible to people on the pier and the beachgoers, especially in the last hour before sunset.

Where WTG hubs may be visible, they would appear at or just above the horizon. The Project components may be faintly visible under ideal weather conditions; under cloudy or hazy conditions the Project may not be visible at all. With the limited visibility resulting from these cumulative factors, the Project should have a minor to negligible effect on viewer activities that involve direct seascape viewing.

The FAA aviation obstruction lighting on the WTGs should be scarcely visible due to the restaurant/bar lighting as well as the lights on the pier that provide illumination for nighttime fishing (the Pier closes at midnight).

3.11.8. Wright Brothers National Memorial

Viewer Sensitivity: High

- **Susceptibility to Change: High.** The Wright Brothers National Memorial is located in the Outer Banks and surrounded by intense coastal development that was not present when Wilbur and Orville took their historic first flights. The NPS property is lined with trees that define the edge of the Memorial and act as a visual buffer to the residential and commercial uses adjacent to the site. Visitors to the National Memorial are presented with a carefully designed and maintained

historic landscape, offering a variety of experiences to engage with the site and its surroundings. The NPS is in the process of preparing a General Management Plan Amendment to address potential changes that may affect visitor use and experiences.

While the Wright Brothers National Memorial encompasses 173 ha (428 ac), the KOP is the only location where the Project may be visible due to its height and cleared sight lines to the ocean.

- **Value Attached to Views: High.** Wright Brothers National Memorial is an important cultural and historic resource, attracting large numbers of visitors to experience first-hand the invention of the airplane. The Memorial contains several focal points, including a visitor center (on the NRHP), the Wright Brothers Memorial atop Kill Devil Hill, the path of the first flights, and a commemorative sculpture. Kill Devil Hill, the high point of the National Memorial, offers 360° views of this section of the Outer Banks. While there are views of the ocean, the main focus is on the visitor center and the location of the first flights.

Magnitude of Visual Impacts: Small

- **Size or Scale of Change: Small.** The visualization from atop Kill Devil Hill indicates that the Project will be faintly visible on the horizon, with very slight contrasts in color due to atmospheric perspective and distance. Due to the elevated viewer position, less of the WTGs will be blocked by the curvature of the earth, making them appear somewhat larger than the view from nearby beaches. At distances exceeding 53 km (29 nm / 33 mi), the movement of the blades will not be apparent. While the FAA aviation obstruction lighting may be visible from the top of Kill Devil Hill, the National Memorial closes at 5PM, generally well before the lights are illuminated.
- **Geographic Extent: Small.** The only part of the Wrights Brothers National Memorial that will have Project visibility is the east side of the plaza at the base of the monument on Kill Devil Hill. The Project will not be visible from the visitor center or any of the other attractions at the site. From the point of visibility, the Project will be visible northeast of the Memorial and will be seen over a HFOV of approximately 27.8°, which is 7.7 percent of the 360° view from the plaza at the base of monument. At a distance more than 61 km (33 nm / 38 mi) to the nearest WTG, the VFOV will be less than 1°; blade movement should not be detectable to the average viewer. Visual obstructions in the midground includes transmission line structures that stand above the horizon line.
- **Duration and Reversibility of Impacts. Fair.** The Project is expected to have a service lifetime of greater than 30 years and thus is considered a long-term installation. While the Project represents a major investment in time, knowledge, and resources, it is fully reversible.

Overall Impact to Viewers: Minor to Negligible. Viewers are drawn to the Wright Brothers National Memorial to learn about the beginning of aviation and to experience the place and the people involved. The views are primarily inwardly focused on the monument, the visitor center, the aviation sculpture, and the path of the first flights. The Project would only be visible from atop the monument on Kill Devil Hill, where it would be seen in the far background at a distance of over 61 km (33 nm / 38 mi) and a HFOV that encompasses just under 8 percent of the 360° view from the monument plaza.

As noted in Section 3.8.1, lighting conditions throughout the day can vary widely, resulting in different levels of color contrast between the WTGs and the background sky conditions. At sunrise on a clear day, Project WTGs will be side lit against the early morning sky, making them appear darker than the sky. However, the Wright Brothers National Memorial does not open to the public until 9AM. As the sun rises and changes position from mid-morning to mid-afternoon, the WTGs will become less obvious and may

become barely visible to Memorial visitors due to the lack of contrast with the sky. From mid-afternoon to early evening, as the sun becomes lower the WTGs ultimately become front-lit during the summer months, which will increase their color contrast and make them more visible to visitors at the monument on Big Kill Devil Hill. The WTGs in visualization V08 (based on a photograph taken at 3:52 PM) appear white, showing the most conservative view of the Project. While the color contrast may intensify as the sun continues to set, the Wright Brothers National Memorial closes to the public at 5PM.

The view toward the ocean where the Project would be seen includes dense coastal development, highways, and a series of large transmission structures that extend above the horizon. The presence of the Project should have a very minor to negligible effect on the viewer experience.

3.11.9. Jockey's Ridge State Park

Viewer Sensitivity: High

- **Susceptibility to Change: Medium - High.** The dunes in Jockey's Ridge State Park are constantly shifting, creating new landforms and viewing opportunities. Visitors to the State Park expect an every-changing landscape, primarily due to the winds that shape the dunes (and provide the energy for much of the recreation activities enjoyed there). As seen in the context photos accompanying the visualization, open views of the ocean and the Project in the far background are interrupted by recent and historic development, plus a highly visible line of transmission structures that parallel the highway.

  While Jockey's Ridge State Park encompasses 176 ha (437 ac), the KOP atop the dunes is representative of the few locations where the Project may be visible due to its height and cleared sight lines to the ocean.

- **Value Attached to Views**: **High**. Jockey's Ridge is home to the largest natural active sand dune system in the eastern United States, with dunes upwards of 18 m (60 ft) tall. While the park does not have frontage on the ocean, the dunes nearest the highways afford easterly panoramic views over the Beach Cottage Row Historic District in Nags Head to the Atlantic. Views to the west look out over Albemarle Sound. The State Park is one of the most popular attractions on the northern Outer Banks and is known for kite-flying, hang-gliding, and sightseeing in a unique, desert-like landscape.

Magnitude of Visual Impacts: Small

- **Size or Scale of Change: Small.** The visualization from the top of the dunes indicates that the Project will be faintly visible on the horizon, with very slight contrasts in color due to the effects of atmospheric perspective and distance. Due to the elevated viewer position, less of the WTGs will be blocked by the curvature of the earth, making them appear somewhat larger than the view from nearby beaches. The Project will be seen through a line of highly visible transmission structures in the foreground, drawing visual attention away from the WTGs. At more than 55 km (30 nm / 34 mi) to the nearest WTG, the VFOV will be less than 1°; blade movement should not be detectable to the average viewer. Under perfect weather conditions and bright sunlight, the WTGs may be faintly visible, as seen in the visualization. The FAA aviation obstruction lighting may be visible from the top of the dunes prior to its evening closing hours (varies from 6, to 8, to 9 PM throughout the year). WTG lighting will be seen in context with the lights from the coastal residences in Nags Head, which will appear immediately below the Project.

- **Geographic Extent: Small.** The Project will be visible northeast of the State Park and will be seen over a HFOV of approximately 26.1°, which is 7.3 percent of the 360° view possible from the top of the dunes. The viewshed map indicates that blade tips may be visible from 0.8 ha (1.9 ac), or less that 0.1 percent of the State Park. The Project is located northeast of the KOP, near the primary view axis from the KOP (primary view is east-northeast). Visual obstructions in the midground includes transmission line structures that stand above the horizon line.
- **Duration and Reversibility of Impacts. Fair.** The Project is expected to have a service lifetime of greater than 30 years and thus is considered a long-term installation. While the Project represents a major investment in time, knowledge, and resources, it is fully reversible.

Overall Impact to Viewers. Minor to Negligible. Jockey's Ridge State Park is one of the most memorable natural and scenic resources along the northern Outer Banks. Viewers are drawn to the Park for a number of reasons, primarily related to the sand dunes and the views of the surrounding landscape/seascape. They are actively engaged in the landscape: climbing the dunes, flying kites, walking the trails and boardwalks, flying/watching the hang-gliders, admiring the views from various and changing vantage points. The Project would only be visible from the top of the dune system, where it would be seen in the far background at a distance of over 54 km (29 nm / 34 mi) and a HFOV that encompasses just over 7 percent of the 360° view.

As noted in Section 3.8.1, lighting conditions throughout the day can vary widely, resulting in different levels of color contrast between the WTGs and the background sky conditions. At sunrise on a clear day, Project WTGs will be side lit against the early morning sky, making them appear darker than the sky. However, Jockey's Ridge State Park does not open to the public until 8AM. As the sun rises and changes position from mid-morning to mid-afternoon, the WTGs will become less obvious and may become barely visible to State Park visitors due to the lack of contrast with the sky. From mid-afternoon to early evening, the sun becomes lower the WTGs ultimately become front-lit during the summer months, which will increase their color contrast and make them more visible to people on the dunes, especially in the last hour before sunset. The Park closes at 9PM, just after sunset.

