EMPIRE OFFSHORE WIND:
EMPIRE WIND PROJECT (EW 1 and EW 2)

CONSTRUCTION AND OPERATIONS PLAN

VOLUME 2d: VISUAL RESOURCES

Prepared for

equinor

Submitted to

Bureau of Ocean Energy Management

Prepared by

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Photo Credit: Jan Arne Wold/Equinor

TABLE OF CONTENTS

TABLES

FIGURES

7. VISUAL RESOURCES

This section discusses visual resources within and surrounding the Project Area. Potential impacts to visual resources resulting from construction, operation, and decommissioning of the Project are discussed. Proposed Project-specific measures adopted by Empire are also described, which are intended to avoid, minimize, and/or mitigate potential impacts on visual resources.

Other resources and assessments detailed within this COP that are related to visual resources include:

- Visual Effects to Historic and Architectural Properties (Section 6.3);
- Recreation and Tourism (Section 8.3);
- Analysis of Visual Effects to Historic and Architectural Properties (AVEHAP; Appendix Z); and
- Visual Impact Assessment (VIA; Appendix AA).

Data Relied Upon and Studies Completed

For the purpose of this section, the Visual Offshore Study Area for the offshore Project components consists of a 44-mi (70.8-km) buffer around the Lease Area (see **Figure 7.1-1**). The Visual Onshore Study Areas for the onshore Project components include the areas within 4 mi (6.4 km) of the onshore substation parcel boundaries and the O&M Base (see **Figure 7.1-2**).[1]

This section was prepared in accordance with BOEM's *Guidelines for Information Requirements for a Renewable Energy Construction and Operations Plan* (2016). BOEM's 2021 *Assessment of Seascape, Landscape, and Visual Impacts of Offshore Wind Energy Developments on the Outer Continental Shelf of the United States* was not available at the time this VIA was prepared; therefore, a standard inventory and assessment approach that applied certain elements of the U.S. Bureau of Land Management (BLM) Visual Resource Management (VRM) system was used for this VIA (BLM 2018). The BLM VRM system is widely used for a variety of projects and, with some modifications, has been applied successfully to projects that do not occur on lands under the jurisdiction of the BLM.

In support of the VIA, the Visual Offshore and Onshore Study Areas were identified based on locations from which offshore and onshore components of the Project were identified as potentially visible and noticeable to the casual observer. The "casual observer" is considered an observer who is not actively looking or searching for the Project facilities but is engaged in activities at locations with potential views of the Project, such as hiking, driving on a scenic road, or relaxing on a beach. The Visual Offshore Study Area was identified through use of a viewshed analysis that indicated where the offshore Project facilities would be potentially visible based on the maximum height and location of the wind turbines, the curvature of the earth, and the topography of the area under optimal viewing conditions (i.e., a clear, sunny day; see **Appendix AA** for additional information). Additionally, it accounted for the screening effects of vegetation and development.

[1] While the O&M Base will serve both EW 1 and EW 2, the base will be located at SBMT, adjacent to the EW 1 onshore substation, and will therefore be included within the EW 1 Onshore Study Area for the purposes of this analysis.

