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Final Environmental Impact Statement for the Sunrise Wind Project

Appendix Q

Assessment of Resources with Minor (or Less) Impact Determinations in the Draft Environmental Impact Statement

BOEM
Bureau of Ocean Energy Management

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Sunrise Wind - Appendix Q: Assessment of Resources with Minor (or Less) Impact Determinations in the Draft Environmental Impact Statement

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3.4 Air Quality

This section examines the existing air quality conditions and the potential impacts on air quality from the Proposed Action, the alternatives, and future offshore wind farm development. The GAA (refer to Figure D-1 Appendix D [*Geographical Analysis Areas*]) covers the airshed within 15.5 miles (mi) (13.4 nautical miles [nm], 24.9 kilometers [km]) of the onshore components and ports, the area within 3.45 mi (3.0 nm, 5.6 km) of state borders, the area within a 25 mi (21.7 nm, 40.2 km) radius around the Sunrise Wind Farm (SRWF), and the offshore export cable.

3.4.1 Description of the Affected Environment and Future Baseline Conditions

The air quality of a region is described in comparison to National Ambient Air Quality Standards (NAAQS) which are standards for criteria air pollutants established by the USEPA pursuant to the Clean Air Act (CAA) (42 *United States Code* [*USC*] 7409). The CAA identifies two types of NAAQS: (1) primary standards to protect public health, including sensitive populations such as children, the elderly, and asthmatics; and (2) secondary standards to protect public welfare, such as protecting against decreased visibility and damage to crops, animals, or buildings (USEPA 2021a). The criteria pollutants are carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), lead, particulate matter less than 2.5 microns ($PM_{2.5}$), and particulate matter less than 10 microns (PM_{10}). The current NAAQS for the criteria pollutants are provided in Table 3.4-1. Ozone is a secondary pollutant produced in the atmosphere from reactions involving sunlight, nitrogen oxides (NO_X), and volatile organic compounds (VOCs); thus, ozone does not have direct emission sources. Statewide pollutant emissions from the 2020 USEPA National Emissions Inventory are provided in Table 3.4-2 (USEPA 2023b). County level criteria air pollutant emissions from the counties where onshore activities and potential port facilities are located are provided in Table 3.4-3 (USEPA 2023b) .

Hazardous air pollutants (HAPs), or air toxics, are pollutants that are known to cause cancer or other serious health issues (USEPA 2021b). HAPs include pollutants such as VOCs, asbestos, and metals. USEPA regulates 188 HAPs.

Table 3.4-1. National Ambient Air Quality Standards for Criteria Pollutants

Criteria Pollutant	Primary or Secondary Standard	Averaging Time	Concentration	Form
CO	Primary	8 hours	9 ppm	Not to be exceeded more than once per year
		1 hour	35 ppm	
Pb	Primary and Secondary	Rolling 3-month average	0.15 μg/m^3	Not to be exceeded
NO_2	Primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations averaged over 3 years
	Primary and Secondary	1 year	53 ppb	Annual mean
O_3	Primary and Secondary	8 hours	70 ppb	Annual fourth highest daily maximum 8-hour concentration averaged over 3 years
$PM_{2.5}$	Primary	1 year	12.0 μg/m^3	Annual mean, averaged over 3 years
	Secondary	1 year	15.0 μg/m^3	
	Primary and Secondary	24 hours	35 μg/m^3	98th percentile, averaged over 3 years
PM_{10}	Primary and Secondary	24 hours	150 μg/m^3	Not to be exceeded more than once per year on average over 3 years
SO_2	Primary	1 hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

Source: USEPA 2023a

Notes:

CO = carbon monoxide, Pb = lead, NO_2 = nitrogen dioxide, O_3 = ozone, $PM_{2.5}$ = particulate matter less than 2.5 microns, PM_{10} = particulate matter less than 10 microns, SO_2 = sulfur dioxide, ppm = parts per million; ppb = parts per billion, μg/m^3 = micrograms per cubic meter

Table 3.4-2. Statewide Emissions of CO_2e (million metric tons of carbon dioxide equivalents [MMT CO_2e]) and Criteria Air Pollutants (tons per year)

State	CO_2e (MMT CO_2e) (year reported)	2020 EPA National Emissions Inventory (tons per year)[a]					
		CO	NO_x	SO_2	VOC	$PM_{2.5}$	PM_{10}
New York	194 (2019)[b]	1,313,310	198,393	11,436	647,496	101,178	297,593
Massachusetts	63.9 (2020)[c]	513,954	67,749	2,095	177,861	26,419	73,575
Connecticut	34.7 (2021)[d]	292,645	37,434	923	117,728	14,221	31,279
Rhode Island	10.0 (2019)[e]	80,966	12,225	396	30,094	4,408	9,141
Maryland	74.0 (2020)[f]	532,087	74,822	12,290	276,486	26,300	75,977
New Jersey	91.0 (2020)[g]	634,877	90,344	2,965	234,646	29,316	106,187
Virginia	137.2 (2019)[h]	1,043,762	167,594	17,696	1,047,035	76,031	194,078

Sources: [a]USEPA 2023a; [b]NYSDEC 2022; [c]Commonwealth of Massachusetts 2023; [d]CT DEEP 2023; [e]RI DEM 2022; [f]MD DE 2022; [g]NJ DEP 2022c; [h]VDEQ 2021.

Notes:

CO_2e = carbon dioxide equivalents, CO = carbon monoxide, NO_X = oxides of nitrogen, O_3 = ozone, $PM_{2.5}$ = particulate matter less than 2.5 microns, PM_{10} = particulate matter less than 10 microns, SO_2 = sulfur dioxide, VOCs = volatile organic compounds, MMT = million metric tons

Table 3.4-3 County Level Emissions (tons per year) from the 2020 National Emissions Inventory

State	County	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOCs
New York	Albany County	24,819	3,758	5,855	2,092	104	9,242
	Kings County	52,805	10,536	5,453	3,456	186	17,004
	New York County	78,300	13,225	17,143	5,690	343	13,240
	Suffolk County	132,193	13,595	11,015	5,228	311	27,971
	New York Total	288,117	41,113	39,466	16,466	944	67,457
Rhode Island	Providence County	41,031	5,615	5,579	2,341	93	14,051
	Washington County	12,281	1,586	1,272	684	26	5,716
	Rhode Island Total	53,312	7,201	6,852	3,025	119	19,767
Connecticut	New London County	24,167	3,187	3,488	1,400	44	14,912
Massachusetts	Bristol County	36,687	4,258	3,714	1,783	64	12,849
New Jersey	Gloucester County	24,435	3,105	5,387	1,284	56	10,471
Maryland	Baltimore County	64,528	7,264	9,323	2,943	1,141	19,890
Virginia	Norfolk County	16,910	3,678	1,616	740	100	4,505

Source. USEPA 2023a

Notes:

CO = carbon monoxide, NO_X = oxides of nitrogen, O_3 = ozone, $PM_{2.5}$ = particulate matter less than 2.5 microns, PM_{10} = particulate matter less than 10 microns, SO_2 = sulfur dioxide, VOCs = volatile organic compounds

The USEPA classifies individual counties as *in attainment*, *nonattainment*, *maintenance*, or *unclassified* for each criteria air pollutant (USEPA 2021b). An area is *in attainment* if it meets the NAAQS for the criteria pollutant. An area is in *nonattainment* if it does not meet the NAAQS. If a county is in nonattainment, the state must develop a State Implementation Plan to attain and maintain the NAAQS. A *maintenance* area is one that recently became *in attainment* and must continue to demonstrate the preservation of the standard before the county can be redesignated as *in attainment*. An area is *unclassified* if there is insufficient information to determine the attainment status; these areas are typically treated as *in attainment* areas.

The CAA prohibits federal agencies from approving any activity that does not conform to a State Implementation Plan. This prohibition applies only with respect to *nonattainment* or *maintenance* areas. Conformity to a State Implementation Plan means conformity to a State Implementation Plan's purpose of reducing the severity and number of violations of the NAAQS to achieve attainment of such standards. The activities for which BOEM has authority are outside of any *nonattainment* or *maintenance* area, and therefore, not subject to the requirement to show conformity.

The CAA provides additional air quality and visibility protection to Class I areas which are national parks larger than 6,000 acres (ac; 24.3 square kilometers [km^2]) and national wilderness areas larger than 5,000 ac (20.2 km^2) (NPS 2018). There are no Class I areas within the GAA. The closest Class 1 area to the proposed Project Area is the Lye Brook Wilderness in Vermont which is approximately 160 mi (270 km) to the north (USEPA 2022c). The Fire Island National Seashore is a Class II area located approximately 100 mi (160 km) to the west of the SRWF. This means that some air pollution is permitted as long as the NAAQS or the maximum allowable increases over baseline concentrations are not exceeded (NPS 2020).

Greenhouse gases (GHGs) are gases that trap heat in the atmosphere and include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases, such as chlorofluorocarbons, perfluorocarbons, hydrofluorocarbons, and sulfur hexafluoride (SF_6). The largest source of GHGs is fossil fuel combustion (USEPA 2021c). CO_2 is the dominant GHG emitted in the United States from human activities. CO_2 is stable in the atmosphere and remains long enough (decades) to become well-mixed throughout the global atmosphere. SF_6 is an electrical insulator used in high-voltage equipment (USEPA 2021d) and to insulate switchgears on the offshore converter station (OCS-DC) and onshore converter station (OnCS-DC). GHG emissions are typically reported in carbon dioxide equivalents (CO_2e) which considers the different global warming potentials of the various GHGs (USEPA 2021e).

There are no federal air quality or emission standards for GHGs. Individual states have developed GHG reduction plans to mitigate the impacts of climate change (e.g., Commonwealth of Massachusetts 2022a; NYS 2022; NJ DEP 2022a). These plans include mandates to decrease GHG emissions through various methods, including improving energy efficiency, energy conservation, and increasing renewable energy sources to reduce GHG emissions to a baseline level (e.g., 1990). Individual states track and report their GHG emissions to measure progress toward the goals. Recent statewide GHG emissions (provided as CO_2e) are provided in Table 3.4-2.

The CAA Section 328 directs the USEPA to regulate air pollution from Outer Continental Shelf (OCS) sources located offshore of states along the Pacific, Arctic, and Atlantic coasts. OCS air regulations (40 *CFR* Part 55) establish air pollution control requirements for permitting, monitoring, fees, compliance, and enforcement for OCS sources subject to the CAA and beyond state seaward boundaries (USEPA 2021f). OCS sources include emissions from construction, installation, operations and maintenance (O&M), and decommissioning within a 25-mi (40.2-km) radius of the centroid of the wind farm. OCS sources that may produce air emissions include vessels only when they are temporarily or permanently attached to the seabed and used for exploring, developing, or producing resources therefrom or physically attached to an OCS facility (40 *CFR* Part 55).

If the estimated emissions from construction of the OCS sources exceed the major source permitting thresholds for NO_x, VOCs, or one or more of the criteria pollutants, then the source would require a major source permit under the Nonattainment New Source Review (NNSR) and/or Prevention of Significant Deterioration (PSD) regulations. NNSR regulations require the lowest achievable emission rate, emission offsets, and public involvement (USEPA 2021g). These regulations apply to sources with the potential to emit 50 tons (45.4 metric tons) per year or more of VOCs or 100 tons (90.7 metric tons) per year or more of NO_x (COP Appendix K; AKRF 2021). PSD regulations require installation of best available control technology (BACT), an air quality analysis, an additional impacts analysis, and public involvement (USEPA 2021h). PSD regulations apply to sources that may emit 250 tons (226.8 metric tons) per year or more of any pollutant. Sunrise Wind submitted an OCS air permit application in August 2022 and the application was deemed complete in March 2023.

Facilities located within 25 nm (28.77 mi; 46.3 km) of a state seaward boundary are required to comply with the air quality controls of the nearest or corresponding onshore area (COA). The permitting authority for the OCS air permit is the COA for an OCS source. The nearest onshore area is typically the COA unless the USEPA designates another area (COP Appendix K; AKRF 2021). The nearest onshore area is Dukes County, Massachusetts; emissions that may occur nearest to Dukes County would be included in the OCS air permit.

3.4.2 Impact Level Definitions for Air Quality

This Final EIS uses a four-level classification scheme to analyze potential impact levels on air quality from the alternatives, including the Proposed Action. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a project or beyond project operations and decommissioning. Table 3.4-4 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for air quality. Table G-3 in Appendix G (*Impact-Producing Factor* [IPF] *Tables*) identifies potential IPFs, issues, and indicators to assess impacts to air quality.

Table 3.4-4. Definition of Potential Adverse and Beneficial Impact Levels for Air Quality

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	Increases in ambient pollutant concentrations due to Project emissions would not be detectable.	Decreases in ambient pollutant concentrations due to Project emissions would not be detectable.
Minor to Moderate	Increases in ambient pollutant concentrations due to project emissions would be detectable but would not lead to exceedance of the NAAQS.	Decreases in ambient pollutant concentrations due to Project emissions would be detectable.
Major	Changes in ambient pollutant concentrations due to Project emissions would lead to exceedance of the NAAQS.	Decreases in ambient pollutant concentrations due to Project emissions would be larger than for minor to moderate impacts.

3.4.3 Impacts of Alternative A - No Action on Air Quality

When analyzing the impacts of the No Action Alternative on air quality, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities, on the baseline conditions for air quality. The cumulative impacts of the No Action Alternative considered the impacts of the No Action Alternative in combination with other planned non-offshore wind and offshore wind activities, as described in Appendix E (*Planned Activities Scenario*).

3.4.3.1 Impacts of the No Action Alternative

Under Alternative A, baseline air quality conditions would continue to follow current regional trends and respond to IPFs introduced by other ongoing non-offshore wind and offshore wind activities. Ongoing activities that could impact air quality in the GAA are continued operation and development of fossil fuel electricity generation facilities, onshore and offshore development, onshore and marine transportation, other commercial and industrial activities, construction of undersea transmission lines or gas pipelines, marine mineral use and dredged material disposal, and military use. Air or HAP emissions from these activities could cause short-term exceedances of air quality standards.

Ongoing offshore wind activities within the GAA that contribute to impacts on air quality include:

- Continued O&M of the Block Island Project (5 WTGs) installed in state waters;
- Continued O&M of the Coastal Virginia Offshore Wind (CVOW) project (2 WTGs) installed in OCS-A 0497, and
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of the Block Island and CVOW projects and ongoing construction of the Vineyard Wind 1 and South Forks projects would affect air quality through the primary IPFs of air emissions, climate change, and accidental releases. Ongoing offshore wind activities would have the same type of impacts from air emissions, climate change, and accidental releases that are described in the following section for planned offshore wind activities, but the impacts would be of lower intensity.

3.4.3.2 Cumulative Impacts of the No Action Alternative

The cumulative impact analysis for the No Action Alternative considers the impacts of the No Action Alternative in combination with other planned non-offshore wind activities and planned offshore wind activities (without the Proposed Action).

Other planned non-offshore wind activities that could impact air quality in the GAA are the continued operation and development of fossil fuel electricity generation facilities, onshore and offshore development, onshore and marine transportation, commercial and industrial activities, construction of undersea transmission lines or gas pipelines, marine mineral use and dredged material disposal, and military use. These activities may result in short-term increases in air, GHG, or HAP emissions which may cause short-term, localized exceedances of air quality standards.

The sections below summarize the potential impacts of planned offshore wind activities on air quality during construction, O&M, and decommissioning of the projects. The GAA of the Revolution Wind, New England Wind, South Coast Wind, and the Bacon Wind 1 Projects overlap with the GAA of the Proposed Action. BOEM anticipates future offshore wind activities to affect air quality through the following primary IPFs.

Air emissions: The potential emission sources from future offshore wind activities would include fossil-fuel combustion in main and auxiliary engines on marine vessels, helicopters, on-vessel equipment, construction vehicles and equipment, and fugitive dust emissions. Most emissions would occur during the construction phase of planned projects. Air emission impacts on air quality would be higher if the construction of multiple projects overlapped spatially or temporally. All projects would be required to comply with the CAA.

Future offshore wind activities other than the Proposed Action that may result in air emissions within the Massachusetts/Rhode Island (MA/RI) Lease Area include New England Wind, South Coast Wind, Revolution Wind, Beacon Wind, Vineyard Northeast Wind, and Bay State Wind. The total number of wind turbine that may be constructed in the MA/RI Lease Area by 2030 (not including the Proposed Action) is 1,068 WTGs which would produce up to approximately 15,000 megawatts (MW) of renewable energy. The total offshore construction phase emissions of criteria pollutants from future offshore wind projects through 2030 are estimated to be 30,217 tons CO; 143,994 tons NO_x; 2,750 tons SO_2, 3,757 tons VOC; 6,477 tons PM_{10}; and 4,421 tons $PM_{2.5}$. The Revolution Wind, New England Wind, South Coast Wind, and Beacon Wind 1 Projects are expected to have overlapping construction schedules with the Proposed Action in 2024 and 2025. The magnitude of emissions and resulting impacts would vary spatially and temporally during the construction phase. BOEM anticipates that air emission impacts on air quality would be minor to moderate.

Air emissions from O&M activities may overlap temporally, but overall, would be intermittent and dispersed and contribute to localized impacts on air quality; emissions during O&M would be less than during the construction and decommissioning phases. Estimated offshore O&M phase emissions through 2030 are 771 tons CO; 3,058 tons NO_x; 45 tons SO_2; 69 tons VOCs; 117 tons PM_{10}; and 109 tons $PM_{2.5}$. Emissions could result from routine or non-routine maintenance activities and repairs involving marine vessels carrying crew and materials, on-vessel equipment, and emergency diesel generators. Overall, operation of planned offshore wind projects would produce negligible emissions because wind turbines do not emit pollutants.

Offshore wind energy development could help offset emissions from fossil fuels, potentially improving regional air quality, reducing GHGs, and providing health benefits. An analysis by Katzenstein and Apt (2009), for example, estimates that CO_2 emissions can be reduced by up to 80 percent and NO_X emissions can be reduced up to 50 percent by implementing wind energy projects. An analysis by Barthelmie and Pryor (2021) calculated that, depending on global trends in GHG emissions and the amount of wind energy expansion, development of wind energy could reduce predicted increases in global surface temperature by 0.5–1.4 degrees Fahrenheit (°F; 0.3–0.8 degrees Celsius [°C]) by 2100. Overall, the development of the Revolution Wind, New England Wind, South Coast Wind, and the Bacon Wind 1 Projects would have minor beneficial impacts.

Climate change: Future offshore wind activities would produce GHG emissions that would minimally impact climate change compared to total global and United States GHG emissions. Fossil-fuel combustion during construction and decommissioning (e.g., from marine vessels and on-vessel equipment, construction equipment, construction vehicles) and during O&M (e.g., from marine vessels carrying crew, construction, and passenger vehicles) would produce CO_2 emissions. The estimated offshore CO_2e emissions from the construction and O&M activities of future offshore wind projects in the MA/RI Lease Area through 2030 are 9,138,691 tons and 751,649 tons, respectively. The development of future offshore wind projects would likely result in reduced regional GHG emissions because the emissions from fossil-fuel combustion would be displaced. Further, the reduced emissions would likely more than offset the small amount of GHG emissions from the future offshore wind activities. Future offshore wind activities would have an overall beneficial impact on climate change and would be an important component of state climate change mitigation plans.

Accidental releases: Accidental chemical spills during construction, O&M, and decommissioning could cause emission of HAPs; accidental releases would be more likely during the construction phase because of the increased vessel traffic and equipment use. Emissions of hazardous VOCs would occur through evaporation. HAPs are generally short-lived in the atmosphere and would cause short-term, localized air quality impacts. Accidental releases would occur infrequently over the lifetime of future offshore wind projects and have minor impacts.

3.4.3.3 Conclusions

Impacts of the No Action Alternative

Under Alternative A, the No Action Alternative, air quality would continue to be affected by existing environmental trends and ongoing activities. Air quality patterns would continue to follow the regional trends and respond to societal, economic, technological, and environmental activities. Non-offshore wind activities may have air quality impacts due to the construction and O&M of new energy generation facilities needed to meet future energy needs or from the maintenance of fossil fuel energy facilities already in service. Ongoing non-offshore and offshore wind activities could cause localized, short-term increases in air, GHG, or HAP emissions, and short-term exceedances of air quality standards. The No Action Alternative would result in **minor** to **moderate** adverse impacts on air quality from air emissions, climate change, and accidental releases and a **minor** to **moderate beneficial** impact due to reduction of fossil fuel emissions.

Cumulative Impacts of the No Action Alternative

Under the No Action Alternative, existing environmental trends and ongoing activities would continue. Planned non-offshore wind activities and offshore wind activities would contribute to impacts on air quality through air and GHG emissions and accidental releases, particularly during the construction phase of projects. Air emission and accidental release cumulative impacts would be **minor** to **moderate** depending on the extent and duration of emissions or releases. Planned activities would produce GHG emissions that would have a **minor** to **moderate** adverse impact on climate change compared to fossil-fuel powered energy generation. As more offshore wind projects come online, the need for fossil fuel power generation would decrease. This would contribute to improved air quality from the larger amount of renewable energy sources and reduced air emissions. Overall, planned offshore wind activities would have an indirect **minor** to **moderate beneficial** cumulative impact on air quality after the offshore wind projects are operational.

3.4.4 Relevant Design Parameters and Potential Variances in Impacts

This Final EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the Project Design Envelope (PDE) would result in impacts similar to or less than described in the sections below. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts on air quality:

- The number of WTGs and number of foundations;
- Length of the inter-array cable (IAC), offshore export cables, and onshore export cable;
- The number of marine vessels, helicopters, construction, and passenger vehicles used during construction, O&M, and decommissioning, and number of trips per vessel;
- Engine and fuel types used in marine vessels, equipment, and construction vehicles;
- The travel routes to and from the offshore and onshore components;

- Air emission ratings of marine vessel, construction equipment, and vehicle engines; and
- Soil characteristics at onshore areas.

3.4.5 Impacts of Alternative B - Proposed Action on Air Quality

The sections below summarize the potential impacts of the Proposed Action on air quality during the various phases of the Proposed Action. Routine activities would include construction, O&M, and decommissioning of the Project, as described in Chapter 2, Section 2.1.2 *Alternative B – Proposed Action.* Construction, O&M, and decommissioning activities associated with the Proposed Action have the potential to cause both direct and indirect impacts on air quality through the IPFs of emissions, climate change, and accidental releases.

3.4.5.1 Construction and Installation

3.4.5.1.1 Onshore Activities and Facilities

Air emissions: Air emissions from the Proposed Action could affect six counties in nonattainment with one or more criteria pollutants. The attainment status of an area is provided in the USEPA Green Book (USEPA 2021i). Albany County, New York[1]; Bristol County, Massachusetts; Providence County and Washington County, Rhode Island; and Norfolk County, Virginia are in attainment for all criteria air pollutants. Kings County, New York is in nonattainment with O_3 and is a maintenance area for CO and $PM_{2.5}$. Suffolk County, New York is in moderate nonattainment with O_3 and maintenance for $PM_{2.5}$. New London County, Connecticut, is in nonattainment of the O_3 standard and is the only port currently planned to be used during the construction phase that is in a nonattainment area (CT DEEP 2016; USEPA 2021i). Dukes County, Massachusetts, is in nonattainment with the 2008 O_3 standard but is in attainment with the 2015 standard (Commonwealth of Massachusetts 2022b; USEPA 2021i). Baltimore County, Maryland, is in nonattainment with the O_3 and SO_2 standards and is a maintenance area for CO. Gloucester County, New Jersey, is in nonattainment with the O_3 standard (NJ DEP 2022b).

Air emissions may occur from fuel combustion in heavy equipment and construction vehicles during construction and installation of the onshore transmission cable, onshore interconnection cable, and the OnCS-DC. Construction of the onshore transmission cable and onshore interconnection cable would involve site preparation, clearing and grading, trench excavation, duct bank and vault installation, cable installation and jointing, testing, and restoration (COP Section 3.3.2.3, Sunrise Wind 2023). Construction of the OnCS-DC would involve clearing and grading, foundation and equipment installation, site restoration, and commissioning (COP Section 3.3.1.2, Sunrise Wind 2023). A variety of on-road and non-road engines would be used during the onshore construction phase including excavators, drills, backhoes, bulldozers, cranes, tractors, cable puller, pumps, compressors, and passenger vehicles (COP

[1] The Port of Albany and the Port of Coeymans are in the former Albany-Schenectady-Troy Area, New York Ozone Nonattainment Area for the 1979 and 1997 NAAQS. However, USEPA has revoked these standards.

Appendix K, AKRF 2021). The onshore construction and installation phase is expected to last 2 years; emissions would cease when construction is complete.

Estimated onshore construction emissions and emissions within 3 nm of the state borders for the Proposed Action are provided in Table 3.4-5; these emissions are less than county level emissions (Table 3.4-3). While the activities for which BOEM has authority are outside of any nonattainment or maintenance area, and therefore, not subject to the requirement to show conformity, for the purpose of evaluating potential effects on air quality of the Proposed Action, the estimated emissions were compared to de minimus threshold values. For a moderate O_3 nonattainment area, the VOC de minimus value is 50 tons/year and for NO_x is 100 tons/year (USEPA 2023c). Onshore VOC emissions (Table 3.4-5) are estimated to be below the threshold for all states and proposed ports. Total onshore NO_x emissions and emissions within 3 nm of state borders are estimated to be above 100 tons/year in New York, Rhode Island, and Maryland. These emissions reflect the sum of all emissions from the various ports proposed in New York and Rhode Island; the emissions from individual proposed ports are less than shown in Table 3.4-5. Only the Port of Albany in New York, the Ports of Providence and Davisville/Quonset Point in Rhode Island, and Sparrows Point in Maryland may have emissions exceeding the de minimus threshold. Considering that these ports may only be used during specific activities and that emissions would be dispersed over time, it is unlikely that emissions from any individual port would cause nonattainment with NAAQS. Overall, these emissions would be temporary, dispersed over the entire construction phase, minimized through mitigation, and much less than county emissions in 2020 (Table 3.4-3).

Site preparation, clearing, grading, and vehicle use may produce fugitive dust emissions (i.e., PM_{10} or $PM_{2.5}$); the magnitude of emissions would depend on the spatial extent of the activities and on the soil type and moisture content. Fugitive dust emissions would be minimized through the Dust Control Plan (AQ-05) and Stormwater Pollution Prevention Plan (SWPPP).

Sunrise Wind would implement environmental protection measures (EPMs; see Applicant Proposed Measure [APM] AQ-01, AQ-02, AQ-03, AQ-04, AQ-05, AQ-06, and AQ-07, listed in Table H-1, Appendix H) to reduce or avoid air emissions during onshore construction and installation activities. These measures include using engines, fuels, and equipment that meet applicable air emissions standards and dust control. Onshore air emissions would be greatest during the construction phase and would be offset by the potential reduction in fossil fuel emissions. Air emissions would be intermittent throughout the 2-year construction phase and would have a minor to moderate impact on air quality.

Table 3.4-5. Estimated Onshore Construction Emissions and Emissions within 3 Nautical Miles of State Borders (tons per year) during the Construction Phase of the Proposed Action

Emission Location	CO	NO_x	VOCs	$PM_{2.5}$	PM_{10}	SO_2
Onshore and within 3 nm of New York	123.9	348.2	7.8	6.6	5.7	1.2
Onshore and within 3 nm of Rhode Island	206	496	11.6	9.1	9.2	0.5

Emission Location	CO	NO_x	VOCs	$PM_{2.5}$	PM_{10}	SO_2
Onshore and within 3 nm of Connecticut	4.0	9.7	0.2	0.2	0.2	0
Onshore and within 3 nm of Massachusetts	3.8	9.3	0.2	0.2	0.2	0
Onshore and within 3 nm of New Jersey	25.6	61.6	1.4	1.1	1.1	0.1
Onshore and within 3 nm of Maryland	276.1	664.6	15.6	12.2	12.2	0.7
Onshore and within 3 nm of Virginia	4.3	10.3	0.2	0.2	0.2	0

Source: Adapted from Table A3 in COP Appendix K, AKRF 2021.

Notes:

CO = carbon monoxide, NO_x = oxides of nitrogen, VOCs = volatile organic compounds, $PM_{2.5}$ = particulate matter less than 2.5 microns, PM_{10} = particulate matter less than 10 microns, SO_2 = sulfur dioxide, nm = nautical miles

Climate change: GHG emissions would occur throughout the onshore construction phase; however, they would be small compared to total annual statewide emissions. CO_2e emissions were estimated to range from 1,074 tons per year (tpy) (974.3 metric tpy) for emissions within 3 nm (3.45 mi; 5.6 km) of Connecticut, to 32,893 tpy (29,840 metric tpy) for emissions within 3 nm of New York, to 73,202 tpy (66,407.7 metric tpy) for emissions within 3 nm (3.45 mi; 5.6 km) of Maryland (COP Appendix K, AKRF 2021). These totals are well below the total CO_2e emissions from fossil-fuel combustion in the United States transportation sector (1,817 MMT CO_2e) or the electricity generation sector (1,602 MMT CO_2e) in 2019 (USEPA 2021k) and from the most recently reported statewide CO_2e emissions (Table 3.4-2). The GHG emissions from the Proposed Action would be offset by the reduction in emissions from the closure or reduced operations of fossil-fueled electricity generating facilities. Overall, it is anticipated that the Proposed Action would have a beneficial impact on GHG emissions and air quality compared to the GHG emissions that would be produced by generation of the same amount of energy from a fossil-fueled generation facility.

Accidental releases: Evaporative emissions of HAPs from accidental chemical spills or releases could occur during the onshore construction of the proposed Project. Coolants, oils, fuels, solvents, and lubricants would be used at the OnCS-DC; an estimated maximum of mineral oils is 101,333 gallons (gal) (383,587 liters [L]) (COP Table 3.3.1-2, Sunrise Wind 2023). These materials, as well as hydraulic fluids, would be used during trenchless and duct bank installation, and installation of the onshore transmission cable and onshore interconnection cable. There is a higher risk of accidental releases during the construction phase than O&M because of the increased amount of construction vehicles and equipment. Accidental HAP emissions would be short-term and localized to the area at or around the release. Accidental releases would be avoided or reduced through the development and implementation of the Environmental Management and Construction Plan (EM&CP), which includes an SWPPP, Spill, Prevention, Control, and Countermeasure (SPCC) Plan, and Oil Spill Response Plan (OSRP) (APM GEN-20, APM GEN-21). Any spills would be governed by state of New York regulations and secondary oil containment procedures following industry standards.

3.4.5.1.2 Offshore Activities and Facilities

Air emissions: During construction of the SRWF, the main sources of air emissions would be from fossil-fuel combustion emissions on helicopters; marine vessels; on-vessel equipment (e.g., compressors); onboard engines including generators; heavy equipment during construction and installation of the foundations, WTG, OCS-DC; construction and cable-laying equipment for the IAC, SRWEC-OCS, and SWREC-NYS; generators on the WTGs and OCS-DC; and vessels traveling to and from the OCS sources when within 25 mi (40.2 km). During the construction phase, there would be increased combustion emissions from increased vessel traffic, air traffic, and construction equipment. The air pollutants that could be emitted include criteria pollutants, HAPs, and VOCs. The specific emissions and amounts would vary throughout the construction phase. Diesel generators would be used to provide temporary power during construction and commissioning of the WTGs which is expected to be completed in less than 1 year. The total offshore construction phase is anticipated to last from 1 year to 18 months. The offshore emissions would be short-term and would cease after construction is complete.

During construction of the SRWEC-OCS, air emissions may arise from vessels burning fossil fuels that are used to transport crew and material and to perform or support laying of the SRWEC and horizontal directional drilling (HDD) installation at landfall. This includes vessels attached to or erected on the seafloor and conducting cable laying within 25 mi (40.2 km) of the OCS source centroid. Air emissions from construction of the SRWEC would be short-term and would stop after construction is complete.

During construction and installation of the SRWEC-NYS, air emissions may come from offshore vessels transiting through state waters, on-vessel equipment, portable diesel generators, or onshore-equipment. The SRWEC construction and installation phase is expected to last approximately 8-months. These emissions would cease when construction of the SRWEC-NYS is complete.

The estimated offshore construction and installation emissions subject to the OCS permit (i.e., within 25 mi [40.2 km] of the SRWF and SRWEC centroids) were compared to emission standards for the COA in Dukes County, Massachusetts. The Massachusetts State Implementation Plan defines the NO_x and VOC emission threshold as 50 tpy (45.4 metric tpy) (MA DEP 2018). Based on the emission estimates for the OCS air permit, the total estimated VOCs emissions (163 tpy [147.9 metric tpy]) from construction emissions of the SRWF (137.8 tpy [125 metric tpy]), SRWEC (7.2 tpy [6.5 metric tpy]) and from crew transport and support (18.0 tpy [16.3 metric tpy]) would exceed the 50 tpy (45.4 metric tpy) threshold (AKRF, 2023a). The total NO_x emissions (3,090.8 tpy [2,803.9 metric tpy]) from construction of the SRWF (2,438.9 tpy [2,212.5 metric tpy]), SRWEC (222.9 tpy [202.2 metric tpy]) and from crew transport and support (426.5 tpy [386.9 metric tpy]) would also exceed the threshold. Most emissions would occur during foundation installation. The offshore VOC and NO_x construction emissions would be short-term, vary spatially, occur throughout the 12-to-18-month construction phase, be permitted under the OCS air permit, and would have a minor to moderate impact on air quality.

SRW submitted an OCS air permit application in February 2023, which included separate reports titled “Sunrise Wind Offshore Coastal Dispersion Air Quality Impact Analysis Report” and the “Sunrise Wind

Class 1 Air Quality and Visibility Impact Analysis Report (AKRF 2023a, 2023b). The application discussed the methods and results of several air quality analyses including emission estimates, air dispersion modeling to demonstrate compliance with the NAAQS, comparisons of estimated potential emissions from the OCS source to PSD and NNSR thresholds, an air quality related value (AQRV) analysis in the Lye Brook Wilderness Class 1 Area, and a visibility analysis.

PSD regulations require that an air quality impact analysis be performed for each pollutant that the Project would emit in a significant quantity to make sure that the Project would not contribute to an exceedance of the NAAQS or an applicable PSD increment. The maximum running 12-month emissions for the worst annual period during construction of the OCS source were estimated to exceed the PSD thresholds for NO_2, CO, PM_{10}, $PM_{2.5}$, SO_2, and VOC and the NNSR thresholds for NO_x and VOC; these results trigger PSD and NNSR permitting and BACT and lowest achievable emission rate analyses. The application is currently under review and emissions from the OCS source would be permitted as part of the OCS air permit.

AQRVs are resources that are sensitive to air quality, such as lakes, rivers, soil, vegetation, fish, wildlife, and visibility; the AQRV of concern to the Lye Brook Wilderness is visibility (USFS, NPS, USFWS 2010; AKRF 2023b). The effect of the Project on natural visibility was assessed by simulating the SRWF's effect on light extinction. The threshold used for light extinction caused by sources over 50 km from the Class I area was a less than 5 percent change in light extinction based on the 98th percentile change in light extinction of each modeled year (2018, 2019, 2020) (USFS, NPS, USFWS 2010). As part of the AQRV analysis, the Project must demonstrate that significant visibility degradation would not occur as a result of increased haze or plumes.

SRW used a combination of offshore and coastal dispersion modeling and the USEPA CALPUFF modeling system for the dispersion modeling and the Class 1 SIL and visibility analyses. Modeling was completed for PM_{10}, $PM_{2.5}$, SO_2, and NO_2, and the impacts for each pollutant were compared to their respective Class 1 SILs. The predicted maximum concentrations for each pollutant were less than their respective SILs suggesting that the Project's impacts would not cause or contribute to an exceedance of the NAAQS and an additional PSD Increment analysis was not needed. The 98th percentile change in light extinction did not exceed 5 percent for any year modeled, thus the Project is not anticipated to have an adverse impact on visibility in the Lye Brook Wilderness Class 1 area.

Sunrise Wind would implement EPMs to reduce or avoid air emissions during offshore activities as described in Section 4.3.4.3 of the COP (APM AQ-01, AQ-02, AQ-03, AQ-05, AQ-06, AQ-07, Sunrise Wind 2023) at a minimum and would comply with the OCS air permit. These measures include using low sulfur diesel in generators on the WTGs or OCS-DC; low sulfur fuel, marine distillate, or marine residual fuels on vessels; engines that meet applicable air emissions standards to satisfy BACT and lowest achievable emission rate requirements; dust control; and obtaining emission reduction credits if required by the OCS permit.

Climate change: GHG emissions would occur during the construction and installation of the offshore components of the proposed Project. The total CO_2e emissions were estimated to be 328,401 tpy (297,920 metric tpy) with 244,527 tpy (221,831 metric tpy) from construction of the SRWF; 17,839 tpy (16,183 metric tpy) due to construction of the SRWEC; and 65,768 tpy (59,664 metric tpy) for crew transport and support (COP Appendix K; AKRF 2021). These emissions would be much less than the total annual statewide emissions (Table 3.4-2).

The proposed Project would use SF_6 insulated switchgears on the OCS-DC. These switchgears are designed to be completely sealed; thus, little to no SF_6 emissions are expected. Low pressure detectors would be installed to detect any SF_6 leaks (APM AQ-07, COP Section 4.3.4.3. Sunrise Wind 2023). SRW performed a BACT assessment for the OCS air permit application that considered the use of SF_6-free equipment. The assessment considered the technology currently available, and its feasibility given the design and high voltage requirement of the OCS-DC, available space on the OCS-DC, how widely available other equipment is, and the cost effectiveness of altering the Project design. It was determined that using SF_6-free switchgears was not technically feasible at this time based on the electrical requirements of the OCS-DC (60 hertz [Hz]-rated components).

Accidental releases: Accidental chemical spills or releases during construction of the offshore components of the proposed Project could result in HAP emissions. Oils, solvents, lubricants, and fuels would be used at the OCS-DC in transformers and reactors, fuel tanks, cranes, rotating equipment, pumps, generators, and chilling/cooling units. HAP emissions from accidental spills would be avoided or reduced through implementation of the EC&MP and OSRP (APM GEN-21). There would be a spill containment system on the OCS-DC designed with at least 110 percent of secondary containment for all oils, fuels, grease, and lubricants.

Each of the WTGs would require oils, fuels, and lubricants for the bearings, yaw pinions, accumulators, pumping unit, actuators, gearbox, transformer, emergency generator, and cooling system. Potential emissions of HAPs would be avoided or minimized through measures to contain accidental releases at the WTGs including 100 percent leakage-free joints, high pressure, and oil level sensors to detect leakages, and retention reservoirs that could contain 110 percent of the volume of any potential leaks (COP Section 3.3.8.1, Sunrise Wind 2023). Accidental HAP emissions would be short-term, intermittent, and localized to the area at or around the spill or leak and result in a minor to moderate impact on air quality.

3.4.5.2 Operations and Maintenance

3.4.5.2.1 Onshore Activities and Facilities

Air emissions: Air emissions would occur during periodic O&M of the OnCS-DC and cables from vehicle use to transport material and personnel and equipment use. Ports in New York and Rhode Island are being considered to support O&M activities. The estimated onshore emissions and emissions within 3 mi (4.8 km) of the New York and Rhode Island state boundaries are provided in Table 3.4-6. The estimated air emissions during the O&M phase would be less than the potential emissions during the onshore construction and installation phase because there would be less workers, passenger and construction vehicles, and equipment used. The estimated NO_x and VOC emissions would be less than the de minimus thresholds for a moderate O_3 nonattainment area (i.e., Suffolk County, NY) and much less than county level emissions (Table 3.4-3). Air emissions would be minimized through implementation of measures described in Section 4.3.4.3 of the COP (APM AQ-01, AQ-02, AQ-03, AQ-04, AQ-05, AQ-06, AQ-07, Sunrise Wind 2023) at a minimum. Air quality impacts would be expected to occur close to the emission source and would be dispersed throughout the 25- to 35-year lifetime of the proposed Project. It is anticipated that the potential emissions from maintenance vehicles and equipment would decrease due to increases in fuel efficiency and standards over the Project lifetime. Onshore air emissions during O&M are expected to have a minor to moderate impact on air quality.

Table 3.4-6. Estimated Onshore Emissions and Emissions within 3 Nautical Miles of State Borders (in tons per year) during the O&M Phase of the Proposed Action

Emission Location	CO	NO_x	VOCs	$PM_{2.5}$	PM_{10}	SO_2
Onshore and within 3 nm of New York	23	54	1	1	1	0
Onshore and within 3 nm of Rhode Island	13	31	1	1	1	0

Source: Adapted from Table A4 in COP Appendix K, AKRF 2021.

Notes:

CO = carbon monoxide, NO_X = oxides of nitrogen, VOCs = volatile organic compounds, $PM_{2.5}$ = particulate matter less than 2.5 microns, PM_{10} = particulate matter less than 10 microns, SO_2 = sulfur dioxide, nm = nautical miles

Climate change: GHG emissions would occur during routine and non-routine O&M activities at the onshore facilities over the 25-to-35-year lifetime of the proposed Project. The estimated CO_2e emissions from O&M activities in New York are 6,001 tpy (5,444 metric tpy) and from activities in Rhode Island are 3,461 tpy (3,140 metric tpy). These emissions would be small compared to the total New York and Rhode Island statewide emissions. Over the lifetime of the Project, GHG emissions would likely decrease through improved technology and emissions standards.

The OnCS-DC would use SF_6 insulated switchgears for electrical insulation purposes. The maximum potential volume of SF_6 that may be used for the OnCS-DC is 3,500 pounds (COP Section 3.3.1.1; Sunrise Wind 2023). Fugitive SF_6 emissions may occur at a rate of 1 percent annually resulting in up to 0.020 tons/year (COP Section 4.3.4.2; Sunrise Wind 2023). The switchgears are designed to be completely sealed and would be expected to result in little to no SF_6 emissions. All SF_6 insulated switchgears would contain low pressure detectors in case a leak was to occur (APM AQ-07).

Accidental releases: Accidental chemical spills or leaks and subsequent HAP emissions could occur during onshore O&M activities. Operation of the OnCS-DC would require oils, lubricants, and fuels. Vehicles used to transport crew and equipment would use diesel fuel. Repair work on the onshore interconnection cable could require the use of hydraulic fluids. Accidental releases would be prevented through implementation of the SPCC Plan and would be infrequent and dispersed throughout the 25-to 35-year lifetime of the proposed Project. Sunrise Wind would implement measures such as using low sulfur diesel, fueling offsite, and an Inadvertent Return Plan, Materials Management Plan, and an SPCC Plan, as part of the EM&CP, to minimize or eliminate accidental HAP emissions during onshore O&M activities (APM WQ-01, WQ-02, GEN-20, GEN-21, GEN-22).

3.4.5.2.2 Offshore Activities and Facilities

Air emissions: During the offshore O&M phase, air emissions could occur during periodic marine vessel or helicopter use to transport material and personnel to the SRWF, OCS-DC, SRWEC, or IAC for regular inspections and maintenance practices and from on-vessel equipment used for repairs or maintenance. Routine inspections of electrical components and minor corrective and preventative maintenance actions are anticipated to occur multiple times per year (COP Section 3.5.2; Sunrise Wind 2023). Annual maintenance activities would include above water and visual inspections, routine service and safety checks, and oil and high-voltage maintenance. Non-routine (e.g., corrective and major repairs) maintenance would occur as needed. It is possible that a WTG installation or cable-laying vessel could be used for repairs or maintenance over the operational life of the proposed Project; however, this would be infrequent.

The SRWF, SRWEC-OCS, or SRWEC-NYS would not emit any pollutants during operation. The temporary generators on the WTGs used during construction and commissioning would no longer be in place during the O&M phase. Emergency generators on the WTGs or OCS-DC would only operate during emergencies or testing; emissions would thus be infrequent and negligible.

A smaller number of vessels would be needed during the O&M phase compared to the construction phase. The total estimated emissions during O&M for the OCS permit are 39.6 tpy CO, 99.2 tpy NO_x, 3.7 tpy VOCs, 1.1 tpy SO_2, 1.6 tpy $PM_{2.5}$, and 1.7 tpy PM_{10} (35.9 metric tpy CO, 90 metric tpy NO_x, 3.4 metric tpy VOCs, 1.0 metric tpy SO_2, 1.45 metric tpy $PM_{2.5}$, and 1.5 metric tpy PM_{10}) (AKRF 2023a). The potential air emissions during the offshore O&M phase would be less than during the construction phase. Sunrise Wind submitted an OCS air permit application in August 2022 and a revised application in February 2023; air emissions from O&M activities would be permitted under the OCS air permit.

Offshore wind energy development would cause beneficial impacts by offsetting emissions from fossil fuel electricity generation, potentially improving regional air quality and reducing GHGs, and by providing health benefits. The minimum and maximum annual avoided emissions from operation of the proposed Project and the minimum and maximum estimated avoided emissions over a 25-year Project lifetime are provided in Table 3.4-7; the emissions were estimated using *Technical Documentation for the Offshore Wind Energy Facilities Emission Estimating Tool* (Chang et al. 2017). The proposed Project is anticipated to displace emissions of NO_x, SO_2, VOC, CO, GHG (CO_2, N_2O, CH_4), particulate matter, black carbon, and lead. These estimates were based on a minimum of 3,083,520 MW-hours generated per year and a maximum of 3,854,400 MW-hours generated per year (COP Appendix K; AKRF 2021). The avoided emissions would have long-term minor to major beneficial impacts.

Table 3.4-7. Emissions Avoided by Operation of the Proposed Project (tons)

Avoided Emissions	NO_x	SO_2	CO	VOCs	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	CO_2e
Minimum annual	1,380	1,227	1,380	85	270	377	2,074,241	68	9	2,078,554
Maximum annual	2,548	2,266	2,548	157	498	696	3,830,275	125	16	3,838,239
Minimum over 25 years	29,486	30,681	34,499	2,124	6,745	9,426	51,856,033	1,689	220	51,963,849
Maximum over 25 years	76,228	79,316	34,499	5,492	17,438	24,639	134,059,630	4,367	569	134,338,360

Source: AKRF 2023a

Notes:

NO_X = oxides of nitrogen, SO_2 = sulfur dioxide, CO = carbon monoxide, VOCs = volatile organic compounds, PM2.5 = particulate matter less than 2.5 microns, PM10 = particulate matter less than 10 microns, CO_2 = carbon dioxide, CH_4 = methane, N_2O = nitrous oxide, CO_2e = carbon dioxide equivalents

The potential health benefits of avoided emissions were evaluated using USEPA's CO-Benefits Risk Assessment (COBRA) health impacts screening and mapping tool (USEPA 2022d). This tool estimates the health and economic benefits of clean energy policies. The COBRA web edition was used to analyze the health impacts of avoided emissions using New York, Connecticut, Rhode Island, and Massachusetts as the states where emission changes would occur. The Fuel Combustion Electric Utility sector was selected as the sector where emission changes would occur. COBRA was run for two different avoided emission scenarios. One scenario used the maximum annual avoided emissions in NO_X (2,548 tons), SO_2 (2,266 tons), VOCs (157 tons), and $PM_{2.5}$ (696 tons) estimated for the Sunrise Wind Project for the OCS air permit (AKRF, 2023a). The other scenario used avoided emissions from the USEPA AVoided Emissions and geneRation Tool (AVERT) v4.0 model for NO_x (580 tons), SO_2 (130 tons), VOCs (70 tons), and $PM_{2.5}$ (160 tons) based on the Proposed Action (1,034 MW). COBRA estimates the total health benefit, which encompasses all saved costs of the avoided health events. COBRA includes a discount rate (3 percent or 7 percent) to express future economic values in present terms because not all health effects and associated economic values occur in the year of analysis; this accounts for the 'time value of money' (USEPA 2022d). The analysis was performed using both discount rates for both scenarios to provide a range of estimated health benefit costs. Using the avoided emissions estimated for the OCS air permit at the 3 percent discount rate, the estimated health benefits would range from $193,032,927 to $435,028,407, and at a 7 percent discount rate, the saved costs would range from $172,273,738 to $387,934,480. Using the avoided emissions based on the AVERT model, the estimated health benefits would range from $35,903,032 to $80,913,308 at a 3 percent discount rate and from $32,042,326 to $72,154,462 at a 7 percent discount rate. This would be a long-term minor beneficial impact.

Climate change: GHG emissions expected to occur during offshore O&M activities would contribute to climate change. The O&M CO_2e emissions are estimated to be 17,726 tpy (16,081 metric tpy) (AKRF 2023a). These estimated emissions would be much less than estimated for the construction phase (Table 3.4-2). The estimated O&M CO_2e emissions are approximately two orders of magnitude lower than the minimum estimated annual avoided CO_2e emissions (2,078,623 tons) (Table 3.4-7). Operation of the proposed Project would have a minor beneficial impact on climate change.

The OCS-DC would use SF_6 insulated switchgears for electrical insulation purposes. The maximum potential volume of SF_6 that may be used for the OCS-DC is 3,960 pounds (Table 3.3.6-1 in COP; Sunrise Wind 2023). A maximum of 0.020 tons/year of fugitive SF_6 emissions may occur during operation of the OCS-DC (COP Section 4.3.4.2; Sunrise Wind 2023). The switchgears are designed to be completely sealed and would be expected to result in little to no SF_6 emissions. All SF_6 insulated switchgears would contain low pressure detectors in case a leak was to occur (APM AQ-07).

Accidental releases: Accidental chemical spills or leaks and subsequent HAP emissions could occur during offshore O&M activities. Spill containment measures on the WTGs and OCS-DC and implementation of best management practices (BMPs) would minimize or eliminate accidental HAP emissions; however, minor HAP emission could occur from broken hoses, pipes, or fasteners (COP Section 4.2.5.1; Sunrise Wind 2023). Accidental releases would be infrequent and less likely to occur than during the construction phase.

3.4.5.3 Conceptual Decommissioning

3.4.5.3.1 Onshore Activities and Facilities

Air emissions: Impacts on air quality from onshore activities during the decommissioning phase would be similar to or of lesser intensity than during the construction and installation phase and would occur for a shorter period of time. Activities would include removing the onshore interconnection cable; however, the OnCS-DC and onshore transmission cable could be abandoned in place (COP Section 4.2.1.3; Sunrise Wind 2023). The potential emissions (e.g., CO, NO_x, VOCs, $PM_{2.5}$, PM_{10}) and sources (e.g., fossil-fuel combustion in construction vehicles and equipment) would be similar to those described for the construction phase. Air emissions from decommissioning were not estimated but are expected to be less than during the construction phase because some facilities may be left in place and because of improved emission control technology and more stringent emission standards 25-35 years in the future. Decommissioning activities would occur in accordance with requirements and permits at that time and with the decommissioning plan. Air emissions would be short-term. Decommissioning would have a minor to moderate impact on air quality.

Climate change: GHG emissions from decommissioning were not estimated but are expected to be less than during the construction phase because some facilities may be left in place and because of improved emission control technology and more stringent emission standards 25-35 years in the future. Decommissioning activities would occur in accordance with requirements and permits at that time and with the decommissioning plan. GHG emissions would be short-term. Decommissioning would have a minor to moderate impact on air quality.

Accidental releases: HAP emissions from accidental chemical spills or leaks during decommissioning may occur infrequently. Emissions would be short-term and would occur at the source. Accidental releases would be minimized or avoided through implementation of BMPs and would have a minor to moderate impact on air quality.

3.4.5.3.2 Offshore Activities and Facilities

Air emissions: Activities during the decommissioning phase would be similar to the construction and installation phase but would occur for a shorter period. Activities would include removing the structure and foundations of the SRWF, OCS-DC, and SRWEC. There would be a short-term increase in marine vessel and helicopter traffic. It is expected that similar equipment would be used as during construction, but air emissions are expected to be less because of improved emission control technology and more stringent emission standards 25-35 years in the future. Decommissioning is expected to be completed within 2 years and any emissions would cease after decommissioning is complete. Decommissioning would occur in accordance with requirements and permits at that time and would have a minor to moderate impact on air quality.

Climate change: Offshore activities during the decommissioning phase would be similar to the construction and installation phase. There would be a short-term increase in marine vessel and helicopter traffic. It is expected that similar equipment would be used as during construction, but GHG emissions are expected to be less because of improved emission control technology and more stringent emission standards 25-35 years in the future. Decommissioning is expected to be completed within 2 years and any emissions would cease after decommissioning is complete.

Accidental releases: HAP emissions from accidental chemical spills or leaks during decommissioning could occur infrequently. Emissions would be short-term and would occur at the source. Accidental releases would be minimized or avoided through implementation of BMPs and would have a minor to moderate impact on air quality.

3.4.5.4 Cumulative Impact of the Proposed Action

The cumulative impacts of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned wind activities.

Air emissions: Onshore and offshore air emissions during construction and installation of the Proposed Action would contribute a noticeable increment to cumulative impacts on air quality. Planned offshore wind construction activities in the MA/RI Lease Area, including the Proposed Action, are estimated to emit 146,087 tons of NO_x; 3,806 tons of VOC; 31,086 tons CO; 6,516 tons PM_{10}; 4,460 tons $PM_{2.5}$; and 2,752 tons of SO_2 (Appendix E); construction emissions associated with the Proposed Action would contribute approximately 1 to 3 percent of the total construction-related emissions through 2030. Emissions from the Proposed Action would be greater than or less than those from other offshore wind projects depending on the project size. The main driver for the impact ratings are combustion emissions from marine vessel, air, and vehicle traffic; construction equipment; and fugitive dust emissions. Emissions would be higher during overlapping activities from ongoing and planned projects but would be short-term, highly variable, and cover large geographic areas and would have a minor to moderate impact on air quality.

Onshore and offshore air emissions during O&M and decommissioning activities would contribute a noticeable increment to cumulative impacts. Planned O&M activities, including the Proposed Action, in the MA/RI Lease Area are estimated to emit 3,241 tons of NO_x; 73.4 tons of VOC; 848 tons CO; 121 tons PM_{10}; 112 tons $PM_{2.5}$; and 45 tons of SO_2 (Appendix E); the Proposed Action would contribute approximately 1 to 9 percent of the total emissions. O&M emissions from the Proposed Action would be greater than or less than those from other offshore wind projects depending on the project size. Overall, cumulative impacts of the Proposed Action associated with O&M activities would be intermittent and widely dispersed and have a minor to moderate impact on air quality. The cumulative avoided emissions resulting from operation of the proposed Project along with other planned offshore wind projects would have a minor to major benefit on air quality. An overall improvement in air quality on a regional scale is expected as fossil-fueled emissions are reduced.

The decommissioning process for all offshore wind projects is expected to be similar to that for SRWF, and air emission impacts would be similar to those of SRWF. Air quality impacts could be greater if decommissioning activities overlap in time. The cumulative impacts of air emissions during decommissioning of the proposed Project would have a minor to moderate impact on air quality.

Climate change: The cumulative impacts of onshore and offshore GHG emissions during construction and installation, O&M, and decommissioning of the Proposed Action would contribute a noticeable increment to cumulative impacts on air quality. Planned construction activities in the MA/RI Lease Area through 2030 are estimated to emit approximately 9,369,195 tons CO_2e of which approximately 3 percent would be contributed by the Proposed Action. The Proposed Action is estimated to contribute approximately 3 percent of the total 771,891 tons CO_2e due to planned cumulative O&M activities. The cumulative impact of GHG emissions would have a minor to moderate impact on air quality. The net decrease in GHG emissions due to increased energy generation from offshore wind projects, including the Proposed Action, would have a cumulative beneficial impact on air quality.

Accidental releases: The Proposed Action would contribute a negligible to noticeable increment to the cumulative accidental release impacts on air quality. Accidental releases would occur infrequently over the 25- to 35-year lifetime of offshore wind projects and would be short-term and localized. The cumulative accidental release impacts during construction, O&M, and decommissioning activities would have a negligible to moderate impact on air quality.

3.4.5.5 Conclusions

Impacts of the Proposed Action

Air emissions, GHG emissions, and accidental releases would each have a **minor** to **moderate** short-term impact on air quality but would be dispersed throughout the construction, O&M, or decommissioning phases of the proposed Project. More air quality impacts from air emissions, GHG emissions, or accidental releases would occur during the construction and decommissioning phases than during the O&M phase because of increased vessel traffic, fugitive dust emissions, and increased use of construction equipment and vehicles. Sunrise Wind has developed an EM&CP and would implement protection, mitigation and enhancement measures to minimize or eliminate potential impacts. Pollutant emissions are not expected to exceed NAAQS because emissions would be spread out in time over the 2-year construction phase, would be less during the O&M and decommissioning phases, and would occur over a large geographic area. Over the lifetime of the Proposed Action, emissions would decrease as emission control technologies improve and emission control standards become more stringent. As the Proposed Action and other offshore wind projects come online, BOEM anticipates that overall emissions from fossil-fuel power generation would decrease and would contribute to a **minor** to **moderate beneficial** indirect impact on air quality through avoided emissions and health benefits.

While there would be emissions of GHGs and criteria pollutants during the construction, O&M, and decommissioning phases, these emissions would be less than the total avoided emissions possible from the proposed Project and would provide **minor** to **moderate beneficial** impacts on air quality. The minimum potential annual avoided CO_2e emissions from the proposed Project are estimated as 2,078,623 tons (1,885,695 metric tons) (COP Appendix K; AKRF 2021). The potential offshore CO_2e emissions during construction of the proposed Project are approximately 10 times less (230,504 tons [209,110 metric tons]) and 2 to 4 orders of magnitude lower than potential onshore construction emissions. The range of potential annual avoided NO_x emissions (1,179 to 1,474 tons [1,070 to 1,337 metric tons]) is similar to the potential emissions during construction of the proposed Project (less than 10 tpy [9.1 metric tons] to approximately 1,000 tpy [907 metric tons] depending on location). However, the minimum expected total avoided NO_X emissions over the 25-to 35-year lifetime of the proposed Project is 29,486 tons (26,749 metric tons) (COP Appendix K; AKRF 2021). Similarly, the range of potential annual avoided VOC emissions (85 tons to 106 tons [77 to 96 metric tons]) is higher than the potential construction, O&M, and decommissioning emissions. Thus, the emissions during construction and operation of the proposed Project would be offset by the avoided emissions and would provide an overall **minor** to **moderate beneficial** impact.

The Council of Environmental Quality (CEQ) issued interim guidance on the consideration of GHGs and climate change under NEPA and recommends that agencies provide context for GHG emissions through the use of the “social cost of greenhouse gases” (SC-GHG) to translate climate impacts into the metric of dollars (CEQ 2023). The SC-GHG consists of the sum of the social cost of carbon, social cost of methane, and the social cost of nitrous oxide and is a monetary estimate of the economic impact of an incremental increase (i.e., emission) of a GHG in a given year. The SC-GHG reflects the social benefits of reducing emissions or the social costs of increasing emissions of the gas in question by one ton (IWG 2021). The SC-GHG includes the value of all climate change impacts, such as changes in agricultural productivity, human health effects, property damage from increased flood risks, risk of conflict, environmental migration, and disruption of energy systems (IWG 2021).

SC-GHG estimates were developed by the Interagency Working Group (IWG) on SC-GHG and published in its Technical Support Document (IWG 2021). A key parameter used in the estimate of the SC-GHG is the discount rate which accounts for the “time value of money” or the general preference for receiving economic benefits now rather than later, by discounting benefits received later. A higher discount rate assumes that future benefits or costs are more heavily discounted than benefits or costs occurring in the present (i.e., future benefits or costs are less valuable or are a less significant factor in present-day decisions) (IWG 2021). In order to account for the uncertainty associated with climate change, the IWG recommends using a range of discount rates to produce a range of estimates for the SC-GHG. IWG developed the current set of interim estimates of SC-GHG using three different annual discount rates: 2.5 percent, 3 percent, and 5 percent (IWG 2021). The state of New York has developed SC-CO_2, SC-CH_4, and SC-N_2O and recommends using discount rates of 1, 2, and 3 percent (NYSDEC 2022). The analysis presented below uses the SC-GHG developed by the state of New York for discount rates of 1, 2, and 3 percent, and the SC-GHG recommended by the IWG for a 5 percent discount rate to provide a range for the SC-GHG associated with the proposed Project.

Table 3.4-8 presents the SC-CO_2, SC-CH_4, SC-N_2O, and SC-GHG estimates associated with emissions from the proposed Project in 2020 dollars. The following years were used for estimating the SC-GHG: construction 2023-2025, O&M 2026-2060, and decommissioning 2061-2062. The negative values based on the minimum and maximum avoided emissions from the OCS air permit reflect a social benefit of avoided emissions. A negative value for the minimum and maximum net SC-GHG indicates that the impact of the Proposed Action would be a net benefit in terms of SC-GHG. Based on the range of discount rates, the SC-GHG associated with construction, O&M, and decommissioning was estimated to range from $79,000,000 to $2,677,000,000 (Table 3.4-8). The net social cost of CO_2, CH_4, and N_2O ranged from -$695,000,000 to -$50,297,000,000; -1,300,000 to -32,000,000; and $100,000 to -37,000,000, respectively. The overall net benefit in terms of SC-GHG ranges from $696,000,000 to $50,367,000,000.

Table 3.4-8. Estimated Social Cost of Greenhouse Gases Associated with the Proposed Action (2020 $) (x10^6)

Description	1% Discount Rate	2% Discount Rate	3% Discount Rate	5% Discount Rate
Social Cost of CO_2				
Construction, O&M, decommissioning	2,634	762	304	77
Minimum avoided emissions	-28,664	-8,163	-3,209	-773
Maximum avoided emissions	-52,931	-15,074	-5,926	-1,427

Description	1% Discount Rate	2% Discount Rate	3% Discount Rate	5% Discount Rate
Minimum net social cost-CO_2	-26,030	-7,401	-2,905	-695
Maximum net social cost-CO_2	-50,297	-14,312	-5,622	-1,349
Social Cost of CH_4				
Construction, O&M, decommissioning	0.32	0.13	0.07	0.03
Minimum avoided emissions	-18	-7	-4	-1.3
Maximum avoided emissions	-33	-13	-7	-2.4
Minimum net social cost-CH_4	-17	-7	-4	-1.3
Maximum net social cost-CH_4	-32	-13	-7	-2.3
Social Cost of N_2O				
Construction, O&M, decommissioning	42	13	5	1.4
Minimum avoided emissions	-45	-13	-5	-1.4
Maximum avoided emissions	-79	-24	-9	-2.4
Minimum net social cost-N_2O	-2	-1	-0.1	0.1
Maximum net social cost-N_2O	-37	-11	-194	-1.0
Social Cost of GHG				
Construction, O&M, decommissioning	2,677	775	309	79
Minimum avoided emissions	-28,727	-8,184	-3,218	-775
Maximum avoided emissions	-53,043	-15,111	-5,942	-1,432
Minimum net social cost-GHG	-26,050	-7,409	-2,909	-696
Maximum net social cost-GHG	-50,367	-14,336	-5,633	-1,353

Notes:

CO_2 = carbon dioxide, CH_4 = methane, N_2O = nitrous oxide, GHG = greenhouse gas

Cumulative Impacts from the Proposed Action

As the Proposed Action and other offshore wind projects come online, BOEM anticipates that overall emissions from fossil-fuel power generation would decrease and would contribute to a **minor** to **moderate beneficial** indirect impact on air quality through avoided emissions and health benefits.

3.4.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

Alternative C-1 would have the same number of turbine locations (up to 94 WTGs) as the Proposed Action that BOEM may approve; however, 8 WTG positions from Priority Area 1 would be excluded from consideration for development. There would be no changes to the onshore facilities, the SRWEC alignments, or the construction timeline and activities. The changes proposed in Alternative C-1 would focus on the arrangement and generating capacity of the WTGs and necessary rearrangement of the IAC to accommodate the new spatial arrangements. Therefore, the discussion of impacts in these sections would focus on the attributes that are substantively different from those under the Proposed Action. In addition, the changes in spatial arrangement are unlikely to affect the duration, intensity, or magnitude of the effects described for the following IPFs: air emissions, climate change, and accidental releases. NEPA directs that an EIS focus on the differences among the alternatives to allow evaluation of their comparative merits. This focus does not disregard the impacts previously described, but the reader is directed to review the direct and indirect impacts on air quality resources described under the Proposed Action in section 3.4.5. A comparison of the alternatives and their potential impacts by IPF is provided in Section 3.4.9.

3.4.6.1 Construction and Installation

3.4.6.1.1 Onshore Activities and Facilities

Under Alternative C-1, impacts on air quality from air emissions, climate change, and accidental releases from onshore construction and installation activities would be the same as described above for the Proposed Action.

3.4.6.1.2 Offshore Activities and Facilities

Under Alternative C-1, the construction of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Air, GHG, and HAP emissions would occur from the same sources as described for the Proposed Action. There would be no substantive difference in the potential for impacts to air quality from air emissions, climate change, or accidental releases under Alternative C-1 as compared to the Proposed Action.

3.4.6.2 Operations and Maintenance

3.4.6.2.1 Onshore Activities and Facilities

Under Alternative C-1, impacts on air quality from air emissions, climate change, and accidental releases during onshore O&M activities would be the same as described above for the Proposed Action.

3.4.6.2.2 Offshore Activities and Facilities

Under Alternative C-1, there would be no substantive differences in the potential impacts to air quality from air emissions, climate change, and accidental releases during O&M compared to the Proposed Action because the same number of WTGs would be operated and require maintenance. The maintenance schedule would likely be similar to the Proposed Action.

3.4.6.3 Conceptual Decommissioning

3.4.6.3.1 Onshore Activities and Facilities

Impacts on air quality from air emissions, climate change, and accidental releases during onshore decommissioning activities would be the same as described above for the Proposed Action.

3.4.6.3.2 Offshore Activities and Facilities

There would be no substantive differences in the potential impacts to air quality from air emissions, climate change, and accidental release during decommissioning of the offshore facilities compared to the Proposed Action because the same number of WTGs would need to be decommissioned.

3.4.6.4 Cumulative Impacts of Alternative C-1

In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-1 to air quality impacts from ongoing and planned activities would not be materially different than the Proposed Action. Ongoing and planned activities, including the Proposed Action or Alternative C-1, would have a **minor** to **major** beneficial impact on air quality because of reduced emissions from fossil-fuel powered electricity generation sources and the associated health benefits.

3.4.6.5 Conclusions

Impacts of Alternative C-1

Under Alternative C-1, impacts on air quality from onshore construction, O&M, and decommissioning would be the same as those described for the Proposed Action. Impacts on air quality from offshore construction, O&M, and decommissioning would not change substantially under Alternative C-1 compared to the impacts described above for the Proposed Action because the same number of WTGs would be installed, maintained, and decommissioned. Under Alternative C-1, the offshore construction and decommissioning phases would be completed in a similar amount of time as compared to the Proposed Action. BOEM expects Alternative C-1 would have a **minor** to **moderate** short-term impact on air quality but would be dispersed throughout the construction, O&M, or decommissioning phases and would have a **minor** to **moderate beneficial** impact due to reduced fossil fuel energy emissions.

Cumulative Impacts of Alternative C-1

BOEM anticipates impacts would be similar to the cumulative impacts of the Proposed Action. Ongoing and planned activities, including Alternative C-1, would have a **minor** to **moderate beneficial** impact on air quality because of reduced emissions from fossil-fuel powered electricity generation sources and the associated health benefits.

3.4.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of up to 12 WTG Positions to the Eastern Side of the Lease Area

For Alternative C-2, the analysis was expanded upon to relocate up to 12 additional WTG positions from the Priority Areas to the eastern side of the Lease Area, in addition to removing up to 8 WTG positions identified in Alternative C-1. This alternative assumes that habitat is more suitable for development on the eastern side of the Lease Area, but surveys conducted in this area in the summer of 2022 found that the southeastern side of the Lease Area contains glauconite substrate that is unsuitable for WTG installation.

3.4.7.1 Construction and Installation

3.4.7.1.1 Onshore Activities and Facilities

Under Alternative C-2, impacts on air quality from air emissions, climate change, and accidental releases from onshore construction and installation activities would be the same as described above for the Proposed Action.

3.4.7.1.2 Offshore Activities and Facilities

Under Alternative C-2, the construction of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Air, GHG, and HAP emissions would occur from the same sources as described for the Proposed Action. Under Alternative C-2, emissions from vessel traffic and installation of the IAC may be slightly more than the Proposed Action because of the longer distance needed to reach the eastern side of the Lease Area.

3.4.7.2 Operations and Maintenance

3.4.7.2.1 Onshore Activities and Facilities

Under Alternative C-1, impacts on air quality from air emissions, climate change, and accidental releases during onshore O&M activities would be the same as described above for the Proposed Action.

3.4.7.2.2 Offshore Activities and Facilities

Under Alternative C-2, the O&M of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Air, GHG, and HAP emissions would occur from the same sources as described for the Proposed Action. Under Alternative C-2, emissions during O&M of the WTGs or IAC may be marginally higher than the Proposed Action because of the longer vessel travel distance and longer length of IAC needed to reach the eastern side of the Lease Area; however, O&M activities of the IAC would be infrequent.

3.4.7.3 Conceptual Decommissioning

3.4.7.3.1 Onshore Activities and Facilities

Impacts on air quality from air emissions, climate change, and accidental releases during onshore decommissioning activities would be the same as described above for the Proposed Action.

3.4.7.3.2 Offshore Activities and Facilities

Under Alternative C-2, air quality impacts from air emissions, climate change, and accidental release during decommissioning would be marginally higher than the Proposed Action because of the longer distance and IAC length needed to reach the eastern side of the Lease Area.

3.4.7.4 Cumulative Impacts of Alternative C-2

In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-2 to air quality impacts from ongoing and planned activities would be marginally more than the Proposed Action. Ongoing and planned wind projects, including the Proposed Action, Alternative C-1, or Alternative C-2, would have a minor to moderate beneficial impact on air quality because of reduced emissions from fossil-fuel powered electricity generation sources and the associated health benefits.

3.4.7.5 Conclusions

Impacts of Alternative C-2

Under Alternative C-2, impacts on air quality from onshore construction, O&M, and decommissioning would be the same as those described for the Proposed Action and Alternative C-1 because the onshore activities would be the same under all alternatives. Impacts on air quality from offshore construction, O&M, and decommissioning would be slightly more under Alternative C-2 compared to the impacts described above for the Proposed Action and Alternative C-1 because of increased vessel emissions due to the longer distance needed to reach the eastern side of the Lease Area and because of the longer length of IAC that would need to be installed, maintained, and decommissioned. Alternative C-2 would have a **minor** to **moderate** adverse impact on air quality and a **minor** to **moderate beneficial** impact due to reduced fossil fuel energy emissions.

Cumulative Impacts of Alternative C-2

Ongoing and planned wind projects, including the Proposed Action, Alternative C-1, or Alternative C-2, would have a **minor** to **moderate beneficial** impact on air quality because of reduced emissions from fossil-fuel powered electricity generation sources and the associated health benefits.

3.4.8 Alternative C-3 - Reduced Layout from Priority Areas Considering Feasibility due to Glauconite Sands

Under Alternative C-3, the construction, O&M, and eventual decommissioning of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Alternative C-3 was developed to address concerns regarding pile refusal due to glauconite sands in the southeastern portion of the Lease Area while still minimizing impacts to benthic and fisheries resources. Alternatives C-3a, C-3b, and C-3c consider different WTG configurations to avoid sensitive habitats and engineering constraints while still meeting the New York State Energy Research and Development Authority (NYSERDA) Offshore Wind Renewable Energy Certificate (OREC). This alternative only considered removal of WTGs from Priority Area 1 based on consultation with NMFS. Under Alternative C-3a, up to 87 11-MW WTGs would be installed in the 87 potential positions. Under Alternative C-3b, up to 84 WTGs would be installed in the 87 potential positions. Under Alternative C-3c, 80 WTGs would be installed in the 87 potential positions.

3.4.8.1 Construction and Installation

3.4.8.1.1 Onshore Activities and Facilities

Under Alternative C-3 impacts on air quality from air emissions, climate change, and accidental releases from onshore construction and installation activities would be the same as described above for the Proposed Action.

3.4.8.1.2 Offshore Activities and Facilities

Under Alternative C-3, the construction of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Air, GHG, and HAP emissions would occur from the same sources as described for the Proposed Action. Under Alternative C-3, a reduced number of WTGs would be installed resulting in slightly less emissions due to construction of the WTGs; however, emissions from vessel traffic and installation of the IAC may be slightly more than the Proposed Action because of the longer distance needed to reach the eastern side of the Lease Area.

3.4.8.2 Operations and Maintenance

3.4.8.2.1 Onshore Activities and Facilities

Under Alternative C-3, impacts on air quality from air emissions, climate change, and accidental releases during onshore O&M activities would be the same as described above for the Proposed Action.

3.4.8.2.2 Offshore Activities and Facilities

Under Alternative C-3, the O&M of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Air, GHG, and HAP emissions would occur from the same sources as described for the Proposed Action. Under Alternative C-3, a reduced number of WTGs would be installed resulting in slightly less emissions due to O&M of the WTGs. O&M of the IAC would be infrequent and not substantially different from the Proposed Action.

3.4.8.3 Conceptual Decommissioning

3.4.8.3.1 Onshore Activities and Facilities

Impacts on air quality from air emissions, climate change, and accidental releases during onshore decommissioning activities would be the same as described above for the Proposed Action.

3.4.8.3.2 Offshore Activities and Facilities

Under Alternative C-3, air quality impacts from air emissions, climate change, and accidental release during decommissioning would be marginally lower than the Proposed Action because of the smaller number of WTGs that would be installed.

3.4.8.4 Cumulative Impacts of Alternative C-3

In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-3 to air quality impacts from ongoing and planned activities would be marginally lower than the Proposed Action. Ongoing and planned wind projects, including the Proposed Action, Alternative C-1, Alternative C-2, or Alternative C-3 would have a minor to moderate beneficial impact on air quality because of reduced emissions from fossil-fuel powered electricity generation sources and the associated health benefits.

3.4.8.5 Conclusions

Impacts of Alternative C-3

Under Alternative C-3, impacts on air quality from onshore construction, O&M, and decommissioning would be the same as those described for the Proposed Action, Alternative C-1, and Alternative C-2 because the onshore activities would be the same under all alternatives. Impacts on air quality from offshore construction, O&M, and decommissioning would be slightly less under Alternative C-3 compared to the impacts described above for the Proposed Action, Alternative C-1, and Alternative C-2 because less construction, O&M, and decommissioning emissions would occur due to fewer WTGs. Alternative C-3 would have a **minor** to **moderate** impact on air quality and a minor to moderate beneficial impact due to reduced fossil fuel energy emissions.

Cumulative Impacts of Alternative C-3

Ongoing and planned wind projects, including the Proposed Action, Alternative C-1, Alternative C-2, or Alternative C-3 would have a **minor** to **moderate beneficial** impact on air quality because of reduced emissions from fossil-fuel powered electricity generation sources and the associated health benefits.

3.4.9 Comparison of Alternatives

BOEM used the USEPA AVERT v4.0 model to estimate the avoided CO_2 emissions for the New York region over the proposed Project's operational lifespan using the default capacity factors in the model. Table 3.4-9 presents the construction emissions for Years 1-3, the O&M emissions for Years 4 to 38, the avoided emissions, net emissions, and operational lifetime new emissions for each alternative. The Proposed Action would result in an annual reduction of 1,728,127 tons of CO_2, equivalent to the removal of 348,867 gasoline-powered passenger vehicles driven for one year (USEPA 2023d). Over the operational lifetime of the Project, there would be an estimated reduction of 60,484,445 tons of CO_2. Alternatives C-1 and C-2 would produce the same, avoided, and net emissions because those alternatives have the same generation capacity, and the same number of WTGs would be installed as the Proposed Action.

The No Action Alternative would result in no emissions during construction or O&M because the proposed Project would not be built. This alternative would provide no avoided emissions resulting in higher CO_2 emissions over the lifetime of the Project and equivalent to adding 365,135 vehicles per year. These estimates are relative to the existing grid configuration, but the actual annual quantity of avoided emissions attributable to the proposed Project is expected to diminish over time if the electric grid becomes lower-emitting due to the addition of other renewable energy facilities and the retirement of high-emitting generators.

Under Alternative C-3a, up to 87 11-MW WTGs would be installed, resulting in a reduction in avoided emissions and construction and O&M emissions of approximately 7.4 percent compared to the Proposed Action. By reducing the energy produced, the avoided emissions would be reduced. The emission reduction under this alternative would be equivalent to removing 322,973 vehicles driven for one year. Under Alternatives C-3b and C-3c, up to 84 11-MW WTGs and 80 11-MW WTGs would be installed, respectively, resulting in approximately 11 percent and 15 percent reductions in avoided, construction, and O&M emissions compared to the Proposed Action. This would be equivalent to the removal of 311,870 gas-powered passenger vehicles driven under Alternative C-3b or 297,044 vehicles driven per year under Alternative C-3c.

Table 3.4-9. Net Emissions of Carbon Dioxide (CO_2) for each Alternative

Annual CO_2 Emissions (U.S. tons)	Construction Emissions (Years 1-3)	O&M Emissions (Years 4-38)	Years 4-38 (Avoided Emissions)	Years 4-38 (Net Emissions)	Operational Lifetime Net Emissions
Alternative A No Action	0	0	0	0	0
Alternative B Proposed	828,278	80,583	1,808,710	-1,728,127	-60,484,445
Alternative C1	828,278	80,583	1,808,710	-1,728,127	-60,484,445
Alternative C2	828,278	80,583	1,808,710	-1,728,127	-60,484,445
Alternative C-3a	766,598	74,582	1,674,440	-1,599,858	-55,995,025
Alternative C-3b	740,163	72,010	1,616,870	-1,544,860	-54,070,088
Alternative C-3c	704,917	68,581	1,540,000	-1,471,419	-51,499,655

*Assumes 35-year operational lifetime of the Project.

Construction, O&M, and decommissioning of Alternatives B, C-1, C-2, and C-3 would have the same overall minor to moderate adverse impacts and minor to moderate beneficial impacts on air quality resources. However, the magnitude of impacts on air quality from offshore construction, O&M, and decommissioning would be slightly more under Alternative C-2 when compared to Alternative B, C-1, and C-3 because of increased vessel traffic due to the longer distance to the eastern side of the Lease Area and length of IAC. Impacts on air quality would be slightly less under Alternative C-3 compared to the impacts described above for the Proposed Action, Alternative C-1, and Alternative C-2 because less construction, O&M, and decommissioning emissions would occur due to fewer WTGs and reduced length of IAC. Table 3.4-10 provides an overall summary of alternative impacts.

Table 3.4-10. Comparison of Alternative Impacts on Air Quality

No Action Alternative (Alternative A)	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C1)	Fisheries Habitat Minimization (Alternative C2)	Fisheries Habitat Minimization Considering Feasibility Due to Glauconite Sands (Alternative C-3)
No Action Alternative: The No Action Alternative would have a **minor** to **moderate** adverse impact on air quality due to ongoing activities that produce air, GHG, and HAP emissions. **Minor** to **moderate beneficial** impacts could occur from avoided fossil-fuel emissions. *Cumulative Impacts of the No Action Alternative:* Existing environmental trends and ongoing and planned activities would have **minor** to **moderate** impacts on air quality. Planned offshore wind activities would have an indirect **minor** to **moderate beneficial** impact on air quality because of reduced emissions from fossil-fuel powered electricity generation sources and the associated health benefits.	*Proposed Action:* The Proposed Action would have a short-term **minor** to **moderate** adverse effect from air emissions, climate change, and accidental releases. While there would be emissions of GHGs and criteria pollutants during the construction, O&M, and decommissioning phases, these emissions would be less than the total avoided emissions possible from the proposed Project and would provide **minor** to **moderate beneficial** impacts. *Cumulative Impacts of the Proposed Action:* The potential emissions from onshore and offshore activities during the construction and installation, O&M, and decommissioning phases would have a **minor** to **moderate** adverse cumulative impact on air quality but would be short-term and dispersed throughout the construction, O&M,	*Alternative C-1:* Alternative C-1 would have a **minor** to **moderate** adverse effect from air emissions, climate change, and accidental releases. **Minor** to **moderate beneficial** indirect impact from reduced emissions from fossil-fueled energy sources and associated health benefits. *Cumulative Impacts of Alternative C-1:* The potential emissions from onshore and offshore activities during the construction and installation, O&M, and decommissioning phases would have a **minor** to **moderate** adverse cumulative impact on air quality but would be short-term and dispersed throughout the construction, O&M, or decommissioning phases. Ongoing and planned activities, including Alternative C-1, would have a **minor** to **moderate beneficial** impact on air quality because of reduced emissions	*Alternative C-2:* Alternative C-2 would have a **minor** to **moderate** adverse effect from air emissions, climate change, and accidental releases. **Minor** to **moderate beneficial** indirect impact from reduced emissions from fossil-fueled energy sources and associated health benefits. *Cumulative Impacts of Alternative C-2:* The potential emissions from onshore and offshore activities during the construction and installation, O&M, and decommissioning phases would have a **minor** to **moderate** adverse cumulative impact on air quality but would be short-term and dispersed throughout the construction, O&M, or decommissioning phases. Ongoing and planned wind projects, including Alternative C-2, would have a **minor** to **moderate beneficial** impact on air quality because of reduced emissions	*Alternative C-3:* Alternative C-3 would have a **minor** to **moderate** adverse effect from air emissions, climate change, and accidental releases. **Minor** to **moderate beneficial** indirect impact from reduced emissions from fossil-fueled energy sources and associated health benefits. *Cumulative Impacts of Alternative C-3:* The potential emissions from onshore and offshore activities during the construction and installation, O&M, and decommissioning phases would have a **minor** to **moderate** adverse cumulative impact on air quality but would be short-term and dispersed throughout the construction, O&M, or decommissioning phases. Ongoing and planned wind projects, including Alternative C-3, would have a **minor** to **moderate beneficial** impact on air quality because of reduced emissions

No Action Alternative (Alternative A)	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C1)	Fisheries Habitat Minimization (Alternative C2)	Fisheries Habitat Minimization Considering Feasibility Due to Glauconite Sands (Alternative C-3)
	or decommissioning phases. BOEM anticipates that overall emissions from fossil fuel power generation would decrease and would contribute to a **minor** to **moderate beneficial** indirect impact on air quality through avoided emissions and health benefits.	from fossil-fuel powered electricity generation sources and the associated health benefits.	from fossil-fuel powered electricity generation sources and the associated health benefits.	from fossil-fuel powered electricity generation sources and the associated health benefits.

3.4.10 Summary of Impacts of the Preferred Alternative

BOEM has identified Alternative C-3b as the Preferred Alternative as depicted in Figure 2.1-11. Alternative C-3b would include installation of up to 84 WTGs, which is 10 fewer WTGs than the maximum WTGs proposed under the PDE of the Proposed Action. Impacts on air quality from offshore construction, O&M, and decommissioning would be slightly less under Alternative C-3 compared to the impacts described above for the Proposed Action, Alternative C-1, and Alternative C-2 because less construction, O&M, and decommissioning emissions would occur due to fewer WTGs. Under Alternatives C-3b, up to 84 11-MW WTGs would be installed, resulting in approximately 11 percent reductions in avoided, construction, and O&M emissions compared to the Proposed Action. This would be equivalent to the removal of 311,870 gas-powered passenger vehicles driven. Alternative C-3 would have a minor to moderate adverse impact on air quality.

3.4.11 Proposed Mitigation Measures

The mitigation measures listed in Table 3.4-11 are recommended for inclusion in the Preferred Alternative.

Table 3.4-11. Proposed Mitigation Measures: Air Quality

Measure	Description	Effect
Air emissions	Sunrise Wind would pursue the procurement of the most efficient and lowest emitting vessels available during the vessel contracting stage of the project. Please note that this mitigation measure is not within BOEM's statutory and regulatory authority but could be adopted and imposed by other governmental agencies.	Reduced vessel emissions during construction, O&M, and decommissioning

3.4.11.1 Effect of Measures Incorporated into the Preferred Alternative

The mitigation measures listed in Table 3.4-11 are recommended for inclusion in the Preferred Alternative. The measure, if adopted, would serve to reduce the potential impacts to air quality through the use of efficient and low emission vessels throughout the life of the project. Because this measure, if adopted, would be implemented regardless of which alternative is identified as the Preferred Alternative, impacts levels discussed above in Section 3.4.5, 3.4.6, 3.4.7 and 3.4.8 would remain unchanged. As such, the Preferred Alternative would have a minor to moderate adverse impact on air quality.

3.5 Water Quality

This section discusses the existing water quality conditions and the potential impacts on water quality from the Proposed Action, the alternatives, and future offshore wind farm development. The GAA (refer to Figure D-2 in Appendix D [*Geographical Analysis Areas*]) includes onshore waters crossed by Project components, a 10-mi (16.1-km) buffer around the offshore Project components, transit routes, and a 15.5-mi (24.9-km) buffer around the ports that may be used for the Proposed Action. Important parameters used to describe the water quality of an area include dissolved oxygen (DO), water temperature, pH, chlorophyll-a, turbidity, salinity, nutrients, and contaminants.

3.5.1 Description of the Affected Environment and Future Baseline Conditions

Water quality within the GAA is managed under the Clean Water Act (CWA) at the federal level by BOEM and USACE, and at the state level by New York, Rhode Island, and Massachusetts agencies. BOEM has jurisdiction over offshore water quality for waters containing the SRWF and SRWEC. New York has jurisdiction over the waterbodies crossed by the SRWEC-NYS and the onshore facilities (Sunrise Wind 2023). The NPS has administrative authority over all waters subject to the jurisdiction of the United States within the legislative boundary of the Fire Island National Seashore, including the water column from the mean high water line up to 4,000 feet (ft; 1,219.2 meters [m]) into Great South Bay, Narrows Bay, and Moriches Bay, and to 1,000 ft (304.8 m) into the Atlantic Ocean, from the eastern boundary of Robert Moses State Park to the western side of Moriches Inlet. New York State (NYS) holds the title to the Atlantic Ocean, including the seafloor, within the park boundary but has granted use and occupancy rights and ceded concurrent jurisdiction to the United States along the ocean for the entire length of the park boundary. New York, Rhode Island, and Massachusetts have authority over concurrence with the Coastal Zone Management Act Federal Consistency Certification.

Sources of pollution to water include point sources, such as pipe or sewer outflows, wastewater or industrial discharges, and non-point sources which include land use practices (e.g., agriculture, urban and stormwater runoff, atmospheric deposition) (COP, Section 4.3.3.1; Sunrise Wind 2023). Water quality in the area is influenced by river runoff (e.g., Connecticut River), surface runoff (from coastal cities), and spills or leaks of chemicals or wastes.

3.5.1.1 Onshore

The state of New York assigns all waters a classification to describe its best uses and its applicable narrative or numeric water quality standards. Information relevant to the proposed Project Area can be found in the New York Codes, Rules, and Regulations Title 6 (6NYCRR). The onshore transmission cable would cross the Intracoastal Waterway (ICW) and Carmans River. The ICW is the area of Great South Bay between Smith Point County Park on Fire Island and Smith Point Marina on Long Island. The state of New York classifies the water in this area as Class SA (NYSDEC 2021a). Class SA water uses include shellfishing for market purposes, primary and secondary contact recreation, and fishing; the waters shall be suitable for fish, shellfish, and wildlife propagation and survival (NYCRR 2021b). Applicable water quality standards are provided in Table 3.5-1 (NYCRR 2021c, 2021d).

Table 3.5-1. Narrative and Numeric Water Quality Standards for Class SA and Class C(TS) Waters

Parameter	Class C(TS)	Class SA and SC
pH	Shall not be less than 6.5 nor more than 8.5.	The normal range shall not be extended by more than one-tenth (0.1) of a pH unit.
DO	For trout spawning (TS) waters the DO concentration shall not be less than 7.0 mg/L from other than natural conditions.	Shall not be less than a daily average of 4.8 mg/L
Dissolved solids	Shall be kept as low as practicable to maintain the best usage of waters but in no case shall it exceed 500 mg/L.	N/A
Taste-, color-, and odor-producing, toxic and other deleterious substances	None in amounts that would adversely affect the taste, color or odor thereof, or impair the waters for their best usages.	
Turbidity	No increase that would cause a substantial visible contrast to natural conditions.	
Phosphorus and nitrogen	None in amounts that would result in growths of algae, weeds and slimes that would impair the waters for their best usages.	

Source: NYCRR 2021c, 2021d.

Notes:
pH = acidity or basicity of an aqueous solution, DO = dissolved oxygen, mg/L = milligram per liter

The Carmans River, located in the town of Brookhaven in Suffolk County, is one of four major rivers on Long lsland, New York. It is within the Atlantic-Long Island Sound water basin, which drains all of Long Island (NYSDEC 2022a). The Carmans River originates in the central portion of Long Island and flows south-southeast through the Central Pine Barrens and Wertheim National Wildlife Refuge and empties into Bellport Bay; it is approximately 10 mi (16.1 km) long (TU 2022). The river's upper 8-mi (12.9-km) reach is freshwater, and the lower 2 mi (3.2 km) are brackish. The section of the Carmans River that would be crossed by the onshore transmission cable is freshwater (COP Appendix L; Stantec 2022) and is classified by the state of New York as Class C(TS), meaning it is Class C and standards for trout spawning waters apply (NYCRR 2021a). The tidal portion of the Carmans River is Class SC. The best use of Class C and Class SC water is fishing, and the water shall be suitable for fish, shellfish, and wildlife propagation and survival, and primary and secondary contact recreation (NYCRR 2021e). The tidal portion of the Carmans River is Class SC. Applicable water quality standards are provided in Table 3.5-1 (NYCRR 2021c, 2021d).

The water quality of Carmans River is influenced by the groundwater that feeds the river, atmospheric deposition, surface and stormwater runoff, agriculture, wastewater, biological activity, and vegetation (Town of Brookhaven 2013). The Carmans River is primarily (95 percent) fed by groundwater from the Nassau/Suffolk Long Island Sole Source aquifer. This aquifer underlies Long Island and is the sole source of freshwater (USEPA 2021a); all the onshore components would cross the aquifer. Contaminants were documented in the Carmans River drainage area that have impacted the groundwater quality but have not affected the river (NYSDEC 2008). The town of Brookhaven adopted the Carmans River Conservation and Management Plan to preserve and protect land within the watershed and water quality in the river and to prevent water quality degradation (Town of Brookhaven 2013).

NYSDEC completed a biological and water quality assessment of the Carmans River in September 2008 (NYSDEC 2008). One of the monitoring sites was just downstream of where the onshore transmission cable would cross the river. The biological assessment profile indicated a slight to moderate impact from a natural state depending on the biological index reflecting good to poor water quality. The DO concentration was 9.6 mg/L and pH was 7.4. The nutrient biotic index for phosphorus and nitrogen indicated eutrophic conditions. Municipal and industrial sources were identified as the source of water quality impacts.

The reach of the Carmans River from approximately 0.4 river miles (RM) (0.6 km) downstream of the crossing site to approximately 7 RMs (11.3 km) upstream was listed as impaired for pH in the draft 2020-2022 CWA Section 303(d) List of Impaired Waters (NYSDEC 2022b). The Carmans River is designated as impaired for its best use (i.e., fishing) because of pH (NYSDEC 2021a). Great South Bay was listed as impaired due to DO and nitrogen levels in 2010; the uses of fishing and secondary contact recreation are listed as impaired (NYSDEC 2021b). Suffolk County developed the Suffolk County Subwatershed Wastewater Plan to address degrading water quality conditions due to high nitrogen levels in marine freshwater and groundwater (SCDHS 2020). Wastewater is the predominant source of nitrogen pollution, followed by fertilizer. Nitrogen concentrations in Great South Bay have increased by 20 percent to 30 percent over the past 15 years (SCDHS 2020).

The United States Geological Survey (USGS) maintains a site (USGS No. 01305000 Carmans River at Yaphank, New York) approximately 3 RMs (4.8 km) upstream of where the onshore transmission cable would cross the Carmans River that monitors river flow and several water quality parameters (USGS 2023). Water quality data collected since 2014 is provided in Table 3.5-2. Water temperature and DO exhibit the typical seasonal variations. DO concentrations were higher in winter/spring and lower in the summer/early fall pH ranged from 6.5 to 7.0 (Table 3.5-2).

Table 3.5-2. Water Quality Data Collected at USGS No. 01305000 Carmans River at Yaphank, New York

Date	Water Temperature (°C)	Specific Conductance (µS/cm)	DO (mg/L)	DO Percent Saturation	pH	Dissolved Solids (mg/L)	Organic Nitrogen (mg/L)	Nitrate+Nitrite (mg/L)	Orthophosphate (mg/L as PO_4)	Phosphorus (mg/L)
9/24/2014	16.3	197	9.5	97	6.8	117	< 0.13	1.44	< 0.012	0.008
3/12/2015	8.7	192	11.5	97	6.6	111	0.2	1.63	0.023	0.01
6/19/2015	21.5	195	9.1	103	6.8	116	0.82	1.27	0.024	0.01
9/25/2015	16.6	213	8.7	88	6.7	121	0.23	1.37	0.015	0.006
3/30/2016	12.9	202	11.4		6.5	121	0.16	1.62	0.014	0.006
6/30/2016	22.7	214	8.8	102	6.9	125	0.25	1.25	< 0.012	0.009
9/23/2016	18.6	218	8.5	91	6.8	122	0.33	1.3	< 0.012	0.007
11/14/2017	7.4	216	11.1	91	6.7	127	0.37	1.74	0.019	0.005
3/19/2018	8	217	11.9	101	6.7	122	0.27	1.82	0.016	0.007
5/30/2018	18.5	201	7.8	83	6.5	117	0.13	1.49	0.016	0.006
9/21/2018	18.9	229	7.5	80	6.6	125	0.78	1.69	0.03	0.011
11/29/2018	8.6	208	10.8		6.9	113	0.5	1.98	0.036	0.012
3/25/2019	9.3	208	10.7		6.9	123	0.25	2.09	0.035	0.006
6/03/2019	17.7	214	9.2		6.7	121	0.27	1.73	0.022	0.009
6/07/2019	20.5	219	8.2		6.6					
8/29/2019	18.8	209	8.3		6.7	118	0.32	1.46	0.024	0.008
11/06/2019	10.3	210	9.5		7	121	0.15	1.91	0.019	0.008

Date	Water Temperature (°C)	Specific Conductance (µS/cm)	DO (mg/L)	DO Percent Saturation	pH	Dissolved Solids (mg/L)	Organic Nitrogen (mg/L)	Nitrate+Nitrite (mg/L)	Orthophosphate (mg/L as PO_4)	Phosphorus (mg/L)
2/24/2020	7.1	198	11.6		6.5	121	0.19	2.06	< 0.012	0.005
5/26/2020	20	203	9.1	99	6.6	117	0.23	1.42	< 0.012	0.007
8/27/2020	19.6	204	8.4	92	6.7	109	< 0.19	1.22	< 0.012	0.009
11/09/2020	13.2	202	9.2	87	6.7	119	0.15	1.83	< 0.012	0.007
2/17/2021	5.7	193	11.9	94	6.8	116	< 0.26	1.95	< 0.012	0.004
5/04/2021	14.8	190	9.5	95	6.7	107	0.22	1.46	< 0.012	0.006
9/13/2021	19.6	203	8.2	89	6.5	113	< 0.15	1.5	0.016	0.008
11/16/2021	9.2	202	10.6	92	6.6	121	< 0.28	1.83	< 0.012	0.004
2/15/2022	2.5	210	12.3	88	6.7	117	0.23	2.04	< 0.012	0.006
6/2/2022	18.3	202	7.6	81	6.6	110	0.21	1.42	< 0.012	0.004
9/8/2022	17.7	202	7.8	82	6.6		0.14	1.33	0.018	0.007

Source: USGS 2023

Notes:

°C = degrees Celsius, µS/cm (microsiemens per centimeter); mg/L = milligram per liter, DO = dissolved oxygen, pH = acidity or basicity of an aqueous solution, PO_4 (phosphate).

The Suffolk County Department of Health Services (SCDHS) monitors water quality at a site approximately 2 RMs (3.2 km) downstream of where the onshore transmission cable cross would the Carmans River (station 95052) and at a site in the ICW (station 90100). Water quality monitoring results from 2015 to 2019 are provided in Table 3.5-3 (adapted from Table 4.3.3-1 and Section 4.3.3.1 of COP; Sunrise Wind 2023).

Table 3.5-3. Water Quality Monitoring Results Completed by the Suffolk County Department of Health Services in 2015 to 2019

Parameter	Station 95052	Station 90100
DO (mg/L)	1.3-11	3.9-12.3
Chlorophyll-a (µg/L)	0.6-44.9	0.53-53.29
Ammonia (mg/L)	0.054	0.073
Nitrite + Nitrate (mg/L)	0.83	1.09
Total Nitrogen (mg/L)	0.39	1.45
Orthophosphate (mg/L)	0.018	0.012
Total Phosphorus (mg/L)	0.064	0.083

Source: Sunrise Wind 2023

Notes:
DO = dissolved oxygen, mg/L = milligram per liter, µg/L = micrograms per liter

The water surrounding some of the proposed ports are listed on state impairment lists. The Port of Albany and the Port of Coeymans are on a reach of the Hudson River in New York that is listed as impaired for fishing because of polychlorinated biphenyl (PCB) pollution (NYSDEC 2022b). Port Jefferson Harbor in New York is listed for shellfishing and primary contact recreation due to fecal coliform. Upper New York Bay, containing the Port of Brooklyn and the Port of New York, is impaired for fishing because of PCBs and dioxins. The Port of Montauk at Lake Montauk, New York, is listed for fishing due to fecal coliform (NYSDEC 2022b). The Paulsboro Marine Terminal on the Delaware River in New Jersey is listed for not supporting fish consumption and aquatic life (NJ DEP 2022). The Thames River at the Port of New London in Connecticut is listed for not supporting marine aquatic life and shellfish (CT DEEP 2020). The New Bedford Marine Commerce Terminal in the New Bedford Inner Harbor in Massachusetts is listed for aesthetics, fish consumption, fish and other aquatic life and wildlife, recreation, and shellfish harvesting (MA DEP 2020). The Port of Providence on the Providence River, Rhode Island, is listed for fish and wildlife habitat because of DO and total nitrogen and for recreation because of fecal coliform (RI DEM 2022).

3.5.1.2 Offshore

The SRWF is located southeast of Block Island, and south of Rhode Island Sound on the OCS in the Mid-Atlantic Bight. The Mid-Atlantic Bight extends from Cape Lookout off North Carolina to Nantucket Shoals off southern New England. Water depths at the SRWF range from approximately 115 to 203 ft (35 to 62

m) (COP Section 4.3.1.1; Sunrise Wind 2023). Typical current velocities vary with depth with stronger currents near the surface that decrease with depth. Overall, surface currents flow to the west in spring to early summer and shift to the east in late summer to fall. Sediments at the SRWF generally consist of a mix of sand and muddy sand, silt, and clay in the southwest of the SRWF with courser sediments to the east and north (COP Section 4.3.2.1; Sunrise Wind 2023). No sand waves are present at the current proposed location of the SRWF. However, areas of sand accumulation in low relief areas were identified across the offshore area. Sediment along the SRWEC-OCS generally consists of sand and muddy sand with some areas of coarse gravelly sand, sand accumulation, and ripple areas.

Several reports describing data collected from waters offshore of Rhode Island and New York were reviewed and results are briefly summarized below to provide a general characterization of water quality in the GAA. Codiga and Ullman (2011) analyzed water temperature and salinity data collected between 1980 and 2007 and water temperature, salinity, DO, chlorophyll-a, and turbidity data collected in 2009 and 2010 for the Rhode Island Ocean Special Area Management Plan. Bathis et al. (2009) presents water quality data collected along the Mid-Atlantic Bight in May 2006 from a joint USEPA and NOAA program. The OceanReports tool was created by BOEM and NOAA to provide an online interactive tool to present environmental ocean characteristics for user-specified areas (NOAA 2021).

The USEPA prepared the National Coastal Condition Reports (NCCR) to describe the environmental conditions in coastal waters. The most recent report describes conditions for 2003 to 2006 (USEPA 2012). The NCCR provides ratings of poor, fair, or good for water quality parameters in coastal waters. In the most recent evaluation published in 2012, the Northeast coastal region (i.e., coastal and estuarine waters from Maine to Virginia) was rated as fair for water quality based on data for DO, chlorophyll-a, dissolved inorganic nitrogen, and dissolved inorganic phosphorus. There was a spatial gradient in the water quality rating with more sampling sites rated fair or good off the coasts of Massachusetts, Rhode Island, Connecticut, and eastern Long Island with more fair and poor sites in western Long Island, and near New York City and New Jersey (USEPA 2012).

In the SRWF and SRWEC-OCS area, water temperature and salinity vary seasonally causing the water column to stratify in late summer with reduced mixing between the surface and bottom waters (Codiga and Ullman 2011; COP Section 4.3.1.1; Sunrise Wind 2023). Upwelling bottom waters and storms in the fall cause mixing and disrupt the thermal stratification pattern. In winter, water temperatures near the surface range from approximately 39°F to 41°F (4°C to 5°C) while temperatures are 40°F to 43°F (4.5°C to 6°C) near the bottom. Water temperatures near the surface in summer are 64°F to 68°F (18°C-20°C) and 52°F to 55°F (11°C to 13°C) near the bottom. Surface water temperatures have a greater seasonal variation (up to 59°F or 15°C) than bottom waters (approximately 41°F or 5°C). Overall, water temperatures are cooler on the eastern side of the SRWF than on the west (Codiga and Ullman 2011; COP Section 4.3.1.1, Sunrise Wind 2023). Water temperatures recorded in May 2006 throughout the Mid-Atlantic Bight ranged from 46.0°F to 64.2°F (7.8°C to 17.9°C) near the surface and from 43.7°F to 59.4°F (6.5°C to 15.2°C) near the bottom (Bathis et al. 2009).

Several lease areas within the Rhode Island/Massachusetts WEAs, including the SRWF, are located on the approximate northern boundary of the Mid-Atlantic Bight cold pool which is a 65- to 200-ft (20-tov60-m)-thick layer of relatively cool water between Cape Hatteras and Georges Bank that is bounded above and onshore by the seasonal thermocline. The cold pool forms in spring and is maintained through the summer by stratification; there is interannual variability in the duration of the cold pool (e.g., Lentz 2017). Overall, water temperatures are less than approximately 10°C (50°F) in the spring and summer and are coldest in the New York bight and are warmer on the eastern side of the cold pool. The potential effects of extensive wind farm development on features like the cold pool is a topic of emerging interest and ongoing research (e.g., Chen et al. 2016; Lentz 2017).

Salinity ranges from approximately 31.5 to 34.5 practical salinity scale (PSS) throughout the GAA. In general, salinity increases with increasing depth and with distance offshore and is higher in the southern end of Rhode Island Sound near the SRWF (COP Section 4.3.1.1; Sunrise Wind 2023). Surface water salinities are highest in the fall and winter, decrease in the spring due to rain and melting, and begin increasing again in summer (Codiga and Ullman 2011; COP Section 4.3.1.1, Sunrise Wind 2023). In May 2006, salinity values near the surface were 31.2 to 33.3 PSS and were 32.2 to 34.4 PSS near the bottom of the Mid-Atlantic Bight (Bathis et al. 2009).

Ocean waters in the offshore Project Area have been shown to be well oxygenated (Bathis et al. 2009; Sunrise Wind 2023). DO concentrations vary seasonally with highest concentrations in early spring and lowest in early fall. In the Rhode Island Sound, DO was reported to be greater than 10 milligrams/liter (mg/L) in March 2009 and between 5 to 9 mg/L during the remainder of the year (Codiga and Ullman 2011). Throughout the Mid-Atlantic Bight, DO ranged from 7.7 to 9.7 mg/L near the surface and 8.1 mg/L to 9.9 mg/L near the bottom (Bathis et al. 2009). These values are considered to represent good water quality based on DO content (USEPA 2012).

Chlorophyll-a levels within the offshore Project Area have been observed to be low (less than 5 micrograms/liter [µg/L]) (Bathis et al. 2009; Codiga and Ullman 2011). Chlorophyll-a was observed to vary seasonally with values below 1 µg/L in summer and 1 to 3 µg/L in spring (NOAA 2021; Sunrise Wind 2023). Chlorophyll-a concentrations less than 5 µg/L are considered good quality (USEPA 2012). Overall, the northeast coastal region was rated fair which represents chlorophyll-a concentrations ranging from 5 to 20 µg/L (USEPA 2012).

The NCCR report rated dissolved inorganic nitrogen and dissolved inorganic phosphorus in Northeast Coastal Waters as good (concentrations of less than 0.1 mg/L) and fair (concentrations ranging from 0.01 to 0.05 mg/L), respectively (USEPA 2012). Bathis et al. (2009) reported dissolved inorganic nitrogen concentrations of 0.01 to 0.20 mg/L in surface waters and higher concentrations of 0.01 to 0.54 mg/L in bottom waters of the Mid-Atlantic Bight; dissolved inorganic phosphorus ranged from 0.02 to 0.06 mg/L at the surface and 0.02 to 0.12 mg/L in bottom waters. Also, in the Mid-Atlantic Bight, pH values of 8.0 to 8.6, and total suspended solid concentrations of 0.9 to 13.5 mg/L have been reported (Bathis et al. 2009).

3.5.2 Impact Level Definitions for Water Quality

This Final EIS uses a four-level classification scheme to analyze potential impact levels on water quality from the alternatives, including the Proposed Action. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of 1 year or less. Long-term impacts may occur throughout the duration of a project or beyond project operations and decommissioning. Table 3.5-4 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for water quality. Table G-4 in Appendix G (*Impact-Producing Factor Tables*) identifies potential IPFs, issues, and indicators to assess impacts to water quality.

Table 3.5-4. Definition of Potential Adverse and Beneficial Impact Levels for Water Quality

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	Impacts on water quality would be undetectable.	Impacts on water quality would be undetectable.
Minor	Impacts on water quality would be detectable but would not result in degradation of water quality in exceedance of standards. Impacts could be avoided with environmental protection measures (EPMs).	Small and measurable improvement in water quality.
Moderate	Impacts on water quality would be detectable and could result in localized, short-term degradation of water quality in exceedance of standards. Impacts could be minimized with EPMs.	Notable and measurable improvement in water quality.
Major	Impacts on water quality would be detectable and could result in extensive, long-term degradation of water quality in exceedance of standards.	Regional improvement in water quality.

3.5.3 Impacts of Alternative A - No Action on Water Quality

When analyzing the impacts of the No Action Alternative on water quality, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities, on the baseline condition for water quality. The cumulative impacts of the No Action Alternative considered the impacts of the No Action Alternative in combination with other planned non-offshore wind and offshore wind activities, as described in Appendix E (*Planned Activities Scenario*).

3.5.3.1 Impacts of the No Action Alternative

Under Alternative A, baseline water quality conditions would continue to follow current regional trends and respond to IPFs introduced by other ongoing non-offshore wind and offshore wind activities. Ongoing activities that could impact water quality in the GAA include onshore development (e.g., urbanization, wastewater or point source discharges, agriculture, forestry), land disturbance (e.g., construction), recreational activities, atmospheric deposition, discharges from marine vessels, dredging, port improvement, commercial fishing, military use, submarine cable and pipeline emplacement, terrestrial runoff, and climate change. Contaminated runoff or accidental releases into surface or groundwaters from these activities could cause exceedances of water quality standards; these impacts would be minimized or avoided through BMPs, state and federal regulations and permitting requirements. BOEM anticipates that impacts from these activities could be short-term to long-term depending on the nature and magnitude of the activities and could have a negligible to moderate impact on water quality.

Ongoing offshore wind activities within the GAA that contribute to impacts on water quality include:

- Continued O&M of the Block Island Project (5 WTGs) installed in state waters; and
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of the Block Island Project and ongoing construction of the Vineyard Wind 1 and South Forks projects would affect water quality through the primary IPFs of accidental releases, cable emplacement and maintenance, discharges, and port utilization. Ongoing offshore wind activities would have the same type of impacts from the IPFs that are described in following section for planned offshore wind activities.

3.5.3.2 Cumulative Impacts of the No Action Alternative

The cumulative impact analysis for the No Action Alternative considers the impacts of the No Action Alternative in combination with other planned non-offshore wind activities and planned offshore wind activities (without the Proposed Action).

Other planned activities that could impact water quality in the GAA are onshore development, land disturbance, recreational activities, atmospheric deposition, discharges from marine vessels, dredging, port improvement, commercial fishing, military use, submarine cable and pipeline emplacement, terrestrial runoff, and climate change. These activities may result in short-term exceedances of water quality standards following a large accidental release, spill, or discharge or short-term increases in turbidity.

The sections below summarize the potential impacts of planned offshore wind activities on water quality during construction, O&M, and decommissioning of the projects. Future offshore wind activities other than the Proposed Action that may result in water quality impacts within the MA/RI Lease Area include New England Wind, South Coast Wind, South Fork Wind, Revolution Wind, Beacon Wind, Vineyard Northeast Wind, and Bay State Wind. The Revolution Wind, New England Wind, South Coast Wind, and Beacon Wind 1 Projects are expected to have overlapping construction schedules with the Proposed Action in 2024 and 2025. The GAA of the South Fork Wind, Revolution Wind, and Bay State Wind Projects overlap with the GAA of the Proposed Action. BOEM anticipates planned offshore wind activities would affect water quality through the following IPFs.

Accidental releases: Planned offshore wind activities may cause accidental releases of contaminants (e.g., oils, fuels, lubricants, coolants, solvents) to the ocean or to onshore waters from marine vessel use, on-vessel equipment, or onshore construction vehicles and equipment. Accidental spills could occur during transfer of fluids, refueling, construction, maintenance, collisions between vessels or with structures, or from large storms. Accidental releases would be short-term, localized to the area of the spill or leak, and be more likely to occur during the construction phase because of increased vessel traffic in ports and offshore construction areas. The probability of a vessel collision or allision is higher if the construction phases of planned offshore wind projects overlap which could occur between 2023 and 2030.

Approximately 629,637 gal of coolant fluids, 1,500,369 gal of oils and lubricants, and 485,427 gal of diesel fuel are estimated to be used in offshore wind projects in the GAA through 2030 (Appendix E). Other chemicals, including grease, paints, and SF_6, would be used at the offshore wind projects, and black and gray water may be stored in sump tanks on facilities. BOEM completed a modeling study to evaluate the likelihood of a chemical spill associated with routine O&M at offshore wind facilities (Bejarano et al. 2013). BOEM found that the risk of a catastrophic release (all oils totaling 129,000 gal [488,318 L] or all chemicals totaling 29,000 gal [109,777 L]) was very low (1 time in greater than or equal to 1,000 years) while small releases (several hundred gallons) were more likely. A small accidental release would have a minor to moderate impact on water quality because it would be short-term and localized to the area of the spill or leak. Future offshore wind projects would be required to comply with all regulatory requirements and permits and to develop an OSRP which requires a rapid spill response, containment, and cleanup for all onshore and offshore activities. A large, catastrophic spill would have short-term to long-term impacts depending on the type and volume of material spilled and impacts on water quality could be minor to major.

An accidental release of trash or debris would be infrequent because planned offshore wind projects would be required to comply with federal and international regulations regarding the management and disposal of trash. An accidental release of trash or debris would have a negligible impact on water quality.

Onshore construction and installation activities would involve the use of fuel and lubricating and hydraulic oils. Use of heavy equipment onshore could result in potential spills during active use or refueling activities. It is assumed that an SPCC Plan would be prepared for each project in accordance with applicable regulatory requirements and would outline spill prevention plans and measures to contain and clean up spills if they were to occur. Additional mitigation and minimization measures (such as refueling away from wetlands, waterbodies, or known private or community potable wells) would be in place to decrease impacts on water quality. Impacts on water quality would be limited to periods of onshore construction and periodic maintenance over the life of each project.

In summary, there is potential for moderate water quality impacts due to a maximum-case scenario accidental release; however, due to the very low likelihood of a maximum-case scenario release occurring, the expected size of the most likely spill to be small, and the expected occurrence to be of low frequency, the cumulative impact of accidental releases is anticipated to be short term, localized, and minor, resulting in little change to water quality. As such, accidental releases from offshore wind development in the water quality GAA would not be expected to contribute appreciably to cumulative impacts on water quality.

Anchoring: Anchoring during planned offshore wind activities would impact water quality through sediment suspension and deposition and increases in turbidity. Anchoring would occur during the construction and installation, O&M, and decommissioning phases of future offshore facilities. Anchoring is estimated to disturb 1,406 ac (6.1 km^2) of the seabed in the GAA. Impacts to water quality would be short-term and within and adjacent to the anchorage area. Impacts could be greater if anchoring activities from more than one project were occurring at the same time. However, due to the localized nature of the sediment plumes, impacts are not expected to overlap geographically. Impacts on water quality would be minor or moderate.

Cable emplacement and maintenance: The installation of offshore export cables is estimated to disturb 2,069 ac (8.4 km^2), and construction of the IAC is estimated to disturb 3,169 ac (12.8 km^2) of the seabed from future offshore wind activities in the GAA. The emplacement and maintenance of cables would result in increased turbidity from the suspension and deposition of sediment. Sediment transport modeling from cable installation completed for the Proposed Action estimated that sediment plumes would remain within approximately 9.8 ft (3 m) above the seabed, that turbidity levels would return to ambient levels within less than 1 hour, and that the maximum deposition would occur within less than approximately 1,000 ft (305 m) from the cable centerline (Woods Hole Group 2022). It is anticipated that future offshore wind projects would use cable emplacement methods that would be most likely to minimize impacts on water quality as much as feasible. Impacts on water quality from future offshore wind activities would be minor or moderate, short-term, localized, and would not be expected to overlap geographically.

Discharges: Permitted discharges would be more likely during the construction and decommissioning phases of planned offshore wind projects and would be infrequent during O&M. During construction, there would be an incremental increase in vessel traffic near ports and in the offshore construction areas and a corresponding increase in regulated discharges (e.g., properly treated wastes, uncontaminated bilge water). All vessels would be required to comply with BMPs and state and federal regulatory requirements and permits related to the prevention and control of discharges.

Offshore wind project structures and facilities (e.g., WTGs, cables) are generally self-contained and do not generate discharges under normal operating conditions. Vessels have onboard containment plans and measures in place to avoid or minimize discharges. Due to the staggered increase in vessels from various projects; the current regulatory requirements administered by USEPA, USACE, USCG, and BSEE; and the restricted allowable discharges, the overall impact of discharges from vessels is anticipated to be short-term, localized, and staggered over time and would have a negligible or minor impact on water quality.