The WTGs in visualization V09 (based on a photograph taken at 11:29AM) appear faintly as dark gray objects on the horizon, due to the heavy cloud cover over the array.

The view toward the ocean where the Project would be seen includes coastal development and a series of large transmission structures that extend above the horizon. The presence of the Project should have a very minor to negligible effect on the viewer experience.

3.11.10. Jennette's Pier

Viewer Sensitivity: Medium

- **Susceptibility to Change: Medium.** Jennette's Pier is a commercial venture, affording people the opportunity to fish and engage in other marine-related activities in an attractive modern setting. The current pier was opened in 2009 after Hurricane Isabel destroyed much of the earlier one build in 1939. The pier attracts a variety of user-groups, some with overlapping interests: people who fish, tourist watching the ocean and those fishing, educational groups, weddings and other social gatherings, and aquarium visitors. Viewer attention is concentrated on the immediate foreground (waves hitting the shoreline, fishing activity) or on the more distant horizon.

  The two-story pier is set in a mixed commercial / residential part of Nags Head, where viewers are accustomed to extensive levels of development and relatively busy roadways. Uses include

single family homes, three-story vacation rentals, one-story motels, a six-story hotel, and tourist-oriented commercial. The elevated view from the pier is similar to views from the surrounding streets, walkways, and first floor of nearby buildings, affording the viewer a slightly greater viewing distance into the open ocean than seen at the water's edge. The concrete pilings and pier substructure interrupts views from the beach in the area adjacent to the pier, while also providing much-needed shade for beachgoers. Due to the length of the pier, it can be a dominant or co-dominant part of the view from surrounding properties.

- **Value Attached to Views**: Medium. Jenette's Pier is a major tourist destination that includes a large on-site parking lot, an aquarium, interpretive exhibits, public art, and leasable function spaces. One of the main draws is the opportunity for ocean fishing, with seating, wash stations, and other amenities. The pier emphasizes resource sustainability, with small wind turbines (currently non-functional), environmental education programming, and a variety of exhibits on ocean wildlife. The pier is owned and managed by the North Carolina Aquarium Society. The 300 m (1,000 ft) pier (the longest in North Carolina) affords visitors a 360° view of the Outer Banks.

  While the ocean view is a major attraction to the Outer Banks, the oceanfront dunes limit visual contact to the developed beachfront, specifically the beach, the pier, and the upper floors of multi-story buildings.

Magnitude of Visual Impacts: Small

- **Size or Scale of Change: Small.** The visualization from the pier shows the WTGs appearing as a faint cluster of small objects on the horizon, with slight contrasts in color due to the effects of atmospheric perspective and distance. The Project will occupy a relatively small amount of the 360° view, with the WTGs appearing at or slightly above the horizon. At distances exceeding 56 km (30 nm / 35 mi), the movement of the blades will not be apparent. Lights on the pier (which closes at 10PM) will make it difficult to achieve the necessary level of darkness around the viewer to make the FAA aviation obstruction lighting visible at night. From the beach in the vicinity of the pier the Project will appear slightly smaller due to the lower viewing location and the effects of earth curvature. From some locations under and/or near the pier, views of the WTGs may be partially screened by the concrete pilings.
- **Geographic Extent: Medium.** While the Project will be visible throughout the length of the pier and along the adjacent beach, the WTGs will appear as very small objects in a relatively tight cluster on the open ocean. The Project will be visible northeast of the pier and will be seen over a HFOV of approximately 24.3°, which is 6.8 percent of the 360° view from the end of the pier. The primary view axis from the pier is to the northeast. The Project is located slightly north of the primary view axis from this KOP.
- **Duration and Reversibility of Impacts. Fair.** The Project is expected to have a service lifetime of greater than 30 years and thus is considered a long-term installation. While the Project represents a major investment in time, knowledge, and resources, it is fully reversible.

Overall Impact to Viewers: Minor to Negligible. The pier is an established commercial part of the Outer Banks seascape, extending a considerable distance into the Atlantic Ocean past the aquarium and event space. At 56 km (30 nm / 35 mi), the Project may be noticeable from the pier, where it will be seen as a relatively minor element in the expansive seascape. There should be no effect on the character or key characteristics of the pier resulting from the Project.

Viewers are drawn to the pier for fishing, educational programs, watching the ocean, and social events. People who are there to fish are generally focused on features within their immediate foreground and should not be sensitive to the change in the seascape caused by the Project. Likewise, the aquarium and event space are social venues that are enhanced by the location over the ocean and the prime location on the Outer Banks. The limited visibility of the Project should have no effect on the quality of the educational experience and may benefit by programming that relates the existing wind WTGs on the pier to the ones being proposed offshore. The Project should have no effect on the experience of visitors to the aquarium or people at indoor social events.

Viewers who are there to watch the waves, the surfers and swimmers, and other offshore activity may be sensitive to the introduction of the Project since it will represent a change to the horizontal view of the ocean. However, given the distance to the Project, coupled with the effects of atmospheric perspective (which greatly diminishes color contrast), curvature of the earth, and limits of visual acuity, it is unlikely that blade movement or even the blades would be visible to the casual viewer.

As noted in Section 3.8.1, lighting conditions throughout the day can vary widely, resulting in different levels of color contrast between the WTGs and the background sky conditions. At sunrise on a clear day on the pier and at the surrounding beach, most of the Project WTGs will be backlit against the early morning sky, making them appear darker than the sky. The WTGs in visualization V10 (based on a photograph taken at 8:04 AM) are light gray, since they are back lit by the morning sun.

As the sun rises and changes position from mid-morning to mid-afternoon, the WTGs will become less obvious and may become barely visible to the average observer due to the lack of contrast with the sky. From mid-afternoon to early evening, the sun becomes lower the WTGs ultimately become front-lit during the summer months, which will increase their color contrast and make them more visible to people on the pier and the beachgoers, especially in the last hour before sunset.

Where WTG hubs may be visible, they would appear at or just above the horizon. The Project components may be faintly visible under ideal weather conditions; under cloudy or hazy conditions the Project may not be visible at all. With the limited visibility resulting from these cumulative factors, the Project should have a very minor to negligible effect on viewer activities that involve direct seascape viewing.

The FAA aviation obstruction lighting on the WTGs should be scarcely visible due to the lights on the pier that provide illumination for evening fishing (Jennette's Pier closes at 10PM between May and October).

3.11.11. Bodie Island Light Station

Viewer Sensitivity: High

- **Susceptibility to Change: High.** The lighthouse is in the northernmost part of Cape Hatteras National Seashore and set in a largely natural environment. As one of the tallest structures on the Outer Banks, it is an iconic, highly visible landmark, visible from many miles away. The grounds are carefully maintained by NPS to give the impression of permanence and timelessness. To the visitor, the National Seashore is the antithesis of the development patterns of much of the northern Outer Banks. Visitors climb the lighthouse to gain an aerial perspective of the National Seashore and the natural systems surrounding the site. The seashore in the immediate vicinity is largely undeveloped, in stark contrast to the Outer Bank communities to the north.

- **Value Attached to Views**: **High**. The iconic coastal light station is on the NRHP and one of the major visitor attractions in Cape Hatteras National Seashore. Visitor use is increasing steadily throughout the National Seashore as a whole. Since 2011 attendance has gone from just under 2 million visits to over 2.6 million visits in 2020. Access to the lighthouse is tightly controlled, limited to 8 persons per half hour, on-line reservations only the day of the visit.

  The views from the viewing platform atop the lighthouse focus on the midground and background viewing distances (Open Ocean). At the ground level, visitors are much more aware of the immediate foreground, due to the screening effects of dunes and shoreline vegetation. The lighthouse grounds also include a visitor center in the restored keepers duplex, fishing access, and a boardwalk leading to a viewing platform overlooking a large, freshwater marsh.

Magnitude of Visual Impacts: Small

- **Size or Scale of Change: Small.** The visualization from the lighthouse indicates that the WTGs will faintly appear as cluster of objects on the horizon, with very slight contrasts in color due to the effects of atmospheric perspective and distance. Due to the elevated viewer position, less of the WTGs will be blocked by the curvature of the earth, making them appear somewhat larger than the view from nearby Coquina Beach (also part of the National Seashore). At distances exceeding 61 km (33 nm / 38 mi), the movement of the blades will not be apparent. While the FAA aviation obstruction lighting may be visible from the lighthouse, it is not open to the public during evening and nighttime hours.
- **Geographic Extent: Small**. The only point within the lighthouse grounds where the Project will be visible is from the observation deck. The Project will be visible northeast of the lighthouse and will be seen over a HFOV of approximately 20.7°, which is 5.8 percent of the 360° view from the observation deck. At a distance in excess of 61 km (33 nm / 38 mi) to the nearest WTG, the VFOV will be less than 1°; blade movement should not be detectable to the average viewer. The Project will not be visible from the lighthouse grounds, the visitor center, or the observation platform adjacent to the lighthouse due to the dunes and intermittent vegetation.
- **Duration and Reversibility of Impacts: Fair**. The Project is expected to have a service lifetime of greater than 30 years and thus is considered a long-term installation. While the Project represents a major investment in time, knowledge, and resources, it is fully reversible.