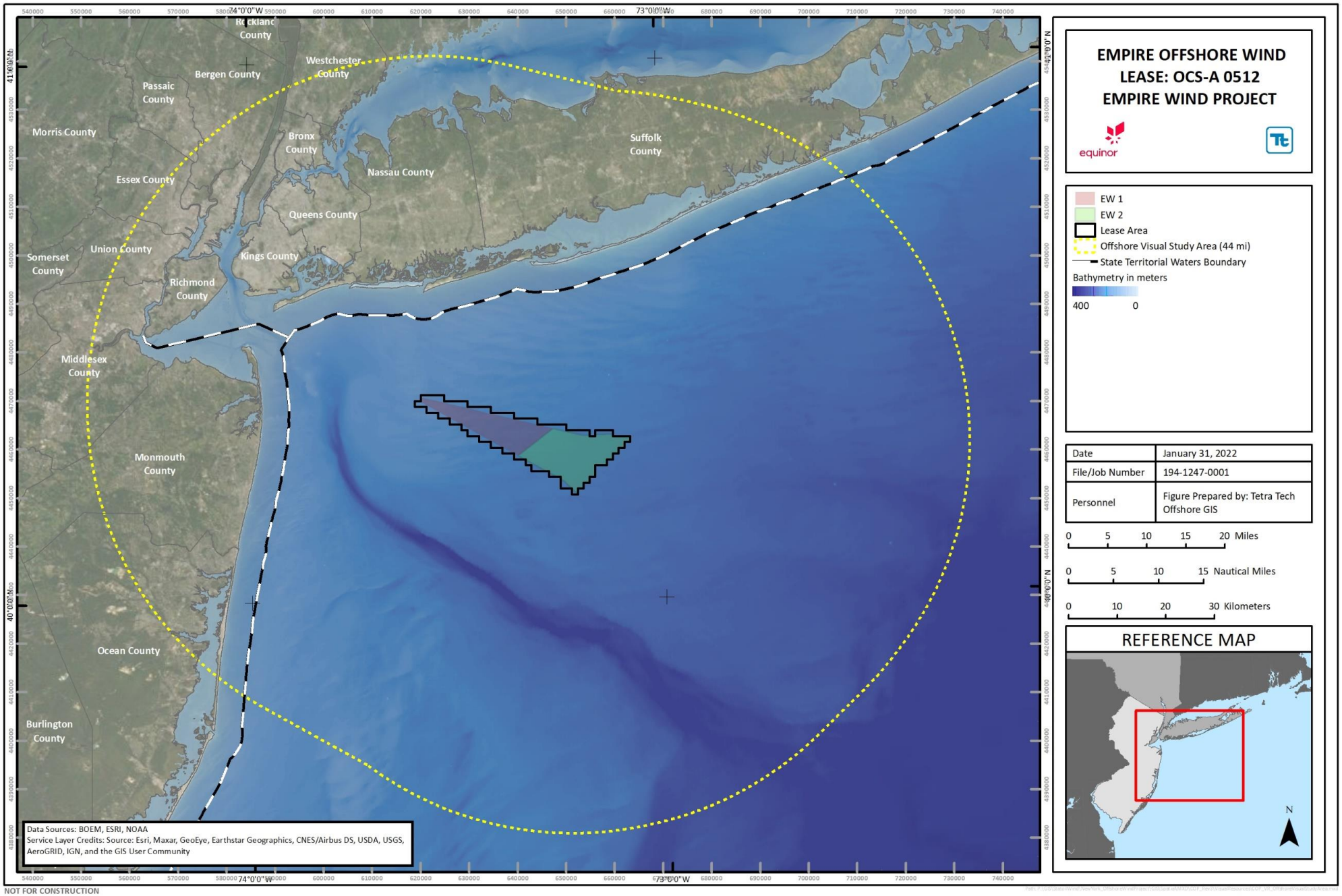


Figure 7.1-1 Visual Offshore Study Area

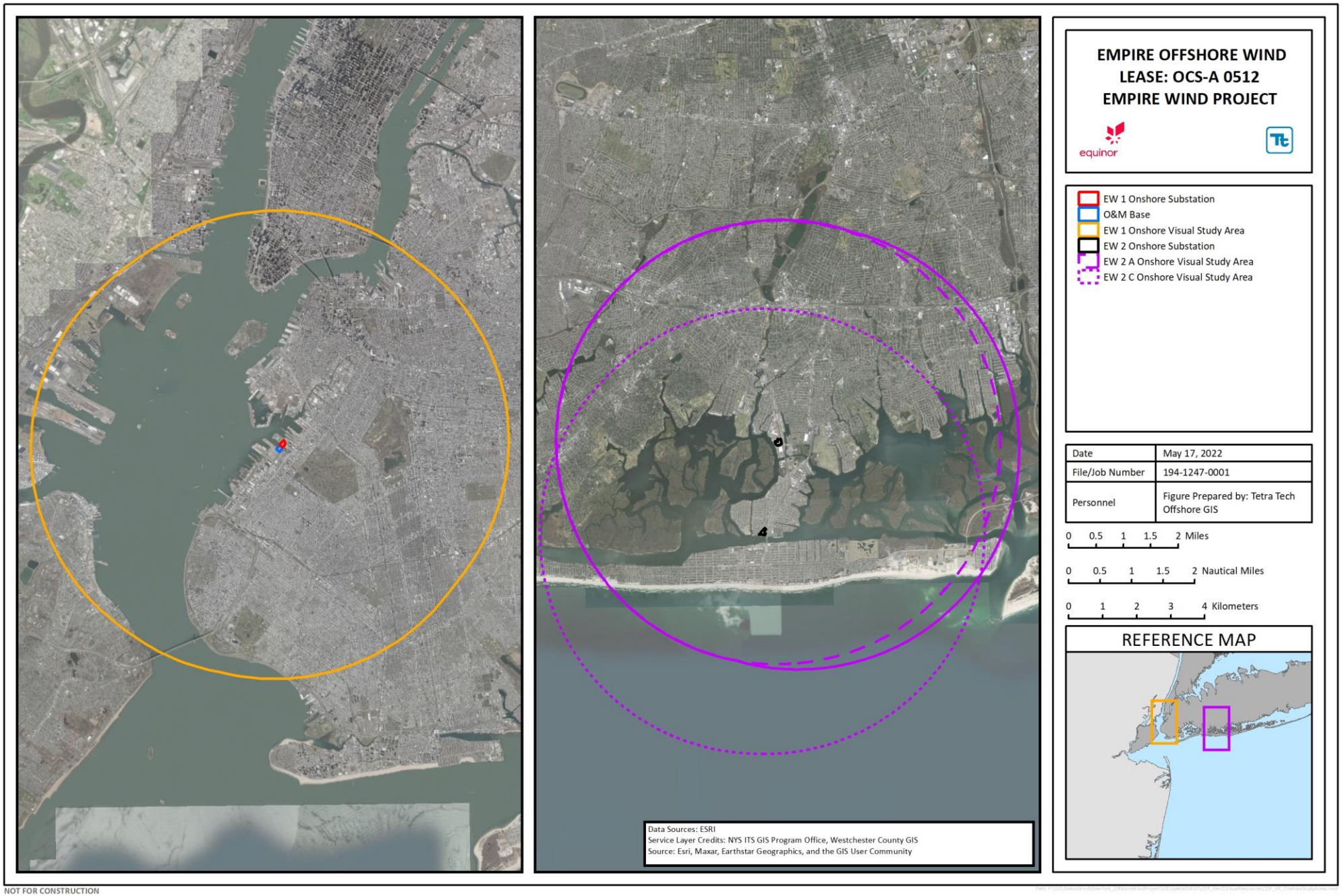


Figure 7.1-2 Visual Onshore Study Areas

A topographic viewshed assumed "bare earth" conditions and was developed from the wind turbine locations looking out to determine areas with potential visibility. The bare-earth modeling approach is based only on the effects of terrain on visibility and does not include potential screening provided by vegetation or development; therefore, the bare-earth modeling approach results in a conservative assessment of potential visibility. To supplement the topographic viewshed analysis, a viewshed accounting for vegetation and building heights was also developed to identify areas within the Visual Offshore Study Area where potential screening may be provided by buildings. These viewsheds helped to focus inventory and field visit efforts based on existing conditions within the landscape.

Based on the size of the offshore Project facilities, a Visual Offshore Study Area of 44 mi (70.8 km) was established around the Lease Area. This approach to determine the study area is consistent with previous visual assessments conducted for proposed offshore wind farms in the United States, which have applied study areas that range from approximately 25 to 30 mi (40 to 48 km), depending on the size of the wind turbine proposed, the layout, and the surrounding landscape (BOEM 2015; Sullivan et al. 2013; Deepwater Wind 2012). This approach was presented to and deemed acceptable by federal and state agencies.

A 4-mi (6.4-km) Visual Onshore Study Area was used to review potential visibility of the onshore substations at the EW 1 onshore substation, O&M Base, the EW 2 Onshore Substation A, and EW 2 Onshore Substation C sites. For onshore substations in a relatively flat area that is heavily developed and/or wooded, such as the ones proposed for the Project, a smaller visual study area would typically be used to assess potential visibility. The use of a 4-mi (6.4-km) Visual Onshore Study Area for this Project was determined by the location of the EW 1 onshore substation site and O&M Base, as well as the EW 2 Onshore Substation C site, being adjacent to open water (i.e., Upper Bay and Reynolds Channel, respectively). The use of a larger visual study area captures the western shore of the bay, where visual receptors may have unobstructed views towards the Project across open water. The 4-mi (6.4-km) Visual Onshore Study Area was maintained across all three onshore substation sites and the O&M Base for consistency. The focus of the visual analysis was modified for each onshore substation site and the O&M Base based on the results of the viewshed analysis and field reconnaissance. The onshore export and interconnection cables associated with each of the proposed onshore substation sites will be entirely underground except at the Barnums Channel crossing; therefore, these cables are only discussed briefly in the construction and operations sections of this document.

Based on the results of the viewshed analysis, field visits were conducted on November 4 and 13, 2018; June 3 through 6, 2019; September 10, 11, and 18, 2019; February 5, 2021; and September 2, 2021, to complete the visual resource inventory and to select key observation points (KOPs); KOPs represent critical or typical viewpoints within, or along, an identified viewing location and are used to assess the visual effect of a proposed project. Criteria used to select KOPs for offshore and onshore Project components included:

Offshore Project Components

- Locations representing the most critical viewpoints (i.e., views from communities, residential areas, or recreational areas, scenic areas specifically identified in planning documents);
- Geographic distribution representing locations closest to the Lease Area and at various distances within the Visual Offshore Study Area (i.e., less than 25 mi [40.2 km), 25 to 30 mi [40.2 to 48.3 km], and 30 to 44 mi [48.3 to 70.8 km]);
- Locations representing level and elevated viewing conditions along the coast and inland within the Visual Offshore Study Area; and
- Representative views looking at the broad boundary (i.e., northern) and the narrow side (i.e., western corner) of the Lease Area.

Onshore Project Components

- Locations representing the most critical viewpoints (i.e., views from communities, residential areas, or recreational areas, scenic areas specifically identified in planning documents); and
- Geographic distribution representing locations closest to the onshore substations and O&M Base and at various distances within the Visual Onshore Study Areas.

7.1.1 Affected Environment

The affected environment is defined as the coastal and offshore areas where key viewer groups in the Visual Study Areas might experience the visual effects of the Project. In general, the types of viewers present within the Visual Study Areas are classified as local residents, travelers, and tourists and recreational users. Distinctions among user groups and their expected sensitivity to landscape changes, based on activity types and viewing characteristics, are standard components of a VIA (**Appendix AA**). Permits necessary for the improvement of port and construction/staging facilities will be the responsibility of the owners of these facilities. Empire expects such improvements will broadly support the offshore wind industry and will be governed by applicable environmental standards, with which Empire will comply when using the facilities.

7.1.1.1 Landscape Character/Existing Conditions

Visual Offshore Study Area

The offshore Project Area is located entirely within the Atlantic Ocean. This area is characterized by broad expanses of open water. The surface of the water varies from smooth and relatively level during calmer weather to undulating and choppy during more turbulent weather conditions. Also varying with weather conditions is the color of the water's surface, which can range from blue to silver to dark gray. Existing man-made visual intrusions that are evident near the Project's offshore components include marine vessel traffic coming and going from New York harbor, including barges, container ships, cruise ships, commercial and recreational fishing, recreational boating, and ferry transportation. In addition, buoys, channel markers and warning lights are located within and around the offshore Project components. In addition to these man-made visual intrusions located at or near sea-level, aircraft (including associated nighttime safety lighting) arriving and departing from New York and New Jersey airports are also common visual intrusions seen above and near the offshore Project components.

Visual Onshore Study Areas

EW 1 Onshore Substation and O&M Base: The EW 1 onshore substation site is an approximately 4.8-ac (1.9-ha) parcel located at the north end of the existing South Brooklyn Marine Terminal (SBMT) site, which is located west of 2nd Avenue between 29th and 39th streets in Brooklyn, New York. The existing Gowanus Point of Interconnection (POI), which will support the interconnection of the Project to the existing electrical grid, is located approximately 0.1 mi (0.2 km) to the northeast of the EW 1 onshore substation. The O&M Base will be located on approximately a 4.5-ac (1.8-ha) portion of SBMT, directly to the south of the EW 1 onshore substation. The topographic character of the Project Area is relatively flat and ranges from approximately 5.9 ft (1.8 m) above mean sea level (AMSL) to approximately 10.8 ft (3.3 m) AMSL elevation NAVD88. The parcel on which the EW 1 onshore substation and O&M Base is proposed to be located consists of paved parking lot and storage area. The onshore substation and O&M Base site is surrounded by a large warehouse to the north, a parking lot, 2nd Avenue and commercial and industrial buildings to the east, open asphalt area and warehouse to the south and Upper Bay to the west. A railroad also runs along the eastern boundary of the EW 1 onshore substation and O&M Base site. Vegetation is limited and includes scattered green grasses and bushy shrubs along the shore of the bay ranging from approximately 10 to 15 ft (3 to 5 m) in height and 3 to 8 ft (1 to 2 m) in width and weeds that have grown up through cracks in the pavement. The EW 1 onshore substation and

O&M Base is in a highly urbanized area that is characterized by several warehouses, commercial buildings, and industrial facilities.

EW 2 Onshore Substation A: The EW 2 Onshore Substation A site is an approximately 6.4-ac (2.6-ha) parcel located north of Daly Boulevard and situated mostly between Hampton Road to the west and Lawson Boulevard to the east. The existing Oceanside POI, which will support the interconnection of the Project to the existing electrical grid, is southeast of the EW 2 Onshore Substation A site. The topographic character of the Project Area ranges from approximately 3.2 ft (1 m) AMSL to 31.9 ft (9.7 m) AMSL elevation NAVD88. The parcel on which the EW 2 Onshore Substation A site is proposed is currently within an industrial setting and is not vegetated. The EW 2 Onshore Substation A site is surrounded by Patriot Recycling to the north, a railroad and commercial development to the east, Daly Boulevard to the south, and Hampton Road to the west. The Oceanside POI is located approximately 0.1 mi (0.2 km) southeast. The EW 2 Onshore Substation A site is located in an urban area characterized by a mixture of industrial, commercial, and residential development.