Offshore wind substations that use a high voltage direct current (HVDC) system to convert AC electricity to DC for long-range transmission may require a cooling system (Middleton and Barnhart 2022). The conversion of AC to DC generates a large amount of heat as a byproduct, and the HVDC system must be cooled when operating. The heated water is then discharged back to the ocean. Future offshore wind projects that use a HVDC system would be required to obtain a NPDES permit for the cooling system discharge. There may be a short-term, localized effect on water temperatures in the area surrounding the outlet pipe until the discharge water has mixed and reached equilibrium. It is generally accepted that the heated discharge water would have a minimal effect given the large mass of surrounding ocean and because it would be absorbed and cool to ambient water temperatures over time (Middleton and Barnhart 2022).

Land disturbance: The onshore construction associated with future offshore wind development could cause land disturbance from site preparation, clearing, grading, filling, and excavating which could introduce sediments or pollutants into coastal or surface waters in small amounts if erosion and sediment control measures were to fail. Land disturbance for offshore wind projects that are at a distance from waterbodies and that implement erosion and sediment control measures would be less likely to impact water quality. Construction and installation of onshore components near waterbodies may involve ground disturbance, which could lead to unvegetated or otherwise unstable soils. Precipitation events could potentially erode the soils, resulting in sedimentation of nearby surface or coastal waters and subsequent increased turbidity. Onshore construction activities would comply with all state and federal permits, erosion and sedimentation control plans, and SWPPPs which would minimize or avoid impacts on water quality. While onshore construction activities may occur at the same time, they likely would not overlap geographically. Any sedimentation into nearby waterbodies following land disturbance would be short-term and localized and have a negligible or minor impact on water quality.

Port utilization: Planned offshore wind projects would use ports as staging areas, for material assembly and fabrication, crew transfer, and to support offshore construction and O&M. In-water work associated with port upgrades or expansion would increase vessel traffic and the risk of an accidental spill, leak, or discharge. Any required port upgrades or expansion would be completed in accordance with state and federal regulations and permits and would be completed in collaboration with multiple entities (e.g., port owners, governmental agencies, states, other offshore wind developers). Impacts on water quality from port utilization would be minor or moderate, short-term, and localized.

Presence of structures: Planned offshore wind activities could result in the installation of up to 1,038 WTGs and approximately 23 converter stations in the MA/RI Lease Area, and 238 WTGs in the water quality GAA. In the MA/RI Lease Area, the total footprint from foundations with the addition of scour protection is estimated to be 3,222 ac (1,304 km^2); 211 ac (0.8 km^2) would be within the water quality GAA.

Offshore wind facilities have the potential to impact atmospheric and oceanographic processes through the presence of structures and the extraction of energy from the wind. The presence of offshore wind turbines has been shown to alter the vertical and horizontal mixing patterns of ocean waters which could influence water quality (e.g., water temperature, nutrients, DO, turbidity) by changing the thermal stratification and mixing between the surface and deep waters (e.g., Carpenter et al. 2016; Cazenave et al. 2016; Schultze et al. 2020; Johnson et al. 2021). The range of potential impacts include increased mixing and turbulence downstream, remobilization of sediments, reduced flow inside wind farms, downstream changes in stratification, redistribution of water temperature, and changes in nutrient upwelling and primary productivity (Van Berkel et al. 2020). Human-made structures, especially tall vertical structures such as foundations, alter local water flow at a fine scale by potentially reducing wind-driven mixing of surface waters or increasing vertical mixing as water flows around the structure (Carpenter et al. 2016; Cazenave et al. 2016; Schultze et al. 2020). Alterations in currents and mixing would affect water quality parameters such as temperature, DO, and salinity, but would vary seasonally and very site-specific. For instance, a modeling study of the North Sea found that a simulated offshore wind farm had small impact on DO levels with lower DO in a bathymetric depression and higher DO in more shallow areas (Daewel et al. 2022).

Most studies of the influence of offshore wind turbines on hydrodynamics within a wind farm conducted to date have focused on ocean modeling rather than field measurement campaigns. Further, the general understanding of offshore wind-related impacts on hydrodynamics and water quality is derived primarily from European based studies making it challenging to apply those results to the local and regional physical oceanographic processes and conditions of the Mid-Atlantic Bight and the RI/MA Lease Area.

Hydrodynamic disturbance resulting from the broadscale development of large offshore wind farms is a topic of emerging concern because of potential effects on the Mid-Atlantic Bight cold pool (e.g., Chen et al. 2016; Lentz 2017). Results from a recent hydrodynamic model of four different WTG build-out scenarios of the offshore RI/MA Lease Areas found that offshore wind projects have the potential to alter local and regional physical oceanic processes (e.g., currents, temperature stratification) via their influence on currents from WTG foundations and by extracting energy from the wind (Johnson et al. 2021). The results of the hydrodynamic model study show that introduction of the offshore wind structures into the offshore WEA modifies the oceanic responses of current magnitude, temperature, and wave heights by (1) reducing the current magnitude through added flow resistance, (2) influencing the temperature stratification by introducing additional mixing, and (3) reducing current magnitude and wave height by extracting of energy from the wind by the offshore wind turbines. The additional mixing downstream the turbines would serve to reduce thermal stratification and mix bottom and surface waters. BOEM also conducted a model study offshore Rhode Island and Massachusetts that evaluated ocean processes during two extreme weather events: the February 1978 Nor'easter (a 100-year storm) and the August 1991 Hurricane Bob (Chen et al. 2016). The results indicated that the wind turbine facility on the eastern shelf of Block Island, Rhode Island would cause more significant local and regional impacts than offshore wind facilities over the outer shelves off Massachusetts and Rhode Island. The model found that the influence of the deployment of a wind turbine facility had a significant spatially variable pattern and had a regional impact during both storm types.

The potential influence of offshore wind turbines on hydrodynamic processes and water quality has been shown to depend upon the strength of the local stratification pattern and the local tidal regime. Van Berkel et al. (2020) and Schultze et al. (2020) noted that environments characterized by strong seasonal stratification are likely to be less sensitive to wind field and turbulent mixing effects of turbines on oceanographic processes. The SRWF and surroundings are characterized by strong seasonal stratification in summer and fall, with increased mixing and deterioration of stratification driven by storms and changes in upwelling in late fall into winter (Chen et al. 2016; Lentz 2017). On the Mid-Atlantic Bight, increased mixing could influence the strength and persistence of the cold pool while also serving to redistribute DO and nutrients. However, the turbulence introduced by monopile foundations is not expected to significantly affect the cold pool due to the strength of the stratification (temperature differences between the surface and the cold pool reach 50°F [10°C] [Lentz 2017]). In strongly stratified locations, the mixing seen at monopiles is often masked by processes forcing toward stratification (Schultze et al. 2020). The introduction of nutrients from depth into the surface mixed layer can also lead to a local increase in primary production (Floeter et al. 2017; refer to Section 3.5.5, *Finfish, Invertebrates, and Essential Fish Habitat*, Section 3.5.6, *Marine Mammals*, and Section 3.5.7, *Sea Turtles*, regarding hydrodynamic and atmospheric wake effects on primary production). Furthermore, Christiansen et al. (2022) discussed the importance of tides on the potential impacts of wake effects on hydrodynamics and suggested that hydrodynamic processes in a tidally dominated regime may only be half as strong as regions not tidally dominated due to tidal currents deflecting wind-induced processes.

The exposure of offshore wind structures, which are mainly made of steel, to the marine environment can result in corrosion without protective measures. Corrosion is a general problem for offshore infrastructures and corrosion protection systems are necessary to maintain the structural integrity. Protective measures for corrosion (e.g., coatings, cathodic protection systems) are often in direct contact with seawater and have different potentials for emissions (e.g., galvanic anodes emitting metals, such as aluminum, zinc, and indium, and organic coatings releasing organic compounds due to weathering and leaching). The current understanding of chemical emissions for offshore wind structures is that emissions appear to be low or not distinguishable from background levels, suggesting a low environmental impact, especially if compared to other offshore activities. However, chemical emissions may become more relevant for the marine environment with increased numbers of offshore wind projects and a better understanding of the potential long-term effects of corrosion protection systems (Kirchgeorg et al. 2018; BSH and Hereon 2022). Based on the current understanding of offshore wind structure corrosion effects on water quality, BOEM anticipates the potential impact to be minor; this area is currently under investigation.

3.5.3.3 Conclusions

Impacts of the No Action Alternative

Under Alternative A, the No Action Alternative, baseline water quality conditions would continue to be affected by existing environmental trends and ongoing activities and to be impacted by existing sources (e.g., runoff, industrial or municipal point sources, atmospheric deposition, agriculture, marine vessel traffic, dredging, coastal road construction, recreation and tourism, harbor and port operations). Ongoing activities include vessel traffic, military activities, onshore development and land disturbance, port development, commercial and industrial activities, recreational activities, and installation of new offshore structures. While water quality impacts would be temporary and localized, and regulatory and permitting requirements minimize these impacts, issues with water quality may still occur. Accidental releases or discharges, anchoring, cable emplacement and maintenance, port utilization, presence of structures, or land/seafloor disturbance would each have negligible to moderate short-term impacts on water quality. Overall, the No Action Alternative would have a **minor** adverse impact on water quality.

Cumulative Impacts of the No Action Alternative

Under the No Action Alternative, existing environmental trends and ongoing activities would continue. Planned offshore wind projects are anticipated to have negligible to moderate adverse impacts on water quality through anchoring; cable installation/maintenance; port utilization; presence of structures; discharges; and land or seafloor disturbance. These IPFs could result in short-term exceedances of water quality standards. Future offshore wind projects may result in a small increase in vessel traffic, particularly during the construction and decommissioning phases, with corresponding potential impacts on water quality. Increased vessel traffic would be localized to the ports, transit routes, and offshore construction areas. Construction and decommissioning activities associated with other offshore wind activities would lead to increases in sediment suspension and turbidity in the offshore lease areas during the first 6 to 10 years of construction of projects and in the latter part of the 30-year life spans of offshore wind projects due to decommissioning activities. Runoff into surface waters or ground waters could result in exceedances of water quality standards that can affect the beneficial uses of the water. BOEM has considered the possibility of impacts resulting from accidental releases; a moderate or major impact could occur if there was a large-volume, catastrophic release or spill. However, the probability of catastrophic release occurring is very low, the expected size of the most likely spill would be very small, and such a spill would be expected to occur infrequently.

The potential impacts on water quality from planned activities would be avoided or minimized through state and federal regulations and any development would comply with all permit requirements (e.g., implementation of BMPs, OSRP, Erosion and Sedimentation Control Plan, and SWPPP). Considering all the IPFs together, BOEM anticipates the overall potential cumulative impacts on water quality associated with planned offshore wind activity would be **minor** adverse.

3.5.4 Relevant Design Parameters and Potential Variances in Impacts

This Final EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than those described in the sections below. The primary proposed PDE parameters (Appendix C) that would influence the magnitude of the impact on water quality include the following:

- The number, capacity, and location of WTGs: the level of impact related to the WTGs is proportional to the number of WTGs installed and the amount of seabed disturbed;
- The amount of vessel use during construction/installation, O&M, and decommissioning: the number of vessels used influences the potential risk of fuel or chemical spills or releases;
- The length of the IAC and export cables: the amount of cable installed influences the amount of seafloor disturbed and sediment mobilized;
- Sediment type influences the amount of sedimentation, deposition, and disturbance;
- Offshore and onshore cable installation and laying methods;
- Different routes for the OTC: the use of different routes influences the potential water bodies crossed by the cable; and
- Quantity and type of oil, lubricants, or other chemicals contained in the equipment, vessels, and WTG.

Variability of the proposed Project design as a result of the PDE includes the number of WTGs (influences number of foundation), capacity of WTGs (influences size of foundation), length of cables (influences volume of seabed disturbed), area of scour protection (influences amount of sedimentation and deposition), number and frequency of vessel use. Changes in design may affect the magnitude, location, and mechanism of water quality impacts.

3.5.5 Impacts of Alternative B - Proposed Action on Water Quality

The sections below summarize the potential impacts of the Proposed Action on water quality during the various phases of the Proposed Action. Routine activities would include construction, O&M, and decommissioning of the Project, as described in Chapter 2, Section 2.1.2 *Alternative B – Proposed Action.* Construction, O&M, and decommissioning activities associated with the Proposed Action would contribute to impacts on water quality from accidental releases and discharges, anchoring, cable emplacement and maintenance, land disturbance, port utilization, and presence of structures.

3.5.5.1 Construction and Installation

3.5.5.1.1 Onshore Activities and Facilities

Accidental release: Accidental release of fuels, oils, solvents, lubricants, drilling, or hydraulic fluids to surface, ground, or coastal waters could occur from construction vehicles, heavy equipment, HDD activities, and refueling during construction and installation of the onshore Project components. The likelihood of a large oil or chemical spill is low, and the magnitude of the impact would depend on the spill volume. However, a direct spill into a water body could degrade water quality. Any impact on surface, coastal, or ground water quality, including the Nassau/Suffolk Long Island Sole Source Aquifer, would be avoided or minimized through implementation of BMPs, development and implementation of an SWPPP and an SPCC Plan (APM GEN-20, GEN-21, WQ-01), and EPMs described in COP Section 4.3.3.3 (Sunrise Wind 2023). An Inadvertent Return Plan would be developed and implemented to avoid or minimize the accidental release of drilling fluid during HDD for installation of the onshore transmission cable (APM GEN-22). The Sunrise Wind EM&CP includes the specific plans referenced above.

Good housekeeping and proper waste collection, storage, and disposal techniques would be implemented to minimize impacts on water quality from trash and debris. All trash and debris created during onshore construction and installation activities would be properly disposed of or recycled at licensed waste management and recycling facilities (APM GEN-19).

Environmental protection and mitigation measures from applicable federal and state permits would be followed which would minimize impacts on water quality. Construction of the onshore facilities is expected to be completed within 2 years and any impacts on water quality would cease after construction is complete. Potential impacts on water quality are anticipated to be localized and short-term and minor or moderate.

Anchoring: There would be no impacts on water quality during the construction and installation of onshore facilities from anchoring.

Cable emplacement and maintenance: Construction and installation of the onshore cables could impact water quality through increased sedimentation and turbidity. Cable emplacement would be conducted using trenchless methods to minimize or avoid impacts on water quality and in accordance with the erosion and sedimentation control plan and SWPPP. Potential impacts to water quality are anticipated to be localized and short-term and negligible to minor.

Dewatering may be necessary to remove ground water and stormwater from open excavations to facilitate excavation activities in areas of shallow groundwater. Some of the dewatering locations may be within or adjacent to the Carmans River 100-Year Groundwater Contributing Area (Dewatering Plan). In the vicinity of the Carmans River, the groundwater is expected to be located from 6 to 14 ft (1.8 to 4.3 m) below grade surface. The majority of trenching activity is not expected to exceed 5 ft (1.5 m); thus, impacts to groundwater are anticipated to be negligible. Onshore activities associated with the SRWF would not be anticipated to interfere with implementation of the Carmans River Conservation and Management Plan and the protection of water quality in the Carmans River (Town of Brookhaven 2013).

Discharges: Onshore construction activities would produce waste (e.g., solid waste, chemicals, oils, solvents, sewage) that would be properly controlled, stored, and disposed of in accordance with state and federal permits. The OnCS-DC, onshore interconnection cable, and onshore transmission cable would be self-contained and would not generate discharges. Discharges would be more likely during the onshore construction phase because of the increased vehicle and equipment use. Impacts on water quality would be negligible or minor.

Seafloor/Land disturbance: Construction of the onshore facilities would require short-term ground-disturbing activities, such as clearing, grading, excavating, trenching, and HDD at the landfall work area, during TJB and HDD installation, installation of the onshore interconnection cable and OTC, and construction of the OnCS-DC. Land disturbance activities would impact the water quality of surface, ground (i.e., the Nassau/Suffolk Long Island Sole Source Aquifer), or coastal waters (e.g., shoreline of Smith Point County Park, Fire Island) through erosion, sedimentation, deposition, resuspension of contaminated sediment, and increased turbidity if control measures were to fail. Impacts on water quality from land disturbance would be more likely during the construction phase.

Land disturbance during onshore construction would be minimized by installing facilities in areas that have been previously disturbed or developed (APM GEN-01). Sunrise Wind selected locations for the OnCS-DC, landfall site, and transmission route that would minimize land disturbances. A maximum area of 7.0 ac (2.8 hectares [ha]) would be disturbed for construction of the OnCS-DC; land disturbance near the OnCS-DC would be minimal because the site is near other industrial and commercial developments and contains minimal vegetated areas (COP Section 2.2.1.1, Sunrise Wind 2023). Smith Point County Park was chosen as the proposed landfall site because it has sufficient workspace within a developed area and minimal conflicts with adjacent land uses. HDD activities would be used to install the SRWEC to the TJB and the onshore transmission cable which would minimize land disturbance. The onshore interconnection cable and proposed onshore transmission route is primarily within an existing right-of-way and near paved, disturbed areas which would confine any disturbance to the construction areas. The disturbance would cease after the cable installation has been completed. Areas disturbed for the short-term creation of construction work areas would be returned to pre-existing conditions.

Sediment suspension and deposition to the ICW and Carmans River could occur during construction and installation of the OTC. The maximum lengths of the ICW and Carmans River that would be crossed are 2,222 ft (667 m) and 2,177 ft (664 m), respectively (COP Section 3.3.2.3, Sunrise Wind 2023). The ICW and Carmans River would be crossed using trenchless installation methods (i.e., HDD) to avoid or minimize impacts to water quality. An Inadvertent Return Plan would be developed and implemented to avoid or minimize the accidental release of drilling fluid during HDD for installation of the onshore transmission cable (APM GEN-22). All land disturbance activities during onshore construction would be conducted in compliance with federal permits (Section 404, Section 401 Water Quality Certification), the NYS Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges associated with construction activities, an approved SWPPP, and EPMs described in Section 4.3.3.3 of the COP (Sunrise Wind 2023) at a minimum; a draft WQC for the Project was issued in August 2023. These measures would serve to protect the Smith Point County Park and Fire Island Wilderness Areas. Construction of all onshore facilities is expected to be completed within 2 years. Potential impacts to water quality would be localized and short-term and cease after construction is completed. Impacts on water quality from land disturbance would be minor or moderate.

Port utilization: Multiple ports are being considered for use during the construction phase. In-water work associated with port upgrades or expansion would increase vessel traffic and the risk of an accidental spill, leak, or discharge. Any required port upgrades or expansion would be completed in accordance with state and federal regulations and permits and would be completed in collaboration with multiple entities (e.g., port owners, governmental agencies, states, other offshore wind developers). Impacts on water quality from port utilization would be minor or moderate, short-term, and localized.

Presence of structures: The presence of structures in coastal waters would not likely impact water quality. An impact could occur if a vessel collides with a structure causing an accidental chemical spill or leak. However, the risk of this is low and any spill would be quickly contained and cleaned. A collision is more likely during the construction phase because of the increased vessel traffic. The impacts of the Proposed Action on onshore water quality due to the presence of structures would be negligible.

3.5.5.1.2 Offshore Activities and Facilities

Accidental releases: Fuels, oils, solvents, and chemicals would be used during construction of the offshore facilities and would be stored on the WTGs and OCS. Approximately 336,004 gal of coolants, 318,250 gal of oils and lubricants, and 24,304 gal of diesel fuel are estimated to be used for the Proposed Action. BOEM has conducted modeling to evaluate the likelihood of a chemical spill at offshore wind facilities at three locations along the Atlantic coast, including an area in the Rhode Island/Massachusetts lease area with a similar number of WTGs (98) as the Proposed Action (Bejarano et al. 2013). Results of the model found that the likelihood of a catastrophic, or maximum-case scenario, release of 129,000 gal of oil mixture was 'Very Low' meaning it could occur one time in 1,000 or more years. The most likely type of spills to occur were from the WTGs at a volume of 90 to 440 gal at a rate of one time in 5 years or a diesel fuel spill of up to 2,000 gal at a rate of one time in 91 years (Bejarano et al. 2013). Overall, the risk of an accidental spill or leak is low but more likely during the construction phase because of the increased vessel traffic and equipment use. However, this would be unlikely because of safety measures such as requirements for vessel lighting and marking, vessel speed restrictions, and spacing of facilities (APM GEN-08, GEN-15, GEN-23). Overall, the probability of an oil or chemical spill occurring that would be large enough to affect water quality is low, and the degree of impact on water quality would depend on the spill volume. If a large spill were to occur (e.g., 129,000 gal, Bejarano et al. 2013), impacts would be short-term to long-term depending on the volume and type of material released. Overall, impacts on water quality from spills and leaks would be short-term and minor to moderate because construction activities would comply with state and federal regulations and impacts would only occur during accidental events (WQ-01). Sunrise Wind would follow all BMPs, an OSRP, and other mitigation measures described in Section 4.3.3.3 of the COP (Sunrise Wind 2023) at a minimum.

The release of contaminants within sediments due to sediment resuspension and deposition is expected to be minor because there are no USEPA-designated ocean disposal sites overlapping or immediately adjacent to the SRWF (USEPA 2021b). Impacts on water quality from resuspension of contaminated sediments would be negligible or minor.

Adverse impacts to waters within the Fire Island National Seashore and nearshore waters would be avoided and minimized through compliance with multiple mitigation plans submitted in the EM&CP, including a Dewatering Plan, Materials Management Plan, Wetland Monitoring and Impact Minimization Plan, OSRP, SPCC Plan, SWPPP, and the Certificate of Environmental Compatibility and Public Need Conditions. SRW would use a transport barge to move material across the ICW to the temporary Landing Structure that would be installed in Narrow Bay. Vessels traveling across the ICW pose a risk for accidental releases. All vessels would be required to comply with USEPA and USCG, and BOEM pollution prevention measures and storage and disposal regulations. The Onshore SPCC and Offshore SPCC plans describe the storage, handling, transportation, and disposal of oil, fuels, petroleum, chemicals or other potentially hazardous or harmful substances, the measures that would be taken to avoid spills, and the procedures for responding, reporting, and remediating any spills.

Sunrise Wind would follow all BOEM and USCG regulations and good housekeeping practices related to the storage and disposal of all trash and debris created during construction and installation of the offshore components. All trash and debris would be properly stored on vessels for disposal or recycling at an appropriate facility on land. Sunrise Wind would follow BMPs including orderly storage of equipment and tools and keeping work areas clean. The disposal of trash and debris to the marine environment is prohibited, and thus unlikely to occur (BOEM 2013). The potential impact of trash and debris on water quality is negligible or minor.

Anchoring: Construction of the offshore facilities would require anchoring of vessels to the seabed which would cause increased sedimentation, deposition, and turbidity. Anchoring could disturb the seabed through penetration of the anchors, dragging of anchors, or the sweeping of chains. The extent and magnitude of impacts from anchoring would depend on the type and size of anchoring used, vessel drag distance, and the sediment characteristics. Approximately 260 ac (1.1 km^2) of seabed is expected to be disturbed due to anchoring from the Proposed Project alone, and 1,204 ac (4.9 km^2) of seabed disturbance with existing and ongoing projects (Appendix E). Impacts on water quality from anchoring would be minor.

Cable emplacement and maintenance: All of the potential cable installation techniques (e.g., jet plowing, mechanical plowing, mechanical cutting, dredging, backfill plowing) would disturb the seafloor. Site preparation activities, such as sand wave clearance and boulder removal, would be required prior to cable installation. Cable emplacement would cause sediment suspension and deposition and increased turbidity; however, the impacts would be short-term and minor. SRW has developed a Suspended Sediment and Water Quality Monitoring Plan for activities associated with the SRWEC-NYS which specifies monitoring requirements for various construction activities (e.g., jet trenching, HDD exit pit excavation, sand wave leveling, cable installation) and total suspended sediment (TSS) limits (APM WQ-02). Further, conditions 9 to 11 of the draft WQC (issued August 2023) describe water quality monitoring requirements.

Hydrodynamic and sediment transport modeling was completed to estimate suspended sediment and deposition levels from construction activities associated with excavation of an HDD exit pit, installation of the IAC, SRWEC-OCS, SRWEC-NYS, and sand wave leveling for seafloor preparation using controlled flow excavation (CFE) and a trailing suction hopper dredge (TSHD) in federal waters (Woods Hole Group 2022). In the model, turbidity levels were represented as TSS, and deposition was represented as thickness above seafloor.

Sediment deposition after HDD exit pit excavation in NYS waters was modeled using a clamshell bucket and using an open bucket. The open bucket method was estimated to produce a higher maximum TSS concentration (greater than 100 mg/L); using a clamshell bucket, TSS concentrations over 100 mg/L did not occur. The area with a deposition thickness greater than 10 mm extended farther from the source using the open bucket method. Using both excavation methods, TSS concentrations were estimated to return to ambient levels within 0.3 hours. For these two scenarios, the excavated material would be transferred through the water column to be stored on a barge. Another option being considered by SRW is to store the sediment on the seafloor next to the excavated pit which would result in lower TSS concentrations; however, sediment mobilization could occur during storm (e.g., high wind) events. Modeling results suggested that nearly all (95 percent) mobilized sediment remained within 500 ft (152 m) of the initial placement site (Woods Hole Group 2022).

Installation of the SRWEC-NYS using HDD was not modeled to produce TSS concentrations above 100 mg/L. The TSS plume was predicted to remain within 8.2 ft (2.5 m) above the seafloor, and TSS concentrations were predicted to return to ambient levels within 0.3 hour after completing installation. For installation of the SRWEC-OCS, the TSS plume was predicted to remain within approximately 9.8 ft (3 m) above the seafloor with maximum concentrations (greater than 100 mg/L) occurring within 2,969 ft (905 m) of the cable centerline. TSS was predicted to return to ambient levels within 0.4 hours. Sedimentation levels above 0.4 inch (10 mm) extended to 791 ft (241 m) from the cable centerline and covered 832.3 ac (3.4 km^2). Sand wave leveling along the SRWEC-OCS would be required using either CFE or TSHD. The TSHD method was modeled to produce lower peak TSS concentrations and higher deposition thicknesses.

For installation of the IAC, modeling was completed for a typical and worst-case scenario (i.e., using jet plowing). Results showed that maximum TSS concentrations (greater than 100 mg/L) occur within 2,031 ft (619 m) to 3,346 ft (1,020 m) of the cable centerline (Woods Hole Group 2022). The plume remained primarily within approximately 9.5 ft to 12.8 ft (2.9 m to 3.9 m) above the seafloor. TSS levels were estimated to return to ambient levels within 0.4 hour to 0.5 hour after completion of installation.

Overall, the sediment transport modeling estimated that sediment plumes would quickly settle to the seabed (less than 1 hour) and would be limited to within 9.8 ft to 13.1 ft (3 m to 4 m) above the seabed. Impacts on water quality from cable emplacement would be short-term, localized, and minor.

Discharges: Discharges of chemicals, sewage, or wastewater (e.g., domestic water, deck drainage, uncontaminated ballast and bilge water) from marine vessels used during offshore construction may occur. All marine vessels used during construction would be required to comply with international, federal, and state regulations and standards for the management, storage, treatment, and disposal of solid and liquid wastes. All vessel operators would be trained and licensed. All solid and liquid wastes would be properly treated and disposed of at appropriate waste receiving sites on land.

The discharge of bilge water, ballast water, and domestic water is permitted (BOEM 2013; 33 *CFR* 151.10). These wastes are expected to quickly disperse, dilute, and biodegrade (BOEM 2013); thus, these regulated discharges would be expected to have minor, local, and short-term impacts. Sunrise Wind would follow all BMPs and the Emergency Response Plan/OSRP and other mitigation measures described in Section 4.3.3.3 of the COP (Sunrise Wind 2023) at a minimum.

Seafloor/Land disturbance: Offshore construction activities would cause short-term seafloor disturbance. Installation of the WTG foundations and OCS-DC, anchoring, seafloor preparation (e.g., sand wave leveling, boulder relocation), and cable installation would cause short-term, localized increases in sediment suspension, deposition, and turbidity levels. The maximum estimated area of seafloor disturbance during construction of the WTG foundations is 3,835 ac (15.5 km^2); OCS-DC is 37.6 ac (0.15 km^2), IAC is 2,150 ac (8.7 km^2), SRWEC-OCS is 1,185 ac (4.8 km^2), and of the SRWEC-NYS is 74 ac (0.3 km^2) (COP Section 3.3.5.2, 3.3.7.2, 3.3.3.5, Sunrise Wind 2023). Disturbance from cable laying would be confined to a narrow region around the cable trench. Construction of the offshore components is expected to be completed within 18 months. Seafloor disturbance would be short-term and cease after construction is complete. Impacts on water quality would be negligible or minor and would be minimized or avoided through use of BMPs and other mitigation measures described in Section 4.3.3.3 of the COP (Sunrise Wind 2023) at a minimum.

Port utilization: Several ports are being considered to support the offshore construction phase. The short-term increase in vessel traffic during construction may increase the likelihood of an accidental release or discharge or sedimentation. Impacts on water quality would be negligible or minor, short-term and localized and minimized through implementation of BMPs and measures described in Section 4.3.3.3 of the COP (Sunrise Wind 2023) at a minimum.

Presence of structures: There are currently no existing stationary facilities or structures within the Lease Area; therefore, there is currently no risk of an allision or collision. After the WTGs and OCS-DC are constructed, the potential risk of collision or allision would be low and an accidental release or discharge would be unlikely because of the reasons discussed above in the *accidental releases* section. The presence of structures is known to alter the vertical and horizontal mixing patterns of ocean waters which could influence water quality (e.g., water temperature, salinity, DO, turbidity) by changing the thermal stratification and mixing between surface and deep waters (e.g., Carpenter et al. 2016; Cazenave et al. 2016; Schultze et al. 2020); however, the potential influence on hydrodynamic processes in the Mid-Atlantic Bight is not well studied. See Section 3.5.3.2 for additional discussion of the potential influence of structures on hydrodynamics. Impacts on water quality from the installation of structures would be minimized through implementation of BMPs and compliance with permits and would be negligible or minor.

3.5.5.2 Operations and Maintenance

3.5.5.2.1 Onshore Activities and Facilities

Accidental releases: Operation of the OnCS-DC would require the storage and use of oils, fuels, and lubricants. A maximum of 101,333 gal (347,918 L) of oils, fuels, and lubricants could be used to operate the OnCS-DC. Passenger vehicles and heavy equipment used during maintenance activities (e.g., equipment testing, routine repairs, vegetation clearing) could infrequently result in the accidental release of fuels or oils during use or refueling. The onshore transmission cable would not contain any chemicals or fuels and would not be susceptible to leaks. Operation and preventative maintenance activities would be completed in accordance with an O&M Plan. Implementation of the SPCC Plan (APM GEN-21), as well as EPMs described in Section 4.3.3.3 of the COP (Sunrise Wind 2023), would prevent or minimize the accidental release of fuels, oils, or lubricants to onshore waters and would contain measures for containment and clean up. Fewer vehicles and equipment would be used during the O&M phase and impacts on water quality would be less likely than during construction. Impacts to water quality due to an inadvertent release would be short-term and localized.

Trash and debris may be generated during O&M activities; the amount of trash and debris would be less than during the construction phase. Good housekeeping and proper waste management methods would minimize or avoid the introduction of trash and debris to onshore waters (APM GEN-19). Potential impacts to onshore water quality would be minor.

Anchoring: There would be no impacts on water quality during O&M activities at onshore facilities from anchoring.

Cable emplacement and maintenance: Impacts on water quality due to cable emplacement and maintenance would be minimal and would only occur if non-routine maintenance or repair activities were needed for the onshore interconnection cable or OTC. Sediment suspension or deposition could occur if there is a fault or failure of an onshore cable in or near the ICW or Carmans River that requires repair. If sediment disturbance is necessary, EPMs and permit requirements would be followed. The SWPPP would include erosion and sedimentation controls to prevent or minimize the introduction of sediment to onshore waters. Potential impacts to water quality would be minor and short-term and less than those that may occur during the construction phase.

Discharges: Operation of the OnCS-DC would require the use of oils, fuels, and lubricants and maintenance vehicles would use engine fuel. Implementation of the SPCC Plan would prevent or minimize the accidental discharge of chemicals or fuels. Impacts to water quality due to an inadvertent discharge would be minor, short-term, and localized.

Seafloor/Land disturbance: Land disturbance due to O&M activities at the onshore facilities is expected to be minimal. Land disturbance could occur if a repair or replacement is needed that would require re-excavation along the cable. Potential impacts to water quality from land disturbance would be less frequent than during the construction phase.

Port utilization: Several ports are being considered to support O&M activities. Port utilization for onshore O&M would have a negligible or minor impact on water quality.

Presence of structures: The presence of structures in coastal waters, such as docks and piers, would not likely impact water quality during onshore O&M activities. An impact could occur if a vessel collides with a structure causing an accidental chemical spill or leak. Vessel traffic would be less than during the construction phase, and the risk of a collision or allision is low. Any spill or discharge would be quickly contained and cleaned. The impacts of the Proposed Action on onshore water quality due to the presence of structures would be negligible.

3.5.5.2.2 Offshore Activities and Facilities

Accidental releases: During the offshore O&M phase, impacts on water quality from accidental releases could occur during periodic vessel use for regular inspections and maintenance practices and from on-vessel equipment used for repairs or maintenance. Routine inspections of electrical components and minor corrective and preventative maintenance actions would occur multiple times per year (COP Section 3.5.2, Sunrise Wind 2023). Annual maintenance activities would include above water and visual inspections, routine service and safety checks, and oil and high-voltage maintenance (COP Section 3.5.4, Sunrise Wind 2023). Non-routine (e.g., corrective and major repairs) maintenance would occur as needed. Accidental releases during the O&M phase would be less likely than during the construction phase because there would be fewer vessels.

Oils, gases, lubricants, and fuels would be used at the OCS-DC in transformers and reactors, fuel tanks, cranes, rotating equipment, pumps, generators, and chilling/cooling units. Each of the WTGs would require oils, fuels, and lubricants for the bearings, accumulators, pumps, actuators, gearbox, transformer, and cooling system. There is a low risk of an accidental release from a diesel generator because they would only be used during emergencies, planned maintenance shutdowns, and testing periods. Approximately 203,916 gal of oils, fuels, gases, and lubricants are currently estimated to be used for the OCS-DC (COP Table 3.3.6-2, Sunrise Wind 2023), and a maximum of 6,551 gal of oils, lubricants, and gas may be stored on each WTG (COP Table 3.3.8-2, Sunrise Wind 2023). Impacts on offshore water quality would be avoided or minimized through measures to contain accidental releases at the WTGs including 100 percent leakage-free joints, high pressure sensors, oil level sensors to detect leakages, and retention reservoirs that could contain 110 percent of the volume of any potential leaks (COP Section 3.3.8.1, Sunrise Wind 2023). Accidental release avoidance and minimization measures for the OCS-DC include a minimum of 110 percent secondary containment of all oils, greases, and lubricants, gas density monitoring devices to detect leaks, and not storing chemicals on the platform (COP Section 3.3.6.1, Sunrise Wind 2023). Sunrise Wind would follow all BMPs and the Emergency Response Plan/OSRP and other mitigation measures described in Section 4.3.3.3 of the COP (APM GEN-11, Sunrise Wind 2023) at a minimum. The potential impact on water quality from an accidental release would be minor or moderate.

Impacts to water quality from trash and debris during the O&M phase are expected to be similar to, but less likely, than during the construction and installation phase because there would be fewer marine vessels used. All regulatory requirements would still apply. Best management and good housekeeping practices would be implemented to minimize or avoid the potential accidental disposal of trash or debris to the ocean.

Anchoring: There would be a minimal impact on water quality due to anchoring during offshore O&M activities because there would be fewer vessels required. Vessel anchoring could be necessary for repairs or maintenance and only for vessels that would need to be onsite for an extended period. This would be infrequent over the 25- to 35-year operational life of the proposed Project. Impacts on water quality would be negligible or minor.

Cable emplacement and maintenance: The IAC and SRWEC are not expected to have maintenance requirements unless a fault or failure requiring repair were to occur, which would be infrequent. Also, it is expected that only a minor amount of cable protection would need to be replaced over the 25-to-35-year lifetime of the Project. Non-routine maintenance and repair activity would impact water quality through sediment suspension, deposition, and increased turbidity. Impacts on water quality through cable emplacement and maintenance during offshore O&M activities over the lifetime of the Project would be short-term, less than during the construction phase, and minor.

Discharges: Impacts to water quality from discharges and releases during the O&M phase are expected to be similar to, but less likely, than during the construction and installation phase because there would be fewer marine vessels used. The estimated amount of solid and liquid wastes generated during 1-year of offshore operations is 1,056 cy (807 cubic meters [m^3]) compared to 13,833 cy (10,576 m^3) generated during offshore construction (COP Table 3.3.10-4, Table 3.5.6-1, Sunrise Wind 2023). All international, federal, and state regulations regarding the management, storage, and disposal of wastes would still apply during O&M activities. Unpermitted, accidental discharges would be unlikely to occur, and any impact would be short-term and localized.

Operation of the OCS-DC would require the continuous withdrawal and discharge of non-contact cooling water. The daily design intake flow (DIF) for the OCS-DC would be 8.1 mgd, and the daily average intake flow would range from 4.0 to 5.3 mgd. The maximum daily average discharge temperature would be 90°F, and the daily average discharge temperature would be 86°F (TRC 2021). The vertical discharge pipe would be oriented downward in the water column, and the thermal effluent would be discharged at a depth of 40 ft (12 m) below local mean sea level (MSL). Hydrothermal modeling determined that this represented the optimal depth for discharge of the heated effluent because rapid and complete mixing would occur and would prevent the thermal plume from migrating to the surface or benthos (TRC 2021). The thermal plume would be contained within 87 ft (26.5 m) of the discharge point and occupy a maximum area of 731 square feet (ft^2; 67.9 square meters [m^2]) under a worst-case scenario. Further, modeling demonstrated that discharge at this depth would not impact water quality beyond the regulatory mixing zone of 330 ft (100 m) from the point of discharge.

The cooling water intake system (CWIS) would contain an electrochlorination system that would produce chlorinated seawater to prevent biofouling within the system (TRC 2021). The chlorinated seawater would be taken up with raw seawater and directed through the Heat Exchange System and the Dump Caisson. The chlorine concentration that would be added would range from 0.5 ppm up to 2 ppm during infrequent shock dosing. The amount of chlorine added to the seawater would be automatically adjusted so that the chlorine would be completely consumed by potential biofouling organisms within the system to minimize or eliminate the release of hypochlorite through the Dump Caisson. Thus, the release of hypochlorite to the seawater is unlikely to occur.

Sunrise Wind submitted an NPDES permit application to the USEPA in December 2021 for the discharge of water from the OCS-DC (TRC 2021) and obtained a draft NPDES permit (Number MA0004940) in May 2023. Federal water quality criteria and ocean discharge criteria apply to the Proposed Action because it is located in federal waters. Section 316(b) of the CWA requires that NPDES permits for facilities with CWIS ensure that the location, design, capacity, and construction use the best technology available to minimize effects on the environment. The draft NPDES permit authorizes the intake and discharge of non-contact cooling water from the OCS-DC; provides effluent limitations for flow, pH, total residual oxidants (including chlorine), temperature, and through-screen intake velocity; and monitoring and reporting requirements (USEPA 2023). Based on review of the thermal modeling, the USEPA determined that the thermal plume would be relatively small (approximately 15-25 m long and 3-3.5 m wide), would be fully mixed within 25 m on either side of the outfall and a depth of 10 m from the outfall, and that mobile aquatic organisms are expected to be able to avoid any adverse effects from the thermal plume

(USEPA 2023a). USEPA determined that the effluent limitations for temperature and chlorine would be protective of marine life and would not cause unreasonable degradation of the marine environment.

Seafloor/Land disturbance: Seafloor disturbance during offshore O&M activities could occur during routine maintenance of infrastructure on the seabed, such as foundations, scour protection, and cable protection. Certain O&M activities could require presence of either a jack-up vessel or anchored barge vessel. Seafloor disturbance may cause a short-term increase in turbidity, sediment suspension, and deposition. Sunrise Wind would implement BMPs and comply with EPMs to minimize or avoid sediment suspension and deposition during O&M activities. Sediment suspension and deposition would to be localized and only result in short-term increases in turbidity near the location of the disturbance. Potential impacts to water quality would be similar to, but less likely, than during construction because the area of seafloor disturbance would be less.

Port utilization: Several ports are being considered to support O&M activities. Impacts on water quality (i.e., accidental chemical spill or discharge) from port utilization could occur from vessel collision or allision during O&M activities; however, this would be infrequent and less likely than during the construction phase. Impacts on water quality from port utilization during O&M would be negligible or minor.

Presence of structures: The presence of up to 94 WTGs and the OCS-DC would present the risk of an allision and an impact on water quality from an accidental chemical spill, leak, or discharge. The risk of a vessel collision or allision with a structure would be low and unlikely. Scour protection would be used at the WTG foundations which would minimize sediment transport around the foundations and the potential for sediment plumes. The total footprint from foundations with the addition of scour protection is estimated to be 98 ac (0.4 km^2).

The presence of structures could alter the water mixing patterns and the distribution of water quality parameters by changing the thermal stratification and mixing between surface and deep waters (e.g., Carpenter et al. 2016; Cazenave et al. 2016; Schultze et al. 2020). However, there is limited information available for the Mid-Atlantic Bight region. Results from a recent hydrodynamic model of four different WTG build-out scenarios of the offshore MA/RI Lease Area found that offshore wind projects have the potential to alter local and regional physical oceanic processes (e.g., currents, temperature stratification), via their influence on currents from WTG foundations and by extracting energy from the wind (Johnson et al. 2021). Alterations in currents and mixing would affect water quality parameters such as temperature, DO, and salinity, but would vary seasonally and regionally. Overall, impacts on water quality from the presence of structures during O&M would be negligible or minor.

The exposure of offshore wind structures, which are mainly made of steel, to the marine environment can result in corrosion without protective measures. Corrosion is a general problem for offshore infrastructures and corrosion protection systems are necessary to maintain the structural integrity. Protective measures for corrosion (e.g., coatings, cathodic protection systems) are often in direct contact with seawater and have different potentials for emissions (e.g., galvanic anodes emitting metals, such as aluminum, zinc, and indium, and organic coatings releasing organic compounds due to weathering and leaching). The current understanding of chemical emissions for offshore wind structures is that emissions appear to be low or within natural variability, suggesting a low environmental impact, especially if compared to other offshore activities (Kirchgeorg et al. 2018). Based on the current understanding of offshore wind structure corrosion effects on water quality, BOEM anticipates the potential impact to be minor.

3.5.5.3 Conceptual Decommissioning

3.5.5.3.1 Onshore Activities and Facilities

Impacts on water quality are expected to be similar to or less than those described for the construction phase. The OnCS-DC may be repurposed, and the onshore transmission cable may be abandoned in place which would limit the amount of land disturbance, the potential for an accidental release or discharge, and shorten the length of time needed for decommissioning activities.

3.5.5.3.2 Offshore Activities and Facilities

Impacts on water quality during offshore decommissioning activities are expected to be similar to or less than impacts during the construction phase. There would be a short-term increase in marine vessel use compared to the O&M phase. Decommissioning is expected to be completed within 2 years and any impacts would cease after decommissioning is complete. Decommissioning would occur in accordance with requirements and permits at that time and would have a minor to moderate impact on water quality.

3.5.5.4 Cumulative Impacts of the Proposed Action

The cumulative impacts of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned wind activities. Ongoing and planned wind activities related to onshore development, runoff and discharges, marine transportation-related discharges, dredging and port improvement projects, commercial fishing, military use, submarine cables and pipelines, atmospheric deposition, and climate change would contribute to impacts on water quality through the primary IPFs of accidental releases, anchoring, cable emplacement and maintenance, discharges, land disturbance, seafloor disturbance, port utilization, and presence of structures. The construction, O&M, and decommissioning of offshore wind projects, including onshore and offshore infrastructure, in the GAA would also contribute to the same primary IPFs. However, given the low probability of accidental releases, the temporary impacts of suspended sediment, and the regulatory and permitting requirements to avoid and minimize impacts on water quality (e.g., NPDES permits, Vessel General Permit, OSRP, SPCC Plan, SWPPP), adverse impacts on water quality would be minimized.

Accidental release: The contribution of the Proposed Action to the cumulative accidental release impacts on water quality would likely be short term and minor to moderate due to the low risk and localized nature of the most likely spills and the use of an OSRP, SPCC Plan, and Materials Management Plan for the Project. Overall, an estimated 1,043,485 gal of coolants, 1,427,665 gal of oils and lubricants, and 452,490 gal of diesel fuel could be used for offshore wind activities in the GAA; approximately 30 percent, 22 percent, and 5 percent would be contributed by the Proposed Action, respectively. In the unlikely event of an accidental release or spill, it would be expected that a small spill would have negligible or minor, short-term impacts, while a larger spill would have potentially minor or moderate impacts for a longer duration.

Anchoring: An estimated area of 1,544 ac of seabed could be disturbed due to anchoring associated with offshore wind activities in the GAA of which approximately 17 percent would be contributed by the Proposed Action. The contribution of the Proposed Action to the cumulative anchoring impacts on water quality would be localized, short term and minor, and would primarily occur during construction and decommissioning.

Cable emplacement and maintenance: The contribution from the Proposed Action to increased sediment concentration and turbidity would be additive with the impact(s) of any and all other cable-installation activities, including offshore wind activities, that occur within the water quality GAA and that would have overlapping timeframes during which sediment is suspended. BOEM anticipates that the contribution of the Proposed Action to the cumulative impacts would likely be short term, localized, and minor to moderate.

Discharges: Cumulative impacts on water quality from the Proposed Action due to discharges would be additive with the impacts from discharges associated with other offshore wind activities in the GAA during the same time frame. Vessel traffic would increase under the Proposed Action and vessel routes may overlap. However, any discharge events would likely be staggered over time and localized. Further, all vessels would be required to comply with all state and federal regulatory requirements and permits related to the prevention and control of discharges and accidental spills. BOEM anticipates that the contribution of the Proposed Action to the cumulative impacts would likely be short term, localized, and minor to moderate and would primarily occur during the construction and decommissioning phases.

Seafloor/Land disturbance: The contribution of the Proposed Action to the cumulative onshore land disturbance impacts on water quality would likely be localized, short term, and negligible due to the low likelihood that onshore activities would overlap geographically or temporally. Compliance with the EM&CP, including the SWPPP and erosion control measures, would minimize or eliminate erosion into nearby coastal, surface, or ground waters.

The estimated area of seafloor disturbance from offshore wind activities in the water quality GAA from offshore export cable construction is 3,174 ac of which approximately 37 percent is contributed by the Proposed Action. Approximately 5,187 ac of seabed are estimated to be disturbed from construction of IAC in the GAA; the Proposed Action would contribute approximately 41 percent of the total. BOEM anticipates the contribution of the Proposed Action to the cumulative seafloor disturbance impacts would likely be short term, localized, but noticeable, and have a minor to moderate impact.

Port utilization: Cumulative port utilization impacts of the Proposed Action would likely be short term and minor. There could be limited overlap in construction schedules for the Proposed Action and the Revolution Wind Project in the water quality GAA which could result in moderate impacts in the unlikely event that a collision or allision were to occur.

Presence of structures: Cumulative impacts on water quality from the Proposed Action due to the presence of structures would be additive with the impacts from other offshore wind projects in the water quality GAA. By 2030, approximately 442 structures (WTGs and converter stations) associated with offshore wind activities could be present within the GAA. BOEM anticipates that the cumulative impacts would be negligible to minor.

The exposure of offshore wind structures to the marine environment can result in emissions of metals and organic compounds from corrosion protection systems. However, the current understanding of chemical emissions for offshore wind structures is that emissions appear to be low, suggesting a low environmental impact (Kirchgeorg et al. 2018). Research suggests that this impact may be site-specific and remains an area of ongoing investigation (e.g., BSH and Hereon 2022).

3.5.5.5 Conclusions

Impacts of the Proposed Action

All onshore and offshore activities during the construction, O&M, and decommissioning phases would be conducted in compliance with federal and state regulations and permits, with BMPs, and EPMs described in Section 4.3.3.3 of the COP (Sunrise Wind 2023) which would minimize or avoid impacts on water quality. Although the risk of an accidental discharge or release of chemicals, oils, fuel, lubricants, trash, or debris is low during all phases of the Proposed Action, in the event a release was to occur, the impact on water quality would be minor or moderate depending on the volume of the spill and the type of material spilled. The impact would be short-term because Sunrise Wind would follow regulations and permitting rules requiring rapid containment and clean up. Impacts from port utilization or the presence of structures would be negligible or minor. Sediment suspension, deposition, and increased turbidity would have a minor impact during anchoring, cable emplacement and maintenance, and seafloor/land disturbance; sediment plumes would be localized and short term. Impacts on water quality from the Proposed Action from individual IPFs would range from negligible to moderate. Overall, the Proposed Action would result in **minor** adverse impacts.

Cumulative Impacts of the Proposed Action

Ongoing and planned activities related to onshore or offshore development, recreation and commercial activities, military use, port improvement, dredging, and submarine cable and pipeline emplacement would contribute to impacts on water quality through the primary IPFs of accidental releases, cable emplacement and maintenance, discharges, land/seafloor disturbance, port utilization, and the presence of structures by causing sediment suspension and deposition, increased turbidity, altering water currents and water chemistry, or causing exceedances of water quality standards. These impacts would be each be short-term and localized and have a negligible to moderate impact. The impacts from a large-volume accidental release could be moderate. Overall, BOEM anticipates that the potential cumulative impacts on water quality would be **minor** adverse.

3.5.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG positions

Alternative C-1 would have the same number of turbine locations (94 WTGs) as the Proposed Action that may be approved by BOEM; however, 8 WTG positions from Priority Area 1 would be excluded from consideration for development. There would be no changes to the onshore facilities, the SRWEC alignments, or the construction timeline and activities. The changes proposed in Alternative C-1 would focus on the arrangement and generating capacity of the WTGs and necessary rearrangement of the IAC to accommodate the new spatial arrangements. Therefore, the discussion of impacts in these sections would focus on the attributes that are substantively different from those under the Proposed Action. In addition, the changes in spatial arrangement are unlikely to affect the duration, intensity, or magnitude of the effects described for the following IPFs: port utilization. NEPA directs that an EIS focus on the differences among the alternatives to allow evaluation of their comparative merits. This focus does not disregard the impacts previously described, but the reader is directed to review the direct and indirect impacts to water quality resources described under the Proposed Action in Section 3.5.5. A comparison of the alternatives and their potential impacts by IPF is provided in Section 3.5.9.

3.5.6.1 Construction and Installation

3.5.6.1.1 Onshore Activities and Facilities

Under Alternative C-1, impacts on water quality from onshore construction and installation activities would be the same as described for the Proposed Action.

3.5.6.1.2 Offshore Activities and Facilities

Under Alternative C-1, the construction of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. There would be no substantive difference in the potential for impacts to water quality from anchoring, cable emplacement, discharges, accidental release, seafloor disturbance, port utilization, and presence of structures under Alternative C-1 as compared to the Proposed Action because the same number of WTGs would be installed.

3.5.6.2 Operations and Maintenance

3.5.6.2.1 Onshore Activities and Facilities

Under Alternative C-1, impacts on water quality from onshore O&M activities would be the same as described for the Proposed Action.

3.5.6.2.2 Offshore Activities and Facilities

Under Alternative C-1, impacts to water quality during offshore O&M activities would likely be similar to the Proposed Action because the same number of WTGs would be operated and maintained. There would be no substantive difference in the potential for impacts to water quality from anchoring, cable emplacement, discharges, accidental release, seafloor disturbance, port utilization, and presence of structures under Alternative C-1 as compared to the Proposed Action because the same number of WTGs would be operated and maintained.

3.5.6.3 Conceptual Decommissioning

3.5.6.3.1 Onshore Activities and Facilities

Under Alternative C-1, impacts on water quality from onshore decommissioning activities would be the same as described for the Proposed Action.

3.5.6.3.2 Offshore Activities and Facilities

Under Alternative C-1, water quality impacts during decommissioning of the offshore facilities would be the same as described for the Proposed Action because there is no difference in offshore components between the Proposed Action and Alternative C-1.

3.5.6.4 Cumulative Impacts of Alternative C-1

In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-1 to water quality impacts from ongoing and planned activities would not be substantially different than the Proposed Action. Considering all the IPFs together, BOEM anticipates that the cumulative impacts of Alternative C-1 would have negligible to moderate impacts on water quality.

3.5.6.5 Conclusions

Impacts of Alternative C-1

Under Alternative C-1, impacts on water quality from onshore and offshore construction, O&M, and decommissioning would be similar to the Proposed Action. The potential for offshore impacts from seafloor disturbance, anchoring, cable emplacement, accidental releases or discharges, port utilization, and the presence of structures would not change substantially under Alternative C-1 compared to the impacts described above for the Proposed Action because the same number of WTGs would be installed, maintained, and decommissioned. Overall, Alternative C-1 would have a **minor** adverse impact on water quality.

Cumulative Impacts of Alternative C-1

In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-1 to water quality impacts from ongoing and planned activities would not be substantially different than the Proposed Action. Considering all the IPFs together, BOEM anticipates that the cumulative impacts of Alternative C-1 would have **minor** adverse impacts on water quality.

3.5.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of up to 12 WTG Positions to the Eastern Side of the Lease Area

For Alternative C-2, the analysis was expanded upon to relocate up to 12 additional WTG positions from the Priority Areas to the eastern side of the Lease Area, in addition to removing up to 8 WTG positions identified in Alternative C-1. This alternative assumes that habitat is more suitable for development on the eastern side of the Lease Area, but surveys conducted in this area in the summer of 2022 found that the southeastern side of the Lease Area contains glauconite substrate that is unsuitable for WTG installation.

3.5.7.1 Construction and Installation

3.5.7.1.1 Onshore Activities and Facilities

Under Alternative C-2, impacts on water quality from onshore construction and installation activities would be the same as described for the Proposed Action.

3.5.7.1.2 Offshore Activities and Facilities

Under Alternative C-2, the construction of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Alternative C-2 includes the relocation of up to 12 WTGs to the eastern side of the Lease Area. Impacts on water quality from the individual IPFs of accidental releases and discharges, cable emplacement and maintenance, and seafloor disturbance would be marginally higher than the Proposed Action because of the longer vessel travel distance and the longer length of IAC needed to reach the eastern side of the Lease Area. Impacts from anchoring, port utilization, and the presence of structures would not be substantively different than the Proposed Action.

3.5.7.2 Operations and Maintenance

3.5.7.2.1 Onshore Activities and Facilities

Under Alternative C-2, impacts on water quality from onshore O&M activities would be the same as described for the Proposed Action.

3.5.7.2.2 Offshore Activities and Facilities

Under Alternative C-2, the O&M of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Under Alternative C-2, impacts to water quality during offshore O&M activities from cable maintenance would be slightly higher than the Proposed Action because of the greater amount of IAC needed to reach the eastern side of the Lease Area. There would be slightly greater risk of an accidental release or discharge because of the longer marine vessel travel distance. Under this alternative, the maintenance schedule would likely be the same as the Proposed Action. Impacts from anchoring, port utilization, or the presence of structures would be the same as the Proposed Action.

3.5.7.3 Conceptual Decommissioning

3.5.7.3.1 Onshore Activities and Facilities

Under Alternative C-2, impacts to water quality from onshore decommissioning activities would be the same as described for the Proposed Action.

3.5.7.3.2 Offshore Activities and Facilities

Water quality impacts during decommissioning of the offshore facilities would be substantially the same as described for the Proposed Action. Potential water quality impacts from accidental releases or discharges and seafloor disturbance would be slightly higher because of the longer IAC and transit route to the relocated WTGs.

3.5.7.4 Cumulative Impacts of Alternative C-2

In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-2 to water quality impacts from ongoing and planned activities would be slightly more, but not materially different, than the Proposed Action and Alternative C-1. Considering all the IPFs together, BOEM anticipates that the cumulative impacts of Alternative C-2 would have **minor** impacts on water quality.

3.5.7.5 Conclusions

Impacts of Alternative C-2

Impacts on water quality under Alternative C-2 from construction, O&M, and decommissioning of the WTGs would be similar to the Proposed Action and Alternative C-1 because the same number of WTGs would be installed. Relocating up to 12 WTGs to the eastern side of the Lease Area would require longer transit distances and a change in the layout of the IAC. The contribution of Alternative C-2 to water quality impacts during construction, O&M, and decommissioning would be slightly more, but not materially different, than the Proposed Action and Alternative C-1 because of the longer length of IAC needed to reach the eastern side of the Lease Area. Overall, Alternative C-2 would have a **minor** adverse impact on water quality.

Cumulative Impacts of Alternative C-2

In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-2 to water quality impacts from ongoing and planned activities would be slightly more, but not materially different, than the Proposed Action and Alternative C-1. Considering all the IPFs together, BOEM anticipates that the cumulative impacts of Alternative C-2 would have **minor** adverse impacts on water quality.

3.5.8 Alternative C-3 - Reduced Layout from Priority Areas Considering Feasibility due to Glauconite Sands

Under Alternative C-3, the construction, O&M, and eventual decommissioning of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Alternatives C-3a, C-3b, and C-3c consider different WTG configurations to avoid sensitive habitats and engineering constraints while still meeting the NYSERDA OREC. This alternative only considered removal of WTGs from Priority Area 1 based on consultation with NMFS. Under Alternative C-3a, up to 87 11-MW WTGs would be installed in the 87 potential positions. Under Alternative C-3b, up to 84 WTGs would be installed in the 87 potential positions. Under Alternative C-3c, 80 WTGs would be installed in the 87 potential positions.

3.5.8.1 Construction and Installation

3.5.8.1.1 Onshore Activities and Facilities

Under Alternative C-3, impacts on water quality from onshore construction and installation activities would be the same as described for the Proposed Action.

3.5.8.1.2 Offshore Activities and Facilities

Under Alternative C-3, the construction of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Impacts on water quality from the individual IPFs of accidental releases, discharges, anchoring, cable emplacement, seafloor disturbance, and presence of structures would be marginally less than the Proposed Action because of the reduced number of WTGs and length of IAC that would be installed. Impacts from port utilization would be similar to the Proposed Action.

3.5.8.2 Operations and Maintenance

3.5.8.2.1 Onshore Activities and Facilities

Under Alternative C-3, impacts on water quality from onshore O&M activities would be the same as described for the Proposed Action.

3.5.8.2.2 Offshore Activities and Facilities

Under Alternative C-3, the O&M of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Under Alternative C-3, a reduced number of WTGs and length of IAC would require O&M resulting in reduced impacts to water quality from the IPFs of anchoring, cable maintenance, accidental release, discharges, seafloor disturbance, and presence of structures. Impacts from port utilization would not be substantively different than the Proposed Action.

3.5.8.3 Conceptual Decommissioning

3.5.8.3.1 Onshore Activities and Facilities

Under Alternative C-3, impacts to water quality from onshore decommissioning activities would be the same as described for the Proposed Action.

3.5.8.3.2 Offshore Activities and Facilities

Under Alternative C-3, water quality impacts during decommissioning of the offshore facilities would be marginally lower than the Proposed Action because of the smaller number of WTGs and amount of cable that would need to be decommissioned.

3.5.8.4 Cumulative Impacts of Alternative C-3

In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-3 to water quality impacts from ongoing and planned activities would be slightly less, than the Proposed Action, Alternative C-1, and Alternative C-2. Considering all the IPFs together, BOEM anticipates that the cumulative impacts of Alternative C-3 would have **minor** impacts on water quality.

3.5.8.5 Conclusions

Impacts of Alternative C-3

Under Alternative C-3, impacts on water quality from onshore construction, O&M, and decommissioning would be the same as those described for the Proposed Action, Alternative C-1, and Alternative C-2. Impacts on water quality from offshore activities would be slightly less under Alternative C-3 compared to the impacts described above for the Proposed Action, Alternative C-1, and Alternative C-2 because of the smaller number of WTGs and shorter length of cable. Overall, Alternative C-3 would have a **minor adverse** impact on water quality.

Cumulative Impacts of Alternative C-3

In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-3 to water quality impacts from ongoing and planned activities would be slightly less, than the Proposed Action, Alternative C-1, and Alternative C-2. Considering all the IPFs together, BOEM anticipates that the cumulative impacts of Alternative C-3 would have **minor** adverse impacts on water quality.

3.5.9 Comparison of Alternatives

The expected impacts discussed above for the Proposed Action would not change substantially under the alternatives because the same construction, O&M, and decommissioning activities would occur. Construction, O&M, and decommissioning of Alternatives B, C-1, C-2, and C-3 would have the same overall negligible to moderate adverse impacts on water quality resources, however, the magnitudes would be slightly different. Alternative C-2 would have slightly higher adverse impacts than the Proposed Action, Alternative C-1, and Alternative C-3 because of the longer length of IAC needed to reach the eastern side of the Lease Area. Alternative C-3 would have slightly less impact because of the smaller number of WTGs and reduced length of IAC. Table 3.5-5 provides an overall summary of alternative impacts.

Table 3.5-5. Comparison of Alternative Impacts on Water Quality

No Action Alternative (Alternative A)	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)	Fisheries Habitat Minimization Considering Feasibility due to Glauconite Sands (Alternative C-3)
No Action Alternative: Existing environmental trends and ongoing activities would continue. Overall, **minor** adverse impacts are anticipated. Negligible to minor impacts from discharges, presence of structures, and seafloor or land disturbance. Minor to moderate effects from anchoring, cable emplacement and maintenance, and port utilization. Moderate effects from accidental releases. *Cumulative Impacts of the No Action Alternative:*	*Proposed Action:* **Minor** adverse effects on water quality overall. Minor effects from anchoring, cable emplacement and maintenance, and seafloor or land disturbance. Minor or moderate effects from accidental releases or discharges, including non-contact cooling water. Negligible or minor effect from port utilization or the presence or structures. *Cumulative Impacts of the Proposed Action:* Minor or moderate effects from anchoring,	*Alternative C-1:* **Minor** adverse effects on water quality overall. Minor effects from anchoring, cable emplacement and maintenance, and seafloor or land disturbance. Minor or moderate effects from accidental releases or discharges, including non-contact cooling water. Negligible or minor effect from port utilization or the presence or structures. *Cumulative Impacts of Alternative C-1*: Minor or moderate effects from anchoring, discharges, cable	*Alternative C-2:* **Minor** adverse effects on water quality overall. Minor effects from anchoring, cable emplacement and maintenance, and seafloor or land disturbance. Minor or moderate effects from accidental releases or discharges, including non-contact cooling waters. Negligible or minor effect from port utilization or the presence or structures. *Cumulative Impacts of Alternative C-2*: Minor or moderate effects from anchoring, discharges, cable	*Alternative C-3:* **Minor** adverse effects on water quality overall. Minor effects from anchoring, cable emplacement and maintenance, and seafloor or land disturbance. Minor or moderate effects from accidental releases or discharges, including non-contact cooling waters. Negligible or minor effect from port utilization or the presence or structures. *Cumulative Impacts of Alternative C-3*: Minor or moderate effects from anchoring, discharges, cable

No Action Alternative (Alternative A)	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)	Fisheries Habitat Minimization Considering Feasibility due to Glauconite Sands (Alternative C-3)
Negligible to minor impacts from discharges, presence of structures, and seafloor or land disturbance. Minor to moderate effects from anchoring, cable emplacement and maintenance, and port utilization. Moderate effects from accidental releases. Overall, **minor** adverse cumulative impacts are anticipated.	discharges, cable emplacement and maintenance, seafloor or land disturbance. Moderate effects from accidental releases. Negligible or minor effect from port utilization or the presence or structures. Overall, **minor** adverse cumulative impacts are anticipated.	emplacement and maintenance, seafloor or land disturbance. Moderate effects from accidental releases. Negligible or minor effect from port utilization or the presence or structures. Overall, **minor** adverse cumulative impacts are anticipated.	emplacement and maintenance, seafloor or land disturbance. Moderate effects from accidental releases. Negligible or minor effect from port utilization or the presence or structures. Overall, **minor** adverse cumulative impacts are anticipated.	emplacement and maintenance, seafloor or land disturbance. Moderate effects from accidental releases. Negligible or minor effect from port utilization or the presence or structures. Overall, **minor** adverse cumulative impacts are anticipated.

3.5.10 Summary of Impacts of the Preferred Alternative

BOEM has identified Alternative C-3b as the Preferred Alternative which would include installation of up to 84 WTGs, which is 10 fewer WTGs than the maximum WTGs proposed under the PDE of the Proposed Action. Under Alternative C-3b, impacts on water quality from onshore construction, O&M, and decommissioning would be the same as those described for the Proposed Action. Impacts on water quality from offshore activities would be slightly less under Alternative C-3b compared to the impacts described above for the Proposed Action, Alternative C-1, and Alternative C-2 because of fewer WTGs and shorter length of cable. Overall, Alternative C-3b would have a **minor** impact on water quality.

3.5.11 Proposed Mitigation Measures

No additional measures to mitigate impacts on water quality have been proposed for analysis.

3.5.11.1 Effect of Measures Incorporated into the Preferred Alternative

Since no mitigation measures have been proposed, impacts levels for the Preferred Alternative would remain as described above in Section 3.5.8.

3.6 Bats

This section examines potential impacts on bats from the proposed Project, alternatives, and future offshore wind activities in the GAA (Appendix D, Figure D-3). The bat GAA, as depicted in Appendix D (*Geographical Analysis Areas*) includes the United States eastern coast from Maine to Florida extending from 0.5 mi (0.8 km) onshore to cover Project component sites and 100 mi (161 km) offshore.

3.6.1 Description of the Affected Environment and Future Baseline Conditions

Eight of the nine bat species present in the northeastern United States and the GAA (Appendix D) are found on Long Island and have the potential to occur within or proximate to the offshore Sunrise Wind Export Cable-New York State/offshore converter station (SRWEC-NYS/SRWEC-OCS-DC) and the onshore activities: OnCS-DC, transmission cable, and interconnection cable (Stegemann and Hicks n.d.). These species can be categorized into two groups based on roosting habitat and migratory behavior: cave-hibernating bats and migratory tree bats. The five non-migratory cave-hibernating bats include the eastern small-footed bat (*Myotis leibii*), the big brown bat (*Eptescius fuscus*), the ESA-listed northern long-eared bat (*Myotis septentrionalis*; endangered) and tricolored bat (*Perimyotis subflavus*; endangered), and the little brown bat (*Myotis lucifugus*) which is currently under review for listing under the ESA. The three migratory tree-roosting bats include the eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), and silver-haired bat (*Lasionycteris noctivagans*) (Stantec 2018b). The ESA-listed Indiana bat (*Myotis sodalist*; endangered) is not known to occur in Long Island's Nassau or Suffolk counties (USFWS 2021) and to date has not been located during regional offshore vessel-based acoustic bat surveys (Pelletier et al. 2013; Stantec 2018b; Sunrise Wind 2023). Therefore, this species is not expected to occur in the proposed Project Area.

In North America, insectivorous bats have a general hearing range of 10 to 100 kilohertz (kHz), depending on the species and specific behavior, with the most sensitive frequency band between 20 and 50 kHz and are generally unable to hear frequencies below 500 hertz (Hz) (DoN 2018). While hearing is echolocating bats' primary sense for foraging and avoiding obstacles, they also use a combination of auditory and visual cues, magneto-reception, and spatial memory for long-distance navigation. Hoary bats, for example, sometimes abandon echolocation when flying, relying solely on intermittent visual cues (True 2021). When there are no reflective surfaces for echolocation, it is possible that bats flying over the ocean use visual cues and therefore are unlikely to fly over the ocean when visibility is low (True 2021).

Bats are active in the region from March through November and use a wide variety of terrestrial habitats (e.g., forests, open fields. riparian corridors, wetlands, urban areas) for foraging. Caves, mine shafts, understructure of bridges, and trees are used for roosting (COP Section 4.4.7, Sunrise Wind 2023). In late summer and fall, non-migratory cave-dwelling bats disperse from summer habitats to winter hibernacula (caves, abandoned mines). Migratory tree-roosting bats migrate longer distances over land and offshore to overwinter in the milder climate of southern states, often at coastal locations (Stantec 2016; Stantec 2018b; Sunrise Wind 2023).

Sightings and acoustic recordings have detected bats flying over the open ocean in the Atlantic region between North Carolina and Nova Scotia (Solick and Newman 2021). In contrast to cave-dwelling bats, which are rarely found offshore, migratory tree-roosting bats have been sporadically found offshore during spring and fall migrations, especially in low wind and mild weather conditions. Acoustic studies observed that 80 percent of offshore bat detections in this region occurred during August and September (Dowling et al. 2017; Hatch et al. 2013; Pelletier et al. 2013; Sunrise Wind 2023). Offshore sightings were recorded in July, August, September, and October (Solick and Newman 2021; Hatch et al. 2013). Recent studies detected bats up to 80 mi (129 km) from land (Stantec 2016), and historical data include observations of bats as far offshore as 1,212 mi (1,950 km) (Hatch et al. 2013). Bats can fly at high altitudes of at least 8,000 ft (2,438 m) (Peurach 2003). Flight altitudes of over 656 ft (200 m) above sea level have been documented in the offshore Mid-Atlantic (Hatch et al. 2013).

In summary, non-migratory cave-hibernating bat activity is greater onshore and at coastal locations when compared to offshore (NPS 2018; Smith and McWilliams 2016; Stantec 2018b; Sunrise Wind 2023). Migratory tree-roosting bats are expected to be more common in onshore and nearshore locations but may occur offshore (Pelletier et al. 2013; Sunrise Wind 2023; Stantec 2016). A description of existing east coast bat resources is presented in the Vineyard Wind 1 FEIS Volume II: Appendix A (BOEM 2021). Additional distribution information is included in the COP Volume I, Section 4.4.7 (Sunrise Wind 2023) and Appendix P1 (Stantec 2022).

Future ongoing onshore and offshore activities (disturbance, displacement, injury, mortality, and habitat conversion) would continue to occur in the region. These impact-producing activities would have minor short- and long-term effects on regional bat populations.

3.6.1.1 ESA-Listed (and Proposed Species)

Northern Long-eared Bat (Endangered)

There are no records of northern long-eared bats over the OCS (ESS Group Inc. 2014; Pelletier et al. 2013; Peterson and Pelletier 2016). A recent study of bat movement on Martha's Vineyard did not find evidence of offshore movement by northern long-eared bats and presented evidence of northern long-eared bats hibernating on Martha's Vineyard and Nantucket islands (Dowling et al. 2017). Similarly, WTG acoustic detectors in the Dominion Energy CVOW pilot project off Virginia did not detect northern long-eared bat (Dominion 2022). During offshore construction of the Block Island Wind Farm, bats were monitored with acoustic detectors on boats; among the 1,546 passes of bats, no northern long-eared bats were detected (Stantec 2018b). During post-construction monitoring of Block Island Wind Farm (August 2017 to January 2018), no northern long-eared bats were detected out of the 1,086 passes recorded by bat acoustic detectors mounted on two turbines 3 mi (5 km) from shore, and 99 percent of bat passes occurred when wind speeds were less than 6.4 feet per second (fps; 5 meters per second

[mps]) (33 percent when there was no wind) (Stantec 2018b). Therefore, given the rarity of the bat in the region, its ecology, and habitat requirements, it is extremely unlikely northern long-eared bats would traverse the offshore portions of the Project Area or experience any effects from offshore activities.

Little Brown Bat (Candidate)

Little brown bats have been recorded in the onshore portions of the Project Area and have the potential to occur in the offshore portions of the Project Area. In addition to historical observations of offshore flights, little brown bats tagged on Martha's Vineyard were detected offshore (Dowling et al. 2017; NYSERDA 2017). They are capable of extended flights, making seasonal migrations between 32 and 344 mi (51 and 554 km) between their spring roosts and hibernacula (Dowling et al. 2017). Because there is documented presence of little brown bats at many of the islands in the Cape Cod region, BOEM anticipates that it is possible that they may migrate through the offshore Project Area where WTGs would operate.

Information regarding little brown bats migration patterns and flight elevations is very limited. A European study on collision risk for bats at wind farms found significant correlation between flight height and collision risk (Roemer et al. 2017). Small species of the genus *Myotis* were found to fly at the lowest heights, with very little activity at a height of 98 ft (30 m), and also had the lowest susceptibility to collision with wind turbines despite having the second highest activity levels. Lacking direct data for little brown bats, we anticipate similar collision risk for little brown bats because they are a small species of the genus *Myotis* and anticipate a very low risk of collision due to the SRWF turbine blades operating above 131 ft (40 m).

Standard environmental operating conditions for the proposed WTGs include cut-in wind speeds of 7 to 11 miles per hour (mph; 3 to 5 mps). The WTGs would automatically shut down outside of the operational criterial for the WTG design. In general, bat activity declines as wind speed increases, which narrows the band of wind speeds where bats are active and WTGs are operating, further reducing the likelihood of little brown bats flying through the RSZ of operating WTGs.

Tricolored Bat (Proposed)

There is evidence of a limited presence of tricolored bats in the onshore portions of the Project Area which includes suitable habitat for their spring and summer roosting (Jackson and Schwager 2012). Prior to the appearance of WNS, tricolored bats were still considered rare in NYS, and their numbers have steadily declined (NYSDEC 2017). They have previously been detected in offshore environments; however, there is little data on their offshore presence compared to other species (Peterson and Pelletier 2016). Tricolored bats are short-distance migrants, generally migrating less than 31 mi (50 km) between their hibernacula and summer habitats (Griffin 1940). This short range of migration would preclude their migration through the Project Area where WTGs would be located. When foraging they typically travel as far as 3 to 4 mi (5 to 6 km) from their roosting areas (Poissant 2009), while the nearest WTG is approximately 15 mi (24 km) offshore. Because WTGs are located in areas where tricolored bats are not expected to be able to reach, either during migration or foraging, the likelihood of collision with operating WTGs is extremely unlikely to occur.

3.6.2 Impact Level Definitions for Bats

This Final EIS uses a four-level classification scheme to analyze potential impact levels on bats from the alternatives, including the Proposed Action. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a project or beyond project operations and decommissioning. Table 3.6-1 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for bats. Table G-5 in Appendix G (*Impact-Producing Factor Tables*) identifies potential IPFs, issues, and indicators to assess impacts to bats.

Table 3.6-1. Definition of Potential Adverse and Beneficial Impact Levels for Bats

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	Impacts on individual bats and/or their habitat, if any, would be at the lowest levels of detection and barely measurable, with no perceptible consequences to individuals or the population.	Impacts on individual bats and/or their habitat would be beneficial but at the lowest levels of detection and barely measurable.
Minor	Impacts on bats are detectable and measurable but are low intensity, highly localized, and short-term in duration. Impacts on individuals and/or their habitat do not lead to population-level effects.	Impacts on individual bats and/or their habitat are detectable and measurable. The effects are likely to benefit individuals, be localized, and/or be short-term and are unlikely to lead to population-level effects.
Moderate	Impacts on individual bats and/or their habitat are detectable and measurable; they are of medium-intensity, can be short- or long-term, and can be localized or extensive. Impacts on individuals and/or their habitat could have population-level effects, but the population can sufficiently recover from the impacts or enough habitat remains functional to maintain the viability of the species both locally and throughout their range.	Impacts on individual bats and/or their habitat are detectable and measurable. These benefits may affect large areas of habitat, be long-term, and/or affect a large number of individuals and may lead to a detectable increase in populations but is not expected to improve the overall viability or recovery of affected species or population.
Major	Impacts on individual bats and/or their habitat are detectable and measurable; they are of severe intensity, can be long-lasting or permanent, and are extensive. Impacts to individuals and/or their habitat would have severe population-level effects and compromise the viability of the species.	Impacts on individual bats and/or their habitat are detectable and measurable. These impacts on habitat may be short-term, long-term, or permanent and would promote the viability of the affected species/population and/or increase the affected species/population levels.

3.6.3 Impacts of Alternative A - No Action on Bats

When analyzing the impacts of the No Action Alternative on bats, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities on the baseline conditions for bats. The cumulative impacts of the No Action Alternative considered the impacts of the No Action Alternative in combination with other planned non-offshore wind and offshore wind activities, as described in Appendix E (*Planned Activities Scenario*).

3.6.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for bats would continue to follow current regional trends and respond to IPFs introduced by other ongoing activities. Ongoing activities within the GAA that contribute to impacts on bats are generally associated with onshore impacts, including onshore construction and climate change. Onshore construction activities and associated impacts are expected to continue at current trends and have the potential to affect bat species. Impacts associated with climate change have the potential to reduce reproductive output and increase individual mortality and disease occurrence. Other future non-Project actions other than offshore wind development activities that may affect bats include new submarine cables and pipelines, oil and gas activities, increasing onshore construction, marine minerals extraction, port expansions, and installation of new structures on the OCS (refer to Appendix E for a complete description of ongoing and planned activities). These activities may result in short-term or permanent displacement and injury or mortality to individual bats, but population-level effects would not be expected.

Global climate change is an ongoing risk to bats although the associated impact mechanisms are complex, not fully understood, and difficult to predict with certainty. Possible impacts to bats include increased storm severity and frequency; increased disease frequency; and altered habitat, ecology, and migration patterns (Sherwin et al. 2013). Over time, climate change and coastal development would alter existing habitats, rendering some areas unsuitable for certain species and more suitable for others.

Ongoing offshore wind activities within the GAA that contribute to impacts on bats include:

- Continued O&M of the Block Island project (5 WTGs) installed in state waters;
- Continued O&M of the CVOW project (2 WTGs) installed in OCS-A 0497; and
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of Block Island and CVOW projects and ongoing construction of the Vineyard Wind 1 and South Fork projects would affect bats through the primary IPFs of noise, presence of structures, and land disturbance. Ongoing offshore wind activities would have the same type of impacts from noise, presence of structures, and land disturbance that are described in detail in the following section for planned offshore wind activities, but the impacts would be of lower intensity.

The sections below summarize the potential impacts of planned offshore wind activities on bats during construction, O&M, and decommissioning of the projects. The federally listed northern long-eared bat is the only bat species listed under the ESA that may be affected by other offshore wind activities. Impacts on the northern long-eared bat would most likely be limited to onshore impacts, and generally during onshore facility construction.

3.6.3.2 Cumulative Impacts of the No Action Alternative

The cumulative impact analysis for the No Action Alternative considers the impacts of the No Action Alternative in combination with other planned non-offshore wind activities and planned offshore wind activities (without the Proposed Action).

Other planned non-offshore wind activities that may affect bats include new submarine cables and pipelines, oil and gas activities, increasing onshore construction, marine minerals extraction, port expansions, and installation of new structures on the OCS (see Appendix E for a complete description of planned activities). These activities may result in short-term and permanent onshore habitat impacts and short-term or permanent displacement and injury of or mortality to individual bats, but population-level effects would not be expected.

The paragraphs below summarize the potential impacts of planned offshore wind activities on bats during construction, O&M, and decommissioning of the projects. The federally listed northern long-eared bat is the only bat species listed under the ESA that may be affected by other offshore wind activities. Impacts on the northern long-eared bat would most likely be limited to onshore impacts, and generally during onshore facility construction. Construction of numerous offshore wind projects (approximately 29 in varying stages of development) is projected for the period of 2022 to 2030. Future offshore wind activities may affect bats through the following primary IPFs.

Land disturbance: A small amount of infrequent construction impacts associated with onshore power infrastructure would be required over the next 6 to 10 years to connect offshore future wind energy projects to the electric grid. Typically, this would require only small amounts of natural habitat removal as the onshore facilities would be constructed in developed areas. Short-term impacts associated with habitat loss and/or avoidance or displacement during construction may occur, but no injury or mortality of individuals would be expected. As such, onshore land disturbance construction associated with future offshore wind development would short-term, minor, and not be expected to appreciably contribute to overall impacts on bats (BOEM 2019).

Noise: Onshore construction noise may result in short-term displacement of individual bats (Schaub et al. 2008). Offshore construction, particularly pile-driving activities, would create noise and may temporarily displace bats; however, research studies indicate that bats may be less sensitive to short-term changes in noise thresholds than other terrestrial animals and that no short-term changes or permanent loss in hearing would be expected from noise (Simmons et al. 2016). Offshore construction noise could result in avoidance or displacement, but these impacts are expected to be short-term due to the known limited use of offshore areas by bats during spring and fall migration periods (refer to Section 3.6.1). Therefore, the overall impact of construction noise to bats would be minor.

Traffic: Most of the construction vehicle activities for future wind energy projects would occur during daytime hours which are non-active periods for bats. It is possible for vehicle approaches to disturb bats, particularly near dusk or pre-sunrise times. Maintenance vessels would be present and operating during offshore O&M activities. Direct collision mortality impacts from construction traffic and stationary vehicles would be expected to be rare events since bats use echolocation to avoid objects. Indirect disturbance impacts may occur but would be short-term. Support vessels present during WTG construction and export cable activities may provide artificial roosting sites for bats and provide a beneficial effect in energy conservation. Onshore cable construction would occur primarily during the day in mostly developed onshore locations where bats are not roosting. The onshore impacts to bats from construction and installation traffic range from negligible to minor and short- to long-term. The impacts to bats from anticipated O&M vessel cable-laying traffic would be short-term, beneficial, and minor.

Lighting: Nighttime lighting associated with onshore structures and construction vessels could attract and concentrate insects and, therefore, attract foraging bats. In addition, this type of lighting can influence the composition and abundance of insects (Davies et al. 2012). If insects are attracted to construction lighting, then foraging bats in the area may benefit from lighting; however, light associated collision impacts are not expected because bats use echolocation to avoid structures. Acoustic bat detection data confirmed bat utilization of onshore and nearshore environments to be much greater than offshore environments. Non-migratory cave-hibernating bat activity is greater onshore and at coastal locations compared to offshore (NPS 2018; Smith and McWilliams 2016; Stantec 2016; Sunrise Wind 2023). Migratory tree-roosting bat activity is more common onshore and nearshore than offshore (Pelletier et al. 2013; Sunrise Wind 2023). Onshore light attraction impacts for bats range from beneficial and negligible to minor and long-term during construction and O&M.

Presence of structures: The primary offshore threats to bats from future offshore wind energy projects are from the potential disruption of migration patterns and mortality via collisions with WTGs. Offshore structures may attract bats or serve as concentration points for offshore activity (Peterson and Pelletier 2016), putting them at risk of collision with operating WTG blades. Although adverse impacts to bats resulting from collision mortality cannot be quantified based on existing studies, some level of mortality is expected during operations at offshore wind facilities (Solick and Newman 2021). Any new operating facility would require a thorough regulatory and environmental review to avoid, minimize, and mitigate adverse impacts to bats. Outside of migration, bats are infrequently found offshore. In addition, the proposed 1.0-nm (1.9-km) spacing between WTG structures with future offshore wind development and the distribution spacing between known projects would reduce collision exposure risk. Individual migratory bats would pass through the rotor-swept zone (RSZ) or pass by wind development sites with only slight course corrections. As a result, adverse impacts to bats would be minor and long-term.

3.6.3.3 Impacts of Alternative A on ESA-Listed Species

The cumulative impact analysis for the No Action Alternative considers the impacts of the No Action Alternative in combination with other planned non-offshore wind activities and planned offshore wind activities (without the Proposed Action). Based on the information contained in this document, BOEM anticipates that the reasonably foreseeable offshore wind activities are likely to result in minor adverse impacts to the northern long-eared, little brown, and tricolored bats.

3.6.3.4 Conclusions

Impacts of the No Action Alternative

Under the No Action Alternative, BOEM would not approve the COP; Project construction and installation, O&M, and conceptual decommissioning would not occur; and potential impacts on bats associated with the proposed Project would not occur; however, ongoing activities would have continued short- to long-term impacts on bats, primarily through construction-related displacement and operational noise, lighting, collision risk, habitat changes, and climate change. Onshore habitat removal areas are small when compared with other past, present, and reasonably foreseeable activities in the region. Population-level effects are not expected to occur to bats from future activities. BOEM anticipates that the overall impacts associated Alternative A, the No Action Alternative, when combined with all other ongoing activities (including ongoing offshore wind projects) in the GAA would result in overall **minor** adverse impacts.

Based on available literature, non-migratory cave-hibernating bats do not typically occur in the OCS, while migratory tree-roosting bats are expected to be infrequent and limited users of the OCS. The IPFs associated with future OCS wind development projects are not expected to significantly affect bat populations. BOEM anticipates that the bat impacts due to ongoing activities associated with the Alternative A - No Action of these ongoing activities would be **minor** adverse. BOEM anticipates that the overall impacts associated Alternative A, the No Action Alternative, when combined with all other planned activities (including offshore wind) in the GAA would result in overall **minor** adverse impacts.

Cumulative Impacts of the No Action Alternative

Other planned non-offshore wind activities that may affect bats include new submarine cables and pipelines, oil and gas activities, increasing onshore construction, marine minerals extraction, port expansions, and installation of new structures on the OCS (see Appendix E for a complete description of planned activities). These activities may result in short-term and permanent onshore habitat impacts and short-term or permanent displacement and injury of or mortality to individual bats, but population-level effects would not be expected. BOEM anticipates that the overall cumulative impacts associated Alternative A, the No Action Alternative, when combined with all ongoing and planned activities (including offshore wind) in the GAA would result in overall **minor** adverse impacts to bats.

3.6.4 Relevant Design Parameters and Potential Variances in Impacts

This Final EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than those described in the sections below. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts to bats:

- The extent of forested bat foraging/roosting habitat removal at the proposed onshore facility site and/or along the onshore cable route;
- Timing of onshore construction; and
- WTG number and size.

Variability of the proposed Project design is outlined in Appendix C. Below is a summary of potential variances in impacts to bats:

- **Forest habitat removal**: Changes in OnCS-DC location and onshore cable could increase or decrease acreage of forested habitat cleared during construction and increase or decrease the potential impacts depending on the extent of cleared acreage. If tree clearing is required in areas with trees suitable for bat roosting during the period when northern long-eared bats may be present, develop avoidance and minimization measures in coordination with United States Fish and Wildlife Service (USFWS) and NYSDEC and conduct pre-construction habitat surveys.
- **WTG number and size**: Potential collision impacts to bats would decrease with fewer WTGs and increase with a greater number of WTGs; however, if a larger turbine is used to replace each smaller removed turbine to maintain the Project’s generating capacity, the overall airspace exposure collision would be nearly identical since the total WTG RSZ area in the proposed Project Area would not appreciably change during operations.
- **Construction timing**: Construction clearing scheduled during the non-active season for bats (December-February) would decrease roosting/foraging impacts to the extent practicable. Variance of impacts would not be expected from construction clearing and operational activities.

3.6.5 Impacts of Alternative B - Proposed Action on Bats

The activities associated with offshore SRWF (94 11-MW WTGs out of 102 potential positions) and SRWEC-OCS/SRWEC-NYS cabling, and OnCS-DC, transmission cable, and interconnection cable with Alternative B include construction and installation, O&M, and decommissioning. These actions have the potential to cause both direct and indirect impacts to bats. The IPFs associated with construction and post-construction O&M activities include land disturbance, lighting, noise, traffic, and presence of structures. These IPFs are thoroughly discussed in the bat assessment prepared for this Project (COP Appendix P1, Stantec 2022). The conclusions of the bat assessment are presented in this section and include consideration of the Project’s mitigation and monitoring measures (Appendix H).

3.6.5.1 Construction and Installation

3.6.5.1.1 Onshore Activities and Facilities

Land disturbance: Potential direct impacts to bat species resulting from land disturbance caused by onshore construction include potential habitat loss and direct mortality or injury. Construction of the OnCS-DC would impact up to 4.7 ac (0.019 km^2) of developed land and 2.3 ac (0.009 km^2) of forested land. Tree clearing on the forested land could potentially reduce suitable bat summer foraging and roosting habitat. Mitigation and monitoring measures include seasonal restrictions and vegetation clearing provisions to avoid direct impact to bats. Onshore cable construction would occur primarily during the day in mostly developed onshore locations where bats are not roosting. The Project would reduce the potential impacts to bats by conducting tree clearing from December through February to the extent practicable. If tree clearing is required in areas suitable for northern long-eared bat roosting, the project proponents would develop specific avoidance and minimization measures in coordination with USFWS and NYSDEC and would conduct pre-construction habitat surveys. The potential for construction land disturbance impacts to bats are considered minor, localized, and short-term because of the small area impacted compared to the surrounding regional landscape.

Noise: Noise during daytime/nighttime construction activities has the potential to indirectly impact bats. Bats respond most strongly (awoke from torpor[2]) to colony and vegetation noise and less to traffic noise (Luo et al. 2014). Bats are known to avoid loud noises (Schaub et al. 2008). No bat-specific study has been conducted on HDD noise, but it is expected that their response would be similar to highway noise (COP Appendix P1, Stantec 2022). A recent study noted that bats may be less sensitive to short-term noise threshold shifts than other mammals, and as a result, bats are not expected to experience short-term or permanent hearing loss during construction (Simmons et al. 2016). During the summer when bats are active, construction activity noise may temporarily disrupt or displace bats; however, noise impacts would be minor, localized, and short-term.

Traffic: Most of the construction vehicle activities would occur during bat non-active daytime hours. It is possible that vehicle approaches may disturb bats, particularly near dusk or pre-sunrise times. Direct collision mortality impacts from construction traffic and stationary vehicles would be expected to be rare events as bats use echolocation to avoid objects. Indirect disturbance impacts may occur but would be short-term. The onshore impacts to bats from construction or installation traffic range from negligible to minor and short- to long-term.

Lighting: Nighttime lighting may be used during some of the OnCS-DC construction. Nighttime lighting may attract and concentrate insects and, therefore, attract foraging bats. In addition, the type of lighting

[2] Torpor is a hypometabolic condition associated with low body temperatures. It enables animals to survive periods of unfavorable environmental conditions. Depending on the duration of the hypometabolic state, the torpor can be daily torpor (short-term) or hibernation (long-term). Accessed August 2022. http://www.differencebetween.net/science/difference-between-torpor-and-hibernation/#ixzz7cYmhvsTY

can influence the composition and abundance of insects (Davies et al. 2012). If insects are attracted to construction lighting, then foraging bats in the area may benefit from lighting; however, light associated with collision impacts are not expected because bats use echolocation to avoid structures. The Project would use lighting technology that minimizes impacts on avian bat species to the extent practicable. Onshore light attraction impacts for bats range from to negligible to minor beneficial and short-term during construction and installation of the onshore facilities.

3.6.5.1.2 Offshore Activities and Facilities

Noise: Offshore construction noise could result in avoidance or displacement, but these impacts are expected to be short-term due to the known limited use of offshore areas by bats during spring and fall migration periods (Refer to Section 3.6.1). Additionally, noise associated with construction and installation is not expected to impact bats over the long term as they can habituate to repeated noise (Luo et al. 2014). Therefore, the overall impact of construction noise to bats would be short-term and minor.

Traffic: Construction and support vessels are expected to be present during construction and installation. Direct collision mortality impacts from construction and support vessels would be expected to be rare events since bats use echolocation to avoid objects, and the speed of vessel traffic is expected to be relatively slow. Support vessels present during construction and installation operations may provide artificial roosting sites for bats and aid in energy conservation. In addition, bats may benefit from lighted vessels and platforms which can attract insects and provide foraging opportunities. Overall, impacts related to construction and installation traffic would be short-term and negligible to minor with negligibly beneficial impacts.

Lighting: Lighting impacts to bats have been previously discussed in the onshore activities and facilities construction and installation section. These impacts identified are expected to be the same but of longer duration. Lighting impacts may be negligible to negligibly beneficial over the short term for bats through concentration of their prey base and improved foraging opportunities.

3.6.5.2 Operations and Maintenance

3.6.5.2.1 Onshore Activities and Facilities

Land disturbance: During the O&M phase of the Project, the only sources of land disturbance are expected to be routine maintenance of facilities and potential repair actions; however, no new facilities would be constructed, no additional habitat would be disturbed during O&M, and effects to bats would be negligible.

Noise: Operational noise associated with the OnCS-DC is not expected to impact bats as they can habituate to repeating noise disturbances (Luo et al. 2014).

Traffic: Collision impacts with the OnCS-DC are not expected as bats echolocate to avoid structures.

Lighting: Nighttime lighting may be used on the OnCS-DC facilities. Nighttime lighting may attract and concentrate insects and, therefore, attract foraging bats. If insects are attracted to construction lighting, then foraging bats in the area may benefit from lighting; however, light associated with collision impacts are not expected because bats use echolocation to avoid structures. The Project would use lighting technology that minimizes impacts on avian bat species to the extent practicable. Onshore light attraction impacts for bats range from to negligible to negligibly beneficial and long-term during construction and installation of the onshore facilities.

3.6.5.2.2 Offshore Activities and Facilities

Noise: Operational noise associated WTGs is not expected to impact bats as they can habituate to repeating noise disturbances (Luo et al. 2014).

Traffic: Maintenance vessels would be present and operating during offshore O&M activities. Direct collision mortality impacts would be expected to be rare events. Indirect disturbance impacts may occur but would be short-term. The impacts to bats from O&M vessel traffic would be localized, minor, and intermittent. Support vessels present during O&M activities may provide artificial roosting sites for bats and provide a negligible beneficial effect in energy conservation. In addition, bats may benefit from lighted vessels that may attract insects and provide foraging opportunities. Collision with vessels is unlikely as bats use echolocation to avoid structures. Overall, impacts related to vessel traffic during O&M would be negligible to negligibly beneficial and short-term.

Lighting: Lighting on WTGs would be limited to navigational lighting. Due to their offshore location and the intermittent operation of navigational lighting, WTG lighting is not anticipated to provide increased insect abundance and is, therefore, expected to have no impact to bats.

Presence of structures: Although adverse impacts to bats resulting from collision mortality cannot be quantified based on existing studies, some level of mortality is expected during operations at offshore wind facilities (Solick and Newman 2021). Any new operating facility would require a thorough regulatory and environmental review to avoid, minimize, and mitigate adverse impacts to bats. Outside of migration, bats are infrequently found offshore. In addition, the proposed 1.0-nm (1.9-km) spacing between WTG structures with the SRWF would reduce collision exposure risk. Bats use echolocation to effectively avoid collisions with visible infrastructure. Bat collision impacts with stationary infrastructure would be rare, unexpected occurrences. Individual migratory bats would pass through the RSZ or pass by wind development sites with only slight course corrections.

For ESA-listed (or proposed) bat species, BOEM (2022) analyzed the potential for impacts to northern long-eared bat, little brown bat, and tricolored bat. Several studies have been conducted to evaluate the presence of bats offshore in the region where the SRWF would be constructed (ESS Group Inc. 2014; Pelletier et al. 2013; Peterson and Pelletier 2016, Stantec 2018c). Northern long-eared bats have not been detected offshore in the Project Area, while little brown bats are expected to fly below the RSZ, eliminating the risk of blade strike. Tricolored bats generally migrate distances less than 31 mi (50 km), and forage less than 4 mi (6.4 km) from their roosts. This short flight range prohibits their presence in the SRWF area.

While the collision potential for individual bat fatalities exists from WTG operational activities, it is unlikely to impact bat populations since offshore bat occurrence and abundance is expected to be low. As a result, adverse impacts to bats from collision would be negligible to minor and long-term.

3.6.5.3 Conceptual Decommissioning

3.6.5.3.1 Onshore Activities and Facilities

Land disturbance: Land disturbance would be negligible since no new land would be disturbed during the process.

Noise: Noise impacts to bats would be the same or less than those described for construction activities. Onshore impacts to bats would range from negligible to minor and short-term during decommissioning.

Traffic: Traffic impacts to bats would be the same or less than those described for construction activities. Bats would avoid visible infrastructure with echolocation. Onshore impacts to bats would range from negligible to minor and short-term during decommissioning.

Lighting: Lighting impacts to bats would be similar to those described for the construction activities. Lighting impacts would be expected to range from negligible to negligibly beneficial from increased prey availability due to nighttime lighting.

3.6.5.3.2 Offshore Activities and Facilities

Noise: Noise impacts to bats would be the same or less than those described for construction activities. Bats would avoid lighted areas and visible infrastructure with echolocation. Noise impacts to bats would be negligible to minor and short-term during decommissioning.

Traffic: Construction and support vessels are expected to be present during conceptual decommissioning activities. Direct collision mortality impacts from construction and support vessels would be expected to be rare events since bats use echolocation to avoid objects, and the speed of the vessel traffic is slow. Support vessels present during decommissioning may provide artificial roosting sites for bats and aid in energy conservation. Overall, impacts related to decommissioning would be negligible and short-term.

Lighting: Lighting impacts to bats have been previously discussed in the construction and installation section. These impacts identified are expected to be similar or less than for conceptual decommissioning due to a shorter overall expected duration of these activities. Lighting impacts may be negligible to beneficially minor for bats through concentration of their prey base and improved foraging opportunities.

3.6.5.4 Impacts of Alternative B on ESA-Listed Species

Based on the information contained in this document, BOEM anticipates that the Proposed Action is likely to result in negligible adverse impacts to the northern long-eared, little brown, and tricolored bats.

3.6.5.5 Cumulative Impacts of the Proposed Action

The cumulative impacts of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned wind activities. Ongoing and planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on bats through the primary IPFs of noise, presence of structures, and land disturbance. The construction, O&M, and decommissioning of both onshore and offshore infrastructure for offshore wind activities across the GAA would also contribute to the primary IPFs of noise, presence of structures, and land disturbance. Given the infrequent and limited anticipated use of the OCS by migrating tree bats during spring and fall migration is anticipated to be infrequent and limited and given that cave bats do not typically occur on the OCS, offshore wind activities would not appreciably contribute to impacts on bats. Short-term disturbance and permanent loss of onshore habitat may occur as a result of constructing onshore infrastructure such as onshore substations and onshore export cables for offshore wind development. However, habitat removal is anticipated to be minimal, and any impacts resulting from habitat loss or disturbance would not be expected to result in individual fitness or population-level effects within the GAA.

3.6.5.6 Conclusions

Impacts of the Proposed Action

Project construction and installation, O&M, and conceptual decommissioning would cause impacts from the following IPFs: land disturbance, noise, traffic, lighting, and the presence of structures. BOEM anticipates the impacts resulting from the Proposed Action alone would range from negligible to minor adverse impacts. Therefore, BOEM expects the overall impact on bats from the Proposed Action alone to be **minor** adverse, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects.

Cumulative Impacts of the Proposed Action

In the context of other reasonably foreseeable environmental trends and planned actions, the incremental impacts under the Proposed Action resulting from individual IPFs would range from negligible to minor impacts over both the short- and long-term, depending on the species. Considering all the IPFs together, BOEM anticipates that the overall cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **minor** adverse impacts to bats. Even though the overall effect would be detectable and measurable, the impacts to individuals and their habitats would not lead to population-level effects.

3.6.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

Under Alternative C-1, the same number of WTGs (up to 94 WTGs) under the Proposed Action may be approved by BOEM; however, 8 WTG potential positions from Priority Area 1 along the northern boundary of the Lease Area would be excluded from consideration (Figure 2.1-7). The WTG positions to be removed from Priority Area 1 were selected to maximize the largest contiguous complex habitat area feasible and/or to reduce the number of 11-MW WTGs located near presumed Atlantic cod spawning location(s). This alternative would not significantly alter the construction methods, O&M, or conceptual decommissioning of the Project. This alternative would not increase the impact level or likelihood of impacts for bats as compared to the Proposed Action. Therefore, Alternative C-1 would be expected to have negligible to moderate impacts on bats from construction and installation, O&M, and conceptual decommissioning activities.

3.6.6.1 Construction and Installation

3.6.6.1.1 Onshore Activities and Facilities

Onshore impacts to bats would be the same as those described for the Proposed Action. Onshore impacts to bats would be minor and short-term.

3.6.6.1.2 Offshore Activities and Facilities

Offshore impacts to bats would be the same as those described for the Proposed Action. Offshore impacts to bats would be minor and long-term.

3.6.6.2 Operations and Maintenance

3.6.6.2.1 Onshore Activities and Facilities

Onshore impacts would be the same as described for the Proposed Action. Onshore impacts to bats would be minor and long-term.

3.6.6.2.2 Offshore Activities and Facilities

Offshore impacts would be the same as described for the Proposed Action. Offshore impacts to bats would be negligible to minor and long-term.

3.6.6.3 Conceptual Decommissioning

3.6.6.3.1 Onshore Activities and Facilities

Onshore impacts would be the same as described for the Proposed Action. Onshore impacts to bats would be minor and short-term.

3.6.6.3.2 Offshore Activities and Facilities

Offshore impacts would be the same as described for the Proposed Action. Offshore impacts to bats would be minor and short-term.

3.6.6.4 Cumulative Impacts of Alternative C-1

The cumulative impacts of Alternative C-1 considered the impacts of this alternative in combination with other ongoing and planned wind activities. Ongoing and planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on bats through the primary IPFs of noise, presence of structures, and land disturbance. The construction, O&M, and decommissioning of both onshore and offshore infrastructure for offshore wind activities across the GAA would also contribute to the primary IPFs of noise, presence of structures, and land disturbance. Given the infrequent and limited anticipated use of the OCS by migrating tree bats during spring and fall migration is anticipated to be infrequent and limited and given that cave bats do not typically occur on the OCS, offshore wind activities would not appreciably contribute to impacts on bats. Short-term disturbance and permanent loss of onshore habitat may occur as a result of constructing onshore infrastructure such as onshore substations and onshore export cables for offshore wind development. However, habitat removal is anticipated to be minimal, and any impacts resulting from habitat loss or disturbance would not be expected to result in individual fitness or population-level effects within the GAA.

The cumulative impacts on bats would likely be negligible because the occurrence of bats offshore is low, and onshore habitat loss is expected to be minimal. In context of reasonably foreseeable environmental trends, Alternative C-1 would contribute an undetectable increment to the cumulative noise, presence of structures, and land disturbance impacts on bats.

3.6.6.5 Impacts of Alternative C-1 on ESA-Listed Species

Based on the information contained in this document, BOEM anticipates that Alternative C-1 is likely to result in negligible adverse impacts to the northern long-eared, little brown, and tricolored bats.

3.6.6.6 Conclusions

Impacts of Alternative C-1

Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for bats. Therefore, the conclusions for impacts of Alternative C-1 are the same as described under the Proposed Action (Alternative B). BOEM expects the overall impact on bats to be **minor** adverse, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects.

Cumulative Impacts of Alternative C-1

Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for bats. Therefore, the conclusions for cumulative impacts of Alternative C-1 are the same as described under the Proposed Action (Alternative B). BOEM expects the overall cumulative impact on bats to be **minor** adverse, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects.

3.6.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of up to 12 WTG Positions to the Eastern Side of the Lease Area

Alternative C-2 differs from Alternative B (Proposed Action) only with the location of the WTGs. WTGs initially planned for the western side of the Project would be moved to an open area on the eastern side of proposed Project Area to minimize impacts to fisheries habitat. Onshore and offshore construction and installation, O&M, and conceptual decommissioning impacts would be the same as described for Alternative B.

3.6.7.1 Construction and Installation

3.6.7.1.1 Onshore Activities and Facilities

Onshore impacts to bats would be the same as those described for Alternative B. Onshore impacts to bats would be minor and short-term.

3.6.7.1.2 Offshore Activities and Facilities

Offshore impacts to bats would be the same as those described for Alternative B. Offshore impacts to bats would be minor and long-term.

3.6.7.2 Operations and Maintenance

3.6.7.2.1 Onshore Activities and Facilities

Onshore impacts would be the same as described in Alternative B. Onshore impacts to bats would be minor and long-term.

3.6.7.2.2 Offshore Activities and Facilities

Offshore impacts would be the same as described in Alternative B. Offshore impacts to bats would be negligible to minor and long-term.

3.6.7.3 Conceptual Decommissioning

3.6.7.3.1 Onshore Activities and Facilities

Onshore impacts would be the same as described in Alternative B. Onshore impacts to bats would be minor and short-term.

3.6.7.3.2 Offshore Activities and Facilities

Offshore impacts would be the same as described in Alternative B. Offshore impacts to bats would be minor and short-term.

3.6.7.4 Cumulative Impacts of Alternative C-2

The cumulative impacts of Alternative C-2 considered the impacts of this alternative in combination with other ongoing and planned wind activities. Ongoing and planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on bats through the primary IPFs of noise, presence of structures, and land disturbance. The construction, O&M, and decommissioning of both onshore and offshore infrastructure for offshore wind activities across the GAA would also contribute to the primary IPFs of noise, presence of structures, and land disturbance. Given the infrequent and limited anticipated use of the OCS by migrating tree bats during spring and fall migration is anticipated to be infrequent and limited and given that cave bats do not typically occur on the OCS, offshore wind activities would not appreciably contribute to impacts on bats. Short-term disturbance and permanent loss of onshore habitat may occur as a result of constructing onshore infrastructure such as onshore substations and onshore export cables for offshore wind development. However, habitat removal is anticipated to be minimal, and any impacts resulting from habitat loss or disturbance would not be expected to result in individual fitness or population-level effects within the GAA.

The cumulative impacts on bats would likely be negligible because the occurrence of bats offshore is low, and onshore habitat loss is expected to be minimal. In context of reasonably foreseeable environmental trends, Alternative C-2 would contribute an undetectable increment to the cumulative noise, presence of structures, and land disturbance impacts on bats.

3.6.7.5 Impacts of Alternative C-2 on ESA-Listed Species

Based on the information contained in this document, BOEM anticipates that Alternative C-2 is likely to result in negligible adverse impacts to the northern long-eared, little brown, and tricolored bats.

3.6.7.6 Conclusions

Impacts of Alternative C-2

Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for bats. Therefore, the conclusions for impacts of Alternative C-2 are the same as described under the Proposed Action (Alternative B). BOEM expects the overall impact on bats to be **minor** adverse, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects.

Cumulative Impacts of Alternative C-2

Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for bats. Therefore, the conclusions for cumulative impacts of Alternative C-2 are the same as described under the Proposed Action (Alternative B). BOEM expects the overall cumulative impact on bats to be **minor** adverse, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects.

3.6.8 Alternative C-3 - Reduced Layout from Priority Areas Considering Feasibility due to Glauconite Sands

Under the Fisheries Habitat Impact Minimization Alternative C-3, the construction, O&M, and eventual decommissioning of the 11-MW WTGs and an OCS within the proposed Project Area and associated inter-array and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. However, Alternative C-3 was developed to address concerns regarding pile refusal due to glauconite sands in the southeastern portion of the Lease Area while still minimizing impacts to benthic and fisheries resources. Alternative C-3a, C-3b, and C-3c described in Section 3.7.8, *Benthic Resources*, consider different WTG configurations to avoid sensitive habitats and engineering constraints while still meeting the NYSERDA OREC. This alternative only considered removal of WTGs from Priority Area 1 based on consultation with NMFS. Areas with high density of boulder, complex habitat, and data suggesting Atlantic cod aggregation and spawning was considered when determining which WTGs to remove.

3.6.8.1 Construction and Installation

3.6.8.1.1 Onshore Activities and Facilities

Onshore impacts to bats would be the same as those described for Alternative B. Onshore impacts to bats would be minor and short-term.

3.6.8.1.2 Offshore Activities and Facilities

Offshore impacts to bats would be the same as those described for Alternative B. Offshore impacts to bats would be minor and long-term.

3.6.8.2 Operations and Maintenance

3.6.8.2.1 Onshore Activities and Facilities

Onshore impacts would be the same as described in Alternative B. Onshore impacts to bats would be minor and long-term.

3.6.8.2.2 Offshore Activities and Facilities

Offshore impacts would be the same as described in Alternative B. Offshore impacts to bats would be negligible to minor and long-term.

3.6.8.3 Conceptual Decommissioning

3.6.8.3.1 Onshore Activities and Facilities

Onshore impacts would be the same as described in Alternative B. Onshore impacts to bats would be minor and short-term.

3.6.8.3.2 Offshore Activities and Facilities

Offshore impacts would be the same as described in Alternative B. Offshore impacts to bats would be minor and short-term.

3.6.8.4 Cumulative Impacts of Alternative C-3

The cumulative impacts of Alternative C-3 considered the impacts of this alternative in combination with other ongoing and planned wind activities. Ongoing and planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on bats through the primary IPFs of noise, presence of structures, and land disturbance. The construction, O&M, and decommissioning of both onshore and offshore infrastructure for offshore wind activities across the GAA would also contribute to the primary IPFs of noise, presence of structures, and land disturbance. Given the infrequent and limited anticipated use of the OCS by migrating tree bats during spring and fall migration is anticipated to be infrequent and limited and given that cave bats do not typically occur on the OCS, offshore wind activities would not appreciably contribute to impacts on bats. Short-term disturbance and permanent loss of onshore habitat may occur as a result of constructing onshore infrastructure such as onshore substations and onshore export cables for offshore wind development. However, habitat removal is anticipated to be minimal, and any impacts resulting from habitat loss or disturbance would not be expected to result in individual fitness or population-level effects within the GAA.

The cumulative impacts on bats would likely be negligible because the occurrence of bats offshore is low, and onshore habitat loss is expected to be minimal. In context of reasonably foreseeable environmental trends, Alternative C-3 would contribute an undetectable increment to the cumulative noise, presence of structures, and land disturbance impacts on bats.

3.6.8.5 Impacts of Alternative C-3 on ESA-Listed Species

Based on the information contained in this document, BOEM anticipates that Alternative C-3 is likely to result in negligible adverse impacts to the northern long-eared, little brown, and tricolored bats.

3.6.8.6 Conclusions

Impacts of Alternative C-3

Alternative C-3 includes changes to turbine installation locations that would not alter any of the findings for bats. Therefore, the conclusions for impacts of Alternative C-3 are the same as described under the Proposed Action (Alternative B). BOEM expects the overall impact on bats to be **minor** adverse, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects.

Cumulative Impacts of Alternative C-3

Alternative C-3 includes changes to turbine installation locations that would not alter any of the findings for bats. Therefore, the conclusions for cumulative impacts of Alternative C-3 are the same as described under the Proposed Action (Alternative B). BOEM expects the overall cumulative impact on bats to be **minor** adverse, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects.

3.6.9 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, C-2, and C-3 would have the same overall minor adverse impacts on bats. Table 3.6-2 provides an overall summary of alternative impacts.

Table 3.6-2. Comparison of Alternative Impacts on Bats

No Action Alternative (Alternative A)	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)	Fisheries Habitat Minimization Considering Feasibility Due to Glauconite Sands (Alternative C-3)
No Action Alternative: Ongoing activities associated with Alternative A would be **minor** adverse**.** *Cumulative Impacts of the No Action Alternative:* Considering all the IPFs together, BOEM anticipates that the overall cumulative impacts associated with past, present, and reasonably foreseeable activities would result in **minor** impacts to bats. Even though the overall effect would be detectable and measurable, the impacts to individuals and their habitats would not lead to population-level effects.	*Proposed Action:* BOEM anticipates the impacts resulting from the Proposed Action alone would be **minor** adverse impacts. Therefore, BOEM expects the overall impact on bats from the Proposed Action to be **minor**, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects. *Cumulative Impacts of the Proposed Action:* Considering all the IPFs together, BOEM anticipates that the overall cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **minor** impacts to bats. Even though the overall	*Alternative C-1:* Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for bat compared to the Proposed Action. BOEM expects the overall impact on bats to be **minor**, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects. *Cumulative Impacts of Alternative C-1:* Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for bat compared to the Proposed Action. The conclusions for cumulative impacts of Alternative C-1 are the same as described under the Proposed Action. BOEM expects the	*Alternative C-2*: Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for bats. BOEM expects the overall impact on bats to be **minor**, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects. *Cumulative Impacts of Alternative C-2:* Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for bats. The conclusions for cumulative impacts of Alternative C-2 are the same as described under the Proposed Action. BOEM expects the overall cumulative impact on bats to be **minor**, as the overall effect would be	*Alternative C-3:* Alternative C-3 includes changes to turbine installation locations that would not alter any of the findings for bats. BOEM expects the overall impact on bats to be **minor**, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects. *Cumulative Impacts of Alternative C-3:* Alternative C-3 includes changes to turbine installation locations that would not alter any of the findings for bats. The conclusions for cumulative impacts of Alternative C-3 are the same as described under the Proposed Action. BOEM expects the overall cumulative impact on bats to be **minor**, as the overall effect would be

No Action Alternative (Alternative A)	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)	Fisheries Habitat Minimization Considering Feasibility Due to Glauconite Sands (Alternative C-3)
	effect would be detectable and measurable, the impacts to individuals and their habitats would not lead to population-level effects.	overall cumulative impact on bats to be **minor**, as the overall effect would be measurable but the impacts to individuals and their habitats would not lead to population-level effects.	measurable but the impacts to individuals and their habitats would not lead to population-level effects.	measurable but the impacts to individuals and their habitats would not lead to population-level effects.

3.6.10 Summary of Impacts of the Preferred Alternative

BOEM has identified Alternative C-3b as the Preferred Alternative which would include installation of up to 84 WTGs, which is 10 fewer WTGs than the maximum WTGs proposed under the PDE of the Proposed Action. Although Alternative C-3b would reduce the number of WTGs, the presence of WTGs could still increase the potential for collision, albeit at lower levels than the Proposed Action. The reduction in effects from impacts would not result in different impact level determinations. These adverse impacts would be avoided and minimized using the same APMs as described in the Proposed Action (see Table 3.6-3). BOEM expects the overall impacts of these alternatives to bats would be similar to the Proposed Action: **minor** adverse.

In the context of other reasonably foreseeable environmental trends and planned actions, BOEM also expects that Alternative C-3b's contribution to cumulative impacts would be similar to the Proposed Action (ranging from negligible to minor adverse). The overall impacts of Alternative C-3b when combined with past, present, and reasonably foreseeable activities would therefore be the same as under the Proposed Action: **minor** adverse.

3.6.11 Proposed Mitigation Measures

The mitigation measures listed in Table 3.6-3 are recommended for inclusion in the Preferred Alternative.