Overall Impact to Viewers: Minor to Negligible. Cape Hatteras National Seashore is a highly sensitive visual environment known for its undeveloped nature, iconic historic resources, and memorable seascapes. At a distance of over 61 km (33 nm / 38 mi), the Project will be a very minor element in the seascape/open ocean, if it is visible at all during the few minutes that the typical viewer spends at the observation platform. The appearance of the WTGs will be a function of lighting conditions and will vary from light gray to dark gray, depending on the direction of the sun and time of day.

As noted in Section 3.8.1, lighting conditions throughout the day can vary widely, resulting in different levels of color contrast between the WTGs and the background sky conditions. At sunrise on a clear day, Project WTGs will be back lit against the early morning sky, making them appear darker than the sky. The WTGs in visualization V11 (based on a photograph taken at 9:12 AM, just after it opens at 9AM) are very light gray, since they are back lit by the morning sun.

As the sun rises and changes position from mid-morning to mid-afternoon, the WTGs will become less obvious and may become barely visible to the average observer due to the lack of contrast with the sky. From mid-afternoon to early evening, as the sun becomes lower the WTGs ultimately become front-lit

during the summer months, which will increase their color contrast and make them more visible to lighthouse visitors. While the color contrast may intensify as the sun continues to set, the lighthouse closes to the public at 5PM.

At a distance of over 61 km (33 nm / 38 mi), the Project should have a very minor to negligible effect on the viewer experience. There will be no visual effect to visitors on the ground level, where most ocean views (except for the marsh overlook) are blocked by vegetated dunes.

4. Onshore Visual Assessment

The visual assessment of onshore facilities includes both aboveground and underground infrastructure components. An assessment of the landfall location, onshore export cable route options, and the proposed site for the onshore substation and switch station are included in this analysis. Figure 19 shows the proposed onshore infrastructure location, with details on the onshore export cable route location and types (also shown in Figure 5 in Section 1.4). The Onshore Infrastructure Map in Attachment 2 (pg. 10) shows the onshore visual study around the aboveground infrastructure (including the onshore substation and switch station and a potential transmission structure option) and identifies the location of all scenic resources.

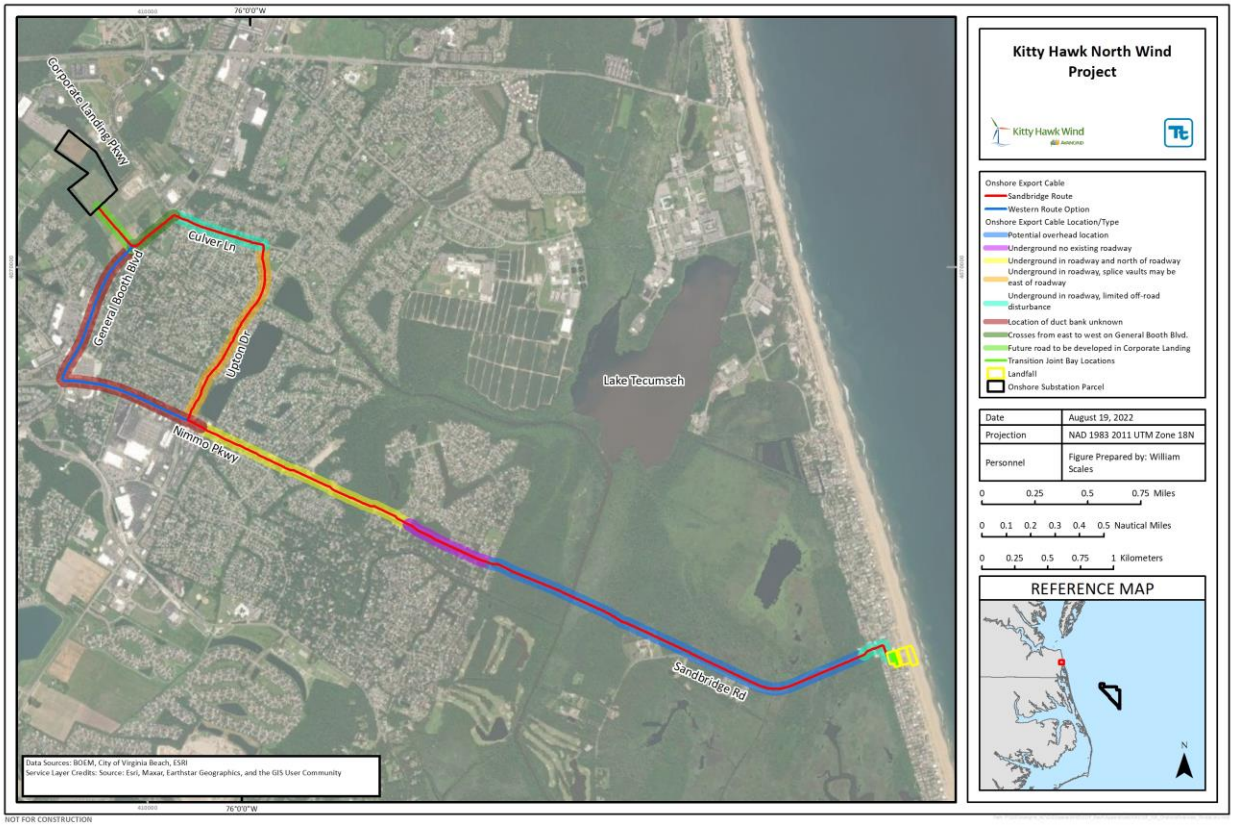


Figure 19. Onshore Export Cable Location and Type

4.1. Landfall Location

It is anticipated that all landfall infrastructure as well as the onshore export cable route options will be underground. There is a slight possibility that a small portion of the export cable route may be located above ground (see description below). The routes would be located within existing parking lots, existing or proposed roadways, existing utility corridors, or previously disturbed areas. The installation of underground cables and splice boxes would require minimal vegetation clearing within the existing ROWs. Noteworthy trees would be identified as part of the final alignment and measures taken to avoid and protect them during construction. Land surrounding the onshore export cables will be restored to pre-

construction conditions. No long-term visual impact due to the proposed underground installation is anticipated.

4.2. Export Cable Route Options

All landfall infrastructure and most of the onshore export cable route options may be underground. The routes would be located within existing parking lots, roadways, existing utility corridors, or previously disturbed areas. For the installation of underground infrastructure, vegetation clearing would be minimal within the existing ROWs. Significant Noteworthy trees would be identified as part of the final alignment and measures taken to avoid and protect them during construction. Land surrounding the onshore export cables will be restored to pre-construction conditions. No long-term permanent visual impact due to the proposed underground installation is anticipated.

For the installation of an aboveground export cable route option, the visual effect of overhead transmission structures will largely be a function of a) the proximity of scenic resources to the transmission line, b) the location of the transmission corridor relative to publicly accessible viewpoints, c) the context of the transmission route and the surrounding land uses, d) visual effect of contrasts (in color, form, line, texture, and scale) between the transmission components and the surrounding landscape, and e) the ability to screen the transmission line from public viewpoints.

The following is a detailed assessment of the proposed route options by section.

4.2.1. Sandbridge Landfall

Location. The export cable will make landfall in the Sandbridge Beach parking lot, adjacent to the Sandbridge Seaside Market. The 76-car lot is operated by the Virginia Beach Parking Management Office from May 1 through September 30. The underground cable will exit the parking lot to Sandpiper Road and then head north for 100± m (330± ft) to Sandbridge Road.

Landscape Character. The landscaped parking lot is surfaced with porous concrete tiles in a regular square grid. Holes in the tiles are filled with gravel to allow infiltration and stormwater recharge. Native pines are planted in islands that break the lot up into smaller visual units. The surrounding landscape is commercial (Sandbridge Seaside Market) and mid-rise residential. The Virginia Beach Fire Station 17 is located on the west side of Sandpiper Road near the landfall site.

Scenic Resources. The export cable route will cross the low dunes of Sandbridge Beach as it comes onshore from the ESP within the Wind Development Area. Sandbridge Beach is a 7.2-km (4.5-mi) barrier island that is part of the Outer Banks of North Carolina and Virginia. Most the beach is heavily developed, with the exception of a 275 m (900 ft) section opposite the landfall site that provides six public pathways through the dunes to the ocean.