Engagement with the POI operator has indicated a potential expansion of the Oceanside POI into this parcel; this location may therefore contain the POI and associated equipment to which the Project will connect into the grid. Electrical equipment to support the Oceanside POI, if constructed, will be similar to what is proposed to be used for the onshore substation and will be installed in an orientation consistent with the conceptual layout analyzed in this document. If plans develop for the Oceanside POI to expand onto this parcel, the co-location of the EW 2 onshore substation would not be possible due to space constraints. Whether this parcel is used for EW 2 Onshore Substation A or an expansion of the POI, the visual conditions are substantially similar.

EW 2 Onshore Substation C: The EW 2 Onshore Substation C site is an approximately 5.2-ac (2.1-ha) parcel located adjacent to Long Beach Road. The existing Oceanside POI, which will support the interconnection of the Project to the existing electrical grid, is north of the EW 2 Onshore Substation C site. The topographic character of the Project Area ranges from approximately 0 ft (0 m) AMSL to 11.1 ft (3.4 m) AMSL elevation NAVD88. The portion of the parcel on which the EW 2 Onshore Substation C site is proposed is currently developed with commercial businesses. Areas that are undeveloped are vegetated primarily with low-growing weeds, grasses, and shrubs and scattered trees. The EW 2 Onshore Substation C site is surrounded by buildings to the north. The EW 2 Onshore Substation C site is located in an urban area characterized by a mixture of industrial, commercial, and residential development.

Cable Bridge: The EW 2 onshore export and interconnection cable route also includes an inland waterway crossing between Island Park and Oceanside, New York, which may utilize the existing Long Beach Road crossing Barnums Channel, or which may utilize an above-water cable bridge. The cable bridge will either be located adjacent to the existing LIRR railway bridge, along EW 2 Route IP-F, and/or adjacent to the existing bridge over Barnums Channel on Long Beach Road, along EW 2 Route IP-G. This trenchless crossing will use up to two support columns (pile caps) located within the waterway to support the truss system, which will hold the cables above the water. These supports may be installed by hammer or other installation methods, up to 100 ft (30 m) below the seabed, with final design subject to geotechnical investigation. These supports will include up to six 1.5-ft (0.5-m)-diameter steel pipe piles per pile cap, for a total of twelve steel pipe piles within the waterway. The cable bridge will be constructed from a prefabricated steel truss system assembled offsite and set in place, and the structure will measure up to 25 ft (7.6 m) wide and 8 ft (2.4 m) tall, and span a length of approximately 300 ft (91 m). The total height of the structure will be up to 15 ft (4.6 m) AMSL, with a maximum total height of 30 ft (9.1 m), approximately the same height as the adjacent railway bridge and Long Beach Road bridge. A rough drawing of the cable bridge can be found in **Figure 7.1-3**.

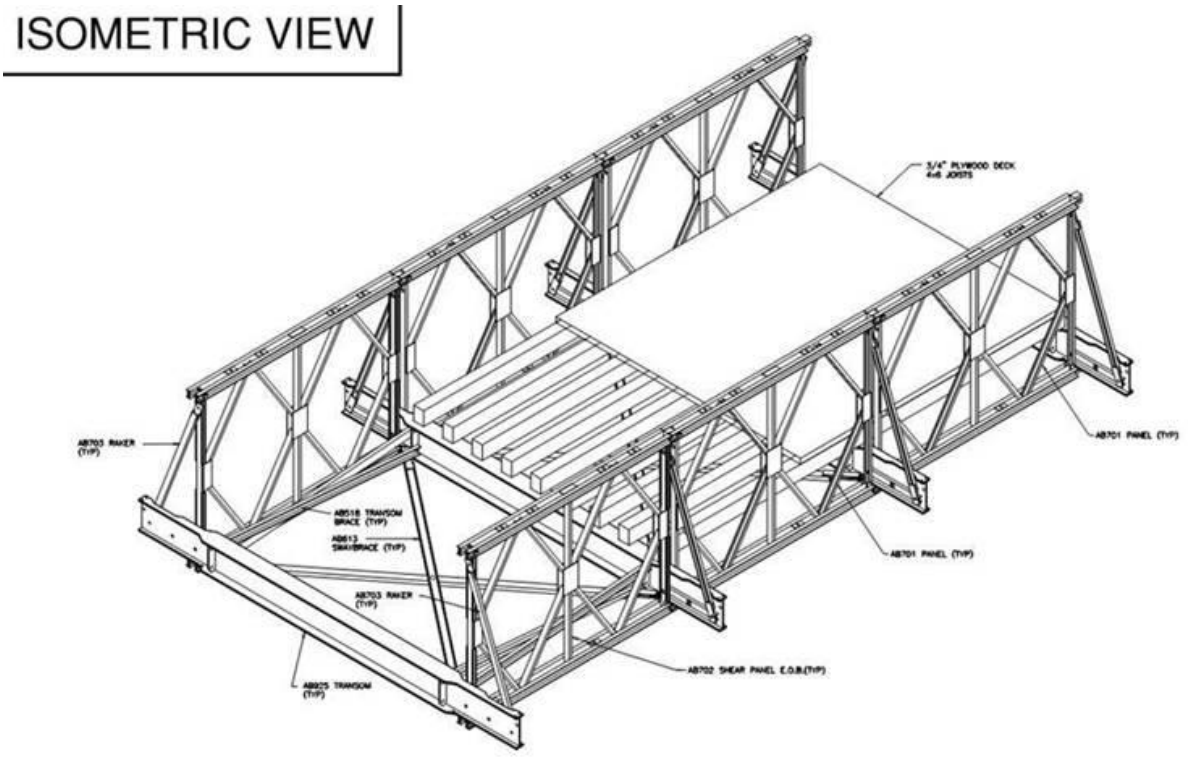


Figure 7.1-3 Cable Bridge Typical Design

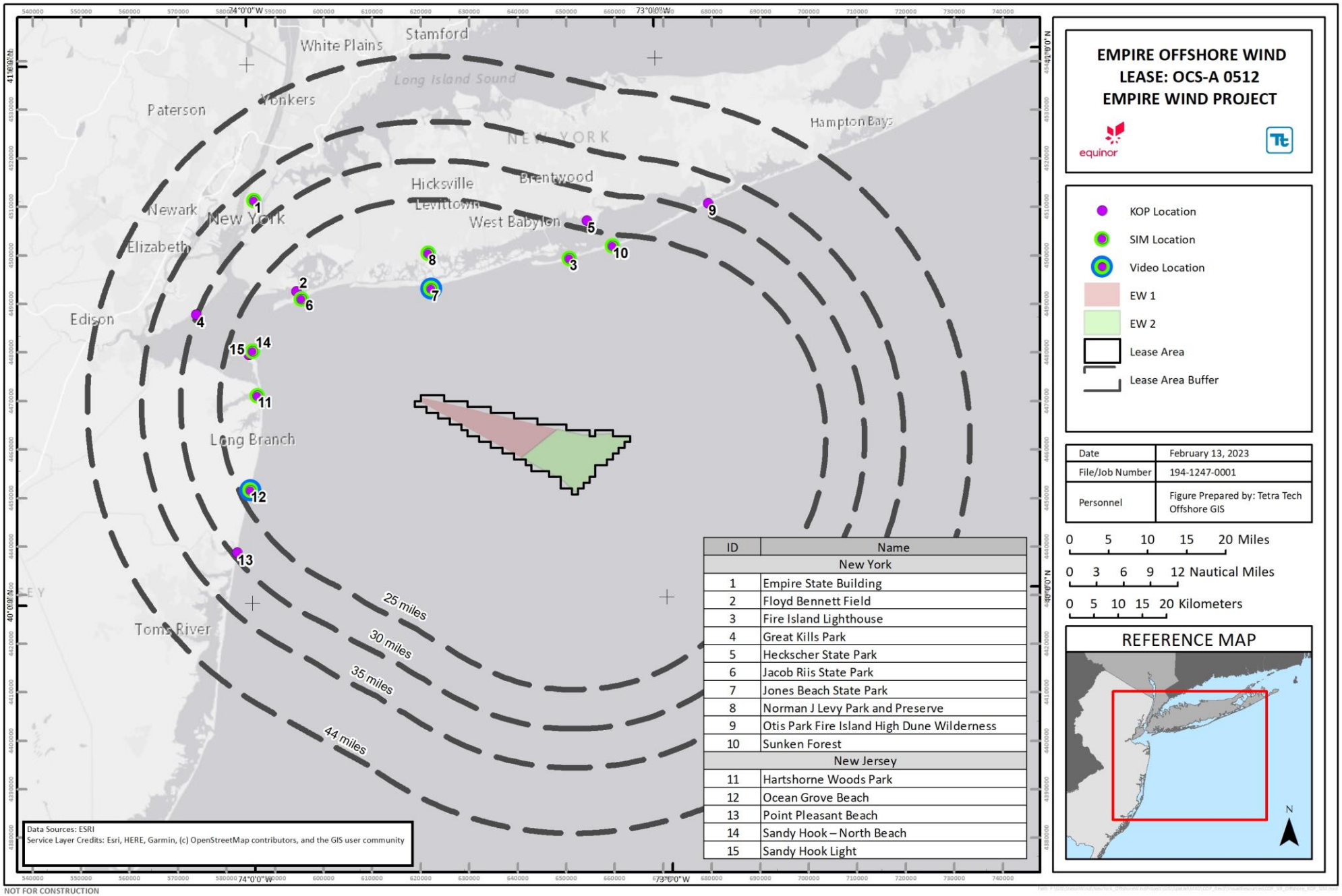
7.1.1.2 Sensitive Viewers/Key Observation Points