Table 3.6-3. Proposed Mitigation Measures: Bats

Measure	Description	Effect
Adaptive mitigation for birds and bats	Sunrise Wind developed a Post-construction Avian and Bat Monitoring Framework that summarizes the approach to monitoring; describes overarching monitoring goals and objectives; identifies the key bat species, prioritizes questions, and data gaps unique to the region and Project Area that would be addressed through monitoring; and describes methods and time frames for data collection, analysis, and reporting. Sunrise Wind would engage with federal and state agencies and eNGOs to identify appropriate monitoring options and technologies, and to facilitate acceptance of the final plan.	If the reported post-construction bat monitoring results indicate bat impacts deviate substantially from the impact analysis included in this EIS, then Sunrise Wind must make recommendations for new mitigation measures or monitoring methods.
Adaptive mitigation for birds and bats	As new technologies become available for monitoring fatalities at offshore wind facilities, such as strike detection technology, Sunrise Wind would commit to deploying these technologies.	If monitoring reveals that impacts to bats are non-negligible, Sunrise Wind would employ minimization strategies and deterrent technologies.
Lighting reduction measures	Construction and operational lighting in the offshore environment will be limited to the minimum necessary to ensure safety and compliance with applicable regulations. Lighting reduction measures could include downward projecting lights, lights triggered by motion sensors, and limiting lighting to that which is required for safety and compliance.	Reduces anthropogenic lighting effects to bat species.
ADLS or related dimming or shielding	Sunrise Wind LLC will use ADLS or related means (e.g., dimming or shielding) to limit visual impact, pursuant to approval by the FAA and BOEM, commercial and technical feasibility at the time of the FDR/FIR approval, and dialogue with stakeholders.	Reduces anthropogenic lighting effects to bat species.
Time-of-year restrictions	Time-of-year restrictions for certain work activities, such as HDD conduit stringing, will be employed to the extent feasible to avoid or minimize direct impacts to rare, threatened, and endangered (RTE) avian species during construction of the Landfall.	Reduces construction impacts to bat species.
Time-of-year restrictions	Time-of-year restrictions for tree removal at the Onshore Facilities to avoid impacts to northern long-eared bats would also benefit breeding birds. If work is anticipated to occur outside of these time-of-year restriction periods, Sunrise Wind LLC will consult with NYSDEC and USFWS, if applicable, regarding impacts to RTE avian species.	Reduces construction impacts to bat species.

Incidental mortality reporting	• Sunrise Wind LLC must provide an annual report to BOEM, BSEE, and the Service documenting any dead (or injured) birds or bats found on vessels and structures during construction, operations, and decommissioning. The report must contain the following information: the name of species, date found, location, a picture to confirm species identity (if possible), and any other relevant information. Carcasses with federal or research bands must be reported to the USGS Bird Band Laboratory, available at https://www.pwrc.usgs.gov/BBL/bblretrv/. • Incidental observations are extremely unlikely to document any fatalities of listed birds that may occur due to turbine collision. While this Conservation Measure appropriately requires documentation and reporting of any fatalities observed incidental to O&M activities, the Avian & Bat Post-Construction Monitoring Plan will make clear that lack of documented fatalities in no way suggests that fatalities are not occurring. Likewise, the agencies will not presume that any documented fatalities were caused by colliding with a turbine unless there is evidence to support this conclusion. • Any occurrence of a dead ESA-listed bird or bat must be reported to BOEM, the BSEE, and the Service as soon as practicable (taking into account crew and vessel safety), but no later than 72 hours after the sighting, and, if practicable, the dead specimen will be carefully collected and preserved in the best possible state.	
Protection of northern long-eared bats	i. No Project component shall be sited or located within 150 feet of any known northern long-eared bat maternity roost, or within 0.25 mile of any known northern long-eared bat hibernaculum. ii. No tree clearing activities shall occur at any time within 150 feet of any NLEB maternity roosts or 0.25 mile of any NLEB hibernacula. All tree clearing activities occurring greater than these distances but within 1.5 miles of a NLEB detection or 5 miles of a NLEB hibernaculum site shall be conducted between December 1 and February 28. iii. If the conditions specified in Certificate Conditions 75 (b) (i) and (ii) cannot be met, the Certificate Holder shall consult with NYSDEC and, if applicable, USFWS, to determine what, if any, permits and/or additional authorizations are required. iv. From March 1 to November 30, the Certificate Holder shall leave uncut all snag and cavity trees as defined under NYSDEC Program Policy ONRDLF-2 Retention on State Forests, unless their removal is necessary for the protection of human life and property. When necessary, snag and cavity trees may be removed after being	Recues adverse impacts to northern long-eared bats.

	cleared by the environmental monitor, who shall conduct a survey for bats exiting the tree. This survey shall begin 1/2 hour before sunset and continue until at least 1 hour after sunset or until it is otherwise too dark to see emerging bats. Unoccupied snag and cavity trees in the approved clearing areas shall be removed within 24-hours of the exit-count survey. v. If at any time during the life of the Project any NLEB maternity roost trees are discovered, NYSDEC will be notified within 24 hours of discovery, and an area of at least 500 feet in radius around the roost tree(s) shall be marked and avoided until notice to continue construction, ground clearing, grading, maintenance or restoration activities, as applicable, at that site is granted by DPS after consultation with NYSDEC, except if necessary for the protection of human life and property. vi. Except as otherwise specified, if it is determined to be necessary to take occupied habitat or individuals of NLEB, the Certificate Holder will develop a Net Conservation Benefit Plan in consultation with and accepted by NYSDEC and DPS staff that satisfies the requirements of 6 NYCRR Part 182.	

3.6.11.1 Effect of Measures Incorporated into the Preferred Alternative

The mitigation measures listed in Table 3.6-3 are recommended for inclusion in the Preferred Alternative. These measures include adaptive mitigation. These measures, if adopted, would have the effect of further reducing the overall impact from the Preferred Alternative.

3.8 Birds

This section discusses potential impacts on birds from the proposed Project, alternatives, and future offshore wind activities in the GAA (Appendix D, Figure D-5). The bird GAA, as depicted in Appendix D, includes the United States eastern coast from Maine to Florida extending from 0.5 mi (0.8 km) onshore to cover Project component sites and 100 mi (161 km) offshore.

3.8.1 Impact Level Definitions for Birds

This Final EIS uses a four-level classification scheme to analyze potential impact levels on birds from the alternatives, including the Proposed Action. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a project or beyond project operations and decommissioning. Table 3.8-1 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for birds. Table G-7 in Appendix G (*Impact-Producing Factor Tables*) identifies potential IPFs, issues, and indicators to assess impacts to birds.

Table 3.8-1. Definition of Potential Adverse and Beneficial Impact Levels for Birds

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	Impacts on individual birds and/or their habitat, if any, would be at the lowest levels of detection and barely measurable, with no perceptible consequences to individuals or the population.	Impacts on individual birds and/or their habitat would be beneficial but at the lowest levels of detection and barely measurable.
Minor	Impacts on birds are detectable and measurable but are low intensity, highly localized, and short-term in duration. Impacts on individuals and/or their habitat do not lead to population-level effects.	Impacts on individual birds and/or their habitat are detectable and measurable. The effects are likely to benefit individuals, be localized, and/or be short-term and are unlikely to lead to population-level effects.
Moderate	Impacts on birds and/or their habitat are detectable and measurable; they are of medium-intensity, can be short- or long-term, and can be localized or extensive. Impacts on individuals and/or their habitat could have population-level effects, but the population can sufficiently recover from the impacts or enough habitat remains functional to maintain the viability of the species both locally and throughout their range.	Impacts on individual birds and/or their habitat are detectable and measurable. These benefits may affect large areas of habitat, be long-term, and/or affect a large number of individuals and may lead to a detectable increase in populations but is not expected to improve the overall viability or recovery of affected species or population.
Major	Impacts on individual birds and/or their habitat detectable and measurable; they are of severe intensity, can be long-lasting or permanent, and are extensive. Impacts to individuals and/or their habitat would have severe population-level effects and compromise the viability of the species.	Impacts on individual birds and/or their habitat are detectable and measurable. These impacts on habitat may be short-term, long-term, or permanent and would promote the viability of the affected species/population and/or increase the affected species/population levels.

3.8.2 Description of the Affected Environment and Future Baseline Conditions

Several avian species groups occur seasonally within or in proximity to the onshore and offshore portions of the Project Area and the GAA, which extends from 0.5 mi (0.8 km) inland to 100 mi (161 km) offshore along the United States coast from Maine to Florida (Appendix D). Situated within the Atlantic Flyway, the Project Area is located within one of four major North American north-south migration routes for many species of seabirds, shorebirds and waterfowl, raptors, and songbirds (Menza et al. 2012). This flyway is an important migratory pathway for up to 164 species of marine/coastal waterbirds and a similar number of land birds with the majority using this pathway annually migrating between wintering and breeding grounds (Watts 2010; NYSDEC 2007; Veit et al. 2016; Normandeau and APEM 2021). Both the coastal and marine environments along the Atlantic Flyway provide important resources for hundreds of these avian species at migration stopover sites, as well as breeding locations, and wintering areas (Menza et al. 2012). Birds use a wide variety of habitats (e.g., forests, grasslands, riparian corridors, lakes, wetlands, coastal shorelines, and offshore marine waters) for breeding, foraging, and roosting.

During migration waterbirds using the Atlantic Flyway typically fly between the coast and several kilometers out onto the OCS, whereas land birds tend to use a wider corridor extending from the coastline to tens of kilometers inland. Although both groups may occur over land or water within the flyway and may extend considerable distances from shore, the highest diversity and density are centered near the shoreline (Watts 2010). COP Tables 4.4.6.1, 4.4.6-2, 4.4.6-3, and 4.4.6-4 (COP, Section 4.4.6; Sunrise Wind 2023) list the timing; distribution; and status of marine, coastal, and land bird taxonomic groups and species that may occur within or proximate to the OnCS-DC and the offshore SRWEC-NYS, SRWEC-OCS, and SRWF Project areas, and are incorporated here by reference.

3.8.2.1 General Distribution OnCS-DC and SRWEC-NYS

Many species of waterfowl, shorebirds, waders, raptors, songbirds, and seabirds may occur at the onshore facilities areas, along the nearshore SRWEC-NYS cable route, and in the adjacent surrounding region on Fire Island, a barrier island that runs parallel to Long Island. Located within the North Atlantic Coast Ecoregion of New York (NYSDEC 2022), terrestrial/aquatic bird habitats of the onshore portions of the Project Area include forests, grasslands, developed areas, beaches, and surface waters such as wetlands, lakes, ponds, rivers.

Many birds use coastal and marine habitats year-round, particularly waterfowl, shorebirds, and other wading birds. Waterfowl such as geese and ducks and wading birds such as herons and egrets typically utilize inland, coastal, and wetland habitats during overwintering or summer breeding, and only occur offshore during migration (Sunrise Wind 2023). Most shorebirds breed and forage along coastal beaches and, other than the uniquely marine phalaropes, only occur offshore during migration.

Colonial seabird and piping plover (*Charadrius melodus*) surveys on coastal Long Island have reported active breeding sites for the least tern (*Sternula antillarum*), common tern (*Sterna hirundo*), Forster's tern (*Sterna forsteri*), black skimmer (*Rynchops niger*), and gull-billed tern (*Gelochelidon nilotica*) (Jennings 2018). Pied-billed grebe (*Podilymbus escrys*) may breed at locations in the vicinity of the onshore transmission cable/interconnection cable (NYSDEC 2007). Each of these species has the potential to utilize resources at or adjacent to the onshore facilities as foraging, nesting, or migrating habitat. The NYSDEC has indicated that terns have historically nested on dredged material adjacent to the Smith Point Marina parking lot (see COP, Section 4.4.6; Sunrise Wind 2023).

Land birds using the surrounding coastal region include songbirds and raptors. A variety of these passerines and other birds migrate along the Atlantic coast and could fly over the Project Area (particularly onshore facilities, the nearshore SRWEC-NYS cable route, and landing sites during migration and may utilize stopover sites and staging areas along the coast. Songbirds breed in onshore habitats during summer and are only present offshore during spring and fall migrations. Raptors, including accipiters, buteos, and harriers, may breed and forage in upland habitats and pass through the area during spring and fall migration. Falcons, osprey, and eagles may utilize coastal areas to breed, forage, and migrate (Sunrise Wind 2023). The New York State Breeding Bird Atlas 2000-2005 survey results indicated that the northern harrier (*Circus hudsonius*) may breed at locations in the vicinity of the onshore transmission cable/interconnection cable (NYSDEC 2007). Northern harriers may also occur along the shoreline to hunt for avian and rodent prey from spring through fall (Smith et al. 2020).

3.8.2.2 General Distribution SRWEC-OCS and SRWF

The SRWF would be situated on the OCS in waters ranging in depth from 114 to 203 ft (35 to 62 m) and located approximately 30.5 mi (49.1 km) east of Montauk, New York and 16.7 mi (26.8 km) from Block Island, Rhode Island (COP, Appendix G1; Sunrise Wind 2022). Various fish, crustaceans, and other zooplankton are available in this offshore area as prey for diving birds at different depths, including the benthos. A total of 83 marine bird species are known to regularly occur off the eastern seaboard of the United States (Nisbet et al. 2013). The diversity of marine bird species that use the Project Area and surrounding region is due in part to its location within the Mid-Atlantic Bight, a region where species that breed in both the Northern and Southern Hemispheres overlap (BOEM 2022a). Bird groups expected to use deeper offshore waters within the GAA at least seasonally or year-round include loons, shearwaters, fulmars, storm-petrels, gannets, sea ducks, jaegers, gulls, terns, and alcids (COP, Appendix P1; Stantec 2022b).

The SRWEC-OCS is located within federal offshore waters of the OCS where a variety of marine birds and/or non-marine migratory bird species are expected to be comparable to those described for the SRWF. Birds known to occur near NYS waters include terns, gulls, cormorants, and shorebirds during summer and sea ducks, dabbling ducks, loons, grebes, alcids, and migrating passerines during spring and summer migrations and winter. Other more pelagic species that could occur include the Cory's shearwater (*Calonectris borealis*), northern gannet (*Morus bassanus*), and black-legged kittiwake (*Rissa tridactyla*) (Sunrise Wind 2023).

3.8.2.3 Endangered Species Act-Listed Species

Species that are federally designated as Threatened or Endangered under the ESA and that may occur in any portion of the Project Area include the piping plover (threatened), rufa red knot (*Calidris canutus rufa*; threatened; USFWS 2021a), and roseate tern (*Sterna dougallii*; endangered). The black-capped petrel (*Pterodroma hasitata*) has been proposed for listing and could potentially occur in the region; however, this species is generally associated with waters deeper than the nearshore waters utilized by the three currently listed species (USFWS 2019).

No ESA-defined critical habitat is currently designated for ESA-listed birds in or near the Project Area. Critical habitat for the rufa red knot has been proposed and encompasses 649,066 ac (2,626.7 km^2) from Massachusetts to Texas. The portion of proposed critical habitat near the Project Area is on southern Long Island and includes 1,001 ac (4.05 km^2) in Moriches Inlet, Sussex County; 1,821 ac (7.37 km^2) in Jones Inlet, Nassau County; and 5,458 ac (22.09 km^2) in Jamaica Bay, Queens County (USFWS 2021a, 2021b).

Piping Plover: Piping plovers nest on sandy beaches near the Project Area and pass through the region during spring and fall migrations. They are present in the region from March to September and nest on beaches on Long Island from April through August (NYSDEC 2017). Results of the 2018 Long Island colonial waterbird surveys found 82 active piping plover breeding sites and 404 breeding pairs along the coast and barrier islands (Jennings 2018). Fire Island at Smith Point County Park had 25 breeding pairs of piping plover in 2018 (Jennings 2018). Piping plover nests have been documented within the Great South Bay area (NYSERDA 2017b). Although offshore flights of piping plovers are believed to be infrequent, telemetry data indicate that the potential exists for this species to infrequently fly over the SRWF (COP, Appendix P1; Stantec 2022b).

Rufa Red Knot: This shorebird undertakes long-distance migratory flights (up to 5,000 mi [8,000 km]; Baker et al. 2013) between breeding grounds in the Arctic and wintering grounds in the southeastern United States, Caribbean, northern Brazil, and Argentina (Tierra del Fuego) (Baker et al. 2013). The red knot may be present along the United States East Coast, including New York, Rhode Island, and Massachusetts, during spring and fall migratory periods (NYSERDA 2017a); the rufa subspecies' primary stopover during spring migration is Delaware Bay (Niles et al. 2009). Red knots may stopover to forage in salt meadows and mudflats of the South Shore of Long Island (NYSDEC 2014a) and may stopover to forage in intertidal areas and roost on beach habitats near the landfall/ICW work area at Smith Point. While primarily a terrestrial or coastal migrant, telemetry data indicate that the potential exists for this species to infrequently fly over the SRWF (COP, Appendix P1; Stantec 2022b).

Roseate Tern: This species of seabird breeds in colonies on coastal islands of the northeastern Atlantic coast and Atlantic Canada and winters in South America (Gochfeld and Burger 2020; USFWS 2010). Roseate terns migrate through the Project Area region on their way to coastal breeding sites in New England and Atlantic Canada and breed on small islands as far south as Long Island (NYSDEC 2014b). Ninety percent of the roseate tern population breeds in the Cape Cod-Long Island area (within 150 nm of the Fire Island landing site) on rocky coastal islands, outer beaches, or salt marsh islands with protective vegetation to conceal nests (USFWS 2001; Veit and Petersen 1993). On Long Island, most breeding pairs nest on Great Gull Island (Jennings 2018; NYSDEC 2014b; NYSERDA 2017a), which is located off the eastern end of the North Fork of Long Island (approximately 50 mi from the Fire Island landing site). Results of the 2018 Long Island colonial seabird surveys found over 2,000 roseate tern breeding pairs on Great Gull Island (Jennings 2018), approximately 48 mi (77 km) east-northeast of Smith Point Park. Roseate terns have historically nested along the barrier beach at Fire Island National Seashore (NYSERDA 2017a) and potentially in the vicinity of the cable landfall location at Smith Point County Park (NPS 2018; Peters 2008), and they may forage over shallow waters or loaf in the area. Fire Island Inlet, approximately 25 mi (40 km) west-southwest of Smith Point County Park, has also provided important foraging habitat (Peters 2008). Roseate terns may be found offshore, but occurrence, frequency and number of roseate terns would be expected to be relatively low there (COP, Appendix P1; Stantec 2022b).

3.8.2.4 Non-ESA-Listed Species

Several other birds that are not federally listed but are designated by individual states as threatened, endangered, or otherwise vulnerable are likely to occur in the Project Area. State-listed bird species documented or potentially present in the offshore SRWF and SRWEC-OCS/SRWEC-NYS cable routes and onshore facilities include the state-threatened northern harrier, bald eagle (*Haliaeetus leucocephalus*), least tern, and common tern (Table 5, Stantec 2018a). Bald eagles were delisted from their endangered ESA status in August 2007 but are still federally protected by the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. Suitable bald eagle habitat on Long Island is limited near onshore Project components (Stantec 2018a), but one bald eagle nest has been recorded in the Wertheim National Wildlife Refuge, approximately 1.5 mi from onshore Project components (USFWS 2022a).

3.8.3 Impacts of Alternative A – No Action on Birds

When analyzing the impacts of the No Action Alternative on birds, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities on the baseline conditions for birds. The cumulative impacts of the No Action Alternative considered the impacts of the No Action Alternative in combination with other planned non-offshore wind and offshore wind activities, as described in Appendix E.

3.8.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for birds described in Section 3.8, *Affected Environment* would continue to follow current regional trends and respond to IPFs introduced by ongoing non-offshore wind and offshore wind activities. Ongoing non-offshore wind activities within the GAA that contribute to impacts to birds are generally associated with onshore and offshore construction and climate change. Onshore construction activities and associated impacts are expected to continue along current trends and have the potential to affect bird species through short-term and permanent habitat removal and noise impacts that could cause avoidance behavior and displacement. Bird strikes would continue to be an additional risk associated with ongoing wind projects. Mortality of individual birds is likely to occur, but population-level effects are not anticipated. Impacts associated with climate change have the potential to reduce reproductive output and increase individual mortality and disease occurrence.

Ongoing offshore wind activities within the GAA that contribute to impacts on birds include:

- Continued O&M of the Block Island project (5 WTGs) installed in state waters;
- Continued O&M of the CVOW project (2 WTGs) installed in OCS-A 0497; and
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of Block Island and CVOW projects and ongoing construction of the Vineyard Wind 1 and South Fork projects would affect birds through the primary IPFs of noise, presence of structures, and land disturbance. Ongoing offshore wind activities would have the same type of impacts from noise, presence of structures, and land disturbance that are described in detail in following section for planned offshore wind activities, but the impacts would be of lower intensity.

3.8.3.2 Cumulative Impacts of the No Action Alternative

The cumulative impact analysis for the No Action Alternative considers the impacts of the No Action Alternative in combination with other planned non-offshore wind activities and planned offshore wind activities (without the Proposed Action).

Ongoing and planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on birds through the primary IPFs of noise, presence of structures, land disturbance, and bird strike. The construction, O&M, and decommissioning of both onshore and offshore infrastructure for offshore wind activities across the GAA would also contribute to the primary IPFs of noise, presence of structures, and land disturbance. Other future non-Project activities other than offshore wind development activities that may affect birds include new submarine cables and pipelines, tidal energy projects, oil and gas activities, dredging and port improvement, marine minerals extraction, military use (i.e., sonar, ship strikes), marine transportation, NMFS research initiatives, and installation of new structures on the United States Continental Shelf (Refer to Appendix E for a description of ongoing and planned activities).

A general description of the IPFs that could occur in the GAA from future planned offshore wind development activities is provided in the following section.

Seafloor disturbance/Sediment suspension and deposition: Localized, short-term seabed disturbance and associated increased suspended sedimentation could occur during construction of future planned wind farm cables (see Appendix E). Elliott et al. (2017) monitored TSS levels during construction of the BIWF. The observed TSS levels were far lower than levels predicted by the reference model, dissipating to baseline levels less than 50 ft (15.2 m) from the disturbance. Both the modeled TSS effects, which are conservatively high, and the observed TSS effects were short-term and within the range of baseline variability; however, these effects would be short-term (lasting only a few tide cycles) due to the low mobility of sediments (primarily sand) in cable and foundation installation areas (Stantec 2020). Disturbed seafloor from construction of future offshore wind projects may affect diving birds' foraging success due to reduced visibility from suspended sediments or may affect some prey species (e.g., benthic assemblages), although impacts to prey in the Project Area vicinity are expected to be short-term and local. Forage fish may become less visible for diving birds and benthic organisms (e.g., mollusks) may be less visible for diving sea ducks. Suspended sediment concentrations during activities other than dredging would, however, remain within 9.8-ft (3-m) of the seabed, and turbidity levels would return to ambient levels in less than 1 hour (see Appendix H). Birds would be able to successfully forage in adjacent areas and would not be expected to be affected by increased suspended sediments. Therefore, impacts would be minor, and no population-level effects on birds would occur.

Noise: Construction noise (i.e., pile driving) from 29 projected offshore wind projects anticipated between 2022 to 2030 (Bennun et al. 2021) along with geophysical and geotechnical (G&G) surveys and vessel traffic could increase underwater and airborne noise levels. Preliminary studies on bird behavior indicated that seabirds may exhibit avoidance behaviors in response to underwater noises (Hansen et al. 2020). Underwater noise may cause behavioral changes in some diving or swimming birds, ranging from mild annoyance to escape behavior, which could affect foraging in feeding habitats adjacent to foundation piles (BOEM 2014; BOEM 2016). Potential impacts could be greater if avoidance and displacement of birds occurred during staging, when birds are concentrated in large numbers to rest and feed prior to seasonal migrations. Because seabirds have the ability to leave the water, it is expected that increased noise levels would cause avoidance behavior that is likely to prevent birds from experiencing Permanent Threshold Shift (PTS) or Temporary Threshold Shift (TTS) from underwater construction noise associated with G&G and pile-driving activities, and any impacts would be short-term and minor.

Approaching vessel noise could temporarily disturb some individual diving birds, but they would be expected to acclimate to the noise or move away, potentially resulting in short-term displacement. Collectively, these noise sources would be short-term and localized and result in a minor impact to these birds.

Low-flying aircraft (i.e., rotary-winged [helicopters]/fixed-winged) generate noise from engines, airframe, and propellers. The dominant tones for these types of aircraft are generally below 500 Hz (BOEM 2022a) and within the airborne auditory range of birds. Rotary-winged/fixed-wing aircraft may cause birds in flight or on the sea surface to flush, resulting in increased energy expenditure. Disturbance to birds would be short-term and localized with impacts dissipating once the aircraft departs the area. Birds may return to relaxed behavior within 5 minutes of the overflight (Komenda-

Zehnder et al. 2003); however, birds can be disturbed up to 0.6 mi (1.0 km) away from an aircraft (Efroymson et al. 2000). No population-level effects to birds would be expected.

Accidental releases – contaminants: Accidental discharges and releases of oil, fuel, or other hazardous materials could directly and indirectly affect birds. Toxin ingestion has the potential to result in lethal and sublethal impacts on birds, including decreased hematological function, dehydration, drowning, hypothermia, starvation, and weight loss (Briggs et al. 1997; Haney et al. 2017; Paruk et al. 2016). Indirect effects of the oiling of feathers can lead to sublethal effects, such as changes in flight efficiencies, resulting in increased energy expenditure during daily and seasonal activities, including chick provisioning, commuting, courtship, foraging, long-distance migration, predator evasion, and territory defense (Maggini 2017). The likelihood of adverse population-level impacts on birds from accidental releases of hazardous materials from future activities on the OCS is considered by BOEM to be low. Current regulations and requirements imposed on federally approved activities prohibit vessels from dumping potentially harmful debris, require measures to avoid and minimize spills of toxic materials, and provide mechanisms for spill reporting and response. Based on these factors, accidental releases and discharges from federally approved activities on the OCS are not expected to appreciably contribute to adverse bird impacts, and, therefore, the effects of the No Action Alternative would be negligible to birds.

Accidental releases – trash and debris: Accidental disposal of trash and debris (plastics, paper, wood, glass, and/or metal) into water represents a risk factor to birds as they could potentially ingest or become entangled in debris. Ingestion of trash can negatively impact foraging and the ability to fly, which would ultimately reduce survival ability (Kühn et al. 2015). Ingestion and inhalation of macro- and microplastics can indirectly affect birds by causing obstruction of the gastrointestinal tract and resulting in mortality. In addition, it can interfere with flight and foraging as well as reduced fitness due to the plastics acting as a vector for other contaminants such as PCBs or plastic-derived additives (Teuten et al. 2009; Tanaka et al. 2013; Yamashita et al. 2011; Roman et al. 2019; Wang et al. 2021). Expected compliance with USCG vessel regulations would minimize exposure to trash or other debris. Therefore, accidental trash releases from offshore construction and maintenance vessels would be rare, and, therefore, the effects of the No Action Alternative would be negligible.

Traffic: Traffic associated with the construction of onshore transmission and interconnection cables, O&M, and decommissioning for future offshore wind activities could also affect shorebirds, some seabirds, and land birds that use the terrestrial habitats in the immediate vicinity of construction activities. Traffic-related impacts would have short-term, minor impacts on birds because construction would occur in already developed areas where birds are habituated to these types of activities. Therefore, the impacts associated with construction traffic would be comparable to existing sources of traffic in the local area.

In offshore areas, vessel, aircraft, and helicopter traffic could cause some birds, including loons, grebes, petrels, shearwaters, gannets, cormorants, sea ducks, terns, and skimmers to temporarily avoid the vicinity surrounding the WTGs and routes used by vessels and aircraft. Birds may collide with the vessels at night if vessels flush birds resting on the water; however, construction traffic would be short-term and similar to normal, non-wind farm related traffic and is not likely to cause permanent displacement or a high risk of collision mortality.

Aircraft operating in association with future wind activities may pose a risk of collision with birds; however, general aviation traffic accounts for approximately two bird strikes per 100,000 flights (Dolbeer et al. 2021). Because number of aircraft flights associated with offshore wind development are expected to be minimal in comparison to baseline conditions, aircraft strikes with birds are highly unlikely to occur. As such, aircraft traffic associated with future wind activities would not be expected to appreciably contribute to overall impacts on birds, and therefore would have negligible impact.

Lighting: Nighttime lighting associated with offshore structures and vessels could represent a source of attraction, particularly for nocturnally-migrating birds under certain low-visibility environmental conditions (reference – many standard ones). As a result of this attraction, birds and bird flocks have the potential to become disoriented, “entrapped” into circling the light to the point of exhaustion or collide with operating WTGs and associated structures and vessels (Rebke et al. 2019; USFWS 2022b). The WTGs and OCS-DC would have hazard and aviation obstruction lighting that would be incrementally added through 2030. Structure lighting may pose an increased collision or predation risk (Hüppop et al. 2006); however, this risk would be localized in extent and minimized by BOEM lighting guidelines (BOEM 2019; Kerlinger et al. 2010). Lighting for WTGs would consist of flashing red aircraft obstruction lighting, which has not been found to be a source of attraction for birds or their prey. Vessel lighting would result in short-term and minor impacts to birds while construction is occurring, while WTG lighting could result in negligible to minor long-term impacts.

Presence of structures: The presence of infrastructure can lead to beneficial and adverse impacts on certain birds. Beneficial effects to some locally foraging diving seabirds or seaducks can occur from the reef effect and the associated increase in certain prey resources. Potential adverse impacts include increased risk of entanglement from gear loss and damage, migration disturbances, and displacement by or collision with WTGs. Similar impacts may arise from other project-associated infrastructures, such as buoys, met towers, foundations, scour and cable protections, and transmission cable infrastructure.

The primary impacts to bird resources expected from the presence of structures would be displacement and collision of migrating birds and flocks with the rotating turbine blades from operating WTGs. Behavioral reactions can include avoidance, resulting in functional habitat or energy loss and attraction, causing an increased risk of collisions with WTGs within the planned WEAs (BOEM 2019; Peschko et al. 2020).

As discussed in BOEM (2012), at least 55 bird species could encounter operating WTGs on the Atlantic OCS. The abundance of bird species that overlap with the anticipated development of wind energy facilities on the Atlantic OCS, however, is relatively small as modeled 47 of those species by Winship et al. (2018). The relative seasonal exposure is expected to be very low, ranging from 0 to 5.2 percent (see Table 3.4.3-2 in BOEM 2021b).

With the proposed 1.15-by-1.15-mi (1.85-by-1.85-km) spacing between structures associated with future offshore wind development and the distribution of anticipated projects, only a small percentage of bird species migrating over the OCS are expected to encounter WTGs. The spacing between turbines would permit some birds to fly through individual lease areas without changing course or with only making minor course corrections to avoid operating WTGs (BOEM 2022a). The additional travel distance would be a maximum of 5 nm, which is a small distance in comparison to the distances traveled during most migrations. Loons, sea ducks, terns, and alcids are most likely to have high displacement ranks (COP, Appendix P1; Stantec 2022b); however, the relative density of birds in the OCS is low, and relatively few birds are likely to encounter wind turbines (BOEM 2021b). Displacement would be miniscule when compared with the overall daily distances traveled by migratory birds, and so is unlikely to cause displacement impacts to most individuals. The WEA is not within critical rest or feeding areas nor is it anticipated interfere with small proportion of birds' that fly through the area ability to reach these areas. Therefore, displacement impacts from future planned offshore wind activities would be long-term but minor, and no population-level effects would be expected.

In the contiguous United States, bird collisions with operating WTGs are believed to be relatively rare events, with one recent study estimating 140,000 to 328,000 (mean = 234,000) birds killed annually by 44,577 onshore turbines (Loss et al. 2013); although collision fatality rate calculations for large commercial-scale WTGs have been limited by confounding variables including knowledge of scavenger rates and the difficulty in observing collisions and collecting specimens over a large area. Data collection for offshore WTG facilities can also be affected by variable carcass sinking rates and other limits to observing and collecting specimens at sea. A collision vulnerability model constructed for SRWF found that no offshore bird species had a high collision vulnerability score; all shearwaters and petrels, most gulls, and terns had a medium collision vulnerability score (COP, Appendix P1; Stantec 2022b). Given that a very small proportion of birds of all species would transit the WEA each year, that most birds would fly below the RSZ during the day or above the RSZ at night (COP, Appendix P1; Stantec 2022b), and the relative low density of birds in the OCS, few birds are likely to encounter wind turbines in the planned WEAs (BOEM 2021b). Collision impacts from future planned offshore wind activities would long-term but minor, and no population-level effects would be expected during turbine operations.

The addition of WTGs to the offshore environment could result in increased functional loss of habitat for those bird species with higher displacement sensitivity; however, open water habitat is not a limiting factor for bird species in the area and substantial foraging habitat for birds would remain available given that future wind farms are only expected to occur in a relatively small portion of the OCS (COP, Appendix P1; Stantec 2022b). Therefore, impacts to birds from habitat loss due to displacement would be minor, and no population-level impacts would occur.

In the Northeast and Mid-Atlantic Bight, fisheries observers and monitors documented 655 bycatch events of seabirds in 2015 and 2016 through interaction with commercial fishing gear each year. Of those, 94 percent were with gillnets and involved shearwaters, gulls, cormorants, gannets, murres, fulmars, and loons (Sigourney et al. 2019). Localized increase in recreational fishery target species associated with construction of structures may result in increased use of the areas immediately around the WTGs for recreational fishing. Therefore, the addition of new WTGs could potentially increase the entanglement risk associated with fishing gear for some species, leading to various bird injuries and mortalities. Impacts from fishing gear would generally be localized; however, the risk of occurrence would continue if structures remained in place. WTGs and foundations could increase pelagic productivity in local areas (English et al. 2017) with these new structures creating a reef effect habitat for structure-oriented and/or hard-bottom prey species. As observed by English et al. (2017) and Causon and Gill (2018), the reef effect habitat associated with WTGs has led to local increases in biomass and diversity within 1 or 2 years after construction, indicating that offshore wind farms can generate beneficial long-term impacts on local ecosystems, translating to increased foraging opportunities for some marine bird species. Therefore, the presence of structures may result in minor beneficial impacts for the duration of the future offshore wind projects (Degraer et al. 2020).

3.8.3.3 Impacts of Alternative A on ESA-Listed Species

Based on the information contained in this document, BOEM anticipates that the reasonably foreseeable offshore wind activities are likely to result in rare cases of mortality for ESA-listed birds. Therefore, the effects from future wind projects are likely to adversely affect but not jeopardize the continued existence of piping plovers, rufa red knots, and roseate terns.

3.8.3.4 Conclusions

Impacts of the No Action Alternative

The proposed Project would not be built under the No Action Alternative and hence would not itself have any adverse impacts on birds. BOEM expects ongoing activities, non-offshore wind and future offshore wind would have continuing short-term and long-term impacts to bird species, including federally listed species. Wind and non-wind activities would introduce land disturbance, seafloor disturbance/sediment suspension and deposition, noise, traffic, accidental releases, lighting, and the presence of structures to the GAA (Appendix D), as well as alter existing bird habitat. The IPFs associated with existing and ongoing projects are not expected to significantly alter bird populations. BOEM anticipates that impacts to birds due to ongoing activities associated with the No Action Alternative would include **minor** adverse impacts as well as the potential for **minor beneficial** impacts.

Cumulative Impacts of the No Action Alternative

Considering all the IPFs from future offshore projects, including future offshore wind development, BOEM anticipates that the overall cumulative impacts associated with offshore wind activities in the GAA under the No Action Alternative would result in long-term **moderate** adverse impacts to birds but could potentially include **minor beneficial** impacts because of the presence of structures. The majority of offshore structures in the GAA would be attributable to the offshore wind development. Migratory birds that use the offshore wind lease areas during all or parts of the year would either be exposed to new collision risk or experience long-term functional habitat loss due to behavioral avoidance and displacement from wind lease areas on the OCS. The offshore wind development would also be responsible for the majority of impacts related to new cable emplacement and pile-driving noise, but effects on birds resulting from these IPFs would be localized and short-term and would not be expected to be biologically significant.

3.8.4 Relevant Design Parameters and Potential Variances in Impacts

This Final EIS analyzes the maximum-case scenario for the Proposed Action; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than described in the sections below. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts to birds:

- The new OnCS-DC and the routing of the OTC
- The number of WTGs
- The size of the WTGs
- The time of year during which construction occurs

Variability of the proposed Project design exists as outlined in Appendix C. Below is a summary of potential variances in impacts:

- Changes to the OnCS-DC location and size and/or the routing location and length of the onshore transmission cable which could require the removal of trees and other natural habitat suitable for nesting, foraging, or roosting birds.
- The number of WTGs: a decrease in the number of WTGs would decrease the potential of collision mortality and displacement impacts to flying birds.
- Season of construction: the activity and distribution of birds exhibit distinct seasonal changes. For instance, summer and fall months (generally May through October) constitute the most active season for birds in the Project Area, and the months of April and November coincide with major migration events. Therefore, construction during months in which birds are not present, not breeding, or less active would have a lesser impact on birds than construction during more active times.

3.8.5 Impacts of Alternative B – Proposed Action on Birds

The activities associated with offshore SRWF (94 11-MW WTGs out of 102 potential positions) and SRWEC-OCS/SRWEC-NYS cabling, and OnCS-DC, transmission cable, and interconnection cable with Alternative B include construction and installation, O&M, and decommissioning. These actions have the potential to cause both direct and indirect impacts to birds. The IPFs associated with construction and post-construction O&M activities include land disturbance, seafloor disturbance/sediment suspension and deposition, noise, traffic, accidental releases, lighting, and the presence of structures. These IPFs are thoroughly discussed in the bird assessment prepared for this Project (COP, Appendix P1; Stantec 2022b). The conclusions of the bird assessment are presented in this section and include consideration of the Project's mitigation and monitoring measures (Appendix H).

3.8.5.1 Construction and Installation

3.8.5.1.1 Onshore Activities and Facilities

Land disturbance: No physical impacts to beach habitats for avian foraging, breeding, and loafing and roosting areas are expected because installation for the SRWEC-NYS would occur under the beach; however, noise and human activity from installation of the cofferdam, from the landfall ICW/HDD in the sea-to-shore transition, and at beach work staging areas could result in short-term, localized disturbance or displacement. The onshore SRWEC-NYS routes would be constructed within existing ROWs comprising predominantly developed land cover type (e.g., Homer et al. 2015) with limited bird use, thus minimizing possible disturbances to land birds. Construction of the OnCS-DC, OTC, and onshore interconnection cable is expected to result in removal of approximately 4.7 ac (0.019 km^2) of developed land and 2.3 ac (0.009 km^2) of permanent tree clearing resulting in negligible impacts to bird habitats. During the breeding season, clearing of trees or vegetation could result in destruction eggs and nestlings, thus adversely impacting some individuals; however, lasting impacts to local breeding populations are not anticipated since the eliminated habitat is small when compared to the available breeding habitat in the outside of the project footprint. Where possible, trees and vegetation would be cut during winter months (December through February) when most migratory birds are not present. Overall, land disturbance from construction and installation is expected to result in minor, short-term impacts to birds.

Seafloor disturbance/Sediment suspension and deposition: At the sea-to-shore transition, HDD would minimize potential construction impacts of seafloor disturbance and sediment suspension and disposition on the intertidal community of foreshore, backshore, dune, and interdunal area near the Fire Island landing site (Sunrise Wind 2023). No long-term changes in intertidal habitat community structure or prey availability (i.e., invertebrates, small crustaceans, bivalve mollusks, small polychaete worms, insects, and talitrid amphipods) are expected (see Section 3.10.5). Any increase in turbidity and sedimentation would be short-term, localized, and minor, resulting in no lasting physical changes to coastal areas or beaches and result in negligible impacts to birds.

Noise: Noise associated with construction of the onshore transmission cable and onshore interconnection cable could affect shorebirds, some seabirds, and land birds that use the terrestrial habitats in the immediate vicinity of construction activities. Noise-related impacts would have short-term, minor impacts on these birds because construction would occur in already developed areas where birds are habituated to these types of activities. Therefore, the impacts associated with construction noise would be like existing sources of noise in the local area.

Noise from installation of the casing pipe or sheet piles and from HDD in the sea-to-shore transition and activities at beach work areas could result in short-term, localized disturbance or displacement of listed threatened and endangered bird species. The piping plover and roseate tern could nest and/or forage in or near the area impacted during construction; both species have historically nested on Fire Island (NYSERDA 2017a; NPS 2018; Peters 2008). The migratory rufa red knot could forage near the landfall site and onshore SRWEC routes. The potential for impacts to these species was considered during the Project siting process. To ensure avoidance of nesting habitat and to minimize the potential for impacts, the HDD work area was set back at least 650 ft (198 m) from the mean high water line so that the entrance point would be in interior land areas and the exit point would be offshore beyond the intertidal zone. Additionally, on-beach construction activities (i.e., between back dunes and mean low water) are not scheduled to occur during the roseate tern and piping plover breeding periods (i.e., April 1 through August 31), and rufa red knots are migratory and do not nest in the United States. Because construction work at the selected landing site would occur largely outside of the breeding period to the extent practical (per APMs) of listed species that might nest in the area and because use of the small area of shoreline by shorebirds at the landing sites would be minimal (Stantec 2018a), onshore impacts for listed species from noise and construction activity would be negligible to minor and short-term. Additionally, the Project would avoid work within a 1,000-m radius from active nests with unfledged piping plover chicks until clearance has been granted by NYSDPS and NYSDEC. During construction, the onsite environmental monitor shall be responsible for recording all occurrences of NYS threatened or endangered species within the Project Corridor. All occurrences shall be reported in a biweekly monitoring report submitted to NYSDPS and NYSDEC.

Traffic: Traffic associated with construction of the onshore transmission cable and onshore interconnection cable could also affect shorebirds, some seabirds, and land birds that use the terrestrial habitats in the immediate vicinity of construction activities. Traffic-related impacts would have short-term, minor impacts on these birds because construction would occur in already developed areas where birds are habituated to these types of activities and would be comparable to existing sources of traffic in the local area Therefore, the impacts associated with construction traffic would be minor and short-term.

3.8.5.1.2 Offshore Activities and Facilities

Seafloor disturbance/Sediment suspension and deposition: Seafloor preparation for the construction of the WTG foundations, scour protection installations, and the subsea cable installations (SRWEC-OCS and SRWEC-NYS in federal and state waters) could result in short-term habitat disturbance through seafloor disturbance and sediment suspension and deposition. These construction activities may temporarily displace prey sources and/or reduce prey visibility for foraging birds (e.g., gannets, cormorants, sea ducks, terns, and gulls) (Fox and Petersen 2019); however, impacts would be negligible to minor given the localized nature of these impacts and the abundance of surrounding foraging habitat.

Noise: Construction noise and vessel traffic could increase underwater and airborne noise levels. Of all the underwater noise sources from the Proposed Action, pile driving and sonar operation associated with G&G surveys are the noise sources that have the most significant overlap with diving bird hearing (Figure 3.8-1. Overlap in Diving Bird Hearing Range with Various Sound Sources. Source: McGrew et al. 2022). Preliminary studies on bird behavior have indicated that seabirds may exhibit avoidance behaviors in response to underwater noises (Hansen et al. 2020). Underwater noise may force some diving bird species to flee from foraging or staging habitats adjacent to foundation piles causing short-term stress and behavioral changes ranging from mild annoyance to escape behavior (BOEM 2014; BOEM 2016). Potential impacts could be greater if avoidance and displacement of birds occurred during their seasonal migration periods. Because seabirds could leave the water, it is expected that increased noise levels would cause avoidance behavior that is likely to prevent birds from experiencing PTS or TTS from underwater construction noise associated with G&G and pile-driving activities. Approaching vessel noise could disturb some individual diving birds which would eventually acclimate to the noise or move away, potentially resulting in short-term displacement. Collectively, these noise sources would be short-term and localized, resulting in a minor impact to these birds.

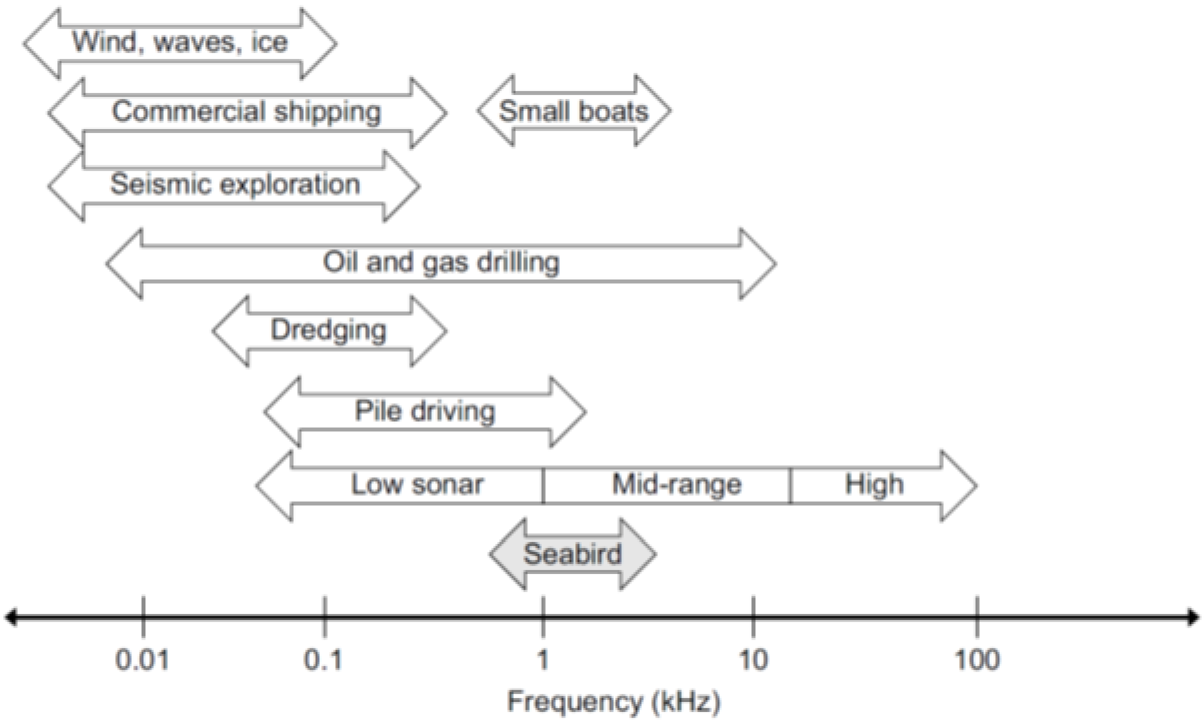

Figure 3.8-1. Overlap in Diving Bird Hearing Range with Various Sound Sources. Source: McGrew et al. 2022

Low-flying aircraft (i.e., rotary-winged [helicopters]/fixed-winged) generate noise from engines, airframe, and propellers. The dominant tones for these types of aircraft are generally below 500 Hz (BOEM 2022a) and are within the airborne auditory range of birds. Rotary-winged/fixed-wing aircraft noise may cause birds in flight or on the sea surface to flush, resulting in increased energy expenditure. Disturbance to birds would be short-term and localized with impacts dissipating once the aircraft has departed the area. Birds may return to relaxed behavior within 5 minutes of the overflight (Komenda-Zehnder et al. 2003); however, birds can be disturbed up to 0.6 mi (1.0 km) away from an aircraft (Efroymson et al. 2000). The potential for bird collision decreases for aircraft flying at speeds greater than 93 mph (41.6 mps) (Efroymson et al. 2000). Approaching aircraft noise could disturb some individual diving birds which would eventually acclimate to the noise or move away, potentially resulting in short-term displacement. No individual or population-level effects to birds would be expected. These noise source disturbances would be short-term and localized, resulting in minor impact to these birds.

Accidental releases – contaminants, trash, and debris: Potential adverse impacts to birds from accidental contaminant discharges and releases (oil) or from improper disposal of trash and debris (macro/microplastics) during construction would be avoided or minimized with adherence to international (IMO MARPOL), federal (USCG, USEPA, BOEM), state, and local regulations regarding disposal of solid and liquid wastes (see Section 3.5.6 in the COP; Sunrise Wind 2023), resulting in negligible to minor short-term impacts to birds.

Traffic: For offshore areas, vessel, aircraft, and helicopter traffic could cause some species of birds, including loons, grebes, petrels, shearwaters, gannets, cormorants, sea ducks, terns, skimmers, and migrant passerines, to temporarily avoid the area. Other species may be attracted to vessel traffic (e.g., gulls are attracted to fishing vessels). In some very rare cases, birds may collide with the vessels at night if vessels flush birds resting on the water; however, construction traffic would be short-term and similar to normal, non-wind farm related traffic and is not likely to cause permanent displacement or a high risk of collision mortality.

Aircraft operating in association with future wind activities may pose a risk of collision with birds; however, general aviation traffic accounts for approximately two bird strikes per 100,000 flights (Dolbeer et al. 2021). Because aircraft flights associated with offshore wind development are expected to be minimal in comparison to baseline conditions, aircraft strikes with birds are highly unlikely to occur. As such, aircraft traffic associated with offshore construction activities would not be expected to appreciably contribute to overall impacts on birds.

Vessel and aircraft traffic associated with construction and installation would result in minor, short-term impacts from behavioral disturbances from vessel and aircraft movement.

Lighting: Brightly illuminated offshore structures pose a risk to birds migrating at night (Rebke et al. 2019; USFWS 2022b). Birds can become disoriented by sources of artificial light (Zapata et al. 2019; Sunrise Wind 2023). Lighting used during construction would be short-term (two construction seasons) and limited to the minimum required for project safety to minimize potential impacts to wildlife. Construction vessels would use lighting technology that minimizes impacts on avian species to the extent practicable such as light shielding and downlights. WTGs would use radar-based Aircraft Detection Lighting System (ADLS) aircraft obstruction lighting.

The Proposed Action includes the use of red flashing aviation obstruction lights on WTGs and electric service platforms (ESPs) in accordance with FAA and BOEM requirements (Sunrise Wind 2023). The lights would consist of two L-864 medium-intensity red lights mounted on the nacelle and up to three L-810 low-intensity red lights mounted on the midsection of the WTG tower, and all lights would have a synchronous flash rate of 30 flashes per minute (Sunrise Wind 2023). ADLS may also be installed so that obstruction lights would only be activated when aircraft are near the turbines. The use of ADLS would dramatically reduce the amount of time the obstruction lights are on. In the Sunrise Wind ADLS efficacy analysis (COP, Appendix Y2, Stantec 2022a), the total obstruction light system for historical air traffic data had an activated duration of 35 minutes and 14 seconds over a 1-year period for 636-ft WTGs. Total obstruction light system activated duration increases slightly to 1 hour 21 minutes and 29 seconds over a 1-year period for 968-ft WTGs. Since the Sunrise Wind WTGs would have a height of 787 ft above MSL, the activated duration of ADLS-controlled obstruction lights could fall around the middle of this range.

Navigation lights would also be placed on all turbines and the OCS-DC. Per the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) guidance document referenced in the COP (Sunrise Wind 2023), navigation lighting would have the following characteristics: corner structures with flashing yellow lights with a visible range of 5 NM (moderate intensity) and a special mark characteristic (special flash pattern) and external border towers with flashing yellow lights with a nominal range of 2 NM (low intensity) (IALA 2013). Significant peripheral structures would be up to 3 NM apart, and the border/periphery lighted structures would be up to 2 NM apart. All other towers could have low-intensity flashing yellow lights visible for 2 NM. Flashing yellow lights of low to moderate intensity are not expected to have any increased mortality in comparison to unlit towers.

The use of ADLS could result in a 99-percent reduction in operational time for WTG warning lights, and flashing red lights minimizes attraction of birds to WTGs in overcast conditions (Rebke et al. 2019). Based on these factors, impacts to birds from lighting associated with construction would be negligible to minor.

Construction vessels are also a source of artificial lighting, which could attract birds and cause disorientation and collision or predation risk. However, the potential impact would be short term, lasting only the duration of construction and, as previously described, the abundance of bird species on the OCS that overlap with the anticipated wind development of wind energy facilities is relatively small. Therefore, BOEM anticipates vessel lighting would result in short-term and minor impacts on birds.

3.8.5.2 Operations and Maintenance

3.8.5.2.1 Onshore Activities and Facilities

Land disturbance: The OnCS-DC is sited in an already developed area with minimal tree cover. Infrequent land disturbance during O&M is expected to be comparable to general commercial and industrial activities already occurring in the area. The APMs outlined in Appendix H (*Mitigation and Monitoring*) of this Final EIS would be used to minimize impacts. Therefore, potential impacts associated with O&M are considered short-term and minor.

Noise: Infrequent sources of noise during O&M are expected to be comparable to general commercial and industrial activities already occurring in the area. Impacts to avian species anticipated during O&M of the OnCS-DC would be the introduction of new sounds associated with the synchronous condenser building. Anthropogenic sources of noise can have negative impacts on fitness and breeding success of land birds (Kleist et al. 2018). The APMs outlined in the EIS Appendix H would be used to minimize noise impacts. Therefore, potential impacts associated with O&M are considered short-term and minor.

Accidental releases – contaminants, trash, and debris: Short-term, routine, and non-routine maintenance activities of the OnCS-DC and onshore transmission cable and onshore interconnection cable may result in accidental discharges and releases; however, any long-term risks would be minor and mitigated through implementation of the spill prevention and control measures and associated BMPs.

Traffic: Infrequent routine and non-routine maintenance traffic during O&M are expected to be comparable to general commercial and industrial activities already occurring in the area. The APMs outlined in the EIS Appendix H would be used to minimize impacts. Therefore, potential impacts associated with O&M are considered short-term and minor.

Lighting: Infrequent nighttime lighting during O&M are expected to be comparable to general commercial and industrial activities already occurring in the area (e.g., commercial shipping and fishing vessels, operating wind farms). The APMs outlined in the EIS Appendix H would be used to minimize impacts. Therefore, potential impacts associated with O&M are considered short-term and minor.

3.8.5.2.2 Offshore Activities and Facilities

Seafloor disturbance/Sediment suspension and deposition: Seafloor disturbance and sediment suspension and deposition during O&M would primarily result from vessel anchoring, jack-up, and any maintenance activities that would require exposing and reburying the IAC. These activities are expected to be non-routine events; they are not expected to occur with any regularity. It is likely that pelagic and mobile benthic prey species present near the SRWF during any maintenance activities would temporarily avoid the area in which activities are occurring, and zooplankton species may face localized, short-term displacement. However, any alterations to marine bird prey distributions are expected to occur over a small scale and a short period. Therefore, the potential impacts to birds from seafloor disturbance/sediment suspension and deposition during O&M would be negligible.

Noise: Low-flying aircraft (i.e., rotary-winged [helicopters]/fixed-winged) generate noise from engines, airframe, and propellers. The dominant tones for these types of aircraft are generally below 500 Hz (BOEM 2022a) and within the airborne auditory range of birds. During the O&M phase of the Proposed Action, rotary-winged/fixed-wing aircraft may cause birds in flight or on the sea surface to flush, resulting in increased energy expenditure. Disturbance to birds would be short-term and localized with impacts dissipating once the aircraft departs. Birds may return to relaxed behavior within 5 minutes of the overflight (Komenda-Zehnder et al. 2003); however, birds can be disturbed up to 0.6 mi (1.0 km) from an aircraft (Efroymson et al. 2000). The potential for bird collision decreases for aircraft flying at speeds greater than 93 mph (41.6 mps) (Efroymson et al. 2000). Aircraft noise could disturb some individual diving birds which would eventually acclimate to the noise or move away, potentially resulting in short-term displacement. These noise source disturbances would be short-term and localized, with no population-level effects expected, resulting in minor impact to these birds.

Accidental releases – contaminants, trash, and debris: Accidental discharges and releases of contaminants (oil) and trash and debris (macro/microplastics) are expected to generally be like other offshore construction and installation resulting in negligible to minor short-term impacts with implementation of APMs outlined in Appendix H of this Final EIS.

Traffic: Vessel and aircraft used during O&M are expected to generally be similar to those used during offshore construction and installation, with similar levels of vessel traffic per year, resulting in negligible implementation of APMs outlined in EIS Appendix H.

Lighting: The WTGs and OCS-DC are required by the FAA to have aviation hazard navigation lights for the duration of the Project. Red flashing aviation obstruction lights are commonly used for this purpose at land-based wind facilities without observed increase in avian mortality compared with unlit turbine towers (Kerlinger et al. 2010). Construction vessels would use lighting technology that minimizes impacts on avian species to the extent practicable such as light shielding and downlights. WTGs would use radar-based ADLS aircraft obstruction lighting.

The Proposed Action includes the use of red flashing aviation obstruction lights on WTGs and ESPs in accordance with FAA and BOEM requirements (Sunrise Wind 2023). The lights would consist of two L-864 medium-intensity red lights mounted on the nacelle and up to three L-810 low-intensity red lights mounted on the midsection of the WTG tower, and all lights would have a synchronous flash rate of 30 flashes per minute (Sunrise Wind 2023). ADLS may also be installed so that obstruction lights would only be activated when aircraft are near the turbines. The use of ADLS would dramatically reduce the amount of time the obstruction lights are on. In the Sunrise Wind ADLS efficacy analysis (COP, Appendix Y2, Stantec 2022a), the total obstruction light system for historical air traffic data had an activated duration of 35 minutes and 14 seconds over a 1-year period for 636-ft WTGs. Total obstruction light system activated duration increases slightly to 1 hour 21 minutes and 29 seconds over a 1-year period for 968-ft WTGs. Since the Sunrise Wind WTGs would have a height of 787 ft above MSL, the activated duration of ADLS-controlled obstruction lights could fall around the middle of this range.

Navigation lights would also be placed on all turbines and the OCS-DC. Per the IALA guidance document referenced in the COP (Sunrise Wind 2023), navigation lighting would have the following characteristics: corner structures with flashing yellow lights with a visible range of 5 NM (moderate intensity) and a special mark characteristic (special flash pattern) and external border towers with flashing yellow lights with a nominal range of 2 NM (low intensity) (IALA 2013). Significant peripheral structures would be up to 3 NM apart, and the border/periphery lighted structures would be up to 2 NM apart. All other towers could have low-intensity flashing yellow lights visible for 2 NM. Flashing yellow lights of low to moderate intensity are not expected to have any increased mortality in comparison to unlit towers.

The use of ADLS could result in a 99-percent reduction in operational time for WTG warning lights, and flashing lights minimize attraction of birds to WTGs in overcast conditions (Rebke et al. 2019). The impact of the Proposed Action alone would not noticeably increase the impacts of light beyond described under the No Action Alternative. In the context of existing conditions and reasonably foreseeable future activities, lighting from the Proposed Action during O&M is expected to have only non-measurable negligible adverse impacts, if any, to individuals or populations.

Construction vessels are also a source of artificial lighting, which could attract birds and cause disorientation and collision or predation risk. However, the potential impact would be short term, lasting only the duration of construction and, as previously described, the abundance of bird species on the OCS that overlap with the anticipated wind development of wind energy facilities is relatively small. Therefore, BOEM anticipates vessel lighting would result in short-term and minor impacts on birds.

Presence of structures: During the O&M period, the primary impact expected for various avian species would be colliding with, or avoiding, turbine blades within the RSZ at the SRWF during migration. Marine birds with relatively greater exposure to the SRWF (i.e., greater than land birds and coastal birds) were included in the SRWF vulnerability model (COP, Appendix P1; Stantec 2022b). Species with high population vulnerability scores (more vulnerability) include one species of sea duck, three species of tern, two species of gull, and two alcid species; however, the density of bird species with high collision sensitivity is low within the offshore portion of the Project Area during all seasons (see Figure 13 in COP, Appendix P1; Stantec 2022b), and risk of collision would be reduced with implementation of APMs outlined in Appendix H (*Mitigation and Monitoring*). The Marine-life Data and Analysis Team density maps for all 38 species within the Lease Area are available in the COP (COP Appendix P1; Stantec 2022b). Table 2-14 in Appendix P1 from the Sunrise Wind COP (Stantec 2022b) presents the final vulnerability scores for those species groups as well as seasons of risk. Federally and state-listed bird species may be at risk of collision during offshore construction/installation although risk of collision is considered low because these species are expected to infrequently occur over the SRWF (Stantec 2018b).

BOEM (2022b) considered the impacts to ESA-listed bird species. Telemetry data indicate that roseate terns, piping plovers, and rufa red knots may cross the SRWF during operation based on the Bay State Wind (2019) and MassCEC surveys (Veit et al. 2016), as well as BOEM and USFWS telemetry tracking data (Loring et al. 2018; Loring et al. 2019). Modeling of strike risk was conducted using the BAND Model (Band 2012) and the SCRAM (Gilbert et al. 2022) models. Model results are summarized in BOEM's biological assessment, BOEM's addendum to the BA, and USFWS Biological Opinion.

Species within the groups of loons and grebes, sea ducks, terns, and alcids had high displacement vulnerability scores (COP, Table 2.14; Sunrise Wind 2023). Displacement impacts are low for most other seabirds. Overall avian impacts would be minor because of the overall small area affected and the low number of birds affected within the entire OCS. Generally, the relative abundance of bird species that are most sensitive to displacement is low within the offshore portion of the Project Area, including several miles/kilometers outside the wind farm area during all seasons (see Figure 1-3 in COP, Appendix P1; Stantec 2022b).

Because SRWF WTGs would be spaced 1 nm apart, ample space between WTGs should allow birds that are not flying above WTGs to fly through individual lease areas without changing course or to make minor course corrections to avoid operating WTGs. The effects of offshore wind farms on bird movement ultimately depend on the bird species, size of the offshore wind farm, spacing of the turbines, and extent of extra energy cost incurred by the displacement of flying birds (relative to normal flight costs pre-construction) and their ability to compensate for this degree of added energy expenditure. Little quantitative information is available on how offshore wind farms may act as a barrier to movement, but Madsen et al. (2012) modeled bird movement through offshore wind farms using bird (common eider) movement data collected at the Nysted offshore wind farm in the western Baltic Sea just south of Denmark. After running several hundred thousand simulations for different layouts/configurations for a 100-WTG offshore wind farm, Madsen et al. (2012) determined that the proportion of birds traveling between turbines increased as distance between turbines increased. With 8 WTG columns at 200-meter (0.1-nm) spacing, no birds passed between the turbines. However, increasing inter-turbine distance to 500 m (0.27 nm) increased the percentage of birds to more than 20 percent, while a spacing of 1,000 m (0.54 nm) increased this further to 99 percent. The 0.6- to 1-nm spacing estimated for most structures that would be proposed on the Atlantic OCS is greater than the distance at which 99 percent of the birds passed through in the model. As such, adverse impacts of additional energy expenditure due to minor course corrections or complete avoidance of offshore wind lease areas would not be expected to be biologically significant. BOEM anticipates that any additional flight distances would likely be relatively small for most migrating birds when compared with the overall migratory distances traveled, and no individual fitness or population-level effects would be expected to occur.

In the Northeast and Mid-Atlantic Bight, fisheries observers and monitors have documented several hundred seabird bycatch events through interaction with commercial fishing gear in previous years, mainly with gillnets (Sigourney et al. 2019). Localized increase in recreational fishery target species associated with of the presence structures may result in increased use of the areas immediately around the WTGs for recreational fishing. Therefore, the addition of new WTGs could potentially increase the entanglement risk associated with recreational fishing gear, leading to various bird injuries and mortalities. Impacts from fishing gear would generally be localized; however, the risk of occurrence would continue as long as structures remain in place.

WTGs and foundations could increase pelagic productivity in local areas (English et al. 2017) with these new structures creating a reef effect habitat for structure-oriented and/or hard-bottom prey species. As observed by English et al. (2017) and Causon and Gill (2018), the reef effect habitat associated with WTGs has led to local increases in biomass and diversity within 1 or 2 years after construction, indicating that offshore wind farms can generate increased foraging opportunities for some marine bird species. Therefore, the presence of proposed Project structures may result in minor beneficial impacts as long as they are present (Degraer et al. 2020).

Long-term adverse impacts would be negligible to minor, depending on whether birds are at high risk for displacement, can access preferred habitat, or are at risk of entanglement. The reef effect associated with the WTG foundation and rock armoring would result in minor long-term beneficial impacts for some species.

3.8.5.3 Conceptual Decommissioning

Decommissioning would employ many of the same procedures and equipment used during construction. Hence, as in the construction phase, avoidance through scheduling and minimization by operational and abatement controls would also generally apply here.

The types of impacts to birds from conceptual decommissioning of the offshore SRWF and SRWEC-OCS would be similar to those described for the construction/installation phase. However, we anticipate that the overall level of impacts would be lower because pile-driving activities would not occur, and some structures and materials may be left in place such as scour protection and cable armoring.

3.8.5.3.1 Onshore Activities and Facilities

Noise: Noise would be a primary IPF during onshore decommissioning activities. Noise impacts to birds would be the same as or less than those described for onshore construction activities since the intensity and duration of potential impacts would likely be reduced from those discussed in the construction section because some materials and structures, including scour armoring and cables, may be left in place during decommissioning. Impacts to birds would be minor and short-term during decommissioning.

Traffic: Traffic would be a primary IPF during this activity. Traffic impacts to birds would be the same as or less than those described for construction activities because the intensity and duration of potential impacts would likely be reduced from those discussed in the construction section because some materials and structures, including scour armoring and cables, may be left in place. Impacts to birds would be minor and short-term during decommissioning.

Onshore impacts from land disturbance, seafloor disturbance, and suspended sediments to birds would be the similar to or of lower impact as those previously discussed for the onshore construction and installation.

3.8.5.3.2 Offshore Activities and Facilities

Noise: Noise would be the primary IPF associated with offshore decommissioning activities. If vessels are present for an extended period, they may provide beneficial roosting and foraging opportunities for birds from light-attracted insects. Underwater noise and disturbance levels generated during conceptual decommissioning would be similar to those described above for construction with the exception that pile driving would not be required. The monopiles would be cut below the bed surface for removal using a cable saw or abrasive waterjet. Noise levels produced by this type of cutting equipment are generally indistinguishable from engine noise generated by the associated construction vessel (Pangerc et al.

2016). Therefore, this decommissioning equipment would have significantly lower potential for noise effects compared to those already considered for construction vessel noise. Noise impacts to birds would be same or less than those described for construction activities. Impacts for all remaining IPFs to birds would be similar to those discussed for construction. Impacts to birds would be short-term and minor during decommissioning.

Traffic: Types of vessels used and overall vessel traffic during conceptual decommissioning is expected to be comparable to those associated with construction and installation. The APMs outlined in the EIS Appendix H would be used to minimize impacts. Therefore, potential impacts associated with conceptual decommissioning is considered short-term and minor.

3.8.5.4 Cumulative Impacts of the Proposed Action

The cumulative impact analysis for the No Action Alternative considers the impacts of the No Action Alternative in combination with other planned non-offshore wind activities and planned offshore wind activities (without the Proposed Action).

The cumulative impacts of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned wind activities. Ongoing and planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on birds through the primary IPFs of noise, presence of structures, and land disturbance. The construction, O&M, and decommissioning of both onshore and offshore infrastructure for offshore wind activities across the GAA would also contribute to the primary IPFs of noise, presence of structures, and land disturbance. Other future non-Project activities other than offshore wind development activities that may affect birds include new submarine cables and pipelines, tidal energy projects, oil and gas activities, dredging and port improvement, marine minerals extraction, military use (i.e., sonar, ship strikes), marine transportation, NMFS research initiatives, and installation of new structures on the United States Continental Shelf (Refer to Appendix E for a description of ongoing and planned activities). These activities could result in short-term or permanent displacement and injury to or mortality of individual birds, but population-level effects would not be expected for most species.

In the context of reasonably foreseeable environmental trends, ongoing, and planned activities, the Proposed Action would contribute an incremental increase in effects from the primary IPFs for birds.

3.8.5.5 Impacts of Alternative B on ESA-Listed Species

Based on the information contained in this document, we anticipate that the Proposed Action is likely to result in rare cases of mortality for ESA-listed birds. Therefore, the effects from the Proposed Action would likely to have negligible to minor adverse impacts to piping plovers, rufa red knots, and roseate terns.

3.8.5.6 Conclusions

Impacts of the Proposed Project

Project construction and installation, O&M, and conceptual decommissioning would cause impacts from the following IPFs: land disturbance, seafloor disturbance/sediment suspension and deposition, noise, traffic, lighting, accidental releases (contaminants, trash, and debris), and the presence of structures. Compared to construction and installation activities, impacts from proposed O&M activities would be similar but would occur at a lesser extent but for the life of the WTGs. BOEM anticipates adverse impacts resulting from the Proposed Action alone would be **minor** with additional **minor beneficial** impacts to some species (diving seabirds) from the presence of structures and underwater armoring. Overall, impacts to individual birds and/or their habitat would be detectable and measurable but would not lead to long-term or population-level effects.

Cumulative Impacts of the Proposed Project

In the context of existing conditions other reasonably foreseeable planned actions, the incremental impacts from the Proposed Action resulting from individual IPFs would be moderate depending on the species depending on habitat or seasonal uses that vary by species. Considering all the IPFs, BOEM anticipates that the overall avian cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable environmental trends and planned non-offshore wind and offshore wind activities would result in **moderate** adverse impacts to birds because those impacts that are detectable and measurable would not lead to long-term or population-level effects. Potential **minor beneficial** impacts may result from the presence of structures.

3.8.6 Alternative C-1 – Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

Under Alternative C-1, the same number of WTGs (up to 94 WTGs) under the Proposed Action may be approved by BOEM; however, 8 WTG positions from Priority Area 1 along the northern boundary of the Lease Area would be excluded from consideration (Figure 2.1.3-1). The WTG sites to be removed from Priority Area 1 were selected to maximize the largest contiguous complex habitat area feasible and/or to reduce the number of 11-MW WTGs located near presumed Atlantic cod spawning location(s). This alternative would not significantly alter the construction methods, O&M, or conceptual decommissioning. Alternative C-1 would not increase the impact level or likelihood of impacts for birds; therefore, Alternative C would be expected to have negligible to minor impacts on birds from construction and installation, O&M, and conceptual decommissioning activities.

3.8.6.1 Construction and Installation

3.8.6.1.1 Onshore Activities and Facilities

No aspect of Alternative C-1 would alter the construction of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the construction of the onshore activities or facilities other than what is described under the Proposed Action.

3.8.6.1.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-1 would significantly alter the construction methods for offshore structures and installation of equipment compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the construction of the offshore activities or facilities other than what is described under the Proposed Action.

3.8.6.2 Operations and Maintenance

3.8.6.2.1 Onshore Activities and Facilities

No aspect of Alternative C-1 would alter the O&M of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the O&M of the onshore activities or facilities other than what is described under the Proposed Action.

3.8.6.2.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-1 would significantly alter the O&M methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the O&M of the offshore activities or facilities other than what is described under the Proposed Action.

3.8.6.3 Conceptual Decommissioning

3.8.6.3.1 Onshore Activities and Facilities

No aspect of Alternative C-1 would alter the conceptual decommissioning of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to conceptual decommissioning of the onshore activities or facilities other than what is described under the Proposed Action.

3.8.6.3.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-1 would significantly alter the conceptual decommissioning methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the conceptual decommissioning of the offshore activities or facilities other than what is described under the Proposed Action.

3.8.6.4 Cumulative Impacts of Alternative C-1

The cumulative impact analysis for Alternative C-1 considers the impacts of this alternative in combination with other planned non-offshore wind activities and planned offshore wind activities.

Ongoing and planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on birds through the primary IPFs of noise, presence of structures, and land disturbance. The construction, O&M, and decommissioning of both onshore and offshore infrastructure for offshore wind activities across the GAA would also contribute to the primary IPFs of noise, presence of structures, and land disturbance. Other future non-Project activities other than offshore wind development activities that may affect birds include new submarine cables and pipelines, tidal energy projects, oil and gas activities, dredging and port improvement, marine minerals extraction, military use (i.e., sonar, ship strikes), marine transportation, NMFS research initiatives, and installation of new structures on the United States Continental Shelf (Refer to Appendix E for a description of ongoing and planned activities). These activities could result in short-term or permanent displacement and injury to or mortality of individual birds, but population-level effects would not be expected for most species.

In the context of reasonably foreseeable environmental trends, ongoing, and planned activities, Alternative C-1 would contribute an incremental increase in effects from the primary IPFs for birds.

3.8.6.5 Impacts of Alternative C-1 on ESA-Listed Species

Based on the information contained in this document, we anticipate that Alternative C-1 for the SRWF Project is likely to adversely affect but not jeopardize the continued existence of piping plovers, rufa red knots, or roseate terns.

3.8.6.6 Conclusions

Impacts of Alternative C-1

Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for birds. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-1 are the same as described under the Proposed Action (Alternative B). BOEM anticipates adverse impacts resulting from Alternative C-1 would be **minor** with additional **minor beneficial** impacts to some species (diving seabirds) from the presence of structures and underwater armoring. Overall, impacts to individual birds and/or their habitat would be detectable and measurable but would not lead to long-term or population-level effects.

Cumulative Impacts of Alternative C-1

Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for birds. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-1 are the same as described under the cumulative impacts of the Proposed Action (Alternative B). BOEM anticipates that the overall avian cumulative impacts associated with Alternative C-1 when combined with past, present, and reasonably foreseeable environmental trends and planned non-offshore wind and offshore wind activities would result in **moderate** adverse and potential **minor beneficial** impacts to birds.

3.8.7 Alternative C-2 – Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of up to 12 WTG Positions to the Eastern Side of the Lease Area

The primary effect of Alternative C-2 is the relocation of WTGs from priority areas to the eastern portion of the Lease Area. This proposed change would not significantly alter the construction methods, O&M, or conceptual decommissioning and would not result in additional impacts to birds other than those described under the Proposed Action (Alternative B).

3.8.7.1 Construction and Installation

3.8.7.1.1 Onshore Activities and Facilities

No aspect of Alternative C-2 would alter the construction of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the construction of the onshore activities or facilities other than what is described under the Proposed Action.

3.8.7.1.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-2 would significantly alter the construction methods for offshore structures and installation of equipment compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the construction of the offshore activities or facilities other than what is described under the Proposed Action.

3.8.7.2 Operations and Maintenance

3.8.7.2.1 Onshore Activities and Facilities

No aspect of Alternative C-2 would alter the O&M of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the O&M of the onshore activities or facilities other than what is described under the Proposed Action.

3.8.7.2.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-2 would significantly alter the O&M methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the O&M of the offshore activities or facilities other than what is described under the Proposed Action.

3.8.7.3 Conceptual Decommissioning

3.8.7.3.1 Onshore Activities and Facilities

No aspect of Alternative C-2 would alter the conceptual decommissioning of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to conceptual decommissioning of the onshore activities or facilities other than what is described under the Proposed Action.

3.8.7.3.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-2 would significantly alter the conceptual decommissioning methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the conceptual decommissioning of the offshore activities or facilities other than what is described under the Proposed Action.

3.8.7.4 Cumulative Impacts of Alternative C-2

The cumulative impact analysis for Alternative C-2 considers the impacts of this alternative in combination with other planned non-offshore wind activities and planned offshore wind activities.

Ongoing and planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on birds through the primary IPFs of noise, presence of structures, and land disturbance. The construction, O&M, and decommissioning of both onshore and offshore infrastructure for offshore wind activities across the GAA would also contribute to the primary IPFs of noise, presence of structures, and land disturbance. Other future non-Project activities other than offshore wind development activities that may affect birds include new submarine cables and pipelines, tidal energy projects, oil and gas activities, dredging and port improvement, marine minerals extraction, military use (i.e., sonar, ship strikes), marine transportation, NMFS research initiatives, and installation of new structures on the United States Continental Shelf (Refer to Appendix E for a description of ongoing and planned activities). These activities could result in short-term or permanent displacement and injury to or mortality of individual birds, but population-level effects would not be expected for most species.

In the context of reasonably foreseeable environmental trends, ongoing, and planned activities, Alternative C-2 would contribute an incremental increase in effects from the primary IPFs for birds.

3.8.7.5 Impacts of Alternative C-2 on ESA-Listed Species

Based on the information contained in this document, it is anticipated that Alternative C-2 for the SRWF Project is likely to adversely affect but not jeopardize the continued existence piping plovers, rufa red knots, or roseate terns.

3.8.7.6 Conclusions

Impacts of Alternative C-2

Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for birds. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-2 are the same as described under the Proposed Action (Alternative B). BOEM anticipates adverse impacts resulting from Alternative C-2 would be **minor** with additional **minor beneficial** impacts to some species (diving seabirds) from the presence of structures and underwater armoring. Overall, impacts to individual birds and/or their habitat would be detectable and measurable but would not lead to long-term or population-level effects.

Cumulative Impacts of Alternative C-2

Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for birds. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-2 are the same as described under the cumulative impacts of the Proposed Action (Alternative B). BOEM anticipates that the overall cumulative avian impacts associated with Alternative C-2 when combined with past, present, and reasonably foreseeable environmental trends and planned non-offshore wind and offshore wind activities would result in **moderate** adverse and potential **minor beneficial** impacts to birds.

3.8.8 Alternative C-3 - Reduced Layout from Priority Areas Considering Feasibility due to Glauconite Sands

Under the Fisheries Habitat Impact Minimization Alternative C-3, the construction, O&M, and eventual decommissioning of the 11-MW WTGs and an OCS within the proposed Project Area and associated inter-array and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. However, Alternative C-3 was developed to address concerns regarding pile refusal due to glauconite sands in the southeastern portion of the Lease Area while still minimizing impacts to benthic and fisheries resources. Alternative C-3a, C-3b, and C-3c described in Section 3.7.8, *Benthic Resources*, consider different WTG configurations to avoid sensitive habitats and engineering constraints while still meeting the NYSERDA OREC. This alternative only considered removal of WTGs from Priority Area 1 based on consultation with NMFS. Areas with high density of boulder, complex habitat, and data suggesting Atlantic cod aggregation and spawning was considered when determining which WTGs to remove.

3.8.8.1 Construction and Installation

3.8.8.1.1 Onshore Activities and Facilities

No aspect of Alternative C-3 would alter the construction of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the construction of the onshore activities or facilities other than what is described under the Proposed Action.

3.8.8.1.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-3 would significantly alter the construction methods for offshore structures and installation of equipment compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the construction of the offshore activities or facilities other than what is described under the Proposed Action.

3.8.8.2 Operations and Maintenance

3.8.8.2.1 Onshore Activities and Facilities

No aspect of Alternative C-3 would alter the O&M of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the O&M of the onshore activities or facilities other than what is described under the Proposed Action.

3.8.8.2.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-3 would significantly alter the O&M methods for offshore activities and facilities compared to the Proposed Action (Alternative B). The primary effect of these changes would be a potential reduction in the number of installed WTGs, with a concurrent reduction in the number of individuals exposed to potential impacts during construction, proportional reduction in the number of bird strikes associated with operating WTGs, and a reduction in the areal extent of long-term impacts to aquatic habitat. However, these changes would not be significant enough to change the impact level determinations for any of the impact level determinations for any of the IPFs. Therefore, there would be no direct or indirect impacts to birds due to the O&M of the offshore activities or facilities other than what is described under the Proposed Action.

3.8.8.3 Conceptual Decommissioning

3.8.8.3.1 Onshore Activities and Facilities

No aspect of Alternative C-3 would alter the conceptual decommissioning of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to conceptual decommissioning of the onshore activities or facilities other than what is described under the Proposed Action.

3.8.8.3.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-3 would significantly alter the conceptual decommissioning methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to birds due to the conceptual decommissioning of the offshore activities or facilities other than what is described under the Proposed Action.

3.8.8.4 Cumulative Impacts of Alternative C-3

The cumulative impact analysis for Alternative C-3 considers the impacts of this alternative in combination with other planned non-offshore wind activities and planned offshore wind activities.

Ongoing and planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on birds through the primary IPFs of noise, presence of structures, and land disturbance. The construction, O&M, and decommissioning of both onshore and offshore infrastructure for offshore wind activities across the GAA would also contribute to the primary IPFs of noise, presence of structures, and land disturbance. Other future non-Project activities other than offshore wind development activities that may affect birds include new submarine cables and pipelines, tidal energy projects, oil and gas activities, dredging and port improvement, marine minerals extraction, military use (i.e., sonar, ship strikes), marine transportation, NMFS research initiatives, and installation of new structures on the United States Continental Shelf (Refer to Appendix E for a description of ongoing and planned activities). These activities could result in short-term or permanent displacement and injury to or mortality of individual birds, but population-level effects would not be expected for most species.

In the context of reasonably foreseeable environmental trends, ongoing, and planned activities, Alternative C-3 would contribute an incremental increase in effects from the primary IPFs for birds.

3.8.8.5 Impacts of Alternative C-3 on ESA-Listed Species

Based on the information contained in this document, it is anticipated that Alternative C-3 for the SRWF Project is likely to adversely affect but not jeopardize the continued existence piping plovers, rufa red knots, or roseate terns.

3.8.8.6 Conclusions

Impacts of Alternative C-3

Alternative C-3 includes changes to turbine installation locations that would not alter any of the findings for birds. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-3 are the same as described under the Proposed Action (Alternative B). BOEM anticipates adverse impacts resulting from Alternative C-3 would be **minor** with additional **minor beneficial** impacts to some species (diving seabirds) from the presence of structures and underwater armoring. Overall, impacts to individual birds and/or their habitat would be detectable and measurable but would not lead to long-term or population-level effects.

Cumulative Impacts of Alternative C-3

Alternative C-3 includes changes to turbine installation locations that would not alter any of the findings for birds. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-3 are the same as described under the cumulative impacts of the Proposed Action (Alternative B). BOEM anticipates that the overall cumulative avian impacts associated with Alternative C-3 when combined with past, present, and reasonably foreseeable environmental trends and planned non-offshore wind and offshore wind activities would result in **moderate** adverse and potential **minor beneficial** impacts to birds.

3.8.9 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, C-2, and C-3 would have the same overall negligible to minor adverse impacts and minor beneficial impacts on birds. Table 3.8-2 provides an overall summary of alternative impacts.

Table 3.8-2. Comparison of Alternative Impacts on Birds

No Action Alternative (Alternative A)	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)	Fisheries Habitat Minimization Considering Feasibility Due to Glauconite Sands (Alternative C-3)
No Action Alternative: The IPFs associated with existing and ongoing projects are not expected to significantly alter bird populations. BOEM anticipates that impacts to birds due to ongoing activities associated with the No Action Alternative would include **minor** adverse impacts as well as the potential for **minor beneficial** impacts. *Cumulative Impacts of the No Action Alternative*: BOEM anticipates that the overall cumulative impacts associated with offshore wind activities in the GAA under the No Action Alternative would result in long-term **moderate** adverse impacts but could potentially include **minor beneficial** impacts because of	*Proposed Action:* BOEM anticipates adverse impacts resulting from the Proposed Action alone would be **minor** with additional **minor beneficial** impacts to some species (diving seabirds) from the presence of structures and underwater armoring. Overall, impacts to individual birds and/or their habitat would be detectable and measurable but would not lead to long-term or population-level effects. *Cumulative Impacts of the Proposed Action:* In the context of existing conditions other reasonably foreseeable planned actions, the incremental impacts from the Proposed Action resulting from	*Alternative C-1:* The conclusions for impacts of Alternative C-1 are the same as described under the Proposed Action. BOEM anticipates adverse impacts resulting from Alternative C-1 would be **minor** with additional **minor beneficial** impacts to some species (diving seabirds) from the presence of structures and underwater armoring. *Cumulative Impacts of Alternative C-1*: The conclusions for cumulative impacts of Alternative C-1 are the same as described under the Proposed Action. Combined with past, present, and reasonably foreseeable environmental trends and planned non-offshore wind and	*Alternative C-2:* The conclusions for impacts of Alternative C-2 are the same as described under the Proposed Action. BOEM anticipates adverse impacts resulting from Alternative C-2 would be **minor** with additional **minor beneficial** impacts to some species (diving seabirds) from the presence of structures and underwater armoring. *Cumulative Impacts of Alternative C-2:* The conclusions for cumulative impacts of Alternative C-2 are the same as described under the Proposed Action. Combined with past, present, and reasonably foreseeable environmental trends and planned non-offshore wind and	*Alternative C-3:* The conclusions for impacts of Alternative C-3 are the same as described under the Proposed Action. BOEM anticipates adverse impacts resulting from Alternative C-3 would be **minor** with additional **minor beneficial** impacts to some species (diving seabirds) from the presence of structures and underwater armoring. *Cumulative Impacts of Alternative C-3:* The conclusions for cumulative impacts of Alternative C-3 are the same as described under the cumulative impacts of the Proposed Action. Combined with past, present, and reasonably foreseeable environmental trends and planned non-

No Action Alternative (Alternative A)	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)	Fisheries Habitat Minimization Considering Feasibility Due to Glauconite Sands (Alternative C-3)
the presence of structures.	individual IPFs would be **moderate** depending on the species depending on habitat or seasonal uses that vary by species. When combined with past, present, and reasonably foreseeable environmental trends and planned non-offshore wind and offshore wind activities would result in **moderate** adverse cumulative impacts to birds because those impacts that are detectable and measurable would not lead to long-term or population-level effects. Potential **minor beneficial** impacts may result from the presence of structures.	offshore wind activities, the Alternative C-1 would result in **moderate** adverse and potential **minor beneficial** cumulative impacts to birds.	offshore wind activities, the Alternative C-2 would result in **moderate** adverse and potential **minor beneficial** cumulative impacts to birds.	offshore wind and offshore wind activities, the Alternative C-3 would result in **moderate** adverse and potential **minor beneficial** cumulative impacts to birds.

3.8.10 Summary of Impacts of the Preferred Alternative

BOEM has identified Alternative C-3b as the Preferred Alternative as depicted in Figure 2.1-10. Alternative C-3b would include installation of up to 84 WTGs, which is 10 fewer WTGs than the maximum WTGs proposed under the PDE of the Proposed Action. Although Alternative C-3b would reduce the number of WTGs and their associated IACs, which would have an associated reduction in potential collision risk, the reduction in effects from impacts would not result in different impact level determinations. These adverse impacts would be avoided and minimized using the same APMs as described in the Proposed Action (see Table 3.8-3 below). BOEM expects that the impacts to birds resulting from the alternative alone would be similar to the Proposed Action and be minor adverse.

Therefore, BOEM expects the overall impact on birds from the Proposed Action alone to be long-term minor adverse; however, the resource would recover completely after decommissioning without remedial or mitigating action.

In the context of other reasonably foreseeable environmental trends and planned actions, BOEM also expects that Alternative C-3b impacts would be similar to the Proposed Action (with individual IPFs leading to impacts ranging from negligible to minor adverse and minor beneficial). The overall impacts of Alternative C-3b when combined with past, present, and reasonably foreseeable activities would therefore be the same level as under the Proposed Action: **moderate** adverse and potentially **minor beneficial**.

3.8.11 Proposed Mitigation Measures

The mitigation measures listed in Table 3.8-3 are recommended for inclusion in the Preferred Alternative.

Table 3.8-3. Proposed Mitigation Measures: Birds

Measure	Description	Effect
Adaptive mitigation for birds and bats	Sunrise Wind developed a Post-construction Avian and Bat Monitoring Framework that summarizes the approach to monitoring; describes overarching monitoring goals and objectives; identifies the key bat species, prioritizes questions, and data gaps unique to the region and Project Area that would be addressed through monitoring; and describes methods and time frames for data collection, analysis, and reporting. Sunrise Wind would engage with federal and state agencies and eNGOs to identify appropriate monitoring options and technologies, and to facilitate acceptance of the final plan.	If the reported post-construction bird monitoring results indicate bird impacts deviate substantially from the impact analysis included in this EIS, then Sunrise Wind must make recommendations for new mitigation measures or monitoring methods.
Bird deterrents	Install bird deterrent devices to minimize bird attraction to operating turbines and on the OSS, where appropriate and where Sunrise Wind determines such devices can be safely deployed.	Potential collision impacts with offshore WTGs and OSS could be reduced by requiring installation of bird deterrent devices to minimize bird attraction to operating WTGs and on the OSS.

3.8.11.1 Effect of Measures Incorporated into the Preferred Alternative

The mitigation measures listed in Table 3.8-3 are recommended for inclusion in the Preferred Alternative. These measures include adaptive mitigation and deterrent devices. These measures, if adopted, would have the effect of further reducing the overall impact from the Preferred Alternative.

3.9 Coastal Habitat and Fauna

This section describes the coastal habitats and fauna of the affected environment and potential impacts to these resources with respect to the Proposed Action, alternatives, and ongoing and planned activities in the GAA in which effects would be evident or expected.

Coastal habitats in the Project Area include those located within state waters (which extend 3 nm [5.6 km] from the shoreline) and inland to the mainland, inclusive of bays, back-barrier lagoons, and/or marshes (USFWS 1997) that separate the barrier islands from the coastal mainland on the Long Island south shore. Onshore Project activities would occur in Smith Point County Park on Fire Island before crossing William Floyd Parkway and then the ICW via HDD to Smith Point Marina on the mainland. Smith Point County Park includes 825 ac at the eastern end of Fire Island, within the boundaries of the 19,580-ac, 26-mile long, Fire Island National Seashore, although it is not managed by NPS. Smith Point County Park is also east of and adjacent to the Otis Pike Fire Island High Dune Wilderness, which is the only federally designated wilderness in the State of New York.

Coastal habitats of the barrier islands and south shore include the foreshore, backshore, dunes, and interdunal areas. Habitats along the mainland transmission corridor range from salt marshes to freshwater marshes and from maritime forests to upland and wetland forests. These coastal habitats are important to numerous species of fauna, including mammals, birds, herpetofauna, and invertebrates that depend on these habitats for food, water, shelter, and reproduction. The GAA for coastal habitats and fauna includes export cable landfalls, onshore export cable routes, the OnCS-DC, and the interconnection to the existing Holbrook Substation, from landfall at Fire Island to the Holbrook Substation (Figure D-6, Appendix D).

The affected environment and environmental consequences of Project activities that are within the GAA and extend into state waters (i.e., HDD for cable landfall and cable laying within 1 mi [1.6 km] of cable landfalls) are presented in Sections 3.7 *Benthic Resources*; 3.10 *Finfish, Invertebrates, and Essential Fish Habitat*; 3.11 *Marine Mammals*; 3.12 *Sea Turtles*; and 3.5 *Water Quality*. Additional information on birds, bats, and wetlands is presented in Section 3.8 *Birds*, Section 3.6 *Bats*, and Section 3.13, *Wetlands* respectively.

3.9.1 Description of the Affected Environment and Future Baseline Conditions

3.9.1.1 Regional Setting

Long Island is a detached segment of the relatively flat alluvial Atlantic Coastal Plain of the Atlantic coast of the United States that was subsequently covered by moraine deposits, glacial drift, and outwash materials from the most recent glaciation. The island slopes gradually southward from an elevation of roughly 200 ft (60 m) from rocky shores and cliffs on the north side of the island to sandy beaches, marshes, mudflats, and barrier islands on the south shore. Relatively rare pine barrens and the nation's only maritime dune grasslands occur on the mainland (Griffith 2010; Sohl 2003). Maritime beaches, dunes, and forests occur along the coastal mainland and the barrier islands.

The bays along the south shore have an average depth of 6.5 ft (1.9 m) (Wilson et al. 1991) and an average salinity of 25.9 parts per thousand (ppt) (Tanski et al. 2001), compared to approximately 35 ppt in seawater and 0.5 ppt in fresh water. Approximately 70 mi (112.7 km) of the south shore, from mean high tide on the ocean side of the barrier islands to the inland limits of the mainland watersheds, are designated as the South Shore Estuary Reserve (SSER Council 2021). The estuary includes 173 mi^2 (448.1 km^2) of shallow bays behind (landward of) the barrier islands and 19,000 ac (76.9 km^2) of vegetated tidal wetlands. The tidal marshes, mud and sand flats, SAV, and broad shallows of this estuarine environment support finfish, shellfish, waterfowl, and other wildlife in the South Shore Estuary Reserve.

Climate change affects these and other coastal habitats due to factors such as sea level rise, increases in the number of storms, and subsequent erosion and habitat loss. Climate change factors also accounted for the loss of approximately 3.4 million ac (13,682 km^2) of forested coastal wetlands across the north Atlantic coastal plain between 1996-2016 (White et al. 2021). A climate change assessment of Fire Island National Seashore (Ricci et al. 2020) predicted vulnerability of coastal habitats and fauna to climate change and found saltmarshes, maritime forests, freshwater ecosystems, and coastal herpetofauna to be the most vulnerable to loss, with little capacity to adapt to climate change. Coastal habitats are considered highly vulnerable to the impacts of climate change, including non-climate stressors such as coastal development (Farr et al. 2021).

3.9.1.2 Barrier Islands

Barrier island shorelines are continually reworked by waves and tidal action and can change on a daily, seasonal, or annual basis, especially in response to severe weather events. For example, in 2012, Hurricane Sandy's wave energy and storm surge resulted in the loss of an average of 54-percent volume in beaches and dunes across Fire Island, with more than 75 percent of the volume loss estimated near the ICW at Smith Point (USGS 2013). Island widths along the south shore typically vary between 984 ft and 2,625 ft (300 m and 800 m) in width. Fire Island, one of five barrier islands along the south shore of Long Island (Tanski et al. 2001), is the landfall site for the Project. Like other barrier islands, it migrates landward due to the transfer of sand from the ocean to the bay side (Nordstrom and Jackson 2005), and breaches and washovers can form platforms that support seagrass meadows.

Vegetation patterns on Fire Island, inclusive of the Otis Pike Fire Island High Dune Wilderness, coincide with gradients of tidal inundation, salinity, and wind across the island from ocean to bay side (GPI 2008). The beaches have four zones: nearshore bottom (submerged areas below mean low water (MLW) to 29.5 ft (9.0 m); foreshore (intertidal areas between MLW to the high tide zone); backshore (exposed sandflats above high tide line to dunes, but occasionally submerged during storms or exceptionally high tides); and dunes that parallel the shore (areas of wind-blown sand ridges or mounds above the highest tide line and exposed to wind action) (USFWS 1997). Dune ridges often parallel the shoreline, and extensive sand flats, interdunal swales, and tidal marshes are behind the dunes. Plant species commonly found seaward of the primary dune and on the foredune include American beach grass (*Ammophila breviligulata*), beach pea (*Lathyrus maritimus*), dusty miller (*Artemisia stelleriana*), seaside goldenrod (*Solidago sempervirens*), common saltwort (*Salsola kali*), seaside spurge (*Euphorbia polygonifolia*), and sea rocket (*Cakile edentula*). On the leeward side of the primary dune, less salt-tolerant woody vegetation such as beach plum (*Prunus maritima*), northern bayberry (*Myrica pensylvanica*), Virginia creeper (*Parthenocissus quinquefolia*), and poison ivy (*Rhus radicans*) are also present. Bearberry (*Arctostaphylos uva-ursi*) and beach-heather (*Hudsonia tomentosa*) may also be found in the swale or near secondary dunes. The federally threatened seabeach amaranth (*Amaranthus pumilus*) may also occur in the sandy beach portions of the Project Area.

Interdunal swales have freshwater inputs via groundwater and may be characterized by wetland species such as purple gerardia (*Agalinis purpurea*), sundews (*Drosera* spp.), large cranberry (*Vaccinium macrocarpon*), and highbush blueberry (*V. corymbosum*). Farther inland, bogs, maritime thickets/forest and salt marshes may be present. On Fire Island, highbush blueberry swamp shrub, northern interdunal cranberry swale, and reedgrass marsh (Klopfer et al. 2002) communities occur (Grossman et al. 1998). Plant species in the bogs include cranberry, highbush blueberry, swamp azalea, (*Rhododendron viscosum*), narrow leaved cattail (*Typha angustifolia)*, wool grass (*Scirpus cyperinus*), common reed *(Phragmites australis*), swamp maple (*Acer rubrum*), sour gum (*Nyssa sylvatica*), sphagnum moss (*Sphagnum* spp*.),* royal ferns (*Osmunda* spp.), marsh St. Johnswort (*Hypericum virginicum*), red chokeberry (*Pyrus arbutifolia*), inkberry (*Ilex glabra*), smartweed (*Polygonum* spp.), various species of sedge (*Carex* spp.), and rushes. Tidal marshes are present along the low energy bay side of Fire Island in broad overwash areas and common species include saltmarsh cord grass (*Spartina alterniflora*), salt-meadow cordgrass (*S. patens*) and coastal salt grass (*Distichlis spicata*), depending on the level of tidal inundation.

3.9.1.3 Mainland

Approximately 18 percent of the bay side of Long Island was bulkheaded by 2009 (Nordstrom et al. 2009), which increases shoreline erosion. Sediment supply is considered the greatest threat to bayside beaches (and is reduced by bulkheading and shoreline hardening, dredging for navigation access, and disposal of dredged material in uplands (Ricci et al. 2020). Developed land uses, primarily residential, have replaced or degraded much of the historical natural communities on the mainland. Residential and recreation and open lands make up 37 and 27 percent of the landcover, respectively, in the Town of Brookhaven, Suffolk County, where onshore Project facilities would be located (see Section 3.18 *Land Use* for further detail). Recreation and open land in the Town of Brookhaven include lands developed for recreation, such as Smith Point County Park and Southaven County Park. Wertheim National Wildlife Refuge (NWR) and Otis Pike Fire Island High Dune Wilderness within the Fire Island National Seashore Wilderness Area have very limited development. The Central Pine Barrens is a 105,000 ac (424.9 km^2) natural area created by the Long Island Pine Barrens Protection Act in 1993 and a prominent feature on the mainland and includes the headwaters for the Carmans River. Tidal marshes are present along the coast of the mainland and the estuarine portion of the Carmans River, while freshwater marshes and forested wetlands occur farther inland and along the upper reaches of the Carmans River. Tidal marshes are analyzed in Section 3.13 *Wetlands and Other Waters of the United States*.

3.9.1.4 Significant Natural Communities and Habitats

The GAA for coastal habitats and fauna is within the state coastal area of New York, as described in the State of New York (1982) and the Long Island Sound Coastal Management Programs (1999), and the SSER Comprehensive Management Plan (SSER Council 2021). The GAA overlaps or is proximate to state and/or federal designations, including the NYSDEC Critical Environmental Areas (CEAs), Significant Coastal Fish and Wildlife Habitats (SCFWH), New York Natural Heritage Program (NYNHP) Significant Natural Communities, Fire Island National Seashore and the Otis Pike Fire Island High Dune Wilderness, and the Central Pine Barrens, described below and mapped in Figure 4.4.1-2 of the COP (Sunrise Wind 2023).

3.9.1.5 Critical Environmental Areas

A portion of the landfall/ICW work area intercepts the Coastal Zone Area South CEA on the mainland. The onshore transmission cable traverses the CEAs for approximately 1 mi (1.6 km) along William Floyd Parkway from the ICW work area to Fawn Place and for approximately 0.7 mi (1.1 km) across the Carmans River. Onshore facilities in the CEAs are located primarily within existing developed areas such as parking lots and paved roadways.

3.9.1.6 Significant Coastal Fish and Wildlife Habitats

- There are four NYSDOS-designated SCFWHs that are intercepted or directly adjacent to onshore transmission facilities. These are described below and corresponding locations with respect to onshore facilities are listed in Table 3.9-1. ***Great South Bay – East:*** This SCFWH includes the Great South Bay and ICW crossing from the landfall/ICW work area on Fire Island to the landfall/ICW work area on mainland, west of and including, the Smith Point Bridge. It is the largest protected, coastal bay in the state of New York, provides feeding and nesting habitat for several rare, threatened, and endangered (RTE) avian species, and supports one of the largest concentrations of wintering waterfowl in the state of New York (NYSDEC 2008a).
- ***Moriches Bay – West:*** The Moriches Bay SCFWH is just east of the Smith Point Bridge. Like Great South Bay, it is a large, protected, bay and provides feeding and nesting habitat for numerous species of fish and shellfish, avian species, and rare plants (NYSDEC 2008c).
- ***Carmans River:*** The proposed transmission cable crosses approximately 70 ft (21 m) of the Carmans River. The Carmans River SCFWH is undeveloped and one of four major rivers on Long Island. Rare species include the eastern tiger salamander (*Ambystoma tigrinum*), eastern box turtle (*Terapene carolina*), sea-run brown trout (*Salmo trutta*), and wild brook trout (*Salvelinus fontinalis*) (NYSDEC 2008d). The Carmans River flows through the Wertheim NWR, located approximately 350 ft (106.7 m) downstream of the proposed crossing.
- ***Smith Point County Park:*** The Smith Point County Park SCFWH is the location of the landfall/ICW work area on Fire Island. The SCFWH is one of the largest segments of undeveloped barrier beach on

Long Island. It provides feeding and nesting habitat for several RTE avian species and supports populations of RTE plant species such as seabeach amaranth (*Amaranthus pumilus*) and seabeach knotweed (*Polygonum glaucum*). Park recreational use is high during the summer months and disturbance by pedestrian and off-road vehicle traffic is common (NYSDEC 2008b).

- ***Great South Bay – East:*** This SCFWH includes the Great South Bay and ICW crossing from the landfall/ICW work area on Fire Island to the landfall/ICW work area on mainland, west of and including, the Smith Point Bridge. It is the largest protected, coastal bay in the state of New York, provides feeding and nesting habitat for several RTE avian species, and supports one of the largest concentrations of wintering waterfowl in New York State (NYSDEC 2008a).
- ***Moriches Bay – West:*** The Moriches Bay SCFWH is just east of the Smith Point Bridge. Like Great South Bay, it is a large, protected, bay and provides feeding and nesting habitat for numerous species of fish and shellfish, avian species, and rare plants (NYSDEC 2008c).
- ***Carmans River*:** The proposed transmission cable crosses approximately 70 ft (21 m) of the Carmans River. The Carmans River SCFWH is undeveloped and one of four major rivers on Long Island. Rare species include the eastern tiger salamander (*Ambystoma tigrinum*), eastern box turtle (*Terapene carolina*), sea-run brown trout (*Salmo trutta*), and wild brook trout (*Salvelinus fontinalis*) (NYSDEC 2008d). The Carmans River flows through the Wertheim NWR, located approximately 350 ft (106.7 m) downstream of the proposed crossing.

Table 3.9-1. Summary of Significant Coastal Fish and Wildlife Habitats, New York Natural Heritage Program Natural Communities and Critical Environmental Areas Intercepted by Proposed Onshore Facilities

Onshore Facility	Significant Coastal Fish and Wildlife Habitats	New York Natural Heritage Program Significant Natural Communities	Critical Environmental Areas
Landfall/ICW Work Area (Fire Island and Mainland)	Smith Point County Park Moriches Bay - West (adjacent) Great South Bay – East	Maritime beach and maritime intertidal gravel/sand beach Marine eelgrass meadow (adjacent) Marine Back-barrier lagoon (adjacent)	Not present
Onshore Transmission Cable Route	SCFWH Moriches Bay (adjacent to ICW HDD location) Great South Bay-East (ICW HDD) Carmans River crossing	Red maple-blackgum swamp (Carmans River) (300 ft [91 m] downstream of Sunrise Highway)	CEA South at ICW HDD and associated work area at Carmans River crossing; includes Central Pine Barrens
Onshore Connector Station (Union Avenue)	None	None	None
Onshore Interconnection Cable Route	None	None	None

Source: Verified data as reported in Appendix L of the COP (Stantec 2022b)
Notes: CEA = Critical Environmental Area; ICW = intracoastal waters; HDD = horizontal directional drilling; SCFWH = Significant Coastal Fish and Wildlife Habitats

3.9.1.7 Significant Natural Communities

Five significant natural community types were identified by the NYNHP (see agency correspondence in Appendix C of Appendix L of the COP, Stantec 2022b) as intercepted by or directly adjacent to the proposed onshore facilities. Although not intercepted, the Otis Pike Fire Island High Dune Wilderness within Fire Island National Seashore is adjacent to the west side of Smith Point County Park and included here.

- ***Maritime beach and maritime intertidal gravel/sand beach:*** These communities are part of a 32 mi (51.5 km) maritime community that is partially within the Smith Point County Park SCFWH on Fire Island where landfall of the transmission cable is planned. Maritime beaches occur on unstable sand, gravel, or cobble shores above the MHWL, are continually modified by wave and wind action, and are sparsely vegetated with beach grass (NYSDEC 2008b; Edinger et al. 2014).
- ***Marine eelgrass meadow:*** Extensive eelgrass (*Zostera marina)* meadows are present in Narrow Bay between Smith Point County Park on Fire Island and Smith Point Marina on the mainland. The grass beds provide spawning and foraging habitat for mollusks, crustaceans, juvenile fish, and diving ducks and help stabilize sediments (NYSDEC 2008a; Edinger et al. 2014). Further discussion of SAV is provided in Section 3.10, *Finfish, Invertebrates, and Essential Fish Habitat*.
- ***Marine back-barrier lagoon:*** A large marine back-barrier lagoon occurs in parts of Great South Bay and Moriches Bay near the landfall/ICW work area, surrounded by developed lands. The protected shores of the lagoons support grass beds, mudflats, and salt marshes.
- ***Red maple-blackgum swamp:*** Red maple (*Acer rubrum*)–blackgum swamp is present approximately 300 ft (91 m) south of the LIE Service Road along the eastern side of the Carmans River. Dominant species include black tupelo (*Nyssa sylvatica*) and red maple, along with understory species such as clammy azalea (*Rhododendron viscosum*) and coastal sweet pepperbush (*Clethra alnifolia*) (NYSDEC 2008d). Faunal information for this community is very limited (Edinger et al. 2014). Further discussion of this community type is presented in Section 3.13, *Wetlands and Other Waters of the United States*.
- **Otis Pike Fire Island High Dune Wilderness:** The Otis Pike Fire Island High Dune Wilderness is adjacent to Smith Point County Park on the west side of the park and is the only federally designated wilderness in the State of New York. The Wilderness is managed by NPS and stretches approximately 7 mi (11.3 km) west from the Wilderness Visitor Center adjacent to Smith Point County Park, west to Watch Hill, and includes approximately 1,363 ac (551.6 ha) of the Fire Island National Seashore. The Wilderness area provides backcountry camping opportunities and hiking, fishing, birdwatching, and nature viewing.
- **Central Pine Barrens:** The Central Pine Barrens occur in central western Long Island and undeveloped stretches of the bay sides of barrier islands (Central Pine Barrens Joint Planning & Policy Commission 2022), including the Long Island south shore. These pine barrens represent the largest remnant of a forest community that once encompassed more than 250 million ac (over 1,011 km^2). Pine barrens are fire-dependent and characterized by the presence of pitch pine (*Pinus rigida)*, but may be pine-or oak- dominated, with different proportions of the same species such as black huckleberry (*Gaylussacia baccata*), Blue Ridge blueberry (*Vaccinium pallidum*), and bear oak (*Quercus ilicifolia*). These communities are particularly recognized for the number of moth and butterfly species that rely on plants such as bear oak for survival and/or reproduction (Davis et al. 2005).

Development in the designated Central Pine Barrens Core Preservation Area is regulated, but it is not prohibited. Sunrise Wind's application for a Core Preservation Area Compelling Public Need and Hardship was granted in April 2022." The link to the approval document is: https://documents.dps.ny.gov/public/MatterManagement/MatterFilingItem.aspx?FilingSeq=303480&MatterSeq=64180. The designated Central Pine Barrens Core Preservation Area includes approximately 52,500 ac (212 km^2) and approximately 47,500 ac (192 km^2) of the Compatible Growth Area, where development is permitted (Central Pine Barrens Joint Planning & Policy Commission 2022). The onshore transmission cable traverses the Core Preservation and Compatible Growth areas at and adjacent to the Carmans River crossing. The Central Pine Barrens Commission has identified mitigation measures for development within the Core Preservation Area. The Core Preservation Area is characterized by predominantly forested wetlands, including red maple-blackgum swamp and oak uplands. The Compatible Growth Area on either side of the Carmans River crossing is developed but includes scattered remnant pine barrens. The onshore transmission cable has been located to the greatest extent practicable within existing road ROWs within the Compatible Growth Area but includes two crossings of remnant pine barrens, one at Sunrise Highway crossing west of William Floyd Parkway and the other at the LIRR crossing.

3.9.1.8 Coastal Fauna

The onshore facilities are located entirely within the SSER, which is home to approximately 120 species of marine and coastal finfish, hundreds of birds, and a wintering territory for small numbers of marine mammals (Lynch 2017). Migratory shorebirds use the beaches, marshes, and especially the intertidal flats of Fire Island as feeding grounds (GPI 2008), feeding on invertebrates in the tidal flats, salt marshes, and ocean beaches in the area and resting on beaches. The habitats in Moriches Bay near the inlet are recognized as one of the best and most consistent shorebird concentration areas on Long Island, primarily in the fall.

Shorebirds, waterfowl, and wading birds are the primary terrestrial species in this area other than the abundant deer and fox (GPI 2008). Birds likely to occur within or proximate to the onshore facilities are provided in Table 4.4.6-4 in the COP (Sunrise Wind 2023), based on the NYS Breeding Bird Atlas (2000–2005). Terrestrial birds such as songbirds occur and breed in a variety of upland and coastal habitats and are only present offshore during migration. Hawk species (e.g., ospreys, harriers) breed and forage in upland habitats and pass through the area during migration. Bald eagles (*Haliaeetus leucocephalus*), protected under the Bald and Golden Eagle Protection Act of 1940 (as amended in 1962) have a year-round presence in the region (NYSDEC 2008b), are present year-round in the region and have been slowly increasing in numbers over the last 30 years. Bald eagles have also returned to Long Island (NYSDEC 2008b).

Dunes on Fire Island are habitat to species such as red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), and whitetail deer (*Odocoileus virginianus*). Fire Island also supports a major breeding population of the state endangered eastern mud turtle (*Kinosternon subrubrum*), which inhabits a variety of wetland habitats including ponds and freshwater and brackish marshes (Cook et al. 2010) and is considered critically imperiled at this northern edge of its distribution. This species is found in only seven wetland complexes on Long Island and nearby islands and the population is declining in all but one (NYNHP 2013).

3.9.1.9 Federally Listed Rare, Threatened, and Endangered Species and Designated Critical Habitat

The NYNHP lists known occurrences of several RTE plant species within the vicinity of the transmission cable corridor and other areas associated with onshore facilities (see agency correspondence in Appendix C of Appendix L of the COP, Stantec 2022b). A USFWS Information for Planning and Consultation (iPaC) query indicated known occurrences of two federally listed plant species in the vicinity of the onshore facilities. Table 3.9-2 provides a list of the known RTE plant occurrences and potential habitat for those species associated with the onshore facilities. Red maple-blackgum swamp is present in Southaven County Park, within 0.2 mi (321.9 m) of the onshore transmission cable and is potential habitat for RTE plant species blunt-lobed grape fern (*Botrychium oneidense*), Collins' sedge (*Carex collinsii*), and water pigmy weed (*Crassula aquatica*), although the potential habitat is outside the proposed work areas and none of these species were found during field surveys. Similarly, potential habitat in a remnant pine barren was surveyed for sandplain wild flax (*Linum intercursum*), a species listed as threatened by NYSDEC and noted to occur proximate to the OTC, was not found. However, incidental observations were made of two state-listed species and one rare species: state-threatened little ladies' tresses (*Spiranthes tuberosa*) and Stuve's bush-clover (*Lespedeza stuevei*), and sickle-leaved golden aster (*Pityopsis falcata*, listed as rare on the NYNHP Watch List), respectively.

Seabeach amaranth (federally threatened) may occur in the maritime beach community at the landfall/ICW work area where suitable habitat is present. There is a documented occurrence of the species approximately 1 mile (1.6 km) from the onshore project components and seabeach amaranth may occur in the sandy beach portions of the Project Area. Field surveys noted that the extensive recreation use and associated impacts from pedestrian and vehicle traffic in this location substantially limit the likelihood of seabeach amaranth occurrences (Appendix L of the COP, Stantec 2022b), however, areas fenced to protect plovers and terns would also provide potential habitat for seabeach amaranth. Potentially suitable habitat for sandplain gerardia is provided in the northern portion of the landfall/ICW work area on Fire Island within the maritime shrubland community north of the parking area. This community supports maritime grassland-associated species interspersed within sandy openings amongst patches of shrubs. Potential habitat for sandplain wild flax is provided in the maritime dune community within the landfall/ICW work area, particularly in the stable back dune areas. Potentially suitable habitat is available in the maritime shrubland community in areas noted above for sandplain gerardia.

The NYNHP identified an occurrence of hairy-necked tiger beetle (*Cincindela hirticollis*), a rare but unlisted species associated with sand beaches, near the landfall/ICW work area on Fire Island (see agency correspondence in Appendix C of Appendix L in the COP, Stantec 2022b). A review of aerial imagery indicates that the ICW HDD work area contains exposed sandy areas and field surveys, noted the maritime dune community, provides potentially suitable habitat for hairy-necked tiger beetle. In addition, the NYNH identified two unlisted but rare fish occurrences within the Carmans River near the OTC: eastern pirate perch (*Aphredoderus sayanus*) and Atlantic silverside (*Menidia menidia*). The river reportedly provides important nursey habitat for striped bass (*Morone saxatilis*) and spawning and nursey habitats for alewife (*Alosa pseudoharengus*), Atlantic menhaden (*Brevoortia tyrannus*), white perch (*Morone americana*), and Atlantic silverside (NYSDEC 2008d). Field surveys confirmed that aquatic habitats of Carmans River provide potentially suitable habitat for both these species (Appendix L of the COP, Stantec 2022b). A USFWS iPaC database query did not indicate occurrences of federally listed fish or non-avian or bat wildlife species in or proximate to the onshore facilities. A query of the New York Nature Explorer database indicates that several other species of fish and non-avian wildlife are known to occur within the Town of Brookhaven (Appendix B of Appendix L of the COP, Stantec 2022b). Several RTE species of moths and butterflies may also occur in the pine barrens (Davis et al. 2005), as noted earlier.