Visual Effect. Following the installation of the underground onshore export cables, the parking lot and adjacent roadways will be returned to their original surface condition with no long-term visual effects. Vegetation that is removed will be replanted with similar species to maintain the current beachfront aesthetic or as agreed upon with the City of Virginia Beach.

4.2.2. Sandbridge Road to Existing Utility Corridor (Underground Route)

Route. From the intersection with Sandpiper Road near the landfall site, the underground cable will follow the public ROW for Sandbridge Road for approximately 1.6 km (1.0 mi) to an existing utility corridor.

Landscape Character. The landscape adjacent to Sandbridge Road between Sandpiper Road and the water tower is characterized by mid-rise residential and one-story commercial development. West of the water tower, the roadside landscape becomes densely forested with patches of wetlands visible from the road. An existing aboveground electric distribution line is located on the north side of the roadway for the first 0.3 km (0.5 mi); it then switches over to the south side of the road. Three driveways service commercial development along Sandbridge Road.

Scenic Resources. A section of Sandbridge Road in Virginia Beach (from the shoreline to New Bridge Road) is a designated Virginia byway. Byways are roads designated by the Commonwealth Transportation Board with relatively high aesthetic or cultural value, leading to or within areas of historical, natural or recreational significance. Sandbridge Road is part of the Green Sea Byway that was designated by the Commonwealth Transportation Board in 2003. The byway extends from Back Bay NWR to Princess Anne Road at the Creeds neighborhood in Virginia Beach and forms a semicircular route around Back Bay. As noted in Section 1.5.2, byway designation does not affect land use controls, nor does it limit road improvements (Scenic Virginia 2022).

Back Bay NWR is located adjacent to the ROW along Sandbridge Road. There are no mapped trails or known public access points in the NWR along the onshore export cable route.

Sandbridge Road Improvements. The City of Virginia Beach is in the process of rebuilding this section of Sandbridge Road to remove a series of reverse curves, reposition the roadway further to the north, and add a multi-use trail on the south side. The onshore export cable would be located off the paved surface within the ROW. The final location of the underground cable has not been determined at this point.

Visual Effect. Discussions are ongoing with the City of Virginia Beach to determine whether to place the cables either north or south of the reconstructed roadway. Vegetation clearing to install the onshore export cables would be minimal, either within the existing Sandbridge ROW or the ROW of the new alignment. The underground corridor should not have a long-term visual effect on the Back Bay NWR or the visual quality of Sandbridge Road.

4.2.3. Existing Utility Corridor: Sandbridge Road to Atwoodtown Road (Underground Option)

Route. The underground corridor would continue from Sandbridge Road straight northwest along an existing 1.6 km (1.0 mi) utility ROW to Atwoodtown Road. From the point where Sandbridge Road veers to the west, the underground corridor would continue in a westerly direction along an existing 1.6 km (1.0 mi) utility ROW to Atwoodtown Road.

Landscape Character. The existing corridor contains an existing overhead distribution line with a cleared width ranging from 10 to 15 m (32 to 50 ft). The corridor crosses Ashville Bridge Creek approximately halfway between Sandbridge Road and Atwoodtown Road. West of the creek the corridor contains the Nimmo Parkway Trail and Greenway, one of a series of non-motorized trails in Virginia Beach. The landscape adjacent to the corridor is forested between Sandbridge Road and Atwoodtown Road.

Scenic Resources. Back Bay NWR is located on both sides of the corridor east of Ashville Bridge Creek. There are no mapped trails or known public access points in the NWR within the vicinity of the corridor. The Nimmo Trail and Greenway is a narrow meandering unpaved footpath in this section of the corridor.

Visual Effect. The installation of the underground cable will result in a minor visual effect within the utility corridor, primarily due to the loss of individual trees within the onshore export cable corridor. The

installation of the cable and the loss of trees should not impact the long-term use or visual experience of viewers on the Nimmo Trail.

4.2.4. Existing Utility Corridor: Atwoodtown Road to Nimmo Parkway

Route. From Atwoodtown Road, the underground corridor would continue in a westerly direction along the existing utility corridor for another 0.7 km (0.4 mi) to the start of Nimmo Parkway at Albuquerque Drive.

Landscape Character. The existing utility corridor currently has a cleared width ranging from 10 to 20 m (32 to 64 ft), which contains an overhead utility line and the Nimmo Parkway Trail and Greenway. The landscape is forested to the south of the corridor with residential development bordering the north side. Fences and some vegetation separate the homes and the cleared corridor.

Scenic Resources. The Nimmo Trail and Greenway is a narrow meandering unpaved footpath in this section of the corridor.

Visual Effect. The installation of the underground cable will result in a minor visual effect within the utility corridor, primarily due to the loss of individual trees within the onshore export cable corridor. The installation of the cable and the loss of trees should not impact the long-term use or visual experience of viewers on the Nimmo Trail. Homes bordering the north side of the utility corridor are screened by wooden fencing and should not be affected.

4.2.5. Nimmo Parkway to Upton Drive

Route. From the eastern end of Nimmo Parkway, the underground corridor would continue in a westerly direction within the ROW for 1.8 km (1.1 mi) to Upton Drive. At this point the Sandbridge Route follows Upton Drive, while the western route option follows Nimmo Parkway.

Landscape Character. Nimmo Parkway passes through suburban residential development that backs up to the roadway. Travelers on the Parkway see a continuous line of fenced back yards. The Nimmo Trail and Greenway is located on the north side of the roadway and meanders through a maintained landscape. At the western end of this route section (west of Sandoval Drive), the development is characterized by commercial pad sites with manicured vegetation separating the Nimmo Parkway from the building facades.

Scenic Resources. West of Albuquerque Drive the Trail becomes is a wide paved pathway on the north side of the Parkway.

Visual Effect. The installation of the underground cable will result in a minor visual effect within the utility corridor and along the Nimmo Parkway, primarily due to the loss of individual trees within the onshore export cable corridor. The installation of the duct banks and splice vaults may require removal of vegetation that acts as screening for commercial and residential neighbors. In the event that vegetation that now acts as a visual screen needs to be removed, the Project will work with the City of Virginia Beach and adjacent landowners to determine an agreeable screening replacement based on the location of the duct banks or splice vault. Mitigation may include planting of screening vegetation that will not impact operations and maintenance of the cables.

The installation of the underground cable and splice vaults and the loss of trees should not impact the long-term use or visual experience of viewers on the Nimmo Trail or the Nimmo Parkway.

4.2.6. Sandbridge Route Options: Nimmo Parkway to Onshore Substation Site

Route. The Sandbridge Route option for the underground cable follows Upton Drive north for 1.5 km (0.9 mi), then turns west on Culver Lane for approximately 0.7 km (0.4 mi) to General Booth Boulevard. The route then heads southwest on General Booth Boulevard for approximately 0.4 km (0.2 mi) to the onshore substation site. It then turns northwest to cross what is now an open field to access the onshore substation and switch station site. Based on current thinking, the underground cable would be installed on the north side of Nimmo Parkway. It could be installed either on the east or west side of General Booth Boulevard, however, east is preferred.

Landscape Character. Upton Drive and Culver Lane are arterial roads bordered by suburban residential development with fenced rear yards. No residential development fronts the cable route; fences and vegetation provide visual buffers between nearby homes and the roadways. General Booth Boulevard is characterized by large, vegetated medians that separate the travel lanes. Land use along the roadway includes mowed fields, office buildings, and the rear yards of adjacent homes.

Scenic Resources. The route passes three local parks adjacent to Upton Drive: Red Mill Farms Park, Ocean Lakes East Park, Ocean Lake North.

Visual Effect. This section of the underground cable route should not have any measurable visual effect on the landscape or the parks along the way. The cable connection between General Booth Boulevard and the onshore substation site will be located in an open field, without the need for clearing between the roadway and the onshore substation site. The plans for the Corporate Landing Business Park call for a new road (Central Plaza Drive) that will provide access to lots at the southern end of the business park. The underground cable are expected to be located within the ROW of this proposed roadway.

4.2.7. Western Route Option: Upton Drive to Onshore Substation Site

Route. The western route option continues on Nimmo Parkway for 1 km (0.6 mi) west of Upton Drive, then turns northeast onto General Booth Boulevard, where it continues for 1.2 km (0.7 mi) and enters the onshore substation site from the southeast.

Landscape Character. This section of the onshore export cable route is characterized by large commercial development (pad sites and big box retail), with some residential development backing up to the eastern side of General Booth Boulevard. Both roadways have large, vegetated medians that divide directional travel lanes. The visual landscape along the route includes mown fields, office buildings, and the rear yards of adjacent residential development.

Scenic Resources. There are no scenic resources adjacent to the roadways in this section of the western route option.