A total of 15 KOPs within the Visual Offshore Study Area (10 in New York and five in New Jersey) and 11 KOPs within the Visual Onshore Study Areas (four for the EW 1 onshore substation, three for the EW 2 Onshore Substation A site, and four for the EW 2 Onshore Substation C site, all in New York) were selected for detailed study. **Table 7.1-1** includes a list of KOPs within the Visual Offshore Study Area, and portions of the wind turbines potentially visible for each scenario based on the results of the offshore viewsheds. KOPs within the Visual Offshore Study Area are shown on **Figure 7.1-4**. **Table 7.1-2** includes a list of KOPs within each of the Visual Onshore Study Areas and potential visibility of the Project based on the results of the onshore viewshed analysis. KOPs within the Visual Onshore Study Area for the EW 1 onshore substation, EW 2 Onshore Substation A, and EW 2 Onshore Substation C sites, and O&M Base are shown on **Figure 7.1-5**, **Figure 7.1-6**, and **Figure 7.1-7**, respectively.

Table 7.1-1 List of Key Observation Points within the Visual Offshore Study Area

Map ID Number a/	Name	Location	Resource Type	Distance to Nearest Project Component (mi [km])	Viewshed Visibility Results b/, c/
New York					
1	Empire State Building	Manhattan	Tourist Destination, Historic (NRHP, NHL, NYC Landmark)	34.2 (55)	Entire Turbine
2	Floyd Bennett Field	Brooklyn	Tourist Destination, Public Recreation Historic (NHRP)	22.1 (35.6)	Hub Up
3	Fire Island Lighthouse	Suffolk	Tourist Destination, Public Recreation, Historic (NRHP)	21.7 (34.9)	Hub Up
4	Great Kills Park	Staten Island	Tourist Destination, Public Recreation	32 (51.5)	Hub Up
5	Heckscher State Park	Suffolk	Tourist Destination, Public Recreation	26.9 (43.3)	Hub Up
6	Jacob Riis Park	Queens	Tourist Destination, Public Recreation, Historic (NHL)	21 (33.8)	Hub Up
7	Jones Beach State Park	Nassau	Tourist Destination, Public Recreation, Historic (NRHP)	14.2 (22.9)	Rotor Swept Area
8	Norman J Levy Park and Preserve	Merrick	Public Recreation	18.8 (30.3)	Rotor Swept Area
9	Otis Pike Fire Island High Dune Wilderness	Suffolk	Tourist Destination, Public Recreation, Historic (NRHP)	32.0 (51.5)	Hub Up
10	Sunken Forest	Suffolk	Tourist Destination, Public Recreation	34.1 (54.9)	Hub Up
New Jersey					
11	Hartshorne Woods Park	Monmouth	Public Recreation, Historic (NRHP, Historic District)	22.3 (35.9)	Rotor Swept Area
12	Ocean Grove Beach	Monmouth	Tourist Destination, Public Recreation, Historic (Historic District)	25.4 (40.9)	Hub Up
13	Point Pleasant Beach	Ocean County	Tourist Destination, Public Recreation	31 (49.9)	Hub Up
14	Sandy Hook – North Beach	Monmouth	Tourist Destination, Public Recreation	23.7 (38.1)	Hub Up
15	Sandy Hook Light	Monmouth	Tourist Destination, Public Recreation, Historic (NRHP, NHL, NJRHP)	24 (38.6)	No Visibility

Notes:
a/ Map ID numbers correspond to the map shown in **Appendix AA, Figure AA-21**.
b/ Portion of the wind turbine visible is based on the viewsheds described in **Appendix AA, Section AA.4.1.1**. Analyses were conducted using ESRI ArcGIS Pro 2.2.0 software with the Spatial Analyst extension to process 10-meter Digital Elevation Models (DEM) based on the National Elevation Dataset and height zones of visible components of the wind turbines (foundation, entire rotor swept area, hub, and maximum blade tip). The viewshed analysis took in account the effects of terrain, vegetation and/or development on visibility.
c/ The viewshed is a desktop-based computer-generated model; actual conditions were field-verified and potential visibility is depicted in the simulations (**Appendix AA, Attachment AA-3**).



ID	Name
	New York
1	Empire State Building
2	Floyd Bennett Field
3	Fire Island Lighthouse
4	Great Kills Park
5	Heckscher State Park
6	Jacob Riis State Park
7	Jones Beach State Park
8	Norman J Levy Park and Preserve
9	Otis Park Fire Island High Dune Wilderness
10	Sunken Forest
	New Jersey
11	Hartshorne Woods Park
12	Ocean Grove Beach
13	Point Pleasant Beach
14	Sandy Hook – North Beach
15	Sandy Hook Light

Figure 7.1-4 Key Observation Points within the Visual Offshore Study Area

Table 7.1-2 List of Key Observation Points within the Visual Onshore Study Areas

Map ID Number a/	Name	Location	Resource Type	Distance to Project Site (mi [km])	Project Visibility
EW 1 Onshore Substation					
1	2nd Avenue	Brooklyn	Travel Way	100 ft (31 m)	Visible
2	Columbia Street Esplanade	Brooklyn	Public Recreation	0.4 (0.6)	Partially Visible
3	Hudson River Waterfront Walkway	Hoboken, New Jersey	Public Recreation	3.7 (6.0)	Visible
4	Statue of Liberty	New York City	Tourist Destination, Historic (National Monument, NRHP, NYC Landmark, NJRHP)	2.8 (4.5)	Partially Visible
EW 2 Onshore Substation A					
1	Residential Neighborhood/Oceanlea Drive	Oceanside, NY	Residential and Travel Way	0.2 (0.3)	Visible
2	Woodmere Dock	Hewlett Neck, NY	Public Recreation and Residential	02.5 (3.6)	Partially Visible
3	Masone Point Beach/Residential Neighborhood	Oceanside, NY	Public Recreation and Residential	1 (1.6 m)	Partially Visible
EW 2 Onshore Substation C					
1	Quebec Road/Residential Neighborhood	Nassau County	Residential	0.07 (0.11)	Partially Visible
2	Long Beach Bridge	Nassau County	Travel Way	0.09 (0.15)	Visible
3	Long Beach Skate Park	Nassau County	Public Recreation	0.43 (0.69)	Partially Visible
4	Island Park Station	Nassau County	Travel Way/Residential	0.19 (0.31)	Partially Visible

Note:
a/ Map ID numbers for the EW 1 onshore substation and O&M Base, EW 2 Onshore Substation A, and EW 2 Onshore Substation C sites correspond to the maps shown on **Figure 7.1-5**, **Figure 7.1-6**, and **Figure 7.1-7**, respectively.