Table 3.9-2. Rare, Threatened, and Endangered and NYS Watch List Plant Species Documented by NYSDEC, USFWS, or Field Surveys Potentially Intercepted or Occurring in the Vicinity of Proposed Onshore Facilities

Project Component	Species	State Listing	Federal Listing	Habitat Association	Approximate Location	Field Results
Landfall/ICW Work Area	Sandplain Gerardia[1] *Agalinis* acuta	Endangered	Endangered	Maritime grassland and shrubland	No location information provided	None observed within area[3]; potential habitat at landfall/ICW work area but outside of landfall and ICW work area
	Seabeach Amaranth[1] *Amaranthus pumilus*	Threatened	Threatened	Maritime beach	No location information provided	None observed[3], potential habitat at landfall/ICW work area but outside of landfall and ICW work area
Onshore Transmission Cable Work Area: Long Island Expressway Service Road Route[4]	Blunt-lobed Grape Fern[2] Botrychium oneidense	Threatened	NL	Floodplain forest, red maple-blackgum swamp	Southaven County Park, within 0.2 mi (0.3 km) of onshore transmission cable; in wet soil under shrubs and vines in red maple swamp	None observed[3]; potential habitat in wetlands associated with Carmans River and Southaven County Park but outside of proposed work areas
	Collins' Sedge[2] Carex collinsii	Endangered	NL	red maple-blackgum swamp	Southaven County Park, within 0.2 mi (0.3 km) of onshore transmission cable; abandoned fish hatchery (part of Suffolk County Park) in a red maple-tupelo swamp	None observed[3]; potential habitat in wetlands associated with Carmans River and Southaven County Park but outside of proposed work areas
	Water Pigmyweed[2]	Endangered	NL	Freshwater intertidal	Within 0.2 mi (0.3 km) of	None observed[3],

Project Component	Species	State Listing	Federal Listing	Habitat Association	Approximate Location	Field Results
	Crassula aquatica			mudflat, freshwater intertidal shore, and freshwater tidal marsh	onshore transmission cable; Carmans River, west side immediately south of Montauk Highway; bank of an intertidal section of river at a road embankment	potential habitat in Carmans River but outside of proposed work areas
	Sandplain Wild Flax[2] *Linum intercursum*	Threatened	NL	Maritime dunes, maritime grassland, maritime shrubland, and pitch pine-scrub oak barrens	Within 0.6 mi (1.0 km) of onshore transmission cable: Station Avenue roadside; plants are on a roadside along pine barrens with very sparse vegetation, dominated by grasses and legumes	None observed; minimal potential habitat; potentially suitable habitat associated with Revilo Avenue work area was surveyed but no sandplain wild flax specimens were observed
	Little Ladies' Tresses[4] *Spiranthes tuberosa*	Threatened	NL	Pitch Pine – Scrub Oak Barren	No location information provided	Observed in vicinity but outside proposed work area
	Stuve's Bush-clover[4] *Lespedeza stuevei*	Threatened	NL	Pitch Pine – Scrub Oak Barren	No location information provided	Observed in vicinity but outside proposed work area
	Sickle-leaved Golden Aster[4] *Pityopsis falcata*	Rare (Watch List)	NL	Pitch Pine – Scrub Oak Barren	No location information provided	Observed in vicinity but outside proposed work area

[1] Source: USFWS Information for Planning and Consultation (iPaC). Accessed March 11, 2020 and April 19, 2021, as reported in Appendix L of the COP (Stantec 2022b).

[2] Source: New York NHP Correspondence, March 27, 2020, and April 15, 2021, as reported in Appendix L of the COP (Stantec 2022b

[3] Field surveys for rare, threatened, and endangered (RTE) plants evaluated the potential for suitable habitat within the onshore facilities and were not targeted surveys to determine potential presence/probable absence of species, as reported in Appendix L of the COP (Stantec 2022b).

[4] Source: September 8, 2021 field survey, as reported in Appendix L of the COP (Stantec 2022b).

3.9.1.10 Onshore Facilities

Coastal habitats associated with the landfall/ICW work areas on Fire Island include maritime beaches, dunes, and grasslands. The landfall/ICW work on Fire Island includes the work area in Smith Point County Park, the adjacent HDD conduit stringing area, and Smith Point Marina on the mainland. Assembly would include welding and short-term placement of assembled HDD conduit sections along approximately 3,500 ft (1,067 m) of beach.

The landfall/ICW work area on the mainland is primarily developed, including a paved parking lot and areas of beach and dune communities along the beach side and to the west and east of the parking lot of Smith Point County Park. Otis Pike Fire Island High Dune Wilderness is directly adjacent to the west side of Smith Point County Park. Landfall/ICW Work Areas on Fire Island would be largely confined to the existing, paved Smith Point County Park parking lot, Burma Road, and maintained recreational fields located west of William Floyd Parkway. HDD conduit stringing may occur on Burma Road within Smith Point County Park, in an area located onshore south of the Smith Point County Park camping area., with the exception of cable stringing on the beach. Coastal habitats in the landfall/ICW work area on the mainland include beach and dune communities located along the south side of the mainland and associated interdunal areas. The onshore facilities would be located mostly within existing developed areas including parking lots and paved roadways.

More detailed information concerning coastal and terrestrial habitat, including the results of NYSDEC and USFWS data requests, desktop assessment, and field surveys are presented in Appendix B of Appendix L in the COP, Stantec 2022b.

3.9.2 Impact Level Definitions for Coastal Habitat and Fauna

This Final EIS uses a four-level classification scheme to analyze potential impact levels to coastal habitat and fauna from the alternatives, including the Proposed Action. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a project or beyond project operations and decommissioning.

Table 3.9-3 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for coastal habitat and fauna. Table G-8 in Appendix G identifies potential IPFs, issues, and indicators to assess impacts to coastal habitat and fauna.

Table 3.9-3. Definition of Potential Adverse and Beneficial Impact Levels for Coastal Habitats and Fauna

Impact Level	Definition of Adverse Impact Levels	Definition of Beneficial Impact Levels
Negligible	Either no effect or no measurable impacts	Either no effect or no measurable impacts
Minor	Small, detectable, measurable, adverse impacts to habitat and/or fauna (abundance, diversity of both common and special-status species); localized; complete recovery anticipated without remedial or mitigating actions within a year; impacts avoidable.	Small and measurable effects that would increase the extent and quality of habitat for both special-status species and species common to the Lease Area and/or increase in populations of species common to the Lease Area.
Moderate	Notable and measurable adverse impacts to the extent and quality of local habitat for common and special-status species, the abundance or diversity of species, would occur and some may be irreversible; or the affected resource would recover completely with remedial or mitigating activities with a specified time frame.	Notable and measurable effects comprising an increase in the extent and quality of local habitat for both special-status species and species common to the Lease Area and/or an increase in individuals or populations of species common to the Lease Area.
Major	Measurable and widespread (population-level or regional) impacts to the extent and quality of local habitat for common and special-status species and the abundance or diversity of species would occur; some impacts may be irreversible; full recovery not anticipated even with remediation or mitigation.	Regional or population-level increase in the extent and quality of habitat for both special-status and commonly occurring species.

3.9.3 Impacts of Alternative A - No Action on Coastal Habitat and Fauna

When analyzing the impacts of the No Action Alternative on coastal habitat and fauna, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities, on the baseline conditions for coastal habitat and fauna. The cumulative impacts of the No Action Alternative considered the impacts of the No Action Alternative in combination with other planned non-offshore wind and offshore wind activities, as described in Appendix E (*Planned Activities Scenario*).

3.9.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for coastal habitat and fauna described in Section 3.9.1, *Affected Environment*, would continue to follow current regional trends and respond to IPFs introduced by other non-offshore wind and offshore wind ongoing activities. Ongoing non-offshore wind activities within the GAA that contribute to impacts on coastal habitat and fauna are generally associated with onshore impacts, including onshore residential, commercial, and industrial development, and climate change. Onshore construction activities and associated impacts are expected to continue at current trends and have the potential to affect coastal flora and fauna through short-term and permanent habitat removal or conversion, short-term noise impacts during construction, and lighting, which could cause avoidance behavior and displacement of animals, as well as injury or mortality to individual animals or loss and alteration of vegetation and individual plants. However, population-level effects would not be anticipated. Climate change and associated sea level rise can cause dieback of coastal habitats due to rising groundwater tables and increased saltwater inundation from storm surges and exceptionally high tides (Sacatelli et al. 2020). Climate change may also affect coastal habitats through increases in instances and severity of droughts and range expansion of invasive species. Warmer temperatures would cause plants to flower earlier, would not provide needed periods of cold weather, and would likely result in declines in reproductive success of plant and pollinator species. Reptile and amphibian populations may experience shifts in distribution, range, reproductive ecology, and habitat availability. Increased temperatures could lead to changes in mating, nesting, reproductive, and foraging behaviors of species, including a change in the sex ratios in reptiles with temperature-dependent sex determination. The effects of climate change on animals would likely include loss of habitat, population declines, increased risk of extinction, decreased reproductive productivity, and changes in species distribution (NJ DEP 2020).

Other planned non-offshore wind activities that may affect coastal habitat and fauna primarily include increasing onshore development activities (see Appendix E for a description of planned activities scenarios). Similar to ongoing activities, other planned non-offshore wind activities may result in short-term and permanent impacts on animals and vegetation, including disturbance, displacement, injury, mortality, habitat and plant degradation and loss, and habitat conversion.

3.9.3.2 Cumulative Impacts of the No Action Alternative

The cumulative impact analysis for the No Action Alternative considers the impacts of the No Action Alternative in combination with other planned non-offshore wind activities and planned offshore wind activities (without the Proposed Action).

Under the No Action Alternative, the proposed Project would not be built and impacts to coastal habitats and fauna described in the following section would not occur, although this does not preclude the implementation of future offshore wind projects in the region. Impacts from future offshore wind and other activities such as increased land development and the impacts of climate change would continue and corresponding impacts to coastal habitats and fauna would persist.

Other planned and non-offshore wind activities that may affect coastal habitat and fauna include new onshore cables and pipelines, onshore construction, port expansions, and development projects (e.g., residential, commercial, industrial). Future projects would contribute to individual displacement, injury, mortality, and habitat loss with respect to coastal habitats and fauna primarily due to land disturbance, but also accidental releases, air emissions, anchoring, cable emplacement, discharges, light, noise, presence of structures, and traffic. Activities from these projects may be short-term, long-term, or permanent, depending on the amount of land disturbance and the timing and duration of the disturbance.

Potential cumulative impacts of planned offshore wind activities, including construction, O&M, and decommissioning of project, on coastal habitats and fauna are summarized below for each relevant IPF.

Accidental releases of fuel, fluids, or hazardous materials would potentially contaminate coastal habitats such as salt marshes and beaches, and fauna such as snails, crabs, and mollusks (discussed in Sections 3.7 and 3.10) due to the release and/or cleanup activities. Accidental releases of fuel from offshore structures and offshore vessels would not likely reach coastal habitats, however. The most likely release is diesel fuel, but the expected size of such a spill is likely to have negligible, localized, and short-term impacts to coastal habitats. Accidental disposal of trash into the water and coastal habitats represents a risk to fauna such as small mammals, birds, herpetofauna, and fish that may ingest or become tangled in the debris. Proper waste management procedures would reduce the potential for trash or debris to be inadvertently left in coastal habitats or waters. The cumulative impacts of accidental releases on coastal habitats are likely to be localized, short-term, and result in negligible impacts to coastal habitats.

Anchoring from small boats may occur along the shoreline during transmission cable landfall activities from the ocean side, potentially increasing turbidity and causing physical damage to coastal habitats such as seagrass beds and hard-bottom habitats (see Sections 3.7 and 3.10). Anchoring close to shore for crew and equipment transport may result in physical disturbance or damage to beaches and/or salt marshes. These impacts would be localized and short-term. Any turbidity would be short-term. Impacts to coastal habitats due to anchoring are expected to be short-term and negligible.

Air emissions from vehicles and heavy machinery (e.g., drill rig, excavation and backfilling equipment, building construction) used in the construction of onshore facilities would result in short-term and localized increases in air pollutants (see Section 3.4). The effects of air pollutants on biogeochemical cycling are well documented, although the effects on most terrestrial organisms and the interaction of air pollution with other stressors are less well understood (Lovett et al. 2009). However, onshore facilities equipment and fuel suppliers would comply with the applicable USEPA or equivalent emission standards and construction and O&M emissions would have negligible to minor, and short-term impacts on coastal habitats and fauna. Long-term benefits of offshore wind include reduced carbon emissions and air pollutants such as nitrogen oxides, sulfur oxides, and mercury, compared with oil and coal combustion (Allison et al. 2019).

Cable emplacement into a trench or as part of a HDD crossing would result in negligible impacts to the environment. However, the cable cannot be installed without the corresponding land disturbance associated with trenching, HDD, traffic, structures, and other activities required to build the containment for the cable. The impacts of cable emplacement would be localized and short-term and no greater that that described for land disturbance and other activities required for the installation. Cables buried deeply enough that the surface protection would not be needed would have no impact on coastal habitats.

Discharges of drilling slurry during HDD at landfall would occur during Project installation and construction. Where HDD is used, an Inadvertent Return Plan would be prepared and implemented to minimize the potential risks associated with the release of drilling fluids. Discharges from vessels are not permitted within 3 nm of shore and are not expected to impact coastal habitats. Onshore construction activities such as trenching may require dewatering and BMPs would be used such as diversion, filtering, and energy dissipation devices. Dewatering activities would be short-term, and water drawdown would be minimal. All earth disturbances from construction activities would comply with State Pollutant Discharge Elimination System General Permits for Stormwater Discharges associated with construction activities and the approved SWPPP for the Project. The likelihood of impacts to coastal habitats and fauna as a result of discharges from the proposed Project are negligible.

Land disturbance is expected to account for the greatest amount of impact to coastal habitats and fauna when compared to other IPFs. Land disturbance would result from construction and installation of transmission cables and associated infrastructure and an OnCS-DC construction. Habitats disturbed during trenching and cable installation would be reseeded with native vegetation where practicable. Total lengths of transmission cable corridor for onshore facilities are much smaller when compared with offshore cables and most of the OTCs are placed within ROWs, utility clearances, and/or other developed areas thereby avoiding habitats and fauna. Onshore activities such as pipe stringing may occur on beaches and would disturb vegetation and fauna for the duration of Project construction. Impacts of these activities are anticipated to be minor to moderate.

Adverse impacts to habitats would occur along cable routes due to trenching, vegetation removal, soil compaction, surface water runoff or pooling, and potential inadvertent burial of vegetation and fauna during construction ROW and locations where the transmission cable installation changes between trenching and HDD. With few exceptions, trenching and burial of transmission cable would be limited to previously disturbed areas, such as transportation ROWs. Trenchless cable crossings (i.e., HDD and jack-piping) are typically used to avoid sensitive environmental areas such beaches, wetlands, and river crossings. For cable installations outside of roadways, such as greenbelt areas, areas would typically be backfilled to the original grade elevation and hydroseeded to prevent soil erosion.

Negligible impacts to coastal habitats are anticipated from areas disturbed by the OnCS-DC facilities because these facilities are generally constructed in already developed areas. Construction of the transmission cable and interconnection facility would provide opportunities for the introduction and establishment of invasive species that would subsequently pose a risk to native vegetation and fauna. In ROW areas, impacts would be short-term and negligible given the areas are already disturbed. In undisturbed habitats, the potential risk is much higher. An Invasive Species Management Plan would be implemented to avoid and manage the introduction and spread of invasive plant species that would likely have negative impacts on native plants and coastal habitat.

Certain work activities (e.g., HDD conduit stringing and tree removal) would result in impacts to coastal habitat and RTE species, such as seabeach amaranth during times of establishment and flowering. Impacts to biologically significant times of year for sea turtles and shore birds are addressed in Sections 3.12 and 3.8, respectively.

Construction activities may also contribute to erosion and sedimentation during construction and result in impacts to sensitive environmental resources. Disturbed habitats are expected to return to their previous condition following construction completion without further restoration. Displaced mobile wildlife would repopulate former habitats once construction is complete and the habitat would recover to pre-construction conditions. Since construction occurs predominantly in already developed areas where wildlife is habituated to human activity regardless of the cable route chosen, impacts of land disturbance would be short-term and negligible to minor because very little construction associated with cable transmission corridors occurs in undisturbed areas.

Maintenance such as periodic clearing of vegetation along existing utility ROWs and other activities to maintain public utilities disturbs and temporarily displaces mobile fauna and may result in injury or death of less-mobile species, albeit at a local level. Clearing and conversion of coastal habitats to developed uses results in permanent loss of the habitat for fauna. Outside currently protected areas, the conversion of natural areas to developed residential, commercial, and industrial uses is expected to continue.

Lighting impacts to coastal habitats and fauna in the GAA from vessels transiting to/from the landfall and coastal work locations or from vessels installing cables in the GAA would occur primarily during construction. Light may emanate from onshore structures associated with the Project construction onshore. The extent of impacts would be limited to the immediate vicinity of the lights, and the intensity of impacts on coastal habitats would likely be undetectable and negligible.

Noise from offshore wind construction activities is not expected to be noticeable in onshore coastal habitats and fauna due to the distance to the offshore activities. Noise pollution is a reported threat to terrestrial fauna such as amphibians, reptiles, and invertebrates, which are already highly threatened (Sordello et al. 2020) and noise would be expected from onshore construction activities. Noise from activities such as trenching and HDD of export cables and construction of onshore facilities, would disturb and displace coastal fauna that may be present during construction. Since construction would occur primarily in already developed ROWs where wildlife is absent or already habituated to human activity and noise, adverse impacts are not anticipated in most places. In potentially sensitive areas outside of ROWs, noise is expected to cause short-term displacement of fauna into adjacent available habitat, although fauna could return. Noise is also anticipated intermittently during construction and O&M phases with similar results. Therefore, impacts to fauna would be short-term and temporary, resulting in negligible to minor impacts.

Presence of structures such as onshore transmission cables and associated facilities along the proposed transmission route is expected to convert existing habitats to hard-top and/or impervious surfaces for cable protection and facilities such as the converter station. These changes would occur during construction and persist as long as the structures remain, resulting in permanent, but minor, habitat loss along the transmission corridor. Cables buried deeply enough that surface protection would not be used would have no impact on coastal habitats and fauna. OnCS-DC facilities would be constructed in a compatible area of industrial or commercial land use and would therefore have negligible impacts on coastal habitats and fauna.

Traffic from vessels and onshore traffic may impact coastal habitats and fauna via physical disturbance of habitats and/or collisions with fauna such as small mammals, birds, and herpetofauna, and/or compaction or crushing of vegetation. Vessel traffic associated with offshore wind energy development may increase during landfall/ICW work activities. Loss or disturbance of coastal habitats such as beaches and marshes could occur due to wake erosion from vessel traffic associated with offshore wind energy but would be limited to approach channels and the coastal areas near ports and bays. Given the amount and nature of vessel traffic into and out of these ports, the small size and number of vessels associated with the Project would result in negligible to minor increases, if any, to wake-induced erosion of associated channels.

Onshore vehicle traffic detours during construction of onshore facilities may increase the number of vehicles along more sensitive alternative routes. Traffic delays may cause travelers to detour through more sensitive areas where coastal habitats and vegetation would be disturbed by increased traffic noise, debris from road and vehicles, and potential collisions with wildlife or off-road detours that damage vegetation may occur. Collisions between wildlife and vehicles or construction equipment would be rare because most individuals are expected to avoid construction areas. However, species with limited mobility, especially herpetofauna, would be more vulnerable to this impact, resulting in minor, short-term, adverse impacts to some species. Traffic disruptions would result in additional noise and dust, typical of other utility construction projects. These impacts would be short-term and overall, impacts to coastal habitats from traffic would be negligible to minor.

Climate change effects on seasonal timing and patterns of species distributions and ecological relationships would continue, resulting in permanent and ongoing changes in coastal habitats, with corresponding impacts on associated fauna. The landward migration of the barrier island shoreline would continue, and sea level rise would ultimately alter the amount and types of coastal habitat available (NPS 2020). Climate change, sea level rise, and other ongoing activities and planned actions would continue to result in the compression of coastal habitats as sea levels rise and reduces the extent of undeveloped coastal areas.

Offshore wind projects that reduce the need for carbon-based fuels such as oil and coal could result in simultaneous and substantial reductions in cumulative carbon emissions (Allan et al. 2020), increases in which are a substantial cause of rising earth temperatures (Lindsey 2020). Loss of coastal vegetation such as seagrasses would reduce the amount of carbon sequestration in the ocean (i.e., blue carbon). Therefore, long-term effects of the Proposed Action may be beneficial to coastal habitats and fauna by helping to reduce the impacts of ongoing climate change on these resources, although this is tempered by the potential reduction in carbon sequestration.

3.9.3.3 Impacts of Alternative A on ESA-Listed Species

Impacts of future and ongoing projects to ESA-listed plant and faunal species in the GAA would contribute to individual displacement, injury, mortality, and habitat loss or modification via noise, land disturbance, vehicle collisions, and climate change. Cable installation impacts to listed species are unlikely due to installation in primarily ROWs and other developed areas; impacts that may occur would not be permanent, and species would likely return to disturbed areas following completion of construction, depending on the amount of land disturbance. Permanent loss of habitat due to construction of buildings such as converter stations is also unlikely because onshore facilities are typically constructed in already developed areas.

Adverse impacts to ESA-listed species from the No Action Alternative would include impacts of future offshore wind projects, which would be the same as those described for the Proposed Action. The two federally listed plant species (seabeach amaranth and sandplain gerardia) in the vicinity of the work area would be affected by future offshore wind projects if the project footprint coincided with the species location(s). Potential impacts to birds and bats are addressed in Sections 3.6 *Bats* or 3.8 *Birds*.

3.9.3.4 Conclusions

Impacts of the No Action Alternative

Under the No Action Alternative, coastal habitats would continue to respond to and reflect current regional trends and current and future environmental and societal activities such as ongoing coastal development. Conditions of coastal habitats in the GAA are relatively stable but can change. For example, marine eelgrass habitats are in decline, with a loss of over 20 percent from 1994 to 2011 (Costello and Kenworthy 2011). The impacts of ongoing activities, especially land disturbance due to development, would be potentially **moderate,** primarily due to ongoing trends in land disturbance and continued climate change.

Offshore wind impacts to coastal habitats and fauna under the No Action Alternative would continue due to erosion, sea level rise, and land development, particularly residential uses, consistent with current regional trends in ongoing and planned activities, including offshore wind project impacts. Construction activities may result in loss of coastal habitat and short-term or permanent displacement and injury or mortality of individual animals, but population-level effects would not be expected. Land disturbance activities associated with development and maintenance would contribute to elevated levels of erosion and sedimentation and accidental releases of fuels or hazardous material discharges of effluent and debris would continue due to ongoing coastal construction and marine activities.

Cumulative Impacts of the No Action Alternative

Future projects would contribute to individual displacement, injury, mortality, and habitat loss or modification via noise, land disturbance, vehicle collisions, and climate change. Cable installation impacts from these projects would not be permanent, and fauna would likely return to disturbed areas following completion of construction, depending on the amount of land disturbance. Permanent loss of habitat due to construction of buildings such as converter stations would be significant if located in sensitive habitats.

Future offshore wind activities are expected to affect coastal habitat and fauna via the primary IPFs presented for the Proposed Action and have similar impacts, resulting in minor impacts to coastal habitats and fauna. More specifically, those IPFs resulting in negligible cumulative impacts include accidental release of fuels, fluids, and hazardous materials; anchoring; discharges, cable emplacement, light, and presence of structures; IPFs resulting in negligible to minor cumulative impacts include land disturbance, noise, and traffic. While air emissions would produce negligible to minor cumulative impacts, reduced overall emissions would result in long-term benefits to the environment.

However, considering the combined effects of IPFs on coastal habitats and fauna, the overall impacts associated with future offshore wind activities, combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable planned actions other than offshore wind would be **moderate** adverse. Land disturbance is expected to continue to have the greatest impact on the condition of coastal habitats and fauna in the GAA.

3.9.4 Relevant Design Parameters and Potential Variances in Impacts

This Final EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than described in the sections below. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts on coastal habitats and fauna:

- Landfall short-term disturbance (onshore) of up to 6.5 ac (0.02 km^2), including the ICW HDD Landfall Work Area, for one landfall HDD and corresponding work area, temporary anchoring walls, and drilling rig, in addition to 2.5 ac (0.01 km^2) for the beach stringing area and trenching to the ICW crossing (Table 3.3.3-2 Landfall HDD Maximum Design Scenario and Table 3.3.3-3 Maximum Disturbance Areas for SRWEC Landfall in COP, Sunrise Wind 2023).
- Temporary landing structure, connecting ramp, and stabilizing spuds used for materials and equipment transport adjacent are anticipated. The pile-supported trestle (i.e., temporary landing structure) would include direct short-term impacts of up to 1,500 ft2 (139.4 m2) of SAV and/or benthic macroalgae due to direct ground disturbance and shading. No recent SAV or benthic macroalgae habitats were mapped in these areas based on the 2020 video survey (see Table 3.4.1-1; Figure 3.4-1 of COP Appendix N1, Stantec 2022a), although historical data from 2018 and 2002 indicate presence of 0.8 ac (3,237.5 m^2) and 0.3 ac (1,214.1 m^2) of SAV in the areas east and west of ICW crossing, respectively, and a pre-construction SAV survey would be conducted prior to construction to confirm current presence of SAV. The likelihood of impacts to intertidal and subtidal vegetated habitats would be considered very low given that the proposed temporary landing structure would be positioned to avoid and minimize impacts to these sensitive habitats to the extent practicable. The temporary landing structure may need to remain in place year-round but the use would be limited to fall and spring. The temporary landing structure may be used during two construction periods since the landfall HDD, ICW HDD, and SRWEC pull-in may occur in different years.
- Onshore transmission cable, including associated transition joint bay and fiber optic cable, up to 17.5 mi (28.2 km) long, with a temporary disturbance corridor of 30 ft (9.1 m) and maximum duct bank target burial depth of 6 ft (1.8 m) (Sunrise Wind 2023).
- Carmans River crossing would include a maximum length of 2,177 ft (664 m) (COP Section 3.3.2.3, Sunrise Wind 2023) within the Carmans River SCFWH. The HDD trenchless construction methods proposed would avoid direct impacts to surface waters and wetlands and no in-water activities would occur. However, tree removal and other construction-related disturbance would occur during installation.
- An OnCS-DC with a construction disturbance footprint of up to 7 ac (2.8 ha) and an operational footprint of 6 ac (2.4 ha) (Table 3.3.1-4 Maximum Disturbance Areas for the OnCS-DC Site in the COP, Sunrise Wind 2023
- May through June are the months in which seabeach amaranth and sandplain gerardia are monitored for germination and the plants may persist through early November. Construction outside of this window would have fewer impacts than during the growing season.

Variances in these parameters would not result in impacts any greater than those for the Proposed Action, because these design parameters represent the maximum construction footprint for onshore facilities. Parameters that may change and affect the magnitude of the impact include the transmission route itself, the location of splicing vaults along the transmission route, changes in the footprint of the OnCS-DC, and the location of the HDD stringing area.

Variances in offshore design parameters would not alter the level of impact to coastal habitats and fauna because the offshore parameters would have no effect on these onshore resources.

3.9.5 Impacts of Alternative B - Proposed Action on Coastal Habitat and Fauna

The GAA for impacts to coastal habitats and fauna is limited to proposed onshore facilities, from landfall of the transmission cable at Smith Point County Park to the Union Street converter station and to the existing electrical grid at the Holbrook Substation on the Long Island mainland (see Figure D-6 in Appendix D).

Primary IPFs relevant to coastal habitats and fauna in the GAA are listed in Table G-8 of Appendix G. Areal extent of impacts to coastal habitats from onshore facilities construction and operation and maintenance are provided in Table 3.9-4.

Table 3.9-4. Acres of Significant Coastal Fish and Wildlife Habitats, New York Natural Heritage Program Natural Communities, and Critical Environmental Areas

Transmission Corridor Width*	Total Area		SCFWH Area		NYNHP Significant Natural Communities		CEA		Total Impacts to Designated Habitats		Remaining Other Land Uses	
	ac	ha	ac	ha	ac	ha	ac	ha	ac	ha	ac	ha
30 ft total	102.7	41.6	31.0	12.5	8.9	3.6	12.6	5.1	39.3	15.9	63.4	25.7

* Includes 29.57 ac (0.048 km^2) landfall/ICW work areas, 7.18 ac (0.029 km^2) Union Street converter station footprint, 6.02 ac (0.024 km^2) Holbrook substation, 0.01 ac in the Carmans River Significant Coastal Fish and Wildlife Habitats (SCFWH) and 2.07 ac (0.008 km^2) splicing vaults.

Sources: NYSDEC 2020, Suffolk County Department of Economic Development and Planning 2016, New York Natural Heritage Program Significant Natural Communities 2021, Suffolk County Department of Economic Development and Planning 2021, NYSDOS 2013.

CEA = Critical Environmental Area; SCFWH = Significant Coastal Fish and Wildlife Habitats; NYNHP = New York Natural Heritage Program; ac = acre; ha = hectare

3.9.5.1 Construction and Installation

Anchoring, cable emplacement, land disturbance, presence of structures, and traffic are the primary IPFs relevant to coastal habitats and fauna as a result of construction and installation activities.

3.9.5.1.1 Onshore Activities and Facilities

The potential impacts to coastal habitats from the construction and installation phases of the Proposed Action are summarized in the following sections for each relevant IPF. Impacts to these resources from offshore wind project in general are addressed under the No Action Alternative (Section 3.9.3).

Impacts to coastal habitats would be associated primarily with land disturbance during construction activities. The Proposed Action would disturb and/or alter habitats during construction and operations and disturbance may last the duration of construction in some places, but habitat would recover without the need for mitigation or restoration in most cases. Although local mortality may occur, population-level impacts to coastal habitats and fauna are not expected due to avoidance and minimization and the relatively small GAA being impacted. Overall impacts to coastal habitats and fauna would be expected to be negligible to minor as a result of the Proposed Action, described below for each relevant IPF.

Anchoring: Anchoring along the shoreline during transmission cable landfall activities would have short-term and negligible impacts to coastal habitats such as seagrass beds and hard-bottom habitats due to the short-term nature of these impacts and the anticipated recovery.

A temporary landing structure, connecting ramp, and stabilizing spuds used for materials and equipment transport adjacent are anticipated, as described in Section 3.9.4, above. Historical data were also presented above.

An additional SAV survey was conducted in the area of the temporary landing at Smith Point County Park by Cornell Cooperative Extension (CCE) of Suffolk County on October 12, 2022. SAV surveys were made using underwater video and a GPS-enabled Seaviewer drop camera along pre-established east-west and north-south transect lines covering the proposed temporary landing site (detailed in the 2023 EFH Assessment). No SAV-forming patches or meadows were observed during the survey. However, eelgrass (*Zostera marina*) was identified at six different locations in the northeastern area of the proposed temporary landing site. Four of the SAV observations were single eelgrass shoots emerging from a dense mat of algae and two SAV observations were multiple shoots of eelgrass (less than six shoots per site) that also emerged from an algal mat on the sediment surface. Due to the small number of shoots observed at both locations, these plants are not part of a larger eelgrass patch at the site, but rather they likely arose from seed that had been deposited by drifting eelgrass flower shoots. Results from the video transects indicate no significant populations of eelgrass in the proposed temporary landing site at Smith Point County Park. Most (four of six observations) of the observed eelgrass occurred as single, unrooted shoots that were likely the result of drifting/rafted eelgrass flower shoots.

The likelihood of impacts to intertidal and subtidal vegetated habitats would be considered very low given that the proposed temporary landing structure would be positioned to avoid and minimize impacts to these sensitive habitats to the extent practicable. The temporary landing structure may need to remain in place year round but the use would be limited to fall and spring. The temporary landing structure may be used during two construction periods since the landfall HDD, ICW HDD, and SRWEC pull-in may occur in different years.

Overall, impacts to coastal habitats due to anchoring associated with the temporary landing structure are expected to be short-term and negligible. Cumulative impacts to coastal habitat and fauna from anchoring would be negligible because short term impacts by nature are not cumulative.

Cable emplacement: Land disturbance from cable emplacement, trenching, HDD, traffic, structures, and other activities would be localized and short-term and no greater that that described for land disturbance and other activities required for the installation. Cables buried deeply enough that the surface protection would not be needed would have no impact on coastal habitats. The total length of the transmission cable corridor for the onshore facilities is approximately 89,959 ft (27,420 m) and less than 1 percent (385 ft; 117 m) of the corridor is outside of existing ROWs or utility clearances. The HDD stringing area would require an additional estimated 3,316 ft (1,010.7 m) of beach outside of existing ROWs and developed areas and activities in this area would disturb vegetation and fauna for the duration of Project construction. HDD, use of previously developed rights-of-way (ROW), and re-rerouting of transmission lines would minimize impacts to natural resources that may occur due to open cut trenching to the maximum extent practicable. The selection of open trench or HDD is a result of geotechnical, engineering, and space requirements, as well as the environmental benefits of one method over the other. Neither HDD nor open cut trenching is feasible or appropriate in all situations. As described above, less than 1 percent (385 ft; 117 m) of the corridor is outside of existing ROWs or utility clearances and open trenching and burial of transmission cable would result in little to no impacts to resources in these areas. Trenchless cable crossings (i.e., HDD and jack-piping) would be used to avoid sensitive environmental areas such as the ICW, Carmans River, Central Pine Barrens Core Preservation Area, and/or other obstructions (e.g., LIRR) (Table 3.3.2-5 of the *Onshore Transmission Cable and Onshore Interconnection Cable Crossing* of the COP [Sunrise Wind 2023]). Where the onshore transmission cable is proposed to cross through the Central Pine Barrens Compatible Growth Area proximate to Victory Avenue, the cable would be trenched within the developed highway ROW.

HDD is used to install cables beneath environmentally sensitive areas, such as shoreline habitats and wetlands, where surface disturbance must be minimized beyond what can be done with other methods. Limitations to using HDD include primarily the risk of inadvertent returns of drilling fluids, and also extended installation duration and a large footprint for stringing and installation. In-water HDD would require multiple seasons to complete because of the time required to install cables via HDD (compared to short-term trenching), resulting in longer term impacts compared to short-term impacts of trenching. HDD stringing along the beach at landfall requires additional space and time and therefore has time of year restrictions to avoid impacts to birds, for example. HDD requires a large footprint of already or previously developed area sufficient for the HDD layout during construction and requires use of much more land on either side of a crossing for a significantly longer duration, resulting in substantial noise and visual impacts and impacts to resources over multiple seasons, and has limitations to the distance over which cable can be pulled. For example, the HDD exit pit, located offshore beyond the Fire Island National Seashore boundary, would disturb up to 61.8 ac (25 ha) of soft-bottom benthic habitat (Sunrise Wind 2023), to be reclaimed after cable installation.

Cable emplacement relevant to coastal habitat and fauna impacts, siting and space requirements for onshore connections to telecommunications networks or from offshore wind energy structures to the power distribution grid represent the most significant potential impact on coastal habitat that requires consideration in offshore wind energy development (BOEM 2019). Cumulative impacts are anticipated to be negligible to minor, consistent with BOEM's *NEPA Documentation for impact-producing Factors in the Offshore Wind Cumulative Impacts Scenario on the North Atlantic Outer Continental Shelf* (BOEM 2019) and with consideration for localized information not included in the earlier document, e.g., location of Carmans River, Fire Island, and other sensitive habitats in the Project Area.

Land disturbance: Land disturbance is expected to account for the greatest amount of impact to coastal habitats and fauna when compared to other IPFs. Land disturbance would result from construction and installation of transmission cables and associated infrastructure and an OnCS-DC construction. Habitats disturbed during trenching and cable installation would be reseeded with native vegetation where practicable. A summary of the areal extent of land disturbances associated with onshore facilities construction and O&M to significant and critical natural communities are described in Table 4.4.1-5 and mapped in Figure 4.4.1-5 of the COP (Sunrise Wind 2023). Primary IPFs relevant to coastal habitats and fauna in the GAA are listed in Table G-8 of Appendix G. Areal extent of impacts to coastal habitats from onshore facilities construction and operation and maintenance are provided in Table 3.9-4.

The proposed transmission cable corridor and onshore facilities construction footprint includes approximately 102.7 ac (0.4 km^2) along and associated with the 30 ft (9.1 m) disturbance area, inclusive of the 30 ft (9.1 m) disturbance corridor, landfall/ICW work areas, HDD stringing area, and splicing vaults. Significant and critical natural communities intercepted include SCFWH and NYNHP Significant Natural Communities; Central Pine Barrens and Carmans River are entirely within the CEA; all other areas overlap substantially. These areas make up 38.3 percent (39.3 ac; 0.16 km^2) of the onshore facilities footprint associated with the 30 ft (9.1 m) disturbance corridor but are located almost exclusively along existing transportation corridors and associated ROWs and utilities clearances. The remaining area (62 percent of the footprint) is primarily recreation and open space and utilities (see Section 3.18, *Land Use and Coastal Infrastructure,* for greater detail on these land uses).

The landfall/ICW work areas are mapped in Figure 3.3.3-3 of the COP (Sunrise Wind 2023). Landfall activities would include HDD stringing on the beach and the use of a drill rig and sheetpiles in the Landfall Work Areas to anchor the onshore drill rig drilling activities (Figure 3.3.3-4 of the COP and detailed in the Project's EM&CP). Where the offshore export cable is proposed to make landfall (i.e., above the MHWL) to be joined with the onshore transmission cable at the transition joint bays, the proposed cable route would intercept maritime beach, a rare and significant coastal community. Impacts to habitats proximate to the landfall/ICW work areas would be avoided by using HDD technology to bury the cable beneath the beach and dune habitats and under the ICW in Great South Bay at Smith Point. Post construction, all work areas would be graded and/or backfilled and returned to pre-construction conditions. Because HDD conduit stringing on the beach would result in the loss of any vegetation it intercepts, there is potential for disturbance of seabeach amaranth if it is present.

Along most of the transmission route, localized adverse impacts to habitats would occur due to trenching, vegetation removal, soil compaction, surface water runoff or pooling, and potential inadvertent burial of vegetation and fauna during construction in ROW and locations where the transmission cable installation changes between trenching and HDD. However, less than 1 percent of the onshore route would be outside existing ROWs, as described in Section 3.9.5.1.1. With few exceptions, trenching and burial of transmission cable would be limited to previously disturbed areas, such as transportation ROWs. Trenchless cable crossings (i.e., HDD and jack-piping) would be used to avoid sensitive environmental areas such as the ICW, Carmans River, Central Pine Barrens Core Preservation

Area, and/or other obstructions (e.g., LIRR), as described in COP Table 3.3.2-5 (Sunrise Wind 2023). No in-water activities would occur at the Carmans River crossing. For installations outside of roadways, such as greenbelt areas, final restoration would typically involve backfilling to the original grade elevation and hydroseeding to prevent soil erosion. Where the onshore transmission cable is proposed to cross through the Central Pine Barrens Compatible Growth Area proximate to Victory Avenue, the cable would be trenched within the developed highway ROW.

The Union Avenue OnCS-DC location is a developed industrial/commercial land use site with linear forest features along the parcel boundaries and would be cleared for construction. Negligible impacts to coastal habitats are anticipated from areas disturbed by the OnCS-DC. Construction of the transmission cable and interconnection facility would provide opportunities for the introduction and establishment of invasive species that would subsequently pose a risk to native vegetation and fauna. In ROW areas, impacts would be short-term and negligible given the areas are already disturbed. In undisturbed habitats, the potential risk is much higher. An Invasive Species Management Plan would be implemented to avoid and manage the introduction and spread of invasive plant species that would likely have negative impacts on native plants and coastal habitat.

Time-of-year restrictions for certain work activities (e.g., HDD conduit stringing and tree removal) would be employed to the extent practicable to avoid or minimize direct impacts to coastal habitat and RTE species, including seabeach amaranth, during construction of the landfall and onshore facilities. Work that would occur outside of these time-of-year restriction periods would be first coordinated with state and federal agencies to develop construction monitoring and impact minimization plans or mitigation plans, as appropriate. Impacts to sea turtles and shore birds are presented in Sections 3.8 and 3.9, respectively.

Construction activities may contribute to erosion and sedimentation during construction. Where appropriate, short-term erosion controls would be installed and maintained until the work areas are restored and stabilized. An OSRP, SWPPP, and SPCC Plan would be implemented to avoid and minimize impacts to sensitive environmental resources. Disturbed habitats are expected to return to their previous condition following construction completion without further restoration. Displaced mobile wildlife would repopulate former habitats once construction is complete and the habitat would recover to pre-construction conditions. Since construction would predominately occur in already developed areas where wildlife is habituated to human activity regardless of the cable route chosen, impacts of land disturbance would be short-term and negligible to minor because very little of the construction along the cable transmission corridor would occur in undisturbed areas and complete recovery is anticipated following Project completion. Cumulative impacts to coastal habitats and fauna from land disturbance would range from negligible to minor due primarily to the localized and short-term nature of these impacts.

Presence of structures: Presence of structures relevant to coastal habitats and fauna include onshore transmission cables and associated facilities along the proposed transmission route; the presence of these structures is expected to convert existing habitats to hard-top and/or impervious surfaces for cable protection and facilities such as the converter station (cable installation is addressed above), albeit relatively small areas of land. The OnCS-DC would be constructed in a compatible area of industrial or commercial land use and would therefore have negligible impacts on coastal habitats and fauna. Similarly, cumulative impacts to coastal habitats and fauna from these structures would be negligible.

Traffic: Traffic from onshore vehicles may impact coastal habitats and fauna via physical disturbance of habitats and/or collisions. Onshore vehicle traffic detours during construction of onshore facilities may increase the number of vehicles along more sensitive alternative routes. Increases in already common pedestrian and vehicle disturbance at Smith Point County Park would result in further disturbance of maritime dune and grassland habitats and could impact the federally threatened seabeach amaranth. Traffic delays may cause travelers to detour through sensitive areas such as the Wertheim NWR where coastal habitats and vegetation would be disturbed by increased traffic noise, debris from road and vehicles, and potential collisions with wildlife or off-road detours that damage vegetation may occur but would be rare for wildlife due to avoidance of construction noise and activity. Species with limited mobility, especially herpetofauna, would be more vulnerable to this impact, resulting in minor, short-term, adverse impacts to some species. Additional impacts from noise and dust would be short-term and negligible to minor. Consequently, cumulative impacts to coastal habitats and fauna would be negligible to minor.

3.9.5.1.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna from the Proposed Action would be limited to onshore activities and facilities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.9.5.2 Operations and Maintenance

3.9.5.2.1 Onshore Activities and Facilities

O&M would be limited to regular and intermittent maintenance to onshore transmission cables and the OnCS-DC. Regular O&M activities would not result in additional or further adverse impacts to coastal habitat or fauna habitat. However, when cable inspection or repairs require excavation, resulting in land disturbance, negligible, short-term, and localized adverse impacts to coastal habitats and fauna would be expected. Light resulting from structures and vessels would lead to negligible impacts, if any, on coastal habitats and fauna because of the distance from the coastal habitats and fauna to the offshore facilities. Impacts to coastal habitats and fauna from conceptual decommissioning would be no greater than for construction impacts. The total estimated footprint of onshore facilities is an estimated 102.7 ac (0.42 km^2) for the 30 ft wide (9.14 m) construction footprint, inclusive of the 60 ft (18.3-m) cable transmission, cable corridor, work areas, HDD stringing area, and splicing vaults. Significant and critical natural communities (i.e., SCFWH, significant natural communities, CEAs, and Central Pine Barrens) account for 38 percent (39.3 ac; 0.16 km^2) of the total construction area associated with the 30 ft (18.3-m) disturbance corridor. The remaining area (62 percent of the footprint) is primarily recreation and open space and utilities (see Section 3.18, *Land Use and Coastal Infrastructure,* for greater detail on these land uses).

Overall, the Proposed Action would result in negligible to minor impacts to coastal habitat loss and negligible to minor impacts on coastal fauna due to individual mortality and short-term displacement. No population impacts to coastal fauna would be expected from operation and maintenance activities.

O&M that includes an Invasive Species Management Plan or monitoring would be a benefit to coastal habitats and fauna and provide needed data with respect to potential impacts of onshore transmission cables to coastal habitats and fauna.

3.9.5.2.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna from the Proposed Action would be limited to onshore activities and facilities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.9.5.3 Conceptual Decommissioning

3.9.5.3.1 Onshore Activities and Facilities

Impacts to coastal habitats and fauna from conceptual decommissioning would be similar to construction impacts described for the Proposed Action. Overall, the conceptual decommissioning would have negligible to minor amounts of coastal habitat loss and negligible to minor impacts on fauna due to mortality and short-term displacement.

3.9.5.3.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna from the Proposed Action would be limited to onshore activities and facilities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.9.5.4 Cumulative Impacts of the Proposed Action

The cumulative impacts analysis of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned wind activities. Ongoing and planned non-offshore wind activities related to onshore cable installation, converter station construction, O&M along cable corridors, and decommissioning of the Project, would contribute to impacts on coastal habitats and fauna through the primary IPFs of anchoring, land disturbance, cable installation and maintenance, presence of structures, and traffic.

Cumulative impacts of offshore wind components are not expected to have more than negligible to minor impacts on coastal habitats and fauna. Onshore components have the potential to result in disturbance and short-term or permanent loss of onshore habitat and individual fauna if onshore substations are constructed in sensitive areas. Onshore cable installation and maintenance would result in short-term loss of habitat and displacement of fauna. These short-term disturbances for construction and cable installation would not be expected to have population-level impacts within the GAA.

3.9.5.5 Impacts of Alternative B on ESA-Listed Species

Two federally listed plant species (endangered sandplain gerardia and threatened seabeach amaranth) would be potentially impacted by construction of Proposed Action. The proposed landfall/ICW work area on Fire Island north of the parking area includes maritime shrubland habitat and maritime grassland species associated with the federally endangered sandplain gerardia. Maritime beach community is habitat to federally threatened seabeach amaranth and is in the vicinity of the landfall/ICW work area. However, the maritime beach community is used extensively for recreation and impacts from pedestrian and vehicle traffic substantially limit the likelihood of seabeach amaranth occurrences. Notably, the federally threatened seabeach amaranth is considered more vulnerable to non-climate stressors such as coastal development and invasive species rather than climate change (Ricci et al. 2020).

Any potential habitat impacts to seabeach amaranth are the same as those addressed for the piping plover (see Section 3.8.1.1). Coordination with USFWS during the permitting phase of the Project would occur to determine potential effects of the Project on these species. If needed, mitigation actions would be developed for monitoring and protecting the species. To minimize the risk of Project activities incidentally damaging or killing plants, conservation measures for any Project activities proposed for any beach or dune during the growing season of May 15 through November 30 would be implemented. Conclusions presented in this section include consideration of the Project's mitigation and monitoring measures, including those for seabeach amaranth (Appendix H).

No federally listed animals are reported as occurring in in the GAA for coastal habitats and fauna that are not addressed in Section 3.6 *Bats* or 3.8 *Birds*. Activities at the Landfall Work Area proximate to the sand beach habitat on Fire Island would be confined to existing developed areas to avoid and minimize potential impacts to the rare hairy-necked tiger beetle. If conducted on the beach, HDD cable duct stringing, however, may result in the short-term disturbance to any vegetation in the area for approximately 2 to 3 weeks per cable between October and March. Seabeach amaranth may occur on the sandy beach and its presence has been documented approximately 1 mile away. Activities affecting seabeach amaranth are the same as those described for plovers under 3.8 *Birds* and protections would be similar. If construction were to occur outside time-of-year restrictions for certain activities (e.g., HDD conduit stringing and tree removal), then coordination with state and federal agencies to develop construction monitoring and impact minimization plans or mitigation plans would be undertaken, as appropriate. There is no designated critical habitat designated within the footprint of the Proposed Action. With respect to impacts to ESA-listed species, results of consultation with USFWS pursuant to Section 7 of the ESA can be found in the USFWS Biological Opinion, recommended mitigations from this consultation can be found in Appendix H. Impacts to state-listed species from construction of the Project would be similar to those discussed for other habitats and fauna. There are no federally designated critical habitats in the GAA. Consequently, no impacts to federally listed species or critical habitat would be expected.

3.9.5.6 Conclusions

Impacts of the Proposed Action Alternative

Areas most sensitive to potential impacts of the Proposed Action are associated with the landfall/ICW work area on Fire Island and the mainland, and the Carmans River crossing, and include significant and critical natural areas that would be disturbed during Project construction. The landfall/ICW work areas at Smith Point County Park and Smith Point Marina include paved parking lot and open land used for recreational activities, but HDD stringing activities may occur on the beach, disturbing any vegetation or fauna present, and may affect, but are not likely to adversely affect, the seabeach amaranth. The use of HDD for installation would minimize impacts to onshore habitats and protect wildlife in those habitats. For installations outside of roadways, such as greenbelt areas, final restoration typically involves backfilling to the original grade elevation and hydroseeding to prevent soil erosion. Two federally listed plant species (no federally listed non-avian or non-bat animal species) reportedly occur in or proximate to the work areas. Neither plant was found during site surveys of the area, but appropriate habitat is present proximate to the work area. Coordination with the USFWS regarding protections for these species would be implemented.

The Proposed Action would a result of the loss of individuals and disturbance to habitats for the duration of Project construction but no population-level impacts to fauna and no permanent loss of habitat is expected. The Proposed Action combined with ongoing activities, particularly land development and climate change, result in **moderate** adverse impacts.

Cumulative Impacts of the Proposed Action Alternative

In context of other reasonably foreseeable environmental trends in the area, the contribution of the Proposed Action to the impacts of individual IPFs resulting from ongoing and planned activities would be moderate. Considering all the IPFs together, the contribution of the Proposed Action to the impacts from ongoing and planned activities would result in moderate impacts to wildlife in the GAA. Ongoing and planned activities contributing to impacts on wildlife in the GAA include climate change and habitat impacts.

Considering the combined effects of IPFs on coastal habitats and fauna, the overall cumulative impacts associated with the Proposed Action in combination with future offshore wind activities, ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable planned actions other than offshore wind would be **moderate** adverse. Land disturbance is expected to continue to have the greatest impact on the condition of coastal habitats and fauna in the GAA.

3.9.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

3.9.6.1 Construction and Installation

3.9.6.1.1 Onshore Activities and Facilities

None of the components included under Alternative C-1 would alter the construction of the proposed onshore facilities as compared to the Proposed Action. Therefore, impacts to coastal habitats and fauna from the reconfigured layout under Alternative C would be the same as those described for the Proposed Action.

3.9.6.1.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna under Alternative C-1 would be limited to onshore activities and facilities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.9.6.2 Operations and Maintenance

3.9.6.2.1 Onshore Activities and Facilities

None of the components under Alternative C-1 would alter the O&M of the proposed onshore facilities described for the Proposed Action. Therefore, impacts to coastal habitats and fauna from the reconfigured layout under Alternative C-1 would be the same as those described for the Proposed Action.

3.9.6.2.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna under Alternative C-1 would be limited to onshore O&M activities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.9.6.3 Conceptual Decommissioning

3.9.6.3.1 Onshore Activities and Facilities

None of the components included under Alternative C would alter the decommissioning processes for the proposed onshore activities described for the Proposed Action. Therefore, impacts to coastal habitats and fauna from the reconfigured layout under Alternative C-1 would be the same as those described for the Proposed Action.

3.9.6.3.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna under Alternative C-1 would be limited to onshore O&M activities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.9.6.4 Cumulative Impacts of Alternative C-1

Cumulative impacts to coastal habitats and fauna under Alternative C-1 would be the same as those described for the Proposed Action Alternative.

3.9.6.5 Impacts of Alternative C-1 on ESA-Listed Species

None of the components under Alternative C-1 would alter the proposed onshore facilities described for the Proposed Action. Therefore, impacts to ESA-listed species from the reconfigured layout under Alternative C-1 would be the same as those described for the Proposed Action.

3.9.6.6 Conclusions

Impacts of Alternative C-1

None of the components under Alternative C-1 would alter the proposed onshore activities and facilities, O&M, or conceptual decommissioning described for the Proposed Action. Therefore, impacts to coastal habitats and fauna, including ESA-listed species, from the reconfigured layout under Alternative C-1 would be the same as those described for the Proposed Action, **moderate** adverse.

Cumulative Impacts of Alternative C-1

Cumulative impacts to coastal habitats and fauna under Alternative C-1 would be the same as those described for the cumulative Proposed Action impacts, **moderate** adverse

3.9.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of up to 12 WTG Positions to the Eastern Side of the Lease Area

None of the components included under Alternative C-2 would alter the construction of the proposed onshore facilities as compared to the Proposed Action. Therefore, impacts to coastal habitats and fauna from the reconfigured layout under Alternative C-2 would be the same as those described for the Proposed Action.

3.9.7.1 Construction and Installation

3.9.7.1.1 Onshore Activities and Facilities

None of the components under Alternative C-2 would alter the O&M of the proposed onshore facilities described for the Proposed Action. Therefore, impacts to coastal habitats and fauna from the reconfigured layout under Alternative C-2 would be the same as those described for the Proposed Action.

3.9.7.1.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna under Alternative C-2 would be limited to onshore activities and facilities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.9.7.2 Operations and Maintenance

3.9.7.2.1 Onshore Activities and Facilities

None of the components under Alternative C-2 would alter the O&M of the proposed onshore facilities described for the Proposed Action. Therefore, impacts to coastal habitats and fauna from the reconfigured layout under Alternative C-2 would be the same as those described for the Proposed Action.

3.9.7.2.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna under Alternative C-2 would be limited to onshore O&M activities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.9.7.3 Conceptual Decommissioning

3.9.7.3.1 Onshore Activities and Facilities

None of the components included under Alternative C would alter the decommissioning processes for the proposed onshore activities described for the Proposed Action. Therefore, impacts to coastal habitats and fauna from the reconfigured layout under Alternative C-2 would be the same as those described for the Proposed Action.

3.9.7.3.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna under Alternative C-2 would be limited to onshore O&M activities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.9.7.4 Cumulative Impacts of Alternative C-2

Cumulative impacts to coastal habitats and fauna under Alternative C-1 would be the same as those described for the No Action Alternative.

3.9.7.5 Impacts of Alternative C-2 on ESA-Listed Species

None of the components under Alternative C-2 would alter the proposed onshore facilities described for the Proposed Action. Therefore, impacts to ESA-listed species from the reconfigured layout under Alternative C-2 would be the same as those described for the Proposed Action.

3.9.7.6 Conclusions

Impacts of Alternative C-2

None of the components under Alternative C-2 would alter the proposed onshore activities and facilities, O&M, or conceptual decommissioning described for the Proposed Action. Therefore, impacts to coastal habitats and fauna, including ESA-listed species, from the reconfigured layout under Alternative C-2 would be the same as those described for the Proposed Action, **moderate** adverse

Cumulative Impacts of Alternative C-2

Cumulative impacts to coastal habitats and fauna under Alternative C-2 would be the same as those described for the cumulative Proposed Action, moderate adverse

3.9.8 Alternative C-3 - Reduced Layout from Priority Areas Considering Feasibility due to Glauconite Sands

Under the Fisheries Habitat Impact Minimization Alternative C-3, the construction, O&M, and eventual decommissioning of the 11-MW WTGs and an OCS within the proposed Project Area and associated inter-array and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. However, Alternative C-3 was developed to address concerns regarding pile refusal due to glauconite sands in the southeastern portion of the Lease Area while still minimizing impacts to benthic and fisheries resources. Alternative C-3a, C-3b, and C-3c described in Section 3.7.8, *Benthic Resources*, consider different WTG configurations to avoid sensitive habitats and engineering constraints while still meeting the NYSERDA OREC. This alternative only considered removal of WTGs from Priority Area 1 based on consultation with NMFS. Areas with high density of boulder, complex habitat, and data suggesting Atlantic cod aggregation and spawning was considered when determining which WTGs to remove.

None of the components included under Alternative C-3 would alter the construction of the proposed onshore facilities as compared to the Proposed Action. Therefore, impacts to coastal habitats and fauna from the reconfigured layout under Alternative C-3 would be the same as those described for the Proposed Action.

3.9.8.1 Construction and Installation

3.9.8.1.1 Onshore Activities and Facilities

None of the components under Alternative C-3 would alter the construction and installation of the proposed onshore facilities described for the Proposed Action. Therefore, impacts to coastal habitats and fauna from the reconfigured layout under Alternative C-3 would be the same as those described for the Proposed Action.

3.9.8.1.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna under Alternative C-3 would be limited to onshore activities and facilities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.9.8.2 Operations and Maintenance

3.9.8.2.1 Onshore Activities and Facilities

None of the components under Alternative C-3 would alter the O&M of the proposed onshore facilities described for the Proposed Action. Therefore, impacts to coastal habitats and fauna from the reconfigured layout under Alternative C-3 would be the same as those described for the Proposed Action.

3.9.8.2.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna under Alternative C-3 would be limited to onshore O&M activities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.9.8.3 Conceptual Decommissioning

3.9.8.3.1 Onshore Activities and Facilities

None of the components included under Alternative C-3 would alter the decommissioning processes for the proposed onshore activities described for the Proposed Action. Therefore, impacts to coastal habitats and fauna from the reconfigured layout under Alternative C-3 would be the same as those described for the Proposed Action.

3.9.8.3.2 Offshore Activities and Facilities

Potential impacts to coastal habitats and fauna under Alternative C-3 would be limited to onshore O&M activities. Therefore, impacts from offshore activities and facilities are not presented for this alternative.

3.9.8.4 Cumulative Impacts of Alternative C-3

Cumulative impacts to coastal habitats and fauna under Alternative C-3 would be the same as those described for the No Action Alternative.

3.9.8.5 Impacts of Alternative C-3 on ESA-Listed Species

None of the components under Alternative C-3 would alter the proposed onshore facilities described for the Proposed Action. Therefore, impacts to ESA-listed species from the reconfigured layout under Alternative C-3 would be the same as those described for the Proposed Action.

3.9.8.6 Conclusions

Impacts of Alternative C-3

None of the components under Alternative C-3 would alter the proposed onshore activities and facilities, O&M, or conceptual decommissioning described for the Proposed Action. Therefore, impacts to coastal habitats and fauna, including ESA-listed species, from the reconfigured layout under Alternative C-3 would be the same as those described for the Proposed Action, **moderate** adverse.

Cumulative Impacts of Alternative C-3

Cumulative impacts to coastal habitats and fauna under Alternative C-3 would be the same as those described for the cumulative Proposed Action, **moderate** adverse.

3.9.9 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, C-2, and C-3 would have the same overall negligible to minor adverse impacts and minor beneficial impacts on coastal habitats and fauna. Table 3.9-5 provides an overall summary of alternative impacts.

Table 3.9-5. Comparison of Alternatives Impacts on Coastal Habitat and Fauna

No Action Alternative (Alternative A)	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)	Fisheries Habitat Minimization Considering Feasibility Due to Glauconite Sands (Alternative C-3)
No Action Alternative: The impacts of ongoing activities, especially land disturbance due to development, would be potentially moderate. The combined impacts of ongoing activities and planned actions other than offshore wind are expected to result in **moderate** adverse impacts on coastal habitats. *Cumulative Impacts of the No Action Alternative:* Considering the combined effects of IPFs on coastal habitats and fauna, the overall impacts associated with future offshore wind activities, combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable planned	*Proposed Action:* Overall adverse impacts to coastal habitats and fauna from the Proposed Action would be **moderate** as a result of the loss of individuals and disturbance to habitats for the duration of Project construction but no population-level impacts to fauna and no permanent loss of habitat is expected. *Cumulative Impacts of the Proposed Action:* The overall impacts associated with the Proposed Action in combination with future offshore wind activities, ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable planned actions other than offshore wind would	*Alternative C-1:* None of the components under Alternative C-1 would alter the proposed onshore activities and facilities, O&M, or conceptual decommissioning described for the Proposed Action. Therefore, adverse impacts to coastal habitats and fauna, including ESA-listed species, from the reconfigured layout under Alternative C-1 would be the same as those described for the Proposed Action, **moderate**. *Cumulative Impacts of Alternative C-1:* Cumulative impacts to coastal habitats and fauna under Alternative C-1 would be the same as those described for the cumulative Proposed Action impacts, **moderate** adverse impacts.	*Alternative C-2:* None of the components under Alternative C-2 would alter the proposed onshore activities and facilities, O&M, or conceptual decommissioning described for the Proposed Action. Therefore, adverse impacts to coastal habitats and fauna, including ESA-listed species, from the reconfigured layout under Alternative C-1 would be the same as those described for the Proposed Action, **moderate**. *Cumulative Impacts of Alternative C-2:* Cumulative impacts to coastal habitats and fauna under Alternative C-2 would be the same as those described for the cumulative Proposed Action impacts, **moderate** adverse impacts.	*Alternative C-3:* None of the components under Alternative C-3 would alter the proposed onshore activities and facilities, O&M, or conceptual decommissioning described for the Proposed Action. Therefore, adverse impacts to coastal habitats and fauna, including ESA-listed species, from the reconfigured layout under Alternative C-3 would be the same as those described for the Proposed Action, **moderate**. *Cumulative Impacts of Alternative C-3:* Cumulative impacts to coastal habitats and fauna under Alternative C-3 would be the same as those described for the cumulative Proposed Action impacts, **moderate** adverse impacts.

No Action Alternative (Alternative A)	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)	Fisheries Habitat Minimization Considering Feasibility Due to Glauconite Sands (Alternative C-3)
actions other than offshore wind would be **moderate** adverse cumulative impacts.	be **moderate** adverse cumulative impacts. Land disturbance is expected to continue to have the greatest impact on the condition of coastal habitats and fauna in the geographic area of analysis.			

3.9.10 Summary of Impacts of the Preferred Alternative

BOEM has identified Alternative C-3b as the Preferred Alternative as depicted in Figure 2.1-10. Alternative C-3b would include installation of up to 84 WTGs, which is 10 fewer WTGs than the maximum WTGs proposed under the PDE of the Proposed Action. As a result, BOEM anticipates Alternative C-3b would have negligible to minor impacts on coastal habitats and fauna within the GAA. Overall impacts to coastal habitats and fauna from the Proposed Action would be **moderate** as a result of the loss of individuals and disturbance to habitats for the duration of Project construction but subsequent recovery from most impacts. No population-level impacts to fauna and no permanent loss of habitat are expected.

3.9.11 Proposed Mitigation Measures

No additional measures to mitigate impacts on coastal habitat and fauna have been proposed for analysis.

3.9.11.1 Effect of Measures Incorporated into the Preferred Alternative

Since no mitigation measures have been proposed, impacts levels for the Preferred Alternative would remain as described above in Section 3.9.8.

3.12 Sea Turtles

This section discusses potential impacts on sea turtles from the proposed Project, alternatives, and future offshore wind activities in the GAA (Appendix D, Figure D-9). The sea turtle GAA as described in Appendix D, includes the Scotian Shelf, Northeast Shelf, and Southeast Shelf large marine ecosystems.

3.12.1 Description of the Affected Environment and Future Baseline Conditions

Of the five sea turtle species with occurrence records off the northeastern coast of the United States (DoN 2005), four species are expected to occur in the proposed Project Area (Table 3.12-1). These species may occur near the onshore facilities (SRWEC landfall location at Smith Point on Long Island, New York) and the in-water areas which range from state waters (SRWEC-NYS from the shoreline to a maximum depth of 29 m) to federal waters (SRWEC-OCS with maximum depth of 68 m and SRWF which ranges from 35 to 62 m in depth) (COP, Appendix G1; Sunrise Wind 2022). Population estimates for sea turtles are difficult as they are wide-ranging and long-lived, and necessary survey methods vary depending on the species (NMFS and USFWS 2015). Expected occurrence in these areas is summarized in Table 3.12-1 and is based on known habitat associations, confirmed sightings and strandings, and the potential for occurrence based on these factors regardless of how frequent that occurrence may be. Ongoing threats to these species in this region include, but are not limited to, entanglement in fishing gear, fisheries bycatch, marine debris ingestion or entanglement, vessel strike, nesting beach impacts, climate change, noise pollution, marine and coastal construction activities, vessel traffic, seismic surveys, sonar and other military activities, beach cleaning, beach nourishment, shoreline armoring, recreational beach equipment, beach driving, artificial lighting, and nest relocation (Hamann et al. 2010; Lutcavage et al. 1997; NMFS et al. 2011a, 2011b; NMFS and USFWS 2008, 2013a, 2013b; Osgood 2008; TEWG 2007; Witherington and Martin 2003).

Brief descriptions of the regional and proposed Project Area occurrence of the sea turtle species expected to occur in the proposed Project Area are provided below. These species are all protected species under the ESA and include the green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta caretta*), and Kemp's ridley sea turtle (*Lepidochelys kempii*). There is no critical habitat in or near the proposed Project Area. Although occasional occurrences are possible, hawksbill sea turtles (*Eretmochelys imbricata*), which are also protected under the ESA, are not expected to occur in the proposed Project Area and are not considered further in this Final EIS. This species primarily occurs in warmer southern waters associated with coral reef habitats (NMFS and USFWS 1993; Diez et al. 2003) and is exceedingly rare north of Florida (GARFO 2021b; Keinath et al. 1991; Lee and Palmer 1981; Parker 1995; Plotkin 1995; USFWS 2001). Kenney and Vigness-Raposa's (2010) assessment of sea turtles present in southern New England, the hawksbill turtle is considered a hypothetical species in this region based on the relatively few stranding records in Massachusetts and New York (Lazell 1980; Morreale et al. 1992; Prescott 2000; Zarriello and Steadman 1987). In addition, no hawksbill turtles have been sighted off the northeastern United States during recent AMAPPS surveys (e.g., NEFSC and SEFSC 2018, 2020, 2021), Rhode Island/Massachusetts WEA surveys (Kraus et al. 2016; O'Brien et al. 2021a; Quintana et al. 2019; Stone et al. 2017), or Project-specific geophysical surveys (Gardline 2021a, 2021b; Smultea Sciences 2020a, 2020b).

Leatherback sea turtle: The leatherback sea turtle is the most globally distributed sea turtle species, ranging broadly from tropical and subtropical to temperate regions of the world's oceans (NMFS and USFWS 1992). Leatherbacks are a pelagic species but are commonly observed in coastal waters along the United States continental shelf (NMFS and USFWS 1992). In the northeastern United States, leatherbacks have a regular, seasonal occurrence. In the late winter and early spring, leatherbacks are distributed primarily in tropical latitudes (Stewart and Johnson 2006); survey data confirm that around this time of year, individuals begin to move north along the North American Atlantic coast. By February and March, the majority of leatherbacks found in Atlantic WOTUS are distributed off northeastern Florida. This movement continues through April and May when leatherbacks begin to occur in large numbers off the coasts of Georgia and North and South Carolina (NMFS 1995, 2000). Leatherbacks become more numerous off the Mid-Atlantic and southern New England coasts in late spring and early summer, and by late summer and early fall, they may be found in the waters off eastern Canada (CETAP 1982; Dodge et al. 2014; Shoop and Kenney 1992; Thompson et al. 2001).

Table 3.12-1. Sea Turtles Expected to Occur in the Proposed Project Area

Species[1]	DPS	ESA Status[2]	Regional Nester Abundance[3]	SRWF Density[4]				Strandings[5]	Expected to Occur in SRWF	Expected to Occur in SRWEC-OCS	Expected to Occur in SRWEC-NYS	Expected to Occur in Onshore Facilities[6]
				Winter	Spring	Summer	Fall					
Leatherback sea turtle (*Dermochelys coriacea*)	Northwest Atlantic	E	20,659 (Northwest Atlantic) (NMFS and USFWS 2020)	0.0034	0.0039	0.2986	0.4431	231	Yes	Yes	Yes	No
Loggerhead sea turtle (*Caretta caretta*)	Northwest Atlantic	T	38,334 (Northwest Atlantic) (Richards et al. 2011)	0.0015	0.0015	0.0147	0.0171	250	Yes	Yes	Yes	Yes
Kemp's ridley sea turtle (*Lepidochelys kempii*)	N/A	E	4,395 (Gulf of Mexico) (NMFS and USFWS 2015)	0.0000	0.0000	0.0053	0.0034	174	Yes	Yes	Yes	Yes
Green sea turtle (*Chelonia mydas*)	North Atlantic	T	167,424 (North Atlantic DPS) (NMFS and USFWS 2016)	0.0000	0.0000	0.0461	0.0264	72	Yes	Yes	Yes	Yes

Source: See references cited within the table and in the notes below.

Notes: DPS = distinct population segment

[1] Taxonomy follows Pritchard (1997).

[2] ESA status: E = endangered, T = threatened

[3] Abundance estimates of nesting females are provided and use best available data.

[4] The seasonal density estimates provided in this table are corrected for perception and availability bias and were derived from the models developed by the U.S. Naval Undersea Warfare Center (NUWC). These models were released in July 2023 (NUWC/EC 2023; Sparks and DiMatteo 2023). Seasons are defined as follows: spring (March through May), summer (June through August), fall (September through November), and winter (December through February). The estimates include OCS Lease Area 0487 with a 10-km (6.2 mi) buffer.

[5] A stranding is defined as "a sea turtle that is either found dead or is alive but is unable to go about its normal behavior due to any injury, illness, or other problem" and is "found washed ashore or floating in the water". Data reflects reports from 2017 to 2021 from New York to Massachusetts (NMFS STSSN 2022).

[6] Occurrence in onshore facilities is based on nesting potential on Long Island. Leatherback nesting in the U.S. is mainly on the Atlantic coast of Florida (Stewart and Johnson 2006) with sporadic nesting in Georgia, South Carolina, and North Carolina (Rabon et al. 2003). Although hardshell turtle nesting beaches are primarily south of NY, loggerhead, green, and Kemp's ridley turtles are known to nest in the Mid-Atlantic, and a Kemp's ridley recently nested on Long Island (Rafferty et al. 2019). A sea turtle nesting response plan is being developed for New York (Bonacci-Sullivan 2018).

Peak leatherback occurrence in the proposed Project Area is expected during the summer and fall although this species may occur in the region year-round (Table 3.12-1). During recent aerial surveys in the NYB, leatherbacks were sighted during all seasons except winter, and most sightings were during summer and fall and were in nearshore and offshore waters (NYSERDA 2020; Tetra Tech and LGL 2019; 2020). AMAPPS surveys conducted from 2010 through 2013 routinely documented leatherbacks in New England waters, including the Rhode Island/Massachusetts WEAs (Palka et al. 2017a, 2017b). The STSSN reported 89 offshore and 142 inshore leatherback sea turtle strandings between 2017 and 2021 from New York to Massachusetts (NMFS STSSN 2022). During the NLPSC surveys in the Rhode Island/Massachusetts WEAs, leatherbacks were recorded during spring, summer, and fall with a strong peak in August (Kraus et al. 2016; O’Brien et al. 2021a, 2021b; Quintana et al. 2019; Stone et al. 2017). Sightings were documented close to shore (within 10 nm) (O’Brien et al. 2021a). During Project-specific geophysical surveys, leatherbacks were sighted in or near the proposed Project Area during June, July, August, and October (Gardline 2021a; Smultea Sciences 2020a).

Loggerhead sea turtle: Foraging loggerhead sea turtles range widely and have been observed along the entire Atlantic coast as far north as Canada (Brazner and McMillan 2008; Ceriani et al. 2014; Shoop and Kenney 1992). In southern New England, loggerhead sea turtles can be found seasonally, primarily during the summer and fall but are typically absent during the winter (Kenney and Vigness-Raposa 2010; Shoop and Kenney 1992) as distribution is dictated primarily by sea surface temperatures (SSTs). Loggerheads are associated with SSTs between 55.5°F and 82.4°F (13°C and 28°C) (Mrosovsky 1980); they tend to become lethargic in SSTs below 59°F (15°C) and may become incapacitated (“cold-stunned”) at temperatures below 50°F (10°C) (Mrosovsky 1980; Schwartz 1978). Loggerheads occur north of Cape Hatteras primarily in late spring through early fall (May and October) with a peak occurrence in June; however, sightings are recorded in Mid-Atlantic and northeast waters throughout the year (CETAP 1982; DoN 2008a, 2008b; Lutcavage and Musick 1985; Shoop and Kenney 1992). During the summer, loggerheads may be found regularly in shelf waters from Delaware Bay to Hudson Canyon, including Long Island Sound and Cape Cod Bay (Burke et al. 1991; Prescott 2000; Shoop and Kenney 1992; University of Delaware Sea Grant 2000). As SSTs decrease in the winter, most individuals move south of Cape Hatteras to overwinter (Epperly et al. 1995; Hawkes et al. 2011; Mitchell et al. 2002). From November to April, loggerheads are primarily found off the coast of southern North Carolina in the South Atlantic Bight (Griffin et al. 2013); however, stranding and sighting data indicate that not all loggerheads leave Mid-Atlantic and New England waters during the winter (Burke et al. 1991).

Loggerhead turtles may occur year-round in the proposed Project Area; peak occurrence is expected to be during summer and fall (Table 3.12-1). Loggerheads are the most commonly sighted sea turtles on the shelf waters from New Jersey to Nova Scotia, Canada. During AMAPPS surveys between December 2014 and March 2015, 280 individuals were recorded in this region (Palka et al. 2017a, 2017b). Throughout the NYB, loggerheads are sighted year-round with fewer sightings recorded during the winter (NYSERDA 2020; Tetra Tech and LGL 2020). Large concentrations of loggerheads are regularly observed south and east of Long Island near the Rhode Island/Massachusetts WEAs (NEFSC and SEFSC 2018). During the NLPSC surveys, loggerhead turtles were sighted within the Rhode Island/Massachusetts WEAs during spring, summer, and fall with the greatest number of observations in summer and fall (Kraus et al. 2016; O’Brien et al. 2021a, 2021b; Quintana et al. 2019; Stone et al. 2017). During Project-specific geophysical surveys, loggerheads were sighted in or near the proposed Project Area during June, July, August, and

September (Smultea Sciences 2020a). The STSSN reported 78 offshore and 172 inshore loggerhead sea turtle strandings between 2017 and 2021 from New York to Massachusetts, the highest number among all turtle species reported (NMFS STSSN 2022). In NYS waters, the New York Marine Rescue Center (NYMRC) documented 816 strandings of loggerhead sea turtles from 1980 to 2018 (New York Marine Rescue Center 2022). Winton et al. (2018) estimated densities of tagged turtles using data from 271 satellite tags deployed on loggerhead sea turtles between 2004 and 2016 and found that tagged loggerheads primarily occupied the continental shelf from Long Island, New York, south to Florida, but relative densities in the Rhode Island/Massachusetts WEAs increased between July and September. Collectively, available information indicates that loggerhead sea turtles are expected to occur commonly as adults, subadults, and juveniles from the late spring through fall, with the highest probability of occurrence from July through September (Winton et al. 2018).

Kemp's ridley sea turtle: Kemp's ridley sea turtles inhabit open ocean and *Sargassum* habitats of the North Atlantic Ocean as post-hatchlings and small juveniles (Manzella et al. 1991; Witherington et al. 2012). The species is primarily associated with habitats on the continental shelf with preferred habitats consisting of sheltered areas along the coastline, including estuaries, lagoons, and bays (Burke et al. 1994; Landry and Costa 1999; Lutcavage and Musick 1985; Seney and Musick 2005) and nearshore waters less than 120 ft (37 m) deep although they can be found in deeper offshore waters (Shaver and Rubio 2008; Shaver et al. 2005). Their most suitable habitats are less than 33-ft-(10 m) deep with SSTs between 72°F and 90°F (22°C and 32°C) (Coyne et al. 2000). Seagrass beds, mud bottom, and live bottom are important developmental habitats (Schmid and Barichivich 2006). Large juveniles and adults move to benthic, nearshore feeding grounds along the Atlantic and Gulf coasts of the United States (Morreale and Standora 2005). Some juveniles may migrate as far north as New York and New England, arriving in these areas around June and leaving to travel south in early October (Morreale and Standora 2005). Nesting occurs primarily on a single beach at Rancho Nuevo on the eastern coast of Mexico (USFWS and NMFS 1992) with a few additional nests in Texas, Florida, South Carolina, and North Carolina (Foote and Mueller 2002; Godfrey 1996; Meylan et al. 1990; Weber 1995) and an occasional nest in Virginia (Boettcher 2015) and New York (Rafferty et al. 2019).

Kemp's ridley turtles may occur year-round in the proposed Project Area; occurrence is expected to be lowest during winter and spring (Table 3.12-1). Despite the amount of aerial survey effort conducted in the NYB and southern New England, this small turtle species is extremely difficult to observe via high-altitude surveys, so sightings may often go undetected. During the recent NYB surveys, relatively few Kemp's ridley turtles were sighted compared to other turtle species; sightings were recorded during spring, summer, and fall (NYSERDA 2020; Tetra Tech and LGL 2020). During NLPSC surveys in the Rhode Island/Massachusetts WEAs, Kemp's ridley sightings were during August and September 2012 (Kraus et al. 2016). During Project-specific geophysical surveys, one Kemp's ridley was sighted in the proposed Project Area during July 2020 (Gardline 2021a). The STSSN reported 17 offshore and 157 inshore Kemp's ridley sea turtle strandings between 2017 and 2021 from New York to Massachusetts (NMFS STSSN 2022), and the NYMRC documented strandings of 620 Kemp's ridley sea turtles within NYS waters between 1980 and 2018 (New York Marine Rescue Center 2022). Cold-stunned Kemp's ridley sea turtles are often found stranded on the beaches of Cape Cod (Liu et al. 2019; Wellfleet Bay Wildlife Sanctuary 2018). The first confirmed Kemp's ridley nesting event on Long Island was in July 2018 (Rafferty et al. 2019).

Green sea turtle: Along the east coast of the United States, adult green sea turtles are only occasionally found north of Florida, which is near the northern extent of the green turtle's Atlantic nesting range, although some nests have been documented in Georgia, the North and South Carolina, and Virginia (Boettcher 2015; NMFS and USFWS 1991a; Peterson et al. 1985; Schwartz 1989; USFWS 2005). Juveniles and subadults range as far north as Massachusetts (NMFS and USFWS 1991a) and are occasionally observed in Long Island Sound, Nantucket Sound, and Cape Cod Bay (CETAP 1982; Lazell 1980; Morreale et al. 1992). The STSSN reported four offshore and 68 inshore green sea turtle strandings between 2017 and 2021 from New York to Massachusetts, and green sea turtles are found each year stranded on Cape Cod beaches (NMFS STSSN 2022; Wellfleet Bay Wildlife Sanctuary 2018). Sightings in or near the proposed Project Area are limited. This species may occur in the proposed Project Area in small numbers throughout the year. Peak occurrence is expected during summer and fall (Table 3.12-1). During the recent NYB surveys, one green sea turtle was sighted during spring 2016 (NYSERDA 2020). Kenney and Vigness-Raposa (2010) recorded one confirmed sighting within the Rhode Island/Massachusetts WEAs in 2005. Five green sea turtle sightings were recorded off the Long Island shoreline 10 to 30 mi (16 to 48 km) southwest of the WEAs during AMAPPS aerial surveys conducted from 2010 to 2013 (NEFSC and SEFSC 2018), but none were positively identified during the NLPSC aerial surveys of the Rhode Island/Massachusetts WEAs from October 2011 to October 2020 (Kraus et al. 2013; O'Brien et al. 2021a, 2021b; Quintana et al. 2019).

3.12.2 Impact Level Definitions for Sea Turtles

This Final EIS uses a four-level classification scheme to analyze potential impact levels on sea turtles from the alternatives, including the Proposed Action. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a project or beyond project operations and decommissioning. Table 3.12-2 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for sea turtles. Table G-11 in Appendix G identifies potential IPFs, issues, and indicators to assess impacts to sea turtles.

Table 3.12-2. Definition of Potential Adverse and Beneficial Impact Levels for Sea Turtles

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	Impacts on sea turtles are undetectable or barely measurable, with no consequences to individuals or populations.	Impacts on individual sea turtles and/or their habitat would be beneficial but at the lowest levels of detection and barely measurable.
Minor	Impacts on sea turtles are detectable and measurable but are low intensity, highly localized, and short-term in duration. May include impacts to or loss of individuals, but these impacts would not result in population-level effects.	Impacts on individual sea turtles and/or their habitat are detectable and measurable. The effects are likely to benefit individuals, be localized, and/or be short-term and are unlikely to lead to population-level effects.
Moderate	Impacts on sea turtles are detectable and measurable. These impacts could result in population-level effects, but those effects	Impacts on individual sea turtles and/or their habitat are detectable and measurable. These benefits may affect large areas of habitat, be

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
	would likely be recoverable and would not affect stock or population viability.	long-term, and/or affect a large number of individuals and may lead to a detectable increase in populations but is not expected to improve the overall viability or recovery of affected species or population.
Major	Impacts on sea turtles are significant and extensive, long-term in duration, and could have population-level effects that are not recoverable, even with mitigation.	Impacts on individual sea turtles and/or their habitat are detectable and measurable. These impacts on habitat may be short-term, long-term, or permanent and would promote the viability of the affected species/population and/or increase the affected species/population levels.

3.12.3 Impacts of Alternative A – No Action on Sea Turtles

When analyzing the impacts of the No Action Alternative on sea turtles, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities, on the baseline conditions for sea turtles. The cumulative impacts of the No Action Alternative considered the impacts of the No Action Alternative in combination with other planned non-offshore wind and offshore wind activities, as described in *Appendix E* (*Planned Activities Scenario*).

3.12.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for sea turtles would continue to follow current regional trends and respond to IPFs introduced by other ongoing offshore wind and non-offshore wind activities.

Important IPFs for sea turtles within the GAA are generally associated with noise and vessel strikes, the presence of structures, and ongoing climate change. Fuel spills and releases of trash and debris have lesser potential impact on sea turtles due to their low probability of occurrence and relatively limited spatial impact. Specific activities other than offshore wind development that may affect sea turtles include commercial fisheries bycatch; marine transportation; military use; oil and gas activities; undersea transmission lines, gas pipelines, and other submarine cables; tidal energy projects; dredging and port improvement; marine minerals use and ocean-dredged material disposal, and global climate change (see Appendix E for a complete description of ongoing and planned activities). Also, the impacts of land use and coastal development affect sea turtles primarily through habitat loss from development near sea turtle nesting areas. These activities could result in short-term or permanent displacement and injury or mortality to individual sea turtles.

Global climate change is an ongoing potential risk to sea turtles, although the associated impact mechanisms are complex, not fully understood, and difficult to predict with certainty, especially considering potential interactions with other IPFs. Possible impacts to sea turtles due to climate change include increased storm severity and frequency; increased erosion and sediment deposition; disease frequency; ocean acidification; and altered habitat, prey availability, ecology, and migration patterns

(Hawkes et al. 2009). The potential implications of these factors and other related environmental changes for sea turtles, and the ways in which they are likely to interact with the effects of regional offshore wind development, are complex and uncertain. Increasing ocean temperatures are already having a quantifiable impact on ecological processes that affect sea turtles (NEFSC and SEFSC 2021). Evidence shows a northward shift in the distribution of certain species based on water temperature (McMahon and Hays 2006; NEFSC and SEFSC 2021), and future warming could result in a higher interaction between sea turtles and offshore wind farms, potentially magnifying the impacts and benefits described above. Over time, climate change, in combination with coastal and offshore development, would alter existing habitats, potentially rendering some areas unsuitable for certain species and more suitable for others. Green, loggerhead, and Kemp's ridley sea turtle populations have generally been increasing over the past few decades, while leatherback sea turtle populations have declined. Leatherback declines are thought to be primarily related to development of nesting habitat, incidental capture from fisheries, entanglement in fishing gear, and vessel strikes (NMFS and USFWS 2020). Therefore, potential climate change could result in population-level impacts on sea turtle species by displacement, impacts on prey species, altered population dynamics, and increased mortality.

Ongoing offshore wind activities within the GAA that contribute to impacts on sea turtles include:

- Continued O&M of the Block Island project (5 WTGs) installed in state waters;
- Continued O&M of the CVOW project (2 WTGs) installed in OCS-A 0497; and
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of Block Island and CVOW projects and ongoing construction of the Vineyard Wind 1 and South Fork projects would affect sea turtles through the primary IPFs of noise, presence of structures, and land disturbance. Ongoing offshore wind activities would have the same type of impacts from noise, presence of structures, and land disturbance that are described in detail in the following section for planned offshore wind activities, but the impacts would be of lower intensity.

3.12.3.2 Cumulative Impacts of the No Action Alternative

The cumulative impact analysis for the No Action Alternative considers the impacts of the No Action Alternative in combination with other planned non-offshore wind activities and planned offshore wind activities (without the Proposed Action).

Planned non-offshore wind activities related to submarine cables and pipelines, oil and gas activities, marine minerals extraction, onshore development, and port expansions would contribute to impacts on sea turtles through the primary IPFs of noise, presence of structures, and land disturbance. The construction, O&M, and decommissioning of offshore infrastructure for offshore wind activities across the GAA would also contribute to the primary IPFs of noise, presence of structures, and land disturbance. These include other offshore wind and renewable energy projects, and potential port improvements to support the development of this industry regionwide (see Appendix E).

This Final EIS expects that future offshore wind activities, exclusive of the Proposed Action, could affect sea turtles through the following primary IPFs: seafloor disturbance, sediment suspension and deposition, noise, electrical and magnetic fields, accidental releases of contaminants, trash, and debris, traffic, lighting, presence of structures, and port utilization. BOEM (2019c) identifies these important IPFs for sea turtles due to offshore wind activities on the North Atlantic OCS and describes the cause and-effect relationships between renewable energy projects and sea turtles.

Offshore wind activities have the potential to produce impacts from site characterization studies, site assessment data collection activities that involve installation of meteorological towers or buoys, and installation and operation of turbine structures. The IPFs deemed to have impacts on sea turtles are summarized in this section for offshore wind activities without the Proposed Action. This section provides a general description of these mechanisms, recognizing the extent and significance of potential effects on conditions cannot be fully quantified for projects that are in the conceptual or proposal stage and have not been fully designed. Where appropriate, certain potential effects resulting from these future actions can be generally characterized by comparison to effects resulting from the Proposed Action that are likely to be similar in nature and significance. The intent of this section is to provide a general overview of how future activities might influence future environmental conditions. Should any or all of the future activities described in Appendix E proceed, each would be subject to independent NEPA analyses and regulatory approvals, and their environmental effects would be fully considered therein.

Seafloor disturbance: Future offshore wind projects could disturb seabed while installing associated undersea cables. Trenching activities to place transmission cables would create areas of short-term seafloor disturbance. Installation of WTGs, support equipment, scour protection, and other related equipment would result in the long-term alteration of substrates. These structures are likely to alter prey composition for sea turtles by adding hard substrates that would result in a reef effect; however, prey availability is not considered a limiting factor for sea turtles. The area permanently altered by new infrastructure and scour protection would be miniscule in comparison to the area of the WEA and OCS region. short-term impacts would occur over a larger area but would be distributed in time from 2023 to 2030 and are expected to only have short-term, localized impacts. The area of short-term impacts would also be small in comparison to the WEA and OCS region. Alterations to the seafloor are not expected to negatively impact prey resources for sea turtles, and the overall impact to sea turtles is expected to be negligible.

Sediment suspension and deposition: Future offshore wind projects could disturb seabed while installing associated undersea cables, causing an increase in suspended sediment. This disturbance would result in short-term plumes of suspended sediments in the immediate construction areas. Elliott (2017) monitored TSS levels during construction of the BIWF. The observed TSS levels were far lower than levels predicted using the same modeling methods, dissipating to baseline levels less than 50 ft (15.2 m) from the disturbance. Both the modeled TSS effects, which are conservatively high, and the observed TSS effects were short-term and within the range of baseline variability; however, these effects are short-term (lasting only a few tide cycles) due to the low mobility of sediments (primarily sand) in a proposed dredge area (Stantec 2020).

This limited temporal effect over a relatively small area is not expected to interfere with sea turtle foraging success. Data are not available regarding impacts of suspended sediments on adult or juvenile sea turtles although elevated suspended sediments may cause individuals to alter normal movements and behaviors. Sea turtles are expected to avoid the immediate vicinity of sediment plumes; however, these changes in behavior would be limited in extent, short-term in duration, and likely too small to be detected (NOAA 2022).

Increases in suspended sediments may also alter the behavior or prey species for sea turtles. Seafloor disturbance during construction of future offshore wind projects may affect foraging success for some prey species and result in short-term behavior disturbances for individual prey species. Because these disturbances are be localized in extent, limited in magnitude, and short-term, only short-term, limited impacts to fish and invertebrates are expected from suspended sediments, and no population-level impacts are expected for any prey species. Therefore, secondary effects from future wind activities to sea turtles from prey availability are expected to have minor, short-term adverse impacts.

Noise: Under the No Action Alternative, human activities would continue to generate underwater noise with the potential to affect sea turtles. Existing and future sources of anthropogenic underwater noise include commercial, government and military, research, and recreational vessel activity, and the development and operation of other wind energy projects on the OCS. Several offshore wind project construction periods would overlap from 2022 to 2030 (see Appendix E). Construction from these projects, most notably pile driving, would create airborne and underwater noise with minor potential to affect sea turtles. Underwater noise could result in physiological and/or behavioral effects, including potential auditory injuries, short-term disturbance or displacement, and possible startle or stress responses. Injury and behavioral disturbance thresholds for sea turtles are provided in Table 3.12-3.

Permanent sublethal hearing injuries, although possible, are unlikely to occur based on current and anticipated future impact avoidance and minimization requirements. Other sources of noise from wind projects include helicopters and aircraft used for transportation and facility monitoring, G&G surveys, WTG operation, and vessel traffic associated with these activities.

Table 3.12-3. Injury and Behavioral Disturbance Thresholds for Sea Turtles

Response	Metric	Threshold Level
Behavioral	SPL (dB re 1 μPa)	175 dB
Injury	L_{pk} (dB re 1 μPa)	232 dB
Injury (impulsive)	SEL (dB re 1 μPa^{2}s)	204 dB
Injury (non-impulsive)	SEL (dB re 1 μPa2s)	220 dB

Source: DoN 2017

Notes:

μPa = micropascal(s); μPa^{2}s = micropascal squared second; dB = decibel(s); L_{pk} = peak sound pressure level; SEL = sound exposure level; SPL = sound pressure level

The noise associated with offshore wind project construction and operation generally falls into two categories: (1) impulsive noise sources, such as impact pile driving, which generate sharp instantaneous changes in sound pressure and (2) non-impulsive noise sources, such as vessel engine noise, vibratory pile driving, and WTG operation, which remain relatively constant and stable over a given time period.

Impulsive and non-impulsive noise sources associated with offshore wind projects and other activities likely to occur on the OCS in the future are discussed below.

G&G Survey noise: Without mitigation, certain types of G&G surveys could result in long-term, high-intensity impacts on sea turtles. These effects may include behavioral avoidance of the ensonified area and increased stress; temporary loss of hearing sensitivity; and permanent auditory injury depending on the type of sound source, distance from the source, and duration of exposure; however, G&G noise resulting from offshore wind site characterization surveys is of less intensity than the acoustic energy characterized by seismic air guns and affects a much smaller area than G&G noise from seismic air gun surveys typically associated with oil and gas exploration. Although seismic air guns are not used for offshore wind site characterization surveys, sub-bottom profiler technologies that are hull-mounted on survey vessels may incidentally harass sea turtles and would require mitigation and monitoring measures.

None of the equipment operated during these surveys has source levels loud enough to result in PTS or TTS based on the peak or cumulative exposure criteria. Therefore, physical effects are extremely unlikely to occur. Sea turtles exhibit a behavioral response when exposed to received SPL levels of 175 dB, and some noise generated from G&G surveys is within their hearing range. Based on analysis of the potential for effects to ESA-listed species from G&G surveys in the Greater Atlantic Region performed by NMFS (Table 5 in NMFS 2021), the distance to the behavioral threshold for sea turtles is 131 ft (40 m) for boomers and bubble guns, and for sparkers, it is 295 ft (90 m) (NMFS 2021). Thus, a sea turtle needs to be within 295 ft (90 m) of the source to be exposed to potentially disturbing levels of noise. It is expected that sea turtles would react to this exposure by swimming away from the sound source; this limits exposure to a short time--just the few seconds it would take an individual to swim away to avoid the noise. The risk of exposure to potentially disturbing levels of noise is reduced by the use of PSOs to monitor for sea turtles. At the start of a survey, equipment cannot be turned on until the clearance zone is clear of turtles for at least 30 minutes. This condition is expected to reduce the potential for sea turtles to be exposed to noise that may be disturbing; however, even if a sea turtle is submerged and not seen by the PSO, it is expected that sea turtles would avoid the area ensonified by the survey equipment that they can perceive (NMFS 2021). This avoidance behavior would ensure that the duration of exposure was short and unlikely to accumulate to causing TTS or PTS.

Because the area where increased underwater noise would occur is transient and increased underwater noise would only be experienced in a particular area for only seconds, it is expected that any effects to behavior would be minor and limited to a short-term disruption of normal behaviors, short-term avoidance of the ensonified area, and minor additional energy expenditure spent while swimming away from the noisy area. If foraging or migrations are disrupted, they would quickly resume once the G&G survey vessel leaves the area. No sea turtles would be displaced from a particular area for more than a few minutes. While the movements of individual sea turtles would be affected by the sound associated with the survey, these effects are short-term (seconds to minutes) and localized (avoiding an area no larger than 295 ft [90 m]) (NMFS 2021), and there would be only a minor and short-term impact on foraging, migrating, or resting sea turtles. Effects to individual sea turtles from brief exposure to potentially disturbing levels of noise would be minor and limited to a brief startle, a short increase in swimming speed, and/or short-term displacement and would be so small that they cannot be meaningfully measured, detected, or evaluated. BOEM has concluded that disturbance of sea turtles from underwater noise generated by site characterization and site assessment activities would likely result in short-term displacement and other behavioral or nonbiologically significant physiological consequences (i.e., no injury or mortality would occur), and impacts on sea turtles would be short-term and minor.

Impact pile driving noise: The most significant impulsive noise source associated with offshore wind projects is pile-driving noise during the construction phase. WTG foundation installation involves impact pile driving, which produces high SPLs in both the surrounding in air and underwater environments. A typical foundation pile installation generates 4 to 6 consecutive hours of impulsive or vibratory noise with intensity levels like those described for the Proposed Action (see Section 3.12.5). Potential noise exposure events would occur intermittently over several weeks during the allowable construction window (which may vary and would be determined through consultation with NMFS) in the sea turtle GAA. Under the No Action Alternative, construction of additional offshore structures would generate short-term and intermittent impulsive underwater noise with the potential to impact sea turtles. These effects would be limited to specific construction windows beginning in 2022 and continuing through 2030.

Due to the anticipated frequency and spatial extent of effects, impulsive underwater noise from impact pile driving during planned offshore wind development represents the highest likelihood for exposure of individual sea turtles to adverse impacts from noise. Although these potential impacts are acknowledged, their potential significance is unclear because sea turtle sensitivity and behavioral responses to underwater noise are a subject of ongoing study (Elliott et al. 2019; Renewables Consulting Group 2018). Potential behavioral impacts may include altered submergence patterns, short-term disturbance, startle response (diving or swimming away), and short-term displacement of feeding / migrating and a short-term stress response, if present within the ensonified area (NSF and USGS 2011; Samuel et al. 2005). The accumulated stress and energetic costs of avoiding repeated exposure to pile-driving noise over a season or a life stage could have long-term impacts on survival and fitness (DoN 2018). Conversely, sea turtles could become habituated to repeated noise exposure over time and not suffer long-term consequences (O'Hara and Wilcox 1990). This type of noise habituation has been demonstrated for sea turtles even when the repeated exposures were separated by several days (Bartol and Bartol 2011; DoN 2018).

Sea turtles that are close to impact pile driving could experience a short-term or permanent loss of hearing sensitivity. In theory, reduced hearing sensitivity could limit the ability to detect predators and prey or find potential mates, reducing the survival and fitness of affected individuals; however, the role and importance of hearing in these biological functions for sea turtles remain poorly understood (Lavender et al. 2014).

Mitigation measures such as those described in the PSMMP for Sea Turtles (LGL Ecological Research Associates 2022) would be required in all offshore wind development projects, and impacts to sea turtles from construction-related noise is likely to be limited to short-term impacts on a small number of individuals. Short-term impacts on individuals would not be significant at the population level and would be minor overall.

MEC/UXO clearance noise: Planned offshore wind activities may encounter UXO on the seabed in their lease areas or along export cable routes. While non-explosive methods may be employed to lift and move these objects, some may need to be removed by explosive detonation. Underwater explosions of this type generate high pressure levels that could cause disturbance and injury to sea turtles, but the number of affected individuals would be small relative to the population sizes. The number and location of detonations that may be required for planned projects as well as the Proposed Action are relatively unknown. Impacts associated with UXO detonations for other projects would be similar to those described and modeled for the Proposed Action in Section 3.12.5.1.

Non-Impulsive noise: Non-impulsive underwater noise sources in the GAA include baseline noise levels from commercial, military and government, research, and recreational vessel traffic; aircraft; and offshore development activities. The planned development of other wind energy facilities would contribute additional new sources of intermittent non-impulsive underwater noise, including helicopters and fixed-wing aircraft, construction and O&M vessels, and vibratory pile driving during construction. Operational noise from WTGs constitutes a low-level, non-impulsive underwater noise source throughout the life of a given project.

Aircraft noise: Helicopters and fixed-wing aircraft may be used during initial site surveys, protected species monitoring prior to and during construction, and facility monitoring. Sea turtle responses to aircraft noise and disturbance is not well documented. Researchers have speculated that sea turtles are not highly sensitive to disturbance from aircraft (Jean et al. 2010). Helicopters and aircraft would operate at altitudes of 1,000 ft (300 m) or more except when helicopters are landing or departing from service vessels. NMFS (2020) determined that noise and disturbance effects on sea turtles from aircraft used for construction and O&M of the Vineyard Wind offshore wind facility would be insignificant. Based on this information, cumulative effects on sea turtles from aircraft used for wind energy development on the OCS would be negligible.

Vibratory pile driving noise: Vibratory pile driving used during submarine cable and port facility construction is the most intensive source of non-impulsive underwater noise expected to result from planned offshore wind energy development. Typical noise levels generated by vibratory pile driving used for facility development and port improvements are below thresholds associated with potential hearing injury in sea turtles. Vibratory pile-driving noise can exceed levels above behavioral disturbance thresholds (Table 3.12-3) for sea turtles but only within a short distance (i.e., less than 33 ft [10 m]) from the source using the NMFS Multispecies Pile Driving Calculator (Version 1.1, NMFS Protected Species Division, Silver Spring, Maryland). Given this low probability of exposure to above-threshold vibratory pile-driving noise and the fact that vibratory pile-driving activities would be limited in extent, short-term in duration, and widely separated, vibratory pile-driving noise effects on sea turtles would be negligible.

Vessel noise: Construction and operational vessels are the most broadly distributed source of continuous non-impulsive noise associated with offshore wind projects. Ocean-going vessels associated with ongoing and planned activities could potentially result in long-term but infrequent impacts on sea turtles, include temporary startle responses, masking of biologically relevant sounds, physiological stress, and behavioral changes, especially their submergence patterns (Samuel et al 2005). Sea turtle exposure to underwater vessel noise would incrementally increase as a result of planned offshore wind projects, especially during construction periods. Applying vessel activity estimates developed by BOEM based on their 2019 study *National Environmental Policy Act Documentation for Impact-producing Factors in the*

Offshore Wind Cumulative Impacts Scenario on the North Atlantic Outer Continental Shelf (BOEM 2019b), vessel activity could peak in 2024, with as many as 379 vessels involved in the construction of reasonably foreseeable projects (see Appendix E for details); however, this increase must be considered relative to the baseline level of vessel traffic.

Annual baseline traffic measured from July 1, 2018, to June 30, 2019, showed 172,267 transits in the Marine Traffic Study Area surrounding the WEA (Appendix X, COP; DNV-GL 2022). Assuming that construction of up to five lease areas could be active at the same time, and assuming similar levels of vessel traffic as estimated for SRWF (323 vessel transits over a 2-year construction period, or 162 per year), construction activities could result in an increase of 810 transits of the WEA per year. This would represent an increase in vessel traffic of approximately 0.5 percent over baseline conditions, with most of the transit travel occurring in existing sea lanes from ports to the WEA. Due to the small change in vessel traffic from the baseline, and limited impact of vessel noise to sea turtles, no injury or behavioral effects from vessel noise are anticipated for planned offshore wind projects. Although sea turtles could become habituated to repeated noise exposure over time (Hazel et al. 2007), vessel noise effects for other wind farm development projects are expected to be broadly similar to noise levels from existing vessel traffic in the region. Nearly all vessels generate SPL of 190 dB or less and would not generate noise above the disturbance thresholds at distances greater than 10 m (Hatch et al. 2008). Nonetheless, periodic localized, intermittent, and short-term behavioral impacts on sea turtles could occur. Based on sea turtle responses to other types of disturbance such as vessel traffic or drone operation (e.g., Bevan et al. 2018), turtle behavior is expected to return to normal when vessel noise dissipates. Given sea turtles' apparent tolerance exposure to high-level underwater noise produced by vessels, the short-term nature of any behavioral responses, and the patchy distribution of sea turtles in the GAA, the effects of vessel noise from future activities on sea turtles would be negligible.

WTG operation noise: The maximum anticipated noise levels produced by operational WTGs are below recommended thresholds for sea turtle injury and behavioral effects. Sea turtles appear to habituate to repetitive underwater noise not accompanied by an overt threat (Bartol and Bartol 2011; DoN 2018; Hazel et al. 2007). This suggests that even if WTGs generate noise detectable to sea turtles in the immediate proximity, the exposed individuals are not expected to experience measurable adverse effects. The effects of operational noise from future wind farm development on sea turtles would be negligible.

Ongoing non-impulsive noise due to future wind farm actions and associated vessel traffic and the operation of WTGs is persistent and expected to continue indefinitely; however, because of sea turtles' apparent tolerance for non-impulsive sources and the small area and short duration they may experience effects, non-impulsive noise would have a negligible effect on sea turtles.

Electric and Magnetic Frequency (EMF): Under the No Action Alternative, several thousand miles of new submarine electrical transmission cables would be added in the GAA for sea turtles. Each cable would generate EMF effects within the immediate proximity. Submarine power cables emit anthropogenic EMF that can interact with natural geomagnetic EMF, potentially affecting the behavior of electromagnetic sensitive species by disrupting cues. EMF are generated by current flow passing through power cables during operation and can be divided into electric fields and magnetic fields (Taormina et al. 2018).

Magnetic fields have a second induced component, a weak electric field, or an induced electric field. Both electric and magnetic fields rapidly diminish in strength with increasing distance from the source.

The available evidence indicates that sea turtles are magnet-sensitive and orient to the earth's magnetic field for navigation. Although sea turtles may detect magnetic fields as low as 0.05 milligauss (mG), they are unlikely to detect magnetic fields below 50 mG (Normandeau et al. 2011; Snoek et al. 2016). Potential EMF effects are be reduced by cable shielding and burial to an appropriate depth. New submarine cables would be installed to maintain a minimum separation of at least 330 ft (100 m) from other known cables to avoid damaging existing infrastructure during installation. This separation distance avoids additive EMF effects from adjacent cables. Although artificial EMF effects on sea turtles are not well studied, the affected areas are be localized around unburied cable segments and limited to within 10 to 25 ft (3 to 7.5 m) of the cable surface (Snyder et al. 2019). Deviations in migration, therefore, would be small and would not significantly impact energy expenditure in sea turtles. EMF impacts from future non-Project activities would be negligible.

Accidental releases - contaminants: Toxic contaminants could be accidentally released as a result of increased human activity associated with future offshore wind construction activities. Aquatic contaminant exposure could result in mortality, and sublethal effects could impact many of the species' physiological systems during all life stages (Bembenek-Bailey et al. 2019; Mitchelmore et al. 2017; Shigenaka et al. 2010; Vargo et al. 1986). Sea turtles may be affected sublethally in a variety of ways which could include experiencing depressed immune system function; poor body condition; and reduced growth rates, fecundity, and reproductive success (Gall and Thompson 2015; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014). Furthermore, accidental releases may indirectly impact sea turtles by impacting prey species; however, all vessels would comply with USCG regulations, and wind farm construction projects would comply with additional BOEM requirements that avoid and minimize accidental releases of fuel, oil, and other potential aquatic contaminants. Therefore, potential accidental releases would not appreciably contribute to adverse impacts to sea turtles, and these impacts would be negligible.

Accidental releases - trash and debris: All species of sea turtles have been documented ingesting plastic fragments (Bugoni et al. 2001; Hoarau et al. 2014; Nelms et al. 2016) and a variety of other anthropogenic waste (Tomás et al. 2002), likely mistaking debris for potential prey items (Schuyler et al. 2014). Ingesting trash or exposure to aquatic contaminants could be lethal to sea turtles; however, sea turtles may be affected subtly in a variety of ways, which could include experiencing depressed immune system function; poor body condition; and reduced growth rates, fecundity, and reproductive success (Gall and Thompson 2015; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014). Sea turtles could additionally become entangled in debris, causing lethal or injurious impacts. Entanglement in lost fishing gear is a significant cause of mortality in both juvenile and adult sea turtles and was noted as a threat to recovery for multiple ESA-listed turtles in the marine environment (NMFS and USFWS 1991b, 1992; NMFS 2011). Based on a recent global review, 5.5 percent of encountered sea turtles were found to be entangled, and 90.6 percent of these were dead (Duncan et al. 2017). Lost or discarded fishing gear was associated with most of these entanglements and is acknowledged as a major cause of mortality for listed sea turtles.

Although these effects are acknowledged, the likelihood of adverse population-level impacts on sea turtles from accidental releases of debris or contaminants from future offshore wind activities on the OCS is low. Current regulations and requirements imposed on federally approved activities prohibit vessels from dumping potentially harmful debris in United States waters. While precautions to prevent accidental releases would be employed by vessels and port operations associated with future offshore wind development, it is likely that some debris could be lost overboard during construction, maintenance, and routine vessel activities; however, the amount would likely be miniscule compared to other inputs already occurring. In the event of a release, it would be an accidental, low-probability event in the vicinity of project areas or the areas from ports to the project areas used by vessels. Based on these factors, accidental releases of trash and debris from federally approved activities on the OCS are not expected to appreciably contribute to adverse sea turtle impacts, and therefore the effects of the No Action Alternative would be negligible.

Traffic: Vessel strike is an increasing concern for sea turtles. The percentage of loggerhead sea turtles stranded with injuries consistent with vessel strikes increased from approximately 10 percent in the 1980s to 20.5 percent in 2004, although an unknown number may have been struck postmortem (NMFS and USFWS 2007). Sea turtles are expected to be most susceptible to vessel collision in shelf waters, where they forage. Furthermore, they cannot reliably avoid being struck by vessels exceeding 2 knots (Hazel et al. 2007); typical vessel speeds in the GAA may exceed 10 knots. Up to 70 vessels associated with offshore wind development may operate in the GAA during the peak construction period in 2025. Additional fishing vessels may be present in the vicinity due to the expected increase in fish biomass around the WTG structures. Increased vessel traffic could result in sea turtle injury or mortality; however, the proportional increase in vessel traffic from baseline would be minimal (refer to Section 3.19, *Navigation and Vessel Traffic*, and Appendix E). Green, loggerhead, and Kemp's ridley sea turtle populations have generally been increasing over the past few decades, while leatherback sea turtle populations have declined. Despite the potential for individual fatalities, no population-level impacts on sea turtles are expected based on occurrence and potential exposure and the low number of additional strikes from wind turbine vessel traffic.

Lighting: Assuming other future offshore wind projects employ the same mitigation measures included in the proposed Project, impacts to sea turtles from nighttime artificial lighting associated with offshore structures and vessels could represent a source of attraction, avoidance, or other behavioral responses in sea turtles. Although responses to light have been studied in various species and life stages of sea turtles in nesting beach environments, the effects of offshore lighting remain uncertain. Shoreline development is the predominant existing artificial lighting source in the nearshore component of the GAA, whereas vessels, mainly fishing vessels, are the predominant artificial lighting source offshore. Future wind energy development would contribute additional light sources to the offshore component of the GAA, including a short-term increase in light from vessels used during construction, and the long-term use of navigational lighting on new WTGs and OSSs. An estimated 3,210 foundations are forecasted for future wind energy construction. Each structure would have minimal yellow flashing navigational lighting as well as red flashing FAA hazard lights in accordance with BOEM's (2019a) guidelines. Although the potential effects of offshore lighting on juvenile and adult sea turtles is uncertain, WTG lighting is anticipated to have a negligible effect on sea turtles based on the current lack of evidence that platform lighting leads to effects on sea turtles, as shown by decades of oil and gas platform operation in the Gulf of Mexico, which can have considerably more lighting than offshore WTGs (BOEM 2019a).

Presence of structures: The addition of additional new offshore foundations in the GAA could increase sea turtle prey availability by creating new hard-bottom habitat, increasing pelagic productivity in local areas, or promoting fish aggregations at foundations (Bailey et al. 2014). Sections 3.7, *Benthic Habitat,* and 3.10, *Finfish, Invertebrates, and Essential Fish Habitat,* discuss reef creation and altered water flow in detail. The significance of this reef effect is unknown but is not expected to result in biologically significant impacts to sea turtles given the broad geographic range of species during their annual foraging migrations.

The presence of structures could indirectly concentrate recreational fishing around foundations, which could indirectly increase the potential for sea turtle entanglement in both lines and nets (Gall and Thompson 2015; Nelms et al. 2016; Shigenaka et al. 2010). Entanglement in both lines and nets could lead to injury and mortality due to abrasions, loss of limbs, and increased drag, leading to reduced foraging efficiency and ability to avoid predators (Barreiros and Raykov 2014; Gregory 2009; Vegter et al. 2014). Between 2016 and 2018, 186 sea turtles were documented as hooked or entangled with recreational fishing gear (BOEM 2021). Due to the high number of foundations in a GAA, it is likely that recreational and for-hire fisheries would avoid overcrowding structures by dispersing effort across many WTG foundations; however, the risk of entanglement and hooking or ingestion of marine debris could slightly increase, since both fishers and turtles may be attracted to the same areas.

Structural elements of WTGs are likely to be present for the 25- to 35-year operational life of each generator. Once WTGs and OCS-DC have foundations have been installed within the seafloor, the presence of the operating WTGs would have converted the existing open water habitat to one with increased hard bottom, making it comparable to an artificial reef-like habitat. The presence of the WTG foundations, scour protection, and IAC protection creates three-dimensional hard-bottom habitats resulting in a reef effect that is expected to attract numerous species of algae, shellfish, finfish, and sea turtles (Langhamer 2012; Reubens et al. 2013; Wilhelmsson et al. 2006). Sea turtles have been observed within the vicinity of offshore structures, such as oil platforms, foraging and resting under the platforms (Gitschlag and Herczeg 1994; National Research Council 1996). High concentrations of sea turtles have been reported around these oil platforms (Gitschlag and Herczeg 1994; National Research Council 1996).

As a result of the increased habitat and foraging opportunities at the new artificial reef-like habitat, sea turtles could potentially remain in areas longer than they normally would and could become susceptible to cold stunning or death; however, artificial habitat created by these offshore structures can provide multiple benefits for sea turtles, including foraging habitats, shelter from predation and strong currents, and methods of removing biological buildup from their carapaces (Barnette 2017; National Research Council 1996). It is estimated that offshore petroleum platforms in the Gulf of Mexico, provided an additional 2,000 mi^2 (5,180 km^2) of hard-bottom habitat (Gallaway 1981). Wakes created by the presence of the foundations may influence distributions of drifting jellyfish aggregations potentially impacting the distribution of leatherbacks but not the overall availability of prey species. Primary prey species for other sea turtle species would not be affected by these wakes. Because of this, impacts on sea turtle foraging are not expected to be substantial (Kraus et al. 2019).

On this basis, BOEM concludes that the presence of visible structures from O&M would have negligible direct effects on sea turtle movement and migration, and negligible to minor beneficial, long-term, indirect effects on the distribution, abundance, and availability of sea turtle prey and forage resources.

Port utilization: Any port expansions could increase the total amount of disturbed benthic habitat (see Alternative A - No Action discussion) and result in impacts on some sea turtle prey species; however, given that port expansions would likely occur in subprime areas for foraging, and the disturbance would be relatively small in comparison to the overall sea turtle foraging areas in the GAA, port expansions are not expected to impact sea turtles. Dredging for port facility improvement could lead to additional impacts on turtles from incidental entrainment, impingement, or capture. Dredging impacts on sea turtles are relatively rare, with most observed injury and mortality events in the United States associated with hopper dredging in and around core habitat areas in the southern portion of the GAA and along the Gulf Coast (Michel et al. 2013; USACE 2020). Ongoing maintenance dredging of these facilities may incrementally increase related risks to individual turtles over the lifetime of the facilities; however, typical mitigation measures such as timing restrictions should minimize this potential. Given the available information, the risk of injury or mortality of individual sea turtles resulting from dredging associated with the projects considered here is low and population-level effects are unlikely to occur. Therefore, associated effects of port expansions on sea turtles would be long term and minor. Potential vessel traffic impacts associated with port use are described under the Vessel Traffic section.

Climate change: Global climate change could result in population-level impacts on sea turtle species by displacement, impacts on prey species, altered population dynamics, and increased mortality. It is well established that climate change has the potential to affect the distribution and abundance of sea turtles and their prey due to changing water temperatures, ocean currents, and increased acidity. Furthermore, rising sea levels and increased storm intensity may negatively affect turtle nesting beaches. Increasing air temperatures can affect sea turtle population structure because temperature-dependent sex determination of embryos would result in a shift toward more female-biased sex ratios (Poloczanska et al. 2009). Patel et al. (2021) used global climate models to predict that the future distribution of suitable thermal habitat for loggerheads along the OCS will likely increase in northern regions. Sea turtle nesting could also shift northward on the U.S. Atlantic coast. Because these changes may affect sea turtle reproduction, survival, and demography, the impacts of climate change on sea turtles are expected to be minor.

3.12.3.3 Impacts of Alternative A – No Action on ESA-Listed Species

All sea turtles that are likely to occur in the proposed Project Area are listed as threatened or endangered under the ESA, therefore the effects to these species would the same as described above. Based on the information contained in this document, we anticipate that the reasonably foreseeable offshore wind activities are likely to have **minor** adverse impacts to leatherback, loggerhead, Kemp's ridley, and green sea turtles.

3.12.3.4 Conclusions

Impacts of the No Action Alternative

Under the No Action Alternative, BOEM would not approve the COP; Project construction and installation, O&M, and conceptual decommissioning would not occur; and potential impacts associated with the Project to sea turtles would not occur. Sea turtles would continue to be affected by current environmental trends and ongoing activities that would continue to have short-term to long-term impacts on sea turtles, primarily through construction-related lighting, noise, habitat alternation, collision risk, and artificial reef effect.

BOEM anticipates that the sea turtle impacts due to current environmental trends and ongoing activities associated with the No Action Alternative would be **minor** adverse with the potential for **minor beneficial** impacts.

Cumulative Impacts of the No Action Alternative

Under the No Action Alternative, existing environmental trends and ongoing activities, natural and human-caused IPFs would continue to affect sea turtles. BOEM anticipates that the overall cumulative impacts associated Alternative A, the No Action Alternative, when combined with all other planned activities (including offshore wind) in the GAA would result in overall **minor** adverse and **minor beneficial** impacts.

3.12.4 Relevant Design Parameters and Potential Variances in Impacts

This Final EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than described in the sections below. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts on sea turtles:

- The number of WTGs;
- Installation methods;
- The time of year during which construction occurs.