Visual Effect. The underground cable route option should not result in any measurable visual effects on the surrounding landscape. The cable connection between General Booth Boulevard and the onshore substation site would have the same effect as the Sandbridge Route described above.

4.2.8. Aboveground Transmission Line Option: Sandbridge Road to Atwoodtown Road

Route. While not the preferred route, there is a remote chance that the onshore export cables may be installed overhead for approximately 3.1 km (1.9 mi) in the portion of the route between Sandbridge Road next to the water tower and Atwoodtown Road. Transmission structures may be up to 42 m (138 ft) in

height. The ROW along Sandbridge Road (which may be relocated as described above) may have to be widened to accommodate the transmission corridor.

Landscape Character. See descriptions of landscape character for the segments between the water tower near the eastern end of Sandbridge Road and Atwoodtown Road (above).

Scenic Resources. The Back Bay NWR (described above) is located adjacent to the utility ROW. The utility corridor contains a portion of the Nimmo Trail and Greenway.

Visual Effect. The potential overhead line is located between the water tower and Atwoodtown Road. If an overhead option was chosen, a set of double circuit self-weathering steel monopoles up to 42 m (138 ft) high would be proposed on the north side of Sandbridge Road and the north side of the City-owned easement. An approximate 46 m (150 ft) corridor would be required. At present, the overhead transmission line corridor would require tree removal. If the aboveground export cable route option were to be required, the visual effect would largely be a function of a) the width of the clearing required for the transmission corridor, b) the height and spacing of the transmission structures, c) contrasts (in color, form, line, texture, and scale) between the proposed transmission structures, existing power lines, and the surrounding landscape, d) the proximity of scenic resources and publicly accessible viewpoints to the transmission line, and e) the ability to screen the transmission line from public viewpoints.

4.3. Onshore Substation Site

4.3.1. Substation Site and Components

The onshore substation and switching station site is located west of the intersection of Corporate Landing Parkway and General Booth Boulevard in Corporate Landing Business Park, a 132 ha (325 ac) Class A office, light-industrial, research and data center development, and mixed-use area[17]. The site is bordered by a parking lot to the northwest, a stormwater management facility to the north, an overhead high-voltage transmission line and potential building sites to the south and east, and wooded areas to the south and west. A single residential property is bordered by the site and is shielded from the substation by the wooded area.

The onshore substation and switching station will be located immediately adjacent to one another in the middle of the business park. Two transmission structures that may reach a height of 42 m (138 ft) will connect the onshore substation and switching station.

The onshore substation site will contain electrical and control equipment, some of which may be enclosed in buildings or walled structures. The indicative height of the tallest electrical component will be 26 m (85 ft). Lightning masts may reach 29 m (95 ft) in height.

The facility will be compliant with Virginia Beach building codes, electrical standards, and environmental regulations. When the Project reaches the design stage, consideration will be given to visually integrate the substation and switching station into the surrounding landscape and coordinating with regulatory agencies and the City of Virginia Beach.

Proposed nighttime lighting associated with the onshore Project components includes security lighting installed along the onshore substation and switching station perimeter fencing and at building entrances.

[17] https://www.yesvirginiabeach.com/business-districts/corporate-landing

Security lighting will be directed downward and shielded to avoid light pollution impacts, where possible. The amount of light generated by the security lights will be consistent with existing sources produced by human-made structures near the proposed onshore substation site; therefore, impacts are not expected.

See Map 4 in Attachment 1. Viewshed Analysis for a map of the substation boundaries, visual study area, area of potential visibility based on the viewshed analysis, and identification of scenic resources.

4.3.2. Onshore Substation Site Visual Assessment

The visual effect of the substation and switching station will largely be a function of a) the proximity of scenic resources, b) the location of the site relative to public viewpoints, c) the context of the site and the surrounding land uses, d) visual effect of contrasts (in color, form, line, texture, and scale) between the substation and switching station components and the surrounding landscape, and e) the ability to screen the substation from public viewpoints. For reference, please see the visualization of the Corporate Landing Substation and Switching Station included in Attachment 3 Visualizations.

Landscape Character. The landscape in the vicinity of the site is characterized by a mix of suburban residential development, agricultural fields, and commercial development (including big box stores and pad sites), and office buildings. The landscape is interconnected by four-lane divided highways with wide medians and regularly spaced trees. Local residential streets provide access from the arterial roads to the adjacent neighborhoods. The landscape is punctuated with large parking lots associated with the commercial developments. The business park features a number of buildings serving as regional headquarters. Most commercial buildings are two to three stories, staying below the tree line.

Transmission line corridors and other electrical infrastructure are visually present in the study area. An existing line of weathering steel H-frame transmission structures runs south of the site, crossing an open field and passing through residential neighborhoods north and south of the site. There is a small substation 0.8 km (0.5 mi) south of this proposed substation site (accessed off London Bridge Road).

Viewer Groups. There are two primary viewer groups that may have views of the substation and switching station. The first are residents of the nearby neighborhoods who may walk and drive through the Business Park and adjacent boulevards and parkways. Views from the neighborhoods are limited by remnant forestland that forms an effective screen between the residential and commercial uses. The second viewer group consists of the employees and patrons of the commercial office buildings in the business park, who may see the substation and switching station from interior spaces or from the well-maintained grounds.

Scenic Resources. Scenic resources in the 1-mile study area consist of 16 local parks. The closest park is Dunwoody Park, located approximately 0.4 km (0.3 mi) to the north. Strawbridge Park East is the second closest park, located south of the site at a distance of approximately 0.7 km (0.4 mi). There are two on-road motorized trail routes: Dam Neck Road Trail, located approximately 0.7 km (0.4 mi) from site and General Booth Boulevard Trail 1.4 km (0.9 mi) from site.

According the computer-based visibility assessment, the only scenic resource with potential visibility of the onshore substation and switching station is the Dam Neck Trail, where the Project components will be seen over Dam Neck Road, across an open field, and in the context of office buildings in the foreground.

Geographic Extent. Visibility of the substation and switching station infrastructure was evaluated in the viewshed analysis on Map 4 of Attachment A. According to this analysis, the infrastructure will be visible from the adjacent arterial roadways and the office buildings located north and east of the site. It will also be visible from Dam Neck Road and portions of the Corporate Landing school campus on the north side

of Dam Neck Road. The infrastructure will be visible from agricultural properties southwest of the site. They will be visible from General Booth Boulevard, Corporate Landing Parkway, and Perimeter Parkway in the vicinity of agricultural fields, office buildings, and a stormwater pond. The substation and switching station will not be visible from the residential neighborhoods within the study area.

Visual Effect. The design, color, form, and materials of the components used in the onshore substation site may present a moderate contrast with the surrounding built environment. While the proposed facilities will be seen in the context of the existing transmission line corridor (southeast of the onshore substation site), there is no other industrial or electrical infrastructure in the immediate vicinity.

The substation site will be located approximately 213 m (700 ft) apart with two transmission structures connecting the two facilities. While the infrastructure may be separated in the landscape, they will appear as a single facility from the northwest and southeast sides of the site due to their orientation to each other. Based on current preliminary design, from the southeast, the substation and transmission structures will appear behind the switching station; from the northwest the switching station and transmission structures will appear behind the substation. Wooded vegetation northeast and southwest of the site will prevent direct views toward the two facilities side-by-side in the landscape.

From the northwest, the substation will be most visible from an office building and parking lot located immediately adjacent to the site [the office building is located approximately 365 m (1,200 ft)] away from the substation. The substation site will introduce new visual elements to the landscape. From the adjacent parking lot, the substation will create contrast in form, line, color, and texture from the surrounding landscape. The existing transmission line structures southeast of the substation site are not clearly visible from the parking lot and will not be seen in context with the substation. Visual screening between the parking lot and the substation will be an important factor in reducing the visual effect of the substation.

From the southeast, the switching station (and to a much lesser extent) and substation will be visible from General Booth Boulevard (located approximately 396 m (1,300 ft) south of the site), where it will be seen over an open field that is currently bisected by an existing transmission line corridor. The proposed facilities will also be visible from Las Cruces Drive, a local residential street on the southwest side of the Boulevard. Homes in this area typically have opaque fences that provide privacy and screening from the traffic on the Boulevard. Visibility from the southeast will be primarily to motorists and pedestrians on the Boulevard and vehicle and motorists existing Las Cruces Drive. Those travelling west (on the north side of the boulevard) are more likely to capture a glimpse of the substation than those travelling east (south side of the road) due to the tree lined median that provides some visual screening from the eastbound travel lane.

A visualization of the proposed substation and switching station is included in Attachment 3. The image is representative of the view that one may see from General Booth Boulevard.

The buildings and other components of the substation and switching station sites have not been designed at this point. Landscape screening, where appropriate, and other factors found in the setting will be important considerations in reducing visual contrast and visually blending these facilities into their surroundings. The visualization provided in Attachment 3 is intended to provide the worst-case scenario and does not include any landscaping or visual screening. As plans are developed there is an expectation that screening will be provided as necessary to minimize views of the electrical infrastructure.