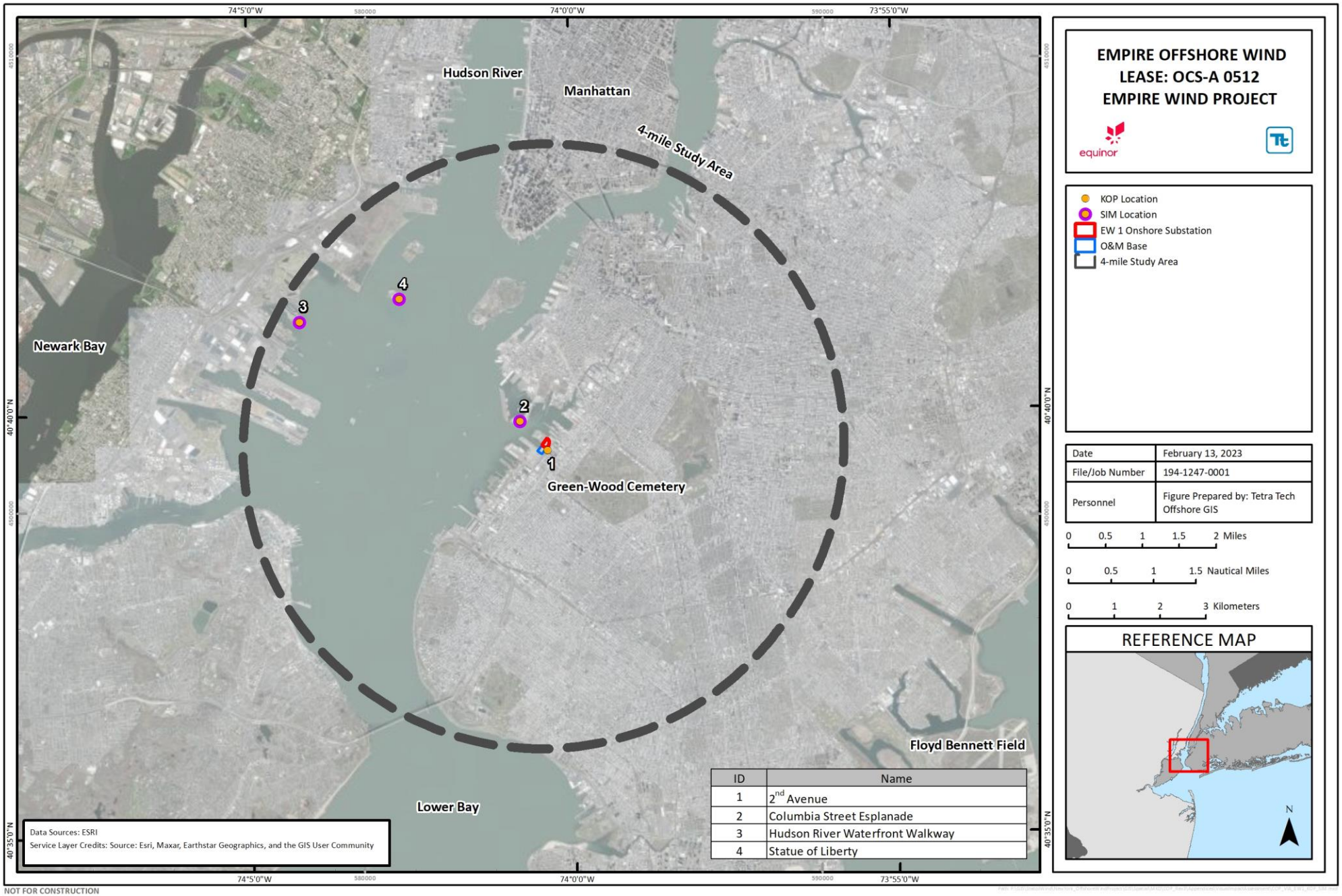


Figure 7.1-5 Key Observation Points within the EW 1 Visual Onshore Study Area

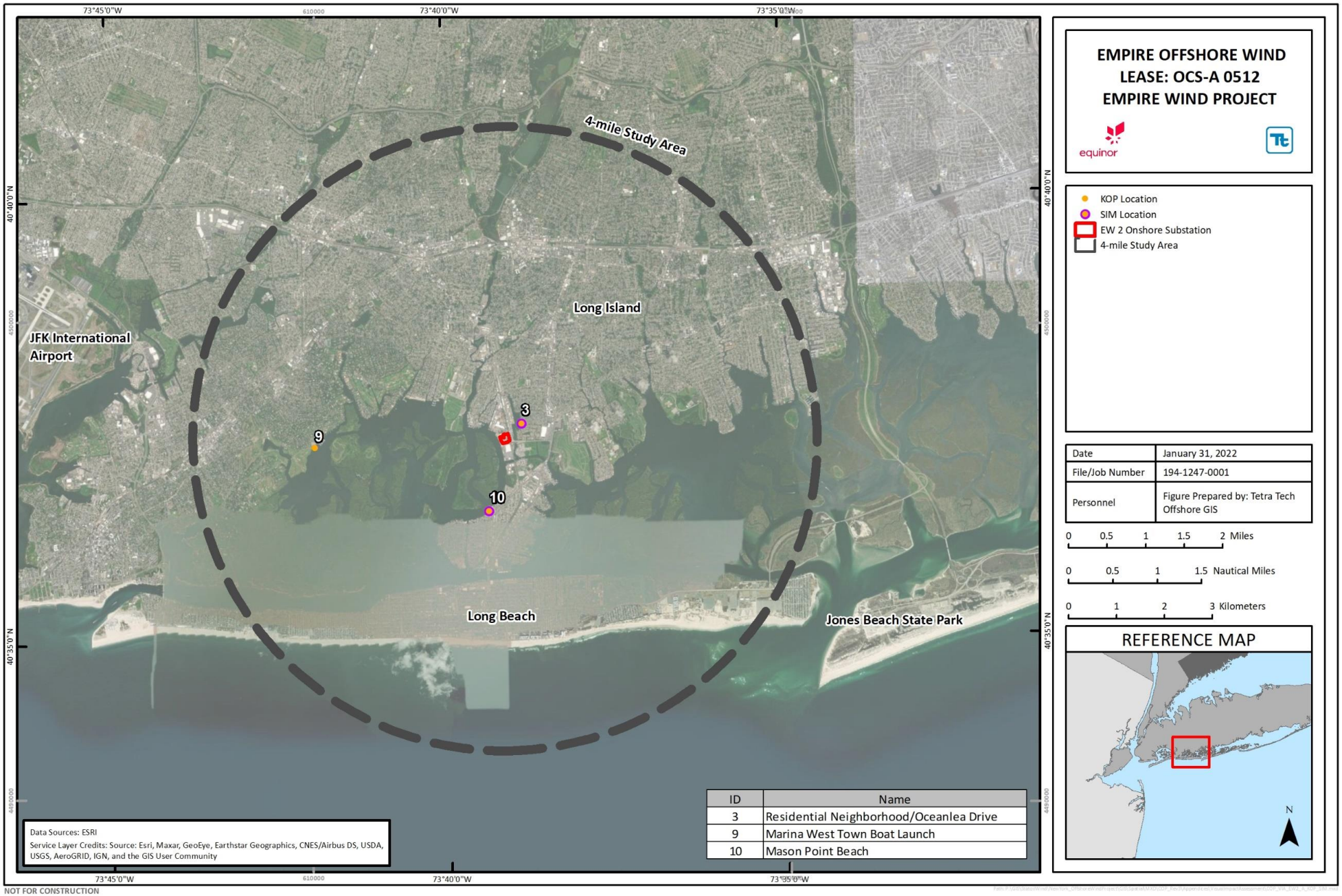


Figure 7.1-6 Key Observation Points within the EW 2 Visual Onshore Study Area – EW 2 Onshore Substation A

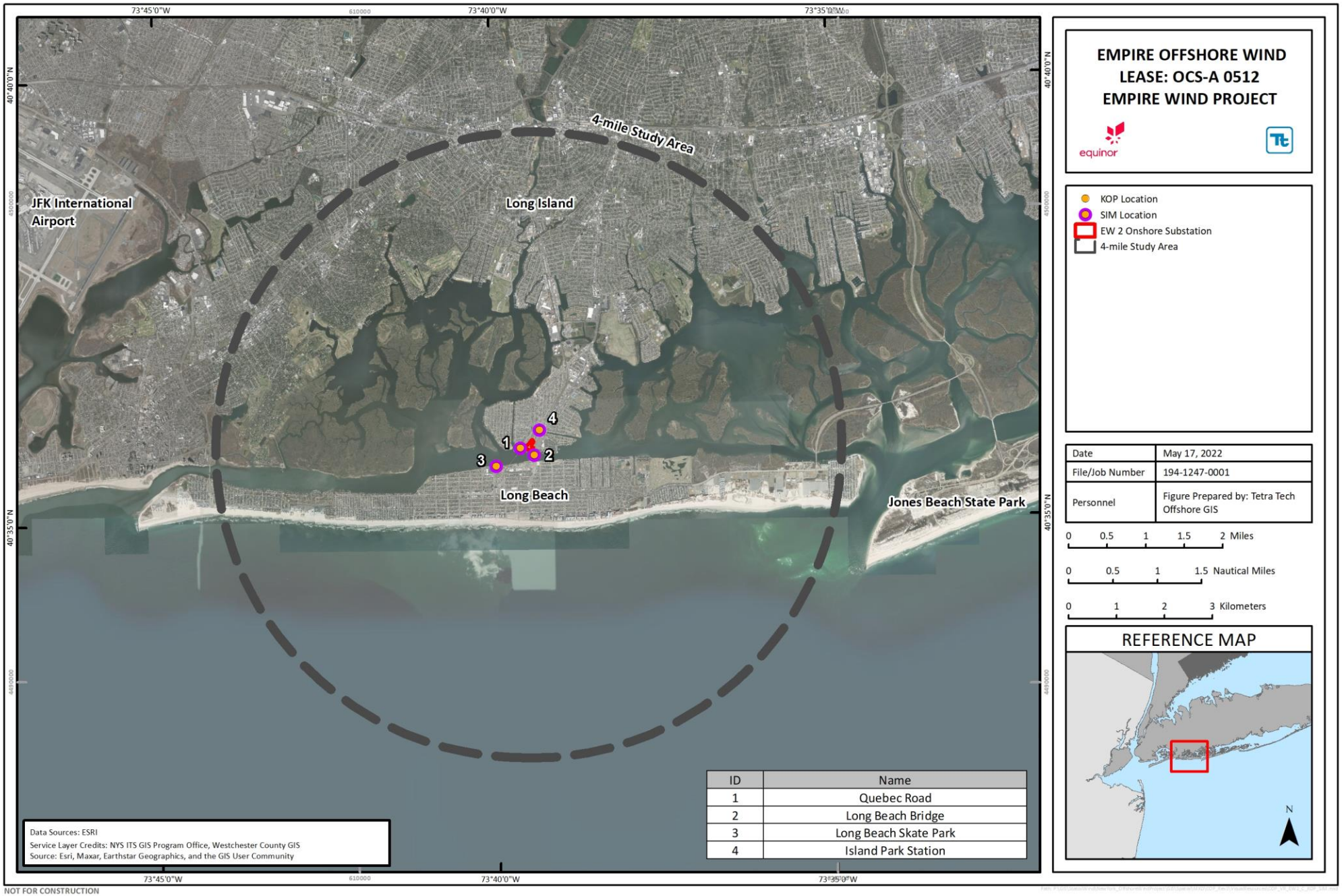


Figure 7.1-7 Key Observation Points within the EW 2 Visual Onshore Study Area – EW 2 Onshore Substation C

7.1.2 Impacts Analysis for Construction, Operations, and Decommissioning

The potential impacts resulting from the construction, operations, and decommissioning of the Project are based on the maximum design scenario from the PDE (for a complete description of the construction, operations, and decommissioning activities that Empire anticipates will be needed for the Project, see **Section 3**). For visual resources the maximum design scenario is the presence of new fixed structures offshore (i.e., wind turbines and offshore substations) and onshore (i.e., onshore substations), as described in **Table 7.1-3**. This design concept incorporates the full build-out of offshore and onshore structures, including two onshore substations and the associated onshore export and interconnection cable routes to EW 1 and EW 2.