Variability of the proposed Project design exists as outlined in Appendix C. Below is a summary of potential variances in impacts:

- WTG number and locations: the level of hazard related to WTGs is proportional to the number of WTGs installed; fewer WTGs would result in lower behavioral disturbance and decreased risk of TTS for sea turtles during construction and installation and O&M. The potential reductions included in Alternative C may reduce the extent and number of individuals affected but would not lower the overall impact level.
- Final installation methods: any variance to installation methods or materials used for the assumptions described in the COP, Appendix I1 (Küsel et al. 2022), may result in large changes to the areas where sea turtles may experience TTS, or behavioral effects. Potential changes to installation methods may reduce or increase the extent and number of individuals affected but would not alter the overall impact level to sea turtles.

- Offshore export cable routes: the route chosen (including variants within the general route) would determine the amount of seafloor disturbance and duration of sediment suspension but would not alter the level of impacts to sea turtles.
- Season of construction: different sea turtles are present and active in the proposed Project Area at different times of year. Construction when fewer sea turtles are present would have a lesser impact than construction when higher numbers are present. Changes to the construction schedule could alter the number of individuals affected or change which species are primarily affected. This would not change the overall impact determination but may help reduce impacts to species whose populations are more sensitive to impacts.

3.12.5 Impacts of Alternative B - Proposed Action on Sea Turtles

The activities associated with offshore SRWF (up to 94 11-MW WTGs out of 102 potential positions) and SRWEC-OCS/SRWEC-NYS cabling, and OnCS-DC, transmission cable, and interconnection cable with Alternative B include construction and installation, O&M, and decommissioning. These actions have the potential to cause both direct and indirect impacts to sea turtles. The IPFs associated with construction and post-construction O&M activities include accidental releases, seafloor disturbance, sediment suspension, and deposition, electric and magnetic fields, lighting, noise, presence of structures, traffic, and port utilization. These IPFs are thoroughly discussed in the sea turtle assessment prepared for this Project (Sunrise Wind 2023). The conclusions of the sea turtle assessment are presented in this section and include consideration of the Project’s mitigation and monitoring measures (Appendix H).

3.12.5.1 Construction and Installation

3.12.5.1.1 Onshore Activities and Facilities

No regular sea turtle nesting occurs in the onshore portion of the proposed Project Area (refer to Section 3.12.1). No project activities are expected to be conducted in beach locations where nests may occur. Cable installation would be done through HDD underneath beaches, avoiding impacts to these areas, and would not cross underneath known sea turtle nesting sites. Construction and operation of onshore facilities is not expected to have any direct impacts to sea turtles, and the potential for impacts is negligible.

3.12.5.1.2 Offshore Activities and Facilities

Construction impacts to sea turtles could occur from the following IPFs: seafloor disturbance, sediment suspension and deposition, noise, electric and magnetic fields, discharges and release, trash and debris, vessel traffic, and lighting. Unless noted otherwise, construction-related impacts would be short-term. The potential for these impacts to occur are discussed in detail in the following sections.

Seafloor disturbance: During construction of the SRWF, seafloor disturbances would be associated with seafloor preparation, placement of scour protection/cable protection, foundation installation, vessel anchoring and jack-up, and IAC installation. These seafloor disturbances could directly impact benthic species such as mollusks and crabs which are prey for sea turtles. As foundations, anchors, and/or jack-ups are placed on the seafloor, direct injury or mortality could occur to benthic species residing within the footprint of the foundations. As discussed for benthic resources (see Section 3.7.5.1), 1 to 3 years for benthic communities to recover to preimpact levels, based on the results of a number of studies on benthic recovery; however, the footprint of direct benthic impacts within the SRWF are minimal when compared to the ample available bottom habitat surrounding the SRWF. Additionally, mobile benthic species are likely to vacate the area during construction activities, avoiding direct injury/mortality.

A number of methodologies for sand wave leveling and cable installation are being considered to prepare the seafloor and install the IAC within the SRWF (e.g., suction hopper dredge, mechanical plow, jet plow) (see Section 3.3.3.4 in COP, Sunrise Wind 2023). The suction hopper dredging technique recovers and relocates excavated materials from one location to another. A drag head is towed over the sand by a vessel while a pump pulls fluidized sand into the vessel's storage hopper. Any sediment removed would be relocated within the local sand wave field along the IAC. Once full, the vessel would relocate to a designated storage or disposal area to offload materials. Excavation activities have the potential to disturb, catch, or entrain sea turtles that may not have moved away from the source of the activity quickly enough (Murray 2011). This potential impact is most likely to harm resting turtles offshore and juveniles utilizing nearshore areas; however, the risk of injury to sea turtles from hopper dredges in particular is expected to be lower in the open ocean, compared to within navigational channels (Michel et al. 2013; USACE 2020). This may be due to the lower density of sea turtles in offshore waters, and the ability to move away from an active drag head. Consultations with agencies in development of EPMs such as the use of PSOs (as detailed below) are likely to reduce risk of injury or mortality of individual sea turtles although included measures are unlikely to eliminate risk of entrainment for sea turtles.

Potential impacts to sea turtles from seafloor disturbance are expected to include direct impact/injury to benthic prey, temporary loss of habitat for benthic prey species, and injury/mortality from use of installation techniques such as a suction hopper dredge; however, given the transient and short duration of construction activities (approximately 18 months), the wide availability of prey outside the SRWF, the ample available habitat surrounding the localized area of disturbances, and EPMs, impacts on sea turtles from seafloor disturbances during construction of the SRWF are expected to be short-term and minimal. Because individual sea turtles may be injured or killed, but no population-level impacts are anticipated, the construction activities for the SRWF would have a minor short-term impact on sea turtles.

Sediment suspension and deposition: SRWF construction activities associated with seafloor preparation, foundation installation, placement of scour protection/cable protection, vessel anchoring and jack-up, and IAC installation would directly result in short-term, localized increases in sediment suspension within the water column, which would increase turbidity. Increased turbidity could decrease visibility for sea turtles, potentially restricting predation efficiency. Additionally, the effects of turbidity on prey species (as discussed in Section 3.7 *Benthic Resources* and Section 3.10 *Finfish, Invertebrates, and Essential Fish Habitat*) could disrupt available forage for sea turtles and cause avoidance behavior within localized construction areas.

The extent of turbidity depends on sediment type and size as well as the expected duration of the sediment-disturbing activities. For example, sediment-disturbing activities in sandy substrates with larger (heavier) particles typically result in shorter periods of elevated turbidity compared to similar work in areas with greater silt and clay content. The longer the disturbance continues, the longer the sediments are expected to be suspended within the water column.

Appendix H (*Sediment Transport Modeling Report*) (Woods Hole Group 2022) of the COP provides further information on suspended sediments from installation of the IAC in federal waters. As detailed in Section 3.7, *Benthic Resources,* and Section 3.10, *Finfish, Invertebrates, and Essential Fish Habitat,* only short-term, limited impacts to fish and invertebrates are expected from suspended sediments; therefore, secondary effects on sea turtle prey availability are not expected. As described in the COP, Appendix H (Woods Hole Group 2022), TSS concentrations are predicted to return to ambient levels (less than 10 mg/L) within 0.4 hours following installation of the modeled SRWEC-OCS cable corridor centerline and within 0.34 hours following installation of the modeled SRWEC-NYS cable corridor centerline. Furthermore, the TSS plumes were shown to be primarily contained within the lower portion of the water column, approximately 9.8-ft (3.0-m) above the seafloor for both SRWEC-OCS and SRWEC-NYS installation. This limited temporal effect over a relatively small area are not expected to interfere with sea turtle foraging success.

Based on the relatively low anticipated density of sea turtles within the SRWF and the expected short-term and localized increases in turbidity, impacts on sea turtles are expected to be short-term and minor.

Noise: Sea turtles may be adversely impacted by underwater noise produced during the construction of the SRWF. The main sources of noise during the construction phase would be G&G surveys, MEC/UXO surveys (requiring potential G&G to locate MEC/UXOs), pile driving activities, and vessel traffic. Underwater noise could result in physiological and/or behavioral effects to sea turtles, including potential auditory injuries, short-term disturbance or displacement, and possible startle or stress responses. A detailed explanation of predicted noise levels is provided in COP, Appendix I1 (Küsel et al. 2022).

Limited research was conducted on the physiological impacts of underwater sound on sea turtles, and very few data are available on the behavioral responses of sea turtles to noise; however, the data available suggest that sea turtles can detect acoustic stimuli and respond behaviorally (Dow Piniak et al. 2012). While general hearing sensitivities for all species are below 2 kHz, primary hearing frequency ranges of sea turtle vary by species and life stage (Bartol and Ketten 2006; Bartol et al. 1999; Dow Piniak et al. 2012; Martin et al. 2012; Piniak et al. 2016).

The studies available on underwater noise impacts to sea turtles examine the behavioral responses of loggerhead and green sea turtles to underwater noise produced by seismic guns. Behavioral responses observed during seismic surveys included avoiding the source of the sound (O'Hara and Wilcox 1990), startle reactions (DeRuiter and Doukara 2012), and increased swimming speeds (McCauley et al. 2000). Other possible behavioral responses could include increased surfacing time and decreased foraging. McCauley et al. (2000) reported that SPL of 166 dB re 1 µPa from seismic air guns corresponded with observed behavioral reactions in sea turtles. Increased surface time increases the risk of vessel strike as described in the analysis for vessel traffic.

BOEM and NOAA have adopted the sea turtle injury thresholds based on the dual criteria of L_{pk} and SEL recommended by Popper et al. (2014) and the U.S. Navy (Blackstock et al. 2018) and adopted by NOAA Fisheries (GARFO 2020, 2021a). Table 3.12-3 summarizes the agency-adopted acoustic thresholds for sea turtles, which are used to evaluate noise impacts to sea turtles from impulsive sounds from impact pile driving and non-impulsive sounds generated by vessel traffic.

Table 3.12-4 summarizes thresholds for underwater noise effects and the highest-modeled distances ($R_{95\%}$) to injurious and behavioral effects from both impulsive and intermittent non-impulsive construction-related underwater noise levels (Küsel et al. 2022). Potential effects were modeled over a range of potential construction schedules, and the results for the highest level of potential impacts among all the construction schedules are included in this document.

Table 3.12-4. Modeled Radial Distances ($R_{95\%}$) to Effect Thresholds for Elevated Underwater Noise from Project Pile Installations: OCS-DC Foundation and WTG Monopile Installation (up to four 12-meter monopiles and four pin piles installed in a day using impact hammer pile driving); 1.2-meter-diameter Casing Pile via Impact Hammer; and Goal Posts Sheet Piles via Vibratory Hammer for Cofferdam Installation

Noise Source	Injurious Effects		Behavioral Effects
	Distance to L_{pk} Single Strike Injury Threshold (mi; 232 dB re: 1 µPa)	Distance to SEL Injury Threshold (mi)1	Distance to SPL Behavioral Threshold (mi) (175 dB re: 1 µPa)
12-m Monopile and OCS-DC foundation[2] – impact installation (impulsive)	0	1.37	1.02
Casing Pipe (1.2-m diameter) - impact installation	0	0.26	0.18
Goal Posts – vibratory sheet pile installation (non-impulsive noise)	0	0	>0.01

Notes: µPa = micropascal; µPa^2 = squared micropascal; dB = decibel(s); L_{pk} = peak sound pressure level; m = meter; mi = mile(s); OCS-DC = Offshore Converter Station; SEL = sound exposure level; SPL = sound pressure level

Source: COP, Appendix I1 (Küsel et al 2022).

[1] Injury thresholds are different for impulsive (204 dB re 1 µPa^2/second) and non-impulsive (220 dB re 1 µPa^2/second) noise. See Table 3.12-3.

[2] Monopile foundation values reflect the maximum possible effect area from a difficult installation of a 12-m-diameter pile with 10-dB broadband attenuation.

G&G survey noise: Short-term, localized G&G surveys during the construction period may include the use of multi-beam echosounders, side-scan sonar, shallow penetration sub-bottom profilers, medium penetration sub-bottom profilers and marine magnetometers. Site-specific verification was previously conducted for geophysical equipment sound sources deployed within the marine portions of the proposed Project Area. The survey equipment to be employed would be equivalent to the equipment utilized during the G&G survey campaigns associated with Lease Area OCS-A 0500 conducted in 2016, 2017, 2018, 2019, and 2020 and within Lease Area OCS-A 0487 conducted in 2018, 2019, and 2020 (Gardline 2021a, 2021b; Smultea Sciences 2020a, 2020b).

G&G surveys use a combination of sonar-based methods to map shallow geophysical features. The equipment is towed behind a moving survey vessel attached by an umbilical cable. G&G equipment operating are frequencies at or below 2,000 Hz (typically sub-bottom profilers) may be audible to sea turtles. Equipment such as echosounders and side-scan sonar operate at higher frequencies and have no effect on sea turtles. The equipment only operates when the vessel is moving along a survey transect, meaning that the ensonified area is intermittent and constantly moving. BOEM (2021) evaluated potential underwater noise effects on sea turtles from G&G surveys and concluded there is no possibility of PTS in sea turtles from G&G sound sources. Some G&G survey noise sources could exceed the behavioral effects threshold up to 300 ft (91.4 m) from the source, depending on the type of equipment used, but given the limited extent of potential noise effects and the APMs used in this Project (e.g., soft-start measures, shutdown procedures, protected species monitoring protocols, use of qualified and NOAA-approved PSOs), adverse impacts to sea turtles are unlikely to occur. BOEM (2021) concluded that planned G&G survey activities across the entire Mid-Atlantic OCS are unlikely to cause PTS injury to sea turtles. While low-level behavioral exposures could occur, these would be limited in extent and short-term in duration. Therefore, underwater noise impacts from G&G surveys are expected to be short-term and minor.

MEC/UXO clearance noise: As detailed in the COP, Section 3.3.3.4 (Sunrise Wind 2023), prior to seafloor preparation, cable routing, and micro-siting of all assets, Sunrise Wind would implement a MEC/UXO Risk Assessment with RARMS designed to evaluate and reduce risk in accordance with the As Low as Reasonably Practical (ALARP) risk mitigation principle. During Project construction, the likelihood of MEC/UXO encounters with sea turtles is very low due to low sea turtle presence in the proposed Project Area and monitoring and mitigation.

For all MEC/UXO clearance methods, mitigation measures include the use of noise attenuation to achieve a 10 dB reduction in sound levels, PSOs, pre-survey clearance monitoring, and the establishment of exclusion zones in which sound sources would be shut down when sea turtles are present (Appendix H). Pre-clearance zones would be monitored for 60 minutes prior to blasting, with clearance zones described in Table 3.12-5.

Table 3.12-5. Mitigation and Monitoring Zones Associated with Unmitigated UXO Detonation of Binned Charge Weights

Species	UXO Charge Weight[1]				
	E4 (2.3 kg)	E6 (9.1 kg)	E8 (45.5 kg)	E10 (227 kg)	E12 (454 kg)
	Pre-Start Clearance Zone[2] (m)	Pre-Start Clearance Zone[2] (m)	Pre-Start Clearance Zone[2] (m)	Pre-Start Clearance Zone[2] (m)	Pre-Start Clearance Zone[2] (m)
Sea turtles	104	241	545	1,030	1,390

Source: Adapted from Protected Species Mitigation and Monitoring Plan dated July 2022 (LGL Ecological Research Associates 2022).

Notes: kg = kilograms; m = meters; PK = peak pressure level; SEL = sound exposure level.

[1] UXO charge weights are groups of similar munitions defined by the U.S. Navy and binned into five categories (E4-E12) by weight (equivalent weight in TNT). Four project sites (S1-S4) were chosen and modeled (see Hannay and Zykov (2022), Appendix C [Project Design Envelope and Maximum-Case Scenario]) for the detonation of each charge weight bin.

[2] Pre-start clearance zones were calculated by selecting the largest Level A threshold (the larger of either the PK or SEL noise metric) for marine mammals and the largest distance to the Permanent Threshold Shift (PTS) threshold for sea turtles. Auditory injury thresholds (PTS PK or SEL noise metrics) were larger than modeled distances to mortality and non-auditory injury criteria. The chosen values were the most conservative per charge weight bin across each of the four modeled sites.

Because the potential for effects from MEC/UXO clearance is extremely unlikely but, if required, could result in injury of a very low number of individuals, the effects to sea turtles would be negligible to minor and short-term.

Impact pile driving noise: Underwater noise generated by impact pile driving is considered one of the predominant IPFs that could result in potential physiological and behavioral impacts on sea turtles due to the relatively high source levels produced by impact pile driving and the large distances over which the noise is predicted to propagate. Up to 94 WTG foundations and 1 OCS-DC foundation with four legs would be installed. The typical SRWF WTG foundation pile installation would require approximately 4 to 6 hours of impact pile driving to a final embedment depth of 164 ft (50 m) below the seafloor, with some difficult installations potentially taking up to 12 hours to install due to more difficult substrate conditions. After installation, the WTG would be placed on top of the foundation pile and the vessels would be repositioned to the next site. Between 1 and 3 WTG monopile foundations may be installed per day. For the OCS-DC foundation, the jacket foundation would be placed first, with the pin pile placed through the jacket and driven to its penetration depth (295 ft [90 m]). Pile driving for a single jacket foundation may take up to 48 hours (see Section 3.3.5.2 in COP, Sunrise Wind 2023). Because separate vessels are anticipated to be used for WTG and OCS-DC foundation installations, these activities may occur concurrently.

The potential significance of impulsive underwater noise is unclear because sea turtle sensitivity and behavioral responses to underwater noise are a subject of ongoing study. Potential behavioral impacts may include altered submergence patterns, short-term disturbance, startle response (diving or swimming away), and short-term displacement of feeding/migrating and a temporary stress response, if present within the ensonified area (NSF and USGS 2011; Samuel et al. 2005). The accumulated stress and energetic costs of avoiding repeated exposure to pile-driving noise over a season or a life stage could have long-term impacts on survival and fitness (DoN 2018). Conversely, sea turtles could become habituated to repeated noise exposure over time and not suffer long-term consequences (O'Hara and Wilcox 1990). This type of noise habituation was demonstrated even when repeated exposures were separated by several days (Bartol and Bartol 2011; DoN 2018).

Sea turtles migrating through the area when pile driving occurs are expected to adjust their course to avoid the area where received SPL is elevated above 175 dB re 1 µPa. Depending on how close the species is to the pile being driven, this could involve swimming up to 1.04 mi (1.68 km) (Sunrise Wind 2023). Such behavioral alterations could cause turtles to cease foraging or expend additional effort and energy avoiding the area. Presumably, turtles could continue foraging activities outside the area of elevated noise levels as adjacent habitat provides similar foraging opportunities. The turtle may experience physiological stress during this avoidance behavior, but this stressed state is anticipated to dissipate over time once the sea turtle is outside the ensonified area. There have been no documented sea turtle mortalities associated with pile driving. Either a short-term or permanent reduction in hearing sensitivity could be harmful for sea turtles, but the potential significance is unclear because the role that hearing plays in sea turtle survival (e.g., for predator avoidance, prey capture, and navigation) is poorly understood (NSF and USGS 2011). The use of PSOs, exclusion and monitoring zones, and pile driving soft-start measures (Table H-1, Appendix H) mitigates the risk of sea turtle exposure to elevated underwater noise levels. Because behavioral effects only last for the duration of active pile driving these effects are expected to last a short time, and sea turtles would return to normal behavior once outside of the harassment area or when pile driving stops (BOEM 2021).

Sea turtles that are close to impact pile driving could experience a temporary or permanent loss of hearing sensitivity. In theory, reduced hearing sensitivity could limit the ability to detect predators and prey or find potential mates, reducing the survival and fitness of affected individuals; however, the role and importance of hearing in these biological functions for sea turtles remain poorly understood (Lavender et al. 2014).

Modeling of sea turtle exposures was done for a range of potential construction scenarios as described in Section 4.4.2 COP Appendix I1 (Küsel et al. 2022). BOEM has adopted a conservative approach of using the highest values for each analyzed criteria from among all five modeled scenarios. As described in Küsel et al. (2022), up to five leatherback sea turtles may experience TTS or PTS injury, while Kemp's ridley, green, and loggerhead sea turtles are expected to have less than one injury from impact pile driving each (Table 3.12-6). Up to 10 leatherback and 10 loggerhead sea turtles may experience behavioral harassment from impact pile driving, while Kemp's ridley and green sea turtles are expected to have less than one incident of behavioral harassment each. These estimates are maximum exposures based on density estimates and exposure ranges, and do not account for mitigation efforts related to observers or shutdown zones. A full description of the acoustic analysis of sea turtle exposures is contained in COP Appendix I1 (Küsel et al. 2022).

Table 3.12-6. Maximum Estimated Sea Turtle Exposures among All Modeled Construction Schedule Scenarios for WTG and OCS-DC Foundation Installation via Impact Pile Driving, Assuming A Minimum of 10 dB of Sound Attenuation

Species	Injury		Behavior
	L_E	L_{pk}	L_p
Kemp's ridley turtle	0.05	0	0.31
Leatherback turtle	4.30	0	9.57
Loggerhead turtle	0.50	0	9.30
Green turtle	0.10	0	0.29

Source: Küsel et al 2022, Tables 4.4-12 through 4.4-16.

As described in Appendix H (*Mitigation and Monitoring*), additional protection measures include noise attenuation technologies, soft starts for pile driving, the use of trained 6-8 PSOs for monopile installation, a 500- pre-clearance and exclusion zone for sea turtles, reduced visibility monitoring tools, adaptive vessel speed reductions, and utilization of software to share visual and acoustic detection data between platforms in real time. PSOs would perform pre-clearance monitoring of the area surrounding the construction site for 60 minutes prior to beginning pile driving. PSOs would also enforce shutdown zones when sea turtles are observed within the shutdown zones. Pile driving would not resume until individuals have left the shutdown zone of their own volition, and no turtles have been observed within the shutdown zone for at least 60 minutes. These measures are likely to reduce the risk of injury or exposure to sea turtles during daylight hours but are not expected to reduce risk for sea turtles during any nighttime pile driving.

Based on the combination of minimization measures mentioned above (e.g., sound reduction technology, soft starts, PSOs) and the low numbers of sea turtles expected in the SRWF and SRWEC, impacts to sea turtles from impact pile driving would be short-term and minor.

Vibratory pile driving noise: Vibratory pile driving may be used during the construction phase of the SRWF for cofferdam installation at the export cable landing. Sea turtles may experience behavioral effects for received SPLs above 175 dB re 1 µPa. Vibratory noise levels are typically lower than for impact pile driving. Because of this, the radius at which behavioral impacts can be expected for sea turtles is less than 10 ft using the NMFS Multispecies Pile Driving Calculator (Version 1.1, *NMFS Protected Species Division, Silver Spring, Maryland*). As shown in Table 3.12-3, vibratory pile-driving noise is not expected to exceed behavioral thresholds (Küsel et al. 2022).

Monitoring and mitigation for vibratory pile installation includes the use of two PSOs, pre-clearance and shutdown zones, and ramp-up procedures during days with decrease visibility of the shutdown zone. The pre-clearance and shutdown zone would be 500 m for all sea turtles. The PSO would halt pile driving if an individual enters the shutdown zone, and pile driving would not resume until the individual has left the shutdown zone and no individuals have been observed for at least 15 minutes (dolphins, porpoises, and seals) or 30 minutes (whales). Appendix H describes the monitoring and mitigation for vibratory pile driving in further detail.

Given the limited spatial extent of these potential effects, the minimization measures required, low densities of sea turtles in the SRWF and SRWEC, and short duration of pile-driving activities, the impacts from vibratory pile driving to sea turtles would be negligible.

Vessel noise: The relatively low-frequency range of turtle hearing (100–1,200 Hz) (Ketten and Moein Bartol 2006; Lavender et al. 2014) overlaps the broad frequency spectrum of intermittent non-impulsive noise produced by vessels (10-1,000 Hz). Sea turtles could respond to vessel approach and/or noise with a startle response and a short-term stress response (NSF and USGS 2011); however, Hazel et al. (2007) suggested that turtles could habituate to vessel sounds in marine areas that experience regular vessel traffic. This could reduce the behavioral impacts of vessel noise but may increase the potential for vessel collision (refer to subsection on vessel traffic below). Underwater noise generated by construction vessels would not exceed injury thresholds for turtles, as noise levels produced by vessels in general are below levels that could cause potential auditory threshold shifts. Behavioral responses to vessels have been reported but are thought to be more associated with visual cues, as opposed to auditory cues (Hazel et al. 2007), although both senses likely play a role in avoidance. A conservative assumption is that construction and support vessels could elicit behavioral changes in individual sea turtles near the vessels. It is assumed that these behavioral changes would be limited to evasive maneuvers such as diving, changes in swimming direction, or changes in swimming speed to distance themselves from vessels. Overall, impacts to sea turtles from vessel noise would be negligible.

Aircraft noise: Fixed-wing aircraft may be used during construction for marine mammal monitoring, and helicopters may be used for crew transport to and from construction vessels. Monitoring aircraft would operate at an altitude of 1,000 ft (300 m) consistent with established guidance. Noise from crew transport helicopters would increase during approach and departure from vessel landing pads. Currently, no published studies describe the impacts of aircraft overflights on sea turtles, although anecdotal reports indicate that sea turtles respond to aircraft by diving (BOEM 2017). While helicopter traffic may cause some short-term and short-term nonbiologically significant behavioral reactions, including startle responses (diving or swimming away), altered submergence patterns, and a short-term stress response (BOEM 2017; NSF and USGS 2011; Samuel et al. 2005), these brief responses are expected to dissipate once the aircraft leaves the area. Operating aircraft are anticipated to be close enough to the water surface to incur behavioral effects only on the order of minutes and only associated with takeoffs and landings. Combined with the relatively low number of aircraft operations, the potential effects of aircraft noise and disturbance on sea turtles are, therefore, expected to be negligible.

EMF: Because EMFs are generated by power production when WTGs are operating, no effects from the IPF are expected during construction of the offshore facilities.

Accidental releases – contaminants: During construction of the SRWF, there could be a short-term risk of sanitary and other waste fluids or fuels and other petrochemicals accidentally entering the water. If sea turtles were to be exposed to an oil spill or a discharge of waste material, studies indicate that respiration, skin, some aspects of blood chemistry and composition, and salt gland function could be significantly impacted in exposed species (Vargo 1986). Any non-routine spills or accidental releases that could result in negligible and short-term impacts to surface-water resources would be avoided or minimized through the implementation of the proposed Project SPCC Plan and other APMs (refer to Appendix H). Impacts on sea turtles from accidental spills or releases of pollutants are considered negligible because of the low probability of the risk and APM implementation.

Accidental releases – trash and debris: Trash and debris that enter the water represent a risk factor to sea turtles because the turtles could ingest or become entangled in debris, causing lethal or injurious impacts. Pollution (e.g., plastic) is often mistaken for food such as jellyfish and ingested, which can block intestinal tracts, causing injury or mortality. Section 3.12.3 provides additional debris and entanglement information. Personnel working offshore would receive training on sea turtle and marine debris awareness. Impacts on sea turtles from accidental deposits of trash or debris associated with the proposed Project would be minor because implementation of proposed APMs (Table H-1, Appendix H) lowers the probability of such risk.

Vessel traffic: Increased vessel activity in the Project Area associated with the Construction and Installation phase of the Proposed Action pose a risk of increased collision-related injury and mortality for sea turtles. Risk of collision injury is commensurate with vessel speed. The probability of a vessel strike increases significantly as speeds increase above 10 knots (Conn and Silber 2013; Kite-Powell et al. 2007; Laist et al. 2001; Vanderlaan and Taggart 2007). Propeller and collision injuries from boats and ships are common in sea turtles and an identified source of mortality (Hazel et al. 2007; Shimada et al. 2017). Hazel et al. (2007) also reported that individuals may become habituated to repeated exposures over time that were not accompanied by an overt threat. Project construction vessels could collide with sea turtles, posing a short-term increase in the risk of injury or death to individual sea turtles.

Sea turtles are likely to be most susceptible to vessel collision in coastal foraging areas crossed by construction vessels traveling between the SRWF and offshore SRWEC and area ports. Hazel et al. (2007) indicated that sea turtles may not be able to avoid being struck by vessels at speeds exceeding 2 knots, and collision risk increases with increasing vessel speed. Habituation to noise may also increase the risk of vessel collision; however, avoidance behaviors observed suggest that a turtle’s ability to detect an approaching vessel is more dependent on vision than sound although both may play a role in eliciting behavioral responses. Construction vessel speeds could periodically exceed 10 knots during transits to and from area ports, posing an incremental increase in collision risk relative to baseline levels of vessel traffic. During construction, vessels generally either remain stationary when installing the monopiles and

WTG/OSS equipment or move slowly (i.e., at less than 10 knots) when traveling between foundation locations. Cable-laying vessels move slowly on the order of 1 mile per day.

Sea turtles are vulnerable to a range of vessel types depending on the environment. Large vessels used during Proposed Action construction would likely include one cable-laying vessel, one rock-dumping vessel, one jack-up barge, six material and feeder barges and four tow tugs, one work vessel, and one fuel bunkering vessel. Similar vessels would be used during decommissioning. These vessels would largely remain on station or travel at speeds well below 10 knots during construction and decommissioning of the SRWF and SRWEC, reducing the risk of vessel strike.

Other vessels used during construction and decommissioning would include crew transports and inflatable support vessels used for PSO monitoring. Two crew transport vessels would be used during operation. These vessels would adhere to speed restrictions and other mitigation measures outlined elsewhere in this document and, in general, are smaller and more maneuverable and better able to avoid collisions with protected species when combined with observers. For this reason, these vessels would pose a minimal risk of collision with sea turtles.

Based on information provided by Sunrise Wind, Project construction would require an estimated total of 1,575 vessel trips between SRWF and ports in Rhode Island, Massachusetts, Connecticut, and New York over the 2-year construction period, with an estimated maximum of nine trips in any given month from U.S. ports outside of the Rhode Island/Massachusetts WEAs. Port traffic within the Rhode Island/Massachusetts WEAs would add an additional 127 one-way trips during WTG installation and 146 one-way trips during cable installation to the SRWF. The construction vessels used for Project construction are described in Table 3.11-15. Typical large construction vessels used in this type of project range from 325 to 350 ft (99 to 107 m) in length, 60 to 100 ft (18 to 30 m) in beam, and draft from 16 to 20 ft (5 to 6 m) (Sunrise Wind 2023). All project vessels operating between local ports and the Project Area would be required to comply with the mitigation described in the PSMMP.

During construction, an estimated 924 vessel trips per year would cross transects 24 through 27 when transiting to and from SRWF (DNV-GL 2022). This would equate to a 64 percent increase in vessel traffic within the SRWF area; however, the Automatic Identification System (AIS) data used in transect analysis do not include many recreational vessels that lack AIS transponders and commercial fishing vessels that deactivate their transponders when actively fishing. These two vessel classes account for the vast majority of vessel activity. For example, Sunrise Wind estimated 19,611 one-way trips per year by commercial fishing vessels between the SRWF and area ports (DNV-GL 2022). When commercial fishing vessel trips are included, Project construction and installation would result in a 4.4 percent increase in vessel transits per year across transects 24 through 27 during the construction and installation phase. In summary, this assessment indicates that construction and installation vessels would likely increase vessel traffic to some degree over baseline conditions. This indicates the potential for increased risk of sea turtle collisions, but that risk is mitigated in part by typical vessel speeds during construction and installation, low relative increase in vessel traffic, and by proposed risk avoidance and minimization measures.

It is anticipated that the risk of vessel strike on ESA-listed species is negligible because of the nature of construction and planned mitigation measures which include vessel strike avoidance measures. The Applicant has committed to a range of EPMs to avoid vessel collisions with sea turtles (see Appendix H).

BOEM would also require additional mitigation measures to avoid and minimize impacts to ESA-listed species. These include strict adherence to NOAA guidance for collision avoidance and a combination of additional measures, including speed restrictions to 10 knots or less for all vessels at all times between November 1 and April 30 and in all North Atlantic right whale (NARW) Dynamic Management Areas. All vessel crews would receive training to ensure that these EPMs are fully implemented for vessels in transit. Once on station, construction vessels either remain stationary when installing the monopiles and WTG/OSS equipment or move slowly (i.e., at less than 10 kt) when traveling between foundation locations. Cable-laying vessels move very slowly at approximately 1 mi per day. Planned mitigation measures, including voluntary speed restrictions and use of PSOs, would effectively limit collision risk when traveling to and from area ports.

Project EPMs and mitigation measures include the implementation of NOAA vessel guidelines for sea turtle strike avoidance measures, including vessel speed restrictions. These measures are intended to minimize the risk of vessel strikes; however, the likelihood of sea turtle injury or mortality resulting from Project-related vessel strikes over the 2-year construction and installation period cannot be discounted. Green, loggerhead, and Kemp’s ridley sea turtle populations have generally been increasing over the past few decades, while leatherback sea turtle populations have declined. Because the abundance of sea turtles in the Project Area is anticipated to be generally low with patchy distribution, and the proportional increase in vessel traffic also low, the number of sea turtles injured or killed by vessel strikes as a result of Project construction is expected be low and would not result in significant effects at the population level. Therefore, the potential for construction vessel collisions on sea turtles would result in short-term minor adverse impacts.

Fishing vessels may be displaced during construction of WTGs and installation of the SRWEC. Up to 300 fishing vessels use the SRWF annually (Section 3.14 *Commercial Fisheries and For-Hire Recreation*) and might decide to avoid the SRWF once it is fully constructed. Potential for displacement of fishing vessels during SRWF operations is discussed further below under Section 3.12.5.3, *Operations and Maintenance and Conceptual Decommissioning*. The increased collision risk in some areas is anticipated to be commensurate with the decreased risk within the SRWF, so changes in collision risk from relocated commercial and for-hire fishing vessels during construction of the SRWF would not be measurable from baseline. Relocation of fishing vessels during construction and installation is considered to have negligible adverse impacts to sea turtles.

Gear utilization: The FBRMP for the Proposed Action has been developed in accordance with recommendations set forth in *Guidelines for Providing Information on Fisheries for Renewable Energy Development on the Atlantic Outer Continental Shelf* (BOEM 2019c). BOEM provides guidance related to specific survey gears that can be used to complete the fisheries monitoring including otter trawl, beam trawl, acoustic telemetry stations, towed or autonomous PAM platforms, and ROVs. BOEM guidelines stipulate that 2 years of pre-construction monitoring data are recommended, and that data should be collected across all four seasons. Consultations with BOEM and other agencies are encouraged during the development of fisheries monitoring plans.

The FBRMP may occur throughout any of the phases of the Proposed Action. The FBRMP would be revised through an iterative process, and survey protocols and methodologies have been and would continue to be refined and updated based on feedback received from stakeholder groups. Much of the research described in this plan would be performed on commercial fishing vessels that are contracted for this monitoring. Further, the field work described in the monitoring plan would be performed by an independent contractor (e.g., local university, research institution, or consulting firm). Chapter 2 describes the proposed activities in detail. Effects of Project vessels, including the ones that would be used for survey and monitoring activities are considered above.

Any sampling that utilizes gear that may pose a risk to turtle species, including gillnet sampling, could be potentially hazardous to some vulnerable species. All sampling efforts would follow included BMPs to limit capture and entanglement risk.

The lessee must ensure that any buoys attached to the seafloor use buoys, lines (chains, cables, or coated rope systems), swivels, shackles, and anchor designs that prevent any potential entanglement of listed species while ensuring the safety and integrity of the structure or device. All mooring lines and ancillary attachment lines must use one or more of the following measures to reduce entanglement risk: shortest practicable line length, rubber sleeves, weak links, chains, cables, or similar equipment types that prevent lines from looping, wrapping, or entrapping protected species. Any equipment must be attached by a line within a rubber sleeve for rigidity. The length of the line must be as short as necessary to meet its intended purpose. All buoys must be properly labeled with lessee and contact information.

Trawl surveys: The capture and mortality of sea turtles in bottom-trawl fisheries is well documented (Henwood and Stuntz 1987; NMFS and USFWS 1991a, 1992, 2008; National Research Council 1990). NOAA has prioritized reduction of sea turtle interactions with fisheries where these species occur. Finkbeiner et al. (2011) compiled sea turtle bycatch in U.S. fisheries and found that in the Atlantic, a mean estimate of 137,700 interactions, of which 4,500 were lethal, occurred annually since the implementation of bycatch mitigation measures; however, a vast majority of the interactions (98 percent) and mortalities (80 percent) occurred in the Southeast/Gulf of Mexico shrimp trawl fishery, although sampling inconsistencies and limitations should be considered when interpreting this data (NMFS 2014).

While sea turtles are capable of remaining submerged for long periods of time, they appear to rapidly consume oxygen stores when entangled and forcibly submerged in fishing gear (Lutcavage and Lutz 1997); however, the preponderance of available research (Epperly et al. 2002; Sasso and Epperly 2006) and anecdotal information from past trawl surveys indicates that limiting tow times to less than 30 minutes would likely eliminate the risk of death for incidentally captured sea turtles. The proposed trawls would be limited to 20 minutes of tow time. The tow begins when winches are locked and an acceptable net geometry is established. The relatively short tow duration is expected to minimize the potential for interactions with sea turtles and pose a negligible risk of mortality. The proposed mitigation measures would be expected to eliminate the risk of serious injury and mortality from forced submergence for sea turtles caught in the bottom otter trawl survey gear. While mortality is expected to be unlikely from either proposed otter trawl surveys, incidentally captured individuals would suffer stress and potential injury. Where possible, turtles are disentangled and if injured, may be brought back to rehabilitation facilities for treatment and recovery. This helps to reduce the rate of death from entanglement. We expect that incidental capture and entanglement of sea turtles would continue in the action area at a similar rate over the life of the Proposed Action. Safe release, disentanglement protocols, and rehabilitation would help to reduce the severity of impacts of these interactions and these efforts are also expected to continue over the life of the project.

SRWF intends to conduct 180 surveys per year using the same methods and gear as the Northeast Area Monitoring and Assessment Program (NEAMAP) surveys, with 20 minutes per tow. Surveys may be conducted during the 2 years of construction and up to 6 additional years. We then apply the capture rates (Table 3.12-7) to the planned surveys to estimate the number of sea turtles that are likely to be captured during trawl surveys (Table 3.12-8).

Table 3.12-7. Sea Turtle Capture Data and Capture Rates in Northeast Fisheries Science Center-affiliated Research from 2004 through 2013 Reported in Turtles per Tow Hour (t/t-h) and per Tow

Survey	Loggerhead Capture Rate	Kemp's Ridley Capture Rate	Green Capture Rate	Leatherback Capture Rate
NEAMAP – Spring (150 tows/year @ 20 minutes/ tow x 10 year = 500 t-h)	0.014 t/t-h (0.0047/tow)	0	0	0
NEAMAP – Fall (150 tows/year @ 20 minutes/ tow x 10 year = 500 t-h)	0.01 t/t-h (0.0033/tow)	0.016 t/t-h (0.0053 per tow)	0.002 t/t-h (0.0007/tow)	0

Source: NMFS 2016a
NEAMAP = Northeast Area Monitoring and Assessment Program surveys

Table 3.12-8. Estimated Trawl Captures from Surveys Associated with the Sunrise Wind Farm

	Estimated Loggerhead Captures	Estimated Kemp's Ridley Captures	Estimated Green Captures	Estimated Leatherback Captures
Per Year	6.72	7.68	0.96	0
Total (8 Years)	53.76	61.44	7.68	0

Source: NMFS 2016a

Extensive trawl surveys in the region have indicated that leatherback sea turtles are extremely unlikely to be captured during trawl surveys (NMFS 2016a). Therefore, trawl surveys are expected to have a negligible adverse impact to leatherback sea turtles.

Green, loggerhead, and Kemp’s ridley sea turtles may be captured during trawl surveys, and capture would cause stress and may result in injury, and in rare cases, post capture mortality. However, most turtles experience no injury or only minor injuries, and mortality occurs only in a small portion of incidental captures (NMFS 2016a). Because of this, while individuals would experience harassment and injury, and a small number of turtles may be killed, no population-level effects are expected for these species. Trawl surveys would result in minor adverse impacts to green, loggerhead, and Kemp's ridley sea turtles.

Passive Acoustic Monitoring surveys: The use of PAM buoys or autonomous PAM devices to monitor noise, marine mammals, passive acoustic telemetry tags, and the use of sound attenuation devices placed on the seafloor for mitigation during pile driving have been proposed by Sunrise Wind (Sunrise Wind 2023).

Based on previous consultations, BOEM anticipates requiring that moored and autonomous PAM systems that may be used for monitoring would either be stationary (e.g., moored) or mobile (e.g., towed, autonomous surface vehicles [ASVs], or autonomous underwater vehicles [AUVs]), respectively. Moored PAM systems would use the best available technology to reduce any potential risks of entanglement. PAM system deployment would follow the same procedures as those described in the previous section to avoid and minimize impacts on ESA-listed species, as detailed in Appendices AA1 and AA2 of the COP (Sunrise Wind 2023). The use of buoys for moored PAM systems, or any other intended purposes, would pose a discountable risk of entanglement to listed sea turtles.

Autonomous PAM systems could have hydrophone equipment attached that operates autonomously in a defined area. ASVs and AUVs in very shallow water can be operated remotely from a vessel or by line of sight from shore by an operator and in an unmanned mode. These autonomous systems are typically very small, lightweight vessels and travel at slow speeds. ASVs and AUVs produce virtually no self-generated noise and pose a negligible risk of injury to sea turtles from collisions due to their low mass, small size, and slow operational speeds. ASVs and AUVs are not expected to pose any reasonable risk of harm to listed species; therefore, the impacts of this type of survey equipment on sea turtles are negligible.

Gear utilization and fisheries survey impacts to prey: Fisheries surveys are designed not to have measurable impacts to surveyed resources and are not anticipated to have any measurable impact on prey availability for sea turtles. All FBRMP survey efforts would affect only extremely small areas relative to available habitat in the Project area. All bycatch is expected to be returned to the water alive, dead, or injured to the extent that the organisms would shortly die. Injured or deceased bycatch would still be available as prey for sea turtles, particularly loggerhead sea turtles, which are known to eat a variety of live prey as well as scavenge dead organisms. Given this information, any impacts on sea turtles from collection of potential sea turtle prey in the trap gear would be so small that they cannot be meaningfully measured, detected, or evaluated and would be negligible.

Lighting: Lights are required on vessels and heavy equipment during construction. Most scientific studies on lighting effects on sea turtles were conducted at nesting sites, which do not occur in the SRWF and SRWEC. Gless et al. (2008) reported that previous studies showed that previous studies showed that loggerhead turtles were attracted to lights from longline fishing vessels. Gless et al. (2008) conducted a laboratory study to see if juvenile leatherbacks responded to lights in the same way as loggerheads. Their study showed that leatherbacks either failed to orient or oriented at an angle away from the lights and concluded that there is no convincing evidence that marine turtles are attracted to vessel lights. Limpus (2006) indicates that navigation/anchor lights on top of vessel masts are not impactful but that bright deck lights should be shielded, if possible, to reduce impacts to sea turtles. If sea turtles are attracted to the lights, it could increase the potential for interaction with equipment or associated Project impacts. However, due to the nature of Project activities and associated seafloor disturbance, turbidity, and noise, listed species and their prey are not likely to be attracted by lighting because they are disturbed by these other factors. Project APMs (Table H-1, Appendix H) include construction vessel light shielding and operational restrictions to limit light use to required periods and minimize artificial lighting effects on the environment. Considering the APMs and the fact that construction vessel activity is unlikely to measurably alter baseline vessel light levels, construction lighting effects on sea turtles would be negligible.

3.12.5.2 Operations and Maintenance

3.12.5.2.1 Onshore Activities and Facilities

No regular sea turtle nesting occurs in the onshore portion of the proposed Project Area (refer to Section 3.12.1). Construction and operation of onshore facilities is not expected to have any direct impacts to sea turtles, and the potential for impacts is negligible.

3.12.5.2.2 Offshore Activities and Facilities

During O&M, impacts to sea turtles could occur from the following IPFs: seafloor disturbance, sediment suspension and deposition, noise, electric and magnetic fields, discharges and release, trash and debris, vessel traffic, and lighting, and visible structures. Unless noted otherwise, O&M-related impacts would be long-term. The potential for these impacts to occur are discussed in detail in the following sections.

Seafloor disturbance: Impacts to sea turtles from seafloor disturbance during O&M of the proposed Project would be limited to the impacts expected on their benthic prey. Seafloor-disturbing activities during O&M of the SRWEC-OCS and NYS are only expected during non-routine maintenance that may require uncovering and reburying the cables and/or the maintenance of the cable protection. These O&M activities are expected to result in similar impacts on benthic resources as those discussed for the SRWF and could therefore temporarily displace sea turtles due to decreased available forage; however, the extent of disturbance would be limited to specific areas along the SRWEC cable corridor centerline and the footprint of the SRWEC is relatively small when compared to the ample surrounding available benthic/prey habitat. Overall impacts of O&M activities would be negligible for sea turtles.

Sediment suspension and deposition: Any maintenance activities that requires exposing and reburying the IAC, and the use of vessel anchoring and jack-up may result in increases in sediment suspension and deposition, which may temporarily increase turbidity in the water column. These activities are expected to be non-routine events and are not expected to occur with any regularity. As discussed for the construction phase, sediment suspension and deposition could result in very short-term reductions in availability or detectability of sea turtle prey species and would have negligible impacts on prey species targeted for consumption by sea turtles in the SRWF and the overall foraging success of sea turtles.

Noise: Direct impacts to sea turtles associated with noise during O&M of the SRWEC may result from G&G Surveys and support vessel and aircraft noise during routine and non-routine maintenance trips and as a result of G&G surveys. Operational noise of wind turbines would not reach levels that could result in behavioral effects to sea turtles.

G&G survey noise: Throughout the proposed operational life of the SRWEC, Sunrise Wind expects to use a variety of vessels to support O&M, including SOVs with deployable work boats (daughter craft), CTVs, jack-up vessels, and cable-laying vessels. Project vessels would undergo routine maintenance trips between potential ports in New York and Rhode Island and the SRWEC. Noise impacts from vessel use during O&M would be similar to those described for construction. Individual sea turtles may experience direct, short-term, reversible behavioral disruptions due to the incremental and transient contribution of O&M vessels. G&G surveys performed during O&M would adhere to the same mitigation requirements described above for construction and installation and detailed in Appendix H. The limited nature of these effects and number of individuals affected would not be significant at stock or population levels. On this basis, the effects of G&G noise on sea turtles would be short-term and minor.

Vessel noise: During the O&M phase, maintenance vessels would intermittently be required to service the WTGs and OCS-DC. Additionally, recreational and commercial fishing vessel traffic is likely to increase near WTG foundations. Sea turtles have hearing abilities limited to low frequencies, and no injury or behavioral effects from vessel noise are anticipated for planned offshore wind projects. Although sea turtles could become habituated to repeated noise exposure over time (Hazel et al. 2007), vessel noise effects from the Proposed Action to be broadly similar to noise levels from existing vessel traffic in the region. Nonetheless, periodic localized, intermittent, and short-term behavioral impacts on sea turtles could occur. Based on sea turtle responses to other types of disturbance (e.g., Bevan et al. 2018), turtle behavior is expected to return to normal when vessel noise dissipates. Given limited turtle sensitivity to underwater noise produced by vessels, the short-term nature of any behavioral responses, and the patchy distribution of sea turtles in the GAA, the effects of vessel noise from vessel activities during O&M on sea turtles would be negligible.

Aircraft noise: Sunrise Wind expects to use a hoist-equipped helicopter, and unmanned aircraft systems may also be used to support O&M. The type and number of vessels and helicopters would vary over the operational lifetime of the Project. Impacts from aircraft use during O&M would be similar to those described for construction and would have negligible impacts on sea turtles.

WTG operation noise: WTG operation is another source of continuous noise but is not expected to result in biologically significant effects on sea turtles. According to measurements at the Block Island Wind Farm, low-frequency noise generated by turbines reach ambient levels at 164 ft (50 m) (Miller and Potty 2017). Other studies observed noise levels ranging from 109 to 127 dB re 1 µPa at 46 and 65.6 ft (14 and 20 m), respectively, at operational wind farms (Tougaard et al. 2020). Operational noise and ambient noise both increase in conjunction with wind speed, meaning that WTG noise is only audible within a short distance from the source (Kraus et al. 2016; Thomsen et al. 2015). Additionally, SRWF turbines would be direct drive turbines, which result in less WTG noise in the underwater environment. It is not expected that noise from WTG operation would approach or exceed the behavioral threshold for sea turtles. Therefore, operational noise from the Proposed Action would be negligible.

EMF: The proposed Project would consist of two offshore electric transmission systems: 180 mi (290 km) of 161 kilovolt (kV) AC IAC and up to 104.6 mi (168.4 km) of 320 kV direct current Sunrise Wind export cables (SRWEC). These effects would be most intense at locations where the SRWEC cannot be buried and is laid on the bed surface covered by a stone or concrete armoring blanket. Up to 15 percent of the IAC (27 mi [43.45 km]) and up to 5 percent of the SRWEC (5.2 mi [8.4 km]) could require secondary cable protection (including jointing, but not including cable crossings). Exponent Engineering, P.C. (2022) modeled anticipated EMF levels generated by the SRWEC and IAC. It estimated induced magnetic field levels ranging from 13.7 to 76.6 mG on the bed surface above the buried and exposed SRWEC cable and 9.1 to 65.3 mG above the IAC. Induced field strength would effectively decrease to 0 mG within 25 ft (7.6 m) of each cable.

Normandeau et al. (2011) indicate that sea turtles are magnetosensitive and orient to the earth's magnetic field for navigation, but they are unlikely to detect magnetic fields below 50 mG. The majority of SRWEC and IAC would be buried 4 to 6 ft (1.2 to 1.8 m) below the bed surface, reducing the magnetic field in the water column below levels detectable to turtles. The transmission cables could produce magnetic field effects above the 50-mG threshold at selected locations where full burial is not possible; these areas would be localized and limited in extent. Magnetic field strength at these locations would decrease rapidly with distance from the cable and drop to 0 mG within 25 ft (7.6 m). Peak magnetic field strength is below the theoretical 50-mG detection limit along the majority of cable length, only exceeding this threshold above the short-cable segments laid on the bed surface. Those EMF effects would dissipate below the 50-mG threshold within 1 to 2 ft (0.3 to 0.6 m) of the cable surface. This indicates that turtles would only be able to detect induced magnetic fields within 1 to 2 ft (0.3 to 0.6 m) of cable segments lying on the bed surface. These cable segments would be relatively short (less than 100 ft [30 m]) and widely dispersed. Exponent Engineering, P.C. (2022) concluded that the shielding provided by burial and the grounded metallic sheaths around the cables would effectively eliminate any induced electrical field effects detectable to turtles. Given the limited extent of measurable magnetic field levels and limited potential for mobile species like sea turtles to encounter field levels above detectable thresholds, the effects of Project-related EMF exposure on sea turtles would be negligible.

Entrainment: Seawater cooling is needed for the OCS– DC (see Section 3.3.6.1 in COP; Sunrise Wind 2023). During operation, the OCS-DC would require continuous cooling water withdrawals and subsequent discharge of heated effluent back to the receiving waters. The maximum DIF and discharge volume is 8.1 million gallons per day with actual intake flow and discharge volumes that are dependent on ambient source water temperature and facility output. Preliminary hydrodynamic modeling indicates that there would be some highly localized increases in water temperature in the immediate vicinity of the discharge location of the OCS-DC. The design, configuration, and operation of the CWIS for the OCS-DC would be permitted as part of an individual NPDES permit and additional details would be included in the permit application submitted to the USEPA. This would include final results of the hydrodynamic modeling.

The OCS-DC would include three openings for intake pipes located approximately 30 ft (10 m) above the pre-installation seafloor grade. The water depth of the intake pipe openings was selected to minimize the potential of biofouling and entrainment of ichthyoplankton and to take advantage of the cooler water temperatures found at depth to maximize cooling potential of water withdrawn. The design intake velocity at the intake screens is less than 0.5 ft/s (less than 15.25 cm/s). This intake velocity estimate is below the threshold required for new facilities defined at 40 *CFR* §125.84(c) and is therefore protective against the impingement of juvenile and adult life stages of sea turtles.

Because of the included intake screens and relatively low intake velocities, sea turtles are not expected to be at risk for entrainment. Due to the extremely localized nature of temperature effects from cooling water discharge, the potential for impacts to sea turtles would be insignificant. Because sea turtles, at the sizes and life stages that may be present in the area are not expected to be at risk for entrainment, this effect is extremely unlikely to occur and would have negligible impact.

Impacts to prey species: A number of mitigation measures included in the design of the OCS-DC would reduce impacts to sea turtle prey species. The low screen velocity would prevent impingement of mobile prey species. The hydraulic zone of influence of the intake does not extend more than 20 ft from the intake (*draft* USEPA NPDES Permit No. MA0004940). Aquatic organisms including eggs and larvae of prey species and macroplanktonic prey species such as jellyfish and salps species would have to pass through this relatively small area in order to be exposed to the influence of the intake and to potentially become impinged or entrained.

The OCS-DC would include three openings for intake pipes located approximately 30 ft (10 m) above the pre-installation seafloor grade. The water depth of the intake pipe openings was selected to minimize the potential of biofouling and entrainment of ichthyoplankton and to take advantage of the cooler water temperatures found at depth to maximize cooling potential of water withdrawn. The location of the intake pipes should reduce entrainment of pelagic and larval life stages.

Additionally, the OCS-DC is designed with VFD pumps to enable the facility to limit the volume of water it withdraws to the amount required to meet cooling water needs. During colder winter months when Atlantic cod spawn, less cooling water is needed. The VFD pumps would allow the intake flow to be throttled back and the actual intake flow would vary between 4.0 and 5.3 mgd as compared to the design flow of 8.1 mgd. The use of VFDs to achieve projected actual intake flows would result in an estimated 47 percent to 49 percent reduction in entrainment (*draft* USEPA NPDES Permit No. MA0004940). At the proposed average monthly intake flows (4.0-5.3 mgd) distributed over two intake pipes, the estimated actual through-screen velocity at the intake is expected to be 0.21 – 0.28 fps. This through-screen velocity is lower than the velocities used in the modeling described below.

To analyze potential prey impacts that may be affected by OCS-DC operations, one representative species of zooplankton was modeled to estimate proportional impact to planktonic species (which includes sea turtle prey species such as jellyfish and salps), as plankton are the most vulnerable to entrainment. *Calanus finmarchicus* is a heavy-bodied, planktonic copepod that is an important prey species for several organisms in the region. Although additional species of zooplankton within the vicinity of the OCS-DC may also be susceptible to entrainment, *C. finmarchicus* was selected as representative due to its trophic importance in the ecosystem. Using the approach described in COP Appendix N2 (TRC 2023), the entrainment of *C. finmarchicus* from the National Centers for Environmental Information density data was estimated to be 1.1 billion organisms annually. For context, assuming an even distribution of this species and an average depth of 148 ft (45 m), the total abundance of *C. finmarchicus* within Lease Area OCS-A 0487 (109,252 ac) would be close to 2 trillion, and the annual entrainment losses would represent less than 0.1 percent of the local population for this zooplankton species. Using the 0.1 percent impact to *C. finmarchicus* as a proxy for planktonic prey species of sea turtles, it is anticipated that this would result in negligible impacts to sea turtle species prey availability.

It is important to note that these potential estimates assume 100 percent mortality of entrained organisms. There is potential that entrained individuals would survive passage through the CWIS due to short residence time in the system and a maximum water temperature exposure of only 90°F (32°C). Entrainment survival studies at existing power plants do not include directly comparable facilities or environments, but Review of Entrainment Survival Studies: 1970–2000 by EPRI identifies 91.4°F (33°C) as an upper threshold discharge temperature for many organisms to survive entrainment in existing power plants located along the Hudson River in New York (TRC 2023). These potential mechanisms for entrainment survival have not yet been applied to this analysis but could be considered when evaluating overall biological impacts of the OCS-DC operation.

Because the total entrained portion of the population of planktonic prey is less than 0.1 percent, the proportion of prey base that may be affected by the operation of the cooling water system is insignificant and, therefore, would result in negligible adverse impacts to sea turtles.

Accidental releases – contaminants: The SRWF would undergo maintenance as needed, which would necessitate vessels and other equipment at the facility for the life of the proposed Project. This presents an opportunity for accidental discharge or spills of fuels and/or fluids during maintenance activities. Spill response APMs (Table H-1, Appendix H) employed during construction would be implemented during maintenance activities. These APMs are expected to avoid or minimize water quality impacts from accidental spills or releases of pollutants during O&M activities. Impacts on sea turtles from accidental spills or releases of pollutants are considered minor and short-term because of the low probability of the risk and APMs (refer to Section 3.5 *Water Quality* for additional details).

Accidental releases – trash and debris: Impacts to sea turtles from disposal of trash and debris during O&M are expected to be similar to, but of lesser likelihood than during construction, as there would be fewer Project-related marine vessels during this phase, and regulatory requirements and preventative measures would still apply. The unanticipated marine disposal of trash and debris is considered an unpermitted, accidental event, and containment and good housekeeping practices would be implemented to minimize the potential.

Indirectly, there may be an increased number of commercial and recreational fishing vessels that operate around the SRWF, which could increase the occurrence of trash and debris from these vessels being released in the SRWF. This could also increase the potential entanglement risk from netted fishing gear, longlines, ropes, traps, or buoy lines. Although unlikely, there would be potential for entanglement or ingestion of line by sea turtles in the vicinity. Adverse impacts incurred from increased fishing activity in the SRWF are not anticipated, but in the event that a line or cable is lost, it could then present a higher risk of sea turtle entanglement. While such entanglements have the potential for a prolonged impact on the individual and may result in mortality, O&M of the SRWF is not expected to directly increase this risk. Therefore, the proposed Project impacts from trash and debris during O&M would be negligible.

Vessel traffic: The potential impacts of vessel traffic are described above in the discussion of potential vessel traffic impacts during construction and installation (Section 3.12.5.1.2). Sunrise Wind has estimated that proposed Project O&M would involve an estimated 76 trips per year, or 2,660 vessel trips over the lifetime of the Project. The majority of vessel trips (2,500) would originate from the Montauk O&M facility, with rare vessel trips (less than one per month) originating from New London, Connecticut, or potentially other unspecified ports (Table 3.14-8, Sunrise Wind FEIS). The increase in vessel traffic of

76 vessel trips per year represents a 0.4 percent increase of vessel traffic within the Project Area. The negligible increase in vessel traffic due to unplanned maintenance is not expected to lead a significant increase in risk of collision with ESA-listed species due to the low number of vessel transits and the low density of these species in the SRWF and SRWEC.

Project-related vessel traffic during O&M would adhere to the same mitigation requirements described above for construction and installation and detailed in COP, Appendix O3 (LGL Ecological Research Associates 2022). While these measures are intended to minimize the risk of vessel strikes; however, the likelihood of sea turtle injury or mortality resulting from Project-related vessel strikes over the duration of the O&M period cannot be discounted. Green, loggerhead, and Kemp’s ridley sea turtle populations have generally been increasing over the past few decades, while leatherback sea turtle populations have declined. Because the abundance of sea turtles in the Project Area is anticipated to be generally low with patchy distribution, and the proportional increase in vessel traffic also low, the number of sea turtles injured or killed by vessel strikes as a result of Project construction is expected be low and would not result in significant effects at the population level. Because vessel traffic is likely to result in injury or mortality to some individual sea turtles but is not expected to have population-level effects, O&M vessel traffic is expected to have minor long-term adverse impact on sea turtles.

Lighting: The SRWF would include a variety of operational lighting, including navigational lighting for mariners, obstruction lighting for aviators, and vessel/work lighting for maintenance and operations. Orr et al. (2013) indicate that lights on wind generators flash intermittently for navigation or safety purposes and do not present a continuous light source. Limpus (2006) suggests that intermittent flashing lights with a very short “on” pulse and long “off” interval are non-disruptive to marine turtle behavior, irrespective of the color. Limpus (2006) also indicates that navigation/anchor lights on top of vessel masts are unlikely to adversely affect sea turtles but that bright deck lights should be shielded, if possible, to reduce impacts to sea turtles.

Sea turtles’ typical behavior of remaining predominantly submerged would additionally limit the exposure of individuals to operational lighting. Operational lighting would be limited to the minimum required by regulation and for safety (Table H-1, Appendix H), further minimizing the potential for exposure. Based on the available information, it is expected that the impact of operational lighting on sea turtles would be negligible.

Presence of structures: Structural elements of the SRWF would be present for the 25- to 35-year operational life of the proposed Project. Once WTGs and OCS-DC have foundations have been installed within the seafloor, the presence of the operating SRWF would have converted the existing open water habitat to one with increased hard bottom, making it comparable to an artificial reef-like habitat. The presence of the SRWF foundations, scour protection, and IAC protection would create three-dimensional hard-bottom habitats resulting in a reef effect that is expected to attract numerous species of algae, shellfish, finfish, and sea turtles (Langhamer 2012; Reubens et al. 2013; Wilhelmsson et al. 2006). Sea turtles have been observed within the vicinity of offshore structures, such as oil platforms, foraging and resting under the platforms (Gitschlag and Herczeg 1994; National Research Council 1996). High concentrations of sea turtles have been reported around these oil platforms (Gitschlag and Herczeg 1994; National Research Council 1996).

As a result of the increased habitat and foraging opportunities at the new artificial reef-like habitat, sea turtles could potentially remain in areas longer than they normally would and could become susceptible to cold stunning or death; however, artificial habitat created by these offshore structures can provide multiple benefits for sea turtles, including foraging habitats, shelter from predation and strong currents, and methods of removing biological buildup from their carapaces (Barnette 2017; National Research Council 1996). It is estimated that offshore petroleum platforms in the Gulf of Mexico, provided an additional 2,000 mi^2 (5,180 km^2) of hard-bottom habitat (Gallaway 1981). Wakes created by the presence of the foundations may influence distributions of drifting jellyfish aggregations; however, since other prey species available to sea turtles would not be affected by these wakes, impacts on sea turtle foraging are not expected to be substantial (Kraus et al. 2019).

On this basis, BOEM concludes that the presence of visible structures from O&M would have negligible direct effects on sea turtle movement and migration, and negligible to minor beneficial, long-term, indirect effects on the distribution, abundance, and availability of sea turtle prey and forage resources.

3.12.5.3 Conceptual Decommissioning

3.12.5.3.1 Onshore Activities and Facilities

No regular sea turtle nesting occurs in the onshore portion of the proposed Project Area (refer to Section 3.12.1). Decommissioning of onshore facilities is not expected to have any direct impacts to sea turtles, and the potential for impacts is negligible.

3.12.5.3.2 Offshore Activities and Facilities

Proposed Project conceptual decommissioning of offshore components would require the use of construction vessels of similar number and class as used during construction. Decommissioning activities would produce similar short-term effects on sea turtles to those described above for proposed Project construction, including short-term displacement, behavioral alteration, and elevated TSS exposure. Underwater noise and disturbance levels generated during conceptual decommissioning are similar to those described above for construction, with the exception that pile driving would not be required. The monopiles would be cut below the bed surface for removal using a cable saw or abrasive waterjet. Noise levels produced by this type of cutting equipment are generally indistinguishable from engine noise generated by the associated construction vessel (Pangerc et al. 2016). Therefore, this decommissioning equipment would have significantly lower potential for noise effects compared to those already considered for construction vessel noise. Decommissioning activities would be required to obtain all appropriate federal permits and would be required to implement mitigation measures based on those permits and the best available information at that time. It is anticipated that those mitigation measures would be similarly effective as those required for construction and installation. The effects of proposed Project conceptual decommissioning on sea turtles would, therefore, range from negligible to minor.

3.12.5.4 Cumulative Impacts of the Proposed Action

The cumulative impacts of the Proposed Action considers the impacts of the Proposed Action in combination with other ongoing and planned wind activities.

Ongoing and planned activities other than offshore wind development activities that may affect sea turtles include new submarine cables and pipelines, tidal energy projects, oil and gas activities, dredging and port improvement, marine minerals extraction, military use (i.e., sonar, ship strikes), marine transportation, NMFS research initiatives, and installation of new structures on the United States Continental Shelf (refer to Appendix E for a description of ongoing and planned activities). These activities would contribute to the primary IPFs of noise, presence of structures, vessel strikes, incidental capture, and entanglement risk and could result in short-term or permanent displacement and injury to or mortality of individual sea turtles, but population-level effects would not be expected for most sea turtle species.

In the context of reasonably foreseeable environmental trends, ongoing, and planned activities, the Proposed Action would contribute an incremental increase in effects from the primary IPFs for sea turtles.

3.12.5.5 Impacts of Alternative B – Proposed Action on ESA-Listed Species

Based on the information contained in this document, we anticipate that the Proposed Action is likely to have minor adverse impacts to leatherback, loggerhead, Kemp's ridley, or green sea turtles.

3.12.5.6 Conclusions

Impacts from the Proposed Action

Project construction and installation, O&M, and conceptual decommissioning would result in habitat disturbance, entrainment and impingement, underwater and airborne noise, water quality degradation, vessel traffic (strikes and noise), artificial lighting, and potential discharges/spills and trash. BOEM anticipates the impacts resulting from the Proposed Action alone would be **minor** adverse impacts and could include potentially **minor beneficial** impacts. Adverse impacts are expected to result mainly from pile-driving noise and increased vessel traffic. Beneficial impacts are expected to result from the presence of structures.

Cumulative Impacts from the Proposed Action

In the context of other reasonably foreseeable environmental trends and planned actions, the incremental impacts under the Proposed Action resulting from individual IPFs would range from negligible to minor adverse and minor beneficial. Considering all the IPFs together, BOEM anticipates that the overall impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **minor** adverse cumulative impacts to sea turtles and could include potentially **minor beneficial** impacts. The main drivers for impact ratings are pile-driving noise and associated potential for auditory injury, the presence of structures, ongoing climate change, and ongoing vessel traffic posing a risk of collision. The Proposed Action would contribute to the overall impact rating primarily through pile-driving noise and the presence of structures. BOEM made this decision because the overall effect would be detectable and measurable, but these impacts would not result in population-level effects.

While the significance level of impacts would remain the same between the No Action Alternative and the Proposed Action, BOEM could further reduce impacts from the Proposed Action to sea turtles with mitigation measures conditioned as part of the COP approval by BOEM that also includes the mitigation, monitoring, and reporting requirements required in the NMFS biological opinion (see Appendix H).

3.12.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

Under Alternative C-1, the same number of turbine locations (up to 94 WTGs) under the Proposed Action may be approved by BOEM; however, 8 WTG positions from Priority Areas 1, 2, 3 or 4 would be removed from consideration (Figure 2.1-7).

3.12.6.1 Construction and Installation

3.12.6.1.1 Onshore Activities and Facilities

No aspect of Alternative C-1 would alter the construction of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the construction of the onshore activities or facilities other than what is described under the Proposed Action.

3.12.6.1.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-1 would significantly alter the construction methods for offshore structures and installation of equipment compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the construction of the offshore activities or facilities other than what is described under the Proposed Action.

3.12.6.2 Operations and Maintenance

3.12.6.2.1 Onshore Activities and Facilities

No aspect of Alternative C-1 would alter the O&M of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the operation and maintenance of the onshore activities or facilities other than what is described under the Proposed Action.

3.12.6.2.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-1 would significantly alter the O&M methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the O&M of the offshore activities or facilities other than what is described under the Proposed Action.

3.12.6.3 Conceptual Decommissioning

3.12.6.3.1 Onshore Activities and Facilities

No aspect of Alternative C-1 would alter the conceptual decommissioning of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to conceptual decommissioning of the onshore activities or facilities other than what is described under the Proposed Action.

3.12.6.3.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-1 would significantly alter the conceptual decommissioning methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the conceptual decommissioning of the offshore activities or facilities other than what is described under the Proposed Action

3.12.6.4 Cumulative Impacts of Alternative C-1

The cumulative impacts of Alternative C-1 considers the impacts of this alternative in combination with other ongoing and planned wind activities.

Ongoing and planned activities other than offshore wind development activities that may affect sea turtles include new submarine cables and pipelines, tidal energy projects, oil and gas activities, dredging and port improvement, marine minerals extraction, military use (i.e., sonar, ship strikes), marine transportation, NMFS research initiatives, and installation of new structures on the United States Continental Shelf (refer to Appendix E for a description of ongoing and planned activities). These activities would contribute to the primary IPFs of noise, presence of structures, vessel strikes, incidental capture, and entanglement risk and could result in short-term or permanent displacement and injury to or mortality of individual sea turtles, but population-level effects would not be expected for most sea turtle species.

In the context of reasonably foreseeable environmental trends, ongoing, and planned activities, Alternative C-1 would contribute an incremental increase in effects from the primary IPFs for sea turtles.

3.12.6.5 Impacts of Alternative C-1 on ESA-Listed Species

All sea turtles that are likely to occur in the proposed Project Area are listed as threatened or endangered under the ESA; therefore, the effects to these species would the same as described above. Based on the information contained in this document, we anticipate that Alternative C-1 for the SRWF Project is likely to have minor adverse impact to leatherback, loggerhead, Kemp's ridley, or green sea turtles.

3.12.6.6 Conclusions

Impacts from Alternative C-1

Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-1 are the same as described under the Proposed Action (Alternative B), **minor** adverse with potential **minor beneficial** impacts.

Cumulative Impacts from Alternative C-1

Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for cumulative impacts of Alternative C-1 are the same as described under the cumulative impacts of the Proposed Action (Alternative B), **minor** adverse with potential **minor beneficial** impacts.

3.12.7 Alternative C-2 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of up to 12 WTG Positions to the Eastern Side of the Lease Area

The primary effect of this alternative is the relocation of WTGs from priority areas to the eastern portion of the Lease Area. This proposed change would not significantly alter the construction methods, O&M, or conceptual decommissioning and would not result in additional impacts to sea turtles other than those described under the Proposed Action (Alternative B).

3.12.7.1 Construction and Installation

3.12.7.1.1 Onshore Activities and Facilities

No aspect of Alternative C-2 would alter the construction of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the construction of the onshore activities or facilities other than what is described under the Proposed Action.

3.12.7.1.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-2 would significantly alter the construction methods for offshore structures and installation of equipment compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the construction of the offshore activities or facilities other than what is described under the Proposed Action

3.12.7.2 Operations and Maintenance

3.12.7.2.1 Onshore Activities and Facilities

No aspect of Alternative C-2 would alter the O&M of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the operation and maintenance of the onshore activities or facilities other than what is described under the Proposed Action.

3.12.7.2.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-2 would significantly alter the construction methods for offshore structures and installation of equipment compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the construction of the offshore activities or facilities other than what is described under the Proposed Action.

3.12.7.3 Conceptual Decommissioning

None of the proposed changes from Alternative C-2 would significantly alter the O&M methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the O&M of the offshore activities or facilities other than what is described under the Proposed Action.

3.12.7.3.1 Onshore Activities and Facilities

No aspect of Alternative C-2 would alter the conceptual decommissioning of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to conceptual decommissioning of the onshore activities or facilities other than what is described under the Proposed Action.

3.12.7.3.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-2 would significantly alter the conceptual decommissioning methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the conceptual decommissioning of the offshore activities or facilities other than what is described under the Proposed Action.

3.12.7.4 Cumulative Impacts of Alternative C-2

The cumulative impacts of Alternative C-2 consider the impacts of this alternative in combination with other ongoing and planned wind activities.

Ongoing and planned activities other than offshore wind development activities that may affect sea turtles include new submarine cables and pipelines, tidal energy projects, oil and gas activities, dredging and port improvement, marine minerals extraction, military use (i.e., sonar, ship strikes), marine transportation, NMFS research initiatives, and installation of new structures on the United States Continental Shelf (Refer to Appendix E for a description of ongoing and planned activities). These activities would contribute to the primary IPFs of noise, presence of structures, vessel strikes, incidental capture, and entanglement risk and could result in short-term or permanent displacement and injury to or mortality of individual sea turtles, but population-level effects would not be expected for most sea turtle species.

In the context of reasonably foreseeable environmental trends, ongoing, and planned activities, Alternative C-2 would contribute an incremental increase in effects from the primary IPFs for sea turtles.

3.12.7.5 Impacts of Alternative C-2 on ESA-Listed Species

All sea turtles that are likely to occur in the proposed Project Area are listed as threatened or endangered under the ESA; therefore, the effects to these species would the same as described above. Based on the information contained in this document, we anticipate that Alternative C-2 for the SRWF Project is likely to have minor adverse impacts to leatherback, loggerhead, Kemp's ridley, or green sea turtles.

3.12.7.6 Conclusions

Impacts from Alternative C-2

Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-2 are the same as described under the Proposed Action (Alternative B), **minor** adverse with potential **minor beneficial** impacts.

Cumulative Impacts from Alternative C-2

Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for cumulative impacts of Alternative C-2 are the same as described under the cumulative impacts of the Proposed Action (Alternative B), **minor** adverse with potential **minor beneficial** impacts.

3.12.8 Alternative C-3 - Reduced Layout from Priority Areas Considering Feasibility Due to Glauconite Sands

Under the Fisheries Habitat Impact Minimization Alternative C-3, the construction, O&M, and eventual decommissioning of the 11-MW WTGs and an OCS within the proposed Project Area and associated inter-array and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. However, Alternative C-3 was developed to address concerns regarding pile refusal due to glauconite sands in the southeastern portion of the Lease Area while still minimizing impacts to benthic and fisheries resources. Alternative C-3a, C-3b, and C-3c described in Section 3.7.8, *Benthic Resources*, consider different WTG configurations to avoid sensitive habitats and engineering constraints while still meeting the NYSERDA OREC. This alternative only considered removal of WTGs from Priority Area 1 based on consultation with NMFS. Areas with high density of boulder, complex habitat, and data suggesting Atlantic cod aggregation and spawning was considered when determining which WTGs to remove.

3.12.8.1 Construction and Installation

Alternative C-3 differs from Alternative B (Proposed Action) only with the location of the WTGs. Alternatives C-3a, C-3b, and C-3c consider different WTG configurations to avoid sensitive habitats and engineering constraints while still meeting the NYSERDA OREC. This alternative only considered removal of WTGs from Priority Area 1 based on consultation with NMFS. Under Alternative C-3a, up to 87 11-MW WTGs would be installed in the 87 potential positions. Under Alternative C-3b, up to 84 WTGs would be installed in the 87 potential positions. Under Alternative C-3c, 80 WTGs would be installed in the 87 potential positions.

3.12.8.1.1 Onshore Activities and Facilities

No aspect of Alternative C-3 would alter the construction of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the construction of the onshore activities or facilities other than what is described under the Proposed Action.

3.12.8.1.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-3 would significantly alter the construction methods for offshore structures and installation of equipment compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the construction of the offshore activities or facilities other than what is described under the Proposed Action.

3.12.8.2 Operations and Maintenance

3.12.8.2.1 Onshore Activities and Facilities

No aspect of Alternative C-3 would alter the O&M of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the operation and maintenance of the onshore activities or facilities other than what is described under the Proposed Action.

3.12.8.2.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-3 would significantly alter the construction methods for offshore structures and installation of equipment compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the construction of the offshore activities or facilities other than what is described under the Proposed Action.

3.12.8.3 Conceptual Decommissioning

None of the proposed changes from Alternative C-3 would significantly alter the O&M methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the O&M of the offshore activities or facilities other than what is described under the Proposed Action.

3.12.8.3.1 Onshore Activities and Facilities

No aspect of Alternative C-3 would alter the conceptual decommissioning of the proposed onshore facilities as compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to conceptual decommissioning of the onshore activities or facilities other than what is described under the Proposed Action.

3.12.8.3.2 Offshore Activities and Facilities

None of the proposed changes from Alternative C-3 would significantly alter the conceptual decommissioning methods for offshore activities and facilities compared to the Proposed Action (Alternative B). Therefore, there would be no direct or indirect impacts to sea turtles due to the conceptual decommissioning of the offshore activities or facilities other than what is described under the Proposed Action.

3.12.8.4 Cumulative Impacts of Alternative C-3

The cumulative impacts of Alternative C-3 consider the impacts of this alternative in combination with other ongoing and planned wind activities.

Ongoing and planned activities other than offshore wind development activities that may affect sea turtles include new submarine cables and pipelines, tidal energy projects, oil and gas activities, dredging and port improvement, marine minerals extraction, military use (i.e., sonar, ship strikes), marine transportation, NMFS research initiatives, and installation of new structures on the United States Continental Shelf (refer to Appendix E for a description of ongoing and planned activities). These activities would contribute to the primary IPFs of noise, presence of structures, vessel strikes, incidental capture, and entanglement risk and could result in short-term or permanent displacement and injury to or mortality of individual sea turtles, but population-level effects would not be expected for most sea turtle species.

In the context of reasonably foreseeable environmental trends, ongoing, and planned activities, Alternative C-3 would contribute an incremental increase in effects from the primary IPFs for sea turtles.

3.12.8.5 Impacts of Alternative C-3 on ESA-Listed Species

All sea turtles that are likely to occur in the proposed Project Area are listed as threatened or endangered under the ESA; therefore, the effects to these species would the same as described above. Based on the information contained in this document, we anticipate that Alternative C-3 for the SRWF Project is likely to have minor adverse impacts to leatherback, loggerhead, Kemp's ridley, or green sea turtles.

3.12.8.6 Conclusions

Impacts from Alternative C-3

Alternative C-3 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-3 are the same as described under the Proposed Action (Alternative B), **minor** adverse with potential **minor beneficial** impacts.

Cumulative Impacts from Alternative C-3

Alternative C-3 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-3 are the same as described under the cumulative impacts of the Proposed Action (Alternative B), **minor** adverse with potential **minor beneficial** impacts.

3.12.9 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, C-2, and C-3 would have the same overall minor adverse impacts and minor beneficial impacts on sea turtles. Table 3.12-9 provides an overall summary of alternative impacts.

Table 3.12-9. Comparison of Alternative Impacts on Sea Turtles

No Action Alternative (Alternative A)	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)	Fisheries Habitat Minimization Considering Feasibility Due to Glauconite Sands (Alternative C-3)
No Action Alternative: BOEM anticipates that the sea turtle impacts due to current environmental trends and ongoing activities associated with the No Action Alternative would be **minor** adverse with the potential for **minor beneficial** impacts. *Cumulative Impacts of the No Action Alternative:* Under the No Action Alternative, existing environmental trends and ongoing activities, natural and human-caused IPFs would continue to affect sea turtles. BOEM anticipates that the overall cumulative impacts associated Alternative A, the No Action Alternative, when combined with all other planned activities (including offshore wind) in the	*Proposed Action:* BOEM anticipates the impacts resulting from the Proposed Action alone would be **minor** adverse impacts and could include potentially **minor beneficial** impacts. Adverse impacts are expected to result mainly from pile-driving noise and increased vessel traffic. Beneficial impacts are expected to result from the presence of structures. *Cumulative Impacts of the Proposed Action:* In the context of other reasonably foreseeable environmental trends and planned actions, the incremental impacts under the Proposed Action resulting from individual IPFs would be **minor** adverse and **minor beneficial**.	*Alternative C-1:* Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for impacts of Alternative C-1 are the same as described under the Proposed Action, **minor** adverse impacts and potentially **minor beneficial** impact. *Cumulative Impacts of Alternative C-1:* Alternative C-1 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for cumulative impacts of Alternative C-1 are the same as described under the cumulative impacts of the Proposed Action, **minor**	*Alternative C-2:* Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for impacts of Alternative C-2 are the same as described under the Proposed Action, **minor** adverse impacts and potentially **minor beneficial** impact. *Cumulative Impacts of Alternative C-2:* Alternative C-2 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for cumulative impacts of Alternative C-2 are the same as described under the cumulative impacts of the Proposed Action, **minor**	*Alternative C-3:* Alternative C-3 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for impacts of Alternative C-3 are the same as described under the Proposed Action, **minor** adverse impacts and potentially **minor beneficial** impacts. *Cumulative Impacts of Alternative C-3:* Alternative C-3 includes changes to turbine installation locations that would not alter any of the findings for sea turtles. Therefore, the conclusions for impacts and cumulative impacts of Alternative C-3 are the same as described under the cumulative impacts of the Proposed

No Action Alternative (Alternative A)	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)	Fisheries Habitat Minimization Considering Feasibility Due to Glauconite Sands (Alternative C-3)
GAA would result in overall **minor** adverse and **minor beneficial** impacts.	Considering all the IPFs together, BOEM anticipates that the overall cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **minor** adverse impacts to sea turtles and could include potentially **minor beneficial** impacts. The main drivers for impact ratings are pile-driving noise and associated potential for auditory injury, the presence of structures, ongoing climate change, and ongoing vessel traffic posing a risk of collision.	adverse impacts and potentially **minor beneficial** impacts.	adverse impacts and potentially **minor beneficial** impacts.	Action, **minor** adverse impacts and potentially **minor beneficial** impacts.

3.12.10 Summary of Impacts of the Preferred Alternative

BOEM has identified Alternative C-3b as the Preferred Alternative as depicted in Figure 2.1.-10. Alternative C-3b would include installation of up to 84 WTGs, which is 10 fewer WTGs than the maximum WTGs proposed under the PDE of the Proposed Action. BOEM has identified Alternative C-3b as the Preferred Alternative as depicted in Figure 2.1-10. Alternative C-3b would include installation of up to 84 WTGs, which is 10 fewer WTGs than the maximum WTGs proposed under the PDE of the Proposed Action. These impacts include exposure to increased vessel traffic, underwater noise impacts from Project construction and O&M, temporary habitat disturbance, and long-term habitat conversion. These adverse impacts would be avoided and minimized using the same APMs as described in the Proposed Action (see Table 3.12-10 below). Alternative C-3b would also generate similar beneficial reef effects but over a smaller area and with a reduced number of reef-forming structures. The resulting effects to sea turtles would therefore be similar to those described for the Proposed Action but reduced in extent and/or duration. The implementation of the Preferred Alternative in comparison to the Proposed Action (Alternative B) would result in an incremental reduction in effects from some construction and installation, O&M, and decommissioning impacts; however, BOEM anticipates that any incremental reduction in impacts would not change the resulting effects on sea turtles to the extent necessary to alter the impact-level conclusions for any impact mechanism. The incremental impact of Alternative C-3b, when compared to the No Action Alternative, would be similar to the Proposed Action: **minor** adverse impacts with potential **minor beneficial** impacts.

In the context of other reasonably foreseeable environmental trends and planned actions, BOEM also expects that Alternative C-3bs impacts to sea turtles would be similar to the Proposed Action (with individual IPFs leading to impacts ranging from negligible to minor adverse and minor beneficial). The overall impacts of Alternative C3-b when combined with past, present, and reasonably foreseeable activities would therefore be the same level as under the Proposed Action: **minor** adverse with potentially **minor beneficial** impacts.

3.12.11 Proposed Mitigation Measures

The mitigation measures listed in Table 3.12-10 are recommended for inclusion in the Preferred Alternative.

Table 3.12-10. Proposed Mitigation Measures: Sea Turtles

Measure	Description	Effect
Marine debris awareness training	The Lessee must ensure that vessel operators, employees, and contractors engaged in offshore activities pursuant to the approved COP complete marine trash and debris awareness training annually. By January 31 of each year, the Lessee must submit to USDOI an annual report that describes its marine trash and debris awareness training process, number of people trained, estimated related costs, and certifies that the training process has been followed for the previous calendar year.	Marine debris and trash awareness training would minimize the risk of sea turtle ingestion of or entanglement in marine debris. While adoption of this measure would decrease risk to marine mammals under the Proposed Action, it would not alter the impact determination of negligible for accidental releases.
PAM Plan	BOEM, BSEE, and USACE shall ensure that Sunrise Wind prepares a PAM Plan that describes all proposed equipment, deployment locations, detection review methodology and other procedures, and protocols related to the required use of PAM for monitoring. This plan must be submitted to NMFS, BOEM and BSEE (at OSWsubmittals@bsee.gov) for review and concurrence at least 90 days prior to the planned start of pile driving.	Sunrise Wind has committed to implementing passive acoustic monitoring, pile driving monitoring, PSO coverage, sound field verification, and shutdown zones as part of the Proposed Action. Compliance with these APMs would be enforced by BOEM, BSEE, and NMFS as indicated in Table H-1. Implementation and
Pile driving monitoring plan	BOEM shall ensure that Sunrise Wind prepare and submit a *Pile Driving Monitoring Plan* to NMFS and BSEE (at OSWsubmittals@bsee.gov) for review and concurrence at	

<table>
<thead>
<tr><th>Measure</th><th>Description</th><th>Effect</th></tr>
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<tr><td></td><td>least 90 days before start of pile driving. The plan shall detail all plans and procedures for sound attenuation as well as for monitoring ESA-listed whales and sea turtles during all impact and vibratory pile driving. The plan shall also describe how BOEM, BSEE, and Sunrise Wind would determine the number of whales exposed to noise above the Level B harassment threshold during pile driving with the vibratory hammer to install the cofferdam at the sea-to-shore transition. Sunrise Wind must obtain NMFS’ concurrence with this plan prior to starting any pile driving.</td><td rowspan="5">enforcement of these APMs would minimize the potential for underwater noise exposure to sea turtles during the conduct of impact pile driving, vibratory pile driving, HRG surveys, and UXO detonation, as disclosed in the analysis of the Proposed Action.

Agency-proposed mitigation measures would further define how the effectiveness and enforcement of APMs would be ensured, by requiring that Sunrise Wind submit PAM and pile driving monitoring plans for approval by BOEM, BSEE, and NMFS and a sound field verification plan for approval by BOEM and BSEE; by ensuring that PSO coverage is sufficient and requiring deployment of additional PSOs or platforms if found insufficient or in the event that clearance or shutdown zones are expanded beyond the distances modeled prior to verification.

While adoption of these measures would increase accountability and ensure the effectiveness of APMs, it would not alter the impact determination of minor for the underwater noise IPF for sea turtles, because analysis of the Proposed Action already includes analysis of the APMs outlined in Table H-1.</td></tr>
<tr><td>PSO Coverage</td><td>BOEM, BSEE, and USACE shall ensure that PSO coverage is sufficient to reliably detect marine mammals and sea turtles at the surface in clearance and shutdown zones to execute any pile driving delays or shutdown requirements. If, at any point prior to or during construction, the PSO coverage that is included as part of the Proposed Action is determined not to be sufficient to reliably detect ESA-listed whales and sea turtles within the clearance and shutdown zones, additional PSOs and/or platforms would be deployed. Determinations prior to construction would be based on review of the Pile Driving Monitoring Plan. Determinations during construction would be based on review of the weekly pile driving reports and other information, as appropriate.</td></tr>
<tr><td>Sound field verification</td><td>BOEM, BSEE, and USACE shall ensure that if the clearance and/or shutdown zones are expanded, PSO coverage is sufficient to reliably monitor the expanded clearance and/or shutdown zones. Additional observers shall be deployed on additional platforms for every 1,500 m that a clearance or shutdown zone is expanded beyond the distances modeled prior to verification.</td></tr>
<tr><td>Shutdown zones</td><td>BOEM, BSEE, and USACE may consider reductions in the pre-start clearance and/or shutdown zones based on the sound field verification measurements. BOEM and BSEE shall ensure that Sunrise Wind submits a Sound Field Verification Plan for review and approval at least 90 days prior to the planned start of pile driving.</td></tr>
<tr><td>Monitoring zone for sea turtles</td><td>BOEM, BSEE, and USACE shall ensure that Sunrise Wind monitors the full extent of the area where noise would exceed the 175 dB rms threshold for sea turtles for the full duration of all pile driving activities and for 30 minutes following the cessation of pile driving activities and record all observations in order to ensure that all take that occurs is documented.</td></tr>
</tbody>
</table>

Measure	Description	Effect
Look out for sea turtles and reporting	Between June 1 and November 30, Sunrise Wind shall have a trained lookout posted on all vessel transits during all phases of the project to observe for sea turtles. The trained lookout would communicate any sightings, in real time, to the captain so that the requirements below can be implemented. Look out protocols are briefly summarized here. See Table H-3 for more information. The trained lookout would maintain a vigilant watch and monitor a Vessel Strike Avoidance Zone (500 m) at all times to maintain minimum separation distances from ESA-listed species. If a sea turtle is sighted within 100 m or less of the operating vessel's forward path, the vessel operator would slow down to 4 knots (unless unsafe to do so) and then proceed away from the turtle at a speed of 4 knots or less until there is a separation distance of at least 100 m at which time the vessel may resume normal operations. If a sea turtle is sighted within 50 m of the forward path of the operating vessel, the vessel operator would shift to neutral when safe to do so and then proceed away from the turtle at a speed of 4 knots. The vessel may resume normal operations once it has passed the turtle. Vessel captains/operators would avoid transiting through areas of visible jellyfish aggregations or floating sargassum lines or mats. In the event that operational safety prevents avoidance of such areas, vessels would slow to 4 knots while transiting through such areas. The only exception is when the safety of the vessel or crew necessitates deviation from these requirements on an emergency basis. If any such incidents occur, they must be reported to NMFS and BSEE within 24 hours. If a vessel is carrying a PSO or trained lookout for the purposes of maintaining watch for North Atlantic right whales, an additional lookout is not required and this PSO or trained lookout must maintain watch for whales and sea turtles.	Measures to minimize vessel interactions would reduce risk of vessel strike. While adoption of this measure would reduce risk to sea turtles under the Proposed Action, it would not alter the impact determination of minor for vessel traffic.
Sea turtle/Atlantic sturgeon identification and data collection	Any sea turtles or Atlantic sturgeon caught and/or retrieved in any fisheries survey gear would first be identified to species or species group. Each ESA-listed species caught and/or retrieved would then be properly documented using appropriate equipment and data collection forms. Biological data, samples, and tagging would occur as outlined below. Live, uninjured animals should be returned to the water as quickly as possible after completing the required handling and documentation. See detailed information in Table H-3.	The regular hauling of sampling gear, recovery of lost survey gear, sea turtle disentanglement, and handling and resuscitation guidelines would reduce risk of entanglement or effects of entanglement in fisheries survey gear. Gear identification, sea turtle identification, and data collection would improve accountability in the case of gear loss or gear entanglement. While adoption of these measures would reduce risk to sea turtles
Sea turtle/Atlantic sturgeon	Any sea turtles or Atlantic sturgeon caught and retrieved in gear used in fisheries surveys would be handled and resuscitated (if unresponsive) according to established	

Measure	Description	Effect
handling and resuscitation guidelines	protocols and whenever at-sea conditions are safe for those handling and resuscitating the animal(s) to do so. Specific protocols are outlined in Table H-3.	and improve accountability under the Proposed Action, it would not alter the impact determination of minor for gear utilization.
Take notification	GARFO PRD would be notified as soon as possible of all observed takes of sea turtles, and Atlantic sturgeon occurring as a result of any fisheries survey. Specific protocols are outlined in Table H-3.	Reporting requirements to document take would improve accountability for documenting sea turtle take associated with the Proposed Action. While adoption of these measures would improve accountability, it would not alter the overall impact determination for the Proposed Action.
Monthly/ annual reporting requirements	BOEM and BSEE would ensure that Sunrise Wind submits regular reports (in consultation with NMFS) necessary to document the amount or extent of take that occurs during all phases of the Proposed Action. Details of reporting would be coordinated between Sunrise Wind, NMFS, BOEM and BSEE. All reports would be sent to: nmfs.gar.incidental-take@noaa.gov and BSEE at OSWsubmittals@bsee.gov.	
Nighttime pile driving monitoring plan	BOEM would require Sunrise Wind to submit a nighttime pile driving monitoring plan for NMFS and BOEM review and approval six months prior to initiating impact pile driving activities. The purpose of the plan is to demonstrate that Sunrise Wind can meet the visual monitoring criteria for the Level A harassment zone(s)/mitigation and monitoring zones plus an agreed upon buffer zone (these combined zones are referred to henceforth as the nighttime clearance and shutdown zones) with the technologies Sunrise Wind is proposing to use for monitoring during nighttime impact pile driving. The nighttime pile driving monitoring plan would include the following components: identification of night vision devices (e.g., mounted thermal/IR camera systems, hand-held or wearable NVDs, IR spotlights) that would be used to detect protected marine mammal and turtle species relative to the nighttime clearance and shutdown zones; discussion of the efficacy (range and accuracy) of each device proposed for nighttime monitoring, including an assessment of the results of the Thayer Mahan Field Trial, and only devices that meet the visual monitoring criteria as demonstrated by Thayer Mahan Field Trial to be capable of detecting marine mammals and sea turtles to the maximum extent of the nighttime clearance and shutdown zones would be acceptable for nighttime monitoring (use of devices not assessed in the Thayer Mahan Field Trial would not be permitted); procedures and timeframes for notifying NMFS, BOEM and BSEE of Sunrise Wind's intent to pursue nighttime impact pile driving; and, reporting procedures, contacts, and timeframes.	Adoption of this measure could increase the ability of Sunrise Wind to detect sea turtles during pile driving but, given the small amount of time that sea turtles spend at the surface, these measures would not eliminate the minor impacts of pile-driving noise on sea turtles.

Measure	Description	Effect
Data Collection Biological Assessment BMPs	BOEM and BSEE would ensure that all Project Design Criteria and Best Management Practices incorporated in the Atlantic Data Collection consultation for Offshore Wind Activities (June 2021) shall be applied to activities associated with the construction, maintenance and operations of the Sunrise Wind project as applicable.	Compliance with Project Design Criteria and best management practices for protected species would minimize risk to sea turtles during HRG surveys. While adoption of this measure would decrease risk to sea turtles under the Proposed Action, it would not alter the impact determination of negligible for HRG activities.
Vessel speed restriction	All vessels 65 ft (20 m) or longer subject to the jurisdiction of the U.S. would comply with the 10-knot speed restriction when entering or departing a port or place subject to U.S. jurisdiction, and in any SMA during North Atlantic right whale (NARW) migratory and calving periods from November 1 to April 30 Standard plan: "Between November 1 and April 30: Vessels of all sizes would operate port to port (from ports in NJ, NY, MD, DE, and VA) at 10 knots or less between November 1 and April 30 except for vessels while transiting in Narragansett Bay or Long Island Sound which have not been demonstrated by best available science to provide consistent habitat for North Atlantic right whales. Vessels transiting from other ports outside those described would operate at 10 knots or less when within any active SMA or within the Wind Development Area, including the Sunrise Wind Farm and Sunrise Wind Export Cable. Year Round: Vessels of all sizes would operate at 10 knots or less in any Dynamic Management Areas.	While adoption of this measure would reduce risk to sea turtles under the Proposed Action, it would not alter the impact determination of minor for vessel traffic.

3.12.11.1 Effect of Measures Incorporated into the Preferred Alternative

The mitigation measures listed in Table 3.12-10 are recommended for inclusion in the Preferred Alternative. These measures are detailed in Table 3.12-10 and include vessel speed restrictions, protocols for reporting, specific protocols for monitoring and mitigation during pile driving, and other strategies. These measures, if adopted, would have the effect of further reducing the overall impact from the Preferred Alternative.

In addition to the mitigation listed above, NMFS has identified terms and conditions in the Biological Opinion for the Sunrise Wind Project in support of BOEM’s ESA consultation with NMFS. These terms and conditions are included in Appendix H, Table H-2 and the final terms and conditions would be incorporated into the ROD as conditions of COP approval.

3.13 Wetlands and Other Waters of the United States

3.13.1 Description of Affected Environment

This section discusses potential impacts on wetlands and other WOTUS from the proposed Project, alternatives, and future offshore wind activities in the GAA (Appendix D, Figure D-10). The Wetlands and other WOTUS GAA as described in Appendix D, includes the terrestrial components of the Carmans River-Great South Bay watershed (HUC-0203020203) and Shinnecock Bay-Atlantic Ocean watershed (HUC-0203020206).

The National Wetlands Inventory (NWI) data was used to determine the potential presence of wetlands within the proposed Project Area. The onshore portions of the project are located within the Carmans River-Great South Bay watershed (HUC-0203020203) and Shinnecock Bay-Atlantic Ocean watershed (HUC-0203020206), which are part of the Southern Long Island Subbasin (HUC-02030202). The Project landfall site begins at Smith Point County Park of Fire Island and crosses the William Floyd Parkway and the ICW to Smith Point Marina located on the mainland. Smith Point Park falls within Fire Island National Seashore and abuts the eastern end of the Otis Pike Fire Island High Dune Wilderness (Figure 3.13-2). This is the only federally designated wilderness area in the state of New York.

Within the GAA (Appendix D, Figure D-10), NWI data identified a variety of freshwater and tidal wetlands (Table 3.13-1). Freshwater forested/shrub wetland communities account for more than half of all the freshwater wetlands in the GAA (Figure 3.13-1 and Figure 3.13-2). Riverine wetlands in the GAA are exclusively associated with the Carmans River (Figure 3.13-1). Tidal wetlands include both estuarine and marine wetlands and are associated with the ICW and the Atlantic Ocean (Figure 3.13-2).

Table 3.13-1. National Wetlands Inventory Wetlands in the Geographic Analysis Area

Wetland Type	Acres	Percent Total
Freshwater Wetlands		
Freshwater emergent wetland	271.1	8.1%
Freshwater forested/shrub wetland	1,779.5	53.2%
Freshwater pond	754.2	22.6%
Lake	505.7	15.1%
Riverine	29.7	0.9%
Palustrine farmed [1]	4.0	0.1%
Total	**3,344.2**	**100%**
Tidal Wetlands		
Estuarine and marine wetland	9,130.7	3.1%
Estuarine and marine deepwater	287,750.0	96.9%
Total	**296,880.7**	**100%**

Source: USFWS 2022

[1] Farmed wetlands are defined as wetlands where "the soil surface has been mechanically or physically altered for production of crops, but where hydrophytes would become reestablished if the farming were discontinued."

Significant Natural Communities. Four wetland communities adjacent to the proposed onshore facilities were identified as significant natural communities by the NYNHP (see agency correspondence in Appendix C of Appendix L of the COP, Stantec 2022). These community types include the red maple – blackgum swamp, the brackish tidal marsh, the marine back-barrier Lagoon, and the marine eelgrass meadow.

Red Maple-Blackgum Swamp. A red maple - blackgum swamp is present along the eastern side of the Carmans River south of the LIE Service Road. Dominant tree species include black tupelo (*Nyssa sylvatica*) and red maple (*Acer rubrum*) along with understory species such as clammy azalea (*Rhododendron viscosum*) and coastal sweet pepperbush (*Clethra alnifolia*) (NYSDEC 2008). This freshwater wetland is located approximately 300 ft (91 m) south of the LIE Service Road. No impacts to this wetland are anticipated.

Brackish Tidal Marsh. A 214-ac (87 ha) brackish tidal marsh was identified along the Carmans River approximately 0.5 (0.8 km) south of the onshore transmission cable location. This community is dominated by graminoids including salt marsh bulrush (*Bolboschoenus robustus*), Olney three-square (*Schoenoplectus americanus*), and wild rice (*Zizania aquatica*) (NYSDEC 2008). Due to the distance of this community to the proposed Project, no impacts to this wetland are anticipated.

Marine Eelgrass Meadow. Extensive eelgrass (*Zostera marina)* meadows are present in Narrow Bay between Smith Point County Park on Fire Island and Smith Point Marina on the mainland. The grass beds provide spawning and foraging habitat for mollusks, crustaceans, juvenile fish, and diving ducks and help stabilize sediments (NYSDEC 2008; Edinger et al. 2014). Further discussion of SAV is provided in Section 3.7 (*Benthic Resources*).

Marine Back-barrier Lagoon. A large marine back-barrier lagoon occurs in parts of Great South Bay and Moriches Bay near the landfall/ICW work area, surrounded by developed lands. The protected shores of the lagoons support grass beds, mudflats, and salt marshes. The trenchless construction methods currently proposed to install the onshore transmission cable would avoid and minimize potential impacts to this community type.

A wetland delineation was conducted in the proposed Landfall/ICW work areas and along the proposed onshore transmission cable route (COP, Appendix L, Stantec 2022). Several tidal and freshwater wetlands were delineated during the field surveys for the proposed Project (Figure 3.13-1 and Figure 3.13-2). These wetlands included three tidal wetlands and two freshwater wetlands associated with the Landfall/ICW Area/Temporary Landing Structure on Fire Island, and two freshwater watercourses, two freshwater waterbodies, and five freshwater wetlands associated with the onshore transmission cable route (COP, Section 4.4.1.1, Sunrise Wind 2023).

Landfall/ICW Area/Temporary Landing Structure

Tidal wetlands occur along the low energy bay side of Fire Island. The three delineated tidal wetlands are characterized as estuarine, intertidal wetlands (E1SS/EM) and occur on sand and sandy loam soils. Common plant species include Jesuit's bark (*Iva frutescens*), common reed (*Phragmites australis*), rambler rose (*Rosa multiflora*), and groundsel tree (*Baccharis halimifolia*).

Both freshwater wetlands associated with Landfall/ICW Area are palustrine emergent wetlands (PEM) that occur in a man-made basin. These wetlands are dominated by common reed and soils range from sand to fine sandy loam soils.

Onshore Transmission Cable Route

The onshore transmission cable would run adjacent to NYSDEC-regulated freshwater wetlands at the Carmans River. The Carmans River may be used by New York RTE species including species of special concern such as the eastern box turtle (*Terrapene carolina carolina*) and osprey (*Pandion haliaetus*); New York threatened species including the pied-billed grebe (*Podilymbus podiceps*); and New York endangered species such as the peregrine falcon (*Falco peregrinus*) and eastern box turtle (*Terrapene carolina carolina*). Some segments of the river also support concentrations of sea-run brown trout (*Salmo trutta*) and wild brook trout (*Salvelinus fontinalis*) (NYSDEC 2008).

The Carmans River is impounded by a small dam at approximately 3.5 RM upstream of the river mouth, resulting in a lacustrine waterbody (L1UBHh) north of Horseblock Road/ Victory Avenue. South of the dam, the Carmans River has been channelized (R2UBH) as a result of historic roadway construction. Field delineations identified a second perennial watercourse (R2UB2) flowing southeast from a freshwater pond (PUBHh) to the impounded lacustrine waterbody associated with the Carmans River.

One isolated palustrine scrub shrub wetland (PSS1E) was identified south of the freshwater pond (Figure 3.13-1. This wetland occurs on mucky peat soils in a confined basin. Common vegetation includes clammy azalea, highbush blueberry (*Vaccinium corymbosum*), and skunk cabbage (*Symplocarpus foetidus*).

Four forested wetlands (PFO1E) were delineated during field surveys. Soils ranged from sand to mucky peat. Common vegetation includes red maple, black tupelo , American elm (*Ulmus americana*), highbush blueberry, clammy azalea, coastal sweet pepperbush (*Clethra alnifolia*), smooth arrow-wood (*Viburnum recognitum*), maleberry (*Lyonia ligustrina*), lamp rush (*Juncus effusus*), cinnamon fern (*Osmundastrum cinnamomeum*), tussock sedge (*Carex stricta*), and skunk cabbage (Sunrise Wind 2023; Stantec 2022; DNV-GL 2021).

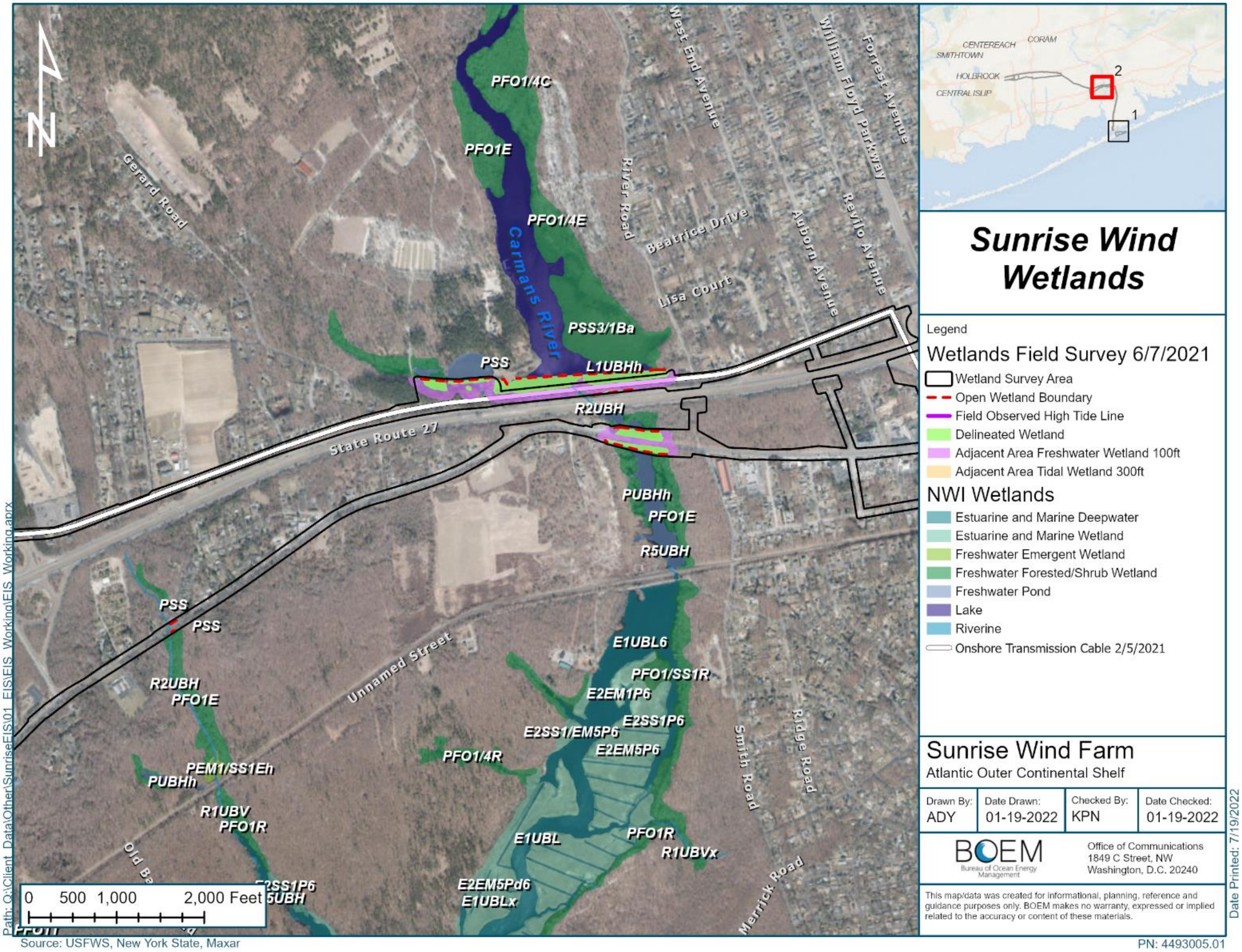

Figure 3.13-1. Delineated and NWI Wetlands in Project Area Crossing Carmans River

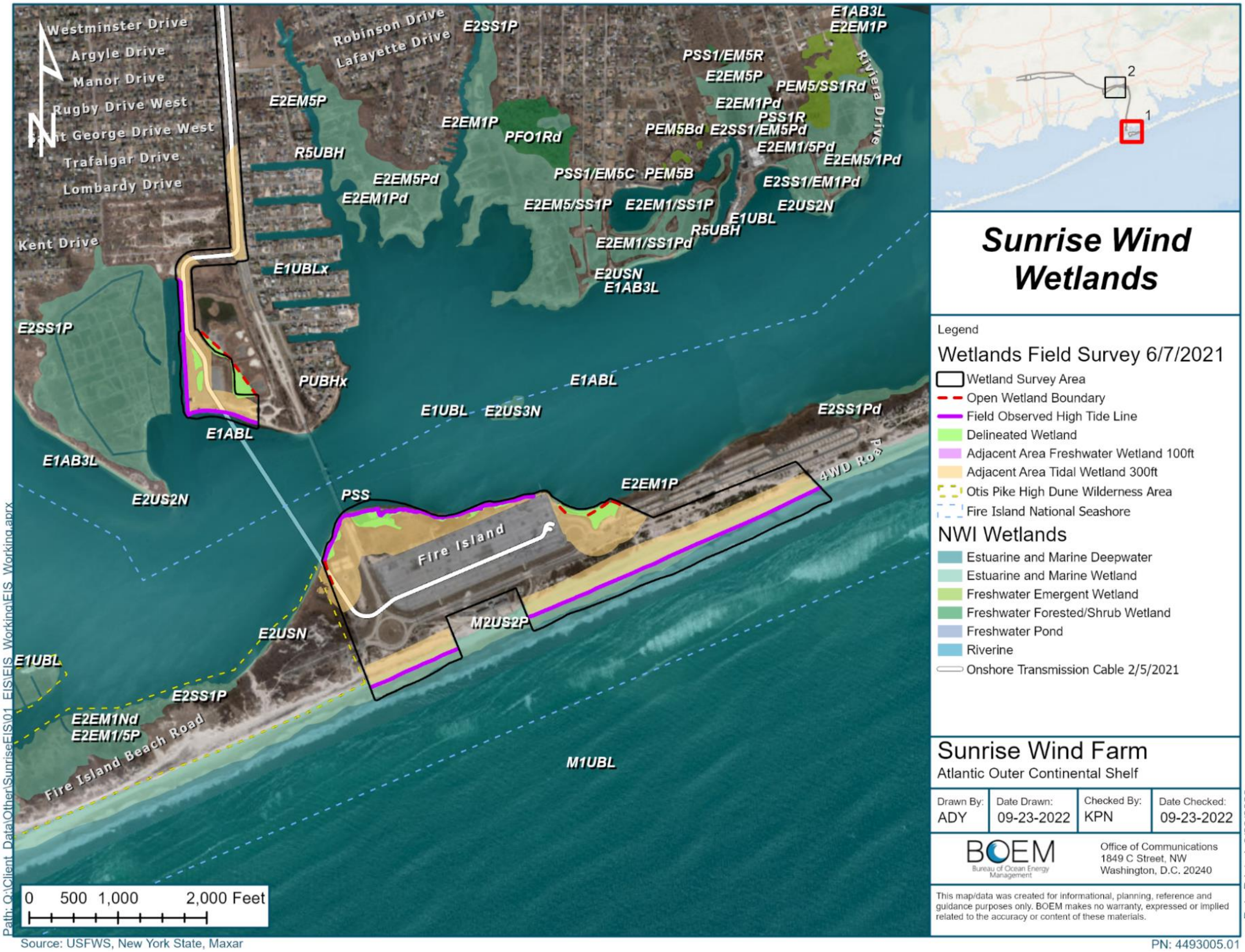

Figure 3.13-2. Delineated and NWI Wetlands in Project Area

3.13.2 Impact Level Definitions for Wetlands and Other Waters of the United States

This Final EIS uses a four-level classification scheme to analyze potential impact levels on wetlands and other WOTUS from the alternatives, including the Proposed Action. Impacts are categorized as beneficial or adverse and may be short-term (temporary) or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur for the duration of the project or beyond project operations and decommissioning.

The USACE and NYSDEC define wetland impacts differently than BOEM as defined under CWA Section 404. The USACE defines temporary impacts as those that occur when fill or cut impact occur in wetlands that are resorted to pre-construction contours when construction activities are complete. Conversion of a wetland type is considered a permanent impact.

Table 3.13-2 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for wetlands and other WOTUS. Table G-12 in Appendix G identifies potential IPFs, issues, and indicators to assess impacts to wetlands and other WOTUS.

Table 3.13-2. Definition of Potential Adverse and Beneficial Impact Levels for Wetlands and Other Waters of the United States

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	Either no effect or no measurable impacts.	Either no effect or no measurable impacts
Minor	Small, measurable, adverse impacts to local wetland or other WOTUS extent, quality, or function; localized; could be avoided with mitigation; impacts that do occur are short-term or temporary in nature; complete recovery anticipated	Small and measurable effects that would increase the extent, quality, and functions of wetlands and other WOTUS in the proposed Project Area
Moderate	Notable and measurable adverse impacts to the extent, functions, or quality of wetlands or other WOTUS could occur, and the affected resource would recover completely with remedial or mitigating activities within a specified time frame.	Notable and measurable effects comprising an increase in the extent, functions, or quality of wetlands or other WOTUS in the proposed Project Area
Major	Measurable, long-term, and widespread (regional or population-level) adverse impacts to the extent, functions, or quality of wetlands or other WOTUS could occur, and full recovery not anticipated even with remediation or mitigation.	Measurable and widespread (regional or population-level) increase in extent, function, or quality of wetlands or other WOTUS.

3.13.3 Impacts of Alternative A - No Action on Wetlands and Other Waters of the United States

When analyzing the impacts of the No Action Alternative on WOTUS, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities, on the baseline conditions for WOTUS. The cumulative impacts of the No Action Alternative considered the impacts of the No Action Alternative in combination with other planned non-offshore wind and offshore wind activities, as described in Appendix E (*Planned Activities Scenario*).

3.13.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, impacts to wetlands would still be affected by IPFs from other ongoing activities and current environmental trends such as land use and climate change. Ongoing onshore development activities other than offshore wind within the GAA and climate change may contribute to impacts to wetlands or areas near wetlands. Onshore development activities may include visible infrastructure such as onshore wind turbines and cell towers, port development, other energy projects such as transmission and pipeline projects, and coastal development projects driven by population growth such as residential, commercial, and industrial development. Appendix E (Planned Activities Scenario) provides a description of ongoing activities that may have continuing temporary or permanent impacts to wetlands and areas adjacent to wetlands. Onshore construction activities may permanently (e.g., fill placement) and temporarily (e.g., vegetation removal, noise) impact wetland habitat, flora and fauna, water quality, and hydrological functions. All activities would be required to comply with federal, state, and local regulations protecting wetlands and other WOTUS, thereby avoiding or minimizing impacts. Mitigation would be anticipated for projects to compensate for wetland loss. Climate change is anticipated to continue to impact wetlands and other WOTUS. Sea level rise caused by climate change would result in the conversion of vegetated wetlands into open water which would result in a loss of wetland functions associated with vegetated wetlands. Although wetlands may migrate landward, onshore features such as steep slopes or developed landscapes may impede the transition. Rising sea levels may cause saltwater encroachment into freshwater wetlands which would result in a change in wetland plant communities, habitat, and wetland functions.

Ongoing offshore wind activities within the GAA that contribute to impacts on wetlands include:

- Continued O&M of the Block Island Project (5 WTGs) installed in state waters;
- Continued O&M of the CVOW project (2 WTGs) installed in OCS-A 0497, and;
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of the Block Island and CVOW projects and ongoing construction of the Vineyard Wind 1 and South Forks projects would affect wetlands through the primary IPFs of land disturbance, sediment suspension and deposition, discharges and releases, and noise. Ongoing offshore wind activities would have the same type of impacts from of land disturbance, sediment suspension and deposition, discharges and releases, and noise that are described in the following section for planned offshore wind activities.