Conclusion. From a visual perspective, the proposed onshore substation, switching station, and transmission structures are located on a site that is well suited for this type of facility. There is no visibility from residential areas and limited visibility from public roadways. Existing vegetation presents an opportunity to screen the substation and minimize its presence in the landscape. The Company will work with the City of Virginia Beach to develop an agreeable landscape screening plan that is appropriate for its context within the Corporate Landing Business Park.

5. Avoidance and Minimization

Measures to reduce potential visual effects of both the offshore and onshore components have been incorporated into the planning and design process and follow the mitigation measures recommended by BOEM.[18]

5.1. Offshore Components

Siting. The Project will be located in a designated Lease Area identified by BOEM as suitable for offshore wind development. All offshore Project components above the water's surface (WTGs and ESP) will be sited in the far background distance zone, i.e., at least 43 km (23 nm / 27 mi) offshore, where visibility will be minimized by the effects of distance, weather conditions, and atmospheric perspective.

Design. All WTGs will be identical in design, color, base configuration, blade length, hub height, and tower type to create a consistent appearance throughout the Project.

Color. As described in more detail above in **Section 1.3.5**, most of the Project components (base, hub, blades) will be painted either white or a uniform light gray, which will minimize color contrast as seen against a sky background. In conformance with BOEM's 2021 guidelines, the foundation structures will be painted high visibility yellow up to 15.2 m (50 ft) from Mean Higher High Water. The yellow portions of the WTGs will not be visible due to earth curvature. Non-reflective paint will be used on all Project components. With few exceptions, the majority of Project views are seen against the sky. The WTGs will not contain any commercial or advertising messages.

5.2. Onshore Components

Siting. The onshore substation site is located within the Corporate Landing Business Park in a parcel owned by the City of Virginia Beach. Factors that led to its selection include the presence of the electrical grid, proximity to the landfall, and available land within an established commercial development. The onshore substation site is largely screened from nearby residential development and will be landscaped and screened to minimize adverse visual effects on the adjacent commercial uses. The site is zoned for Light Industrial; the proposed onshore substation site will be consistent with existing zoning.

Screening/Landscaping. Where onshore substation and switching station components may be visible and highly contrasting with their surroundings, the Project will develop plans to be reviewed and approved by the City to provide supplemental plantings and other landscape elements to screen the substation from public view to the extent possible.

[18] BOEM. 2007b. Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternative Use of Facilities on the Outer Continental Shelf – Final Environmental Impact Statement, Section 5 Potential Impacts of Alternative Energy Development.

Transmission Lines. As noted in the introduction, the onshore export cables may consist of underground and/or aboveground components. The onshore export cable route has been selected to minimize disturbance to residential or commercial properties, landscaped medians in the parkways, and recreational trails along the route.

Security Lighting. Lighting installed on the onshore substation and switching station for security and/or emergency operations will utilize full cut-off fixtures to avoid light pollution and trespass outside the property.

6. Overall Project Impacts

6.1. Offshore Components

The VIA evaluated potential visual effects from six distinct Character Areas: Open Ocean, Developed Beachfronts, Natural Beachfronts, Conservation Areas, Coastal Communities, and Sounds. Viewshed analysis and field evaluation determined that the Project would be visible from:

- the Open Ocean (varying degrees, depending upon distance from the observer to the Project;
- virtually all of the Developed Beachfronts (which constitute the majority of the seascape within the study area);
- limited portions of the Natural Beachfronts (which also include considerable areas of conserved lands on the west side of the beach);
- limited portions of the important Conservation Areas;
- none of the Coastal Communities outside of the Developed Beachfronts; and
- very limited portions of the Sounds and the abutting land areas.

While the Project will be theoretically visible over a large onshore area, the overall visual effect on the seascape/landscape, based on the degree of WTG visibility illustrated in the visualizations, will be negligible in most instances. The limited visibility is a function of distance (the closest WTGs are between 45 and 61 km [24 and 33 nm / 28 and 38 mi] from the observer); curvature of the earth (as seen in the visualizations, many of the WTGs will be below the visible horizon); and atmospheric perspective (distance combined with haze to decrease the color contrast and saturation of the WTGs. WTG visibility and the compatibility with the seascape/landscape can be described as a continuum, ranging from Dominant to Faint (see Table 21). As seen in the visualizations, and described in the VIA, the Kitty Hawk North Wind Project is at the outer end of the continuum with faint visibility.

Table 21. Seascape / Landscape Compatibility Ratings

SEASCAPE/LANDSCAPE COMPATIBILITY					
	FAINT	APPARENT	CONSPICUOUS	PROMINENT	DOMINANT
Compatibility Evaluation	Project is indistinct or not obvious within the view, either due to its proximity, massing, width, height, number of structures, duration of view, scale, visibility or contrast with the surrounding seascape. Project causes a very small alteration to the seascape character, or features within the seascape, such that there is a de minimis change from the pre-existing condition.	Project is visible or evident within the view, either due to its proximity, massing, width, height, number of structures, duration of view, scale, visibility or contrast with the surrounding seascape. Project causes a small alteration to the seascape character, or features within the seascape, such that there is a perceptible change from the pre-existing condition.	Project is clearly visible and noticeable within the view, either due to its proximity, massing, width, height, number of structures, duration of view, scale, visibility or contrast with the surrounding seascape. Project causes a moderate alteration to the seascape character, or features within the seascape, such that there is a distinct change from the pre-existing condition.	Project stands out or is striking in the view, either due to its proximity, massing, width, height, number of structures, duration of view, scale, visibility or contrast with the surrounding seascape. Project causes a large alteration to the seascape character, or features within the seascape, such that there is an unmistakable change from the pre-existing condition.	Project commands or controls the view, either due to its proximity, massing, width, height, number of structures, duration of view, scale, visibility, or contrast with surrounding seascape. Project causes a very large alteration to the seascape character, or features within the seascape, such that here is a fundamental change from the pre-existing condition.

6.2. Onshore Components

Onshore Export Cable: Underground Option. The underground export cable route option should not result in any measurable visual effects on the surrounding landscape.

Onshore Export Cable: **Aboveground Option**. Although the onshore export cables may be installed overhead, the Company is currently developing the design for an underground configuration. Therefore, this assessment does not further evaluate an overhead configuration at this time.

Onshore Substation Site. From a visual perspective, the proposed site is well suited for the proposed use. There is no visibility from residential areas and limited visibility from public roadways. Existing vegetation presents an opportunity to screen the infrastructure and minimize its presence in the landscape. There are a number of options that will help to reduce visibility and visual contrast of the infrastructure as seen from the surrounding office buildings.

7. References

BLM (Bureau of Land Management). 1986. Visual Resource Inventory. BLM Manual Handbook 8410-1, Release 8-28, U.S. Department of the Interior, Washington, D.C.

BLM. 2013. Best Management Practices for Reducing Visual Impacts of Renewable Energy Facilities on BLM-Administered Lands. Cheyenne, Wyoming. 342 pp,

BLM. 2018. Visual Resources: Visual Impact Assessment Methodologies for Other Federal Agencies. Available online at: http://blmwyomingvisual.anl.gov/assess-simulate/other-federal/. Accessed July 22, 2019.

BOEM (Bureau of Ocean Energy Management). 2007a. Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternative Use of Facilities on the Outer Continental Shelf – Final Environmental Impact Statement, Section 4 Affected Environment. Available online at: https://www.boem.gov/Renewable-Energy- Program/Regulatory-Information/Alt_Energy_FPEIS_VolIIFrontMatter.aspx.

BOEM. 2007b. Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf, Final Environmental Impact Statement October 2007, Volume II: Chapter 5. . Available online at: https://www.boem.gov/sites/default/files/renewable-energy-program/Regulatory-Information/Alt_Energy_FPEIS_VolIIFrontMatter.pdf. Accessed September 26, 2022.

BOEM. 2012. Visualization Study for Offshore North Carolina. Mangi Environmental Group, T.J. Boyle Associates, LPES, Inc. Available online at: https://www.boem.gov/Offshore-North-Carolina-Visualization-Study/. Accessed September 12, 2022.

BOEM. 2013. Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore North Carolina. Revised Environmental Assessment. OCS EIS/EA BOEM 2015-038.

BOEM. 2013. Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Rhode Island and Massachusetts. Revised Environmental Assessment. OCS EIS/EA BOEM 2013-1131.

BOEM. 2015. Renewable Energy Viewshed Analysis and Visualization Simulation for the New York Outer Continental Shelf Call Area: Compendium Report. OCS Study BOEM 2015-044.

BOEM. 2016. Guidelines for Information Requirements for a Renewable Energy Construction and Operations Plan. United States Department of the Interior Office of Renewable Energy Programs, Bureau of Ocean Energy Management. Available online at: https://www.boem.gov/COP-Guidelines/. Accessed July 16, 2019.