Table 7.1-3 Summary of Maximum Design Scenario Parameters for Visual Resources

Parameter	Maximum Design Scenario	Rationale
Construction		
Duration offshore construction	Based on full build-out of EW 1 and EW 2. EW 1: 57 wind turbines and 1 offshore substation. EW 2: 90 wind turbines and 1 offshore substation.	Representative of the maximum period required to install the offshore components, which has the potential to visually impact resources in the Project Area.
Duration onshore construction	Based on EW 1 and EW 2. Construction and installation of export cables landfalls, onshore export and interconnection cables, and onshore substations.	Representative of the maximum period required to install the onshore components, which has the potential to visually impact resources in the Project Area.
Operations		
Offshore structures	Based on full build-out of EW 1 and EW 2 (147 wind turbines and 2 offshore substations). EW 1: 57 wind turbines and 1 offshore substation. EW 2: 90 wind turbines and 1 offshore substation.	Representative of the presence of the maximum number of new fixed structures in an area that previously had none.
Onshore substations	Based on EW 1 and EW 2: EW 1: 4.8-ac (1.9-ha) area. EW 2: 6.4-ac (2.6-ha) area.	Representative of the presence of a new structure in an area where there was previously none.
O&M Base	4.5-ac (1.8-ha) area.	Representative of the presence of a new structure in an area where there was previously none.

7.1.2.1 Construction

During construction, the potential impact-producing factors to visual resources may include:

- Construction of the offshore components, including the foundations, submarine export cables, and interarray cables;
- Staging activities and assembly of Project components at applicable facilities or areas; and

- Construction of the onshore components, including the export cable landfall, the onshore export and interconnection cables, the onshore substations, and the O&M Base.

The following impacts may occur as a consequence of factors identified above:

- Short-term visual impacts during offshore construction activities; and
- Short-term visual impacts during onshore construction activities.

Short-term visual effects during offshore construction activities. Vessel traffic is common along the Atlantic coast and it is anticipated that the vessels required to transport Project components to and from the Lease Area will not substantially increase the volume of traffic along the southern and eastern coast of New York and New Jersey, respectively. There are several ports along the coastline of New York and New Jersey. The majority of the vessels that will be used for Project construction will be similar in size and shape to existing commercial and military vessels; therefore, weak contrast will be introduced for viewers along the southern and eastern coast of New York and New Jersey, who will see vessels in the foreground to middleground traveling from ports on the mainland to the Lease Area.

Short-term visual effects will occur during construction of the submarine export cable siting corridors and will result from visual evidence of construction activities and the presence of construction equipment and work crews. Installation of the submarine export cables in nearshore waters will introduce vessels relatively close to shore along the southern coast of Long Island, New York and in the areas near the export cable landfall. While these vessels will be easily visible from shore, they will not remain in any area for more than several months. Because of the relatively short duration that they will be in any single location, they are not anticipated to adversely affect visual resources.

Nighttime construction activities are also proposed to occur within the Lease Area. Navigation lights associated with large vessels (i.e., barges and jack-up vessels) and lights necessary to perform construction activities may be visible from coastal vantage points. However, visual effects resulting from nighttime construction activities will be limited to select locations within the Lease Area. These visual effects will also be short-term because large vessels and lights necessary to perform construction activities will not be present overnight once construction is complete.

Short-term visual effects during onshore construction activities. Construction activities associated with the onshore export and interconnection cable routes, onshore substations, cable bridge, and O&M Base will include surveying; clearing the construction site and linear right-of-way (of either pavement, existing buildings and/or vegetation depending on the site); stockpiling top soil; grading; forming and construction of the buildings and outdoor electrical equipment foundations; placement and erection of buildings and electrical equipment; placement of perimeter fencing; and restoration and landscaping installation (if required). Maintenance work may be required in roadways or onshore substation, cable bridge, and O&M Base areas infrequently which could cause some minor effects. It is anticipated that contrast will be introduced during Project construction primarily for viewers adjacent to the site, where the presence of construction equipment, materials, and crews will be dominant in the foreground.

The onshore export and interconnection cables will be installed underground primarily within existing roadways, except where the cable crosses Barnums Channel. Short-term impacts are anticipated during construction. Roads will be repaired and repaved post construction. Unless paving of the entire roadway occurs, contrast in color (new vs. old paving) may be noticeable, however contrast is expected to be minimal and viewers are unlikely to notice significant changes in an urban environment.

For the onshore substations, cable bridge, and O&M Base, construction and installation activities will be present for viewers. Viewers associated with the EW 1 onshore substation and O&M Base include viewers within commercial and industrial buildings along the east side of 2nd Avenue, Columbia Street Esplanade[2], and marine vessels in Gowanus Bay. Viewers associated with the EW 2 Onshore Substation A includes viewers along Daly Boulevard, Hampton Road, and Lawson Boulevard. For EW 2 Onshore Substation C, viewers include those primarily along Long Beach Road and across Reynolds Channel. For the cable bridge, viewers include LIRR commuters and industrial and commercial establishments along EW 2 IP-F and commuters and commercial establishments along EW 2 IP-G. However, these visual effects will be short-term because construction equipment and crews will be removed once construction is complete. Views of Project construction from areas not immediately adjacent to the onshore substation, cable bridge, and O&M Base sites will be mostly screened by residential, commercial or industrial buildings, vegetation and/or topography. Activities at staging and construction facilities will be consistent with the established and permitted uses of these facilities, and Empire will comply with applicable permitting standards to limit environmental impacts from Project-related activities. Visual effects to these viewers will be mostly limited to seeing construction traffic on local roads.

7.1.2.2 Operations and Maintenance

During operations, the potential impact-producing factors to visual resources may include:

- The presence of new fixed structures offshore (e.g., wind turbines and offshore substations); and
- The presence of new fixed structures onshore (e.g., onshore substations and O&M Base).

The following impacts may occur as a consequence of the factors identified above:

- Long-term visual impacts resulting from the presence of new fixed structures offshore (e.g., wind turbines and offshore substations); and
- Long-term visual impacts resulting from the presence of new fixed structures onshore (e.g., onshore substations and O&M Base).

Long-term visual impacts resulting from the presence of new fixed structures offshore. During operations, views of the offshore Project components (i.e., wind turbines and offshore substations) will be limited primarily to coastal areas of New York and New Jersey that are within approximately 26 mi (42 km) from the Lease Area and have views of the Atlantic Ocean. Areas along the southern coast of New York (specifically barrier islands along the southern coast of Long Island) and the eastern coast of New Jersey within 26 mi (42 km) of the Lease Area will theoretically have views of the nacelle (hub), the majority of the rotor blades, and tops of the towers of the representative wind turbines. Viewers along the coast will perceive a change in the landscape, and it is anticipated that the contrast created by the change will vary from strong to none. Perceived change will be higher along the southern coast of Long Island, New York, and the eastern coast of New Jersey that are closest to the Lease Area and where views are toward the broad side of the Lease Area. Perceived change will be less elsewhere on the coastline as viewers get farther away from the Lease Area. Among the KOPs representing coastal views (at beach level) along the southern coast of Long Island, New York, and the eastern coast of New Jersey, contrast was rated as strong for one KOP (Jones Beach State Park), moderate for two KOPs (Sunken Forest and Ocean Grove Beach), and none for two KOPs (Otis Pike Fire Island High Dune Wilderness and Point Pleasant Beach).

[2] Columbus Street Esplanade is a boardwalk along Columbus Street, which is located on Gowanus Bay approximately 0.4 mi (0.6 km) west of EW 1 onshore substation and O&M Base site.

The perceived change in the landscape may be greater in coastal areas with elevated viewing locations, where there are elevated views along beaches or where views of the Atlantic Ocean are framed by topography and/or vegetation and only a portion of the ocean is visible; in such cases, more of the Lease Area may be visible and the Project may appear more spatially dominant due to the elevated views. However, locations with these viewing conditions are limited in this region. One of the four KOPs representing elevated viewing conditions (Fire Island Lighthouse) received a strong contrast rating, one KOP (Norman J Levy Park and Preserve) received a moderate contrast rating and two KOPs (Hartshorne Woods Park and Sandy Hook Light) were rated as weak contrast, due to vegetation and development in the foreground that dominated the view.