3.13.3.2 Cumulative Impacts of the No Action Alternative

Future offshore wind activities and current environmental trends may have impacts on wetlands and other WOTUS if onshore activities from these projects overlaps with the GAA. Appendix E provides additional information on other ongoing and planned actions considered in the planned activities scenario that contribute to the No Action baseline. Future offshore wind activities including projects proposed for development in Lease Area 0500 Bay State would likely have cable landings intersecting the GAA of the Proposed Action. Potential impacts of future offshore wind activities would likely be similar to those of the Proposed Action.

Land disturbance: Construction of onshore components for potential future offshore wind projects is anticipated to require vegetation clearing, excavating, trenching, filling, and grading. These activities may permanently or temporarily reduce, alter, or degrade wetland resources. Fill material permanently placed in wetlands during construction would result in the permanent loss of wetland habitat and functions, including flood and storage capacity and water quality functions, such as nutrient removal and sediment stabilization. Partially filling or fragmentation of a wetland may result in changes in wetland vegetation communities (e.g., forested wetland to herbaceous wetland). This could result in habitat loss or a change in natural hydrologic flow impeding a wetland’s capacity to retain stormwater and floodwater. Permanent fill, fragmentation, or alteration in vegetation communities could drive out native, wetland species, and provide habitat for opportunistic edge and invasive species. Permanent wetland loss or alteration could affect wetlands within the watershed and reduce capacity of regional wetlands to provide wetland functions. Short-term impacts, such as rutting, compaction, and mixing of topsoil and subsoils during construction activities may temporarily affect the function of wetlands. Impacts from land disturbance on wetlands would be moderate because permanent wetland impacts would likely occur, and compensatory mitigation would be required under Section 404 of the CWA.

Sediment suspension and deposition: Sedimentation resulting from construction activities would increase the concentration of suspended solids in the water column which would affect water quality and wetland functions (e.g., smother sensitive vegetation, reduce water oxygen levels, or decrease the water storage capacity of the wetland) in adjacent or nearby wetlands or other WOTUS. The degree of impacts would depend on the type of construction activity, the extent of sediment loads, the duration of suspended sediment, and the proximity of the activities to the wetland. These impacts would be expected to be short-term and would occur largely during construction and decommissioning of the project (Refer to Section 3.5 *Water Quality*). However, sedimentation may occur during O&M if new ground disturbance is required during routine maintenance.

Discharges and releases: Spills or accidental releases of fuels, lubricants, or hydraulic fluids could occur during the construction of onshore components and could impact adjacent or nearby wetland or other WOTUS by reducing water quality and degrading habitat. Although a primary function of wetlands is to filter contaminants, a significant increase in the contaminate load could inhibit the wetland from performing water quality functions. Accidental spills are most likely to occur during construction and decommissioning but may occur during O&M to a lesser extent. However, due to construction and compliance measures, the frequency of spills and the volume of spilled materials are expected to be small. Compliance with applicable state and federal regulations related to oil spills and waste handing would minimize potential impacts from accidental spills. Trash and debris from onshore work area during construction of onshore components could have also have temporary effects on water quality and habitat in adjacent or nearby wetland or other WOTUS. With proper waste management procedures, the potential for trash or debris to be inadvertently introduced into wetland or other WOTUS is unlikely. Impacts for accidental releases and trash or debris are expected to be minor.

Noise: Noise from ongoing and planned offshore wind construction activities is not expected to be noticeable in onshore wetland habitats due to the distance to the offshore activities. However, noise from onshore activities and construction of other onshore facilities, would disturb and displace wetland fauna. Noise pollution is a reported threat to faunal groups such as amphibians, reptiles, and invertebrates, which are highly threatened (Sordello et al. 2020). Overall, noise is not anticipated to cause any meaningful change to coastal habitats and fauna, resulting in negligible impacts.

Climate Change: Climate change is anticipated to continue to impact wetlands and other WOTUS. Sea level rise caused by climate change would result in the conversion of vegetated wetlands into open water which would result in a loss of wetland functions associated with vegetated wetlands. Although wetlands may migrate landward, onshore features such as steep slopes or developed landscapes may impede the transition. Rising sea levels may cause saltwater encroachment into freshwater wetlands which would result in a change in wetland plant communities, habitat, and wetland functions.

The extent of wetland impacts from these IPFs would depend on the type of construction activity and the proximity of these activities to wetlands. It is anticipated that these impacts would largely occur during construction and decommissioning. Impacts during O&M would likely occur in the event of a fault or failure and would be expected to be short-term and negligible. BOEM expects that onshore components for other offshore wind projects would be designed to avoid wetlands and other WOTUS to the extent feasible. This would include siting project components in previously disturbed areas (e.g., along existing roadways and ROW). Offshore wind projects would be required to comply with federal, state, and local regulations related to the protection of wetlands and other WOTUS, thereby avoiding and minimizing impacts. This includes compliance with the SPDES General Permit for Stormwater Discharges and an approved SWPPP to minimize impacts from disturbed sediments and implementing good housekeeping measures to minimize trash and debris in the work areas. The in-water work would be required to be conducted in accordance with NYSDEC permits for Excavation and Fill in Navigable Waters and Tidal Wetlands (dredging permits), CWA Section 404 Permit from USACE, and a Section 401 Water Quality Certification from NYSDEC. Mitigation for any lost wetlands or other WOTUS would be required if impacts could not be avoided or minimized.

3.13.3.3 Conclusions

Impacts of the No Action Alternative

Under the No Action Alternative, BOEM would not approve the COP and proposed Project construction and installation, O&M, and decommissioning would not occur. Therefore, any potential impacts on wetlands and other WOTUS associated with the proposed Project would not occur. However, ongoing activities and environmental trends in the region would have continuing impacts on wetlands and other WOTUS. Activities would be required to comply with federal, state, and local regulations protecting wetlands and other WOTUS, thereby avoiding or minimizing impacts. Mitigation would be anticipated to compensate for wetland loss if impacts could not be avoided or minimized. BOEM anticipates that the impact on wetlands resulting from ongoing activities associated with the No Action Alternative would be **minor**.

Cumulative Impacts of the No Action Alternative

Planned activities other than offshore wind may also have impacts on wetlands including increased land disturbance from onshore construction. BOEM anticipates that the cumulative impact on wetlands resulting from planned activities associated with the No Action Alternative would be **moderate**.

Potential future offshore wind activities that would overlap the GAA could cause impacts similar to the impacts of the proposed Project. Activities would be required to comply with federal, state, and local regulations protecting wetlands and other WOTUS, thereby avoiding or minimizing impacts. If impacts would not be entirely avoided, mitigation would be anticipated for projects to compensate for the loss of wetlands. BOEM anticipates that the cumulative impact on wetlands resulting from potential future offshore wind activities associated with the No Action Alternative would be **moderate**.

Under the No Action Alternative, wetlands would continue to be impacted by environmental trends and activities associated with ongoing and planned activities, including offshore wind. BOEM anticipates that the overall impacts associated with Alternative A, the No Action Alternative, when combined with environmental trends and all other planned activities (including offshore wind) in the GAA would result in overall **moderate** cumulative impacts.

3.13.4 Relevant Design Parameters and Potential Variances in Impacts

This Final EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than described in the sections below. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts on wetlands:

- The onshore transmission cable routing variants within the onshore Project Area.

An alternate onshore transmission cable route with fewer wetlands or other WOTUS within or adjacent to the right-of-way would have less potential for direct and indirect impacts on wetlands.

3.13.5 Impacts of Alternative B - Proposed Action on Wetlands and Other Waters of the United States

The IPFs associated with the onshore facilities that could directly or indirectly impact wetlands or other WOTUS include land disturbance, sediment suspension and deposition, discharges and releases, and noise disturbance. These IPFs have the potential to affect temporarily or permanently the condition or function of sensitive resources previously identified.

3.13.5.1 Construction and Installation

3.13.5.1.1 Onshore Activities and Facilities

Land disturbance: Construction and installation of onshore components may require excavation, grading, filling, and vegetation clearing and/or trimming. These activities may permanently or temporarily reduce, alter, or degrade wetland resources. The onshore transmission cable route includes crossing the ICW and Carmans River to reach the OnCS-DC. Additionally, this route runs parallel to or intersects with delineated freshwater and tidal wetlands listed in Table 3.13-3. The trenchless construction methods currently proposed are expected to avoid direct impacts to surface waters and wetlands; therefore, no wetlands or other WOTUS are expected to be directly impacted by construction and installation of the proposed Project's onshore components. Additionally, most of the construction associated with the installation of the onshore proposed facilities would occur within existing roadways to minimize associated land disturbances or conversion of terrestrial wetland habitats (APM GEN-01,). Installation technology was designed to minimize disturbances to sensitive habitats (i.e., wetlands) would be used to the extent practicable (APM GEN-04, APM GEN-05). Any disturbed areas in the proposed Project Area would be restored to pre-existing contours (maintaining natural surface drainage patterns) and allow vegetation to become reestablished once construction activities are completed, to the extent practicable (APM GEN-20). Sunrise Wind is currently evaluating locations and facilities to provide O&M support to the Project. These sites include existing ports across New York, New England, and the Mid-Atlantic. It is anticipated that any O&M facility site that is used would also support other offshore wind or maritime industries on the east coast. A major criterium for the location of the O&M facilities is the presence of existing infrastructure. Therefore, wetland impacts from the O&M facilities are expected to be avoided or minimized. A temporary landing structure (i.e., pile-supported trestle) may be installed at Smith Point County Park to aid in the offloading of equipment and materials required for onshore construction. The temporary landing structure may result in 0.02 ac (960 sq ft) of temporary impacts to tidal wetlands which includes the transition pad and up to 24 spuds, piles, or anchors which secure the landing structure to the seabed. An additional SAV survey was conducted in the area of the temporary landing at Smith Point County Park by Cornell Cooperative Extension (CCE) of Suffolk County on October 12, 2022 (detailed in the BOEM 2023 EFH Assessment). No SAV-forming patches or meadows were observed during the survey. However, eelgrass (*Zostera marina*) was identified at six different locations in the northeastern area of the proposed temporary landing site. Results from the survey indicate no significant populations of eelgrass in the proposed temporary landing site at Smith Point County Park. The structure would be positioned to avoid and minimize impacts to these sensitive habitats to the extent practicable (APM GEN-04). If impacts occur during construction activities, they would be temporary, localized, and would be expected to recover completely (Sunrise Wind 2023). Table 3.13-3 provides a quantitative summary of anticipated impact to delineated wetlands and waterbodies by the Proposed Action component (Sunrise Wind 2023; Stantec 2022). Potential adverse impacts on wetlands would be short-term and localized. Due to the proposed construction methods and minimization measures, no permanent impacts to wetlands are anticipated and compensatory mitigation would likely not be necessary. The impact of land disturbance on wetlands resulting from the Proposed Action would be minor.

Table 3.13-3. Anticipated Impacts to Delineated Wetland and Waterbody Resources by Project Component

Project Component	Delineated Waterbody or Wetland Type/Number	Delineated Wetlands in Project Area (Acres)	Areal Extent of Potential Impact (Acres)	Areal Extent of Anticipated Impact (Acres)	Duration of Impact	Percent Impact Relative to Total Wetland Area
Landfall/ICW area/temporary landing structure	Estuarine/3	4.84	0.02	0.02	Temporary	0.20%
	Palustrine emergent/2	0.69	0	0^	N/A	N/A
Onshore transmission cable route	Lacustrine (Carmans River)/1	0.76	0	0^	N/A	N/A
	Riverine (Carmans River, unnamed perennial)/2	0.3	0.01	0*	N/A*	<0.01%
	Freshwater pond/1	0.38	0	0^	N/A	N/A
	Palustrine scrub shrub/1	0.07	0	0^	N/A	N/A
	Palustrine forested wetland/4	0.74	0	0^	N/A	N/A
	Total	**7.78**	**0.03**	**0.02**		

Source: COP Table 4.4.1-5 (Sunrise Wind 2023) and COP Appendix L (Stantec 2022)

Notes: * No impacts, installed via HDD; ^ No impact, outside of work area

Sediment suspension and deposition: As described above, the waterbodies crossed by the proposed Project (Carmans River and ICW) would likely be crossed using trenchless installation methods. These methods are expected to avoid direct impact to wetlands and other WOTUS. All earth disturbances from construction activities would be conducted in compliance with the New York SPDES for stormwater discharges which would further minimize impacts from disturbed sediments into waterbodies. Additionally, an SWPPP, including erosion and sedimentation control BMPs and revegetation measures would be implemented to minimize potential water quality impacts from construction (APM GEN-20).

Any impacts are expected to be localized and temporary with water quality returning to pre-existing conditions soon after the cessation of construction activities (COP, Section 4.4.2.2, Sunrise Wind 2023).

Discharges and releases: Although no impacts for discharges and releases are anticipated, spill or accidental releases of fuels, lubricants, or hydraulic fluids could occur during construction activities. A SPCC Plan would be developed, and any discharges or release would be governed by NYS regulations (APM GEN-21). Additionally, where HDD is utilized, an Inadvertent Return Plan would be prepared and implemented to minimize the potential risks associated with release of drilling fluids (APM GEN-22). Any unanticipated discharges or releases within the onshore facilities during construction are expected to result in minor, temporary impacts; activities are heavily regulated, and discharges and releases are considered accidental events that are unlikely to occur (COP, Section 4.4.2.2, Sunrise Wind 2023). Good housekeeping practices would be implemented to minimize trash and debris in onshore work areas. These practices would include orderly storage of tools, equipment, and materials, as well as proper waste collection, storage, and disposal to keep work areas clean and minimize potential environmental impacts. All trash and debris returned to shore from offshore vessels would be properly disposed of or recycled at licensed waste management and/or recycling facilities. Disposal of any solid waste or debris in the water would be prohibited. With proper waste management procedures, the potential for trash or debris to be inadvertently introduced into wetland or other WOTUS is unlikely, and any impacts would be minor and temporary (COP, Section 4.4.2.2, Sunrise Wind 2023).

Noise: As described above, noise from offshore wind construction activities is not expected to be noticeable in onshore wetland habitats due to the distance to the offshore activities. However, noise from onshore activities, e.g., trenching and HDD of export cables and construction of other onshore facilities, would disturb and displace wetland fauna. Noise is anticipated intermittently during construction phases. Wildlife would be temporarily displaced but would have access to adjacent habitat and would repopulate work areas once construction ceases. However, noise pollution is a reported threat to wetland groups such as aquatic invertebrates (Hopson 2019) and road noise is a reported threat to birds (Hirvonen 2001). Construction is anticipated to occur within established ROWs where wildlife is absent or have been habituated to human activity and noise. Noise is not anticipated to cause any meaningful change to coastal habitats and fauna due to existing traffic and recreational noise. Therefore, impacts to fauna would be temporary and short-term resulting in negligible to minor impacts.

3.13.5.1.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.13.5.2 Operations and Maintenance

3.13.5.2.1 Onshore Activities and Facilities

Normal O&M activities are not expected to involve further wetland alterations. The onshore interconnection cable route and associated facilities generally have no maintenance needs unless a fault or failure occurs; therefore, O&M is not expected to affect wetlands or other WOTUS. Any non-routine maintenance may cause limited land disturbance and noise disturbance for temporary access to assess damage and for repair or replacement of infrastructure, but any impact is expected to be short-term and negligible.

3.13.5.2.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.13.5.3 Conceptual Decommissioning

3.13.5.3.1 Onshore Activities and Facilities

Decommissioning of the onshore proposed Project components are anticipated to be similar to or less adverse than those described for construction. If impacts do occur during decommissioning, they would be short-term and localized.

3.13.5.3.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.13.5.4 Cumulative Impacts of the Proposed Action

In context of reasonably foreseeable environmental trends, the impacts on wetlands under the Proposed Action may add to the impacts of ongoing and future land disturbance, sediment suspension and deposition, discharges and releases, and noise. Impacts due to onshore land use changes are expected to include a gradually increasing amount of wetland alteration and loss. The future extent of land disturbance from ongoing activities and future non-offshore wind activities over the next 35 years is not known with as much certainty as the extent of land disturbance that would be cause by the Proposed Action but based on regional trends is anticipated to be similar to or greater than that of the Proposed Action. If a future project were to overlap the GAA or even be co-located (partly or completely) within the same right-of-way corridor that the Proposed Action would use, then the impacts of those future projects on wetlands would be of the same type as those of the Proposed Action alone; the degree of impacts may increase, although the location and timing of future activities would influence this. For example, repeated construction in a single right-of-way corridor would be expected to have less impact on wetlands than construction in an equivalent area of undisturbed wetland. Offshore wind projects would be required to comply with federal, state, and local regulations related to the protection of wetlands and other WOTUS, thereby avoiding and minimizing impacts. This includes compliance with the New York SPDES General Permit for Stormwater Discharges and an approved SWPPP to minimize impacts from disturbed sediments and implementing good housekeeping measures to minimize trash and debris in the work areas. The in-water work would be required to be conducted in accordance with NYSDEC permits for Excavation and Fill in Navigable Waters and Tidal Wetlands (dredging permits), CWA Section 404 Permit from USACE, and a Section 401 Water Quality Certification from NYSDEC. Mitigation for any lost wetlands or other WOTUS would be required if impacts could not be avoided or minimized. Therefore, in context of reasonably foreseeable environmental trends, combined land disturbance, sediment suspension and deposition, discharges and releases, and noise impacts on wetlands from ongoing and planned activities, including the Proposed Action, would likely be minimal.

3.13.5.5 Conclusions

Impacts of the Proposed Action

The activities associated with the Proposed Action may result in short-term impacts to wetlands or other WOTUS from activities within or adjacent to these resources. Due to proposed design and construction methods (e.g., constructing within existing ROWs, trenchless construction) direct impacts to surface waters and wetlands are mostly avoided. Because of the proposed Project design which includes avoidance, minimization measures, and mitigation measures required under federal and state statutes, BOEM expects the Proposed Action would likely have a **minor** adverse impact on wetlands and other WOTUS.

Cumulative Impacts of the Proposed Action

In the context of other ongoing and planned activities, the incremental contribution of the Proposed Action to the impacts of individual IPFs would be negligible to minor. Considering all the IPFs together, BOEM expects that the overall cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **moderate** adverse impacts to wetlands and other WOTUS. Measurable impacts from the Proposed Action would be small and contribute to the overall impact rating mainly through short-term impacts on wetlands from onshore construction activities adjacent to wetlands and other WOTUS. These resources would be expected to recover completely from these activities.

3.13.6 Alternative C-1 - Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

3.13.6.1 Construction and Installation

3.13.6.1.1 Onshore Activities and Facilities

All onshore Project components and construction and installation activities would be the same as the Proposed Action. As such, the impact of this alternative would be the same as the Proposed Action.

3.13.6.1.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.13.6.2 Operations and Maintenance

3.13.6.2.1 Onshore Activities and Facilities

All onshore Project components and O&M activities would be the same as the Proposed Action. As such, the impact of this alternative would be the same as the Proposed Action.

3.13.6.2.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.13.6.3 Conceptual Decommissioning

3.13.6.3.1 Onshore Activities and Facilities

All onshore proposed Project components and conceptual decommissioning activities would be the same as the Proposed Action. As such, the impact of this alternative would be the same as the Proposed Action.

3.13.6.3.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.13.6.4 Cumulative Impacts of Alternative C-1

The cumulative impacts of Alternative C-1 considered the impacts of Alternative C-1 in combination with other planned onshore wind and other offshore activities. Cumulative impacts would be similar to those described for the Proposed Action.

3.13.6.5 Conclusions

Impacts of Alternative C-1

Because changes in the WTGs arrangement would not impact onshore wetlands and other WOTUS, BOEM expects that the adverse impacts resulting from Alternative C-1 would be the same as the Proposed Action: **minor**.

Cumulative Impacts of Alternative C-1

In the context of other ongoing and planned activities, the contribution of Alternative C-1 to the impacts of individual IPFs would be similar to the Proposed Action: negligible to minor. Considering all the IPFs together, the overall cumulative impacts of the alternatives when combined with past, present, and reasonably foreseeable activities would be the same as the Proposed Action and result in **moderate** adverse impacts to wetlands and other WOTUS.

3.13.7 Alternative C-2 – Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of up to 12 WTG Positions to the Eastern Side of the Lease Area

3.13.7.1 Construction and Installation

3.13.7.1.1 Onshore Activities and Facilities

All onshore Project components and construction and installation activities would be the same as the Proposed Action. As such, the impact of this alternative would be the same as the Proposed Action.

3.13.7.1.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.13.7.2 Operations and Maintenance

3.13.7.2.1 Onshore Activities and Facilities

All onshore Project components and O&M activities would be the same as the Proposed Action. As such, the impact of this alternative would be the same as the Proposed Action.

3.13.7.2.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.13.7.3 Conceptual Decommissioning

3.13.7.3.1 Onshore Activities and Facilities

All onshore Project components and conceptual decommissioning activities would be the same as the Proposed Action. As such, the impact of this alternative would be the same as the Proposed Action

3.13.7.3.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.13.7.4 Cumulative Impacts of Alternative C-2

The cumulative impacts of Alternative C-2 considered the impacts of Alternative C-2 in combination with other planned onshore wind and other offshore activities. Cumulative impacts would be similar to those described for the Proposed Action.

3.13.7.5 Conclusions

Impacts of Alternative C-2

Since changes in the WTGs arrangement would not impact onshore wetlands and other WOTUS, BOEM expects that the adverse impacts resulting from Alternative C-2 would be the same as the Proposed Action: **minor**.

Cumulative Impacts of Alternative C-2

In the context of ongoing and planned activities, the incremental contribution of Alternative C-2 to the impacts of individual IPFs would be similar to the Proposed Action: negligible to minor. Considering all the IPFs together, the overall cumulative impacts of the alternatives when combined with past, present, and reasonably foreseeable activities would be the same as the Proposed Action and result in **moderate** adverse impacts to wetlands and other WOTUS.

3.13.8 Alternative C-3 - Reduced Layout from Priority Areas Considering Feasibility due to Glauconite Sands

Under the Fisheries Habitat Impact Minimization Alternative C-3, the construction, O&M, and eventual decommissioning of the 11-MW WTGs and an OCS within the proposed Project Area and associated inter-array and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. However, Alternative C-3 was developed to address concerns regarding pile refusal due to glauconite sands in the southeastern portion of the Lease Area while still minimizing impacts to benthic and fisheries resources. Alternative C-3a, C-3b, and C-3c described in Section 3.7.8, *Benthic Resources*, consider different WTG configurations to avoid sensitive habitats and engineering constraints while still meeting the NYSERDA OREC. This alternative only considered removal of WTGs from Priority Area 1 based on consultation with NMFS. Areas with high density of boulder, complex habitat, and data suggesting Atlantic cod aggregation and spawning was considered when determining which WTGs to remove.

3.13.8.1 Construction and Installation

3.13.8.1.1 Onshore Activities and Facilities

All onshore Project components and construction and installation activities would be the same as the Proposed Action under Alternative C-3. As such, the impact of this alternative would be the same as the Proposed Action.

3.13.8.1.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.13.8.2 Operations and Maintenance

3.13.8.2.1 Onshore Activities and Facilities

All onshore Project components and O&M activities would be the same as the Proposed Action under Alternative C-3. As such, the impact of this alternative would be the same as the Proposed Action.

3.13.8.2.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.13.8.3 Conceptual Decommissioning

3.13.8.3.1 Onshore Activities and Facilities

All onshore Project components and conceptual decommissioning activities would be the same as the Proposed Action under Alternative C-3. As such, the impact of this alternative would be the same as the Proposed Action

3.13.8.3.2 Offshore Activities and Facilities

Offshore activities would not impact wetlands and other WOTUS.

3.13.8.4 Cumulative Impacts of Alternative C-3

The cumulative impacts of Alternative C-3 considered the impacts of Alternative C-3 in combination with other planned onshore wind and other offshore activities. Cumulative impacts of Alternative C-3 would be similar to those described for the Proposed Action.

3.13.8.5 Conclusions

Impacts of Alternative C-3

Since changes in the WTGs arrangement would not impact onshore wetlands and other WOTUS, BOEM expects that the adverse impacts resulting from Alternative C-3 would be the same as the Proposed Action: **minor**.

Cumulative Impacts of Alternative C-3

In the context of ongoing and planned activities, the incremental contribution of Alternative C-3 to the impacts of individual IPFs would be similar to the Proposed Action: negligible to minor. Considering all the IPFs together, the overall cumulative impacts of the alternatives when combined with past, present, and reasonably foreseeable activities would be the same as the Proposed Action and result in **moderate** adverse impacts to wetlands and other WOTUS.

3.13.9 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, C-2, and C-3 would have the same overall negligible to minor adverse impacts on wetlands. Table 3.13-4 provides an overall summary of alternative impacts.

Table 3.13-4. Comparison of Alternative Impacts on Wetlands and Other Waters of the United States

No Action Alternative	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)	Fisheries Habitat Minimization Considering Feasibility Due to Glauconite Sands (Alternative C-3)
No Action Alternative: BOEM expects that the impact on wetlands and other waters of the United States (WOTUS) resulting from ongoing activities associated with the No Action Alternative would be **minor** adverse. *Cumulative Impacts of the No Action Alternative:* BOEM anticipates that the overall cumulative impacts associated with the No Action Alternative, when combined with all other planned activities (including offshore wind) in the GAA would result in overall **moderate** adverse impacts.	*Proposed Action:* BOEM expects the impacts resulting for the Proposed Action alone would likely have **minor** adverse impact on wetlands and other WOTUS. *Cumulative Impacts of the Proposed Action:* Considering all the IPFs together, BOEM expects that the overall cumulative impacts associated with the Proposed Action when combined with past, present, and reasonably foreseeable activities would result in **moderate** adverse impacts to wetlands and other WOTUS.	*Alternative C-1:* Because changes in the WTGs arrangement would not impact onshore wetlands and other WOTUS, BOEM expects that the adverse impacts resulting from Alternative C-1 alone would be the same as the Proposed Action: **minor.** *Cumulative Impacts of Alternative C-1:* Considering all the IPFs together, the overall cumulative impacts of the alternatives when combined with past, present, and reasonably foreseeable activities would be the same as the Proposed Action and result in **moderate** adverse impacts to wetlands and other WOTUS.	*Alternative C-2:* Since changes in the WTGs arrangement would not impact onshore wetlands and other WOTUS, BOEM expects that the adverse impacts resulting from Alternative C-2 alone would be the same as the Proposed Action: **minor.** *Cumulative Impacts of Alternative C-2:* Considering all the IPFs together, the overall cumulative impacts of the alternatives when combined with past, present, and reasonably foreseeable activities would be the same as the Proposed Action and result in **moderate** adverse impacts to wetlands and other WOTUS.	*Alternative C-3:* Since changes in the WTGs arrangement would not impact onshore wetlands and other WOTUS, BOEM expects that the adverse Impacts resulting from Alternative C-3 alone would be the same as the Proposed Action: **minor**. *Cumulative Impacts of Alternative C-3:* Considering all the IPFs together, the overall cumulative impacts of the alternatives when combined with past, present, and reasonably foreseeable activities would be the same as the Proposed Action and result in **moderate** adverse impacts to wetlands and other WOTUS.

3.13.10 Summary of Impacts of the Preferred Alternative

BOEM has identified Alternative C-3b as the Preferred Alternative as depicted in Figure 2.1-10. Alternative C-3b would include installation of up to 84 WTGs, which is 10 fewer WTGs than the maximum WTGs proposed under the PDE of the Proposed Action. BOEM anticipates Alternative C-3b would have minor adverse impacts to wetlands and other WOTUS within the GAA. Overall cumulative impacts to wetlands from the Preferred Alternative combined with past, present, and reasonably foreseeable activities would be moderate adverse due to the short-term impacts on wetlands from onshore construction activities adjacent to wetlands and other WOTUS. These resources would be expected to recover completely from these activities.

3.13.11 Proposed Mitigation Measures

No additional measures to mitigate impacts on wetlands or other WOTUS have been proposed for analysis.

3.13.11.1 Effect of Measures Incorporated into the Preferred Alternative

Since no mitigation measures have been proposed, impact levels for the Preferred Alternative would remain as described above in Section 3.13.8.

3.16 Demographics, Employment, and Economics

This section discusses potential impacts on demographics, employment, and economics from the proposed Project, alternatives, and ongoing and planned activities in the GAA (Appendix D, Figure D-13). In the COP, it is not indicated that any single state or county would be the primary recipient of the Project's economic impacts, adverse or beneficial. Therefore, the Analysis Area used to evaluate the demographic, employment, and economic impacts of the proposed Project includes the states, counties, and communities that are in the vicinity of the proposed Project, include a port that may support a phase of the proposed Project, or are within the viewshed of the proposed Project.

Table 3.16-1 lists the communities, including the associated county/borough, where proposed onshore infrastructure and potential port cities are located, as well as the counties in closest proximity to the SRWF Lease Area. These are also assigned to an analysis area, either Primary or Expanded, depending on how potential Project impacts would be evaluated for that community. The Primary Analysis Area for demographics, employment, and economics is defined as the area where the Project would occur and where potential ports are located, which includes the states of New York, Connecticut, Maryland, Massachusetts, New Jersey, Rhode Island, and Virginia. The Expanded Analysis Area includes the communities within the potential viewshed of the SRWF. The potential for effects on property values and recreation/tourism are considered in the Expanded Analysis Area.

Table 3.16-1. States, Counties, and Communities within the Demographics, Employment and Economics Analysis Area

County/Borough	Communities	Analysis Area	
		Primary	Expanded
New York			
Suffolk	Town of Brookhaven Port Jefferson Village Fire Island Census Designated Place (CDP) Shirley CDP Mastic Beach CDP Brookhaven CDP Medford CDP North Bellport CDP North Patchogue CDP East Patchogue CDP Yaphank CDP Holtsville CDP Holbrook CDP	X	
	Town of East Hampton Montauk CDP	X	X
	Town of Southold		X
Albany	City of Albany Town of Coeymans Town of Bethlehem	X	
Kings County	Borough of Brooklyn	X	
New York County	New York City	X	
Connecticut			
New London	City of New London	X	
	Town of North Stonington Town of Stonington		X
Maryland			
Baltimore	Sparrows Point CDP (Edgemere) [a]	X	
Massachusetts			
Barnstable	Town of Falmouth Town of Mashpee		X
Bristol	City of New Bedford	X	X
	Town of Dartmouth Town of Fairhaven City of Fall River Town of Westport		X
Dukes	Town of Aquinnah Town of Chilmark Edgartown Community Town of Gosnold Town of Oak Bluffs Town of Tisbury Town of West Tisbury		X
Nantucket	Town of Nantucket		X
Plymouth	Town of Mattapoisett		X

County/Borough	Communities	Analysis Area	
		Primary	Expanded
New Jersey			
Gloucester	Paulsboro (borough) [b]	X	
Rhode Island			
Kent	East Greenwich West Greenwich		X
Newport	Jamestown Little Compton Middleton Newport Portsmouth Tiverton		X
Providence	City of Providence	X	
Washington	Village of Galilee Village of Point Judith Quonset Point Community	X	
	Town of Charleston Town of Exeter Town of Hopkinton Town of New Shoreham Town of Richmond Town of South Kingstown Town of Westerly		X
	Town of Narragansett Town of North Kingstown	X	X
Virginia			
City of Norfolk	City of Norfolk [c]	X	

Notes:

[a] Edgemere, MD is the (geographically) closest residential area to Sparrow’s Point. This area is an unincorporated community and Census Designated Place (CDP) in Baltimore County.

[b] This study used the Borough of Paulsboro for census data. The Borough of Paulsboro includes the community of Billingsport, NJ.

[c] This study used the city of Norfolk and Norfolk International Terminals as the locations for this community and port, respectively. The city of Norfolk is considered a county-equivalent area according to the United States Census Bureau (USCB).

The Primary Analysis Area includes existing ports that are being evaluated to support construction and O&M of the Project, which are listed along with potential project port activities in Table 3.16-2. The COP (Sunrise Wind 2023a) states that “no final determination has been made concerning the specific location(s) of these activities, which could take place at various locations and are expected to serve multiple offshore wind projects and potentially multiple offshore wind related and other maritime industries.”

Table 3.16-2. Potential Port Facilities

State	Port	City/Town, County	Summary of Potential Activities				
			WTG Tower, Nacelle, and Blade Storage, Pre-Commissioning, and Marshalling	Foundation Marshalling and Advanced Foundation Component Fabrication	O&M Activities	Construction Base	Electrical Activities and Support
Connecticut	Port of New London	New London, New London County	X				
Massachusetts	New Bedford Marine Commerce Terminal	New Bedford, Bristol County	X				
Maryland	Sparrows Point	Sparrows Point, Baltimore County		X			
New Jersey	Paulsboro Marine Terminal	Paulsboro, Gloucester County		X			
New York	Port of Albany	Albany, Albany County		X			
	Port of Brooklyn	Brooklyn, Kings County			X		
	Port of Coeymans	Coeymans, Albany County		X			
	Port Jefferson	Port Jefferson Village, Suffolk County			X		
	Port of New York	New York City, New York County					X
	Port of Montauk	Montauk, Suffolk County			X		
Rhode Island	Port of Providence	Providence, Providence County	X	X			X
	Port of Davisville and Quonset Point	North Kingstown, Washington County			X	X	
	Port of Galilee	Narragansett, Washington County			X		
Virginia	Port of Norfolk	Norfolk, Norfolk County	X				

3.16.1 Description of the Affected Environment and Future Baseline Conditions

Demographic Characteristics within the Primary Analysis Area

This section describes the demographic characteristics and trends in the Primary Analysis Area. Table 3.16-3 describes each potentially affected state, county, and city/town by the following metrics: square miles; population in 2000, 2010, and 2018; population density; population change from 2000-2018; and median age.

Among the counties within the Primary Analysis Area, Kings County (Brooklyn), NY had the largest population in 2018 (approximately 2.6 million), followed by New York County (Manhattan) with approximately 1.6 million, and then by Suffolk County (approximately 1.5 million). Among the municipalities (cities and towns), aside from New York City, the Town of Brookhaven, NY had the largest population (484,671) (USCB 2018a). New York City (including Brooklyn and Manhattan) has by far the highest population density with 28,111 persons per mi^2, followed by the City of Providence, RI with 9,747 persons per mi^2. Albany, NY; North Patchogue, NY; New London, CT; New Bedford, MA; and Norfolk, VA also have significant population densities, each with between approximately 3,800 and 4,800 persons per mi^2.

Table 3.16-4 also lists the percent change between the decennial census taken in 2000 and the 2014 to 2018 American Community Survey (ACS) 5-Year Estimates and shows the changes in population over the same time period. Since 2000, for areas in New York, the change in population within the Primary Analysis Area ranges from a decrease of 20 percent in Fire Island, NY to an increase of 29 percent in North Bellport, NY. Albany County and North Bellport, NY experienced the most dramatic population changes for this period (27 and 29 percent increase, respectively). The median age throughout the Primary Analysis Area ranges from a low of 30 in the City of Providence, RI and 31 in Albany, NY, New London, CT, and Norfolk, VA to a high of 54 in Montauk, NY.

The median age across these municipalities ranged from the low 30s in some of the more urban areas and cities (i.e., Albany, New London, Providence) to the low- to mid-50s in areas on the eastern end of Long Island where there are more retirees (i.e., Montauk and East Hampton).

Table 3.16-3. Demographic Characteristics within the Primary Analysis Area

Entity	Land Area in miles² (km²) [a]	Decennial Census Population Count (2000)	Decennial Census Population County (2010)	ACS Population Estimate (2018)	Population Density per mi² (2018) [b]	% Population Change (2000 – 2018)	ACS Median Age (2018)
New York	47,126 (122,059)	18,976,457	19,378,102	19,618,453	416	3	39
Suffolk County	912 (2,363)	1,419,369	1,493,350	1,487,901	1,632	5	41
Town of Brookhaven	259 (671)	448,248	486,040	484,671	1,869	8	40
Port Jefferson Village	3 (8)	7,837	7,750	7,871	2,574	0	46
Fire Island CDP	9 (23)	310	292	249	27	-20	42
Shirley CDP	11 (28)	25,395	27,854	28,698	2,502	13	36
Mastic Beach CDP	5 (13)	11,543	12,930	11,953	2,532	4	39
Brookhaven CDP	6 (16)	3,570	3,451	3,531	609	-1	50
Medford CDP	11 (28)	21,985	24,142	24,247	2,245	10	41
North Bellport CDP	5 (13)	9,007	11,545	11,593	2,367	29	33
North Patchogue CDP	2 (5)	7,825	7,246	7,561	3,832	-3	38
East Patchogue CDP	8 (21)	20,824	22,469	22,637	2,720	9	42
Yaphank CDP	14 (36)	5,025	5,945	6,390	468	27	38
Holtsville CDP	7 (18)	17,006	19,714	19,365	2,724	14	44
Holbrook CDP	7 (18)	27,512	27,195	26,286	3,664	-4	42

Entity	Land Area in miles^2 (km^2) [a]	Decennial Census Population Count (2000)	Decennial Census Population County (2010)	ACS Population Estimate (2018)	Population Density per mi^2 (2018) [b]	% Population Change (2000 – 2018)	ACS Median Age (2018)
Town of East Hampton	74 (192)	19,719	21,457	21,903	295	11	52
Montauk CDP	18 (47)	3,851	3,326	3,655	209	-5	54
Albany County	523 (1,355)	294,565	304,204	307,426	588	4	38
City of Albany	21 (54)	95,658	97,856	97,889	4,574	2	31
Town of Coeymans	50 (129)	8,151	7,418	7,363	147	-10	43
Town of Bethlehem	49 (127)	31,304	33,656	34,888	712	11	43
New York County	23 (60)	1,537,195	1,585,873	1,632,480	72,053	6	37
New York City	300 (777)	8,008,278	8,175,133	8,443,713	28,111	5	37
Kings County	68 (179)	2,465,326	2,504,700	2,600,747	27,490	5	35
Connecticut	**4,842 (12,540)**	**3,405,565**	**3,574,097**	**3,581,504**	**740**	**5**	**41**
New London County	665 (1,722)	259,088	274,055	268,881	404	4	41
City of New London	6 (16)	25,671	27,620	27,032	4,809	5	31
Maryland	**9,711 (25,151)**	**5,296,486**	**5,773,552**	**6,003,435**	**618**	**13**	**39**
Baltimore County	598 (1,549)	754,292	805,029	827,625	1,383	10	39
Sparrows Point (Edgemere CDP)	11 (28)	9,248	8,669	8,633	795	-7	46

Entity	Land Area in miles^2 (km^2) [a]	Decennial Census Population Count (2000)	Decennial Census Population County (2010)	ACS Population Estimate (2018)	Population Density per mi^2 (2018) [b]	% Population Change (2000 – 2018)	ACS Median Age (2018)
Massachusetts	**7,801 (20,205)**	**6,349,097**	**6,547,629**	**6,830,193**	**876**	**8**	**39**
Bristol County	553 (1,432)	534,678	548,285	558,905	1,011	5	41
City of New Bedford	20 (52)	93,768	95,072	95,117	4,757	1	37
New Jersey	**7,354 (19,047)**	**8,414,350**	**8,791,894**	**8,881,845**	**1,208**	**6**	**40**
Gloucester County	895 (2,318)	254,673	288,288	290,852	903	14	40
Borough of Paulsboro	2 (5)	6,160	6,097	5,937	3,085	-4	45
Rhode Island	**1,034 (2,678)**	**1,048,319**	**1,052,567**	**1,056,611**	**1,022**	**1**	**40**
Providence County	410 (1,062)	621,602	626,667	634,533	1,550	2	37
City of Providence	18 (47)	173,618	178,042	179,435	9,747	3	30
Washington County	329 (852)	123,546	126,979	126,242	383	2	45
Town of Narragansett	14 (36)	16,361	15,868	15,550	1,122	5	46
Town of North Kingston	43 (111)	26,326	26,486	26,207	607	-0.5	46
Virginia	**39,482 (102,258)**	**7,078,515**	**8,001,024**	**8,413,774**	**213**	**19**	**38**
City of Norfolk [c]	53 (137)	234,403	242,803	245,592	4,610	5	31

Sources: USCB 2000, 2010, 2018a, 2019

USCB = U.S. Census Bureau; ACS = American Community Survey; CDP = Census Designated Place; km^2 = square kilometers

Notes:

[a] Rounded to the nearest mi^2

[b] Values from USCB and may not be computed from table due to rounding.

[c] Norfolk is a county-equivalent area according to the USCB.

Additional demographic characteristics for the municipalities in the Primary Analysis Area are presented under employment and economics within this section, as well as within Section 3.17, *Environmental Justice*, as it relates to race/ethnicity and low-income characteristics.

Employment Characteristics within the Primary Analysis Area

Employment characteristics for states and counties in the Primary Analysis Area are summarized in Table 3.16-4. Among the counties, Kings County, NY has the largest labor force with approximately 1.2 million workers (as of 2018), while Washington County, RI has the smallest labor force with approximately 69,000 workers (USBLS 2020). Unemployment rates are low throughout the Primary Analysis Area (excluding states) and range from 3.6 percent in the Washington County, RI and the city of Norfolk, VA to a high of 4.4 percent in Providence County, RI. Per capita personal income in 2017 ranged from $40,094 in Norfolk, VA to $65,758 in Suffolk County, NY (excluding New York County [Manhattan], which had the highest per capita personal income at $175,960) (BEA 2018). At the state level, the labor force is largest in New York (more than 9.5 million workers) and smallest in Rhode Island (557,000 workers).

Table 3.16-4. Employment Characteristics for States and Counties within the Primary Analysis Area

Entity	Labor Force (2018)	Employment (2018)	Unemployment (2018)	Unemployment Rate (%) (2018)	Per Capita Personal Income ($) (2017)
New York	**9,542,000**	**9,147,000**	**395,000**	**4.1**	**64,540**
Albany County	157,500	151,700	5,800	3.7	58,048
Kings County	1,201,400	1,149,800	51,600	4.3	48,758
New York County	914,200	880,100	34,100	3.7	175,960
Suffolk County	777,784	747,832	29,952	3.9	65,758
Connecticut	**1,898,000**	**1,819,000**	**79,000**	**4.1**	**71,823**
New London County	137,463	132,032	5,431	4.0	56,725
Maryland	**3,184,000**	**3.051,000**	**132,000**	**4.2**	**60,847**
Baltimore County	450,366	432,164	18,202	4.0	59,130
Massachusetts	**3,823,000**	**3,693,000**	**130,000**	**3.4**	**67,630**
Bristol County	302,918	289,955	12,963	4.3	51,298
New Jersey	**4,418,000**	**4,232,000**	**186,000**	**4.2**	**64,537**
Gloucester County	147,175	140,940	6,235	4.2	52,506
Rhode Island	**557,000**	**534,000**	**23,000**	**4.1**	**52,786**
Providence County	325,587	311,259	14,328	4.4	46,470
Washington County	69,005	66,529	2,476	3.6	62,357
Virginia	**4,352,000**	**4,224,000**	**127,000**	**2.9**	**55,105**
City of Norfolk [a]	111,524	107,496	4,028	3.6	40,094

Sources: BEA 2018; USBLS 2019, 2020; Connecticut Department of Labor 2018; Rhode Island Department of Labor and Training 2019a, 2019b, 2019c; New York State Department of Labor 2019; Massachusetts Executive Office of Labor and Workforce Development 2019.

Note:

[a] Norfolk is a county-equivalent area according to the U.S. Census Bureau.

Housing Characteristics within the Primary Analysis Area

The areas along the coast, which include many of the jurisdictions within the Primary Analysis Area, oftentimes have tourism and visitor-centric economies, and also have seasonal housing that may be present. Therefore, the population during certain times of the year may increase with seasonal visitors to these homes or vacation rentals. This is especially true in areas of eastern Long Island, such as the municipalities of Montauk and Town of East Hampton but includes several other areas and jurisdictions as well. Table 3.16-5 presents housing data for the Primary Analysis Area, and includes total housing units, vacant units (for both owner-occupied and rentals) and median house values and median gross rent.

Table 3.16-5. Housing Characteristics within the Primary Analysis Area

Entity	Housing Units	Vacant Housing Units	Homeowner Vacancy Rate (%)	Rental Vacancy Rate (%)	Median Value ($)	Median Gross Rent ($)
New York	**8,287,087**	**970,550**	**1.7**	**4.3**	**302,200**	**1,240**
Suffolk County	575,162	87,181	1.4	5.7	386,800	1,698
Town of East Hampton	22,035	13,029	0.8	14.6	850,000	1,867
Montauk CDP	4,631	3,251	0.8	50.9	890,200	2,302
Town of Brookhaven	175,772	15,170	1.3	4.7	338,800	1,736
Port Jefferson Village	3,230	200	0.0	0.0	501,700	1,794
Brookhaven CDP	1,242	118	0.7	0.0	421,200	1,352
Holbrook CDP	9,353	499	0.0	5.2	364,700	1,906
Holtsville CDP	6,843	289	0.5	6.1	355,800	1,642
East Patchogue CDP	8,641	393	0.5	1.5	321,200	1,407
Fire Island CDP	3,473	3,397	2.9	0.0	425,000	N/A
Mastic Beach CDP	4,915	798	4.7	2.0	212,200	1,791
Medford CDP	8,328	372	0.6	0.0	311,200	1,965
North Bellport CDP	3,830	300	0.0	6.1	277,000	2,143
North Patchogue CDP	2,484	87	2.3	0.0	300,400	1,541
Shirley CDP	9,150	744	2.6	0.0	259,900	2,088
Yaphank CDP	2,063	69	0.0	5.1	311,300	2,125
Albany County	140,830	14,822	1.7	4.7	218,100	993
City of Albany	48,625	7,418	3.6	5.8	173,300	951
Town of Bethlehem	14,830	727	0.6	5.9	269,900	1,185
Town of Coeymans	3,458	400	2.8	7.8	178,700	854
New York City	3,472,354	318,251	1.9	3.4	570,500	1,396
Kings County	1,035,746	84,890	1.7	3.4	665,300	1,374
New York County	874,237	116,104	2.6	4.6	944,600	1,682
Connecticut	**1,512,305**	**144,931**	**1.8**	**6.5**	**272,700**	**1,156**
New London County	123,001	15,599	2.6	5.1	239,000	1,099
City of New London	12,645	1,670	4.7	5.2	181,300	958
Maryland	**2,437,740**	**245,222**	**1.7**	**6.2**	**305,000**	**1,357**
Baltimore County	336,554	23,641	1.7	6.7	255,400	1,263
Sparrows Point (Edgemere CDP)	3,539	281	1.8	1.1	274,400	1,322

Entity	Housing Units	Vacant Housing Units	Homeowner Vacancy Rate (%)	Rental Vacancy Rate (%)	Median Value ($)	Median Gross Rent ($)
Massachusetts	**2,882,739**	**280,825**	**1.0**	**3.8**	**366,800**	**1,225**
Bristol County	234,458	17,840	1.2	4.8	290,100	872
City of New Bedford	43,262	4,020	1.5	6.5	218,100	819
New Jersey	**3,605,401**	**392,039**	**1.7**	**5.2**	**327,900**	**1,295**
Gloucester County	113,024	8,437	1.3	6.8	216,700	1,186
Borough of Paulsboro	3,137	585	0.0	8.9	112,700	1,039
Rhode Island	**467,412**	**56,527**	**1.8**	**5.8**	**249,800**	**981**
Providence County	265,991	27,820	2.1	6.1	223,600	945
City of Providence	72,860	11,222	3.0	7.3	192,100	972
Washington County	63,737	14,626	1.6	5.8	328,300	1,100
Town of Narragansett	10,156	3,478	2.7	4.4	418,600	1,532
Town of North Kingston	11,513	1,101	0.9	4.7	340,600	983
Virginia	**3,491,091**	**362,676**	**1.6**	**5.7**	**264,900**	**1,202**
City of Norfolk [a]	97,257	9,102	2.9	6.4	199,400	1,031

Source: USCB 2018c

Note: [a] Norfolk is a county-equivalent area according to the United States Census Bureau.

As shown in Table 3.16-5, median home values in the communities within the Primary Analysis Area range from approximately $173,300 in Albany, NY and $179,000 in Coeymans, NY to $890,000 in Montauk, NY and $944,600 in Manhattan. At $192,100, the median home value in the City of Providence, RI is similar to that in the City of New London, CT ($181,300), while the Towns of North Kingstown and Narragansett in Rhode Island have median home values ($340,600 and $418,600, respectively) nearly or more than double that of the City of New London, CT. New Bedford, MA and Norfolk VA, had slightly higher median home values compared to the City of Providence, RI and the City of New London, CT. These trends are similar with regard to median gross rent, with Montauk, NY having the highest value ($2,302) and Coeymans, NY the lowest value ($854). The City of Providence, RI ($972) and New London, CT ($958) also have similar values, and the Towns of Narragansett and North Kingstown in Rhode Island ($1,352 and $983, respectively) have higher values (USCB 2018a). The median reported gross rent is slightly higher in the Town of East Hampton, NY compared to the Town of Brookhaven, NY ($1,867 and $1,736, respectively). Property values within the Primary and Expanded Analysis Area are further discussed below.

The vacancy status provides insight into the overall housing market and the analysis area's ability to accommodate non-local construction workers with short-term, rental accommodations. Table 3.16-6 provides additional housing statistics, specific to vacant housing units and their type of vacancy, which would allow for identification of units that could be available to non-local construction or O&M workers by state and county. This table illustrates the key role that “seasonal, recreational, or occasional use” and “other vacant” units play in the local housing supply. For the Primary Analysis Area, these two occupancy uses comprise more than half the vacant units in nearly all of the counties (exceptions being Baltimore County, MD and the city of Norfolk, VA). For certain counties, such as Suffolk County, NY and Washington County, RI, it accounts for the vast majority of the vacant units, at 86-percent and 90-percent, respectively. Both “seasonal, recreational, or occasional use” and “other vacant” uses are associated with seasonal tourism or secondary vacation homes, with other vacant units often being used by a caretaker or janitor. As a result, the availability of seasonal units in many of these communities would typically be very limited during peak summer construction periods.

For communities with ports identified to support the O&M phase of the project, it would be expected that there would be fewer non-local construction workers in the area than other potential port locations.

As indicated in the table, the number of rental vacancies that may be available for migrant workers is limited, other housing options would be short-term accommodations, such as hotel and motel rooms and sites for recreational vehicles, and the need would primarily be associated with the communities around staging ports supporting construction activities, as well as construction of onshore facilities (as noted in the COP, much of the workforce for offshore construction would be housed offshore; Sunrise Wind 2023a).

Table 3.16-6. Vacant Housing Statistics within the Primary Analysis Area

Entity	Total Vacant Units [a]	For Rent	For Sale Only	For Seasonal, Recreational or Occasional Use	For Migrant Workers	Other Vacant
New York	**890,510**	**152,802**	**68,359**	**342,825**	**2,331**	**324,193**
Suffolk County	82,703	5,878	5,615	53,539	405	17,266
Suffolk County % Distribution [b]	–	*7*	*7*	*65*	*<1*	*21*
Albany County	13,157	2,690	1,237	1,707	0	7,523
Albany County % Distribution [b]	–	*20*	*9*	*13*	*0*	*57*
Kings County	84,890	23,723	4,942	9,230	49	36,267
Kings County % Distribution [b]	–	*28*	*6*	*11*	*0*	*43*
New York County	116,104	27,668	4,929	45,970	195	23,736
New York County % Distribution [b]	–	*24*	*4*	*40*	*0*	*20*
Connecticut	**131,961**	**31,889**	**16,808**	**29,855**	**93**	**53,316**
New London County	14,399	1,932	1,877	5,083	0	5,507
New London County % Distribution [b]	–	*13*	*13*	*35*	*0*	*38*
Maryland	**229,303**	**48,476**	**25,716**	**59,900**	**211**	**95,000**
Baltimore County	21,607	7,755	3,591	1,170	31	9,060
Baltimore County % Distribution [b]	–	*36*	*17*	*5*	*0*	*42*
Massachusetts	**254,652**	**39,087**	**16,817**	**127,508**	**84**	**71,156**
Bristol County	16,597	4,062	1,702	2,836	23	7,974
Bristol County %Distribution [b]	–	*21*	*20*	*24*	*2*	*34*
New Jersey	**366,466**	**63,742**	**35,674**	**135,527**	**231**	**131,272**
Gloucester County	7,634	1,507	1,132	271	0	4,724
Gloucester County % Distribution [b]	–	*20*	*15*	*4*	*0*	*62*
Rhode Island	**52,004**	**10,059**	**4,620**	**17,699**	**0**	**19,626**
Providence County	24,820	7,161	2,716	1,297	0	13,646
Providence County % Distribution [b]	–	*29*	*11*	*5*	*0*	*55*
Washington County	14,189	769	580	11,129	0	1,711

Entity	Total Vacant Units [a]	For Rent	For Sale Only	For Seasonal, Recreational or Occasional Use	For Migrant Workers	Other Vacant
Washington County % Distribution [b]	–	*5*	*4*	*78*	*0*	*12*
Virginia	**329,152**	**63,404**	**33,483**	**88,357**	**370**	**143,538**
Norfolk	8,420	3,426	1,150	438	0	3,406
Norfolk % Distribution [b]	–	*41*	*14*	*5*	*0*	*40*

Sources: USCB 2018c

Notes:

[a] Not including those rented or sold.

[b] Percent distribution reflects the distribution of the total number of vacant units in each county by type of vacancy (e.g., tenure).

Property Values within the Expanded Analysis Area

The Expanded Analysis Area has a substantial geographic reach when considering potential project impacts. This seven-state area also has a wide range of housing characteristics, including property values. The median home values in the communities within the Primary Analysis Area were presented in Table 3.16-5, and Table 3.16-7 below presents additional information with respect to both the Primary Analysis Area and the Expanded analysis area. As noted in Section 3.16.1, the Expanded Analysis Area is being considered mostly as it relates to potential visual impacts and the correlation to property values. Therefore, this additional information is being provided on the Expanded Area of Analysis. Table 3.16-7 presents the range of home values in 2018 and the percent distribution of homes within those ranges.

Among the counties within the Primary and Expanded Analysis Area, each has less than 10 percent of their owner-occupied housing unit values between $0 and $99,999 (USCB 2018c). Conversely, the percentage of units valued at $500,000 or greater spanned a much larger range from three percent in Gloucester County, NJ to 90 percent in Nantucket County, MA (USCB 2018c), indicating some counties are wealthier than others. At the state level, as noted in Table 4.7.1-9 of the COP (Sunrise Wind 2023a), New York and Massachusetts have a quarter or more of their owner-occupied housing unit values at greater than $500,000. Maryland, New Jersey, and Virginia each have about one-fifth of their owner-occupied housing units in that highest category, indicating similar wealth of the housing stock. Connecticut and Rhode Island have lesser percentages of their units valued at greater than $500,000 (17 and 11 percent, respectively) (USCB 2018c).

Table 3.16-7. Housing Values and Percent Distribution within the Counties in the Primary and Expanded Region of Interest

	Albany, NY	Kings, NY	New York, NY	Suffolk, NY	New London, CT	Baltimore, MD	Barnstable, MA	Bristol, MA	Dukes, MA	Nantucket, MA	Plymouth, MA	Gloucester, NJ	Kent, RI	Newport, RI	Providence, RI	Washington, RI	Norfolk, VA
Total Number of Owner-Occupied Housing Units	71,253	285,330	182,949	390,897	71,459	205,641	74,991	135,377	4,930	2,576	141,482	83,845	48,097	21,849	127,394	36,608	38,029
$0 to $99,999 (%)	9	4	4	3	7	6	2	4	1	1	4	7	6	4	6	3	8
$100,000 to $124,999 (%)	5	1	1	1	5	4	1	2	<1	<1	1	5	4	2	4	2	8
$125,000 to $149,999 (%)	7	1	<1	1	5	5	1	2	<1	1	1	8	6	1	7	1	9
$150,000 to $174,999 (%)	11	1	1	2	11	9	2	5	0	<1	3	13	12	3	13	3	13
$175,000 to $199,999 (%)	11	1	<1	2	9	8	2	6	<1	<1	3	11	13	2	11	4	13
$200,000 to $249,999 (%)	21	3	1	6	17	18	7	18	2	1	11	19	21	10	21	14	18
$250,000 to $299,999 (%)	13	3	2	11	15	13	12	18	1	1	13	15	13	11	13	17	10
$300,000 to $399,999 (%)	15	9	5	29	17	17	28	24	11	3	27	15	15	23	15	27	9
$400,000 to $499,999 (%)	5	11	10	19	7	9	17	12	14	3	15	4	6	15	6	12	5
$500,000 to $749,999 (%)	3	27	18	17	5	9	17	8	32	17	15	2	4	16	4	11	5
$750,000 to $999,999 (%)	1	17	14	6	2	2	6	2	21	19	5	<1	2	6	1	4	2
$1,000,000 to $1,499,999 (%)	<1	13	14	2	1	1	3	1	8	23	2	<1	<1	4	<1	2	1
$1,500,000 to $1,999,999 (%)	<1	5	8	1	<1	<1	1	<1	4	9	1	<1	<1	1	<1	1	<1
$2,000,000 or more (%)	<1	6	24	1	<1	<1	1	<1	7	22	1	<1	<1	2	<1	1	<1
$500,000 or more (%)	4	68	79	27	8	12	29	11	72	90	24	3	6	30	6	19	8

Source: USCB 2018a

Note: Norfolk is a county-equivalent area according to the United States Census Bureau.

Economic Characteristics within the Primary Analysis Area

The Gross Domestic Product (GDP) represents the market value of goods and services produced by the labor and property located within a geographic area and is influenced to a large degree by the size of that area. GDP serves as a relative indicator of the size of the economies within the region, particularly when viewed as a percentage of the overall national economy. Table 3.16-8 summarizes the GDP for all states within the Analysis Area for the most recent years for which data are available. New York has the highest GDP of all the states in the Analysis Area. Maryland, Massachusetts, New Jersey, and Virginia have relatively similar GDPs that are all less than New York, while Connecticut and Rhode Island have the smallest GDPs of all states within the Analysis Area (BEA 2022).

Table 3.16-8. Current-Dollar Gross Domestic Product by State for 2020 and 2021

Entity	GDP (in millions of current dollars)		2020 – 2022 % Change	Percent of the US GDP	
	2020	2021 (Preliminary Statistics)		2020	2021
United States	**20,893,746**	**22,996,086**	**10.1%**	**-**	**-**
New York	1,724,759	1,853,926	7.5%	8.3%	8.1%
Connecticut	276,423	296,498	7.3%	1.3%	1.3%
Maryland	410,675	438,235	6.7%	2.0%	1.9%
Massachusetts	582,477	636,514	9.3%	2.8%	2.8%
New Jersey	618,579	672,089	8.7%	3.0%	2.9%
Rhode Island	60,556	65,939	8.9%	0.3%	0.3%
Virginia	549,536	591,851	7.7%	2.6%	2.6%

Source: BEA 2022

Table 3.16-9. Percent Employed Civilian Population by Industry in the States in the Primary Region of Interest

Industry	Percent Employed										
	Albany, NY	Suffolk, NY	NYC, NY [a]	New London, CT	Baltimore, MD	Bristol, MA	Gloucester, NJ	Newport, RI	Providence, RI	Washington, RI	Norfolk, VA [b]
Agriculture, forestry, fishing, hunting, mining	<1	1	<1	1	<1	<1	1	1	<1	1	<1
Construction	4	8	5	6	6	7	7	7	5	6	8
Manufacturing	5	7	3	13	5	11	8	7	12	10	7
Wholesale trade	2	3	2	2	2	3	4	2	2	2	2
Retail trade	10	12	9	11	11	13	11	9	13	11	12
Transportation and warehousing, and utilities	4	6	6	4	5	4	6	3	4	3	5
Information	2	3	4	2	2	2	2	2	2	1	2
Finance and insurance, real estate, rental and leasing	7	7	10	5	8	6	7	7	7	6	6
Professional, scientific, management, and administrative and waste management services	11	12	14	9	13	9	11	12	10	10	11
Education services, and health care and social assistance	28	27	27	24	27	27	28	27	27	28	23
Arts, entertainment, recreation, food services, accommodation	9	7	11	15	8	9	7	13	10	13	13
Other services, except public administration	5	4	5	4	5	4	4	6	5	4	5
Public administration	12	5	4	5	8	4	5	5	4	4	9

Source: USCB 2018b

Notes:

a Includes Kings and New York Counties.

b Norfolk is considered a county-equivalent area according to the United States Census Bureau.

BOEM identified coastal counties (and in several cases, hotspots within particular counties) along the US east coast, from Maine to Georgia, as a function of their potential to experience socioeconomic impacts, both beneficial and detrimental, associated with each phase (planning, construction, and decommissioning) of wind facility development (ICF 2012).

Criteria used to rank and evaluate the potential sensitivity of coastal areas of interest to offshore wind development included counties where:

- Ocean recreation and tourism account for a sizable percentage of the location's tourism economy;
- Ocean recreation and tourism account for a sizable percentage of the location's marine economy;
- Tourism accounts for a large percentage of the location's economy;
- The location has a large number of establishments related to coastal and water recreation;
- The location has a high percentage of natural or historic and cultural areas; and
- The location has significant development along the coast (ICF 2012).

Of the 113 geographic areas (i.e., counties and hotspots within particular counties) originally identified for analysis, 14 coincided with counties that were either in the Primary or Expanded Analysis Area for this Project. The three that were not included in BOEM's original list included Baltimore County, MD, Gloucester County, NJ, and Albany County, New York. Based on the methodology presented by ICF (2012), the recreation and tourism industries in these counties are less likely to be sensitive to offshore wind development as compared to those included in BOEM's assessment, likely because they are located further inland from the coast, or were not located in proximity to an area considered for offshore wind development.

Ultimately, a scorecard analysis was performed on the original 113 geographies identified, and the highest ranked 70 were chosen to move forward and analyze with community profiles. Those that were also counties within the Primary and/or Expanded Analysis Area included Suffolk, Kings, and New York counties, NY; New London County, CT; Barnstable, Bristol, Dukes, Nantucket, and Plymouth counties, Massachusetts; and Kent, Newport, Providence and Washington counties, RI, and the community profiles are included in Appendix E of the ICF 2012 report.

Information relative to the "ocean economy" is also available and tracked via NOAA's Office for Coastal Management – DIGITALCOAST program. The Economics: National Ocean Watch (ENOW) tool streamlines obtaining and comparing data for the six sectors depended on the ocean and Great Lakes, which includes: (1) living resources, (2) marine construction, (3) marine transportation, (4) offshore mineral resources, (5) ship and boat building, and (6) tourism and recreation (NOAA 2018, 2022).

Table 3.16-10 summarizes the significance of the ocean economy, including ocean-related tourism and recreation, to each geography within the Expanded Analysis Area. Gloucester County, NJ had the lowest percentage of ocean-related tourism jobs (27.5 percent), followed by New London County, CT (36.2 percent), while Nantucket County, Massachusetts had the highest percentage of ocean-related tourism jobs (99.5 percent) (with relatively few establishments). The number of employees per ocean-related establishment was far higher in Gloucester and New London Counties (approximately 43 and 38, respectively) than in the other counties within the Expanded Analysis Area (ranging from approximately nine in Dukes County, Massachusetts to 23 in Washington County, RI) (ICF 2012). In terms of ocean-related GDP from tourism and recreation, the total value of goods produced and services provided in the ocean-related tourism and recreation economy was most significant in Suffolk County, NY ($1.9 billion), followed by $1.1 billion in Barnstable County, MA, and least significant in Gloucester County, NJ ($52.3 million). Collectively, the counties of had a combined GDP of nearly $1.8 billion. Additional recreation and tourism details are provided in Section 3.21 *Recreation and Tourism*.

Table 3.16-10. Summary of Ocean-Related Tourism Indicators within the Expanded Analysis Area (2018)

County in the Expanded Analysis Area	Ocean Jobs Related to Tourism and Recreation (%)	Ocean Establishments Related to Tourism and Recreation	Ocean-related Establishments/ Employment	Ocean-related GDP from Tourism and Recreation (in millions of $)
New York				
Albany County	N/A	N/A	38/625	N/A
Kings County	91.9	3,759	3,997/38,536	1,800
New York County	99.1	9,621	9,782/221,081	22,200
Suffolk County	87.9	2,741	3,032/43,138	1,900
Connecticut				
New London County	36.2	490	541/20,673	374.3
Maryland				
Baltimore County	60.2	391	483/9,350	209.4
Massachusetts				
Barnstable County	94.0	1,222	1,356/19,247	1,100
Bristol County	48.9	193	509/6,964	105.8
Dukes County	97.5	167	183/1,587	120.1
Nantucket County	99.5	134	142/1,739	159.7
Plymouth County	87.5	642	741/11,192	400.9
New Jersey				
Gloucester County	27.5	85	130/5,579	52.3
Rhode Island				
Kent County	96.4	373	388/7,842	321.8
Newport County	82.0	421	462/8,847	444.1
Providence County	92.1	873	928/16,541	700.0
Washington County	53.5	441	513/11,896	327.6
Virginia				
Norfolk [a]	56.6	487	561/16,073	311.6

Source: NOAA, Office for Coastal Management, DigitalCoast, ENOW Explorer, 2018.

Notes: N/A = Not Available

[a] Norfolk is a county-equivalent area according to the United States Census Bureau.

3.16.2 Impact Level Definitions for Demographics, Employment, and Economics

This Final EIS uses a four-level classification scheme to analyze potential impact levels on demographics, employment and economics from the alternatives, including the Proposed Action. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a project or beyond project operations and decommissioning. Table 3.16-11 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for demographics, employment and economics. Table G-15 in Appendix G identifies potential IPFs, issues, and indicators to assess impacts to demographics, employment and economics.

Table 3.16-11. Definitions of Potential Adverse and Beneficial Impact Levels for Demographics, Employment, and Economics

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	No measurable impacts would occur.	No measurable impacts would occur.
Minor	Adverse impacts would not disrupt the normal or routine functions of the affected activity or geographic place.	A small and measurable benefit to related to demographics, employment and economics could occur.
Moderate	The affected activity or geographic place would have to adjust somewhat to account for disruptions due to impacts of the Project.	A notable and measurable benefit to related to demographics, employment and economics could occur.
Major	The affected activity or geographic place would experience unavoidable disruptions to a degree beyond what is normally acceptable.	A large local or notable regional benefit to related to demographics, employment and economics could occur.

3.16.3 Impacts of Alternative A – No Action on Demographics, Employment, and Economics

When analyzing the impacts of the No Action Alternative on demographics, employment and economics, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities on the baseline conditions. The cumulative impacts of the No Action Alternative are considered the impacts of the No Action Alternative in combination with other planned non-offshore wind and offshore wind activities, as described in Appendix E (*Planned Activities Scenario*).

3.16.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, the demographics, employment, and economics described in Section 3.16, *Affected Environment,* would continue to follow current regional trends and respond to IPFs introduced by other ongoing non-offshore wind and offshore wind activities.

Activities that would remain important to the region's economy would include tourism, recreation, and marine industries (e.g., fishing). Ongoing non-offshore wind activities within the GAA that would contribute to impacts on demographics, employment, and economics, include ocean-based industries, including tourism and recreation, commercial fishing, marine transportation, ongoing port maintenance and upgrades, maintenance of existing structures (e.g., seawalls, piers), and climate change. There would likely be adverse economic impacts from activities like climate change, that could adversely impact businesses, employment, and wages. Ongoing and planned activities like port maintenance and commercial shipping generate economic activity and would likely benefit the local economy.

Ongoing offshore wind activities within the GAA that contribute to impacts on demographics, employment and economics include:

- Continued O&M of the Block Island project (5 WTGs) installed in state waters;
- Continued O&M of the CVOW project (2 WTGs) installed in OCS-A 0497; and
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of the Block Island and CVOW projects and ongoing construction of the Vineyard Wind 1 and South Fork projects would affect demographics, economics and employment through the primary IPFs of energy security/generation, land disturbance, lighting, noise, port utilization, presence of structures, and traffic. Ongoing offshore wind activities would have the same type of impacts from these IPFs that are described in detail in the section below for planned offshore wind activities, but the impacts would be of lower intensity.

3.16.3.2 Cumulative Impacts of the No Action Alternative

The cumulative impact analysis for the No Action Alternative considers the impacts of the No Action Alternative in combination with other planned non-offshore wind activities and planned offshore wind activities (without the Proposed Action).

Future activities without the Proposed Action include residential, commercial, and industrial development of onshore utility projects, land-based wind energy projects, and other offshore wind projects (excluding the Sunrise Wind project). Offshore projects other than offshore wind would support the existing marine industries and workforce. Ocean-based industries, including tourism and recreation, commercial fishing, and marine transportation, would continue to be important to the economies of many of the counties within the Primary Analysis Area.

The demographic, employment, and economics of the Primary Analysis Area would continue to follow current regional trends and respond to IPFs introduced by other current, ongoing or planned offshore wind development projects, and other coastal and ocean-based projects.

Offshore wind could become a new industry for the Atlantic states and The Nation. Several recent reports provide national estimates of employment and economic activity. These studies acknowledge that offshore wind component manufacture and installation capacity exists primarily outside the United States; however, domestic capacity is anticipated to increase. This Final EIS uses available data, analysis, and projections to make reasoned conclusions on potential economic and employment impacts within the GAA.

Expected job creation from the development of the offshore wind industry in the Northeast was recently described in the report *U.S. Job Creation in Offshore* Wind, which was prepared for NYSERDA and represented a collaboration with members of the Massachusetts Department of Energy Resources, the Massachusetts Clean Energy Center (MassCEC) and the Rhode Island Office of Energy Resources (BVG 2017). This study estimated that during the initial implementation of offshore wind projects along the U.S. northeast coast, a base level of 35 percent of jobs, with a high probability of up to 55 percent of jobs, would be sourced from within the United States. The proportion of jobs filled within the United States would increase as the offshore wind energy industry grows, due to growth of a supply chain and supporting industries along the east coast, as well as a growing number of local operations and maintenance jobs for established wind facilities. By 2030 and continuing through 2056, approximately 65 to 75 percent of jobs associated with offshore wind are projected to be within the United States. Overseas manufacturers of components and specialized ships based overseas that are contracted for installation of foundations and WTGs would fill jobs outside of the United States (BVG 2017). As an example of the mix of local, national, and foreign job creation, for the 5-turbine Block Island Wind Farm, turbine blade manufacturing occurred in Denmark, generator and nacelle manufacturing occurred in France, tower component manufacturing occurred in Spain, and foundation manufacturing occurred in Louisiana (Gould and Cresswell 2017).

The American Wind Energy Association (AWEA) estimates that the wind industry would invest between $80 and $106 billion in U.S. offshore wind development by 2030, of which $28 to $57 billion would be invested within the United States. This figure depends on installation levels and supply chain growth, as other investment would occur in countries manufacturing or assembling wind energy components for U.S. -based projects. While most economic and employment impacts would be concentrated in Atlantic coastal states where offshore wind development would occur—there are over $1.3 billion of announced domestic investments in wind energy manufacturing facilities, ports, and vessel construction—there would be nationwide effects as well (AWEA 2020). The AWEA report analyzes base and high scenarios for offshore wind direct impacts, turbine and supply chain impacts, and induced impacts. The base scenario assumes 20 GW of offshore wind power by 2030 and domestic content increasing to 30 percent in 2025 and 50 percent in 2030, while the high scenario assumes 30 GW of offshore wind power by 2030 and domestic content increasing to 40 percent in 2025 and 60 percent in 2030. Offshore wind energy development would support $14.2 billion in economic output and $7 billion in value added by 2030 under the base scenario. Offshore wind energy development would support $25.4 billion in economic output and $12.5 billion in value added under the high scenario. It is unclear where in the U.S. supply chain growth would occur.

The University of Delaware projects that offshore wind power would generate 30 GW along the Atlantic coast through 2030. This initiative would require capital expenditures of $100 billion over the next 10 years (University of Delaware 2019). Although the industry supply chain is global and foreign sources would be responsible for some expenditures, more U.S. suppliers are expected to enter the industry.

Compared to the $14.2 to $25.4 billion in offshore wind economic output (AWEA 2020), the 2019 annual GDP for states with offshore wind projects (Connecticut, Massachusetts, Rhode Island, New York, New

Jersey, Delaware, Maryland, Virginia, and North Carolina) ranged from $63.5 billion in Rhode Island to $1.73 trillion in New York (BEA 2020) and totaled nearly $5.0 trillion. The $14.2 to $25.4 billion in offshore wind industry output would represent 0.3 to 0.5 percent of the combined GDP of these states.

The AWEA study estimates offshore wind would support 45,500 (base scenario) to 82,500 (high scenario) jobs—full-time equivalent jobs at a given point in time—in the year 2030 nationwide, including direct, supply chain, and induced jobs. Most offshore wind jobs are created during the short-term construction phase. About 60 percent of jobs would be short-term (development and construction) and 40 percent would be long-term (operations and maintenance). A 2020 study commissioned by RODA estimated that offshore wind projects through 2030 would generate 55,989 to 86,138 job-years (a full-time equivalent job lasting 1 year) for construction and 5,003 to 6,994 long-term jobs for operations and maintenance (Georgetown Economic Services 2020). These estimates are generally consistent with the AWEA study in total jobs supported, although the Georgetown Economic Services study concludes that a greater proportion of jobs would be in the construction phase. As with the AWEA estimates of economic output, the RODA study assumed that offshore wind energy jobs would be focused in states hosting offshore wind projects, but would also be generated in other states where manufacturing and other supply chain activities occur. The demand for an increased workforce to is further documented in a National Renewable Energy Laboratory (NREL) report that states that by 2030 the average annual employment levels are estimated at 15,000 and 58,000 based on 25-percent and 100-percent domestic content scenarios, respectively (NREL 2022). This was followed by a second NREL report outlining a road map for actions and outcomes that could address this workforce demand (NREL 2023).

The Primary Analysis Area for this Final EIS is geographically large. In 2018, employment in the seven-state Primary Analysis Area was a combined was 27.8 million (Table 3.16-9). Because projected offshore wind jobs could be located anywhere in the United States, the extent of impacts on the GAA cannot be clearly foreseen; however, a substantial portion of the workforce for planned Massachusetts, Rhode Island, New York, and other northeast and Mid-Atlantic States offshore wind projects would likely be drawn from, or would relocate to, areas within commuting distance of one of the several ports being considered for offshore wind staging, construction and operations.

Some local economic activity has already begun in preparation for the anticipated offshore wind industry. Planned offshore wind activities include offshore wind energy development activities on the Atlantic OCS other than the Proposed Action determined by BOEM to be reasonably foreseeable (see Section E-1 and Attachment 2 in Appendix E for a complete description of planned offshore wind activities). BOEM expects planned offshore wind activities to affect demographics, employment and economics through the following primary IPFs.

Energy security/generation: Once built, offshore wind energy projects could produce energy at long-term fixed costs. These projects could provide reliable prices once built compared to the volatility of fossil fuel prices. Appendix E outlines the estimated electricity planned for offshore wind activities along the east coast. The economic impacts of future offshore wind activities (including associated energy storage and capacity projects) on energy generation and energy security cannot be quantified but could be long term and beneficial.

Cable emplacement and maintenance: Offshore cable emplacement for future offshore wind projects would temporarily impact commercial fishing and for-hire recreational fishing businesses, static gear fishing vessels, and recreational vessels based in the GAA during cable installation and maintenance. Cable emplacement supporting offshore wind activities would occur offshore from the GAA for demographics, employment, and economics, resulting in seafloor disturbance, and fishing vessels may not have access to impacted areas during active construction. The disruption from cable installation may occur concurrently or sequentially, with similar impacts on commercial fishery resources. Disruption may result in conflict over other fishing grounds, increased operating costs for vessels, and lower revenue (e.g., if the substituted fishing area is less productive or supports less valuable species). Short-term productivity reductions would also affect seafood processing and wholesaling businesses that depend upon the fishing industry.

Assuming other projects use installation procedures similar to those proposed in the Sunrise Wind COP Section 3.3 (Sunrise Wind 2023a), the duration and extent of impacts would be limited. Commercial fishing and for-hire recreational fishing and the related processing industries represent a small portion of the employment and economic activity in the GAA. The economic impact of cable emplacement and maintenance on commercial fishing and for-hire recreational fishing businesses is covered in more detail in Section 3.14, *Commercial Fisheries and For-Hire Recreational Fishing*, and would be localized and short-term.

Land disturbance: Offshore wind development would require onshore cable installation, substation construction or expansion, and possibly expansion of shore-based port facilities. Depending on siting, land disturbance could result in localized, short-term disturbances of businesses near cable routes and construction sites for substations and other electrical infrastructure, and could consist of increased noise, traffic, and road disturbances. The activities would be similar in character and duration to other common construction projects, such as utility installations, road repairs, and industrial site construction. Impacts on employment would be localized, short-term, and both beneficial (jobs and revenues to local businesses that participate in onshore construction) and adverse (potentially lost revenue due to construction disturbances).

Lighting: Aviation obstruction warning lights are required for offshore WTGs and would be visible from some beaches and coastlines and could have effects on economic activity in certain locations if the lighting influences visitors in selecting coastal locations to visit, or potential residents in selecting residences. At night, required aviation obstruction lighting on the WTGs would consist of two L-864 medium-intensity red lights mounted on the nacelle flashing 30 times per minute, as well as up to three L-810 low-intensity red lights mounted on the midsection of the WTG. Depending on the location of the other offshore wind projects, some may be more visible than others from land viewpoints. However, a University of Delaware study evaluating the impacts of visible offshore WTGs on beach use found that WTGs visible more than 15 mi (24.1 km) from the viewer would have negligible impacts on businesses dependent on recreation and tourism activity (Parsons and Firestone 2018). The vast majority of the WTG positions envisioned offshore of the GAA would be more than 15 mi (24.1 km) from coastal locations with views of the WTGs. These lights would be incrementally added over the construction period and would be visible for the operating lives of future offshore wind activities. Distance from shore, topography, and atmospheric conditions would affect light visibility.

ADLS is an emerging technology that, if implemented at offshore wind projects, would only activate aviation warning lighting on WTGs when aircraft enter a predefined airspace. If implemented, ADLS would reduce the amount of time that WTG lighting is visible. Visibility would depend on distance from shore, topography, and atmospheric conditions. Such systems would likely reduce impacts on demographics, employment, and economics associated with lighting.

Nighttime construction and maintenance of offshore wind projects would require lighting for vessels in transit and at offshore construction work areas. Vessel lighting would enable commercial shipping and commercial fishing operations to safely navigate around the vessels and work areas and would be visible from coastal locations, primarily while the vessels are in transit. Vessel lighting is not anticipated to impact the volume of business at visitor-oriented businesses or other businesses. Impacts of vessel lighting would be localized, short-term, intermittent, and possibly adverse.

Noise: Noise from site assessment G&G survey activities, O&M, pile driving, trenching, and vessels could result in short-term impacts on employment and economics via the impacts on marine businesses (e.g., commercial fishing and for-hire recreational fishing, and recreational sightseeing).

Noise (especially site assessment G&G surveys and pile driving) would affect fish populations, with effects on commercial fishing and for-hire recreational fishing. As discussed in Section 3.14, *Commercial Fisheries and For-Hire Recreational Fishing,* increased noise could temporarily affect the availability of fish within work areas, causing fishing vessels to relocate to other fishing locations in order to continue to earn revenue. This could potentially lead to increased conflict in relocation areas, increased operating costs for vessels, and lower revenue. The severity of such impacts would depend on the overlap of construction activities, where construction activities occur in relation to preferred fishing locations, and how exactly the commercial fishing industry responds to future construction activities.

Overall, offshore wind-generated noise could result in visitor-oriented services avoiding areas of noise and impacts on marine life important for fishing and marine sightseeing businesses (i.e., marine mammal tours offshore, etc.). Section 3.14, *Commercial Fisheries and For-Hire Recreational Fishing*, provides details on potential economic impacts on commercial fishing and for-hire recreational fishing businesses. Section 3.21, *Recreation and Tourism*, provides details on potential impacts to recreation and tourism. Both types of impacts would be localized and short-term, occurring during surveying and construction, with only periodic, short-term impacts during the O&M phase of the project. Noise impacts during surveying and construction would be more widespread when multiple offshore wind projects are under construction at the same time in the marine area off the coast of the GAA.

Onshore construction noise could possibly result in a short-term reduction of economic activity for businesses near installation sites for onshore cables or substations, temporarily inconveniencing workers, residents, and visitors. Because the location of onshore improvements is not known and cannot be determined until specific projects are proposed, the magnitude of noise associated with onshore construction and the number of businesses and homes affected cannot be determined. Impacts on demographics, employment, and economics from noise would be, intermittent and short-term, similar to other onshore utility construction activity.

Port utilization: Offshore wind installation would require port facilities for berthing, staging, O&M and loadout. Development activities would bolster port investment and employment while also supporting jobs and businesses in supporting industries. Future offshore wind development would also support planned expansions and modifications at ports in the GAA. While simultaneous construction or decommissioning (and, to a lesser degree, O&M) activities for multiple offshore wind projects in the GAA could stress port capacity, it would also generate considerable economic activity and benefit the regional economy and infrastructure investment.

Port utilization would require a trained workforce for the offshore wind industry including additional shore-based and marine workers that would contribute to local and regional economic activity. Improvements to existing ports and channels would be beneficial to other port activity, including commercial fishing and for-hire recreational fishing, and other marine businesses. Port utilization in the GAA would occur primarily during development and construction projects, anticipated to occur primarily between 2023 and 2030. Ongoing O&M activities would sustain port activity and employment at a lower level after construction.

Offshore wind activities and associated port investment and usage would have long-term, beneficial impacts on employment and economic activity by providing employment and industries such as marine construction, ship construction and servicing, and related manufacturing. The greatest benefits would occur during offshore wind project construction between 2023 and 2030. If offshore wind construction results in competition for scarce berthing space and port service, port usage could potentially have short- to medium-term adverse impacts on commercial shipping.

Presence of structures: Appendix E outlines the offshore wind activities expected in the U.S. Atlantic coast under the No Action Alternative and outlines the number of offshore wind structures (WTGs) expected. The offshore export cables and hard protection associated with these offshore wind farm developments would increase the risk of gear loss connected with cable mattresses and structures along the east coast. Fisheries using bottom gear may be permanently disrupted, which would increase economic impacts on the commercial fishing and for-hire recreational fishing industries. These offshore facilities would also pose allision and height hazard risks, creating obstructions and navigational complexity for marine vehicles, which would impose fuel costs, time, and risk and require adequate technological aids and trained personnel for safe navigation. In the event of an allision, vessel damage and spills could result in both direct and indirect costs for commercial/for-hire recreational fishing.

The potential for additional offshore wind energy structures within the GAA could encourage fish aggregation and generate reef effects that attract recreational fishing vessels. Fish aggregation could increase human fishing activities, but this attraction would likely be limited to the minority of recreational fishing vessels that already travel as far from the shore as the wind energy facilities. Fish aggregation could potentially result in broad changes in recreational fishing practices if these effects are widespread enough to encourage more participants to travel farther from shore.

The increase in hard coverage for future offshore wind foundations could create foraging opportunities for harbor and gray seals, sea turtles, bats, northern gannets, loons, and peregrine falcons, possibly attracting private or commercial recreational sightseeing vessels. As a result, the presence of new habitat could increase economic activity associated with offshore sightseeing. New structures would be added intermittently between 2023 and 2030 and could benefit structure-oriented species as long as the structures remain.

As a result of fish aggregation and reef effects associated with the presence of offshore wind structures, there would be long-term impacts on commercial fishing operations and support businesses such as seafood processing. The fishing industry is expected to be able to adapt its fishing practices over time in response to these changes. These effects could simultaneously provide new business opportunities such as fishing and tourism. Overall, the presence of offshore wind structures would have continuous, long-term impacts on demographics, employment, and economics.

The offshore structures would also necessitate alterations in the routes of for-hire recreational fishing, recreational tour boat businesses, sailing races, and highly migratory species (HMS) angling. Some offshore wind structures would provide new business opportunities due to fish aggregation and reef effects—which could attract fish valued for recreational fishing—and the possibility of tours for visitors interested in a close-up view of the wind structures, as has occurred for the Block Island Wind Farm.

The views of offshore WTGs could have impacts on certain businesses serving the recreation and tourism industry. Impacts could be adverse for particular locations if visitors and customers avoid certain businesses (i.e., hotels or rental dwellings) due to views of the WTGs; impacts could be neutral or beneficial if views do not affect visitor decisions or influence some visitors beneficially. Section 3.22, *Scenic and Visual Resources*, discusses visibility of WTGs from beaches and coastal areas in the GAA for demographics, employment, and economics.

A joint research study of the University of Connecticut and Lawrence Berkeley National Laboratory titled *Relationship between Wind Turbines and Residential Property Values in Massachusetts,* found no net effects from WTGs on property values in Massachusetts (Atkinson-Palombo and Hoen 2014). The study examined impacts of 41 onshore WTGs located 0.25 to 1 mile (0.4 to 1.6 kilometers) from residences. The study noted weak evidence linking the announcement of new WTGs to adverse impact on home prices and found that those effects were no longer apparent after the start of WTG operations. The offshore wind structures would be different from the report data in that offshore WTGs would be much larger than the onshore WTGs but located much further from residences and appear small on the horizon. Additionally, a 2017 study found that when placed more than 8 mi (7 nm; 13 km) from shore, there is a minimal effect on vacation rental values associated with offshore wind farms (Lutzeyer et al. 2017). A 2018 study also found that there was no impact on property values when the wind farm is located 5.6 mi (9 km) offshore (Jensen et al. 2018). Therefore, it is unlikely that the development of offshore wind farms and the presence of structures would have an impact on property values of homes onshore.

Overall, the presence of offshore wind structures would have a continuous, long-term impact on employment and economics in commercial fishing and for-hire recreational fishing, marine recreation and coastal recreation and tourism.

Traffic: Offshore wind construction and decommissioning and, to a lesser extent, offshore wind operations would generate increased vessel traffic. This additional traffic would support increased employment and economic activity for marine transportation and supporting businesses, investment in the ports which are being considered as staging points for this Project and investment in other ports outside of the GAA. Increased vessel traffic would have continuous, beneficial impacts during all project phases, with stronger impacts during construction and decommissioning.

Impacts of short-term increased vessel traffic during construction could include increased vessel traffic congestion, delays at ports, and a risk for collisions between vessels. As stated in Section 3.16, future offshore wind projects would result in a small incremental increase in vessel traffic, with a short-term peak during construction. Increased vessel traffic would be localized near affected ports and offshore construction areas. Congestion and delays could increase fuel costs (i.e., for vessels forced to wait for port traffic to pass), and could decrease productivity for commercial shipping, fishing, and recreational vessel businesses, whose income depends on the ability to spend time out of port. Collisions could lead to vessel damage and spills, which could have direct costs (i.e., vessel repairs and spill cleanup) as well as indirect costs from damage caused by spills.

The magnitude of increased vessel traffic is described in more detail in Section 3.19, *Navigation and Vessel Traffic*, and would depend upon the vessel traffic volumes generated by each offshore wind project, the extent of concurrent or sequential construction of wind energy projects, and the ports selected for each project. Increased vessel traffic congestion and collision risk would have continuous, short-term impacts during all project phases, with stronger impacts during construction and decommissioning.

Climate change: Climate change could affect demographics, employment, and economics in the GAA. Sea level rise and increased storm frequency and severity could result in property or infrastructure damage, increase insurance cost, and reduce the economic viability of coastal communities. Impacts on marine life due to ocean acidification, altered habitats and migration patterns, and disease frequency would affect industries that rely on these species. It is anticipated that there would be a net reduction in GHG emissions that contribute to climate change, and no collective adverse impact on climate change as a result of offshore wind projects.

3.16.3.3 Conclusions

Impacts of the No Action Alternative

Under the No Action Alternative, the GAA would continue to be influenced by regional demographic and economic trends. Ongoing activities, future non-offshore wind activities, and future offshore wind activities would continue to sustain and support economic activity and growth within the GAA based on anticipated population growth and ongoing development of businesses and industry. Tourism and recreation would continue to be important to the economies of the coastal areas. Marine industries such as commercial fishing and shipping would continue to be active and important components of the regional economy. Counties in the GAA would continue to seek to diversify their economies—including maintaining or increasing their year-round population and protect environmental resources.

BOEM anticipates that ongoing activities in the GAA (continued commercial shipping and commercial fishing; ongoing port maintenance and upgrades; periodic channel dredging; maintenance of piers, pilings, seawalls, and buoys; and the use of small-scale, onshore renewable energy) would have **minor** adverse and **minor beneficial** impacts on demographics, employment, and economics.

Planned activities for coastal and marine activity, other than offshore wind, include development of diversified, small-scale, onshore renewable energy sources; ongoing onshore development at or near current rates; continued increases in the size of commercial vessels; potential port expansion and channel-deepening activities; and efforts to protect against potential increased storm damage and sea level rise. BOEM anticipates that there would be **minor** adverse and **minor beneficial** impacts on demographic, employment, and economics from these planned activities. BOEM expects the combination of ongoing and planned non-offshore wind activities to result in minor adverse impacts and minor beneficial impacts on ocean-based employment and economics, driven primarily by the continued operation of existing marine industries, especially commercial fishing, recreation/tourism, and shipping; increased pressure for environmental protection of coastal resources; the need for port maintenance and upgrades; and the risks of storm damage and sea level rise. Increased investment in land and marine ports, shipping, and logistics capability is an expected result of the project, along with component laydown and assembly facilities, job training, and other services and infrastructure necessary for offshore wind construction and operations. Additional manufacturing and servicing businesses would result either in the GAA or other locations in the United States if supply chains develop as expected. While it is not possible to estimate the extent of job growth and economic output within the GAA specifically, there would be notable and measurable benefits to employment, economic output, infrastructure improvements, and community services, especially job training, because of offshore wind development.

Many jobs generated by offshore wind are short-term construction jobs. However, the combination of construction needs across multiple offshore wind projects creates notable employment opportunities. Other beneficial impacts include long-term O&M jobs; long-term tax revenues; long-term economic benefits of improved ports and other industrial land areas; diversification of marine industries, especially in areas currently dominated by recreation and tourism; and growth in a skilled marine construction workforce. Therefore, BOEM anticipates that there would be overall **minor beneficial** impacts from future offshore wind activities in the GAA, combined with ongoing activities and planned activities other than offshore wind.

Cumulative Impacts of the No Action Alternative

BOEM anticipates that the No Action Alternative, when combined with all planned activities (including other offshore wind activities), would result in **minor** adverse and **moderate beneficial** cumulative impacts due primarily to the impacts on commercial fishing and for-hire recreational fishing businesses and marine recreational businesses (tour boats, marine suppliers) primarily through cable emplacement, noise and vessel traffic during construction, and the presence of offshore structures during operations. These IPFs would temporarily disturb marine species and displace commercial or for-hire fishing vessels, which could cause conflicts over other fishing grounds, increased operating costs, and lower revenue for marine industries and supporting businesses. The long-term presence of offshore wind structures would also lead to increased navigational constraints and risks and potential gear entanglement and loss. Beneficial impacts would result from increase employment and economic activity associated with multiple offshore wind projects being developed and operated in the region.

3.16.4 Relevant Design Parameters and Potential Variances in Impacts

This Final EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in Appendix C would result in impacts similar to or less than those described in the sections below. The following proposed PDE and potential variances (Appendix C) that would influence the magnitude of the impacts to demographics, employment and economics:

- The number, size, and location of WTGs;
- During the construction phase, the amount of helicopter support required;
- Related to onshore export cable route and construction (Holbrook Construction Areas and Volumes), the length of onshore cable route, cable trenches, corridor width, and corridor area;
- Related to the onshore substation (Holbrook), the permanent site area and short-term construction workspace;
- Related to the overhead Transmission Line (Holbrook), the maximum length of onshore interconnection cable route, landfall type, the HDD noise levels, and number of personnel.

The size of the proposed Project would affect the overall investment and economic impacts associated with the proposed Project and alternatives outlined below. An adjustment in the number or type of WTGs installed would be changes in the amount of materials purchased, number of vessels required, and amount of labor and equipment required. Beneficial economic impacts within the GAA would depend on the number of workers, materials, vessels, equipment, and services required for the WTGs purchased and layout, and the overall proportion that can be locally sourced and the specific ports used by the proposed Project.

3.16.5 Impacts of Alternative B – Proposed Action on Demographics, Employment, and Economics

The Proposed Action's beneficial impacts on demographics, employment and economics depend on the proportion of workers, materials, vessels, equipment, and services that can be locally sourced. A study conducted by BW Research Partnership on behalf of E2, a national, nonpartisan group of advocates for policies that benefit both the economy and environment, evaluated the potential spending impacts across five states on the east coast, including New York, New Jersey, and Virginia, which are in the Primary Analysis Area for this proposed Project. The study indicated that for every $1.00 spent building an offshore wind farm is estimated to generate $1.72, $1.83, and $1.73 for New York, New Jersey, and Virginia's state economies (E2 2018). It is presumed that the other states within the Primary Analysis Area would fall in a similar range but is dependent on the amount of locally sourced labor and project components noted above.

Sunrise Wind's economic impact study includes an assessment of job creation based on the widely recognized Jobs and Economic Development Impact (JEDI) Offshore Wind Model, developed by the NREL, and most recently updated in 2021. That analysis found that the construction of the Project would support an estimated 1,843 direct U.S. job-years (full-time equivalent jobs multiplied by the number of construction years) during the construction phase and approximately 189 additional annual direct U.S. jobs during the operations phase (COP, December 1, 2020, Appendix W – *Economic Modeling Report*, AKRF 2020).

Direct employment refers to jobs created by the direct hiring of workers. Indirect employment refers to jobs created through increased demand for materials, equipment, and services. Induced employment refers to jobs created at businesses where offshore wind industry workers would spend their incomes. This direct U.S. job creation as a result of the Sunrise Wind project, noted above, would also result in indirect and induced job creation. Overall, including consideration of both direct (onsite) jobs and those generated indirectly from supply chain and support services, as well as induced jobs supported by worker spending, construction of the Project would support an estimated 16,193 U.S. job-years (full-time equivalent jobs multiplied by the number of construction years) during the construction phase and approximately 635 additional annual U.S. jobs during the operations phase. The geographic location of these jobs would be dependent on the phase of the proposed Project, the ports chosen to support the staging, construction, O&M and decommissioning of the proposed Project, among other variables.

The Proposed Action would support a range of positions for professionals such as engineers, environmental scientists, financial analysts, administrative personnel; trade workers such as electricians, technicians, steel workers, welders, and ship workers; and other construction jobs during construction and installation of the Proposed Action. O&M would create jobs for maintenance crews, substation and turbine technicians, and other support roles. The decommissioning phase would also generate professional and trade jobs and support roles. Therefore, all phases of the Proposed Action would lead to local employment and economic activity.

Assuming that conditions are similar to those of the Vineyard Wind project, job compensation (including benefits) is estimated to average between $88,000 and $96,000 for the construction phase, with occupations including engineers, construction managers, trade workers, and construction technicians. O&M occupations would consist of turbine technicians, plant managers, water transportation workers, and engineers, with average annual compensation of approximately $99,000 (BOEM 2021). A study from the New York Workforce Development Institute provided estimates of salaries for jobs in the wind energy industry that concur with Vineyard Wind’s projections. The expected salary range for trade workers and technicians ranges from $43,000 to $96,000, $65,000 to $73,000 for ships’ crew and officers, and $64,000 to $150,000 for managers and engineers (Gould and Cresswell 2017).

The hiring of local workers would stimulate economic activity through increased demand on housing, food, transportation, entertainment, and other goods and services. Seasonal housing units are available in the vicinity of the proposed Project; however, many of these may be second homes and vacation rentals that may not be reliable as rentals. In addition, during the summer, competition for short-term accommodations may arise, leading to higher rents. However, this effect would be short-term during the active construction period and could be reduced if construction is scheduled outside the busy summer season. Permanent workers are expected to reside locally; there is adequate housing supply to accommodate the increase in the local workforce (Table 3.16-5). As indicated previously, where feasible workers would be hired from the local workforce to meet labor needs of the proposed Project’s construction, O&M, and decommissioning.

Tax revenues for state and local governments would increase as a result of Project expenditures. Equipment, fuel, and some construction materials would likely be purchased from local or regional vendors. These purchases would result in short-term impacts on local businesses by generating additional revenues and contributing to the tax base. Once the Project is operational, property taxes would be assessed on the value of the Sunrise Wind facilities. The increased tax base during operations would be a long-term, beneficial impact on local governments in the proposed Project Area.

In addition, Sunrise Wind has committed to invest more than $400 million in New York in accordance with the OREC agreement for the proposed Project and this agreement includes several commitments. In March 2023, the Town of Brookhaven entered into a host community agreement with Sunrise Wind that outlined a variety of developments, investments and benefits to the community. It could result in more than $700 million of investment for assets, jobs and programming in Suffolk County (Sunrise Wind 2023b). Sunrise Wind is committed to working with minority and women-owned businesses so that the developing offshore wind supply chain is inclusive and diverse. Sunrise Wind is also providing $10 million in seed funding to create a National Offshore Wind Training Center in Brentwood, within Suffolk County. Together with partners from labor, academia, and the environmental community, the National Offshore Wind Training Center would feature specialized facilities and programming that is essential to offshore work, aiming to cement Suffolk County’s role as an integral part of the emerging offshore wind industry. Suffolk County Community College would serve as the academic arm of this initiative. A state-of-the-art Operations and Maintenance Hub would be created in East Setauket that would create up to 100 new, long-term jobs, and Sunrise Wind designated Port Jefferson as the home port of the project’s custom-built 260 ft Service Operation Vessel, as well as funding $5 million for a Research and Development Partnership with Stony Brook University (Sunrise Wind 2023b). Finally, Sunrise Wind has also committed to performing secondary steel fabrication in the New York Capital Region and funding the Upper Hudson Valley Work Force Initiative. These initiatives would ensure residents throughout New York have access to this opportunity and the training needed to succeed in the offshore wind industry.

In addition, as stated in their Draft EIS comment letter dated February 14, 2023, Sunrise Wind also indicated they were entering negotiations with New York contractors and trade labor organizations on a Project Labor Agreement to cover construction activities for the proposed Project and committing to paying prevailing wages.

The reasonably foreseeable environmental trends and impacts of the Proposed Action are described by IPFs below.

3.16.5.1 Construction and Installation

3.16.5.1.1 Onshore Activities and Facilities

Cable emplacement and maintenance: Onshore cable related construction includes installation of the onshore transmission cable and onshore interconnection cable. Construction would primarily occur within existing public road and utility ROWs and the construction activities would be similar to other construction projects, where there may be additional noise and/or traffic impacts in certain areas, which could disrupt business activities in those areas. These disruptions would be short-term, adverse impacts, but mitigated through implementation of mitigation and EPMs. APMs to minimize impacts from cable emplacement and maintenance include conducting construction of the Landfall and ICW HDD outside of the summer tourist season, which is generally between Memorial Day and Labor Day, the construction of the remaining onshore facilities (such as the cables) would be designed to minimize impacts to the local communities to the extent feasible, and where feasible, local workers would be hired to meet labor needs for the Proposed Action. In addition, the onshore transmission cable and onshore interconnection cable would not include any overhead utility poles, thus minimizing potential impacts to adjacent properties.

Cable emplacement and maintenance for onshore activities and facilities would create short-term, jobs during the construction period, which would be a beneficial impact, and where feasible, local workers would be hired to meet labor needs for proposed Project construction.

Land disturbance: Construction of the Proposed Action would require construction of the OnCS-DC, onshore transmission cable and onshore interconnection cable. Installation of the cables would occur within a short-term construction corridor, which are mostly within existing roadways and ROW. Landfall would occur at Smith Point County Park, and the cables would then traverse north and west to terminate at the OnCS-DC and ultimately connect to the Holbrook Substation (Figure 2.1-3). The employment and economic impact of the Proposed Action caused by disturbance of businesses near the onshore cable route and substation construction site would result in localized, short-term, minor impacts. The Proposed Action's impact to land disturbance impacts on demographics, employment, and economics from ongoing and planned activities would be short-term and minor due to the short-term and localized disruption of onshore businesses.

Lighting: Lighting in this context primarily refers to aviation safety lighting for the offshore WTGs, and there is not anticipated to be additional lighting for onshore activities and facilities outside of perhaps some lights during the construction period, as needed. The impact of any onshore lighting related to the Proposed Action would be short-term and negligible.

Noise: Noise onshore may be present from the construction and installation of the OnCS-DC, onshore transmission cable and onshore interconnection cable, including construction-related vehicle noise (i.e., dump trucks, backhoes, concrete saws, air compressors and portable generators), noise from areas requiring HDD, site preparation, and general vehicular traffic. The noise generated during construction and installation of onshore facilities would be short-term and may have a minor impact on adjacent land uses; however, mitigation measures would be implemented, and the proposed Project would be designed to minimize impacts to the local communities to the extent feasible, including Sunrise Wind committing to screening at the OnCS-DC to the extent feasible, to reduce potential visibility and noise.

Presence of structures: Presence of structures in this context primarily refers to the WTGs and other support facilities offshore; therefore, there would be no impact related to onshore activities and facilities. Most of the onshore facilities would be buried (i.e., the cables), but the OnCS-DC would be above-ground construction; however, the OnCS-DC would be located in a heavily industrial area and impacts would be long-term and negligible.

Traffic: Traffic in this context refers to land-based vehicular traffic related to the construction of onshore facilities, including the OnCS-DC, onshore transmission cable and onshore interconnection cable. Sunrise Wind has proposed an APM of coordinating with local authorities to develop a Maintenance and Protection of Traffic (MPT) Plan as part of the Project's EM&CP to minimize potential traffic impacts during construction to help minimize impact from construction. However, construction activities may require some detours and/or additional congestion during the period of construction of the onshore facilities along the roadways where the cable would be installed but be similar to a routine construction project. This could result in temporary disruption to business activities in adjacent land uses; however, these impacts would be short-term and minor.

3.16.5.1.2 Offshore Activities and Facilities

Cable emplacement and maintenance: The Proposed Action's cable emplacement would generate vessel anchoring and dredging at the worksite, requiring other vessels to avoid and navigate around the worksites and resulting in short-term disturbance to species important to commercial and recreational fishing, other forms of recreation and tourism, with potential adverse effects on employment and income. The SRWEC includes a corridor length of up to 104.7 mi (168.5 km) where cable emplacement would be conducted, as well as IAC amongst the WTGs within the SRWF.

The maximum seafloor disturbance associated with construction and operation of the SRWEC and IAC is summarized in Appendix C. This seafloor disturbance would result in a disruption of fish stocks, and concrete mattresses covering cables in hard-bottom areas could hinder commercial trawlers/dredgers, potentially reducing income and increasing costs for affected businesses over the long term. Cable installation would have localized, short-term, minor impacts on demographics, employment, and economics, while maintenance of the Proposed Action and other existing submarine cables would have intermittent, long-term, negligible impacts.

Lighting: Lighting in this context refers primarily to the aviation hazard lighting on the WTGs but could also include effects from nighttime lighting associated with vessels and other construction and installation related equipment. The impacts would be primarily to the recreational and commercial fishing, pleasure, and tour boating community. Impacts would be short-term and negligible, and the impacts to potential fishing, recreating or other marine-related businesses would be minor.

Noise: Noise from the offshore facilities component of the Proposed Action construction (primarily pile driving) could temporarily affect fish and marine mammal populations, hindering fishing and sightseeing near construction activity within the SRWF, which could discourage some businesses from operating in these areas during pile driving (see Section 3.14, *Commercial Fisheries and For-Hire Recreational Fishing*). This would result in a localized, short-term, minor impact on these marine-related businesses and therefore demographics, employment, and economics, but would return to normal conditions following the completion of construction activities.

In addition, trenching and/or HDD for cable emplacement activities emit noise. This noise could temporarily disrupt commercial fishing, marine recreational businesses, and onshore recreational businesses. Noise from trenching and trenchless technology would affect marine life populations, which would in turn affect commercial and recreational fishing businesses. Impacts on marine life would also affect onshore recreational businesses due to noise near public beaches, parks, residences, and offices. The use of trenchless technology at natural and sensitive landfall locations where possible would minimize direct impacts, as well as the intent to perform construction at the landfall outside the summer tourist season, which is generally between Memorial Day and Labor Day. Cable laying, trenching, and HDD would have localized, intermittent, short-term, and negligible impacts on demographics, employment, and economics.

Vessel noise could affect marine species relied upon by commercial fishing businesses, marine recreational businesses, recreational boaters, and marine sightseeing activities. Vessel traffic would occur between ports (outside the recreational and tourism GAA) and offshore wind work areas. Most vessel traffic would travel to the WTG installation area, with fewer vessels needed along the cable installation routes. Noise from vessels would have short-term, intermittent, negligible impacts on demographics, employment, and economics.

Noise generated by the Proposed Action's staging operations at ports would produce some noise; however, these are existing ports in industrial areas. Several ports are being considered to support construction and installation of offshore facilities. Depending upon the specific ports selected to support construction, noise from the Proposed Action, in combination with ongoing and planned activities, would have a variable, short-term, negligible to minor impact on demographics, employment, and economics.

Port utilization: The Proposed Action would require port facilities for berthing, staging, and loadout to support the construction and installation of offshore facilities. The activities at ports would support port investment and employment and would also support jobs and businesses in supporting industries and commerce. There are 10 ports identified for consideration that could support construction and installation activities for offshore facilities (Table 3.16-2). These ports would require a trained workforce for the offshore wind industry including additional shore-based and marine workers that would contribute to local and regional economic activity.

The economic benefits would be greatest during construction when the most jobs and most economic activity at ports supporting the Proposed Action would occur. These jobs related to construction and installation of offshore facilities would be short-term and are outlined at the beginning of this section (see Section 3.16.5). As a result of this activity, and offshore wind development in general, investments are being made at many of these ports, which would benefit other port users, including maintenance and dredging of shipping channels. The Proposed Action would have a minor to moderate beneficial impact on demographics, employment, and economics from port utilization due to greater economic activity and increased employment at ports used by the Proposed Action.

Traffic: In this context, traffic is referring to vessel traffic generated during construction of the offshore facilities as part of the Proposed Action. The Proposed Action would generate vessel traffic in the proposed Project Area and to and from the ports supporting project construction of offshore facilities. Increased vessel traffic would increase the use of port and marine businesses, including tug services, dockage, fueling, inspection/repairs, and provisioning. The vessel traffic generated by the Proposed Action alone would result in increased business for marine transportation and supporting services in the GAA with continuous, short-term, and minor beneficial impacts during construction.

Vessel traffic associated with the Proposed Action could also result in short-term, periodic congestion within and near ports, leading to potential delays and an increased risk for collisions between vessels, which would result in economic costs for vessel owners. As a result of potential delays from increased congestion and increased risk of damage from collisions and/or allisions, the Proposed Action would have continuous, short-term, and minor impacts during construction.

3.16.5.2 Operations and Maintenance

3.16.5.2.1 Onshore Activities and Facilities

Land disturbance: During the O&M phase of the project, the onshore transmission cable infrastructure, including cable landfall sites and onshore cables, would be underground and primarily within roads and utility ROW, while the substation would operate within an industrial area. As a result, operations and occasional maintenance or repair operations from the Proposed Action alone would have negligible and long-term impacts.

Lighting: Lighting in this context primarily refers to aviation safety lighting for the offshore WTGs. There is not anticipated to be lighting for onshore activities and facilities during the O&M phase of the project, beyond perhaps some lights during a specific repair or maintenance activity, as needed during non-daylight hours. The impact of any onshore lighting related to O&M and the Proposed Action on demographics, employment and economics would be negligible.

Noise: Noise onshore may be present from O&M activities related to the OnCS-DC, onshore transmission cable and onshore interconnection cable. This would include operation of the OnCS-DC, which would be a new noise source and limited noise from routine maintenance that may require short-term use of equipment to facilitate inspections and repairs. Sunrise Wind proposes to implement screening at the OnCS-DC, an APM that is intended to reduce potential noise and visibility.

The OnCS-DC is located in an already industrial area and noise generated from O&M activities would be minimal, ongoing, and long-term for operation of the OnCS-DC and therefore would have a negligible impact on demographics, employment, and economics.

Traffic: Traffic in this context primarily refers to land-based vehicular traffic during the O&M phase for onshore facilities. Once the onshore facilities are constructed, there would be minimal long-term traffic impacts. There could be routine or as-needed maintenance along the cable routes or at the OnCS-DC; however, this would be negligible in the context of the surrounding area.

3.16.5.2.2 Offshore Activities and Facilities

Energy security/generation: The Proposed Action would install 94, 11-MW WTGs within 102 positions that would expect to produce up to 1,034 MW of electricity, or 3 percent of the estimated 35 GW of reasonably foreseeable offshore wind generation potential for the U.S. east coast. Offshore wind energy projects could produce energy at long-term fixed costs, which could provide stability against fossil fuel price volatility once built. Therefore, the Proposed Action would provide long-term contributions to energy security and resilience through a stable supply of energy. In context of reasonably foreseeable environmental trends, future offshore wind activities would have similar contributions to energy generation and security as the Proposed Action but on a larger scale. Impacts related to energy generation and security would have long-term, regional, and minor beneficial impacts on demographics, employment, and economics.

Cable emplacement and maintenance: O&M activities related to the offshore cable emplacement for the Proposed Action would temporarily affect commercial fishing and for-hire recreational fishing businesses, marine recreation, and subsistence fishing during infrequent maintenance; however, would be less than during construction and installation and considered negligible.

Lighting: As described in Section 3.22, *Scenic and Visual Resources*, nighttime aviation safety lighting on all of the Proposed Action's WTGs could be visible from coastal and elevated locations (depending on vegetation, topography, weather, and atmospheric conditions). Sunrise Wind has committed to voluntarily implement ADLS or related means (e.g., dimming or shielding) to limit visual impact as an APM to limit visual impacts. ADLS would activate the Proposed Action's WTG lighting only when aircraft approach the Sunrise Wind Project WTGs, as compared to standard continuous FAA hazard lighting.

Aviation hazard lighting from 94 WTGs associated with the Proposed Action could potentially be visible from coastal locations. Related impacts could include recreational and commercial fishing, pleasure, and tour boating community would experience major adverse effects in foreground views, while onshore viewers would experience minor to moderate effects from nighttime lighting associated with O&M activities. ADLS reduces nighttime impact significance from major to moderate and moderate to minor, due to substantially limited hours of lighting.

In addition, as noted in Section 3.16, studies have shown that there is little evidence to indicate the construction and operation of WTGs in offshore areas at the distance the SRWF would be located would have an impact on property values. Therefore, it is unlikely that the development of offshore wind farms and the presence of structures, and associated lighting, would have an impact on property values of homes onshore, so impacts on demographics, employment, and economics would be negligible.

Noise: Noise impacts related to the Proposed Action's O&M activities for offshore facilities would take two forms. In the offshore environment, noise from vessel traffic would affect commercial fishing businesses and recreational businesses due to impacts on species important to commercial fishing and for-hire fishing, recreational fishing, and marine sightseeing activities and noise from maintenance and repair operations that make the wind energy facilities less attractive to fishing operators and recreational boaters. Noise from O&M activities would have localized, intermittent, long-term, negligible impacts on demographics, employment, and economics.

The Proposed Action would also consider the use of five ports for support during offshore O&M activities. These ports have other industrial and commercial sites, as well as major roads, which generate ongoing noise. Therefore, noise from vessels or O&M mobilizing activities from the Proposed Action alone would have variable, negligible impacts on demographics, employment and economics.

Port utilization: The Proposed Action would require port facilities to support O&M activities related to offshore facilities. Five ports are being considered for supporting offshore O&M activities (see Table 3.16-2). These ports would require a trained workforce for the offshore wind industry including additional shore-based and marine workers that would contribute to local and regional economic activity. Long-term job creation related to offshore O&M activities are noted at the beginning of this section (see Section 3.16.5), and to the extent feasible would be hired from the local labor force.

The Proposed Action would have a long-term, minor beneficial impact due to greater economic activity and increased employment at the ports in the GAA, although to a lesser extent during the O&M phase than during construction. The Proposed Action would also have minor beneficial impacts on through long-term increased job availability and investment in port facilities supporting other marine-related businesses.

Presence of structures: The Proposed Action would add up to 95 offshore wind structures (94 WTGs and 1 OCS-DC) along with an offshore export cable. The presence of structures could have both adverse and beneficial effects as outlined below.

The presence of these structures could affect marine-based businesses (i.e., commercial fishing and for-hire recreational fishing businesses, offshore recreational businesses, and related businesses) through impacts such as entanglement and gear loss/damage, navigational hazard and risk of allisions, fish aggregation, habitat alteration, and space-use conflicts. These structures may cause vessel operators to reroute, which would affect their fuel costs, operating time, and revenue. Due to the risk of gear entanglement, fisheries using bottom gear may be permanently disrupted, which would increase economic impacts on the commercial fishing and for-hire recreational fishing industries. This would have continuous, long-term, and minor impacts on demographics, employment, and economics.

Offshore wind structures could encourage fish aggregation and generate reef effects that attract recreational fishing vessels. These effects would only affect the minority of recreational fishing vessels that reach the wind energy facilities. This would have long-term, negligible benefits on demographics, employment, and economics. Proposed Action structures could increase economic activity associated with offshore sightseeing because these structures create foraging opportunities for harbor and gray seals, sea turtles, bats, northern gannets, loons, and peregrine falcons. Some offshore wind structures would provide the possibility of tours for visitors interested in a close-up view of the wind structures, as has occurred for the BIWF. This would have long-term, negligible beneficial impacts on demographics, employment, and economics.

Views of WTGs could have impacts on businesses serving the recreation and tourism industry. The presence of offshore wind structures could affect shore-based activities, surface-water activities, wildlife and sightseeing activities, diving/snorkeling, and recreational boating (see Section 3.21, *Recreation and Tourism*, and Section 3.22, *Scenic and Visual Resources*, for additional discussion of related impacts). In addition, as noted previously in this section, studies have shown that there is little evidence to indicate the construction and operation of WTGs in offshore areas at the distance the SRWF would be located would have an impact on property values (Atkinson-Palombo and Hoen 2014). Therefore, it is unlikely that the development of offshore wind farms and the presence of structures would have an impact on property values of homes onshore.