BOEM. 2017. Visualization Simulations for Offshore Massachusetts and Rhode Island Wind Energy Area: Meteorological Report. OCS Study BOEM 2017-037. Available online at: https://www.boem.gov/Final-Meteorological-Report/. Accessed July 22, 2109.

BOEM. 2018. Analysis of the Effects of the Block Island Wind Farm (BIWF) on Rhode Island Recreation and Tourism Activities. United States Department of the Interior Office of Renewable Energy Programs, Bureau of Ocean Energy Management. University of Rhode Island. OCS Study BOEM 2018-068. December 2018.

Cape Cod Commission. 2012. Technical Bulletin #12 – 001 Visual Impact Assessment (VIA) Methodology for Offshore Development.

Corolla Guide & Carova. Corolla History. Available online at: https://corollaguide.com/history, Accessed July 22, 2021.

Data USA. Duck, North Carolina. Available online at: https://datausa.io/profile/geo/duck-nc, Accessed July 22, 2021.

Deering, Michael F. *The Limits of Human Vision*. Sun Microsystems. 1998. Available online at: https://www.swift.ac.uk/about/files/vision.pdf. Accessed July 7, 2022.

DTI (Department of Trade and Industry). 2005. Guidance of the Assessment of the Impact of Offshore Wind Farms: Seascape and Visual Impact Report. London, England, Nov. Available online at: https://webarchive.nationalarchives.gov.uk/+/http:/www.berr.gov.uk/files/file22852.pdf. Accessed April 16, 2013.

Duck Guide & Southern Shores. Duck and Southern Shores, North Carolina. Available online at: https://duckncguide.com/southern-shores-nc. Accessed July 20, 2021.

Dunnavant, Joren Walter. Virginia Commonwealth University. Masters of Urban and Regional Planning. Beach Cottage Row Historic District. Nags Head, North Carolina. 2008.

Environmental Design & Research. New York State Offshore Wind Master Plan Visibility Threshold Study. Prepared for New York State Energy Research and Development Authority. Syracuse, NY. December 2017.

Federal Aviation Administration (FAA). 2005. Development of Obstruction Lighting Standards for Wind Turbine Farms. DOT/FAA/AR-TN 05/50. U.S. Department of Transportation, Washington, D.C. Accessed July 22, 2019.

Friends of Jockey's Ridge State Park, Nags Head, North Carolina. Available online at: https://friendsofjockeysridge.org. Accessed July 23, 2021.

ICF Incorporated, L.L.C. 2012. Atlantic Region Wind Energy Development: Recreation and Tourism Economic Baseline Development. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Herndon, Virginia. OCS Study BOEM 2012-085, 35 pp.

Island Free Press. Cape Hatteras National Seashore Breaks All-Time January Visitation Record. March 1, 2021. Available online at: https://islandfreepress.org/outer-banks-driving-on-the-beach/cape-hatteras-national-seashore-breaks-all-time-january-visitation-record/. Accessed July 22, 2021.

Klein, J.I., M.D. Harris, W.M. Tankersley, R. Meyer, G.C. Smith, and W.J. Chadwick. 2012. Evaluation of visual impact on cultural resources/historic properties: North Atlantic, Mid- Atlantic, South Atlantic, and Florida Straits. Volume I: Technical report of findings. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEM 2012-006. 24 pp.

Klein, J.I., M.D. Harris, W.M. Tankersley, R. Meyer, G.C. Smith, and W.J. Chadwick. 2012. Evaluation of visual impact on cultural resources/historic properties: North Atlantic, Mid- Atlantic, South Atlantic, and Florida Straits. Volume II: Appendices. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEM 2012-007. 10 appendices.

Ladenburg J., 2010. Attitudes Towards Offshore Wind Farms – The Role of Beach Visits on Attitude and Demographic and Attitude Relations. Energy Policy, 38, 1297-1304. Available online at: http://www.mresearch.com/pdfs/docket4185/NG11/doc57.pdf. Accessed July 22, 2019.

Landscape Institute and Institute of Environmental Management & Assessment. 2013. Guidelines for Landscape and Visual Impact Assessment, Third Edition. Routeledge, New York.

Management Analysis, Incorporated. Visitor Survey. 2014-2015. The Outer Banks Visitor Bureau. Volume 1 Visitor Survey Report. October 2015. Available online at: https://www.nagsheadnc.gov/DocumentCenter/View/2104/The-Outer-Banks-Visitors-Bureau-Visitors-Survey-. Accessed August 17, 2021.

NOAA (National Oceanic and Atmospheric Administration). 2019. Office for Coastal Management: Coastal Zone Management Act. Available online at: https://coast.noaa.gov/czm/act/. Accessed August 5, 2022.

National Oceanographic and Atmospheric Administration (NOAA), Coastal Pilot: Cape Henry to Key West. Available online at: https://nauticalcharts.noaa.gov/publications/coast-pilot/files/xml2html.php?xml=cp4/CPB4_C03_WEB.xml. Accessed August 20, 2021.

North Carolina Aquariums. Jennette's Pier. Available online at: https://www.ncaquariums.com/jennettes-pier-about-us. Accessed July 23, 2021.

North Carolina Department of Environment and Natural Resources, Division of Coastal Management. Kitty Hawk Woods Reserve Management Plan. Town of Kitty Hawk & North Carolina Division of Coastal Management Coastal Reserve Program. November 28, 1998.

OBX Beach Access. Corolla Beach Access. Available online at: https://www.sscaobx.org. Accessed July 20, 2021.

Old Nags Head Place Home Owners Association. Architectural Review. Available online at: https://oldnagsheadplace.com/architectural-committee/. Accessed July 22, 2021.

Orr, T., Wood, S., Drunsic, M., and Perkins, G. 2016. Development of Guidance for Lighting of Offshore Wind Turbines Beyond 12 Nautical Miles. US Dept. of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Sterling, Virginia. OCS Study BOEM 2016-002. [138] pp.

OuterBanks. Com. Visitors Guide. Albermarle Sound. Available online at: https://www.outerbanks.com/albemarle-sound.html Accessed July 22, 2021.

OuterBanks.Com. Visitors Guide. Coquina Beach. Available online at: https://www.outerbanks.com/coquina-beach.htm. Accessed July 23, 2021

OuterBanks. Com. Visitors Guide. Currituck Sound. Available online at: https://www.outerbanks.com/currituck-sound.html. Accessed July 22, 2021.

OuterBanks. Com. Visitors Guide. Jennette's Pier. Available online at: https://www.outerbanks.com/jennettes-pier.html. Accessed July 22, 2021.

OuterBanks. Com. Visitors Guide. Kitty Hawk Pier. Available online at: https://www.outerbanks.com/kitty-hawk-pier.html. Accessed July 22, 2021.

OuterBanks. Com. Visitors Guide. Nags Head Woods Ecological Preserve. Available online at: https://www.outerbanks.com/nags-head-woods.html. Accessed July 23, 2021.

OuterBanks. Com. Visitors Guide. Whalehead in Historic Corolla. Available online at: https://www.outerbanks.com/the-whalehead-club.html. Accessed July 20, 2021.

Scenic Virginia. Virginia's Scenic Byways. https://scenicvirginia.org/scenic-resources-toolbox/resources-scenic-byways/. Accessed August 6, 2022.

Smardon, R.C., J.F. Palmer, and J.P. Felleman (eds.). 1986. Foundations for Visual Project Analysis. John Wiley & Sons, Inc. New York, NY.

Southern Shores Civic Association. SSCA Architectural Review Board Guidelines, Policies, and Procedures. June 9, 2020.

Southern Shores Civic Association. Southern Shores Civic Association. Available online at: https://www.sscaobx.org. Accessed July 20, 2021.

Strategic Marketing & Research, Inc. Outer Banks Visitor Bureau. Visitor Research Wave 4 – 2006. September 2006. Available online at: https://assets.simpleviewinc.com/simpleview/image/upload/v1/clients/outerbanks/2005_2006_year_long_visitor_profile_54ac9971-3bff-4693-bd45-493f12d06e09.pdf. Accessed August 17, 2021.

Sullivan, Robert G. Assessment of Seascape, Landscape, and Visual Impacts of Offshore Wind Energy Developments on the Outer Continental Shelf of the United States. OCS Study BOEM 2021-032. Argonne National Laboratory, Lemont, IL. April 2021.

Sullivan, Robert. G. Direct Expert Testimony of Robert G. Sullivan on Behalf of The Town of Ocean City Before the Public Service Commission of Maryland. Case No. 9629. In the Matter of Skipjack Offshore Energy, LLC's Qualified Offshore Wind Project's Compliance with Conditions Approved in 2017. April 17, 2020.