The perceived change may vary between moderate or none in some parts of the Visual Offshore Study Area, such as inland areas (not elevated) primarily along the shores of inland bays where views of the Atlantic Ocean are screened by barrier islands and/or peninsulas and only the upper portions of wind turbines may be visible. Although primarily only the rotor blades will be visible extending over the barrier islands and/or peninsulas the number and motion of the rotor blades may draw viewers' attention. One of the two KOPs (Heckscher State Park) representing inland views along the southern coast of Long Island, New York, resulted in moderate contrast and the other KOP (Floyd Bennett Field) resulted in none to weak contrast. Perceived change may also be less for viewers looking toward the narrow end of the Lease Area, where the spatial spread along the horizon will be less than if looking at the broad side and fewer wind turbines would be visible because the wind turbines in the eastern portion of the Lease Area would fall completely below the horizon. Locations on the southern coast of New York and eastern coast of New Jersey with views toward the narrow end of the Lease Area are located 21 mi (33.8 km) or more from the Project. Two of the three KOPs (Jacob Riis Park and Sandy Hook – North Beach) representing views toward the narrow end of the Lease Area received weak contrast ratings and one KOP (Great Kills Park) was rated as no visual contrast. From elevated inland locations, such as buildings in downtown Manhattan, New York, the Lease Area is located 30 mi (48 km) or more away and the Project would be seen in the context of dense urban development. Contrast for the KOP representing elevated views from Manhattan, New York (Empire State Building) was rated as moderate.

Views of the offshore substations will be limited to vantage points along the southern coast of Long Island, New York and the eastern coast of New Jersey. The offshore substations will appear as small, grayish blocks on the horizon and will be seen in the context of the wind turbines and large marine vessels. It is anticipated that the offshore substations will result in weak contrast or will not be noticeable or perceived from coastal vantage points.

Table 7.1-4 provides a summary of the level of contrast (i.e., strong, moderate, weak, none) created by offshore Project components for each KOP. Long term effects on visual resources that may occur as a result of offshore Project components are more fully described in the Visual Impact Assessment (**Appendix AA**).

Table 7.1-4 Summary of Contrast Rating of Key Observation Points for Offshore Project Components

Name	Location	Distance to Nearest Project Component (mi [km])	Contrast Rating a/	Simulation Created for KOP b/
		Wind Turbine	Wind Turbine	
New York				
Empire State Building	Manhattan	34.2 (55)	Moderate	Yes
Floyd Bennett Field	Brooklyn	22.1 (35.6)	Weak	-
Fire Island Lighthouse	Suffolk	21.7 (34.9)	Strong	Yes
Great Kills Park	Staten Island	32 (51.5)	None	-
Heckscher State Park	Suffolk	26.9 (43.3)	Moderate	-
Jacob Riis Park	Queens	21 (33.8)	Weak	Yes
Jones Beach State Park	Nassau	14.2 (22.9)	Strong	Yes
Norman J Levy Park and Preserve	Merrick	18.8 (30.3)	Moderate	Yes
Otis Pike Fire Island High Dune Wilderness	Suffolk	32.0 (51.5)	None	-
Sunken Forest	Suffolk	34.1 (54.9)	Moderate	Yes
Statue of Liberty c/	Hudson	33.5 (53.9)	None	Yes
New Jersey				
Hartshorne Woods Park	Monmouth	22.3 (35.9)	Weak	Yes
Ocean Grove Beach	Monmouth	25.4 (40.9)	Moderate	Yes
Point Pleasant Beach	Ocean County	31 (49.9)	None	-
Sandy Hook – North Beach	Monmouth	23.7 (38.1)	Weak	Yes
Sandy Hook Light	Monmouth	24 (38.6)	Weak	Yes

Notes:
a/ Visual Contrast Rating Worksheets for each KOP is included in **Appendix AA, Attachment AA-2**. Contrast Rating Worksheets for each KOP appear in the same order as they are listed in Table AA-4.
b/ Visual simulations are included in **Appendix AA, Attachment AA-3**.
c/ Due to no visibility, the Statue of Liberty was not chosen as a KOP for the offshore Project components, however, a simulation was created. The Statue of Liberty is a KOP for EW 1 Onshore Substation and O&M Base.

Obstruction marking lights installed to meet FAA guidelines (referred to herein as FAA lights) will be visible from locations where the mid-tower and nacelle portions of a turbine are visible above the horizon line. It is anticipated that FAA lights will be more visible along the coastline and that most inland views will be screened by vegetation, topography, and/or development. Exceptions include elevated viewing locations, in which case FAA lights will most likely be seen in the context of other light sources such as marine vessels, residential or urban development, streetlights, and vehicle headlights.

The introduction of nighttime lights into the relatively dark setting of the Atlantic Ocean will be most noticeable from the southern coast of Long Island, New York and the eastern coast of New Jersey, respectively, particularly from locations that have views looking at the broad side of the Lease Area. It is anticipated that more contrast will be introduced in areas that are relatively void of man-made light sources, such as beaches and natural areas along barrier islands, including Jones Beach, Robert Moses State Park, and Fire Island in New York, and Sea

Bright, Monmouth, and Seven Presidents beaches in New Jersey. However, given that these areas are primarily used during daytime hours and most of the local, state and federal parks and beaches close at sunset, the number of affected viewers will be limited. In areas where boardwalks and other developed parallel beaches, such as along the southern coast of Long Beach and the Rockaway Peninsula in Long Island, New York, and Asbury Park and Point Pleasant Beach in New Jersey, nighttime lighting associated with the Project will be seen in the context of man-made lights such as pedestrian lights along the boardwalk and lights associated with restaurants, hotels, arcades and other commercial businesses. At greater distances, turbines in portions of the Project Area will not be visible because the nacelle of some wind turbines will fall below the horizon.

For viewers looking toward the narrow end of the Project Area, where the spatial spread of the Project is much smaller than if looking at the broad side, fewer wind turbines (both scenarios) will be visible above the horizon and fewer lights will be visible. For example, from Sandy Hook – North Beach, New Jersey, at a distance of approximately 23 mi (37.0 km) from the Project Area, just over half of the representative wind turbines (60 percent) will extend above the horizon. Furthermore, FAA lights on wind turbines that are visible above the horizon will be seen in the context of lights on buoys, lane markers, commercial ships, barges and other marine vessels. The wind turbines will not be visible from the eastern shore of Staten Island, New York, as the hub of the wind turbines will be below the horizon.

Empire will consider implementing an ADLS (or a similar system) to turn the aviation obstruction lights on and off in response to detection of nearby aircraft, pending commercial availability, technical feasibility, and agency review and approval. Empire conducted an analysis of historical air traffic operations to determine how often the ADLS would activate the obstruction lights for the Project (see **Appendix BB ADLS Analysis**).

Long-term visual impacts resulting from the presence of new fixed structure onshore. Overall, the onshore Project components would result in changes to the landscape conditions that vary from strong to minimal for viewers within the Visual Onshore Study Areas for each of the onshore substations and O&M Base under consideration.[3] The onshore substations and O&M Base will introduce tall, rectangular forms and vertical and geometric structures into landscape settings that in many cases have been heavily modified by commercial, industrial and/or residential development. The onshore export and interconnection cables associated with the proposed onshore substation will be entirely underground and mainly installed under existing roadways. Unless paving of the entire roadway occurs, contrast in color (new vs. old paving) may be noticeable however contrast is expected to be minimal and viewers are unlikely to notice significant changes in an urban environment.

EW 1 Onshore Substation and O&M Base: Views of the EW 1 onshore substation and O&M Base will be limited primarily to viewers directly adjacent to the site, including from local roads and commercial buildings, and viewers across Upper Bay along the New Jersey coast. Viewers adjacent to the site and along the New Jersey coast will perceive a change in the landscape, and it is anticipated that the contrast created by the change will vary from strong to none. Perceived change will be higher along roads and from buildings that are closest to the site on the west, where the proposed buildings and outdoor electrical equipment will be located in an open paved area. Perceived change will be less for viewers to the west of the site along the New Jersey coast, where views of the site will be seen in the context of the downtown Manhattan skyline, dense urban development along the coast of Brooklyn, New York, and marine vessels within the Upper Bay. Due to the distance of the EW 1 onshore substation and O&M Base and the densely developed landscape in which the proposed substation would be seen, it is anticipated that the Project will introduce weak contrast or not be

[3] Subsequent to initial efforts, Empire continues to refine the design of the onshore substations and O&M Base. This is informed by analysis including visual simulations, acoustic modeling, and other field surveys, as well as engagement with municipalities and other stakeholders.

perceived within views from New Jersey. Views from areas to the north, east, and south of the site will be screened by dense industrial and commercial development. One of the two KOPs representing views in close proximity to the site (2nd Avenue) resulted in strong contrast while one KOP (Columbia Street Esplanade) resulted in weak contrast. One of the two KOPs representing more distance views across Upper Bay (Hudson River Waterfront Walkway) resulted in weak contrast and one KOP (Statue of Liberty) resulted in no visual contrast.