The development of offshore wind and presence of offshore structures in general would affect employment and economics by affecting marine-based businesses. Presence of structures would have both beneficial impacts, such as by providing sightseeing opportunities and fish aggregation that benefit recreational businesses, and adverse effects, such as by causing fishing gear loss, navigational hazards, and viewshed impacts that could affect business operations and income. The Proposed Action would have a long-term, moderate impact on demographics, employment, and economics, due to impacts on commercial fishing and for-hire recreational fishing, for-hire recreational boating, and associated businesses.

Traffic: The Proposed Action would generate vessel traffic in the proposed Project Area and to and from the ports supporting offshore project O&M activities. Increased vessel traffic would increase the use of port and marine businesses, including tug services, dockage, fueling, inspection/repairs, and provisioning. The vessel traffic generated by the Proposed Action alone would result in increased business for marine transportation and supporting services in the GAA with continuous, short-term, and negligible beneficial impacts during the O&M phase. Vessel traffic associated with the Proposed Action could also result in short-term, periodic congestion within and near ports, leading to potential delays and an increased risk for collisions between vessels, which would result in economic costs for vessel owners. As a result of potential delays from increased congestion and increased risk of damage from collisions, the Proposed Action would have continuous, short-term, and negligible impacts during operations.

Climate change: Climate models predict climate change if current trends continue. Climate change has adverse implications for demographics and economic health of coastal communities, due in part to the costs of resultant damage to property and infrastructure, fisheries, and other natural resources, among other factors. It is anticipated that there would be a net reduction in GHG emissions that contribute to climate change, and no collective adverse impact on climate change as a result of offshore wind projects. To the degree that offshore wind facilities contribute to the overall effort to limit climate change, these projects would reduce the socioeconomic impacts associated with the effects of climate change. The Proposed Action would have long-term, negligible beneficial impacts on demographics, employment, and economics from these IPFs due to the small reduction in or avoidance of emissions from power generation. Future offshore wind activities would have similar contributions as the Proposed Action but at a larger scale. The contribution of the Proposed Action to the combined impacts from ongoing and planned activities would have a long-term, minor benefit.

3.16.5.3 Conceptual Decommissioning

3.16.5.3.1 Onshore Activities and Facilities

Cable emplacement and maintenance: Onshore cable decommissioning would be similar in nature to the construction and installation related impacts. Impacts during cable decommissioning would be similar to other construction type projects, and could include air emissions, noise, and traffic impacts, as well as visual impacts. However, the decommissioning would be short-term and even shorter-term than construction and is considered a negligible impact.

Land disturbance: The decommissioning phase for onshore activities and facilities would be similar to, or of lesser intensity, than during the construction and installation phase and would occur for a shorter period of time. Potential impacts related to land disturbance would be similar to, or less than under the construction and installation phase, and also short-term, and therefore considered a negligible impact.

Lighting: Lighting in this context primarily refers to aviation safety lighting for the offshore WTGs, and there is not anticipated to be additional lighting for onshore activities and facilities outside of perhaps some lights during the decommissioning period, as needed. The impact of any onshore lighting related to the Proposed Action would be short-term and negligible.

Noise: Noise onshore may be present from the decommissioning activities of the OnCS-DC, onshore transmission cable and onshore interconnection cable, which may include similar activities as during construction and installation. This would include construction-related vehicle noise (i.e., dump trucks, backhoes, concrete saws, air compressors and portable generators), site rehabilitation, and general vehicular traffic. The noise generated during decommissioning of onshore facilities would be short-term, and impacts would be negligible to minor.

Traffic: Traffic in this context primarily refers to land-based vehicular traffic related to the decommissioning of onshore facilities, including the OnCS-DC, onshore transmission cable and onshore interconnection cable, which is assumed to be similar to construction and installation. This may require some detours and/or additional congestion during the period of decommissioning of the onshore facilities along the roadways where the cable would be installed but be similar to a routine construction project. Traffic pattern changes or congestion could affect business activities in the vicinity of the onshore facilities, but impacts would be short-term nature and considered negligible to minor.

3.16.5.3.2 Offshore Activities and Facilities

Cable emplacement and maintenance: The decommissioning of offshore cable for the Proposed Action would temporarily affect commercial fishing and for-hire recreational fishing businesses, marine recreation, and subsistence fishing during cable installation, in a similar manner as during construction and installation but to a lesser degree. Decommissioning activities would have a short-term, localized, minor impact on marine businesses (commercial fishing or recreation businesses). Decommissioning activities could affect fish and mammals of interest for fishing and sightseeing through dredging and turbulence, although species would recover upon completion and removal of the cable. Decommissioning of offshore components for the Proposed Action could therefore have a short-term, minor impact.

Lighting: Lighting in this context refers primarily to the aviation hazard lighting on the WTGs but could also include effects from nighttime lighting associated with vessels and other decommissioning related equipment. The impacts would be primarily to the recreational and commercial fishing, pleasure, and tour boating community. The impact from visual impacts associated with lighting from offshore facility decommissioning would be negligible and the impacts from potential marine-related businesses being impacted would be short-term and minor.

Noise: Noise from decommissioning offshore facilities associated with the Proposed Action could temporarily affect fish and marine mammal populations, hindering fishing and sightseeing near decommissioning activity within the SRWF Lease Area, which could discourage some businesses from operating in these areas (see Section 3.14, *Commercial Fisheries and For-Hire Recreational Fishing*). It is assumed noise generated during decommissioning would be similar to that experienced during construction. This would result in a localized, short-term, negligible impact on marine-related businesses and therefore demographics, employment and economics, but would return to normal conditions following the completion of decommissioning activities.

Port utilization: The Proposed Action would require port facilities for decommissioning activities related to offshore facilities. It is assumed that the same 10 ports identified for construction and installation would support decommissioning activities. Similar to construction, these ports would require a trained workforce for the offshore wind industry including additional shore-based and marine workers that would contribute to local and regional economic activity.

These jobs related to decommissioning of offshore facilities would be short-term. As a result of this activity, and offshore wind development in general, investments are being made at many of these ports, which would benefit other port users, including maintenance and dredging of shipping channels. The Proposed Action would have a minor beneficial impact on demographics, employment, and economics from port utilization during decommissioning activities.

Traffic: In this context, traffic is referring to vessel traffic generated during decommissioning of offshore facilities related to the Proposed Action. It is assumed that vessels supporting the decommissioning would originate or terminate at one of the same 10 ports being considered to support the proposed Project during the construction and installation phase. Vessel traffic impacts during decommissioning would be similar to, or less than the impacts during construction and installation and be considered negligible to minor.

3.16.5.4 Cumulative Impacts of the Proposed Action

This section outlines the cumulative impacts of the Proposed Action considered in combination with other ongoing and planned wind activities.

In context of reasonably foreseeable environmental trends, the incremental contributions of the Proposed Action to the combined energy security/generation impacts from ongoing and planned activities including offshore wind. Impacts related to energy generation and security would have long-term, regional, and minor beneficial impacts on demographics, employment, and economics.

The exact extent of land disturbance associated with other projects would depend on the locations of landfall, onshore transmission cable routes, and onshore substations for offshore wind energy projects. Therefore, in context of reasonably foreseeable environmental trends, the incremental impacts contributed by the Proposed Action to the combined land disturbance impacts from ongoing and planned activities including offshore wind would be short-term and noticeable due to the short-term and localized disruption of onshore businesses.

WTG lighting in ongoing and planned offshore wind activities would be visible from the same locations as the Proposed Action. In context of reasonably foreseeable environmental trends, the Proposed Action would contribute a noticeable increment to the combined lighting impacts from ongoing and planned activities including offshore wind, which would be negligible.

In context of reasonably foreseeable environmental trends, the Proposed Action would contribute a noticeable increment to the combined cable emplacement and maintenance impacts on demographics, employment, and economics from ongoing and planned activities including offshore wind, which would be short-term and minor.

There are several wind projects adjacent to or in close proximity to the SRWF Lease Area, and the Proposed Action is anticipated to overlap with construction of these offshore wind projects, potentially contributing to increased noise impacts during simultaneous construction activity (Appendix E). While operational activity would overlap, noise impacts during operations would be far less than during construction. Therefore, in context of reasonably foreseeable environmental trends, the Proposed Action would contribute a noticeable increment to the combined noise impacts on demographics, employment, and economics from ongoing and planned activities including offshore wind, which would be short-term and negligible.

Other offshore wind energy activity would provide support (either construction support, O&M or both) at the same ports as the Proposed Action as well as other ports within the GAA. Port investments are ongoing and planned in response to offshore wind activity. Maintenance and dredging of shipping channels are expected to increase, which would benefit other port users. In context of reasonably foreseeable environmental trends, the Proposed Action would contribute a noticeable increment to the impacts from other ongoing and planned activities, which would be long term, moderate, and beneficial on port utilization and the associated trained and skilled offshore wind workforce that would contribute economic activity in port communities and the region as a whole.

Offshore structures, including those of the Proposed Action, would affect employment and economics by affecting marine-based businesses. Presence of structures would have both beneficial impacts, such as by providing sightseeing opportunities and fish aggregation that benefit recreational businesses, and adverse effects, such as by causing fishing gear loss, navigational hazards, and viewshed impacts that could affect business operations and income. In context of reasonably foreseeable environmental trends, the Proposed Action would contribute an undetectable increment to the combined impacts on demographics, employment, and economics from other ongoing and planned activities including offshore wind, which would be long-term and moderate due to impacts on commercial and for-hire recreational fishing, for-hire recreational boating, and associated businesses.

In context of reasonably foreseeable environmental trends, the Proposed Action would contribute a noticeable increment to the combined impacts on vessel traffic from ongoing and planned activities including offshore wind, which would be minor during construction and decommissioning and negligible during operations. Increased vessel traffic would produce demand for supporting marine services, with beneficial impacts on employment and economics during all project phases, including minor to moderate beneficial impacts during construction and decommissioning and negligible beneficial impacts during operations. The increased vessel traffic congestion and collision risk would also have long-term, continuous impacts on marine businesses during all project phases, with minor impacts during construction and decommissioning and negligible impacts during operations.

3.16.5.5 Conclusions

Impacts of the Proposed Action

BOEM anticipates that the Proposed Action would have **minor** adverse impacts on demographics within the analysis area. While it is likely that some workers would relocate to the area due to the Proposed Action, this volume of workers would not be substantial compared to the current population and housing supply in the analysis area. In addition, where feasible, as presented within the COP, Section 4.7.1.3 (Sunrise Wind 2023a), to the extent feasible local workers would be hired to meet labor needs for the proposed Project. The Proposed Action would affect employment and economics through job creation, expenditures on local businesses, tax revenues, grant funds, and support for additional regional offshore wind development, which would have **minor beneficial** impacts. Construction would have a minor beneficial impact on employment and economics due to jobs and revenue creation over the short duration of the construction period. The beneficial impact of employment and expenditures during O&M would less than during construction and have a modest magnitude over the 35-year duration of the proposed Project. Although tax revenues and grant funds would be modest in magnitude compared to other economic activity in the region, they also would provide a beneficial impact on public expenditures and local workforce and supply chain development for offshore wind. If the Proposed Action becomes decommissioned, the impacts on demographics, employment, and economics would be minor and beneficial due to the construction activity necessary to remove wind facility structures and associated equipment both onshore and offshore. After decommissioning, the Proposed Action would no longer affect employment or produce other offshore wind-related revenues.

While the Proposed Action's investments in wind energy would largely benefit the local and regional economies through job creation, workforce development, and income and tax revenue, adverse impacts on individual businesses and communities would also occur. Short-term increases in IPFs such as noise during construction, cable emplacement, land disturbance, and the long-term presence of offshore lighting and structures would have negligible to minor adverse impacts on demographics, employment, and economics. This would include impacts during construction, and to a lesser degree during O&M, to the commercial fishing and for-hire recreational fishing industry and other marine-related businesses that depend on local seafood production. Overall, the impacts on commercial fishing and onshore seafood businesses would have minor impacts on demographics, employment, and economics for this component of the GAA's economy. Although commercial fishing is a relatively small component of the regional economy, it is important to the identity of local communities within the region and analysis area. The IPFs associated with the Proposed Action would also result in impacts on certain recreation and tourism businesses (see also Section 3.21, *Recreation and Tourism*) that range from negligible to minor, with an overall minor impact on employment and economic activity for this component of the analysis area's economy.

Cumulative Impacts of the Proposed Action

In context of other reasonably foreseeable environmental trends, the contribution of the Proposed Action to the impacts of individual IPFs resulting from ongoing and planned activities would range from negligible to moderate adverse impacts and negligible to moderate beneficial impacts. Overall, BOEM anticipates that the Proposed Action and ongoing and planned activities would result in **minor** adverse cumulative impacts and **moderate beneficial** impacts on demographics, employment, and economics in the GAA. The moderate beneficial impacts primarily would be associated with the investment in offshore wind, job creation and workforce development, income and tax revenue, and infrastructure (i.e., ports, etc.) improvements, while the minor adverse effects would result from aviation hazard lighting on WTGs, new cable emplacement and maintenance, the presence of structures, vessel traffic and collisions during construction, and land disturbance. Impacts on commercial and for-hire recreational fishing are anticipated to be moderate on an individual basis, but only one component of the overall impacts. Because they are not expected to disrupt normal demographic, employment, and economic trends, the overall impacts in the GAA likely would be minor adverse. In addition, in context of reasonably foreseeable environmental trends, the Proposed Action and ongoing and planned activities would have a notable and measurable benefit from construction and operations phase employment and would have moderate beneficial cumulative impacts on demographics, employment, and economics.

3.16.6 Alternative C-1 – Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

3.16.6.1 Construction and Installation

3.16.6.1.1 Onshore Activities and Facilities

Under Alternative C-1, the potential impacts to demographics, employment and economics from the construction and installation of onshore activities and facilities are anticipated to be the same as described under the Proposed Action.

3.16.6.1.2 Offshore Activities and Facilities

Under Alternative C-1, the construction of the 11-MW WTGs, OCS-DC, and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Removal of 8 WTG positions from Priority Areas would not change the overall number of WTGs associated with the Project. Therefore, the potential impacts from the construction and installation of offshore activities and facilities on demographics, employment and economics are anticipated to be the same as described under the Proposed Action.

3.16.6.2 Operations and Maintenance

3.16.6.2.1 Onshore Activities and Facilities

Under Alternative C-1, the potential impacts to demographics, employment and economics are anticipated to be the same as described under the Proposed Action.

3.16.6.2.2 Offshore Activities and Facilities

Under Alternative C-1, the construction of the 11-MW WTGs, OCS-DC, and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Removal of 8 WTG positions from Priority Areas would not change the overall number of WTGs associated with the Project. Therefore, the potential impacts from the O&M of offshore activities and facilities on demographics, employment and economics are anticipated to be the same as described under the Proposed Action.

3.16.6.3 Conceptual Decommissioning

3.16.6.3.1 Onshore Activities and Facilities

Under Alternative C-1, the potential impacts to demographics, employment and economics are anticipated to be the same as described under the Proposed Action.

3.16.6.3.2 Offshore Activities and Facilities

Under Alternative C-1, the construction of the 11-MW WTGs, OCS-DC, and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. Removal of 8 WTG positions from Priority Areas would not change the overall number of WTGs associated with the Project. Therefore, the potential impacts from the conceptual decommissioning of offshore activities and facilities on demographics, employment and economics are anticipated to be the same as described under the Proposed Action.

3.16.6.4 Cumulative Impacts Alternative C-1

In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 to the cumulative impacts on demographics, employment, and economics would be essentially the same as those described under the Proposed Action, which were noticeable to moderate, depending on the IPF.

3.16.6.5 Conclusions

Impacts of Alternative C-1

Alternative C-1 would exclude from development 8 WTG positions in the Priority Areas for the purposes of habitat impact minimization; however, the same overall number of WTGs (94) as the Proposed Action would be installed and operated, along with the same onshore facilities and components. The impacts resulting from individual IPFs associated with Alterative C-1 would result in no change to the overall impact magnitudes to demographics, employment and economics as compared to the Proposed Action. These are anticipated to be **minor** adverse impacts and **minor beneficial** impacts on demographics, employment, and economics.

Cumulative Impacts of Alternative C-1

Overall, Alternative C-1 combined with ongoing and planned activities would result in the same cumulative impacts as described in the Proposed Action, which include **minor** adverse impacts and **moderate beneficial** impacts on demographics, employment and economics in the GAA.

3.16.7 Alternative C-2 – Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of up to 12 WTG Positions to the Eastern Side of the Lease Area

3.16.7.1 Construction and Installation

3.16.7.1.1 Onshore Activities and Facilities

Under Alternative C-2, the potential impacts to demographics, employment and economics for onshore activities and facilities are anticipated to be the same as described under the Proposed Action and Alternative C-1. The relocation of up to 12 WTG positions away from Priority Areas would not change the overall impacts.

3.16.7.1.2 Offshore Activities and Facilities

Under Alternative C-2, the potential impacts to demographics, employment and economics are anticipated to be the same as described under Alternative C-1. Both Alternative C-1 and C-2 include the exclusion of up to 8 WTG positions from Priority Areas and the only difference between the alternatives is the relocation of up to an additional 12 WTGs to the eastern side of the Lease Area under Alternative C-2, which would not substantially change impacts.

3.16.7.2 Operations and Maintenance

3.16.7.2.1 Onshore Activities and Facilities

Under Alternative C-2, the potential impacts to demographics, employment and economics for O&M onshore activities and facilities are anticipated to be the same as described under the Proposed Action and Alternative C-1. The exclusion of up to 8 WTG positions from Priority Areas and the relocation of up to an additional 12 WTGs would not change the overall impacts.

3.16.7.2.2 Offshore Activities and Facilities

Under Alternative C-2, the potential impacts to demographics, employment and economics are anticipated to be the same as described under Alternative C-1. Both Alternative C-1 and C-2 include the exclusion of up to 8 WTG positions from Priority Areas and the only difference between the alternatives is the relocation of up to an additional 12 WTG positions to the eastern side of the Lease Area under Alternative C-2, which would not substantially change impacts.

3.16.7.3 Conceptual Decommissioning

3.16.7.3.1 Onshore Activities and Facilities

Under Alternative C-2, the potential impacts to demographics, employment and economics for decommissioning of onshore facilities are anticipated to be the same as described under the Proposed Action and Alternative C-1. The exclusion of up to 8 WTG positions from Priority Areas and the relocation of up to an additional 12 WTG positions would not change the overall impacts.

3.16.7.3.2 Offshore Activities and Facilities

Under Alternative C-2, the potential impacts to demographics, employment and economics due to decommissioning of offshore facilities are anticipated to be the same as described under Alternative C-1. Both Alternative C-1 and C-2 include the exclusion of up to 8 WTG positions from Priority Areas and the only difference between the alternatives is the relocation of up to an additional 12 WTG positions to the eastern side of the Lease Area under Alternative C-2, which would not substantially change impacts.

3.16.7.4 Cumulative Impacts of Alternative C-2

In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-2 to the cumulative impacts on demographics, employment and economics would be similar to or slightly less than those described under the Proposed Action, which were noticeable to moderate, depending on the IPF. The relocation of up to 12 WTG positions to the eastern portion of the SRWF Lease Area for the purposes of habitat impact minimization would lessen the impacts under certain IPFs but would not substantially change the incremental contribution to cumulative impacts.

3.16.7.5 Conclusions

Impacts of Alternative C-2

Alternative C-2 would include the exclusion of development of up to 8 WTG positions from Priority Areas and the relocation of up to an additional 12 WTG positions to the eastern portion of the SRWF Lease Area for the purposes of habitat impact minimization; however, the same overall number of WTGs (94) as the Proposed Action would be installed and operated. In addition, there would be no change to the onshore facilities and components. The impacts resulting from individual IPFs associated with Alterative C-2 would be the same as Alternative C-1. The overall impact magnitudes under Alternative C-2 are anticipated to be **minor** adverse impacts and **minor beneficial** impacts on demographics, employment, and economics.

Cumulative Impacts of Alternative C-2

Impacts related to Alternative C-2 combined with ongoing and planned activities would result in the same cumulative impacts as described in the Proposed Action (and Alternative C-1), which include **minor** adverse impacts and **moderate beneficial** impacts on demographics, employment and economics in the GAA.

3.16.8 Alternative C-3 - Reduced Layout from Priority Areas Considering Feasibility due to Glauconite Sands

Under the Fisheries Habitat Impact Minimization Alternative C-3, the construction, O&M, and eventual decommissioning of the 11-MW WTGs and an OCS within the proposed Project Area and associated inter-array and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. However, Alternative C-3 was developed to address concerns regarding pile refusal due to glauconite sands in the southeastern portion of the Lease Area while still minimizing impacts to benthic and fisheries resources. Alternative C-3a, C-3b, and C-3c described in Section 3.7.8, *Benthic Resources*, consider different WTG configurations to avoid sensitive habitats and engineering constraints while still meeting the NYSERDA OREC. This alternative only considered removal of WTGs from Priority Area 1 based on consultation with NMFS. Areas with high density of boulder, complex habitat, and data suggesting Atlantic cod aggregation and spawning was considered when determining which WTGs to remove.

3.16.8.1 Construction and Installation

3.16.8.1.1 Onshore Activities and Facilities

Under Alternative C-3, the potential impacts to demographics, employment and economics for onshore activities and facilities are anticipated to be the same as described under the Proposed Action, as well as Alternatives C-1 and C-2. The reduction in the number of WTGs would not change onshore activities or impacts.

3.16.8.1.2 Offshore Activities and Facilities

Under Alternative C-3, the potential impacts to demographics, employment and economics are anticipated to be nearly identical to those described under Alternative C-1 and C-2. Alternative C-3 reduces the number of WTGs that would be installed by between 7 and 14 in total. This reduction in the number of WTGs that would be constructed would slightly decrease the adverse impacts associated with other resource areas, such as commercial fisheries and for-hire recreational fishing and recreation and tourism impacts; however, the incremental reduction in potential adverse impacts would not substantially change conclusions.

3.16.8.2 Operations and Maintenance

3.16.8.2.1 Onshore Activities and Facilities

Under Alternative C-3, the potential impacts to demographics, employment and economics for O&M onshore activities and facilities are anticipated to be the same as described under the Proposed Action, as well as Alternatives C-1 and C-2. The reduction in the number of WTGs would not change onshore activities or impacts.

3.16.8.2.2 Offshore Activities and Facilities

Under Alternative C-3, the potential impacts to demographics, employment and economics are anticipated to be similar as those described under Alternatives C-1 and C-2. Alternative C-3 reduces the number of WTGs that would be installed by between 7 and 14 in total. This reduction in the number of WTGs that would require O&M would slightly decrease the long-term adverse impacts associated with other resource areas, such as commercial fisheries and for-hire recreational fishing and recreation and tourism impacts; however, the incremental reduction in potential adverse impacts would not substantially change conclusions.

3.16.8.3 Conceptual Decommissioning

3.16.8.3.1 Onshore Activities and Facilities

Under Alternative C-3, the potential impacts to demographics, employment and economics for decommissioning of onshore facilities are anticipated to be the same as described under the Proposed

Action, as well as Alternatives C-1 and C-2. The reduction in the number of WTGs would not change onshore activities or impacts.

3.16.8.3.2 Offshore Activities and Facilities

Under Alternative C-2, the potential impacts to demographics, employment and economics due to decommissioning of offshore facilities are anticipated to be similar to those described under Alternatives C-1 and C-2. Alternative C-3 reduces the number of WTGs that would be installed by between 7 and 14 in total. This reduction in the number of WTGs that would require decommissioning would slightly decrease the adverse impacts associated with other resource areas, such as commercial fisheries and for-hire recreational fishing and recreation and tourism impacts; however, the incremental reduction in potential adverse impacts would not substantially change conclusions.

3.16.8.4 Cumulative Impacts of Alternative C-3

In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-3 to the cumulative impacts on demographics, employment and economics would be similar to or slightly less than those described under the Proposed Action (and Alternatives C-1 and C-2), which were noticeable to moderate, depending on the IPF. The reduction of between 7 and 14 WTGs to avoid glauconite sands would lessen the impacts under certain IPFs but would not substantially change the incremental contribution to cumulative impacts.

3.16.8.5 Conclusions

Impacts of Alternative C-3

Alternative C-3 would include the reduction of between 7 and 14 WTGs from primarily the southern and eastern portion of the SRWF Lease Area for the purposes of avoiding glauconite sands. In addition, there would be no change to the onshore facilities and components. The impacts resulting from individual IPFs associated with Alterative C-3 would be similar to, but slightly less adverse than those described under Alternatives C-1, C-2, as well as Alternative B. The overall impact magnitudes under Alternative C-3 are anticipated to be **minor** adverse impacts and **minor beneficial** impacts on demographics, employment, and economics.

Cumulative Impacts of Alternative C-3

Impacts related to Alternative C-3 combined with ongoing and planned activities would result in similar cumulative impacts as described in the Proposed Action (and Alternatives C-1 and C-2), which include **minor** adverse impacts and **moderate beneficial** impacts on demographics, employment and economics in the GAA. The overall reduction in the number of WTGs that would be installed and operated would result in a slight incremental reduction in impacts to certain resources and IPFs, but would not change the overall conclusions.

3.16.9 Comparison of Alternatives

As noted above, most alternatives alone are effectively identical in terms of the level of impact on demographics, employment, and economics. The relocation of WTGs associated with Alternatives C-1 and C-2 could have fewer adverse impacts as it relates to fishing industries supported by the local economy, due to locating WTGs away from popular and productive fishing areas and sensitive habitats. Similarly, the overall reduction of between 7 and 14 WTGs under Alternative C-3 to avoid glauconite sands would have a similar result of fewer adverse impacts. Despite these slightly varied impacts, BOEM anticipates that impacts to demographics, employment and economics would range from minor adverse to minor beneficial for all evaluated action alternatives.

Adverse impacts would result from construction activity (onshore and offshore), port utilization and vessel traffic, noise/lighting, and presence of structures, while beneficial impacts would result primarily from construction activity, job creation, and port infrastructure investment. In combination with reasonably foreseeable trends for the analysis area, impacts to demographics, employment and economics from all evaluated action alternatives and other offshore activity would range from minor adverse to minor to moderate beneficial.

Table 3.16-12 provides an overall summary of alternative impacts.

Table 3.16-12. Comparison of Alternative Impacts on Demographics, Employment and Economics

No Action Alternative (Alternative A)	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)	Fisheries Habitat Minimization Considering Feasibility Due to Glauconite Sands (Alternative C-3)
No Action Alternative: BOEM anticipates that ongoing activities in the GAA (continued commercial shipping and commercial fishing; ongoing port maintenance and upgrades; periodic channel dredging; maintenance of piers, pilings, seawalls, and buoys; and the use of small-scale, onshore renewable energy) would have **minor** adverse and **minor beneficial** impacts on demographics, employment, and economics. *Cumulative Impacts of the No Action Alternative:* BOEM anticipates that the No Action Alternative, when combined with all planned activities (including other offshore wind activities), would result in **minor** adverse and **moderate beneficial** cumulative impacts due primarily to the impacts on commercial fishing	*Proposed Action:* BOEM anticipates that the Proposed Action would have **minor** adverse impacts on demographics within the analysis area. Short-term increases in noise during construction, cable emplacement, land disturbance, and the long-term presence of offshore lighting and structures would have minor adverse impacts on demographics, employment, and economics. The impacts on commercial fishing and onshore seafood businesses would have minor impacts on demographics, employment, and economics for this component of the GAA's economy. The IPFs associated with the Proposed Action would also result in **minor beneficial** impacts on employment and economic activity for this component of the analysis area's economy.	*Alternative C-1:* The impacts resulting from individual IPFs associated with Alterative C-1 would result in no change to the overall impact magnitudes to demographics, employment and economics as compared to the Proposed Action. These are anticipated to be **minor** adverse impacts and **minor beneficial** impacts on demographics, employment, and economics. *Cumulative Impacts of Alternative C-1:* Overall, Alternative C-1 combined with ongoing and planned activities would result in the same cumulative impacts as described in the Proposed Action, which include **minor** adverse impacts and **moderate beneficial** impacts on demographics, employment and economics in the GAA.	*Alternative C-2*: The impacts resulting from individual IPFs associated with Alterative C-2 would be the same as Alternative C-1. The overall impact magnitudes under Alternative C-2 are anticipated to be **minor** adverse impacts and **minor beneficial** impacts on demographics, employment, and economics. *Cumulative Impacts of Alternative C-2:* Impacts related to Alternative C-2 combined with ongoing and planned activities would result in the same cumulative impacts as described in the Proposed Action (and Alternative C-1), which include **minor** adverse impacts and **moderate beneficial** impacts on demographics, employment and economics in the GAA.	*Alternative C-3:* The impacts resulting from individual IPFs associated with Alterative C-3 would be similar to those described under Alternatives C-1 and C-2. The overall impact magnitudes under Alternative C-3 are anticipated to be **minor** adverse impacts and **minor beneficial** impacts on demographics, employment, and economics. The reduction of between 7 and 14 WTGs under Alternative C-3 would lessen adverse impacts for some other resource areas, but not substantially enough to change conclusions. *Cumulative Impacts of Alternative C-3:* Impacts related to Alternative C-3 combined with ongoing and planned activities would result in similar cumulative impacts to those described in the Proposed Action (and Alternatives C-1 and C-2), which include **minor** adverse

No Action Alternative (Alternative A)	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)	Fisheries Habitat Minimization Considering Feasibility Due to Glauconite Sands (Alternative C-3)
and for-hire recreational fishing businesses and marine recreational businesses (tour boats, marine suppliers) primarily through cable emplacement, noise and vessel traffic during construction, and the presence of offshore structures during operations.	*Cumulative Impacts of the Proposed Action:* Overall, BOEM anticipates that the Proposed Action and ongoing and planned activities would result in **minor** adverse impacts and **moderate beneficial** cumulative impacts on demographics, employment, and economics in the GAA. The moderate beneficial impacts primarily would be associated with the investment in offshore wind, job creation and workforce development, income and tax revenue, and infrastructure (i.e., ports, etc.) improvements, while the minor adverse effects would result from aviation hazard lighting on WTGs, new cable emplacement and maintenance, the presence of structures, vessel traffic and collisions during construction, and land disturbance.			impacts and **moderate beneficial** impacts on demographics, employment and economics in the GAA.

3.16.10 Summary of Impacts of the Preferred Alternative

BOEM has identified Alternative C-3b as the Preferred Alternative as depicted in Figure 2.1-10. Alternative C-3b would include installation of up to 84 WTGs, which is 10 fewer WTGs than the maximum WTGs proposed under the PDE of the Proposed Action. As a result, BOEM anticipates Alternative C-3b would have negligible impacts on demographics within the GAA, along with some short-term disturbance during construction and long-term visual impacts (i.e., presence of structures and lighting) that may have a **minor** adverse impact on demographics, employment and economics. In addition, impacts to commercial fishing and related onshore seafood businesses would have **minor** adverse impacts to demographics, employment and economics. The overall impacts related to the implementation of Alternative C-3b would be similar to, but slightly less than those described under Alternative B, since less WTGs would be installed.

3.16.11 Proposed Mitigation Measures

No additional measures to mitigate impacts on demographics, employment and economics have been proposed for analysis.

3.16.11.1 Effect of Measures Incorporated into the Preferred Alternative

Since no mitigation measures have been proposed, impacts levels for the Preferred Alternative would remain as described above in Section 3.16.8.

3.18 Land Use and Coastal Infrastructure

Under the Proposed Action, onshore infrastructure would be located in the Town of Brookhaven, Suffolk County, New York, on the south shore of Long Island. The SRWEC would meet landfall at the Smith Point County Park located within the Fire Island National Seashore. An onshore interconnection cable and onshore transmission cable would connect the landfall site to the existing Holbrook substation located within the Town of Brookhaven. The GAA for land use and coastal infrastructure includes the Town of Brookhaven, New York, resources adjacent to the landfall construction area, including land within the Fire Island National Seashore boundary, Smith Point County Park boundary, and Otis Pike Wilderness boundary, 1,000 ft (304.8 m) into the Atlantic Ocean, and 4,000 ft (1,219.2 m) into Great South Bay that is located within the boundary of the fire Island national Seashore, and the ports potentially used for Project construction, O&M, and conceptual decommissioning. Please see Appendix D, Figure D-15 for a detailed overview of the GAA.

3.18.1 Description of the Affected Environment and Future Baseline Conditions

Brookhaven is the most populous of the 10 towns in Suffolk County and is the only one that stretches from the north shore to the south shore of Long Island (NYS 2022). The town is characterized by unique hamlets, villages, and communities; two world renowned research centers, Stony Brook University and Brookhaven National Laboratory; popular beaches; and recreation areas (Brookhaven 2022). The western half of the town has a much higher concentration of development, with the eastern half having a much higher area of preserved recreation and open space (Suffolk County 2016). Commercial, industrial, and institutional land uses predominantly occur directly adjacent to transportation and roadways. Town land use predominantly consists of preserved recreation and open space (43 percent of the acreage of town lands), low-density and medium-density residential areas (21 percent of the acreage of town lands), and vacant land (10 percent of the acreage of town lands) (Suffolk County 2020). There are eight harbors located in Brookhaven on both the north shore and south shore of Long Island, including two on Fire Island: Corey North, Corey South, Davis Park, Forge River, Great Gun, Mt. Sinai, Port Jefferson, and Sandspit (Brookhaven 2022).

The Smith Point County Park is located within the Fire Island National Seashore in the town of Brookhaven. While Smith Point County Park is not owned by the federal government, it is within the boundaries of Fire Island National Seashore. The park is accessible by car via the William Floyd Parkway, and parking is available at the fee-based public Smith Point County Park parking lot (Suffolk County Parks 2018). Public access at the site includes beach access, camping facilities, showers, a playground, and staff present, including lifeguards (Suffolk County Parks 2018). The landing site is proposed to occur in the southeast corner of the public parking lot.

Within the Smith Point County Park is the TWA Flight 800 International Memorial. This space memorializes the victims of TWA Flight 800, which crashed off Fire Island on July 17, 1996 (NPS 2023). This area is located outside of the proposed work area, but adjacent to where construction activities would occur.

The Fire Island National Seashore is a 26-mile-long (41.8-km) protected section of the approximately 30-mile-long (48.2-km-long) Fire Island, separated from Long Island by the Great South Bay. The Fire Island

National Seashore was established "[f]or the purpose of conserving and preserving for the use of future generations certain relatively unspoiled and undeveloped beaches, dunes, and other natural features within Suffolk County, New York, which possess high values to the Nation as examples of unspoiled areas of great natural beauty in close proximity to large concentrations of urban population" (16 *USC* § 459e(a)). The Otis Pike Fire Island High Dune Wilderness Act (enacted December 23, 1980) designated approximately 1,363 ac (551.6 ha) of the Fire Island National Seashore as federally designated wilderness (Otis Pike Wilderness Area) and later expanded the wilderness area to an additional 18 ac (7.3 ha). The Otis Pike Wilderness area is the smallest wilderness area managed by the National Park Service and the only federally designated wilderness area in the state of New York. Figure 3.18-1 denotes the location of the Fire Island National Seashore and Otis Pike Wilderness Area. The Otis Pike Wilderness is located directly west of Smith County Park, and in an area where, per enabling legislation for the Fire Island National seashore, "every effort shall be exerted to maintain and preserve" this area of the seashore "in as nearly [its] present state and condition as possible" (16 *USC* § 459e-6(b)).

The Fire Island National Seashore is characterized by dynamic barrier island beaches, an ancient maritime forest, and historic resources, and contains 17 communities and the Otis Pike Wilderness Area (National Park Foundation 2022). The Fire Island National Seashore has communities, the wilderness area, natural areas, and historical and cultural resources within its boundaries. More than three-quarters of Fire Island National Seashore is marine or estuarine habitat, with 14,644 ac (59.3 km^2) of the park consisting of open water. The Seashore boundary extends 1,000 ft (304.8 m) into the Atlantic Ocean from Moriches Inlet to Robert Moses State Park, and up to 4,000 ft (1,219.2) into the Great South Bay, and Bellport, Narrow and Moriches Bay (NPS 2023). Two bridges connect the island to the mainland where cars can access the island but cannot drive from one end to the other, with the majority of people arriving on the island via ferry or private boat (NPS 2021). Fire Island is a popular tourism destination and day-trip location for recreationalists and beachgoers. The Fire Island Wilderness Visitor Center is located at the southernmost end of the William Floyd Parkway, adjacent to the Smith County Park. The Otis Pike Wilderness Area is accessible year-round, and parking is available at the Smith County Park. It includes a ranger contact station, an exhibit space, and an elevated viewing area.

Figure 3.18-1. **Fire Island National Seashore Area**

Sunrise Wind selected Smith Point County Park as the landfall site, stating that it would provide sufficient area to accommodate onshore HDD operations within developed areas, with minimal disruption to adjacent land uses, and would minimize direct disturbance to natural or cultural resources in the nearshore, coastal, and intracoastal areas. Section 2.2 further describes how Sunrise Wind selected the Smith Point County Park as the landfall site for the Proposed Action.

The onshore cable route between Smith Point County Park and the Holbrook substation is 17 mi (27.4 km). Each of the alternative landfall sites would have an onshore cable route to the Holbrook Substation that is at least 25 mi (40.2 km) in length, creating a greater distance of potential impacts from onshore cable installation. Access to the Landfall Work Area would be through Smith County Park, with the Landfall HDD entry location located in the parking lot. No trenching would occur on the Fire Island National Seashore beach.

From the landing site, the onshore transmission cable would parallel to Fire Island Beach Road within the paved Smith Point County parking lot within the Fire Island National Seashore, crossing under the William Floyd Parkway to a recreational area located to the west of the William Floyd Parkway. The cable would then be routed across the ICW, where it would then run north along East Concourse, north along William Floyd Parkway and Surrey circle, and cross the LIRR via trenchless crossing. The route then would turn west along Mastic Boulevard, north along Francine Places, and cross the Montauk Highway to Revilo Avenue, where it would continue north crossing Sunrise Highway. Then, the LIE Service Road Route turns west along Victory Avenue, where a crossing at Carmans River occurs, until it turns northwest along Horseblock Road. The cable would then cross the LIRR at Manor Road to Long Island Avenue, turn west along the LIE South Service Road, and continue to Waverly Avenue, where it turns south. From Waverly Avenue, the cable would turn west to Long Island Avenue and continue west to Union Avenue, where it would reach the OnCS-DC (see Figure 2.1.2-3).

Land use adjacent to the existing ROW varies, but includes community cultural spaces that are utilized by the public and contribute to the local community culture and environment. The Southaven County Park is located north of the Sunrise Highway and bisected by the Carmans River. It occupies 1,323 ac (535 ha), and includes camping facilities, high-capacity picnic areas, fishing and boating access, and public trails (Discover Long Island 2023). The Wertheim NWR is located south of the Sunrise Highway, straddling the Carmans River. The Wertheim NWR protects 2,550 ac (1,032 ha) of grasslands, oak-pine woodlands, and fresh, brackish, and saltwater wetlands (USFWS 2023). The Brookhaven Fairgrounds are located south of the Long Island Expressway at 440 Express Drive. This area is where the Brookhaven Fair has been held in the past, with the last fair held in 2019. The Long Island Baptist Church is also located adjacent to the proposed onshore transmission route at 125 Long Island Avenue, Holtsville New York 11742. Weekly services and prayer meetings are held at this church (Long Island Baptist 2023).

The OnCS-DC for the Project is proposed to be constructed at the intersection of the Long Island Expressway and Route 97 at the Union Avenue South site in the town of Brookhaven. The OnCS-DC would convert DC power from the onshore transmission cable to AC power at 138 kV. This site would have an operational footprint of up to 6 ac (2.4 ha). This facility would be constructed to support interconnection to the existing Holbrook Substation. This site is in close proximity to the Holbrook Station, approximately 1.0 mile (1.6 km) away, and is currently being utilized for industrial/commercial purposes. The site is maintained, contains gravel and paved locations, multiple buildings, and facilities associated with various commercial developments. This facility would include all equipment and safety features necessary to connect the SRWEC with the NYISO transmission system (see Figure 2.2-1 in COP; Sunrise Wind 2023).

The onshore interconnection cable would connect the OnCS-DC to the existing Holbrook Substation (see Figure 3.3.1-1 in COP; Sunrise Wind 2023). This cable would be installed underground within a duct bank to the Holbrook Substation and would convey AC power. The number of 138 kV onshore interconnection cables would be 12, with the potential for up to two fiber optic cables under the maximum design scenario.

Additionally, the Project would need to utilize various ports for construction, installation, O&M, and decommissioning activities. Sunrise Wind is evaluating several existing port facilities to support construction activities, located in New York, Connecticut and Rhode Island. Vessels traveling from Europe may also travel to ports in Canada (e.g. for foundation marshalling and/or for material loading for scour protection and secondary cable protection) prior to traveling to the SRWF. At the majority of ports being evaluated, upgrades would not be required. At existing ports where upgrades or modifications would be needed for the Project to proceed, upgrades would either be permitted and undertaken by port owners/operators and/or governmental entities or upgrades would occur in conjunction with other planned offshore wind projects that would be under construction before the SRWF. The primary construction ports expected to be used include Albany and/or Coeymans, New York; Port of New London, Connecticut; and Port of Davisville-Quonset Point, Rhode Island. It is expected that Sunrise would utilize ports that are industrial in nature and have the facilities needed to accommodate decommissioning activities, and that based on current conditions, the ports that would be considered would be the same as those considered for construction activities.

The Port of Albany is in the city of Albany, New York and is a modern, industrial port on the Hudson River. The port is located 124 nm (229.6 km) north of New York Harbor and is upstate New York’s largest public port (Port of Albany 2019). Marmen/Welcon, the first Offshore Wind Tower Manufacturer, is located at the Port of Albany, making it a potentially key area for construction of offshore wind projects. The port has more than 400 ac (162 ha) of land and deepwater facilities and is a major port of entry in the United States. The Port of Albany is located at the crossroads of Interstates I-90 and I-87 and two Class 1 rail services have access to the port, making it a convenient location to distribute goods (Port of Albany 2019).

The Port of Coeymans is a port located in Coeymans, New York on the Hudson River, 100 mi (161 km) north of New York City and 10 mi (16 km) South of Albany. The port is industrial and commercial, and the services are centered around large construction projects, small manufacturing, marine construction, aggregates, and disaster recovery projects (Carver Companies 2022). The Port of Coeymans has dock capacity for ships up to 750 ft (228.6 m) in length and has sites set up for storage, fabrication, or final assembly before being loaded on to a ship (Carver Companies 2022).

The Port of New London is an industrial port located in New London, Connecticut near the mouth of the Thames River on the north side of Block Island Sound. The port is one of Connecticut’s three deepwater ports and is located at the intersection of maritime access and distribution networks (Connecticut Port Authority 2021). On February 11, 2020, the Connecticut Port Authority, the state’s quasi-public agency who coordinates development of the port, Ørsted, and Eversource Investment, LLC (Eversource) finalized a harbor agreement to redevelop the State Pier in New London into a facility that would facilitate heavy lifting to help support the offshore wind industry (Connecticut Port Authority 2021). The improvements would allow for the port to accommodate heavy-lift cargo and is expected to be completed by 2023. Following this, the Ørsted and Eversource joint venture company would enter into a 10-year lease agreement that would allow for WTG preassembly and staging to occur at the State Pier.

Quonset Point houses the industrial port of Davisville that consists of two piers, a bulkhead, on-dock rail, and laydown and terminal storage located near the mouth of Narragnsett Bay in Rhode Island (Quonset Business Park 2022). Quonset Point played a key role in the development of Deepwater Wind's Block Island Project and served as the principal port for the project's heavy installation (Quonset Business Park 2022). In the summer of 2012, the Port of Davisville invested almost $30 million to improve its facilities, with the principal investment going toward the installation of a 150 metric tonne (330,693 pounds) mobile harbor crane to assist with a wide range of project cargoes (Quonset Business Park 2022).

Port facilities in Connecticut, Massachusetts, Maryland, New Jersey, New York, Rhode Island, and Virginia could potentially support construction and O&M of the SRWF facilities and the SRWEC (see Figure 3.3.10-1 in of COP; Sunrise Wind 2023). The ports are characterized as commercial and industrial in nature, and are generally adjacent to areas where the major land uses are commercial, industrial, or transportation related. Before construction activities begin, SRWF would finalize plans at the major port facilities. For further information on recreational vessel and commercial fishing activities relevant to these ports, see Section 3.14, *Commercial Fisheries and For-Hire Recreational Fishing*, Section 3.6.3 16, *Demographics, Employment, and Economics*, and Section 3.21, *Recreation and Tourism*.

3.18.2 Impact Level Definitions for Land Use and Coastal Infrastructure

This Final EIS uses a four-level classification scheme to analyze potential impact levels on Land Use and Coastal Infrastructure from the alternatives, including the Proposed Action. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a project or beyond project operations and decommissioning. Table 3.18-1 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for on Land Use and Coastal Infrastructure. Table G-17 in Appendix G identifies potential IPFs, issues, and indicators to assess impacts to on Land Use and Coastal Infrastructure.

Table 3.18-1. Definitions of Potential Adverse and Beneficial Impact Levels for Land Use and Coastal Infrastructure

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	No measurable/detectable change to area land use would occur.	No measurable/detectable change to area land use would occur
Minor	Impacts would be detectable but would be short-term and localized.	Beneficial impacts would be detectable but would be short-term and localized.

Moderate	Impacts would be detectable and broad-based, affecting a variety of land uses, but would be short-term and would not result in long-term change.	A detectable and broad-based benefit that would be short-term and would not result in long-term change.
Major	Impacts would be detectable, long-term, extensive, and result in permanent land use change.	A detectable, long-term, extensive benefit that would result in permanent land use change.

3.18.3 Impacts of Alternative A – No Action on Land Use and Coastal Infrastructure

When analyzing the impacts of the No Action Alternative on land use and coastal infrastructure, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities as the baseline conditions for land use and coastal infrastructure. The cumulative impacts of the No Action Alternative considered the impacts of the No Action Alternative in combination with other planned non-offshore wind and offshore wind activities. The Description of the Affected Environment and Baseline Conditions in section 3.18.1 provides an overview of information on trends from past and present activities on existing land use and coastal infrastructure. The GAA (Figure D-15, Appendix D) is within developed communities that would experience potential impacts from development of planned activities and the existence of ongoing activities.

3.18.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for land use and coastal infrastructure in the GAA described in Section 3.18.1, *Affected Environment*, would continue to be affected by ongoing non-offshore wind activities and offshore wind activities. Ongoing non-offshore wind activities within the GAA that contribute to impacts on land use and coastal infrastructure include beach, dune, and berm construction; breach response plans; port expansion; onshore development projects; underwater improvement projects such as dredging; upgrades to roads. The GAA lies within communities that already are highly developed, and it would be expected that construction activities would occur in areas that have previously had development activities occur. However, there is the potential for some development to occur on land that is not already development. It is expected that impacts to land use and coastal infrastructure in the GAA from ongoing activities would be minimal, as the area is already developed and zoning measures in place would help determine which activities would be allowed to occur, and that activities within the GAA that activities and associated impacts are expected to continue are current trends and have the potential to affect land use and coastal infrastructure through land disturbance, lighting, port utilization, noise, and presence of structures.

Ongoing offshore wind activities within the GAA that contribute to impacts on land use and coastal infrastructure include:

- Continued O&M of the Block Island project (5 WTGs) installed in state waters,
- Continued O&M of the CVOW project (2 WTGs) installed in OCS-A 0497, and
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork Wind Project (12 WTGS and 1 OSS) in OCS0A.

The GAA for land use and coastal infrastructure includes ports that are used for the continued O&M and ongoing construction of wind projects. Ongoing O&M of Block Island and CVOW projects and ongoing construction of the Vineyard Wind 1 and South Fork projects would affect land use and coastal infrastructure through the primary IPFs of accidental releases and discharges, land disturbance, lighting, port utilization, presence of structure, traffic, and noise. Ongoing offshore wind activities would have the same type of impacts from the primary IPFs that are described in detail in the following section for planned offshore wind activities, but the impacts would be of lower intensity.

3.18.3.2 Cumulative Impacts of the No Action Alternative

The cumulative impact analysis for the No Action Alternative considers the impact of the No Action Alternative in combination with other planned non-offshore wind activities and planned offshore wind activities (without the Proposed Action). BOEM expects planned future offshore wind development activities to affect land use and coastal infrastructure through the following primary IPFs.

Accidental releases and discharges: Discharges and releases of liquids and solid wastes could increase due to future offshore wind activities. The risk would be highest during construction activities, but there would still be the possibility of accidental releases and discharges occurring during operation and decommissioning of offshore wind facilities. Releases and discharges would be minimized with vessels complying with USCG regulations. Impacts to land use and coastal infrastructure would be dependent upon the location that the release or discharge occurs, and the locations of landfall, substations, cable routes, and ports that would be necessary to support offshore wind projects. However, any impacts other than very large spills, would generally be minor, short-term, and localized.

Land disturbance: The installation of onshore transmission cable transmission infrastructure would be required to support future offshore wind projects. This could lead to potential impacts to adjacent properties during construction activities and the potentially during maintenance activities. Impacts would be anticipated to be negligible to minor, localized and short-term during construction or maintenance activities and would be dependent upon the locations of both landfall and offshore transmission cable routes.

Lighting: Offshore WTGs would be equipped with permanent aviation warning lighting that would be visible from some beaches and coastlines. The visibility of the lighting would result in localized, continuous, long-term impacts, but would be dependent upon the distance from shore, topography, and atmospheric conditions. Impacts from lighting could have effects on property values, recreation, and tourism. A University of Delaware study evaluated the impact of approximately 574-ft-tall (175-m-tall) WTGs visible more than 15 mi (24.1 km) from the viewer to beach use and found that impacts would be negligible to tourism and recreation activity (Parsons and Firestone 2018). As currently proposed, the majority of WTG positions for future offshore wind projects in the GAA would be located greater than 15 mi (24.1 km) from coastal viewpoints. See Section 3.22, *Scenic and Visual Resources*, for further discussion on impacts of aviation hazard lighting.

Lighting on the WTGs would come from either standard continuous, medium-intensity red strobe light aircraft warning systems or from short duration synchronized flashing of the ADLS. ADLS would activate aviation warning lights on the WTGs when aircraft approach them and would have less nighttime visual impacts than standard warning lights. Sunrise Wind has proposed to implement ADLS as an APM, which would result in less impacts to land use from WTG lighting.

Lighting from onshore infrastructure, including new substations, could affect adjacent property use and residential development. However, it is likely that future offshore projects would construct new substations or expand existing substations near existing energy infrastructure in areas where land use regulations allow for such developments. This would lead to negligible to minimal adverse impacts on land uses, dependent upon the location of proposed substations. Generally, impacts would be localized, constant, and long-term.

Port utilization: Future offshore wind projects would utilize various ports to support construction, operation, and decommissioning activities. Some ports would require improvements to occur within existing port facilities and would likely lead to beneficial impacts from greater economic activity and increased employment due to increased port utilization. Increased employment would stem from demand for vessel maintenance services, vessel berthing, loading and unloading activities, warehousing and fabrication facilities for offshore wind components, and other business activity related to offshore wind. Future offshore wind projects may result in dredging and other improvement projects in the GAA. Impacts from these activities would be minimized by state and local agencies through managing port resources and traffic control to ensure continued access to ports and adjacent land uses.

There is the possibility that the construction of multiple offshore wind projects occurring at the same time and relying on the same ports and resources. If this occurs, there could potentially be increases in marine and road traffic, noise, and air pollution in the area, along with the potential for port resources to be stressed. The overall impacts on port utilization would have constant, long-term, beneficial impacts on port utilization due to port improvements and productive uses of the ports. However, there would also be the potential for localized, short-term adverse impacts if individual ports are stressed due to multiple construction activities occurring at the same time.

Presence of structures: Coastal locations in the GAA could have impacts during operations from the presence of offshore WTGs. The presence of structures could have impacts on recreation, tourism, and property values. Some WTGs could be visible from some coastal areas and beaches depending upon distance, vegetation, topography, and atmospheric conditions. See Section 3.22, *Scenic and Visual Resources*, for further discussion on the visual impacts of the presence of WTGs. Impacts to visibility from the presence of structures would be localized, constant, and long-term.

Future offshore wind development would also result in the presence of onshore transmission cable infrastructure and substations. It is expected that new substations or expanded existing substations would occur in locations near existing energy infrastructure in areas where land use regulations allow for such development. It is also anticipated that cable conduits associated with future offshore wind projects would be primarily underground and to the extent possible, co-located with roads or other utilities. This would minimize the impacts to land use and would not affect the established and planned land uses of the area.

Traffic: There could be increased road traffic that could impact land use and coastal infrastructure from the development of future offshore wind projects. There is the potential for occasional disruptions to road traffic during construction, repairs, and maintenance activities of onshore cables. The extent of the impacts on traffic from future offshore wind projects would be dependent upon the locations of onshore transmission cable routes, locations of landfall, and management plans developed by offshore wind energy developers with local governments.

Noise: Future offshore wind projects would generate noise that could impact land use and coastal infrastructure, primarily through construction activities associated with substation construction and onshore cable trenching. It is not expected that noise from offshore wind farm construction would be loud enough in magnitude to reach shores, and therefore, would not have impacts in the GAA. Noise from onshore construction activities and onshore cable trenching could impact residents', businesses', and tourists' choices of where to live, spend time, and visit. Ongoing noise from human activities, including construction projects and transportation, occurs frequently in the developed areas in the GAA. The intensity and extent of this noise varies depending upon the activity occurring but Impacts from this noise are local and short-term. Noise from ongoing and planned onshore construction activity is expected to be similar to noise from other ongoing projects in the GAAs, with impacts to land use and coastal infrastructure being short-term and minor.

3.18.3.3 Conclusions

Impacts of the No Action Alternative

Under the No Action Alternative, land use and coastal infrastructure would continue to be affected by existing environmental trends and ongoing activities. Ongoing activities are expected to have continued short-term and permanent impacts on land use and coastal infrastructure. The identified IPFs relevant to land use and coastal infrastructure from ongoing non-offshore wind and offshore wind activities include accidental releases and discharges, lighting, land disturbance, presence of structures, noise, traffic, and port utilization. The No Action Alternative would result in **minor beneficial** and **minor** adverse impacts on land use and coastal infrastructure.

Cumulative Impacts of the No Action Alternative

Under the No Action Alternative, existing environmental trends and ongoing activities would continue, and land use and coastal infrastructure would be affected by the relevant identified IPFs. The identified IPFs relevant to land use and coastal infrastructure include accidental releases and discharges, lighting, land disturbance, presence of structures, noise, traffic, and port utilization. Ongoing development and operation of offshore wind projects would support the region's diverse mix of land uses and provides supported for continued maintenance and improvement of coastal infrastructure. There are potential adverse impacts from future offshore wind to land use and coastal infrastructure through accidental releases and discharges during onshore construction, land disturbance during installation of onshore cables and substations, the presence of WTGs on the viewshed, nighttime lighting on WTGs and from onshore construction, and the presence of other structures. Potential beneficial impacts to land use and coastal infrastructure would result from the expansion and productive utilization of ports and associated infrastructure that would be utilized for future offshore wind activity. BOEM anticipates that the cumulative impacts of the No Action Alternative would be both **minor beneficial** and **minor** adverse in the GAA.

3.18.4 Relevant Design Parameters and Potential Variances in Impacts

This Final EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than described in the sections below. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts on land use and coastal infrastructure:

- The time of year which construction occurs. Tourism and recreational activities in the GAA tend to be higher from May through September, particularly from June through August (Parsons and Firestone 2018). If Project construction were to occur during this season, impacts on traffic and land uses during the busy tourist season would be exacerbated.
- Location of the onshore transmission facilities, including sites for OnCS-DC, sites for landfall, and routes for the OTC.
- Construction alternatives utilized for the installation methods of the onshore transmission cable and onshore interconnection cable.
- Port selected for the SRWF Project O&M facility.

Changes to the turbine layout would not alter the maximum potential impacts on land use and coastal infrastructure for the Proposed Action and other alternatives because the capacity or number of turbines would not affect onshore infrastructure or port utilization.

3.18.5 Impacts of Alternative B – Proposed Action on Land Use and Coastal Infrastructure

The Proposed Action would result in the construction of the SRWF. The proposed SRWF would have the potential to result in localized impacts; however, it is not anticipated to change the overall land use and infrastructure within the GAA. The IPFs that are anticipated to have the largest impacts on land use and coastal infrastructure would occur from the presence of onshore structures, the utilization of ports, and the land disturbance that would occur during the installation of the onshore cable. Other IPFs, such as noise and accidental releases, would potentially result in impacts on land use and coastal infrastructure, but of a lesser and/or short-term extent. These IPFs would occur primarily during construction, with the potential for some to occur during O&M activities and decommissioning.

3.18.5.1 Construction and Installation

3.18.5.1.1 Onshore Activities and Facilities

Accidental releases and discharges: Accidental releases and discharges from the Proposed Action from onshore construction activities could include release of fuel/fluids/hazardous materials from the installation of onshore cables and improvements to the substation. Accidental releases and discharges would potentially have negative impacts on land use to the Fire Island National Seashore waters and onshore Otis Pike Wilderness Area. Releases and discharges could result in disruptions to land use in these areas by potentially causing for areas utilized by visitors to be temporarily closed due to the presence of fuel/fluids/hazardous materials and negatively influencing the wilderness area by polluting the area. All onshore construction activities would be completed in compliance with the New York SPDES General permit.

The OnCS-DC would require mineral oils and sulfur hexafluoride to support safe and efficient operation of the facility equipment. To help mitigate the risk of accidental releases and discharges, Sunrise would install equipment so that it would be mounted on concrete foundations with a concrete secondary oil containment designed in accordance with industry and local utility standards when constructing the OnCS-DC.

Construction of the onshore transmission cable could result in potential accidental releases and discharges. The SRWEC would reach the landfall location via HDD methodology, which involves using drilling heads and reaming tools of various sizes that have drilling fluid comprised of bentonite, drilling additives, and water pumped to the drilling head during operation. If the geology and site is suitable, Sunrise Wind would use a casing pipe to contain and collect drilling fluid and minimize releases and discharges that could impact land use (COP Section 3.3.3.3; Sunrise Wind 2023). Sunrise would prepare and implement an Inadvertent Return Plan where HDD is utilized to minimize the potential risks associated with release of drilling fluids. Sunrise Wind would develop an SPCC Plan to help minimize any potential onshore impacts during construction (COP Table 4.9-1-, Page 4-661; Sunrise Wind 2023). The Onshore SPCC Plan is applicable to the storage, handling, transportation, and disposal of petroleum, fuels, oil, chemicals, hazardous substances, and other potentially harmful substances which may be used or stored during, or in connection with, onshore construction, operation, or maintenance. This Plan addresses measures that would be taken to avoid spills and improper storage or application in the vicinity of ecologically sensitive sites along the ROW and access roads and details the procedures for responding to and remediating the effects of petroleum, fuel, oil, chemical, hazardous substances, and other potentially harmful substance spills per the applicable state and federal laws, regulations, and guidance. The Offshore SPCC Plan outlines measures that would be taken to avoid spills and improper storage or application in NYS coastal waters and details on the procedures for responding to and remediating the effects of petroleum, fuel, oil, chemical, hazardous substances, and other potentially harmful spills per applicable state and federal laws, regulations, and guidance. The overall risk is anticipated to be low due to the nature and quantity of chemicals used and procedures in place for storage, handling, and disposal. Additionally, offshore construction vessels associated with the Project would have an USEPA, USCG, and BOEM compliant OSRP onboard for accidental releases of petroleum, fuels, oil, chemicals, hazardous substances into the marine and coastal environment. With the necessary mitigation steps that Sunrise Wind is proposing to take to help minimize impacts, accidental releases and discharges from the Proposed Action from the construction and installation of onshore activities and facilities would have localized, short-term negligible to minor impacts on land use and coastal infrastructure.

Land disturbance: The SRWEC would be connected to onshore facilities and spliced with the onshore transmission cable at co-located TJB and link boxes located at Smith Point County Park on Fire Island in the Town of Brookhaven, New York. The onshore portion of the SRWEC (up to 1,152 ft [351 m]) would be buried underground up to the TJB. Two segments of the SRWEC-NYS would be installed via the Landfall HDD. The HDD methodology would require temporary use of a Landfall Work Area onshore, within which the TJB would be installed, and HDD construction activities would occur. The SRWEC would land at the landfall location via HDD methodology, would occur within the boundaries of Smith County Park and the

Fire Island National Seashore, and would be adjacent to the Otis Pike Wilderness area (COP Section 3.3.3.3; Sunrise Wind 2023). The Landfall Work Area is located in the eastern area of the Smith Point County Park beach parking lot and accessed from Fire Island Beach Road. The Landfall Work Area would be fenced for security and safety purposes; however, vehicle and pedestrian traffic within the parking lot would be maintained. The Burma Road Pipe Stringing Area is located onshore south of the Smith Point County Park camping area within which the conduit pipe would be placed temporarily prior to maneuvering offshore. The entry location for the Landfall HDD would be in a parking lot 755 ft (230 m) landward from the FIMP Project. The exit location for the Landfall HDD would be 2,525 ft (770 m) seaward from the FIMP Project. The cable would be installed at a depth of approximately 60 ft (18 m) below the 0’ datum where the FIMP Project is located.

A temporary landing structure would be installed at Smith Point County Park to aid in the offloading of equipment and/or materials. The temporary landing structure would be a temporary fixed pier, measuring up to approximately 3,872 ft^2 (359 m^2), with dimensions of approximately 16 ft wide by 242 ft long (4.8 m by 73.7 m). The temporary fixed pier would be placed using a crane barge with four spuds each, with a diameter of 30 in (76.2 cm). The transit barge would have four spuds each with a diameter of 30 in (76.2 cm). The maximum mudline temporary footprint for piles and spuds would be approximately 150 ft^2 (13.9 m^2). The temporary landing structure would potentially need to remain in place year-round, but the use of it would be limited to fall, winter, and spring. The temporary landing structure would be used during two construction periods.

This landfall site was selected by Sunrise Wind as the preferred landfall site in the COP as it minimizes direct disturbances to natural or cultural resources in the nearshore and coastal areas and has minimal interruptions to existing nearby land uses, when compared to the other five landfall sites considered along southern Long Island. Smith Point County Park provides sufficient area to accommodate onshore HDD operations within developed areas, as opposed to areas that have not been developed at the other landfall sites considered, with minor to moderate disruption to adjacent land uses. This site was chosen as favorable because of its distance from existing sand borrow areas, mapped shipwrecks or obstructions and recreational boating activity, and due to minimal impacts on natural resources. Smith Point County Park is a public recreation facility and based on information from the Town of Brookhaven Division of Public Information (2020), land use within the area is characterized as “Recreational and Open Space.” Zoning in the vicinity is characterized as Commercial Recreation, which is consistent with the zoning of multiple parks and campground sites located throughout the Fire Island National Seashore. The proposed nearshore portion of the HDD would traverse through Fire Island National Seashore through an area over which the United States holds an easement. NPS exercises authority over the National Park System. While Smith Point County Park is not owned by the federal government, it is within the boundaries of Fire Island National Seashore and portions of the SRWEC-NYS would be located under the seafloor within Fire Island National Seashore, in an area where the United States holds an easement for the use and occupation of lands for the purposes of Fire Island National seashore. This easement on the Atlantic Ocean side extends from mean high tide to 1,000 ft (304.8 m) out and on the bay side. Relevant to the proposed activity, the NPS also administers waters subject to the jurisdiction of the United States located within the boundaries of Fire Island National Seashore. Those boundaries are described in 16 *USC* 459e(b). Sunrise Wind submitted an application for special use permits for temporary construction activities and a ROW Permit pursuant to 54 *USC* § 100902 in September 2021, and the application was deemed complete by NPS in June 2022 (COP Section 1.4; Sunrise Wind 2023). A right-of-way permit would be required for the transmission cable and conduit to reside in lands where the United States holds an easement, i.e., from the mean high water line to 1,000 ft (304.8 m) into the Atlantic Ocean. Special use permits for construction would be required for construction (1) on those same lands and within the associated water column, and (2) within waters in the intracoastal waterway that are subject to the jurisdiction of the United States and within the boundaries of Fire Island National Seashore. Construction activities with land disturbance would occur within Smith Point County Park.

Sunrise Wind has proposed, as an APM to land disturbance, that all construction-related impacts to roadways and parking lots would be restored to pre-construction conditions and in accordance with *NYSDOT Standard Specifications for Construction Materials* and in coordination with local entities. Locations used for HDD work areas and temporary laydown yards would be restored to pre-existing conditions in accordance with landowner requests and permit requirements.

Land uses would be impacted during construction activities, including disturbances to portions of the parking lots causing interruptions to recreation activities at both Smith County Park and the Fire Island National Seashore, and would be moderate, short-term during the period of construction (COP Section 2.2.1.1; Sunrise Wind 2023). The landfall site within Smith Point County Park is adjacent to the federally designated Otis Pike Wilderness Area. The closest Project disturbance to the Otis Pike Wilderness Area would occur approximately 65 ft (20 m) east of the wilderness boundary. All site disturbances would be confined to the Project's Limit of Disturbance, per requirements from the state of New York. The Limit of Disturbance would be delineated prior to construction activities occurring, and would be inspected and maintained throughout to ensure that direct impacts would not occur to the wilderness area. An existing split rail and chain link fence provide an additional barrier around the west areas of the Limit of Disturbance, helping contain impacts. Land uses in the adjacent wilderness area would be indirectly impacted due to land disturbance activities from construction activities but would not prevent access to areas during construction activities. These impacts to adjacent land uses are anticipated to be moderate during the construction period. Sunrise Wind has proposed an APM to minimize impacts that states that the construction of the Landfall and ICW HDD is expected to occur outside the summer tourist season, which is generally between Memorial Day and Labor Day and that the construction schedule for the remaining onshore Facilities would be designed to minimize impacts to the local communities to the extent feasible. Landfall HDD construction is expected to take three to four months to be completed. While the busiest months at Fire Island National Seashore are July and August, visitors come to the area throughout the entire year, so there would be impacts to recreation and tourism, which are existing land uses for the area (NPS 2023). The Otis Pike Wilderness Area is the only federally designated wilderness in the State of New York, and reports both recreational and non-recreational visitors to the area throughout the entire year. This area also is the location of the Fire Island Wilderness Center, which serves as the eastern entry point to the Otis Pike Fire Island Dune Wilderness (NPS 2023). The Proposed Action would include short-term interruptions to current use of these spaces, as construction activities would temporarily change visitor experience, but would still allow for access and recreation and tourism activities and other existing uses of the area to occur.

Temporary laydown areas at Smith Point County Park would be restored to the previous condition once construction activities have been completed. The presence of other construction activities, including impacts from construction activities at Smith Point County Park and within the boundaries of the Fire

Island National Seashore would be short-term and minor to moderate to land use and coastal infrastructure. The TWA Flight 800 International Memorial would be impacted with construction activities at the landfall site, where the export cable makes its sea-to-shore transition via HDD. This area would be indirectly impacted during this phase of construction due to disruptions to current land uses, and these impacts would be moderate, short-term, and localized. After construction activities are complete, it is not anticipated that the Proposed Action would have any permanent impacts to the area.

The onshore transmission cable route of the Proposed Action has been sited within existing disturbed ROW to the greatest extent possible. The onshore transmission cable would be located underground. Construction of the onshore transmission cable and onshore interconnection cable would involve site preparation, trench excavation, duct bank and vault installation, cable jointing, final testing, and restoration. Laydown yards utilized for construction activities would be short-term, and would generally be located in areas that are previously disturbed industrial sites or locations containing open lands. Sunrise Wind identified one laydown yard, Zorn, to support cable installation as well as other Project activities (COP Figure 3.2.1-1 and COP Section 3.3.2.1; Sunrise Wind 2023). Upon completion of construction, temporary laydown yards would be restored to pre-existing conditions in accordance with landowner, local, and state requirements (COP Section 3.3.2.3; Sunrise Wind 2023). Southaven County Park, Wertheim NWR, the Brookhaven Fairgrounds, and the Long Island Baptist Church are all important community spaces that are located adjacent to the onshore transmission cable route of the Proposed Action that would experience impacts during construction of the OTC. The onshore transmission cable would be installed in an underground duct bank consisting of concrete encased conduits, utilizing cable splice vaults for installation and maintenance access. Each splice vault would be accessible by up to two utility hole covers visible from the surface and spaced approximately 0.5 mi (0.8 km) apart, with the exception of at the trenchless crossings. Outside of sensitive areas, excavators would be used for excavation of trenches and splice vault installation. Land disturbance associated with this excavation is considered temporary, as these areas would be backfilled and surface conditions restored to pre-existing conditions in coordination with local entities, after construction is completed. Sunrise Wind would utilize trenchless crossing installation to avoid sensitive environmental resources or other physical obstructions (e.g., major highways, railroads) at certain crossing locations. The trenchless installation(s) would either consist of excavating a pair of pits on either side of a crossing or jacking pipe under a crossing (e.g., railroad), which would require additional temporary disturbance areas to support the setup of equipment necessary to perform each crossing. The Project’s HDDs are described in detail in the HDD Work Plan provided as Appendix NN of the EM&CP 2. The remaining trenchless crossings are shown on the *Onshore Transmission Cable Drawings* provided as Appendix KK of the EM&CP 2. Impacts from construction activities would result in short-term impacts to neighboring land uses through construction noise, lighting, vibration, dust, travel delays, and changes in the visual characteristics. Construction of the cables would occur in areas where land is already disturbed and much of the land use is designated for roadways, utilities, or other industrial uses. The land uses of the Proposed Action are generally compatible with existing and proposed land uses within the GAA. However, some construction activities would occur in areas utilized for recreation and tourism and neighbor residential areas and adjacent areas would experience indirect impacts from construction activities. Impacts from construction would be short-term and minor to moderate to land use and coastal infrastructure during the construction period.

The construction of onshore substations would result in short-term impacts due to construction activities and permanent impacts due to the facilities that would be completed after construction. Construction of the onshore substation requires a site that is within close proximity to the Holbrook Substation, a parcel of approximately 6 to 10 ac (0.02 to 0.04 km^2), suitable parcel shape, suitable ground conditions, appropriate zoning and land use compatibility, and avoidance of disturbance to sensitive natural and cultural resources (COP Section 2.2.1.1; Sunrise Wind 2023). The Union Avenue site, located in Brookhaven, New York, and bordering the town of Islip, New York, would be in an area of existing industrial development, and is currently being utilized for industrial and commercial development (Suffolk County 2020). Therefore, construction at this site would be compatible with existing land uses and the potential impacts on land use would be minor. Interconnection would also occur at the exiting Holbrook substation. Any upgrades or construction activities associated with the existing Holbrook site would be compatible with existing uses and would result in minor impacts to land use and coastal infrastructure.

Lighting: Onshore construction activities would have general yard lighting present, but lighting would be minimal. Additional lighting may be required if construction activities are occurring at night or if the contractor deems additional lights necessary for safety and security purposes. Sunrise Wind would follow state and local requirements for lighting otherwise (COP, Section 3.3.1; Sunrise Wind 2023). Impacts to land use and coastal infrastructure from lighting during construction activities should be short-term and negligible to minor.

Noise: Construction of onshore facilities would generate noise from HDD operations, installation of the onshore transmission cable and onshore interconnection cable, installation of the OnCS-DC, and vehicular traffic. Construction activities that occur at all trenchless crossings would exceed the NYSDEC criterion of 65 dB in the proximity of noise sensitive receptors if left unmitigated. BMPs would be implemented to reduce noise at all trenchless crossing locations along the onshore transmission cable route. Installation of the OnCS-DC would occur during daytime hours, making it exempt from both Suffolk County and the Town of Brookhaven noise ordinances. However, per NYSDEC policy of limiting levels to 65 dB at residential properties and 79 dB at industrial properties, BMPs would be implemented to minimize noise. Noise levels at noise sensitive receptors are anticipated to be similar to existing conditions. Onshore construction activities would occur adjacent to the Otis Pike Wilderness Area, an area that is managed by the NPS. The NPS utilizes the Acoustical Toolbox: Recommendations for Reducing Noise Impacts in National Parks to help reduce noise pollution and increase opportunities for visitors to hear unique natural and cultural sounds in the park (NPS 2010). Sunrise Wind would consult with NPS on planned construction activities to ensure noise impacts to the Otis Pike Wilderness area are minimized to the extent practicable during construction to the Project and it is anticipated that the NPS would utilize the Acoustical Toolbox as appropriate to guide these recommendations.

Onshore construction activities would also increase vehicle noise, particularly in the area surrounding Smith Point County Park, in some residential areas in the Town of Brookhaven, New York, and in other locations that are characterized as community spaces and utilized by the public. Increased noise from construction activities would influence the use of the TWA Flight 800 International Memorial, Fire Island Wilderness Center, Smith Point County Park, Southaven County Park, Wertheim NWR, the Brookhaven Fairgrounds, and Long Island Baptist Church during construction activities. Access to the landfall area would be maintained through Smith County Park and would not traverse portions of the Otis Pike

Wilderness area or other portions of the Fire Island National Seashore. Vehicles would include heavy equipment, such as excavators, cranes, dump trucks, and paving equipment, and the increased noise levels are anticipated to be similar to standard utility or roadway construction work (COP Section 4.2.3.3; Sunrise Wind 2023). Construction activities associated with site preparation at HDD and horizontal auger boring sites would generate noise of approximately 84 dB at a distance of 50 ft (15 m) after implementing noise control strategies. Permissible noise limits are not expected to be exceeded at the Landfall HDD, the ICW, HDD, or TCPs along the onshore interconnection cable route since the specified controls are anticipated to reduce noise at NSRs below permissible levels. Mitigative measures would be implemented to attenuate construction noise from drilling operations below permissible levels (COP Appendix I2; Exponent Engineering P.C. 2022). Impacts from noise would be short-term, localized, and minor to moderate on land use and coastal infrastructure during onshore construction activities.

Port utilization: Under the Proposed Action, the anticipated primary construction ports that would be used include Albany and/or Coeymans, New York; Port of New London, Connecticut; and Port of Davisville-Quonset Point, Rhode Island. At these ports, there would not be a need for upgrades beyond what has already occurred or upgrades that are currently occurring to support the construction of the SRWF. For example, the Port of New London is redeveloping the State Pier into a facility to accommodate heavy lifting to help support the offshore wind industry and is expected to have improvements completed by 2023 (Connecticut Port Authority 2021). Additionally, the Port of Davisville recently invested almost $30 million to improve its facilities to accommodate a wide range of projects, including offshore wind (Quonset Business Park 2022). Use of these ports during construction activities could result in minor beneficial impacts due to the increased use and associated economic benefits. These ports are expected to be used during construction but would not be dedicated solely to use of the Project. Construction activities occurring at ports could result in noise, vibration, and vehicle traffic at the ports. However, these impacts are typical for industrial port, and would result in negligible impacts to land uses or use of coastal infrastructure.

Presence of structures: The Proposed Action has a landfall location at Smith Point County Park in Brookhaven, New York. Construction at the landing site would lead to short-term disturbances to neighboring land uses, including recreation uses and residential uses, through construction noise, vibration, dust, and increased traffic in the vicinity of the construction activity. Sunrise Wind proposes as an APM to utilize landfall construction methods that would minimize impacts on land use, and areas would be restored to their previous condition after construction activities are complete. Under the Proposed Action, the onshore transmission cable and onshore interconnection cable would be located underground and generally in areas where land is already disturbed and designated for roadways, utilities, or other industrial uses. However, some construction activities would occur in areas utilized for recreation and tourism and residential areas. Impacts from onshore construction activities would be short-term, minor, and would stem from construction noise, lighting, vibration, dust, travel delays, and changes in the visual characteristics.

The Union Avenue site of the OnCS-DC would have an operational footprint of up to 6 ac (2.4 ha) and be sited in an area that is currently used for industrial/commercial development. The site is bound by areas of commercial and industrial development. Since the OnCS-DC is proposed to be built on a previously developed site, there would be minimal change to existing land use. Two laydown yards, Northville and Zorn, are previously disturbed parcels and would be used to support construction activities. Northville is an industrial site that was previously cleared and graded to support various activities at the existing fuel terminal. Zorn was previously cleared and graded to support the stockpiling of materials, parking, and equipment storage during construction of the CLIEC complex on Zorn Boulevard.

Onshore construction activities associated with the Proposed Action would result in short-term or permanent impacts to land use. Under the Proposed Action, Sunrise Wind proposes a construction schedule to minimize onshore construction activities during the peak tourism and recreation season from May to September. Expected impacts to existing land use during onshore construction activities include short-term increases in noise levels, lighting, and traffic. Sunrise Wind would implement BMPs to help minimize impacts to surrounding land uses and coastal infrastructure. Onshore construction activities would not change existing land uses. Therefore, the onshore construction would have short-term, minor adverse impacts on land use and coastal infrastructure.

Traffic: Onshore construction activities within and adjacent to existing roadways could result in short-term, localized impacts to traffic from activities such as lane closures, shifted traffic patterns, or closed roadways. Vehicular traffic associated with construction activities would be comparable to typical roadway or utility construction work that would occur in a congested region. As stated in the COP (COP Section 4.2.7.3; Sunrise Wind 2023), the onshore construction activities would comply with local ordinances to the extent practicable, and would need to adhere to local ordinances. The onshore transmission cable route would travel up to 17.5 mi (28.2 km) in length from the Landfall Work Area to the OnCS-DC (COP Section 3.3.2; Sunrise Wind 2023). From the Landfall Work Area, the onshore transmission cable would run parallel to Fire Island Beach Road within the paved Smith Point County parking lot, crossing under the William Floyd Parkway to a recreational area located to the west of William Floyd Parkway. The onshore transmission cable would be routed across the ICW via the ICW HDD to a paved parking lot within the Smith Point Marina along East Concourse Drive. From the ICW Work Area, the onshore transmission cable would turn north along East Concourse and north along William Floyd Parkway to the intersection with Surrey Circle. The onshore transmission cable would be routed along Surrey Circle and would continue north along Church Road then turn west along Mastic Boulevard, north along Francine Place, to the intersection with Montauk Highway. It would cross Montauk Highway to Revilo Avenue and would continue north along Revilo Avenue to the work area for the Sunrise Highway crossing. The onshore transmission cable would then cross Sunrise Highway via trenchless methods to Revilo Avenue, continuing north to the intersection with Victory Avenue and then continue west on Victory Avenue to Horseblock Road, crossing the Carmans River via HDD. The onshore transmission cable would continue northwest along Horseblock Road to Manor Road, then turn north onto Manor Road and cross the LIRR to Long Island Avenue via trenchless methods. The onshore transmission cable would then turn west along the LIE Service Road, then turn south on Waverly Avenue to Long Island Avenue. The onshore transmission cable would then turn west on Long Island Avenue to Union Avenue and reach the Union Avenue site. Construction activities along these roadways and parking lots could lead to increases in traffic and limitations of parking availability in the vicinity of construction activities, and in particular, along the onshore transmission cable route. However, Sunrise Wind has committed to maintaining access to all roads and the Smith Point County Park parking lot during construction, so no road closures would be required, which helps minimize impacts to traffic. Sunrise Wind proposed an APM to allow for traffic to move safely; traffic control measures, such as signage and traffic flaggers, would be used wherever necessary. Traffic control measures to address traffic flow in and around construction areas would be developed as part of the MPT Plan. Proper traffic control measures would be utilized to ensure the movement of traffic and to mitigate impacts on bus route schedules. Access to bus stops would also be maintained or temporarily relocated during construction, thereby minimizing impacts to bus stops and bus stop access. As stated in the COP (COP Section 4.8.2.2; Sunrise Wind 2023), Sunrise Wind would use commercially-reasonable efforts to maintain at least one travel lane of traffic in the section(s) of the road(s) in which construction crews are working; however, during certain periods of work, short-term road closures may be necessary. Sunrise Wind would develop a MPT Plan within the Project’s EM&CP that describes measures to minimize and mitigate for potential impacts to land transportation to the maximum extent practicable during construction (COP Section 4.8.2.2; Sunrise Wind 2023). Roadways would be returned to pre-construction conditions and would not result in changes to the existing land use.

It is anticipated that there would be short-term increases of vehicular traffic in the area around Smith Point County Park, including the Fire Island National Seashore and along the route of the OTC. Construction of the Onshore Facilities would result in short-term reduction in access to recreational areas, including portions of the parking lot at Smith Point County Park, with the level of impact from traffic varying depending on the location, construction activity occurring, and time of year. Access to Smith Point County Park and the Fire Island National Seashore would still be maintained throughout construction activities, however, partial areas of the parking lots may be closed during the offseason time. Sunrise Wind would also implement BMPs and proposes that the construction of the Landfall and ICW HDD is anticipated to occur outside the summer tourist season, which is generally between Memorial Day and Labor Day. The construction schedule for the remaining onshore Facilities would be designed to minimize impacts to the local communities to the extent feasible. Construction activities would still result in disruptions to parking and traffic flow in Smith Point County Park, the Fire Island Wilderness Center, and along the route of the OTC. Sunrise Wind anticipates coordination with the NPS, Federal Highway Administration (FHWA), New York State Department of Transportation (NYSDOT), and local Departments of Public Works on bridge use, LIE crossing, and local roads for construction-related activities, and would implement BMPs to the extent practicable to minimize impacts in coordination with these agencies. After construction activities are completed, roadways would be returned to pre-construction conditions. Impacts to traffic would be short-term and localized would have short-term, moderate adverse impacts on land use and coastal infrastructure.

3.18.5.1.2 Offshore Activities and Facilities

Accidental releases and discharges: The construction of offshore facilities could result in accidental discharges and releases of fuels, fluids, and hazardous materials that could impact land use. Sunrise Wind would manage accidental releases or discharges during offshore construction activities through an Emergency Response Plan/OSRP, an APM that would minimize impacts from accidental releases and discharges to land use and coastal infrastructure. All construction vessels would be required to comply with applicable federal and state regulations and standards for the prevention and control of spills and discharge. Accidental releases from the Proposed Action on land use and coastal infrastructure would have short-term, localized, negligible to minor impacts.

Lighting: Offshore construction activities would result in increased vessel and air traffic that could be visible from some coastlines and elevated areas within the GAA and offshore nighttime construction lighting. The visibility would be dependent upon distances from the viewer, vegetation, topography, weather, and atmospheric conditions. The increased presence of lighting could result in minor impacts to land use through impacts on recreation, tourism, and changes in property values if the presence of lighting influences the decisions of visitors and those purchasing property. The USCG maintains a listing of all coastal light sources, which includes offshore structures such as buoys, markers, and lighthouses, and indicates that there are lighted buoys and markers present in the GAA (USCG 2022). Visual impacts from lighting are further discussed in Section 3.22, *Scenic and Visual Resources*. Lighting from offshore construction activities would have short-term, minor impacts on land use and coastal infrastructure.

Noise: The Proposed Action would comply with NYSDEC and local noise regulations to the extent practicable to help minimize the impacts to nearby communities. Activities associated with offshore construction of the Proposed Action would generate noise. However, these activities would occur at a significant distance away from existing land use. For example, the exit side of the Landfall HDD is located approximately 0.5 mi (800 m) offshore. Construction at this site would produce a sound level of approximately 60 dB or less at the nearest shoreline, which is below all applicable criteria (COP, Section 4.2.3.3; Sunrise Wind 2023). This would result in short-term, negligible impacts to land use and coastal infrastructure as noise levels from offshore construction activities should not change existing land use or coastal activities.

Port utilization: The Proposed Action would include increased utilization of ports that are already industrial or commercial in nature. Impacts to land use and coastal infrastructure would include increased vehicle traffic to and from the ports, increased construction noise and vibration at the ports, and increased vehicular emissions (BOEM 2016). However, these impacts would be minor and typical of activities that already occur at these ports and would not change the existing land use. The existing land uses meet the goals and zoning criteria of the locations of the ports. Increased port utilization and improvements could also lead to minor beneficial impacts through the support of designated uses and infrastructure improvements.

Traffic: Offshore construction activities would result in increased vessel and air traffic for construction equipment and supplies. This increased vessel and air traffic could be visible from coastal and onshore locations within the geographic area, but would not be expected to have impacts on land uses and coastal infrastructure. Offshore construction activities could result in increases in vehicle traffic around ports utilized for construction activities. However, these impacts would be short-term, localized, and negligible, and would be occurring in areas that are utilized for industrial or commercial land uses.

3.18.5.2 Operations and Maintenance

3.18.5.2.1 Onshore Activities and Facilities

Accidental releases and discharges: Operation of the OnCS-DC could result in the release of fuel/fluids/hazardous materials. Accidental releases and discharges would potentially have negative impacts on land use to the Fire Island National Seashore waters and onshore Otis Pike Wilderness Area. Releases and discharges could result in disruptions to land use in these areas by potentially causing for areas utilized by visitors to be temporarily closed due to the presence of fuel/fluids/hazardous materials and negatively influencing the wilderness area by polluting the area. However, to help minimize the risk of this, equipment to operate the OnCS-DC would be mounted on concrete foundations with a concrete secondary oil containment designed in accordance with industry and local utility standards (COP Section 3.3.1.1; Sunrise Wind 2023). Under the Proposed Action, onshore facilities would be designed in accordance with National Electric Safety Code, American National Standards Institute/Institute of Electrical and Electronics Engineers Standards and New York Independent System Operation requirements to help minimize impacts (COP Section 3.3.1; Sunrise Wind 2023). Therefore, O&M activities would have negligible adverse impacts on land use and coastal infrastructure.

Land Disturbance: The OnCS-DC would result in a permanent structure and site and associated infrastructure. After onshore facilities have been installed, adjacent land uses would not be changed, and it is not expected that coastal infrastructure would be affected. Onshore facilities would be located in areas compatible with their intended land uses, and areas where construction activities had occurred would have been restored back to their previous uses. The OnCS-DC would be located in land use areas designated for commercial and industrial land use and would be connected to the existing Holbrook Station. The Proposed Action would result in new infrastructure and uses that are compatible with existing land uses. Due to this, potential adverse impacts on land use and coastal infrastructure would be minor.

Lighting: Routine operations at the OnCS-DC would have security lighting present. However, yard lighting would be minimal at night and subject to state and local requirements. As an APM (COP Section 3.3.1; Sunrise Wind 2023), Sunrise Wind proposes to implement shielding to security lighting for mitigating light pollution. Facilities would be located in areas that are already used for commercial and industrial land uses, and the presence of security lighting should not change the character of the area. Therefore, impacts from lighting at onshore facilities would be negligible on land use and coastal infrastructure.

Noise: During O&M, a new noise source would be anticipated to regularly occur from the operation of the OnCS-DC from the converter transformers, reactors, filters, and outdoor cooling equipment associated with the valve hall. Other noises associated with the OnCS-DC would not be anticipated to add significant contributions to the overall sound levels in the vicinity of the facility. Modeling activities have found that in-air noise from the OnCS-DC associated with the Proposed Action would range from 28 to 67 dB, which would result in a sound level of 42 dB at the closest residence, a 9 dB increase in the total sound level relative to existing conditions. The predicted total sound levels of the OnCS-DC comply with all applicable criteria as specified by the USEPA, NYSDEC, and the Town of Brookhaven (COP Section 4.2.3.2; Sunrise Wind 2023). Any routine O&M activities of the onshore transmission cable and onshore interconnection cable may result in short-term, localized noise to adjacent areas. Impacts from noise from O&M activities to land use and coastal infrastructure are anticipated to be minor adverse.

Port utilization: The Proposed Action would result in the Project having an onshore O&M facility located at an existing, industrial port. The Proposed Action's offshore facilities would require daily activity to occur at the O&M facility. The facilities needed to support the O&M facility would be consistent with the range of land uses that already occur at the proposed ports. The increased activity would reinforce the designated land use of the port, support jobs, and would provide a source of investment to coastal infrastructure. This would have minor, beneficial impacts to land use and coastal infrastructure.

Presence of structures: Onshore facilities would be located primarily in areas that are already used for commercial and industrial purposes, so the OnCS-DC structure and land use would be compatible with adjacent areas. The existing use of the proposed location for the OnCS-DC is zoned for commercial and industrial uses, and therefore, would not change the current land use of the proposed site. Once construction activities are completed, the onshore transmission cable and onshore interconnection cable would be located primarily underground in already disturbed areas and existing ROWs when practicable. With compatible OnCS-DC structure for commercial and industrial uses and underground facilities, the anticipated impacts would be negligible to land use and coastal infrastructure.

Traffic: Onshore facilities would require periodic maintenance and inspection activities that would require the use of construction vehicles and equipment that could temporarily impact traffic. These impacts would be expected to be similar to other routine utility and construction activities and would lead to negligible adverse impacts to land use and coastal infrastructure.

3.18.5.2.2 Offshore Activities and Facilities

Accidental releases and discharges: O&M activities associated with offshore facilities have the potential to result in accidental discharges and releases of fuels, fluids, and hazardous materials that could impact land use. Sunrise Wind would manage accidental releases or discharges through an Emergency Response Plan/OSRP if needed, an APM that would minimize impacts from accidental releases and discharges to land use and coastal infrastructure. Accidental releases would have short-term, localized, negligible to minor impacts depending upon the size of the release.

Lighting: The Proposed Action would include the installation and continuous use of aviation hazard avoidance lighting on WTGs during low-light nighttime conditions. Please see Section 3.22, *Scenic and Visual Resources*, for further discussion on the impacts to visual resources from lighting. During operations, lighting from up to 94 WTGs and one OSC-DC structure could be visible from coastal locations within the GAA depending upon distance of the viewer, vegetation, topography, weather, and atmospheric conditions. To help minimize impacts, Sunrise Wind proposes to implement ADLS as an APM, which would result in aviation obstruction lights being turned on and off when aircraft are in proximity of the wind farm. This could result in the lights being on for a shorter duration of time, thus reducing the impacts on land use and coastal infrastructure. This lighting could result in impacts to recreation and tourism activities in the GAA and has the potential to effect property value and use. The impacts of offshore facility lighting would result in long-term negligible to minor impacts on land use and coastal infrastructure.

Port utilization: The Proposed Action would result in the Project having an onshore O&M facility located at an existing, industrial port. The Proposed Action's offshore facilities would require daily activity to occur at the O&M facility. The facilities that would need to support the O&M facility would be consistent with the range of land uses that already occur at the proposed ports. The increased activity would reinforce the designated land use of the port, support jobs, and would provide a source of investment to coastal infrastructure. This would have minor, beneficial impacts to land use and coastal infrastructure.

Presence of structures: The Proposed Action would result in up to 94 WTGs and one OSC-DC present in the offshore environment that could be visible from coastal locations within the GAA depending upon the distance of the viewer, vegetation, topography, weather, and atmospheric conditions. The presence of structures could result in impacts to recreation and tourism activities in the GAA and has the potential to effect property value and use. Please see Section 3.22, *Scenic and Visual Resources*, for further discussion on the impacts to visual resources from the presence of structures. A University of Delaware study evaluated the potential impacts of visible offshore WTGs on beach use ad found that WTGs of approximately 574 ft (175 m) in height visible from greater than 15 mi (24.1 km) away would have negligible impacts on existing land uses that rely on recreation and tourism activity (Parsons and Firestone 2018). The presence of WTGs would be long-term and have negligible to minor impacts on land use and coastal infrastructure.

3.18.5.3 Conceptual Decommissioning

3.18.5.3.1 Onshore Activities and Facilities

Conceptual decommissioning of the Proposed Action would have similar, negligible to moderate adverse and minor beneficial impacts to land use and coastal infrastructure as described under construction activities. BMPs would be implemented to limit adverse impacts from noise, lighting, traffic, and land disturbance, and major onshore construction activities would occur outside of the busy recreation and tourism summer season.

3.18.5.3.2 Offshore Activities and Facilities

Conceptual decommissioning of the Proposed Action would have similar, negligible to minor adverse and minor beneficial impacts to land use and coastal infrastructure as described under construction activities. BMPs would be implemented to limit adverse impacts from noise, lighting, traffic, and land disturbance.

3.18.5.4 Cumulative Impacts of the Proposed Action

The cumulative impacts of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned offshore wind activities.

Accidental releases and discharges: The Proposed Action would contribute a noticeable increment to the cumulative accidental release impacts on land use and costal infrastructure. There is an increased risk of accidental releases of fuel/fluids/hazardous materials in the GAA that would result in increased impacts that are short-term, and negligible to minor on land use and coastal infrastructure.

Land Disturbance: The Proposed Action would result in localized, short-term, minor to moderate impacts to land use and coastal infrastructure due to construction-related disturbance and access limitations at the landfall site and along the onshore transmission cable route. The impacts expected from the Proposed Action would only be additive if land disturbance with one or more other projects occurs in close spatial and temporal proximity, as the anticipated impacts are short-term and localized. The cumulative impacts of the Proposed Action would be negligible to moderate.

Lighting: The Proposed Action would contribute a noticeable increment to the cumulative impacts from WTGs and construction activities to lighting. Offshore WTG lighting would result in continuous, long-term, negligible to minor impacts to land use and coastal infrastructure, whereas impacts from construction activities would be short-term and localized. Section 3.22, *Scenic and Visual Resources* describes that offshore nighttime construction lighting and operational aviation hazard lighting for the potential 1,073 WTGs in the visual GAA associated with the Proposed Action and other offshore wind projects could be visible from some shorelines. The visibility of the lighting would be dependent upon the distance of the viewer, the atmospheric conditions, vegetation, topography, and weather. The impacts from the Proposed Action to land use and coastal infrastructure in context of planned activities would be similar, but more significant than, the impacts associated with just the Proposed Action. The cumulative impacts of lighting from the Proposed Action would be continuous, long-term, and negligible to minor.

Noise: The Proposed Action would contribute a noticeable increment to the cumulative impacts on land use and coastal infrastructure, which would result in localized, short-term, minor to moderate impacts. Impacts on land use and coastal infrastructure from noise would only be additive if construction activities associated with one or more projects occurs in close spatial and temporal proximity.

Port Utilization: Offshore wind development, including the Proposed Action, would require port facilities for construction activities and ports for daily activity at an O&M facility. This would support ongoing or new activities at ports that would reinforce the designated land use of the port, support jobs, and would provide a source of investment to coastal infrastructure. The cumulative impacts from the Proposed Action of port utilization would have minor, beneficial impacts to land use and coastal infrastructure.

Presence of Structures: The Proposed Action would contribute a noticeable increment to the cumulative onshore transmission cable infrastructure and the presence of structures on land use and coastal infrastructure. The Proposed Action's substation is located in areas designated for industrial uses and would co-locate the onshore transmission cable with existing roads and other utility ROWs. If other Projects were also located in areas designated for utility or industrial uses and cables were located in existing ROWs or roads, then it would not be anticipated that there would be conflicts with established and planned land uses or coastal infrastructure in local areas. These impacts are expected to be minor adverse.

Traffic: Localized, short-term and moderate cumulative impacts on land use and coastal infrastructure due to lane closures, shifted traffic patterns, closed roadways, or limits in parking are anticipated. Impacts on land use and coastal infrastructure from traffic would only be additive if traffic associated with one or more projects occurs in close spatial and temporal proximity. Impacts would be negligible to minor on land use and coastal infrastructure.

3.18.5.5 Conclusions

Impacts of the Proposed Action

BOEM anticipates that overall impacts on land use and coastal infrastructure from the Proposed Action would be **moderate** adverse with **minor beneficial** impacts. The Proposed Action would have moderate adverse impacts resulting from traffic, land disturbance, and noise from onshore construction activities. The Proposed Action would have minor adverse impacts resulting from accidental releases and discharge, the construction of onshore facilities, and the presence of WTGs. The Proposed Action would have negligible adverse impacts to lighting, offshore construction noise, and increased port utilization.

The Proposed Action would have minor beneficial impacts to port utilization by supporting designated activities that already occur at existing ports. The overall adverse impacts to land use and coastal infrastructure would be short-term, localized, and small, with beneficial impacts resulting from port utilization.

Cumulative Impacts of the Proposed Action

In the context of other reasonably foreseeable environmental trends in the area, the overall cumulative impacts resulting from individual IPFs would be **moderate** with **minor beneficial** impacts. Considering all the IPFs together, BOEM anticipates that the contribution of the Proposed Action to the impacts associated with ongoing and planned activities would result in **moderate** adverse impacts and **minor beneficial** impacts on land use and coastal infrastructure in the GAA.

3.18.6 Alternative C-1 – Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

3.18.6.1 Construction and Installation

3.18.6.1.1 Onshore Activities and Facilities

The impacts of Alternative C-1 on construction and installation would be similar to the Proposed Action for onshore activities and facilities.

3.18.6.1.2 Offshore Activities and Facilities

The impacts of Alternative C-1 on construction and installation would be similar to the Proposed Action for offshore activities and facilities.

3.18.6.2 Operations and Maintenance

3.18.6.2.1 Onshore Activities and Facilities

The impacts of Alternative C-1 on O&M would be similar to the Proposed Action for onshore activities and facilities.

3.18.6.2.2 Offshore Activities and Facilities

The impacts of Alternative C-1 on O&M would be similar to the Proposed Action for offshore activities and facilities.

3.18.6.3 Conceptual Decommissioning

3.18.6.3.1 Onshore Activities and Facilities

The impacts of Alternative C-1 on the conceptual decommissioning would be similar to the Proposed Action for onshore activities and facilities.

3.18.6.3.2 Offshore Activities and Facilities

The impacts of Alternative C-1 on the conceptual decommissioning would be similar to the Proposed Action for offshore activities and facilities.

3.18.6.4 Cumulative Impacts of Alternative C-1

The cumulative impacts on land use and coastal would range from negligible to moderate adverse to minor beneficial impacts. In the context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 to the cumulative impacts on land use and coastal infrastructure would be similar to those described under the Proposed Action.

3.18.6.5 Conclusions

Impacts of Alternative C-1

Under Alternative C-1, the potential impacts to land use and coastal infrastructure are anticipated to be the same as described under the Proposed Action under Construction and Installation, Operation and Maintenance, and Conceptual Decommissioning actions. Under this alternative, the construction of onshore facilities would remain the same, and changes in construction to offshore facilities would not result in significantly different impacts than under the Proposed Action. There is the potential for differences in the visual impacts from the lighting and location of WTGs in the offshore area; however, these differences would not result in changes to land use and coastal infrastructure impacts. As a result, BOEM expects that the overall impacts from Alternative C-1 to land use and coastal infrastructure would be similar to the Proposed Action, **moderate** adverse with **minor beneficial** impacts.

Cumulative Impacts of Alternative C-1

In context of reasonably foreseeable environmental trends, the contribution of Alternative C-1 to the cumulative impacts resulting from individual IPFs associated with ongoing and planned activities would be the same as that of the Proposed Action. Impacts are expected to result in **moderate** adverse impacts for onshore land use and coastal infrastructure and **minor beneficial** impacts. The overall impacts of Alternative C-1 combined with ongoing and planned activities on land use would be very similar to those of the Proposed Action. These impacts would primarily stem from installation of onshore infrastructure and port utilization, which would be the same for all of the alternatives considered.

3.18.7 Alternative C-2 – Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of up to 12 WTG Positions to the Eastern Side of the Lease Area

Alternative C-2 was developed to potentially reduce impacts to fisheries habitat within the Lease Area by removing up to 8 WTGs from Priority Areas 1, 2, 3, and/or 4 and relocating up to an additional 12 WTGs to currently unoccupied positions along the eastern side of the Lease Area. Under Alternative C-2, the 11-MW WTGs and OCS-DC would occur within the range of design parameters outlined in the COP.

3.18.7.1 Construction and Installation

3.18.7.1.1 Onshore Activities and Facilities

The impacts of Alternative C-2 on construction and installation would be similar to the Proposed Action for onshore activities and facilities.

3.18.7.1.2 Offshore Activities and Facilities

The impacts of Alternative C-2 on construction and installation would be similar to the Proposed Action for offshore activities and facilities.

3.18.7.2 Operations and Maintenance

3.18.7.2.1 Onshore Activities and Facilities

The impacts of Alternative C-2 on O&M would be similar to the Proposed Action for onshore activities and facilities.

3.18.7.2.2 Offshore Activities and Facilities

The impacts of Alternative C-2 on O&M would be similar to the Proposed Action for offshore activities and facilities.

3.18.7.3 Conceptual Decommissioning

3.18.7.3.1 Onshore Activities and Facilities

The impacts of Alternative C-2 on decommissioning would be similar to the Proposed Action for onshore activities and facilities.

3.18.7.3.2 Offshore Activities and Facilities

The impacts of Alternative C-2 on decommissioning would be similar to the Proposed Action for offshore activities and facilities.

3.18.7.4 Cumulative Impacts of Alternative C-2

The cumulative impacts on land use and coastal would range from negligible to moderate adverse to minor beneficial impacts. In the context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-2 to the cumulative impacts on land use and coastal infrastructure would be similar to those described under the Proposed Action.

3.18.7.5 Conclusions

Impacts of Alternative C-2

Under Alternative C-2, the potential impacts to land use and coastal infrastructure are anticipated to be the same as described under the Proposed Action under Construction and Installation, Operation and Maintenance, and Conceptual Decommissioning actions. Under this alternative, the construction of onshore facilities would remain the same, and changes in construction to offshore facilities would not result in significantly different impacts than under the Proposed Action. There is the potential for differences in the visual impacts from the lighting and location of WTGs in the offshore area; however, these differences would not result in changes to land use and coastal infrastructure impacts. As a result, BOEM expects that the overall impacts from Alternative C-2 to land use and coastal infrastructure would be similar to the Proposed Action, and impacts would be **moderate** adverse with **minor beneficial** impacts.

Cumulative Impacts of Alternative C-2

In context of reasonably foreseeable environmental trends, the contribution of Alternative C-2 to the impacts resulting from individual IPFs associated with ongoing and planned activities would be the same as that of the Proposed Action. Impacts are expected to result in **moderate** adverse impacts for onshore land use and infrastructure with **minor beneficial** impacts. The overall impacts of Alternative C-2 combined with ongoing and planned activities on land use would be very similar to those of the Proposed Action. These impacts would primarily stem from installation of onshore infrastructure and port utilization, which would be the same for all of the alternatives considered.

3.18.8 Alternative C-3 - Reduced Layout from Priority Areas Considering Feasibility due to Glauconite Sands

Under the Fisheries Habitat Impact Minimization Alternative C-3, the construction, O&M, and eventual decommissioning of the 11-MW WTGs and an OCS within the proposed Project Area and associated inter-array and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. However, Alternative C-3 was developed to address concerns regarding pile refusal due to glauconite sands in the southeastern portion of the Lease Area while still minimizing impacts to benthic and fisheries resources. Alternative C-3a, C-3b, and C-3c described in Section 3.7.8, *Benthic Resources*, consider different WTG configurations to avoid sensitive habitats and engineering constraints while still meeting the NYSERDA OREC. This alternative only considered removal of WTGs from Priority Area 1 based on consultation with NMFS. Areas with high density of boulder, complex habitat, and data suggesting Atlantic cod aggregation and spawning was considered when determining which WTGs to remove.

3.18.8.1 Construction and Installation

3.18.8.1.1 Onshore Activities and Facilities

The impacts of Alternative C-3a, C-3b, and C-3c on construction and installation would be similar to the Proposed Action for onshore activities and facilities.

3.18.8.1.2 Offshore Activities and Facilities

The impacts of Alternative C-3a, C-3b, and C-3c on construction and installation would be similar to the Proposed Action for offshore activities and facilities.

3.18.8.2 Operations and Maintenance

3.18.8.2.1 Onshore Activities and Facilities

The impacts of Alternative C-3a, C-3b, and C-3c on O&M would be similar to the Proposed Action for onshore activities and facilities.

3.18.8.2.2 Offshore Activities and Facilities

The impacts of Alternative C-3a, C-3b, and C-3c on O&M would be similar to the Proposed Action for offshore activities and facilities.

3.18.8.3 Conceptual Decommissioning

3.18.8.3.1 Onshore Activities and Facilities

The impacts of Alternative C-3a, C-3b, and C-3c on decommissioning would be similar to the Proposed Action for onshore activities and facilities.

3.18.8.3.2 Offshore Activities and Facilities

The impacts of Alternative C-3a, C-3b, and C-3c on decommissioning would be similar to the Proposed Action for offshore activities and facilities.

3.18.8.4 Cumulative Impacts of Alternative C-3

The cumulative impacts on land use and coastal would range from **negligible** to **moderate** adverse to **minor beneficial** impacts. In the context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-3 to the cumulative impacts on land use and coastal infrastructure would be similar to those described under the Proposed Action.

3.18.8.5 Conclusions

Impacts of Alternative C-3

Under Alternative C-3a, C-3b, and C-3c, the potential impacts to land use and coastal infrastructure are anticipated to be the same as described under the Proposed Action under Construction and Installation, Operation and Maintenance, and Conceptual Decommissioning actions. Under this alternative, the construction of onshore facilities would remain the same, and changes in construction to offshore facilities would not result in significantly different impacts than under the Proposed Action. There is the potential for differences in the visual impacts from the lighting and location of WTGs in the offshore area; however, these differences would not result in changes to land use and coastal infrastructure impacts. As a result, BOEM expects that the overall impacts from Alternative C-3a, C-3b, and C-3c to land use and coastal infrastructure would be similar to the Proposed Action, and impacts would be **moderate** adverse with **minor beneficial** impacts.

Cumulative Impacts of Alternative C-3

In context of reasonably foreseeable environmental trends, the contribution of Alternative C-3a, C-3b, and C-3c to the impacts resulting from individual IPFs associated with ongoing and planned activities would be the same as that of the Proposed Action. Cumulative impacts are expected to result in **moderate** adverse impacts for onshore land use and infrastructure with **minor beneficial** impacts. The overall impacts of Alternative C-3a, C-3b, and C-3c combined with ongoing and planned activities on land use would be very similar to those of the Proposed Action. These impacts would primarily stem from installation of onshore infrastructure and port utilization, which would be the same for all of the alternatives considered.

3.18.9 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, C-2, and C-3 would have the same overall negligible to moderate adverse impacts and minor beneficial impacts on land use and coastal infrastructure. Table 3.18-2 provides an overall summary of alternative impacts.

Table 3.18-2. Comparison of Impacts on Land Use and Coastal Infrastructure

No Action Alternative (Alternative A)	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)	Fisheries Habitat Minimization Considering Feasibility Due to Glauconite Sands (Alternative C-3)
No Action Alternative: BOEM anticipates that impacts on land use and coastal infrastructure from the No Action Alternative would be **minor** adverse impacts with **minor beneficial** impacts. *Cumulative Impacts of the No Action Alternative:* In context of reasonably foreseeable environmental trends, BOEM anticipates that the cumulative impacts resulting from all of the IPFs together result in **minor** adverse impacts for onshore land use and coastal infrastructure and **minor beneficial** impacts.	*Proposed Action:* BOEM anticipates that impacts on land use and coastal infrastructure from the Proposed Action would be **moderate** adverse with **minor beneficial** impacts. *Cumulative Impacts of the Proposed Action:* Considering all the IPFs together, BOEM anticipates that the contribution of the Proposed Action to the impacts associated with ongoing and planned activities would result in **moderate** adverse impacts and **minor beneficial** cumulative impacts on land use and coastal infrastructure in the GAA.	*Alternative C-1:* BOEM expects that the impacts from Alternative C-1 to land use and coastal infrastructure would be similar to the Proposed Action, and impacts would be **moderate** adverse with **minor beneficial** impacts. *Cumulative Impacts of Alternative C-1:* In context of reasonably foreseeable environmental trends, the contribution of Alternative C-1 to the cumulative impacts resulting from individual IPFs associated with ongoing and planned activities would be the same as that of the Proposed Action. Cumulative impacts are expected to result in **moderate** adverse impacts for onshore land use	*Alternative C-2*: BOEM expects that the impacts from Alternative C-2 to land use and coastal infrastructure would be similar to the Proposed Action, and impacts would be **moderate** adverse with **minor beneficial** impacts. *Cumulative Impacts of Alternative C-2:* In context of reasonably foreseeable environmental trends, the contribution of Alternative C-2 to the impacts resulting from individual IPFs associated with ongoing and planned activities would be the same as that of the Proposed Action. Cumulative impacts are expected to result in **moderate** adverse impacts for onshore land use and infrastructure and **minor beneficial** impacts.	*Alternative C-3:* BOEM expects that the impacts from Alternative C-3 to land use and coastal infrastructure would be similar to the Proposed Action, and impacts would be **moderate** adverse with **minor beneficial** impacts. *Cumulative Impacts of Alternative C-3:* In context of reasonably foreseeable environmental trends, the contribution of Alternative C-3 to the impacts resulting from individual IPFs associated with ongoing and planned activities would be the same as that of the Proposed Action. Cumulative impacts are expected to result in **moderate** adverse impacts for onshore land use

No Action Alternative (Alternative A)	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)	Fisheries Habitat Minimization Considering Feasibility Due to Glauconite Sands (Alternative C-3)
		and coastal infrastructure and **minor beneficial** impacts.		and coastal infrastructure and **minor beneficial** impacts.

3.18.10 Summary of Impacts of the Preferred Alternative

BOEM has identified Alternative C-3b as the Preferred Alternative as depicted in Figure 2.1-10. Alternative C-3b would include installation of up to 84 WTGs, which is 10 fewer WTGs than the maximum WTGs proposed under the PDE of the Proposed Action. Under Alternative C-3b, overall impacts on land use and coastal infrastructure would be similar to the Proposed Action, **moderate** adverse with **minor beneficial** impacts for the Preferred Alternative.

3.18.11 Proposed Mitigation Measures

No additional measures to mitigate impacts on land use and coastal infrastructure have been proposed for analysis.

3.18.11.1 Effect of Measures Incorporated into the Preferred Alternative

Since no mitigation measures have been proposed, impact levels for the Preferred Alternative would remain as described above in Section 3.18.8.

3.19 Navigation and Vessel Traffic

This section discusses potential impacts on navigation and vessel traffic from the proposed Project, alternatives, and future offshore wind activities in the GAA (Appendix D, Figure D-16). The navigation and vessel traffic GAA as described in Appendix D, includes a 10-mile buffer around SRWF and neighboring wind farms, as well as port facilities and neighboring fairways and recommended vessel routes.

In 2019, the USCG conducted the Massachusetts and Rhode Island Port Access Route Study to determine what, if any, navigational safety concerns exist with vessel transits in the study area, and to evaluate the need for establishing vessel routing measures for projects in the Rhode Island/Massachusetts WEA (USCG 2020). The study recommended that the turbine layout be developed along a standard and uniform grid pattern with at least three lines of orientation and standard 1-nm spacing to accommodate vessel transits, fishing operations, and search and rescue operations (USCG 2020). The USCG further concluded that adoption of a standard and uniform grid pattern would likely eliminate the need for formal or informal routing measures (USCG 2020). In 2019, all leases in the Rhode Island and Massachusetts WEAs proposed a uniform and aligned 1-nm x 1-nm structure layout (Navigation Risk and Safety Assessment [NRSA]) (DNV-GL 2020).

Sunrise Wind included a NRSA (DNV-GL 2020) as part of the Sunrise Wind COP in accordance with USCG Navigation and Vessel Inspection Circular (NVIC 01-19). The NSRA used traffic data (including AIS and VMS data), operational data, and environmental data to evaluate the impact of the proposed SRWF on navigation.

DNV-GL utilized AIS data from July 1, 2018, to June 30, 2019, and the Marine Accident Risk Calculation System (MARCS) model to calculate incident frequency within the SRWF Project Area. MARCS was developed by DNV-GL in the mid-1990s and combines a risk model with calculation tools that estimate the frequency of navigation hazards, including collision, grounding, and allision as outlined by the NVIC 01-19. MARCS calculates the frequency at which critical situations are produced. In the context of navigation risk, critical situations may result in an incident: defined as collision, allision, or grounding. A vessel colliding with another vessel is defined as a collision. A vessel colliding with a stationary object is an allision. A craft contacting the seabed is known as grounding (COP, Section 4.8.1; Sunrise Wind 2023).

3.19.1 Description of the Affected Environment and Future Baseline Conditions

Existing marine traffic and navigation in the region, including the SRWF, were outlined in Appendix X *Navigational Safety Risk Assessment* of the COP (DNV-GL 2022). This assessment details the variety of vessels using the Lease Area and the surrounding waters. Commercial, military, and recreational vessels comprise the major types of vessels transiting these waters. Recreational vessels are seasonally active, compared to the year-round transit of commercial and military vessels (COP, Section 4.8.1; Sunrise Wind 2023). Summer traffic in the region can increase as much as four times the winter traffic due to this increase in recreational and pleasure watercraft (USCG 2020).

The majority of vessel traffic within the SRWF is pleasure, fishing, and other/undefined (COP, Section 4.8.1; Sunrise Wind 2023). Other/undefined AIS data may be the result of improper equipment registration or the system using it as a default value, but these records were not found to deviate from patterns of defined vessels (USCG 2020). Fishing vessels and cargo and tanker vessels in the Lease Area transited mostly on repeat routes by type, whereas pleasure, recreation, and other/undefined vessels were much less common and did not follow a typical transit pattern when they did pass through the Lease Area. Cargo and tanker vessels are infrequent in their travel through the Lease Area, even though they are the most regular in their transits; AIS data show north-south and east-west cargo and tanker ship travel through the Lease Area (COP, Section 4.8.1; Sunrise Wind 2023). AIS data confirm that fewer than one tanker and one cargo vessel per day transit the Lease Area. Tugs and service vessels similarly displayed very few crossings into the Lease Area, maintaining coastwise transit patterns (COP, Section 4.8.1; Sunrise Wind 2023).

Future baseline conditions are hard to predict. One of the only indicators of future vessel traffic is proposed port development activities because the region has a lack of proper infrastructure with sufficient water depths for larger vessels (USCG 2020). Current or projected dredging projects in the immediate vicinity would not be expected to impact vessel traffic or density because they are to maintain currently authorized depths and there are no permitted bridge projects with the intention to increase air draft (USCG 2020). While the ports of New York and New Jersey and Boston Harbor are deepening to accommodate post-Panamax vessels, the data suggest that vessel traffic within the MR/RI WEA is expected to remain relatively stable into the foreseeable future (BOEM 2019). However, the ports of New Bedford, Fairhaven, Davisville, and Brayton Point have been upgraded to support offshore wind activities, from construction through O&M and decommissioning (USCG 2020). An increase is expected at the Port of Providence in the number of liquified petroleum gas vessels that transit through the WEA, up to eight annually, while the Port of Newport anticipates the current rate of 40 to 50 cruise ships to double (USCG 2020). During wind farm development activities, the USCG (2020) anticipates that there may be a slight increase in certain vessels and traffic characteristics, which should be met with an equal increase in vessels and traffic conditions during decommissioning. The USCG (2020) anticipates the number of recreational vessels, excursion vessels, and fishing vessels to increase post-construction. The Project assumes that large vessels would navigate around the wind farm (COP, Section 4.8.1; Sunrise Wind 2023).