Sullivan, Robert. Wind Turbine Visibility and Visual Impact Threshold Distances in Western Landscapes. Argonne National Laboratory. May 2012.

Sullivan, R.G., L.B. Kirchler, J. Cothren, S.L. Winters. 2013. Offshore Wind Turbine Visibility and Visual Impact Threshold Distances. Environmental Practice. Volume 14, Number 1. Pp. 33-49.

Sullivan, Robert, and Mark Meyer. Argonne National Laboratory and National Park Service. Guide to Evaluating Visual Impact Assessments for Renewable Energy Projects. Natural Resource Report NPS/ARD/NRR – 2014/836. Fort Collins, CO. August 2014.

Teisl, Mario f.; McCoy, Shannon K.; Marrinan, Sarah J.; Noblet, Caroline L.; Johnson, Teresa R.; Wibberly, Megan; and Klein, Sharon, "Will Offshore Energy Face "Fair Winds and Following Seas?:" Understanding the Factors Influencing Offshore Wind Acceptance" (2015). Publications. 59. Available online at: https://digitalcommons.library.umaine.edu/mitchellcenter_pubs/59. Accessed July 22, 2019.

Tripadvisor. Nags Head Woods Preserve. Available online at: https://www.tripadvisor.com/Attraction_Review-g49256-d143708-Reviews-Nags_Head_Woods_Preserve-Kill_Devil_Hills_Outer_Banks_North_Carolina.html. Accessed July 23, 2021.

Tucker, John. The History of the Outer Banks Dunes. Available online at: https://www.ourstate.com/history-of-the-outer-banks-dunes/. Accessed July 22, 2021.

US Army Corps of Engineers, Engineer Research and Development Center Website. Field Research Facility, Duck, North Carolina. Available online at: https://www.erdc.usace.army.mil/Media/Fact-Sheets/Fact-Sheet-Article-View/Article/476710/field-research-facility/. Accessed July 20, 2021.

USDA Forest Service. Landscape Aesthetics: A Handbook for Scenery Management. Agricultural Handbook Number 701. December 1995.

USDI (U.S. Department of the Interior). 2013. Best Management Practices for Reducing Visual Impacts of Renewable Energy Facilities on BLM-Administered Lands. Bureau of Land Management, Cheyenne, Wyoming. 342 p.

USDI, Office of Renewable Energy Programs, Bureau of Ocean Energy Management. Guidelines for Information Requirements for a Renewable Energy Construction and Operations Plan (COP). Version 3.0: April 7, 2016.

USDI, National Park Service. Cape Hatteras National Seashore, Bodie Island Light Station. Available online at: https://www.nps.gov/caha/planyourvisit/bils.htm. Accessed July 20, 2021.

USDI, National Park Service. Cape Hatteras National Seashore, Lighthouse Climbs. Available online at: https://www.nps.gov/caha/planyourvisit/lighthouseclimbs.htm. Accessed July 20, 2021.

USDI, National Park Service. Cape Hatteras National Seashore. Maps. Available online at:https://www.nps.gov/caha/planyourvisit/maps.htm. Accessed July 20, 2021.

USDI, National Park Service. Cape Hatteras National Seashore. Plants. Available online at: https://www.nps.gov/caha/learn/nature/plants.htm. Accessed July 23, 2021.

USDI, National Park Service. General Management Plan Amendment for Wright Brothers National Memorial. Newsletter, August 2019.

USDI, National Park Service. Recreation Visits by Month: Cape Hatteras National Seashore. Available online at: https://irma.nps.gov/STATS/SSRSReports/Park%20Specific%20Reports/Recreation%20Visitors%20By%20Month%20(1979%20-%20Last%20Calendar%20Year)?Park=WRBR. Accessed August 11, 2021.

USDI, National Park Service. Recreation Visits by Month: Wright Brothers National Memorial. Available online at: https://irma.nps.gov/STATS/SSRSReports/Park%20Specific%20Reports/Recreation%20Visitors%20By%20Month%20(1979%20-%20Last%20Calendar%20Year)?Park=WRBR. Accessed August 11, 2021.

USDI, National Park Service. Shaping the Future of Wright Brothers National Memorial. General Management Plan Amendment. Newsletter, August 2019.

US Fish and Wildlife Service. Currituck National Wildlife Refuge (Brochure and Site Map). Available online at: https://www.fws.gov/refuge/currituck/. Accessed July 20, 2021.

Weather Spark. Average Weather in Kitty Hawk, North Carolina. Available online at: https://weatherspark.com/y/22643/Average-Weather-in-Kitty-Hawk-North-Carolina-United-States-Year-Round. Accessed August 18, 2021.

Virginia Beach Development Authority. 2021. Corporate Landing Business Park Design Criteria, Available online at: https://www.yesvirginiabeach.com/_assets/Documents/AboutUs/VBDA/2021/Corporate-Landing-Design-Criteria-Update-FINAL_12072021.pdf . Accessed August 5, 2022.

Virginia Department of Historic Resources. Guidelines for Assessing Impacts of Proposed Transmission Lines and Associated Facilities on Historic Resources in the Commonwealth of Virginia. Available online at: https://www.dhr.virginia.gov/wp-content/uploads/2018/08/DHR_Guidelines_for_Transmission_Line_Assessment.pdf. January 2008. Accessed August 5, 2022.

Virginia Legislative Information System. House Bill No. 1648. A BILL to amend and reenact § 33.1-63 of the Code of Virginia, relating to consideration of impacts that projects of certain governmental entities might have upon roads designated Virginia byways. February 9, 2009. Available online at: https://lis.virginia.gov/cgi-bin/legp604.exe?091+ful+HB1648E. Accessed August 6, 2022.

Whalehead Club. Whalehead in Historic Corolla. Available online at: http://www.whaleheadwedding.com. Accessed July 20, 2021.

Scenic Resource Databases

National Park Service, U.S. Department of the Interior. National Register of Historic Places, *NRIS_CR_Standards_Public.gdb [computer file].* 2021. Washington, D.C., National Park Service. Available online at: https://irma.nps.gov/DataStore/Reference/Profile/2210280. Accessed May 1, 2021.

North Carolina Natural Heritage Program. Open Space and Conserved Lands Dataset, *Open_Space_and_Conservation_Lands [computer file].* 2021. Raleigh, North Carolina, Natural Heritage Program. Available online at: https://ncnhde.natureserve.org/content/data-download. Accessed May 1, 2021.

North Carolina Wildlife Resources Commission. NCWRC Boating Access Areas, *BAA [computer file].* 2021. Raleigh, North Carolina, N.C. Geographic Information Coordinating Council, North Carolina OneMap. Available online at : https://www.nconemap.gov/datasets/ncwrc::baa/explore?location=35.118288%2C-79.937916%2C7.27. Accessed May 1, 2021.

Virginia Department of Conservation and Recreation. Statewide Scenic Rivers, *vop-scenic-rivers [computer file]*. 2021. Richmond Virginia, Virginia Department of Conservation and Recreation. Available online at: https://www.dcr.virginia.gov/recreational-planning/vop-gis-data. Accessed May 1, 2021.

Virginia Department of Conservation and Recreation. Water Access Sites, *vop-public-access [computer file]*. 2021. Richmond Virginia, Virginia Department of Conservation and Recreation. Available online at: https://www.dcr.virginia.gov/recreational-planning/vop-gis-data. Accessed May 1, 2021.

Virginia Department of Conservation and Recreation. Water Trails layer, *vop-watertrails [computer file]*, 2021. Richmond Virginia, Virginia Department of Conservation and Recreation. Available online at: https://www.dcr.virginia.gov/recreational-planning/vop-gis-data. Accessed May 1, 2021.

Virginia Department of Conservation and Recreation. Trailhead data, *vop-gis-trailheads [computer file]*, 2021. Richmond Virginia, Virginia Department of Conservation and Recreation. Available online at: https://www.dcr.virginia.gov/recreational-planning/vop-gis-data. Accessed May 1, 2021.

Virginia Department of Conservation and Recreation, Natural Heritage. Conservation Lands Database, *conslands [computer file].* 2021. Richmond Virginia, Virginia Department of Conservation and Recreation. Available online at : https://www.dcr.virginia.gov/natural-heritage/cldownload. Accessed May 1, 2021.

Virginia Department of Wildlife Resources. DWR Maintained Boating Access Locations, *Boating_Access_Sites [computer file]*. 2021. Henrico, Virginia, Virginia Department of Wildlife Resources. Available online at: https://dwr.virginia.gov/gis/data/download/. Accessed May 1, 2021.

Virginia Department of Wildlife Resources. Virginia Birding and Wildlife Trail – Sites and Loops, *VBWT_Sites&Loops [computer file]*. 2021. Henrico, Virginia, Virginia Department of Wildlife Resources. Available online at: https://dwr.virginia.gov/gis/data/download/. Accessed May 1, 2021.