EW 2 Onshore Substation A: Views of the EW 2 Onshore Substation A site are limited primarily to viewers adjacent to the north and west and viewers located on the north side of Long Beach Island to the southeast and southwest of the site. Viewers adjacent to the site (i.e., along local roads) and west and southwest of the site will perceive a change in the landscape, and it is anticipated that the contrast created by the change will vary from strong to weak. Perceived change will be higher from areas close to the site, such as from along Hampton Road and Daly Boulevard where the substation will introduce strong contrast. Residential development adjacent to water (Hewlett Bay) directly west of the site may also have some weak to moderate contrast. Perceived change will be reduced to weak for viewers along the north side of Long Beach Island, where views toward the site will be partially screened by topography, vegetation, and/or development. In addition, the onshore substation will be seen in the context of other similar energy facilities (i.e., the Oceanside POI) and industrial areas. Views to the northwest, north[4] and northeast will be screened by development, vegetation, and topography and will not be changed by the Project.

EW 2 Onshore Substation C: Views of the EW 2 Onshore Substation C site will be primarily within the immediate vicinity of the proposed site, from the north and northeast along Long Beach Road, which is adjacent to the EW 2 Onshore Substation C site. Views to the south are partially blocked by the Long Island Rail Road bridge across Reynolds Channel, Long Beach Bridge, and existing buildings and vegetation. Views to the west and north are screened by development and vegetation. From Long Beach Road, the large rectangular form and light color of the proposed building will contrast with the dark green, irregular forms of the existing vegetation. The onshore substation will be seen in the context of existing streetlights and utility lines in the foreground. Although existing structures and utilities are visible in the view, the Project will be a dominant feature in the view due to the proximity of the EW 2 Onshore Substation C to the viewpoint and the large scale and light color of the building. As such, it is anticipated that the Project will introduce strong visual contrast in views from the southeast. Viewers not directly adjacent to the EW 2 Onshore Substation C site resulted in weak to no views towards the Project. Views to the south are anticipated to have moderate views where vegetation and buildings are not blocking views towards the substation.

Cable Bridge: Views of the cable bridge are limited primarily to viewers adjacent to Barnums Channel, with minimal views to the west towards a large waterbody. Viewers adjacent to the bridge will perceive a change in the landscape, and it is anticipated that the contrast created by the change will be weak. Perceived change will be higher from areas close to the site, such as from commercial and industrial development immediately surrounding Barnums Channel. In both proposed locations, the cable bridge crossing over Barnums Channel is located within a landscape setting that has been modified by commercial and industrial development. The cable bridge near the Long Beach Road bridge will be seen in the context of existing views of the built environment, which currently includes commercial and industrial views. The cable bridge near the LIRR bridge will be seen in the context of an existing train bridge and an overhead pedestrian bridge on the south side of Barnums Channel.

[4] This refers to viewers farther north beyond the industrial area.

Table 7.1-5 provides a summary of the level of contrast (i.e., strong, moderate, weak, none) created by onshore Project components for each KOP. Long term effects on visual resources that may occur as a result of onshore Project components are more fully described in the Visual Impact Assessment (**Appendix AA**).

Table 7.1-5 Summary of Contrast Rating of Key Observation Points for Onshore Project Components

Name	Location	Distance to Project Site (mi [km]) a/	Contrast Rating b/	Simulation Created for KOP c/
EW 1 Onshore Substation and O&M Base				
2nd Avenue	Brooklyn, NY	100 ft (31 m)	Strong	-
Columbia Street Esplanade	Brooklyn, NY	0.4 (0.6)	Weak	Yes
Hudson River Waterfront Walkway	Jersey City, NJ	3.7 (6.0)	Weak	Yes
Statue of Liberty	New York, NY	2.8 (4.5)	None	-
EW 2 Onshore Substation A				
Residential Neighborhood/Oceanlea Drive	Oceanside, NY	0.2 (0.3)	Moderate	Yes
Woodmere Docks/Residential Neighborhood	Hewlett Neck, NY	2.25 (3.6)	Weak	-
Masone Point Beach/Residential Neighborhood	Oceanside, NY	1 (1.6)	Weak	Yes
EW 2 Onshore Substation C				
Quebec Road/Residential Neighborhood	Island Park, NY	0.07 (0.11)	Weak d/	Yes
Long Beach Bridge	Island Park, NY	0.09 (0.15)	Strong	Yes
Long Beach Skate Park	Long Beach, NY	0.43 (0.69)	Moderate	Yes
Island Park Station	Island Park, NY	0.19 (0.31)	Moderate	Yes

Notes:
a/ For KOPs located within 0.1 mi (0.16 km) from the onshore Project components, distance is provided in ft (m).
b/ Visual Contrast Rating Worksheets for each KOP is included in **Appendix AA, Attachment AA-2**.
c/ Visual simulations are included in **Appendix AA, Attachment AA-3.**
d/ No contrast from the public right-of-way (see simulations in **Appendix AA**); however, from backyards immediately adjacent to the LIRR, intermittent views may be possible.

Proposed nighttime lighting associated with the onshore Project components includes security lighting installed along the onshore substation perimeter fencing and at building entrances. 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 at other development near the proposed onshore substation sites; therefore, impacts are not expected.

7.1.2.3 Decommissioning

Impacts during decommissioning are expected to be similar or less than those experienced during construction, as described in Section 7.1.2.1. It is important to note that advances in decommissioning methods/technologies are expected to occur throughout the operations phase of the Project. A full decommissioning plan will be approved by BOEM prior to any decommissioning activities, and potential impacts will be re-evaluated at that

time. For additional information on the decommissioning activities that Empire anticipates will be needed for the Project, please see **Section 3**.

7.1.3 Summary of Avoidance, Minimization, and Mitigation Measures

In order to mitigate the potential impact-producing factors described in Section 7.1.2, Empire is proposing to implement the following avoidance, minimization, and mitigation measures.

7.1.3.1 Construction

During construction, Empire will commit to the following avoidance, minimization, and mitigation measures to mitigate the impacts described in Section 7.1.2.1:

- Onshore components have been proactively sited in highly developed and previously disturbed areas, where feasible, where they will introduce less visual contrast relative to their surroundings.

In addition, during construction, Empire will consider the following avoidance, minimization, and mitigation measures to mitigate the impacts described in Section 7.1.2.1:

- Vegetative screening, as needed, at the onshore substation sites to help screen views of the onshore substation by nearby residents, subject to New York permitting requirements.

7.1.3.2 Operations and Maintenance

During operations, Empire will commit to the following avoidance, minimization, and mitigation measures to mitigate the impacts described in Section 7.1.2.2:

- Marking and lighting and paint color of above water offshore Project components will be consistent with regulatory requirements and guidance (see **Section 3** for additional details on the proposed marking and lighting measures);
- Wind turbine design and appearance will be in line with mitigation measures recommended by BOEM (2007);
- Buildings will be a combination of cladded steel frame and concrete buildings, designed to match the style and visual character of the surrounding urban landscape, and are proposed to be painted a light shade gray or white color. Empire will continue to work with local stakeholders throughout the permitting process and will submit final building architectural design details in the Environmental Management and Construction Plan as part of the New York state approval process for the Project;
- Lighting at the onshore substation sites will be designed to reduce light pollution, where feasible (e.g., downward lighting, motion-detecting sensors); and
- The EW 1 onshore substation and O&M Base will meet the design standards set forth in the Waterfront Revitalization Program policies, as applicable (see **Appendix AA**).

In addition, during operations, Empire will consider the following avoidance, minimization, and mitigation measures to mitigate the impacts described in Section 7.1.2.2:

- Implementation of an ADLS on turbines (or a similar system) to turn the aviation obstruction lights on and off in response to detection of nearby aircraft, as a base case, pending commercial availability, technical feasibility, and agency review and approval; and

- Vegetative screening, as needed, along the north side of the EW 2 Onshore Substation A site to help screen views of the substation by nearby residents, subject to New York and New Jersey permitting requirements.

7.1.3.3 Decommissioning

Avoidance, minimization, and mitigation measures proposed to be implemented during decommissioning are expected to be similar to those implemented during construction and operations, as described in Section 7.1.2.1 and Section 7.1.2.2. A full decommissioning plan will be approved by BOEM prior to any decommissioning activities, and avoidance, minimization, and mitigation measures for decommissioning activities will be proposed at that time.

7.1.4 References

Table 7.1-6 Data Sources

Source	Includes	Available at	Metadata Link
BOEM	Lease Area	https://www.boem.gov/BOEM-Renewable-Energy-Geodatabase.zip	N/A
BOEM	State Territorial Waters Boundary	https://www.boem.gov/Oil-and-Gas-Energy-Program/Mapping-and-Data/ATL_SLA(3).aspx	http://metadata.boem.gov/geospatial/OCS_SubmergedLandsActBoundary_Atlantic_NAD83.xml
NOAA NCEI	Bathymetry	https://www.ngdc.noaa.gov/mgg/coastal/crm.html	N/A

BOEM (Bureau of Ocean Energy Management). 2007. 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. Available online at: https://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Alt_Energy_FPEIS_VolIIFrontMatter.aspx. Accessed May 23, 2019.

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