3.19.2 Impact Level Definitions for Navigation and Vessel Traffic

This Final EIS uses a four-level classification scheme to analyze potential impact levels to navigation and vessel traffic from the alternatives, including the Proposed Action. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a project or beyond project operations and decommissioning. Table 3.19-1 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for navigation and vessel traffic. Table G-18 in Appendix G identifies potential IPFs, issues, and indicators to assess impacts to navigation and vessel traffic.

Table 3.19-1. Definitions of Potential Beneficial and Adverse Impact Levels for Navigation and Vessel Traffic

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	No measurable impacts would occur	Either no effect or no measurable impacts
Minor	Impacts to vessels and turbines could be avoided with environmental protection measures (EPMs). Impacts would not disrupt the normal or routine functions or navigation of the vessel or turbine.	N/A
Moderate	Impacts are unavoidable, although EPMs would reduce impacts substantially during the life of the Project. The vessel would have to adjust somewhat to account for disruptions due to impacts of the Project	N/A
Major	Vessel traffic would experience unavoidable disruptions to a degree beyond what is normally acceptable.	N/A

3.19.3 Impacts of Alternative A – No Action on Navigation and Vessel Traffic

When analyzing the impacts of the No Action Alternative on navigation, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities on the baseline conditions for navigation. The cumulative impacts of the No Action Alternative considered the impacts of the No Action Alternative in combination with other planned non-offshore wind and offshore wind activities, as described in Appendix E (*Planned Activities Scenario*).

The description of Section 3.19.3, *Affected Environment and Future Baseline Conditions,* provides an overview of information on past and present activities related to navigation and vessel traffic. Future non-Project actions include offshore wind energy development, undersea transmission lines, gas pipelines, other submarine cables, tidal energy projects, marine minerals use and ocean-dredged material disposal, military uses, marine transportation, fisheries use and management, global climate change, oil and gas activities, and onshore development activities which are discussed in further detail in Appendix E. Impacts associated with future offshore wind activities in relation to navigation and vessel traffic are described in the following text.

3.19.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for navigation and vessel traffic would continue to follow regional current trends and respond to IPFs introduced by other ongoing and planned activities. Ongoing activities within the GAA that contribute to impacts on navigation and vessel traffic are generally associated with marine transportation, military use, NMFS activities and scientific research, fisheries use and management, and existing and permitted/in construction offshore wind farms. Impacts from these activities increase vessel traffic in the area, adding to congestion in waterways and increasing the potential for maritime accidents. Impacts associated with global climate change have the potential to require modifications to existing port infrastructure and Aids to Navigation, with the former adding to port congestion and limited berths during construction activities.

Ongoing offshore wind activities within the GAA that contribute to impacts on navigation include:

- Continued O&M of the Block Island Project (5 WTGs) installed in state waters;
- Continued O&M of the CVOW project (2 WTGs) installed in OCS-A 0497; and
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of the Block Island and CVOW projects and ongoing construction of the Vineyard Wind 1 and South Forks projects would affect navigation through the primary IPFs of anchoring, cable emplacement and maintenance, presence of structures, port utilization, and traffic. Ongoing offshore wind activities would have the same type of impacts from anchoring, cable emplacement and maintenance, presence of structures, port utilization, and traffic that are described in the following section for planned offshore wind activities.

3.19.3.2 Cumulative Impacts of the No Action Alternative

The cumulative impact analysis for the No Action Alternative considers the impacts of the No Action Alternative in combination with other planned non-offshore wind activities and planned offshore wind activities (without the Proposed Action).

Planned non-offshore wind activities that may affect navigation and vessel traffic in the GAA include port improvement projects, dredging projects, and installation of new structures on the OCS (refer to Appendix E for a description of ongoing and planned activities). These activities may result in a moderate increase in port maintenance activities, port upgrades to accommodate larger deep-draft vessels, and short-term increases in vessel traffic for offshore cable emplacement and maintenance. Appendix E provides a summary of potential impacts associated with ongoing and planned non-offshore wind activities by IPF for navigation and vessel traffic.

Including the SRWF, a total of three other wind farms are proposed for Rhode Island/Massachusetts WEA with others in planning and construction phases. These future activities are expected to affect navigation and vessel traffic through the following primary IPFs.

Anchoring: Future offshore wind developers are expected to coordinate with the maritime community and USCG to avoid laying export cables through any traditional or designated lightering/anchorage areas, meaning that any risk for deep-draft vessels would come from anchoring in an emergency scenario, specifically near the Narragansett Bay and Buzzards Bay traffic separation schemes (Table 3.19-2). Larger vessels accidentally dropping anchor on an export cable (buried or mattress protected) to prevent drifting in the event of vessel power failure would result in damage to the export cable, risks to the vessel associated with an anchor contacting an electrified cable, and impacts to the vessel operator's liability and insurance. Impacts on navigation and vessel traffic would be short-term and localized, and navigation and vessel traffic would fully recover following the disturbance.

Cable emplacement and maintenance: Under the No Action Alternative, every other project within the Rhode Island/Massachusetts WEA is expected to plan a unique cable route. Cable emplacement would have short-term, localized adverse impacts on boating because of the need to navigate around construction activities and minimize exposure to hazardous conditions.

Presence of structures: The placement of structures would have long-term adverse impacts on vessel traffic in the Rhode Island/Massachusetts WEA. Ocean renewable infrastructure would likely displace large vessels. In 2016, USCG concluded that creating routing measures where structures currently do not exist would more than likely result in an increase in risk due to vessels navigating in closer proximity to each other than they would otherwise in an open ocean scenario (USCG 2016). While large vessels are expected to navigate around the Rhode Island/Massachusetts WEA, this would increase journey time and voyage cost.

BOEM assumes that all offshore wind developments would utilize the joint lessee proposed structure layout, to be developed along a standard and uniform grid pattern with at least three lines of orientation and standard 1-nm (1.9-km) spacing. Because this layout supports the traditional east-west active fishing operations, traditional northwest to southeast transit patterns, and allows for dispersal of small vessel traffic, this arrangement would reduce, but not eliminate, navigational complexity and economic displacement during the operational phase of the project.

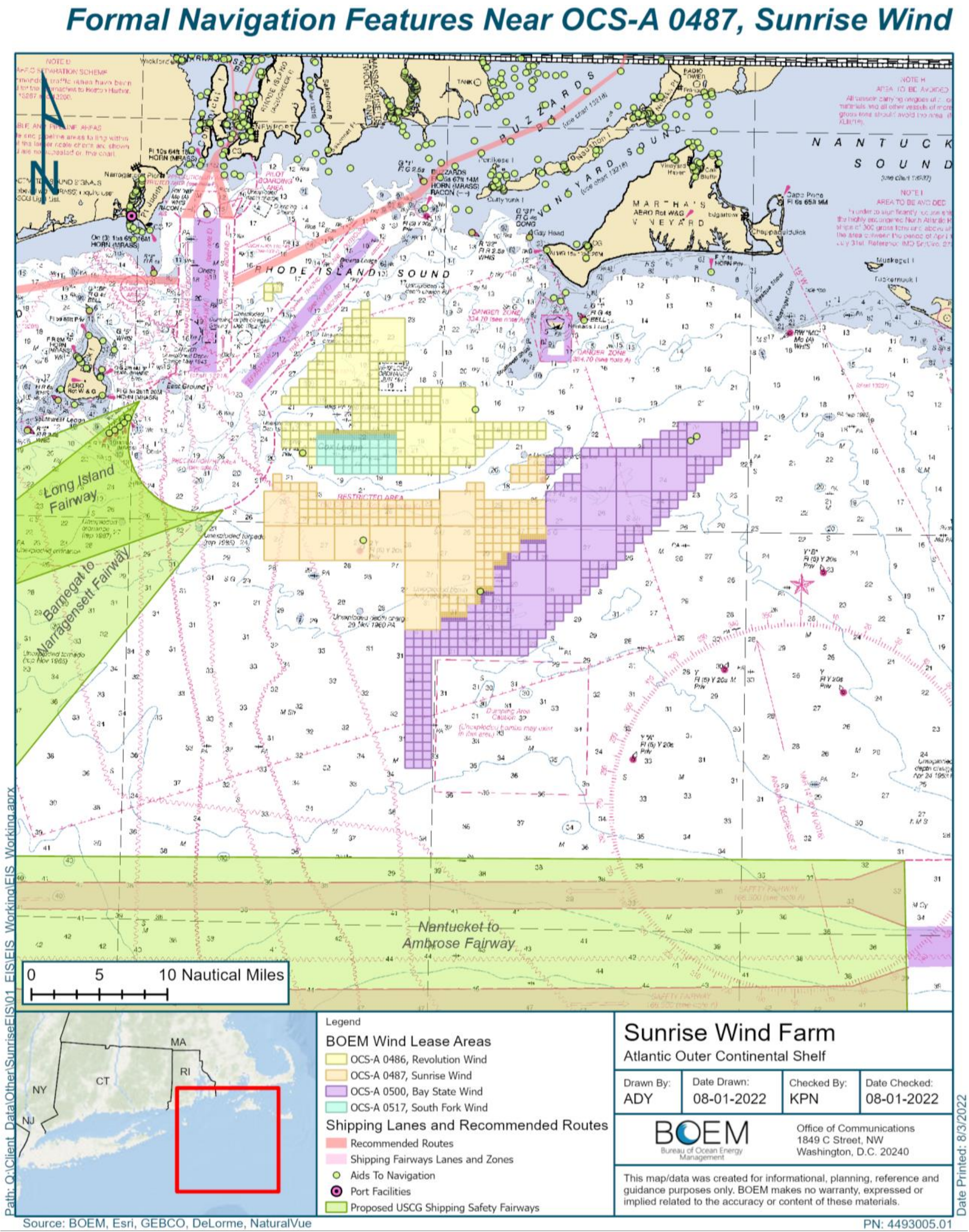

Figure 3.19-1. Current and Proposed Offshore Wind Farms within the Rhode Island / Massachusetts WEA with Convex Hull which Represents the Shortest Path around the Navigational Obstruction

Marine vessel radars are not optimized to operate in the Rhode Island/Massachusetts WEA, because the nominal WTG structure has a large radar cross-section (RCS) leading to many strong reflected signals entering the radar receiver, which is further complicated by multipath and other ambiguous returns (National Academies of Sciences, Engineering, and Medicine 2022). BOEM expects the industry to adopt both technological and non-technology-based measures to reduce impacts on marine radar, including greater use of AIS and electronic charting systems, new technologies like light detection and radar (LIDAR), employing more watchstanders[3], and simply avoiding wind farms altogether (National Academies of Sciences, Engineering, and Medicine 2022).

Port utilization: The USCG indicates that the ports of New Bedford, Fairhaven, Davisville, and Brayton Point have been upgraded to support offshore wind activities associated with the Rhode Island/Massachusetts WEA, while the ports of Bridgeport, New London, Port Jefferson, and New York have announced upgrade projects to support the wind energy industry (USCG 2020). It is expected that vessel congestion would increase in the short-term, during construction and again during decommissioning. However, it is unlikely significant enough to impact safe navigation through wind farms (USCG 2020). Construction port facilities are expected to serve multiple offshore wind projects, and potentially multiple offshore wind related and other maritime industries. Specifically, the COP indicates the following are primary construction ports, Albany and/or Coeymans, New York (foundation), New London, Connecticut (staging and preassembly), and the Port of Davisville-Quonset Point, Rhode Island (construction management base) (COP, Section 3.3.10; Sunrise Wind 2023). Back-up options include the Port of New York-New Jersey, New York, the New Bedford Marine Commerce Terminal, Massachusetts, Sparrow's Point, Maryland, Paulsboro Marine Terminal, New Jersey, Port of Providence, Rhode Island and Port of Norfolk, Virginia (COP, Section 3.3.10; Sunrise Wind 2023).

Traffic: Construction and decommissioning activities associated with adjacent wind farms would result in an increase of vessel traffic near those areas. Additional impacts would include delays within or approaching ports; increased navigational complexity; detours to offshore travel or port approaches; or increased risk of incidents such as collision, strikes or allisions, and groundings. Other reasonably foreseeable future offshore projects would produce additional vessel traffic during construction, but because of their timing, they are not anticipated to use the same traffic routes. Construction of other offshore wind projects would be scheduled to minimize overlapping construction periods and reduce the number of construction vessels in operation at any given time, effectively reducing the cumulative impact on port congestion and construction vessel rerouting.

3.19.3.3 Conclusions

Impacts of the No Action Alternative

Under the No Action Alternative, BOEM would not approve the COP; Project construction and installation, O&M, and conceptual decommissioning would not occur at any proposed project; and potential impacts on navigation and vessel traffic associated with the Project would not occur. However, ongoing and future activities would have continued short-term to long-term impacts on navigation,

[3] Watchstander--a person on watch on a ship.

primarily through existing traffic activity, port use, and the presence of structures. Continuation of existing environmental trends and activities under the No Action Alternative would result in **moderate** adverse impacts on navigation and vessel traffic.

Cumulative Impacts of the No Action Alternative

BOEM anticipates that the cumulative impacts for reasonably foreseeable offshore wind activities, especially the presence of structures, port utilization, and vessel traffic, would be **moderate** adverse. Future offshore wind projects, once approved, would increase vessel activity, which could lead to congestion at affected ports, the possible need for port upgrades beyond those currently envisioned, as well as an increased likelihood of collisions and allisions, with resultant increased risk of accidental releases. In addition, the presence of new WTGs would increase the risk for collisions, allisions, and resultant accidental releases and threats to human health and safety.

Considering all the IPFs together, BOEM anticipates that the impacts associated with future offshore wind activities in the GAA combined with ongoing activities, reasonably foreseeable environmental trends, and reasonably foreseeable activities other than offshore wind would result in **moderate** adverse impacts because the overall effect would be notable, but vessels could adjust to account for disruptions and EPMs would reduce impacts.

3.19.4 Relevant Design Parameters and Potential Variances in Impacts

This Final EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the COP, Section 4.8.1 (Sunrise Wind 2023), would result in impacts similar to or less than the described actions listed below. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts on navigation and vessel traffic characteristics:

- The Project layout including the number, type, and placement of the WTGs and OCS-DC including the location, width, and orientation of the SRWF rows and columns;
- The number of vessels utilized for construction, installation, and decommissioning;
- The SRWEC corridor route;
- Time of year of construction;
- Ports selected to support construction, installation, and decommissioning;
- Ports selected to perform O&M; and
- Variances in any of these factors could affect navigation vessel traffic and navigation routes. Since this section assessed the maximum-case scenario, variances are expected to lead to similar or even reduced impacts.

3.19.5 Impacts of Alternative B – Proposed Action on Navigation and Vessel Traffic

BOEM expects the Proposed Action to impact navigation and vessel traffic during construction and installation, O&M, and decommissioning activities.

3.19.5.1 Construction and Installation

During the construction and installation phase of the Project, the Proposed Action is anticipated to affect navigation and vessel traffic. The Project would plan vessel routes for all vessel types in accordance with industry guidelines and best practices as defined by the International Chamber of Shipping (COP, Section 4.8.1; Sunrise Wind 2023). All vessels associated with the construction of the SRWF would be equipped with AIS to monitor compliance with speed requirements (COP, Section 4.8.1; Sunrise Wind 2023). All offshore work would halt during unsafe wind conditions, lightning storms, and/or sea states that exceed Project operational limits (COP, Section 4.8.1; Sunrise Wind 2023). Sunrise Wind would implement a communication plan during the construction phase to inform mariners of construction-related activities, which would be facilitated through the maintenance of a Project website, liaison with fisheries, notice to mariners and vessel float plans, and in coordination with the USCG (COP, Section 4.8.1; Sunrise Wind 2023).

3.19.5.1.1 Onshore Activities and Facilities

Construction and installation associated with onshore facilities would not be expected to impact navigation and vessel traffic.

3.19.5.1.2 Offshore Activities and Facilities

Planned offshore construction and installation activities associated with the SRWF would significantly impact navigation and vessel traffic. Project effects include increased vessel traffic near the SRWF and OCS-DC, and ports used by the Project; obstructions to navigation; delays within or approaching ports; increased navigational complexity; changes to navigation patterns; detours to offshore travel or port approaches; or increased risk of incidents such as collision, allision, and groundings. The Project may request that the USCG establish temporary safety zones around each WTG, and the OCS-DC (COP, Section 4.8.1; Sunrise Wind 2023). However, mariners must always abide by Convention on the International Regulations for Preventing Collisions at Sea.

The expected timeline to construct and install offshore facilities would span from second quarter 2024 to the end of the fourth quarter 2025 (COP, Section 4.8.1; Sunrise Wind 2023). During that timeline, up to 94 11-MW WTGs, inter-array cabling, and an OCS-DC would be constructed, and 106 miles of export cable would be laid (COP, Section 4.8.1; Sunrise Wind 2023).

Anchoring: SRWF is expected to coordinate with the maritime community and USCG to avoid laying export cables through any traditional or designated lightering/anchorage areas, meaning that any risk for deep-draft vessels would come from anchoring in an emergency scenario. The cable and other Project features would be appropriately plotted on nautical charts as well. Generally, larger vessels accidentally dropping anchor on top of an export cable (buried or mattress protected) to prevent drifting in the event of vessel power failure would result in damage to the export cable, risks to the vessel associated with an anchor contacting an electrified cable, and impacts to the vessel operator’s liability and insurance. Cables would typically target a burial depth of 4 to 6 ft (1.2 to 1.8 m). However, the target burial depth in specific areas along the cable routes would be determined based on an assessment of seafloor conditions, seabed mobility, and the risk of interaction with external hazards such as fishing gear and vessel anchors: which would be determined through a Cable Burial Risk Assessment (CBRA) if the COP is approved. Impacts on navigation and vessel traffic would be short-term and localized, and navigation and vessel traffic would fully recover following the disturbance.

Cable emplacement and maintenance: Cable emplacement would have short-term, localized adverse impacts on boating because of the need to navigate around construction activities and minimize exposure to hazardous conditions. The SRWEC would be installed within a survey corridor ranging in width from 1,312 ft to 2,625 ft (400 m to 800 m) depending on water depth, buried to a target depth of 4 ft to 6 ft (1.2 mi to 1.8 m), and supported by 31 different vessels during construction (COP, Section 3.3.4; Sunrise Wind 2023). A cable-laying vessel would move along the pre-determined route from landfall towards the SRWF (COP, Section 3.3.3.4; Sunrise Wind 2023). BOEM expects that Sunrise Wind would implement a communication plan during the cable emplacement and maintenance, which would be facilitated through the maintenance of a Project website, liaison with fisheries, notice to mariners and vessel float plans, and in coordination with the USCG (COP, Section 4.8.1; Sunrise Wind 2023). Additionally, the USCG requests timely access to construction plans, such as Facility Design Reports and/or Fabrication Installation Reports for the purpose of identifying activities impacting Navigation and Vessel Traffic and USCG missions on the Marine Transportation System, especially Cable Burial Plans and their associated risk and feasibility assessments. Early access to these documents may prevent conflicts with planned activities.

Presence of structures: The placement of structures would have long-term adverse impacts on vessel traffic in the Rhode Island/Massachusetts WEA. Ocean renewable infrastructure would likely displace large vessels. In 2016, USCG concluded that creating routing measures where structures currently do not exist would more than likely result in an increase in risk due to vessels navigating in closer proximity to each other than they would otherwise in an open ocean scenario (USCG 2016). While large vessels are expected to navigate around the Rhode Island/Massachusetts WEA, this would increase journey time and voyage cost.

BOEM assumes that all offshore wind developments would utilize the joint lessee proposed structure layout, to be developed along a standard and uniform grid pattern with at least three lines of orientation and standard 1-nm (1.9-km) spacing. As the proposed layout for SRWF is aligned with the joint proposed layout, and because this layout supports the traditional east-west active fishing operations, traditional northwest to southeast transit patterns, and allows for dispersal of small vessel traffic, this arrangement would reduce, but not eliminate, navigational complexity and economic displacement during the operational phase of the Project.

Marine vessel radars are not optimized to operate in the Rhode Island/Massachusetts WEA, because the nominal WTG structure has a large RCS leading to many strong reflected signals entering the radar receiver, which is further complicated by multipath and other ambiguous returns (National Academies of Sciences, Engineering, and Medicine 2022). BOEM expects the industry to adopt both technological and non-technology-based measures to reduce impacts on marine radar, including greater use of AIS and electronic charting systems, new technologies like LIDAR, employing more watchstanders, and simply avoiding wind farms altogether (National Academies of Sciences, Engineering, and Medicine 2022).

Port utilization: The USCG indicates that the ports of New Bedford, Fairhaven, Davisville, New London, and Brayton Point have been upgraded to support offshore wind activities associated with the Rhode Island/Massachusetts WEA, while the ports of Bridgeport, Port Jefferson, and New York have announced upgrade projects to support the wind energy industry (USCG 2020). During construction, the Project could utilize ports in seven different states for WTG component storage, pre-commissioning, foundation fabrication, staging, preassembly, and to serve as a construction base (Port of Davisville) (COP, Section 4.8.1; Sunrise Wind 2023). Specifically, the COP indicates the following are primary construction ports, Albany and/or Coeymans, New York (foundation scope), New London, Connecticut (WTG scope), and the Port of Davisville-Quonset Point, Rhode Island (construction management base) (COP, Section 3.3.10; Sunrise Wind 2023). Back-up options include the Port of New York-New Jersey, New York, the New Bedford Marine Commerce Terminal, Massachusetts, Sparrow's Point, Maryland, Paulsboro Marine Terminal, New Jersey, Port of Providence, Rhode Island and Port of Norfolk, Virginia (COP, Section 3.3.10; Sunrise Wind 2023). It is expected that vessel congestion would increase in the short-term, during construction and again during decommissioning. However, it is unlikely significant enough to impact safe navigation through wind farms and in approaching ports (USCG 2020).

Traffic: Construction and decommissioning activities associated with SRWF would result in an increase of vessel traffic near those areas and the applicable ports. Prior to WTG installation, short-term vessel traffic within the SRWF would increase during G&G surveys, surveys for MEC/UXO, and missions to clean seafloor debris. Installation of a single monopile could last from 1 to 4 hours (monopile), up to 3 monopile foundations could be installed in a 24-hour period. Installation of the single piled jacket foundation for the OCS-DC is estimated to need a maximum of 48 hours of piling driving for installation (COP, Section 3.3.5.2; Sunrise Wind 2023). At a maximum, it is expected that two vessels would be working simultaneously (i.e., two monopile vessels, or one monopile foundation vessel and one piled jacket foundation vessel) (COP, Section 3.3.52; Sunrise Wind 2023). Additional impacts would include delays within or approaching ports; increased navigational complexity; detours to offshore travel or port approaches; or increased risk of incidents such as collision, strikes or allisions, and groundings. Other reasonably foreseeable future offshore projects would produce additional vessel traffic during construction, but because of their timing, they are not anticipated to use the same traffic routes. Construction of other offshore wind projects would be scheduled to minimize overlapping construction periods and reduce the number of construction vessels in operation at any given time, effectively reducing the cumulative impact on port congestion and construction vessel rerouting.

3.19.5.2 Operations and Maintenance

A 24/7 SCADA surveillance system would operate the Project remotely, and when issues arise would sound an alarm (COP, Section 3.5; Sunrise Wind 2023). The Project's asset management system provides a data-driven assessment of the asset condition and allows for prediction and assessment of whether inspections and/or maintenance activities should be accelerated or postponed (COP, Section 3.5.1; Sunrise Wind 2023). In addition to reactive and predictive maintenance, the Project would also implement a reliability maintenance program aimed at preventing mechanical breakdowns with a potential 20 missions per year for routine service of electrical components (COP, Section 3.5.1; Sunrise Wind 2023).

3.19.5.2.1 Onshore Activities and Facilities

O&M of onshore facilities would not be expected to impact navigation and vessel traffic.

3.19.5.2.2 Offshore Activities and Facilities

Anchoring: The SRWF is expected to coordinate with the maritime community and USCG to avoid laying export cables through any traditional or designated lightering/anchorage areas, meaning that any risk for deep-draft vessels would come from anchoring in an emergency scenario. Generally, larger vessels accidentally dropping anchor on top of an export cable (buried or mattress protected) to prevent drifting in the event of vessel power failure would result in damage to the export cable, risks to the vessel associated with an anchor contacting an electrified cable, and impacts to the vessel operator's liability and insurance. Cables would typically target a burial depth of 4 to 6 ft (1.2 to 1.8 m). However, the target burial depth in specific areas along the cable routes would be determined based on an assessment of seafloor conditions, seabed mobility, and the risk of interaction with external hazards such as fishing gear and vessel anchors: which would be determined through a Cable Burial Risk Assessment (CBRA) if the COP is approved. Impacts on navigation and vessel traffic would be short-term and localized, and navigation and vessel traffic would fully recover following the disturbance.

Cable emplacement and maintenance: Regular maintenance of the SRWEC would occur routinely and would result in an increase in vessel traffic and density. The SRWF would communicate regularly scheduled maintenance with mariners.

Presence of structures: The placement of structures would have long-term adverse impacts on vessels. Ocean renewable infrastructure would likely displace large vessels. In 2016, USCG concluded that creating routing measures where structures currently do not exist would more than likely result in an increase in risk due to vessels navigating in closer proximity to each other than they would otherwise in an open ocean scenario (USCG 2016). While large vessels would be expected to navigate around the Rhode Island/Massachusetts WEA, this would increase journey time and voyage cost.

Smaller vessels, such as fishing vessels, O&M tenders, and recreational vessels are expected to transit through the SRWF. During the O&M phase of the Project, DNV-GL predicts incident probabilities would increase in frequency by 1.6 accidents per year (COP, Section 4.8.1; Sunrise Wind 2023). Compared to a No Action Alternative baseline, the increase is accounted for by allision accidents caused by vessels striking wind structures. There are no potential grounding areas within the wind farm area.

BOEM assumes that all offshore wind developments would utilize the joint lessee proposed structure layout, to be developed along a standard and uniform grid pattern with at least three lines of orientation and standard 1-nm (1.9-km) spacing. As the proposed layout for SRWF is aligned with the joint proposed layout, and because this layout supports the traditional east-west active fishing operations, traditional northwest to southeast transit patterns, and allows for dispersal of small vessel traffic, this arrangement would reduce, but not eliminate, navigational complexity and economic displacement during the operational phase of the Project.

Finally, BOEM expects that Sunrise Wind would procure valid Private Aid to Navigation permits for each of its structures in accordance with applicable guidance, supporting navigation both within and outside of SRWF (COP, Section 4.8.1; Sunrise Wind 2023).

The WTGs and OCS-DC would be lit and marked in accordance with BOEM and USCG requirements for aviation and navigation obstruction lighting, respectively (Appendix H). They also would be lit and marked in accordance with FAA Advisory Circular 70/7460-1L (2018), as recommended by BOEM's *Guidelines for Lighting and Marking of Structures Supporting Renewable Energy Development* (BOEM 2021). A notional lighting plan has been included in the COP based on existing USCG regulations and policy and standards promulgated by the International Association of Marine Aids to Navigation and Lighthouse Authorities in Recommendation O-139, the Marking of Man-Made Offshore Structure (IALA 2013).

Port utilization: While not yet chosen, five potential ports have been identified for O&M activities, including the Port of Brooklyn, Port Jefferson, Port of Montauk, Port of Davisville, and the Port of Galilee. The Project expects that any ports used by O&M vessels would accommodate their needs without significant modifications or upgrades.

Traffic: O&M activities associated with SRWF and OCS-DC would result in an increase of vessel traffic near those areas and the applicable ports. Additional impacts would include increased navigational complexity; or increased risk of incidents such as collision, strikes or allisions, and groundings. Other reasonably foreseeable future offshore projects would produce additional vessel traffic during O&M that would lead to increased navigational complexity and increased risk of incidents within those projects.

3.19.5.3 Conceptual Decommissioning

Decommissioning would occur at the end of the Project’s operational life according to a yet to be completed plan. The plan would follow applicable laws, regulations, and BMPs that exist at the end of the Project’s operational life. It is anticipated that conceptual decommissioning would have similar adverse impacts as construction because a conceptual decommissioning would use similar number of vessels and implement the same EPMs.

3.19.5.3.1 Onshore Activities and Facilities

Onshore decommissioning activities would not be expected to impact navigation and vessel traffic.

3.19.5.3.2 Offshore Activities and Facilities

During the decommissioning phase of the Project, the Proposed Action would affect navigation and vessel traffic. The Project would plan vessel routes for all vessel types in accordance with industry guidelines and best practices as defined by the International Chamber of Shipping (COP, Section 4.8.1; Sunrise Wind 2023). All vessels associated with the decommissioning of the SRWF would be equipped with AIS technology to monitor compliance with speed requirements and ensure that all vessels operate in accordance with applicable rules and regulations for maritime operation in United States and federal waters (COP, Section 4.8.1; Sunrise Wind 2023). All offshore work would halt during unsafe wind conditions, lightning storms, and/or sea states that exceed Project operational limits (COP, Section 4.8.1;

Sunrise Wind 2023). Sunrise Wind would implement a communication plan during the decommissioning phase to inform mariners of construction-related activities, which would be facilitated through the maintenance of a Project website, liaison with fisheries, notice to mariners and vessel float plans, and in coordination with the USCG (COP, Section 4.8.1; Sunrise Wind 2023).

Anchoring: Generally, larger vessels accidentally dropping anchor on top of an export cable (buried or mattress protected) to prevent drifting in the event of vessel power failure would result in damage to the export cable, risks to the vessel associated with an anchor contacting an electrified cable, risks to decommissioning vessels attached to the cable and/or each other, and impacts to the vessel operator's liability and insurance. Impacts on navigation and vessel traffic would be short-term and localized, and navigation and vessel traffic would fully recover following the disturbance.

Cable emplacement and maintenance: Cable decommissioning would have short-term, localized adverse impacts on boating because of the need to navigate around construction activities and minimize exposure to hazardous conditions.

Presence of structures: Decommissioning is expected to impact navigation and vessel traffic at levels equivalent to the construction and commissioning phase of the Project. Presence of structures and decommissioning vessels would have significant short-term impact. Fishing and recreational vessels that once enjoyed transit through the SRWF would be temporarily restricted due to decommissioning and structure removal activities.

Port utilization: It is not yet known which ports would support decommissioning activities, however, BOEM anticipates that impacts generated during decommissioning would be equivalent to those generated during construction. It is expected that vessel congestion would increase in the short-term.

Traffic: Construction and decommissioning activities associated with SRWF would result in an increase of vessel traffic near those areas and the applicable ports. Additional impacts would include delays within or approaching ports; increased navigational complexity; detours to offshore travel or port approaches; or increased risk of incidents such as collision, strikes or allisions, and groundings. Other reasonably foreseeable future offshore projects would produce additional vessel traffic during construction, but because of their timing, they are not anticipated to use the same traffic routes. Decommissioning of other offshore wind projects would be scheduled to minimize overlapping periods and reduce the number of vessels in operation at any given time, effectively reducing the cumulative impact on port congestion and construction vessel rerouting.

3.19.5.4 Cumulative Impacts of the Proposed Action

These future activities are expected to affect navigation and vessel traffic through the following primary IPFs.

Anchoring: Future offshore wind developers are expected to coordinate with the maritime community and USCG to avoid laying export cables through any traditional or designated lightering/anchorage areas, meaning that any risk for deep-draft vessels would come from anchoring in an emergency scenario, specifically near the Narragansett Bay and Buzzards Bay traffic separation schemes (Table 3.19-2). Larger vessels accidentally dropping anchor on an export cable (buried or mattress protected) to prevent drifting in the event of vessel power failure would result in damage to the export cable, risks to the vessel associated with an anchor contacting an electrified cable, and impacts to the vessel operator's liability and insurance. Impacts on navigation and vessel traffic would be short-term and localized, and navigation and vessel traffic would fully recover following the disturbance.

Cable emplacement and maintenance: Under the Proposed Action, SRWF and all other proposed offshore wind farms are is expected to plan a unique cable route. Cable emplacement would have short-term, localized adverse impacts on boating because of the need to navigate around construction activities and minimize exposure to hazardous conditions.

Presence of structures: The placement of structures would have long-term adverse impacts on vessel traffic in the Rhode Island/Massachusetts WEA. Ocean renewable infrastructure would likely displace large vessels while smaller vessels could still navigate through. In 2016, USCG concluded that creating routing measures where structures currently do not exist would more than likely result in an increase in risk due to vessels navigating in closer proximity to each other than they would otherwise in an open ocean scenario (USCG 2016). While large vessels are expected to navigate around the Rhode Island/Massachusetts WEA, this would increase journey time and voyage cost.

BOEM assumes that all offshore wind developments would utilize the joint lessee proposed structure layout, to be developed along a standard and uniform grid pattern with at least three lines of orientation and standard 1-nm (1.9-km) spacing. Because this layout supports the traditional east-west active fishing operations, traditional northwest to southeast transit patterns, and allows for dispersal of small vessel traffic, this arrangement would reduce, but not eliminate, navigational complexity and economic displacement during the operational phase of the project.

Marine vessel radars are not optimized to operate in the Rhode Island/Massachusetts WEA, because the nominal WTG structure has a large RCS leading to many strong reflected signals entering the radar receiver, which is further complicated by multipath and other ambiguous returns (National Academies of Sciences, Engineering, and Medicine 2022). Given the equipment commonly used on larger fishing vessels, it can be difficult to determine proximity to WTGs and smaller vessels. Marine vessel radar operating at S-band or 3GHz frequency receives disrupted signals or false readings when within close proximity to WTGs (National Academies of Sciences, Engineering, and Medicine 2022). Magnetron and non-Doppler assisted radar systems can have false readings or signals caused by the RCS of these turbines and a larger number of turbines can magnify this effect within a given area (Ghobrial 2020). These false readings or disturbances create wind turbine clutter (WTC).

WTC can cause vessels to have difficulty navigating the area to avoid stationary objects, as well as the potential to miss smaller vessels operating in closer ranges. The potential safety concerns regarding WTC are the collision of two moving objects, or allision, a moving object colliding with a stationary secondary part, such as a vessel into a WTG. The impact of WTC could be significant enough to impair the equipment utilized by USCG or Navy dispatch to properly assess and execute rescue efforts, increasing the possibility of injury or loss of life. Damages such as denting, fragmentation, cutting or any combination could collapse the tower. Fragmentation or collapse of the tower could damage submerged transmission lines, resulting in economic loss.

In combination with damages to WTGs, damage to vessels could have significant economic and societal impacts on the commercial fishing industry and recreational boating community. The main effect of wind farms on fishing navigation was loss of ground, loss of gear, and disruption to fishing effort from operation and maintenance activities (Hooper, Ashley, and Austen 2015). These impacts force fishers to fish in other areas, affecting their steaming time which could lead to change in fuel costs, decreased efficiency, extended time at sea, decrease in quality of landed fish, increased safety risks from increased time at sea (Slijkerman and Tamis 2015). In a simulation model of the Atlantic surfclam industry, BOEM found that the restrictions placed on the fishery within the SRWF are only evident in the no-fishing and no-transit cases with catch declining by 0.9 percent and time at sea increasing by 2.2 percent (Munroe et al. 2022). BOEM predicts that this would affect the profitability of the industry with revenues declining by 0.9 percent, profits declining by 2.5 percent, fuel costs increasing by 1.4 percent and processor revenues declining by 0.8 percent (Munroe et al. 2022). The same model indicated that fishers from New Bedford harbor would be impacted the greatest. Using publicly available Global Fishing Watch fishing effort data, Dunkley and Solandt (2022) found fishing rate from vessels using bottom-towed gear was reduced by 77 percent following wind farm construction in 11 of the 12 sites studied. However, the same study found evidence that wind farms offer protection to benthic habitat from bottom-towed gear, which could lead to biological spillover effects. In 2013, a socioeconomic wellbeing study was conducted in the UK following offshore wind farm development. The results suggested that the wind farms displaced effort, however the perceived socioeconomic wellbeing was unaffected because fishers expanded their operating range into more productive areas while market forces aided in offsetting economic losses (Stevenson, Tissot and Walsh 2013).

The offshore wind industry in the United States has the benefit of nearly a generation of research, development, and testing in Europe. Throughout that time, navigation impacts have been assessed and best practices have been developed. Offshore wind-related navigational accidents were studied in the UK from 2010 to 2019, and it was found that the majority of accidents occurred in inshore waterways during port approaches. Allisions with Wind Farm Support Vessels were more common than collisions, and recreational and fishing vessels were more likely to collide. Despite the usefulness of Navigation Risk Assessments in the UK, in assessing navigation hazards, there is considerable uncertainty in their models. The models tend to overestimate the frequency of navigation incidents. However, in the UK, accidents related to ocean renewable infrastructure are rare. Additionally, mitigation measures aimed at redirecting traffic flow may not necessarily enhance navigational safety since they can transfer the risk of turbine contact to an increased risk of vessel collision. (Rawson and Brito 2022; Rawson and Rogers 2015).

Regardless, economic impacts, injury or loss of life have the potential to burden the fishing industry and lead to further regulation of the wind industry. BOEM expects the shipping and fishing industries to adopt both technological and non-technology-based measures to reduce impacts on marine radar, including greater use of AIS and electronic charting systems, new technologies like LIDAR, employing more watchstanders, and simply avoiding wind farms altogether (National Academies of Sciences, Engineering, and Medicine 2022).

Traditional magnetron-based radar systems experience WTC, and it takes a skilled operator to weed out the false readings and clutter. Operator training on correctly reducing inaccuracies helps but does not resolve the issue entirely (De le Vega 2013). The use of electronic charts in support of updated radar technologies and AIS is recommended.

However, systems integrating Doppler technology reduce the impact of WTC on imaging, aiding in navigation through these areas. Agencies and organizations utilizing HF radar have been working to develop algorithms and filters to reduce the inaccuracies and false readings caused by WTGs (Yang et al. 2014, De la Vega 2013).

Regulatory strategies to address the effect on the radars include mandatory requirements to update technology and require AIS on all vessels. Mandatory training on the common issues regarding radar and navigation systems would reduce the number of potential events and establish marine avoidance zones in which offshore wind farms reside. Since navigating around the wind farms entirely is the only confirmed way to avoid any allision with WTGs, it is the safest mitigation strategy.

Reduction in RCS is an effective way to reduce reflections of radar signals from WTGs, thus reducing signal shadowing from masking signals from smaller vessels (De le Vega 2013). Turbine design can influence the reflection of signals, including blade shape and dimensions, nacelle shape, and tower size and materials (National Academies of Sciences, Engineering, and Medicine 2022). The reduction in RCS due to optimal turbine design on each WTG could substantially reduce the overall influence of radar over a large farm.

The availability of filters and algorithms to reduce WTC in HF radar technology is promising. Land-based long-range HF radar can have gaps in data where wind farms are present (Gillman 2020). A way to mitigate this concern would be to share real-time telemetry data of surface currents and blade rotation rates to fill in those gaps. Reducing operations during inclement weather and when rescue efforts are being conducted within the zone is also proposed to reduce the chances of allision or other related incidents. USCG, the Navy and other parties that utilize this technology should not have an issue executing their efforts with the continued research and development of mitigation strategies. In the event of an incident within the proposed area, the 1 nm spacing between WTGs would give adequate room for rescue operations without worrying about further allision with another turbine.

Marking and lighting of offshore structures would conform to Coast Guard guidance if BOEM approves the Project. The lighting of WTGs, associated equipment, and vessels necessary for the operation and maintenance would have negligible impacts on navigation under Alternative B. A notional lighting plan has been included in the COP based on existing USCG regulations and policy and standards promulgated by the International Association of Marine Aids to Navigation and Lighthouse Authorities in Recommendation O-139, the Marking of Man-Made Offshore Structure (IALA 2013). The USCG has endorsed those standards. This includes any/all requirements that may be imposed in conjunction with BOEM's anticipated permit conditions. They also would be lit and marked in accordance with FAA Advisory Circular 70/7460-1L (2018), as recommended by BOEM's *Guidelines for Lighting and Marking of Structures Supporting Renewable Energy Development* (BOEM 2021). The WTGs and OCS-DC would be lit and marked in accordance with BOEM and USCG requirements for aviation and navigation obstruction lighting, respectively.

Port utilization: The USCG indicates that the ports of New Bedford, Fairhaven, Davisville, and Brayton Point have been upgraded to support offshore wind activities associated with the Rhode

Island/Massachusetts WEA, while the ports of Bridgeport, New London, Port Jefferson, and New York have announced upgrade projects to support the wind energy industry (USCG 2020). It is expected that vessel congestion would increase in the short-term, during construction and again during decommissioning. However, it is unlikely significant enough to impact safe navigation through wind farms (USCG 2020). Construction port facilities are expected to serve multiple offshore wind projects, and potentially multiple offshore wind related and other maritime industries. Specifically, the COP indicates the following are primary construction ports, Albany and/or Coeymans, New York (foundation), New London, Connecticut (staging and preassembly), and the Port of Davisville-Quonset Point, Rhode Island (construction management base) (COP, Section 3.3.10; Sunrise Wind 2023). Back-up options include the Port of New York-New Jersey, New York, the New Bedford Marine Commerce Terminal, Massachusetts, Sparrow’s Point, Maryland, Paulsboro Marine Terminal, New Jersey, Port of Providence, Rhode Island and Port of Norfolk, Virginia (COP, Section 3.3.10; Sunrise Wind 2023).

Traffic: Construction and decommissioning activities associated with adjacent wind farms would result in an increase of vessel traffic near those areas. Additional impacts would include delays within or approaching ports; increased navigational complexity; detours to offshore travel or port approaches; or increased risk of incidents such as collision, strikes or allisions, and groundings. Other reasonably foreseeable future offshore projects would produce additional vessel traffic during construction, but because of their timing, they are not anticipated to use the same traffic routes. Construction of other offshore wind projects would be scheduled to minimize overlapping construction periods and reduce the number of construction vessels in operation at any given time, effectively reducing the cumulative impact on port congestion and construction vessel rerouting.

3.19.5.5 Conclusions

Impacts of the Proposed Action

Construction, installation, O&M, and decommissioning activities would impact navigation and vessel traffic within and around the SRWF. The anticipated impacts would be generated through increased vessel traffic, obstructions to navigation, delays within or approaching ports, increased navigational complexity, changes to navigation patterns, detours to offshore travel or port approaches; or increased risk of incidents such as collision, allision, and groundings. Therefore, BOEM expects the overall impact on navigation from the Proposed Action and ongoing activities to be **moderate** adverse, as the change in navigation and safety risk would be minimal.

Cumulative Impacts of the Proposed Action

In the context of reasonably foreseeable environmental trends and planned actions, the cumulative impacts under the Proposed Action resulting from individual IPFs would be **moderate** adverse. The main IPF is the presence of structures, which could alter navigation patterns as large vessels would likely navigate around the Project. Small vessels such as fishing vessels, recreational, and O&M tenders would navigate within the SRWF and DNV-GL predicts up to 1.61 incidents per year. Potential incidents range from collisions to allisions. DNV-GL concluded that there was no area shallow enough within or in the immediate vicinity of the Project.

3.19.6 Alternative C-1 – Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

Under the Fisheries Habitat Impact Minimization Alternative C-1, the construction, O&M, and eventual decommissioning of the 11-MW WTGs and an OCS-DC within the proposed Project Area and associated IAC and SRWEC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. However, 8 WTG positions would be selected for removal to potentially reduce impacts to complex fisheries habitats that are the most vulnerable to long-term impacts. The impacts to navigation and vessel traffic generated by this alternative would not be expected to be greater than the proposed Project.

3.19.6.1 Construction and Installation

3.19.6.1.1 Onshore Activities and Facilities

Onshore development activities for Alternative C-1 would not be expected to impact navigation and vessel traffic.

3.19.6.1.2 Offshore Activities and Facilities

Under Alternative C-1, the construction and installation of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. The impacts on navigation and vessel traffic would be similar to if not slightly larger than described for the Proposed Action since the exclusion of turbines may lead to decreased uniformity and increased risk to vessel navigation. All WTG's including orphaned WTG's would remain aligned on the 1 by 1 nm grid with the rest of the Project Area.

3.19.6.2 Operations and Maintenance

3.19.6.2.1 Onshore Activities and Facilities

O&M associated with onshore activities and facilities would not be expected to impact navigation and vessel traffic.

3.19.6.2.2 Offshore Activities and Facilities

Under Alternative C-1, O&M of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. The impacts on navigation and vessel traffic would be similar to if not slightly larger than described for the Proposed Action since the exclusion of turbines may lead to decreased uniformity and increased risk to vessel navigation.

3.19.6.3 Conceptual Decommissioning

3.19.6.3.1 Onshore Activities and Facilities

Onshore decommissioning activities associated with any alternative would not be expected to impact navigation and vessel traffic.

3.19.6.3.2 Offshore Activities and Facilities

Under Alternative C-1, the conceptual decommissioning of the proposed Project components would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. The impacts on navigation and vessel traffic would be similar to as described for the Proposed Action because there is no difference in the number of offshore components between the Proposed Action and Alternative C-1.

3.19.6.4 Cumulative Impacts of Alternative C-1

The cumulative impacts of Alternative C-1 activities are expected to affect navigation and vessel traffic through the following primary IPFs.

Anchoring: Future offshore wind developers are expected to coordinate with the maritime community and USCG to avoid laying export cables through any traditional or designated lightering/anchorage areas, meaning that any risk for deep-draft vessels would come from anchoring in an emergency scenario, specifically near the Narragansett Bay and Buzzards Bay traffic separation schemes (Table 3.19-2). Impacts on navigation and vessel traffic would be short-term and localized, and navigation and vessel traffic would fully recover following the disturbance. Thus, the contribution of Alternative C-1 to navigation and vessel traffic impacts from ongoing and future activities would be moderate and the same as the Proposed Action.

Cable emplacement and maintenance: Under the Alternative C-1, SRWF and all other proposed offshore wind farms are is expected to plan a unique cable route. Cable emplacement would have short-term, localized adverse impacts on boating because of the need to navigate around construction activities and minimize exposure to hazardous conditions.

Presence of structures: The placement of structures would have long-term adverse impacts on vessel traffic in the Rhode Island/Massachusetts WEA. Ocean renewable infrastructure would likely displace large vessels while smaller vessels could still navigate through. In the event of an incident within the proposed area, the 1-nm spacing between WTGs would give adequate room for rescue operations without worrying about further allision with another turbine. Given these terms, the contribution of Alternative C-1 to navigation and vessel traffic impacts from ongoing and future activities would be moderate and the same as the Proposed Action.

The lighting of WTGs, associated equipment, and vessels would have minimal to no impact on navigation under Alternative C-1 and the same as the Proposed Action.

Traffic: Construction and decommissioning activities associated with Alternative C-1 to navigation and vessel traffic impacts from ongoing and future activities would be moderate and the same as the Proposed Action.

3.19.6.5 Conclusions

Impacts of Alternative C-1

Under Alternative C-1, impacts on navigation and vessel traffic from onshore and offshore construction, O&M, and decommissioning would be the same described for the Proposed Action. The anticipated impacts would be generated through increased vessel traffic, obstructions to navigation, delays within or approaching ports, increased navigational complexity, changes to navigation patterns, detours to offshore travel or port approaches; or increased risk of incidents such as collision, allision, and groundings. Therefore, BOEM expects the overall impact on navigation and vessel traffic from Alternative C-1 to be **moderate** adverse, as the change in navigation and safety risk would be minimal.

Cumulative Impacts of Alternative C-1

In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-1 to navigation and vessel traffic cumulative impacts from ongoing and future activities would be **moderate** adverse and the same as the Proposed Action.

3.19.7 Alternative C-2 – Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of up to 12 WTG Positions to the Eastern Side of the Lease Area

3.19.7.1 Construction and Installation

Under the Fisheries Habitat Impact Minimization Alternative C-2, the construction, O&M, and eventual decommissioning of the 11-MW WTGs and an OSS-AC within the proposed Project Area and associated IAC and SRWEC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. However, for Alternative C-2, in addition to excluding up to 8 WTG positions for development within the Priority Areas, up to another 12 WTG positions would be relocated to the eastern side to potentially further reduce impacts to complex fisheries habitats that are the most vulnerable to long-term impacts. The impacts generated by this alternative would not be expected to be greater than the proposed Project, as it would construct the same number of structures for sea surface navigation.

3.19.7.1.1 Onshore Activities and Facilities

Onshore construction and installation activities for Alternative C-2 would not be expected to impact navigation and vessel traffic.

3.19.7.1.2 Offshore Activities and Facilities

Under Alternative C-2, the construction and installation of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. The impacts on navigation and vessel traffic would be similar to if not slightly larger than described for the Proposed Action since the exclusion of turbines may lead to decreased uniformity and increased risk to vessel navigation. All WTG's including orphaned WTG's would remain aligned on the grid with the rest of the Project Area.

3.19.7.2 Operations and Maintenance

3.19.7.2.1 Onshore Activities and Facilities

O&M associated with onshore activities and facilities would not be expected to impact navigation and vessel traffic.

3.19.7.2.2 Offshore Activities and Facilities

Under Alternative C-2, the O&M of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. The impacts on navigation and vessel traffic would be similar to if not slightly larger than described for the Proposed Action since the exclusion of turbines may lead to decreased uniformity and increased risk to vessel navigation. All WTG's including orphaned WTG's would remain aligned on the grid with the rest of the Project Area.

3.19.7.3 Conceptual Decommissioning

3.19.7.3.1 Onshore Activities and Facilities

Onshore decommissioning activities associated with any alternative would not be expected to impact navigation and vessel traffic.

3.19.7.3.2 Offshore Activities and Facilities

Under Alternative C-2, the conceptual decommissioning of the proposed Project components would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. The impacts on navigation and vessel traffic would be similar to as described for the Proposed Action because there is no difference in the number of offshore components between the Proposed Action and Alternative C-2.

3.19.7.4 Cumulative Impacts of Alternative C-2

The cumulative impacts of Alternative C-2 activities are expected to affect navigation and vessel traffic through the following primary IPFs.

Anchoring: The effects of anchoring from Alternative C-2 are expected to be moderate and the same as the Proposed Action.

Cable emplacement and maintenance: Under the Alternative C-2, SRWF and all other proposed offshore wind farms are is expected to plan a unique cable route. Cable emplacement would have short-term, localized adverse impacts on boating because of the need to navigate around construction activities and minimize exposure to hazardous conditions.

Presence of structures: The placement of structures would have long-term adverse impacts on vessel traffic in the Rhode Island/Massachusetts WEA. Given these terms, the contribution of Alternative C-2 to navigation and vessel traffic impacts from ongoing and future activities would be moderate and the same as the Proposed Action. The lighting of WTGs, associated equipment, and vessels would have minimal to no impact on navigation under Alternative C-2 and the same as the Proposed Action.

Traffic: Construction and decommissioning activities associated with adjacent wind farms would result in an increase of vessel traffic near those areas. Thus, the contribution of Alternative C-2 to navigation and vessel traffic impacts from ongoing and future activities would be moderate and the same as the Proposed Action.

3.19.7.5 Conclusions

Impacts of Alternative C-2

Under Alternative C-2, impacts on navigation and vessel traffic from onshore and offshore construction, O&M, and decommissioning would be the same described for the Proposed Action. The anticipated impacts would be generated through increased vessel traffic, obstructions to navigation, delays within or approaching ports, increased navigational complexity, changes to navigation patterns, detours to offshore travel or port approaches; or increased risk of incidents such as collision, allision, and groundings. Therefore, BOEM expects the overall impact on navigation from the Alternative C-2 alone to be **moderate** adverse, as the change in navigation and safety risk would be minimal.

Cumulative Impacts of Alternative C-2

In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-2 to navigation and vessel traffic impacts from ongoing and future activities would be **moderate** and the same as the Proposed Action.

3.19.8 Alternative C-3 - Reduced Layout from Priority Areas Considering Feasibility due to Glauconite Sands

Under the Fisheries Habitat Impact Minimization Alternative C-3, the construction, O&M, and eventual decommissioning of the 11-MW WTGs and an OCS within the proposed Project Area and associated inter-array and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. However, Alternative C-3 was developed to address concerns regarding pile refusal due to glauconite sands in the southeastern portion of the Lease Area while still minimizing impacts to benthic and fisheries resources. Alternative C-3a, C-3b, and C-3c described in Section 3.7.8, *Benthic Resources*, consider different WTG configurations to avoid sensitive habitats and engineering constraints while still meeting the NYSERDA OREC. This alternative only considered removal of WTGs from Priority Area 1 based on consultation with NMFS. Areas with high density of boulder, complex habitat, and data suggesting Atlantic cod aggregation and spawning was considered when determining which WTGs to remove.

3.19.8.1 Construction and Installation

3.19.8.1.1 Onshore Activities and Facilities

Onshore construction and installation activities for Alternative C-3 would not be expected to impact navigation and vessel traffic.

3.19.8.1.2 Offshore Activities and Facilities

Under Alternative C-3, the construction and installation of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. The impacts on navigation and vessel traffic would be similar to if not slightly less than described for the Proposed Action since there are fewer WTGs being installed.

3.19.8.2 Operations and Maintenance

3.19.8.2.1 Onshore Activities and Facilities

O&M associated with onshore activities and facilities would not be expected to impact navigation and vessel traffic.

3.19.8.2.2 Offshore Activities and Facilities

Under Alternative C-3, the O&M of the 11-MW WTGs, OCS-DC, IAC, and SWREC would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. The impacts on navigation and vessel traffic would be similar to if not slightly less than described for the Proposed Action since there are fewer WTGs being installed.

3.19.8.3 Conceptual Decommissioning

3.19.8.3.1 Onshore Activities and Facilities

Onshore decommissioning activities associated with any alternative would not be expected to impact navigation and vessel traffic.

3.19.8.3.2 Offshore Activities and Facilities

Under Alternative C-3, the conceptual decommissioning of the proposed Project components would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. The impacts on navigation and vessel traffic would be similar to as described for the Proposed Action for decommissioning activities.

3.19.8.4 Cumulative Impacts of Alternative C-3

The cumulative impacts of Alternative C-3 activities are expected to affect navigation and vessel traffic through the following primary IPFs.

Anchoring: The effects of anchoring from Alternative C-3 are expected to be moderate and the same as the Proposed Action.

Cable emplacement and maintenance: Under the Alternative C-3, SRWF and all other proposed offshore wind farms are expected to plan a unique cable route. Cable emplacement would have short-term, localized adverse impacts on boating because of the need to navigate around construction activities and minimize exposure to hazardous conditions.

Presence of structures: The placement of structures would have long-term adverse impacts on vessel traffic in the Rhode Island/Massachusetts WEA. Given these terms, the contribution of Alternative C-3 to navigation and vessel traffic impacts from ongoing and future activities would be moderate and the same as the Proposed Action.

Port utilization: The USCG indicates that the ports of New Bedford, Fairhaven, Davisville, and Brayton Point have been upgraded to support offshore wind activities associated with the Rhode Island/Massachusetts WEA, while the ports of Bridgeport, New London, Port Jefferson, and New York have announced upgrade projects to support the wind energy industry (USCG 2020). It is expected that vessel congestion would increase in the short-term, during construction and again during decommissioning. However, it is unlikely significant enough to impact safe navigation through wind farms (USCG 2020). Construction port facilities are expected to serve multiple offshore wind projects, and potentially multiple offshore wind related and other maritime industries. Specifically, the COP indicates the following are primary construction ports, Albany and/or Coeymans, New York (foundation), New London, Connecticut (staging and preassembly), and the Port of Davisville-Quonset Point, Rhode Island (construction management base) (COP, Section 3.3.10; Sunrise Wind 2023). Back-up options include the Port of New York-New Jersey, New York, the New Bedford Marine Commerce Terminal, Massachusetts, Sparrow's Point, Maryland, Paulsboro Marine Terminal, New Jersey, Port of Providence, Rhode Island and Port of Norfolk, Virginia (COP, Section 3.3.10; Sunrise Wind 2023).

Traffic: Construction and decommissioning activities associated with adjacent wind farms would result in an increase of vessel traffic near those areas. Thus, the contribution of Alternative C-2 to navigation and vessel traffic impacts from ongoing and future activities would be moderate and the same as the Proposed Action.

3.19.8.5 Conclusions

Impacts of Alternative C-3

Under Alternative C-3, impacts on navigation and vessel traffic from onshore and offshore construction, O&M, and decommissioning would be the slightly less than described for the Proposed Action. The anticipated impacts would be generated through increased vessel traffic, obstructions to navigation, delays within or approaching ports, increased navigational complexity, changes to navigation patterns, detours to offshore travel or port approaches; or increased risk of incidents such as collision, allision, and groundings. Therefore, BOEM expects the overall impact on navigation from the Alternative C-3 alone to be **moderate** adverse, as the change in navigation and safety risk would be minimal.

Cumulative Impacts of Alternative C-3

In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-3 to navigation and vessel traffic impacts from ongoing and future activities would be **moderate** adverse and slightly less than the Proposed Action.

3.19.9 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, C-2 and C-3 would have the same overall negligible to moderate adverse impacts on navigation and vessel traffic. Table 3.19-2 provides an overall summary of alternative impacts.

Table 3.19-2. Comparison of Impacts on Navigation and Vessel Traffic

No Action Alternative (Alternative A)	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)	Fisheries Habitat Minimization Considering Feasibility Due to Glauconite Sands (Alternative C-3)
No Action Alternative: BOEM anticipates that impacts on navigation and vessel traffic from the No Action Alternative would be **moderate** adverse impacts. *Cumulative Impacts of the No Action Alternative:* In context of reasonably foreseeable environmental trends, BOEM anticipates that the cumulative impacts resulting from all of the IPFs together would be **moderate** adverse and not disrupt vessel traffic.	*Proposed Action:* BOEM anticipates that the impacts resulting from the Proposed Action would be **moderate**. Therefore, BOEM expects the overall adverse impact on navigation from the Proposed Action and ongoing activities to be **moderate**, as the change in navigation and safety risk would be small. *Cumulative Impacts of the Proposed Action:* In the context of reasonably foreseeable environmental trends and planned actions, the cumulative impacts under the Proposed Action resulting from individual IPFs would be **moderate**. The main IPF is the presence of structures, which could alter navigation patterns as large	*Alternative C-1:* BOEM anticipates that the impacts resulting from the Proposed Action would be **moderate.** Therefore, BOEM expects the overall adverse impact on navigation and vessel traffic from Alternative C-1 to be **moderate**, as the change in navigation and safety risk would be small. *Cumulative Impacts of Alternative C-1:* In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-1 to navigation and vessel traffic cumulative impacts from ongoing and future activities would be **moderate** and the same as the Proposed Action.	*Alternative C-2*: BOEM anticipates that the impacts resulting from the Proposed Action would be **moderate.** Therefore, BOEM expects the overall adverse impact on navigation and vessel traffic from Alternative C-2 to be **moderate**, as the change in navigation and safety risk would be small. *Cumulative Impacts of Alternative C-2*: In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-2 to navigation and vessel traffic cumulative impacts from ongoing and future activities would be **moderate** and the same as the Proposed Action	*Alternative C-3:* BOEM anticipates that the impacts resulting from the Proposed Action would be **moderate.** Therefore, BOEM expects the overall adverse impact on navigation and vessel traffic from Alternative C-3 to be **moderate**, as the change in navigation and safety risk would be small. *Cumulative Impacts of Alternative C-3:* In the context of reasonably foreseeable environmental trends, the contribution of Alternative C-3 to navigation and vessel traffic cumulative impacts from ongoing and future activities would be **moderate** and the same as the Proposed Action

No Action Alternative (Alternative A)	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)	Fisheries Habitat Minimization Considering Feasibility Due to Glauconite Sands (Alternative C-3)
	vessels would likely navigate around the Project.			

3.19.10 Summary of Impacts of the Preferred Alternative

BOEM has identified Alternative C-3b as the Preferred Alternative as depicted in Figure 2.1-10. Alternative C-3b would include installation of up to 84 WTGs, which is 10 fewer WTGs than the maximum WTGs proposed under the PDE of the Proposed Action. Under Alternative C-3b, impacts on navigation and vessel traffic from onshore and offshore construction, O&M, and decommissioning would be the slightly less than described for the Proposed Action. The anticipated impacts would be generated through increased vessel traffic, obstructions to navigation, delays within or approaching ports, increased navigational complexity, changes to navigation patterns, detours to offshore travel or port approaches; or increased risk of incidents such as collision, allision, and groundings. BOEM anticipates that the impacts resulting from the Proposed Action would be **moderate**. Therefore, BOEM expects the overall impact on navigation from the Alternative C-3b alone to be **moderate**, as the change in navigation and safety risk would be slightly less.

3.19.11 Proposed Mitigation Measures

The mitigation measures listed in Table 3.19-3 are recommended for inclusion in the Preferred Alternative.

Table 3.19-3. Proposed Mitigation Measures: Navigation and Vessel Traffic

Measure	Description	Effect
Cable maintenance plan	BOEM and BSEE would ensure that Sunrise Wind develops a cable maintenance and monitoring plan that outlines a process for identifying when cable burial depths reach unacceptable risks, requires prompt remediation of exposed and shallow-buried cable segments, and includes review to address repeat exposures. The conditions in the SRWEC-NYS Maintenance Plan submitted to the NYS Public Service Commission on March 27, 2023 are also generally applicable to those portions of the cable in federal waters	This measure would not modify the impact determinations for navigation and vessel traffic but would ensure that these effects do not exceed the levels analyzed herein.
Develop mariner communication plan	In addition to the proposed fisheries communication and outreach plan, and communication plan, Sunrise Wind would coordinate with other mariners, including the commercial shipping industry and recreational users via a mariner communication plan. This plan would include notices when construction, maintenance, and decommissioning activities are scheduled to commence, consultation with stakeholders on approximate schedule of activities in relation to existing uses in the area, and post-construction notice of all cable protection measure locations, areas where the identified burial depth of the cable is less than the target burial depth, and other obstructions to navigation created by the Project.	This measure would not modify the impact determinations for navigation and vessel traffic but would ensure that these effects do not exceed the levels analyzed herein.

3.19.11.1 Effect of Measures Incorporated into the Preferred Alternative

The mitigation measures listed in Table 3.19-3 are recommended for inclusion in the Preferred Alternative. A cable maintenance plan would ensure that Sunrise Wind develops a cable maintenance and monitoring plan that outlines a process for identifying when cable burial depths reach unacceptable risks, requires prompt remediation of exposed and shallow-buried cable segments, and includes review to address repeat exposures. Lastly, Sunrise Wind would develop a Mariner Communication Plan, coordinate with other mariners, including the commercial shipping industry and recreational users via a mariner communication plan. This plan would include notices when construction, maintenance, and decommissioning activities are scheduled to commence, consultation with stakeholders on approximate schedule of activities in relation to existing uses in the area, post-construction notice of all cable protection measure locations, areas where the identified burial depth of the cable is less than the target burial depth, and other obstructions to navigation created by the Project. These measures, if adopted, would have the effect of reducing the overall moderate impact from the Preferred Alternative.

3.21 Recreation and Tourism

3.21.1 Description of the Affected Environment and Future Baseline Conditions

As a resource, recreation and tourism is described as the relationship between the natural setting and resources of an area with public use and values of the resources (BOEM 2012). This section describes the affected environment and potential effects related to recreation and tourism from the construction and installation, O&M, and conceptual decommissioning of the SRWF within the GAA, which includes the vicinity of the Project in the expanded Region of Influence (ROI) (COP Figure ES-1, Sunrise Wind 2023; COP Table 4.7-1; Sunrise Wind 2023). The GAA includes the communities within the viewshed, defined as the area within a 40-mile (64.4 km) radius of the SRWF; resources adjacent to the landfall construction area, including land within the Fire Island National Seashore boundary, Smith Point County Park boundary, and Otis Pike Wilderness boundary; 1,000 ft (304.8 m) into the Atlantic Ocean, and up to 4,000 ft (1,219.2 m) into Great South Bay that is located within the boundary of the Fire Island National Seashore; a 3-mile (4.8-km) radius around the proposed OnCS-DC site (Union Avenue site); and portions of the towns of Brookhaven and Islip along with small portions of the villages of Lake Grove and Patchogue and the cable landfall and cable routes to the OnCS-DC site, as described in Appendix D, Figure D-19, that could experience potential effects of the SRWF on recreation and tourism. Please refer to Appendix D, Figure D-18, to view the GAA for Recreation and Tourism activities related to the proposed Project. Recreation and tourism resources associated with the proposed Project are primarily related to coastal and nearshore/offshore activities, with inland and open ocean recreation and tourism activities also considered. In the proposed Project Area, there are extensive opportunities for recreation and tourism activities to occur based on the landscape and natural resources in this region. These activities can occur in a wide variety of manners; they can require recreational equipment, occur in groups or individually, can require specialized skills, and can be passive (e.g., sunbathing or wildlife viewing) or active (e.g., swimming or hiking) recreational and tourism activities. The location, environment, and landscape of the Project provide opportunities for a variety of high-quality recreation and tourism experiences. In these communities, the scenic quality and natural resources associated with the coastal environment can be an important contributing factor to recreation and tourism activities and experiences.

The proposed Project facilities would occur on land in New York and could result in potential effects to coastal communities in New York, Connecticut, Massachusetts, and Rhode Island. BOEM ranked and evaluated the potential sensitivity of coastal communities along the east coast of the United States. In this analysis, 113 geographic areas were analyzed, 16 were within the states in the expanded ROI (ICF 2012). Recreation and tourism constitute a sizable portion of the coastal economies of the states and counties affected by the Project. The NOAA gathers data regarding ocean economies by collecting the economic data for six different sectors that are dependent upon the ocean and Great Lakes. These six sectors are marine construction, living resources, offshore mineral extraction, ship and boat building, tourism and recreation, and marine transportation. The economic activities considered are based only on those that are related to the ocean economy. The dataset only includes establishments located in shore-adjacent zip codes, and for establishments such as restaurants or hotels, only includes those nearest to the coast. The Tourism and Recreation sector is composed of North American Industry

Classification System data for the categories Sporting and Athletic Goods Manufacturing, Scenic and Sightseeing Transportation, Sports and Recreation Instruction, Recreation Goods Rental, Amusement and Recreation Services Not Elsewhere Classified, Zoo and Botanical Gardens, and Nature Parks and Other Similar Institutions (NMFS 2021b). A summary of ocean economic data for counties identified in the ROI identified in Section 3.16, *Demographics, Employment, and Economics,* is aggregated in Table 3.21-1. Recreation and tourism were predominant sources of ocean economic activity for the majority of the locations and make up a significant portion of the economies of the geographic areas within the ROI.

Table 3.21-1. 2018 Ocean Economies Tourism and Recreation Data for Counties and States That Would Be Directly or Indirectly Affected by the Sunrise Wind Project

Location	Number of Establishments (% of total establishments in ocean economy)	Number of Employed Residents for Tourism and Recreation (% of total residents employed in ocean economy)	Total Wages for Tourism and Recreation (% of total wages generated by ocean economy)	Total GDP for Tourism and Recreation (% of total GDP generated by ocean economy)
New York (NY)	22,269 (93%)	359,193 (91%)	$12.6 billion (83%)	$29 billion (87%)
Suffolk, NY	2,740 (90%)	36,385 (88%)	$921.1 million (70%)	$1.9 billion (74%)
Connecticut (CT)	2,830 (91%)	39,238 (68%)	$992 million (40%)	$2 billion (44%)
New London, CT	490 (91%)	7,397 (36%)	$176.5 million (13%)	$374.3 million (16%)
Massachusetts (MA)	4,775 (81%)	79,117 (80%)	$2.2 billion (59%)	$4.7 billion (60%)
Barnstable, MA	1,222 (90%)	17,028 (94%)	$489 million (88%)	$1.1 billion (87%)
Bristol, MA	193 (38%)	2,963 (49%)	$55 million (19%)	$105.8 million (16%)
Dukes, MA	167 (91%)	1,394 (97%)	$52.9 million (96%)	$120.1 million (97%)
Nantucket, MA	134 (94%)	1,668 (99%)	$71.2 million (99%)	$159.7 million (99%)
Plymouth, MA	642 (87%)	9,180 (87%)	$203.8 million (71%)	$400.9 million (71%)
Rhode Island (RI)	2,248 (91%)	37,127 (81%)	$850.8 million (60%)	$1.9 billion (58%)
Kent, RI	373 (96%)	7,338 (96%)	$148.5 million (92%)	$321.8 million (93%)
Newport, RI	421 (91%)	6,976 (82%)	$184.4 million (54%)	$444.1 million (57%)
Providence, RI	873 (94%)	14,803 (92%)	$326.3 million (85%)	$700 million (88%)
Washington, RI	441 (86%)	6,032 (53%)	$145.2 million (32%)	$327.6 million (28%)

Source: NOAA 2018

The GAA supports inland, coastal or beach, and ocean-based activities related to recreation and tourism. The majority of recreation and tourism activities that are potentially impacted by the SRWF occur close to the shore and along the shoreline. The summer months of June, July, and August are when approximately two-thirds of trips are made to the beach on the east coast of the United States, thus representing the time with the largest potential impacts (Parsons and Firestone 2018). Common recreational activities in the GAA include beach-going, photography, walking/hiking, swimming, surfing, paddleboarding, kite sailing, wildlife watching, kayaking, boating, boat-fishing, sailing, parasailing, yachting, harbor cruises, with further offshore activities including recreational boating, sailboat racing, yachting, cruise ship tourism, scuba diving, and offshore wildlife viewing (ICF 2012; NYSERDA 2017). The majority of these activities occur at higher intensities along and adjacent to the shoreline and along the oceanfront closer to shore.

Offshore activities include wildlife watching, scuba diving, boating, sailboat racing, and recreational fishing. Three scuba diving sites were identified within 2 mi (3.2 km) of the SRWEC and the SRWF; the Moriches Anglers site, the SeaWolf site, and the Suffolk site. Six offshore recreational dive sites were identified as sensitive within the Area of Analysis of NYSERDA's *Offshore Wind Master Plan-Marine Recreational Uses Study*, with one being present in the expanded ROI, located southeast of Montauk, New York (NYSERDA 2017). These sites were classified as sensitive due to their cultural, historic, high conservation, or human use values. Many of the offshore recreation activities are directly linked with local businesses centered around tourism, including hotels, restaurants, and other leisure activities.

Sailboat, boat, and yacht races occur within the GAA. Many of these races are associated with local yacht clubs and marinas. The races can range from approximately 15 vessels to over 150 vessels depending on the event and typically occur from May to September (ICF 2012). Larger events include, but are not limited to, the Newport to Bermuda Yacht Race, the Fishers Island Yacht Club Round Island Race, the Long Island Sound IRC/PHRF Championships, and the Storm Trysail Foundation/Fishers Island Yacht Club Jr. Safety at Sea race (ICF 2012; Bloeser et al. 2015; COP Figure 4.7.3-1; Sunrise Wind 2023; COP Table 4.7.3-1; Sunrise Wind 2023; COP Table 4.7.3-2; Sunrise Wind 2023).

Recreational boating and fishing are significant recreational activities that occur in coastal waters in the GAA. The *2012 Northeast Recreational Boater Survey* identified recreation and tourism locations and routes within the GAA, and estimated that during the 2012 study season, there were approximately 817,368 boating trips in ocean and coastal waters by boaters documented and registered in the four states within the GAA, Connecticut, Massachusetts, New York, and Rhode Island (SeaPlan 2013). There were many routes used by recreational boaters identified in the GAA (COP Figure 4.7.4-1; Sunrise Wind 2023). In this survey, 52 percent of boating trips occurred within 1 mi (1.6 km) of the coastline, with the largest levels in harbors and partially protected bays near major cities (SeaPlan 2013).

Recreational fishing of highly migratory species and fishing along the coastline are both popular in the GAA and throughout Southern New England waters. NOAA compiles estimates of data related to recreational fisheries, including the number of participants, number of trips by state, and estimates of the recreational catch. In 2019, marine recreational anglers on the Atlantic coast caught a total of 597 million fish on almost 130 million trips (NMFS 2021a). More than 10 percent of these trips, approximately 13 million trips, were made in New York and almost 6 percent of total trips, approximately 7.8 million trips, were made from Massachusetts. The most commonly caught non-bait species by number were black sea bass (*Centropristis striata*), bluefish (*Pomatomus saltatrix*), striped bass (*Morone saxatilis*), summer flounder (*Paralichthys denatus*), and scup (*Stenotomus chrysops*). By weight, the largest harvest of fish were striped bass, bluefish, scup, dolphinfish, and black sea bass (NMFS 2021a).

Fishing occurs from shore, from fishing piers, near shore in boats, and offshore in boats (ICF 2012). Recreational fishing efforts were studied at the nearby Vineyard Wind lease area with data collected through an online survey that had responses from 136 private anglers, 34 charter/headboat captains, and one unknown respondent, data from NMFS Large Pelagics Intercept Survey, and tagging data (Kneebone and Capizzano 2020). It was identified that there was widespread angling effort of highly migratory species throughout Southern New England seasonally from June to October, with fleets of 50-100 recreational vessels sometimes congregating to target popular HMS in small geographic areas (Kneebone and Capizzano 2020). Approximately 12 percent of HMS trips from 2002 through 2018 occurred within the Rhode Island/Massachusetts lease areas. In the WEA, Coxes Ledge, The Fingers, and The Claw had the highest amount of effort, with a large amount of effort reported in areas both inside and outside of the WEA (Kneebone and Capizzano 2020). Recreational fishermen would also have to travel through the WEA to reach some of the southern New England canyons, and to other popular fishing grounds, including The Dump, Tuna Ridge, The Horns, and The Lanes (Kneebone and Capizzano 2020). Section 3.14, *Commercial Fisheries and For-Hire Recreational Fishing*, provides additional detail on for-hire recreational fishing and commercial fishing.

Within the ROI, there are 346 public beaches, 226 marinas, 82 harbors, 83 yacht clubs, and nine national parks and wildlife refuges (COP Section 4.7.3.1; Sunrise Wind 2023). These include: Suffolk County, NY: Fire Island National Seashore and Sagamore Hill National Historic Site; Barnstable County, Massachusetts: Cape Cod National Seashore, Mashpee NWR, and Monomoy NWR; Bristol County Massachusetts: New Bedford Whaling National Historical Park; Nantucket County, Massachusetts: Nantucket NWR; Newport County RI: Touro Synagogue National Historic Site; and Providence County, RI: Roger Williams National Memorial. The communities located within the ROI have a variety of resources that support and have shaped the recreation and tourism industries (COP Table 4.7.3-3; Sunrise Wind 2023). The closest communities to the Project in Massachusetts and Rhode Island, Martha's Vineyard, and Block Island respectively, both have economies that are highly dependent upon recreation and tourism. Both communities are accessible only by boat or by air. On Block Island, water sports are popular recreation activities, including snorkeling, sailing, parasailing, fishing, boating, wildlife viewing, and kayaking (COP Section 4.7.3.1; Sunrise Wind 2023). Other coastal communities in Massachusetts and Rhode Island have major tourism and recreation industries centered around their beaches and coastal activities (ICF 2012). Public beaches are prominent throughout the ROI, with 202 public beaches present between Barnstable, Bristol, Dukes, Nantucket, and Plymouth counties. The tourism industry in these areas have high levels of tourism with activities that include beach-going, yachting, sailing, and visiting cultural landmarks, such as lighthouses.

The proposed Project's Onshore Facilities would be located in Suffolk County, which has many summer tourism destinations and approximately 980 mi (1,577 km) of coastline, including Montauk, the Hamptons, and Fire Island (Bolger 2016). Southampton is a popular recreation and tourism destination that has two of America's 10 top-rated golf courses, shops and attractions, and white sand beaches (ICF 2012). The Fire Island National Seashore encompasses 19,579 ac (79.2 km^2) of protected land that features high dunes, forestland, undeveloped sandy beaches, and abundant wildlife that attracts large numbers of visitors, including surfers, nature enthusiasts, campers, boaters, and beachgoers (ICF 2012; Bolger 2016). The Fire Island National Seashore was established "[f]or the purpose of conserving and preserving for the use of future generations certain relatively unspoiled and undeveloped beaches, dunes, and other natural features within Suffolk County, New York, which possess high values to the Nation as examples of unspoiled areas of great natural beauty in close proximity to large concentrations of urban population" (16 *USC* § 459e(a)). This area also houses the Fire Island Lighthouse, listed on the National Register of Historic Places, a culturally and historically significant monument (NPS 2018). In 2017, 681,518 people visited the National Park sites on the Fire Island National Seashore. The Fire Island National Seashore has communities, the Otis Pike Wilderness Area, natural areas, and historical and cultural resources within its boundaries (see Figure 3.18-1 in Section 3.18, *Land Use and Coastal Infrastructure*). The Fire Island Wilderness center and associated parking serves as the eastern entry point to the Otis Pike Fire Island Dune Wilderness, which is the only example of a federally designated wilderness area in New York (NPS 2023c). The Fire Island Wilderness Visitor Center includes a ranger contact station, second floor viewing area, and exhibit space (NPS 2023c). More than three-quarters of Fire Island National Seashore is marine or estuarine habitat, with 14,644 ac (59.3 km^2) of the park consisting of open water. The Seashore boundary extends 1,000 ft (304.8 m) into the Atlantic Ocean from Moriches Inlet to Robert Moses State Park, and up to 4,000 ft (1,219.2 m) into the Great South Bay, and Bellport, Narrow and Moriches Bay (NPS 2023a). In 2021, 255,000 park visitors spent an estimated $11.1 million in local gateways while visiting Fire Island National Seashore. These expenditures supported a total of 110 jobs, $6.1 million in labor income, $9.9 million in value added, and $14.9 million in economic output in local gateway economies surrounding Fire Island National Seashore (NPS 2022).

The proposed Project's onshore facilities would be located adjacent to community spaces that are used by the public for various reasons, including recreation and tourism, and that contribute to the local community culture and environment. The Project landfall would occur at Smith Point County Park, located on the eastern portion of Fire Island and within the boundary of Fire Island National Seashore. The County Park occupies 2,293 ac (928 ha) and includes 270 campsites, a protected beach, boat launch, and amenities (Discover Long Island 2023). The TWA Flight 800 International Memorial and Garden is located within Smith Point County Park. This area was opened to the public on July 17, 1996 to memorialize the victims of TWA Flight 800, which crashed off Fire Island on July 17, 1996 (NPS 2023b). This area provides a wide variety of recreational opportunities and services not available at national park facilities on Fire Island.

Adjacent to the route of the proposed Project's onshore transmission cable includes a county park, a U.S. Fish and Wildlife Service administered wildlife refuge, a church, and a fairground. All of these areas are considered to be community spaces and are utilized by the public and contribute to the local community culture and environment. The Southaven County Park is located north of the Sunrise Highway and bisected by the Carmans River. The Southaven County Park occupies 1,323 ac (525 ha) and includes camping facilities, high-capacity picnic areas, fishing and boating access, and public trails (Discover Long Island 2023). The Wertheim NWR provides visitors with opportunities for wildlife viewing, hiking, fishing, educational programs and special events offered by refuge staff, interns, and volunteers. The Wertheim National Refuge protects 2,550 ac (1,032 ha) of grasslands, oak-pine woodlands, and fresh, brackish, and saltwater wetlands (USFWS 2023). Although the Brookhaven Fair has been in hiatus since 2020 when it was postponed due to the COVID-19 pandemic, the Brookhaven Fairgrounds are located south of the Long Island Expressway at 440 Express Drive South (Brookhaven Fair 2023). The Long Island Baptist Church is located at 125 Long Island Avenue, Holtsville, New York 11742. Weekly Services and prayer meetings are held at this church and offers a community space to be utilized by the public (Long Island Baptist 2023).

Under the Proposed Action, there are a variety of potential port facilities where an operations and management facility for the SRWF would be established (COP Table 3.3.10-1; Sunrise Wind 2023; COP Figure 3.3.10-1; Sunrise Wind 2023). These port locations would include New York (the Port of Brooklyn, Port Jefferson, and Port of Montauk) and in Rhode Island (Port of Davisville, Quonset Point, and the Port of Gailee). These ports are currently all primarily industrial, with limited recreation and tourism activities occurring in the adjacent vicinities.

3.21.2 Impact Level Definitions for Recreation and Tourism

This Final EIS uses a four-level classification scheme to analyze potential impact levels on recreation and tourism from the alternatives, including the Proposed Action. Impacts are categorized as beneficial or adverse and may be short-term or long-term in duration. Short-term impacts may occur over a period of a year or less. Long-term impacts may occur throughout the duration of a project or beyond project operations and decommissioning. Table 3.21-2 lists the definitions for both the potential adverse impact levels and potential beneficial impact levels for recreation and tourism. Table G-20 in Appendix G identifies potential IPFs, Issues, and Indicators to assess impacts to recreation and tourism.

The analysis for recreation and tourism has a strong relationship to visual resources, Section 3.22, *Scenic and Visual Resources*, as the setting of recreation and tourism is highly dependent upon the viewscape of the area.

Table 3.21-2. Definitions of Potential Adverse and Beneficial Impact Levels for Recreation and Tourism

Impact Level	Definition of Potential Adverse Impact Levels	Definition of Potential Beneficial Impact Levels
Negligible	No measurable impacts to the recreation setting, recreation opportunities, or recreation experiences would occur.	No measurable impacts or effects to the recreation setting, recreation opportunities, or recreation experiences would occur.
Minor	Impacts would not disrupt the normal functions of the affected activities and communities.	A small and measurable benefit for tourism or recreation activities in the GAA.
Moderate	The affected activity or community would have to adjust somewhat to account for disruptions due to the project.	A notable and measurable benefit for tourism or recreation activities in the GAA.
Major	The affected activity or community would have to adjust to significant disruptions due to large local or notable regional adverse impacts of the project.	A large local, or notable regional benefit for tourism or recreation and tourism in the GAA.

3.21.3 Impacts of Alternative A – No Action on Recreation and Tourism

When analyzing the impacts of the No Action Alternative on recreation and tourism, BOEM considered the impacts of ongoing and planned non-offshore wind activities and other offshore activities, including ongoing non-offshore wind and ongoing offshore wind activities on the baseline conditions for recreation and tourism. The cumulative impacts of the No Action Alternative considered the impacts of the No Action Alternative in combination with other planned non-offshore wind and offshore wind activities, as described in Appendix E (*Planned Activities Scenario*).

3.21.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for recreation and tourism described in Section 3.21.1, *Affected Environment*, would continue to follow current regional trends and respond to IPFs introduced by ongoing activities. Ongoing non-offshore wind activities within the GAA that contribute to impacts on recreation and tourism include undersea transmission lines, gas pipelines, other submarine cables, tidal energy projects, marine minerals use and ocean-dredged material disposal, military uses, marine transportation, fisheries and management, global climate change, oil and gas activities, and onshore development activities. Specifically, within the vicinity of landfall within Fire Island National Seashore, ongoing and planned non-offshore wind activities that contribute to such impacts include other submarine cables, wildlife and fisheries management, global climate change, and onshore development activities. These activities are expected to continue at current trends and have the potential to affect recreation and tourism. Recreation and tourism activities would experience periodic disruption from these activities, but would not be significantly impacted, as they are a typical part of daily life along the coast in the GAA. It is expected that visitors would continue to pursue recreation and tourism activities that rely on the area's coastal and ocean environment, scenic qualities, natural resources, and establishments that provide services for recreation and tourism activities. The beach, and by proxy the ocean, are resources that are of primary concern for recreation and tourism.

Ongoing offshore wind activities within the GAA that contribute to impacts on recreation and tourism include:

- Continued O&M of the Block Island project (5 WTGs) installed in state waters; and
- Ongoing construction of two offshore wind projects, the Vineyard Wind 1 project (62 WTGs and 1 OSS) in OCS-A 0501 and the South Fork project (12 WTGs and 1 OSS) in OCS-A 0517.

Ongoing O&M of Block Island and ongoing construction of the Vineyard Wind 1 and South Fork projects would affect recreation and tourism through the primary IPFs of traffic, anchoring, port utilization, lighting, presence of structure, and new cable emplacement and maintenance. Ongoing offshore wind activities would have the same type of impacts from the IPFs that are described in detail in the following section for planned offshore wind activities, but the impacts would be of lower intensity.

3.21.3.2 Cumulative Impacts of the No Action Alternative

The cumulative impact analysis for the No Action Alternative considers the impacts of the No Action Alternative in combination with other planned non-offshore wind activities and planned offshore wind activities (without the Proposed Action).

Other planned non-offshore wind activities that may affect recreation and tourism include undersea transmission lines, gas pipelines, other submarine cables, tidal energy projects, marine minerals use and ocean-dredged material disposal, military uses, marine transportation, fisheries and management, global climate change, oil and gas activities, and onshore development activities.

The sections below summarize the potential impacts of planned offshore wind activities on recreation and tourism during construction, O&M, and decommissioning of the projects. BOEM anticipates future offshore wind activities to affect recreation and tourism through the following primary IPFs.

Traffic: The construction and decommissioning of future offshore wind projects would generate increased onshore vehicle traffic in localized areas near ports needed for construction activities. Traffic would occur on existing roadways that are used by recreators. During construction, safety guidelines and plans would be implemented to prevent most adverse impacts for recreational users. The construction of offshore projects would result in small increases in vehicle traffic from O&M activities, and therefore, would present minor, short-term impacts on recreational users in the impacted area and negligible long-term adverse impacts as a result of maintenance activities.

Future projects would generate increased vessel traffic, predominantly during construction and decommissioning activities, but also with operation and maintenance of facilities, which could result in nuisances for recreational vessels. The impacts would occur within the GAA, largely along routes between ports and potential construction areas. The exact vessel traffic associated with each future project is not known, but the construction of the proposed SRWF would be expected to use 69 different vessels, that would not all be operating at the same time (COP Section 4.8.1.2; Sunrise Wind 2023). Increased vessel traffic could result in collisions, minor delays, or route adjustments for recreational vessels in the GAA. The risks and associated impacts would increase if future offshore wind facilities were simultaneously under construction. However, the majority of construction-related vessel traffic would be located within temporary safety zones and safety guidelines would be established to help minimize potential adverse impacts and risks with recreational and tourism-related activities. Increased traffic would be higher during construction, thus resulting in greater inconveniences. However, the increased traffic would be short-term and localized during these activities and should not incrementally add to adverse impacts. Vessel traffic associated with operation and maintenance of future projects would likely be much lower than during the construction period but would add on to the impacts of vessel traffic associated with other projects. Vessel traffic from offshore wind activities would represent a small portion of total vessels. Impacts from increased vessel traffic due to future offshore wind development are anticipated to result in minor, localized adverse impacts on recreational users.

Anchoring: With increased vessel traffic, there would also be an increase in anchoring. Anchoring impacts to fish species targeted for recreational fishing are addressed in Section 3.14.3. The presence of additional anchored vessels within the GAA and the development of areas with cable hardcover or scour protection could result in adverse impacts to recreational vessels by limiting or making it more difficult to anchor in areas. The largest portion of anchored vessels associated with the offshore wind development would be located in offshore work areas during construction and decommissioning activities. During these periods, anchored construction-related vessels would most likely be within established temporary safety zones established by the USCG. These safety zones would be located around all marine construction activities, including each WTG site, OCS-DC site, and each cable-laying vessel. During construction activities at the Block Island Wind Farm, the Coast Guard established a 500-yard safety zone around each location where WTGs and cables were installed[4]. The size of the safety zone for the SRWF has not yet been established, but it is anticipated that it would be similar to the that established at the Block Island Wind Farm. Within the GAA, future offshore wind development is expected to lead to overlapping construction periods and increases in survey activities. Once a project has been constructed, vessel anchoring would also occur during O&M activities. The development of offshore wind projects would likely result in an increase in the number of anchored vessels and work platforms that could impact recreation and tourism vessels. There would be localized, short-term impacts on recreational boating from anchored construction, survey, or service vehicles. Adverse impacts are anticipated to range from minor to moderate, depending upon the frequency and number of anchored vessels needed, as this leads to inconvenience and navigational complexity for recreational vessels and would be less frequent during operations.

Port utilization: The utilization of ports for staging and construction activities for future projects could also provide facilities for recreational boats or may be on waterways that are shared with recreational marinas. The majority of regional ports that are suitable for staging and construction activities associated with offshore wind are primarily industrial, with recreational activity use being secondary. If improvements at ports are necessary for construction, it could result in short-term adverse impacts during construction, but long-term benefits for improvements to facilities and channels for recreational vessels. Regardless of future offshore wind development, recreation and tourism activities related to current marine industrial activities at existing ports would not experience significant changes (BOEM 2016). Therefore, the impact of port utilization to recreation and tourism would be negligible.

Light: Construction of future projects could result in light impacts for recreational users and tourists. Some projects would result in the construction of new visible structures or lighting during the nighttime at onshore locations. The majority of onshore project components are expected to be located in areas that are already lighted and previously developed, minimizing adverse impacts. The adverse effects to recreation and tourism of lighting from onshore construction would be short-term and localized.

The construction of future offshore wind projects would require nighttime, dusk, or early morning lighting on WTGs, vessels, and platforms that may be visible to tourists, onshore recreational users, and offshore boaters recreating at those times. Permanent aviation warning lighting on the WTGs could cumulatively adversely impact recreation and tourism activities from south-facing beaches within the GAA if lighting is a factor that is considered when deciding locations to visit. Previous studies found that WTGs visible more than 15 mi (24.1 km) from the viewer would have negligible impacts on recreation and tourism activity, which is where BOEM-related projects would be located (Parsons and Firestone

[4] As described in 81 *Federal Register* 31862. https://www.federalregister.gov/documents/2016/05/20/2016-11826/safety-zone-block-island-wind-farm-rhode-island-sound-ri

2018). Aviation warning lighting would be visible from shore and would vary in both appearance and intensity depending upon the elevation of the viewer, height of the WTG, and the distance between the two. However, it has been found that an ADLS could result in over a 99 percent reduction in system activated duration as compared to traditional always-on obstruction lighting systems (COP Section 4.8.1.2; Sunrise Wind 2023).

The GAA includes the southern shores of Martha's Vineyard and the western shores of Nantucket, both of which are part of the viewshed. These areas include landscapes that are characterized by bluffs, beaches, dunes, and tidal marshes with low development density in this area, leading to there being very little existing nighttime lighting. This would lead to more pronounced impacts to these areas than to viewsheds that are located in developed and industrial areas. Nighttime lighting on WTGs would add to cumulative visual impacts on recreation and tourism in the GAA. These impacts would be long-term and continuous and would vary between minor to moderate adverse impacts for recreation and tourism dependent upon the project and the distance of the user from the modified feature.

Presence of structures: The development of future offshore wind projects in the Rhode Island Massachusetts Lease Areas would include the presence of in-water structures, including WTGs and the offshore substations/converter stations that would have impacts on recreation and tourism. In-water structures would remain in place for up to 30 years from installation until the decommissioning of the facility. These project features would be the most visible and would have the highest impact on the viewshed of recreational users and tourists. Adverse impacts to recreational boating and fishing include the risk of collision; risk of gear entanglement, damage, or loss; navigational hazards; presence of cable infrastructure; visual impacts; and space-use conflicts.

The risk of collision with WTGs or offshore substations/converter stations is greater for smaller vessels, including recreational vessels, moving in close proximity to installed facilities. However, the *2012 Northeast Recreational Boater Survey* found that 52 percent of recreational boaters within the area of analysis typically traveled within 1 nm of the coastline (SeaPlan 2013). Larger recreational vessels generally remain within 3 to 10 nm of the coast, and this trend is expected to continue into the future. This would reduce potential conflict between recreational boating and in-water structures of future offshore wind development, as the Lease Areas in Rhode Island and Massachusetts are located further offshore.

Recreational vessels that travel further offshore, including recreational fishing vessels, long-distance sailboat races, wildlife watching boats, large sailing vessels, and sightseeing tours, would be impacted by in-water structures. This could result in recreational users having to change the routes that they use to avoid the in-water structures. Wildlife watching boats, including whale watchers, and sightseeing boats often travel further offshore where wildlife is more likely to be present, and would need to take extra caution in navigating through or around future projects. Large sailing vessels would likely navigate away from future offshore wind projects if they are equipped with masts taller than the lowest elevation of WTG blade tips. The height of the WTGs would vary with the size of the WTGs installed in future offshore wind farms. Depending upon the route chosen, the Transatlantic Race, Marion Bermuda Race, and Newport Bermuda Race, long-distance sailboat and yacht races, have the potential to pass through the area of analysis. The development of future projects could require the routes of recreational boaters, sightseeing boats, wildlife watching boats, and boat races to be adjusted. The adverse impact to recreational boating would be minor and limited as the majority of documented routes by recreational boaters occur closer to shore.

Future offshore wind projects would lead to additional cable protection and scour protection located on the ocean floor. Lessees of future projects would need to continue to work with both the USCG and NOAA to ensure that recreational vessel users have up-to-date information regarding the location of these structures. Cable protection can make it so that anchors could become stuck on the hard structures and lost or create difficulty in holding in place. Future offshore WTGs would be installed in water depths where anchoring is uncommon, but there is the potential for impacts to recreational users to have higher anchoring risk in the areas where export cables are located closer to shore. The adverse impacts from anchoring would be minor, localized, continuous, and would last for the duration of the time that the project remains installed.

In-water structures from offshore wind development may overlap with fisheries that target highly migratory fish species located further offshore. The presence of structures could inhibit some mobile methods used to target highly migratory species, including trolling and drifting, as it would be more challenging for the recreational user to avoid the presence of the in-water structures. Despite these challenges, the in-water structures serve as artificial reefs and shelter for fish, making them attractive sites for the recreational fishing industry (Webster and Porter 2020). At the Block Island Wind Farm, fishermen have noted that the site has been incredibly popular, resulting in issues with fishing pressure, vessel crowding, and an increased risk of allision (Webster and Porter 2020). Future offshore wind development could provide attractive sites for recreational fishermen and spread fishing pressure. The artificial habitat provided by these structures could lead to an increase in the amount of target species present near offshore wind facilities and could have minor, positive effects on recreational fishing.

In-water structures of future offshore wind projects could provide new opportunities for offshore tourism. The Block Island Wind Farm has led to the creation of tours to allow for interested tourists to travel out to the Project, and similar tours could be established for future offshore wind projects (Block Island Ferry 2022). There could result in additional opportunities associated with recreational fishing and wildlife watching. The structures could attract species targeted for recreational fishing, leading to more recreational fishing vessels traveling offshore to fish near the WTGs and offshore substations/converter stations. The in-water structures may also lead to higher densities of seals, odontocetes, and sea turtles that would forage near the structures. This could create negligible, beneficial impacts to recreation and tourism, but the benefits would likely decline with distance from shore, as recreational vessels would likely not travel to projects located further away from the coast.

In-water structures would be the most visible part of future offshore wind projects. The presence of these structures on the offshore horizon would differ from the ocean’s water surface and the visual horizon. The color of the turbines would contrast with sun angles throughout the day, and the motion of the WTGs for generation would draw attention from recreational users and tourists within the viewshed. The visual dominance of the WTGs would be influenced by a variety of factors, with the most significant being the distance between the WTGs and the viewing location. A survey-based study found that the net effect, considering the difference between respondents reporting the presence of turbines (of approximately 574 ft [175 m] in height) would make their experience worse and better, was at 12.5 mi (19.6 km) the net effect is 7 percent worse, at 15 mi (24.1 km) the net effect is zero, and at 20 mi (32.2

km) it is 7 percent better (Parsons and Firestone 2018). As described above, the southern shores of Martha's Vineyard and the western shores of Nantucket have little development and high value for tourism, scenic, historic, and recreational qualities. Future offshore wind development would result in WTGs that could be visible from shorelines, adding a developed/industrial visual element to the viewshed that previously was characterized by open ocean with periodic aircraft and transient vessels. This change in the viewshed would have negligible to moderate adverse impacts on visual resources depending on the location due to the introduction of industrial elements into an area that previously did not have development. Visual impacts would be long-term, continuous, and negligible to major adverse to recreation and tourism. See Section 3.22, *Scenic and Visual Resources,* for a more detailed discussion regarding potential impacts to Visual Resources. There is the possibility that some areas with the most direct viewsheds of the WTGs and other in-water structures could have some reductions in recreational and tourism activities, but it is not anticipated that there would be overall reductions in recreation and tourism in the GAA.

Noise: Noise from planned future projects could have adverse impacts on recreation and tourism by disrupting the natural sounds of the marine environment. Offshore noise that could impact recreation and tourism includes noise from G&G survey activities, pile driving, trenching, and construction-related vessel noise. Pile driving is anticipated to be the activity that would have the loudest noise associated with construction activities. Noise associated with this should not be audible from onshore locations, as the majority of pile-driving activities would occur a sufficient distance away from shore. Noise could be audible to some offshore boaters and recreational fishers, and cause for them to avoid areas where they are occurring. However, the loudest noises would come from within the safety zones that would be expected to be established by offshore wind developers and USCG, meaning that very few recreational users would be in the vicinity of the loudest sound levels from pile-driving activities. The safety zones are anticipated to be 500-yards around each WTG, OCS-DC, and cable while under construction based on the size of safety zones that have been established during previous offshore wind farm construction activities. However, the size of the safety zone could be different for the SRWF. Pile-driving activities would be anticipated to reach airborne sound levels of 60 dBA at a distance of 2,400 ft (731.5 m) (COP , Appendix I3; Stantec 2022), comparable to a vacuum cleaner at 9.8 ft (3.0 m) or normal conversation at 3.3 ft (1.0 m) (FHWA 2018). FHWA data and the distance of future offshore wind farms from the shoreline, suggests that noise from pile driving of future projects would not be expected to have adverse impacts on sound levels to recreation and tourism activities occurring on land or near the coastline. Noise from pile driving would be produced periodically throughout construction and could be amplified if construction was occurring at more than one project at the same time. Sound levels from pile driving activities would not be expected to have adverse impacts to human health or wellness but may present inconveniences to recreational boaters.

Noise from construction activities could have short-term, localized adverse impacts to fish species that are sensitive to underwater sound, driving fish away from the construction site, thus impacting recreational fishing in the vicinity of future offshore wind projects. As is discussed when describing IPFs associated with in-water structures, recreational fishing targeting highly migratory species would have a greater potential to be impacted, as fishing efforts occur further offshore and closer to where construction of future offshore wind projects would take place. Marine mammals, primarily whales, may be deterred from construction areas due to noise, resulting in adverse impacts on offshore wildlife watching. Section 3.11, *Marine Mammals*, further describes potential impacts on marine mammals, and as noted, BMPs can minimize exposure. Operational noise from WTGs should not impact recreational fishing or offshore wildlife watching as the amount of noise produced should have little effect on fish and marine mammals. Construction activities would result in short-term, localized minor short-term adverse impacts to offshore wildlife watching and recreational fishing activities, but with BMPs employed, no long-term adverse impacts would be expected.

During normal operations, WTG operation would generate continuous noise, with sound pressure levels at or below ambient levels at relatively short distances from WTG foundations (Kraus et al. 2016). Noise levels measured during normal operations at the Block Island Wind Farm at the WTG base at 164 ft (50 m) minimally exceeded ambient noise levels. As wind speeds increase, the correlated increase in noise of the WTGs becomes less detectable due to the increase in ambient noise. During field observations, it was also determined that WTG operational noise was not detectable from the shore from Block Island Wind Farm operations (HDR 2019). Noise associated with maintenance operations could result in short-term, localized adverse impacts to recreation and tourism.

Noise from onshore construction activities would be short-term but could have adverse impacts to nearby recreation or tourism areas as the noise could be disruptive. Noise producing activities of onshore construction would include the cable installation at the landfall sites. Adverse impacts of onshore noise would be negligible, short-term and localized and would be expected to occur in previously developed areas. The impact level would depend upon the project type and the distance from the recreation and tourism site but would range from negligible to minor.

New cable emplacement and maintenance: Within the GAA, there is the potential of seabed disturbance up to 7,783 ac (31.5 km^2) for the export cable and 9,565 ac (38.7 km^2) for the IAC for other future offshore wind projects between 2022 and 2030. The installation of offshore cable emplacement would create localized, short-term adverse to recreational boating due to noise of installation and the need to navigate around work areas. Cable installation could also have short-term minor adverse impacts on recreational fishing, as targeted fish and invertebrates may be disturbed due to the required dredging, turbulence, disturbance, and turbidity. After installation has occurred, recreational boating would be impacted by cables only during maintenance operations and if they are not properly noted on charts, operators could lose anchors as the hard-bottom areas could make anchoring more difficult. Risks associated with anchoring would be minimal, as recreational vessels do not commonly anchor in the water depths where offshore structures would be installed. Impacts of cable emplacement on recreation and tourism would be negligible to minor, short-term, localized, and adverse.

3.21.3.3 Conclusions

Impacts of the No Action Alternative

Under the No Action Alternative, recreation and tourism would continue to be affected by existing environmental trends and ongoing activities. Recreation and tourism in the GAA would continue to be affected by ongoing activities, including vessel traffic, noise and trenching from periodic maintenance or installation of coastal and nearshore infrastructure, and onshore development activities. These activities would lead to periodic disruptions to recreation and tourism activities but would not significantly impact recreation and tourism as they are a typical part of daily life along the coast in the GAA. Overall, the No Action Alternative would result in **moderate** adverse and **minor beneficial** impacts.

Cumulative Impacts of the No Action Alternative

Under the No Action Alternative, existing environmental trends and ongoing activities would continue, and recreation and tourism would continue to be affected by IPFs associated with those activities. Planned non-offshore wind activities that could affect recreation and tourism include the installation of undersea transmission lines, gas pipelines, and other submarine cables, marine minerals use and ocean-dredged material disposal, military uses, dredging activities, and port improvements, through primary IPFs of vessel traffic, noise, and cable installation. Planned activities would have short-term, localized adverse impacts, but would not impact the area's scenic quality. Adverse impacts would result primarily from changes in the viewshed from undeveloped to having industrialized structures present and impacts associated with marine construction activities, including noise, lighting, and traffic. Beneficial impacts to recreation and tourism would come from increased sightseeing opportunities and the potential for improvements to recreational fishing from the presence of in-water structures. It is anticipated that recreation and tourism activities would continue to occur in the GAA with or without future offshore wind projects. BOEM anticipates that the cumulative impacts of the No Action Alternative would likely be **moderate** adverse and **minor beneficial**.

The impacts associated with future offshore wind activities in the GAA, considered with other reasonably foreseeable activities, current activities, and environmental trends, would be **moderate** adverse effects if no other offshore wind farms are authorized. Most of the adverse impacts could be avoided with APMs, but some impacts would only be minimized with APMs in place. If other offshore wind farms are authorized, BOEM would anticipate **moderate** adverse impacts to recreation and tourism with **minor beneficial** impacts.

3.21.4 Relevant Design Parameters and Potential Variances in Impacts

This Final EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than described in the sections below. The following proposed PDE parameters (Appendix C) would influence the magnitude of the impacts on recreation and tourism:

- The Project layout, including the number, type, height, and placement of the WTGs and OSS;
- The choice of location for port operations;
- The design of visibility lighting on in-water structures;
- The time of year that construction occurs both near the coast and onshore;
- The accessibility of Smith County Park and Fire Island National Seashore to recreation users during construction; and
- The accessibility for recreational boaters to the Project Area.

Variability of the proposed Project design exists as outlined in Appendix E. Below is a summary of potential variances in impacts:

- WTG number, size, location, and lighting. Visual impacts that could impact recreation and tourism would change depending upon the distance from the shore and the size of the turbines present.
- WTG arrangement. The arrangement of WTG arrays could have different impacts on navigational routes of recreational boaters and present different safety issues.
- Choice of location for port operations: Different ports have varying levels of recreational use both at the ports and in nearshore waters adjacent to the ports. The choice of port could change the level of impact to recreational boaters.
- Design of visibility of lighting: Visibility lighting design options would impact the nighttime visibility of WTGs to onshore communities depending upon the orientation and type of safety lighting.
- Time of construction: Recreation and tourism activities in the expanded ROI are centered around the summer months (Parsons and Firestone 2018). Impacts on recreation and tourism would be more significant if construction were to occur during the recreation and tourism season.
- Accessibility of public recreational resources: Some recreation and tourism activities occur year-round, and there is the potential for activities to occur that affect public access. Public access to Smith County Park would not be allowed during construction activities. Additionally, public access could be limited to specific areas of the Fire Island National Seashore. However, the level of this impact would be directly associated with the time of year that construction activities would occur.

Impacts to tourism and recreation would vary if the incremental contributions from the action differ. Impacts could be beneficial or adverse. The incremental differences between relevant design parameters would be similar, with impacts ranging from negligible to moderate adverse and minor beneficial. IPFs from lighting, noise, in-water infrastructure and traffic could be slightly modified depending upon the design parameters. Short-term impacts to recreational boaters related to traffic could be mitigated if construction activities were limited to being outside of the busy summer season, as recreation and tourism activities in the GAA are centered around the summer months (Parsons and Firestone 2018). It is important that communication around construction schedules occurs to help minimize adverse impacts of the Project. Construction schedule plays an important role in determining the impacts of the Project. Construction of the onshore facilities are proposed to occur in the offseason of tourism, helping to minimize potential adverse impacts. This would help minimize interference with public use at Smith Point County Park and Fire Island National Seashore by allowing for use to occur during busy season. Additionally, establishing restriction zones would influence the potential impacts of the Project. If the general public no longer had access to recreational resources, impacts would be greater.

The number of WTGs could change the incremental impacts associated with recreation and tourism. If WTGs with higher capacities were installed, it would result in less WTGs overall. This would lead to less adverse impacts on traffic and boating, as navigating would be easier through less WTGs, but would lead to greater adverse impacts to the viewshed as the WTGs would be more prominent and seen from a further distance away. As such, the incremental differences would change, but the overall impact would remain the same.

The choice of port for O&M activities could have implications in the long-term, continuous impacts of the SRWF on recreation and tourism. The choice of a port that is more industrialized in nature would result in less impacts to tourism and recreation.

3.21.5 Impacts of Alternative B – Proposed Action on Recreation and Tourism

3.21.5.1 Construction and Installation

The construction of the SRWF could result in potential onshore and offshore impacts to recreation and tourism from vessel traffic, visible infrastructure, noise, and lighting and marking. The Proposed Action would have long-term, minor adverse impacts on recreation and tourism in the geographic area due to the presence of up to 94 11-MW WTGs within 102 potential positions. The WTGs would impact visual resources within the viewshed of coastal locations and would create potential impacts due to increased safety risks within the area where WTGs are present. The Proposed Action would also have long-term minor beneficial impacts to recreation and tourism from the presence of in-water structures both creating artificial habitat that would lead to increased fish aggregation and improving recreational fishing opportunities and creating the potential for increased opportunities for sightseeing. There would be short-term minor impacts associated with increased vessel traffic, noise, and lighting from construction and decommissioning activities of the Proposed Action.

3.21.5.1.1 Onshore Activities and Facilities

Anchoring: Anchoring activities would not impact onshore activities and facilities related to recreation and tourism. Impacts to offshore activities and facilities during construction activities are discussed below.

Noise: Noise from construction activities and the potential for recreational users and tourists to have workers, equipment, vehicles, debris, or cleared areas in their GAA could have short-term, short-term adverse impacts on recreation and tourism near the landfall site at Smith Point County Park, a public beach access point within the Fire Island National Seashore, and adjacent to the federally designated Otis Pike Wilderness Area. Noise from construction activities would also be expected to have adverse impacts on recreation and tourism in areas utilized by the public adjacent to construction activities, including the TWA Flight 800 International Memorial, the Fire Island Wilderness Center, Southaven County Park, Wertheim NWR, and the Brookhaven Fairgrounds. Sunrise Wind has proposed to implement an APM that the construction of the Landfall and ICW HDD would be expected to occur outside the summer tourist season, which is generally between Memorial Day and Labor Day. The construction schedule for the remaining onshore facilities would be designed to minimize impacts to local communities, and thus recreation and tourism, the extent feasible. If implemented, this would help lessen impacts to recreation and tourism, as two-thirds of tourism activities occur within the summer season, from Memorial Day to Labor Day, but impacts would still occur. The Fire Island National Seashore is open year-round to visitors. Visitors would be expected to be present in areas adjacent to construction activities and would be adversely impacted from construction noise. BMPs to mitigate impacts from noise are identified in Appendix H and would help lessen impacts to visitors in adjacent areas. Impacts from noise would be short-term and range from minor to moderate for onshore recreation and tourism activities.

Land Disturbance: The onshore transmission cable route has, to the extent practical, been sited within existing disturbed ROW, with the intent to minimize changes to the view and nature of surrounding facilities. Within the public ROW, the onshore transmission cable portion of the Project corridor consists of the full extent of the ROW, and during construction, would typically require a temporary disturbance width of up to 30 ft (9 m), excluding disturbance areas for trenchless crossing locations and splice vaults. The onshore transmission cable route is sited to cross under the William Floyd Parkway to a recreational area located to the west of William Floyd Parkway. The onshore transmission cable would be installed via HDD below the Carmans River, in the vicinity of a segment that is a NYS designated Recreational River. The Project's HDDs are described in detail in the HDD Work Plan, provided as Appendix NN of the EM&CP 2. During construction activities, access to this recreational resource would be limited. There would be short-term, minor adverse impacts to recreational users of this area, as opportunities may be limited during the construction period.

The construction of the Landfall and ICW HDD is expected to occur over a three to four-month period outside of the peak summer tourist season to minimize impacts to recreation and tourism. Construction would result in short-term reductions in facilities that provide access to recreational areas, including those at Smith Point County Park, Fire Island National Seashore, Fire Island Wilderness Visitor Center, Otis Pike Wilderness Area, Smith Point Marina, the TWA Flight 800 International Memorial, Wertheim NWR, Southaven County Park, and Brookhaven Fair Grounds. This would have short-term, localized impacts to both onshore recreation and tourism activities and recreation and tourism activities that occur along the coast in the proposed construction area, including swimming, surfing, scuba diving, and recreational fishing. Landfall HDD construction would be anticipated to occur over three to four months, with the construction schedule for the remaining onshore facilities designed to the best extent possible to minimize impacts to local communities and local recreation and tourism activities. Sunrise Wind has committed to maintaining public access to all facilities at Smith Point County Park and Smith Point Marina unless temporarily necessary for safety purposes, allowing for recreation actions to continue to occur in the surrounding area both onshore and in the water. Sunrise would develop a plan for access in parkland and open space such that the Project would not hinder the use of recreational uses or reduce existing parking areas below what is needed to accommodate seasonal use, as is identified in New York's Certificate of Environmental Compatibility and Need issued on November 18, 2022, to minimize impacts to recreation opportunities to the extent practical. Construction staging areas would be located, to the extent possible, so that public parking, beach access, access to recreational facilities, and access to campsites would be maintained. Sunrise Wind has proposed an APM to minimize impacts to recreation and tourism that unless otherwise necessary for safety purposes, where disruptions would be short-term and infrequent, lasting minutes. Sunrise Wind would maintain continual pedestrian and vehicular use of and access to park amenities within Smith Point County Park on Fire Island, Smith Point County Marina, Southaven County Park in the Town of Brookhaven, and other existing public access areas. Impacts from onshore construction would be minor to moderate, short-term and would occur during times when recreation and tourism are not as busy in the area.

Port utilization: Sunrise Wind is investigating existing facilities in New York, Connecticut, Massachusetts, Maryland, New Jersey, Rhode Island, and Virginia for potential use for staging, construction, and/or for O&M purposes. The proposed locations are all existing industrial ports, which would result in minimal impacts to recreation and tourism. A BOEM study has found that recreation and tourism should not experience long-term, significant impacts at existing ports centered around marine industrial activities with or without offshore wind development (BOEM 2016). Sunrise Wind would consider potential impacts to recreation and tourism when selecting the port that would be utilized for O&M. Impacts from port utilization to recreation and tourism would be negligible.

Presence of structures: The interconnection facility in Brookhaven is proposed in close proximity to the existing Holbrook substation and is located in an already developed area that is zoned for commercial and utility use. Onshore construction and installation would result in the incremental additions of an O&M facility, an interconnection facility, and distribution cable. The locations of these onshore structures are already developed, and commercial/industrial in nature, but recreation users may be sensitive to the changes in the view from construction impacts. This would not result in long-term adverse visual impacts to recreational users. Sunrise Wind has proposed to maintain public access to all facilities at Smith Point County Park and Smith Point Marina, unless temporarily necessary for safety purposes, which, if necessary, would result in minor, short-term impacts. During Landfall HDD and ICW HDD, a temporary landing structure would be installed to aid in the offloading of equipment and materials. The temporary landing structure would be installed within the Narrow Bay/Long Island ICW to support the transport of heavy construction materials to ocean-side export cable landing site at Smith Point County Park. The landing structure would be approximately 16 ft wide by 242 ft long and secured to the seabed by approximately 21 steel piles, each measuring 16 inches in diameter. The landing structure may need to remain in place year-round, but the use would be limited to fall and spring. Visual impacts from construction activities are further discussed in Section 3.22.5. Onshore recreation and tourism would have short-term, minor adverse impacts from the presence of structures during construction activities, as public access would remain in recreation areas to the extent feasible while allowing for safe construction. However, these impacts would be short-term and only last during the duration of construction activities.

Traffic: Recreation and tourism users along the Long Island Expressway and Route 97 may experience delays from onshore SRWF construction activities occurring along or adjacent to the roadways. Roadways or short-term lane closures may need to occur during construction activities, resulting in adverse impacts for local communities. Sunrise Wind has consulted with local entities including the Suffolk County Department of Public Works, the Town of Brookhaven Department of Public Works, and the NYSDOT regarding route location, traffic management, construction methodology, and time of year considerations (COP Section 4.8.2.2; Sunrise Wind 2023). In addition, as required by NYS law, Sunrise Wind would implement an APM by developing an MPT Plan to minimize potential traffic impacts during construction. The MPT Plan would be submitted to the New York Department of Public Service for review and approval during the Article VII review process (COP Section 4.8.2.2; Sunrise Wind 2023). Additionally, Sunrise Wind would coordinate, to the extent practicable, onshore construction activities to occur outside of the busy summer tourism season, implementing another APM to help minimize impacts to recreation and tourism activities at Smith County Park, the Fire Island National Seashore, and Otis Pike Wilderness Area. Construction vehicles would add short-term, adverse minor to moderate impacts from traffic delays on local roadways, as well as short-term, adverse light, noise, and traffic and parking limitations at the Smith Point County Park landfall site, which provides parking for Smith Point County Park and the adjacent Fire Island National Seashore and Otis Pike Wilderness Area. However, Sunrise Wind has committed to maintaining public access to all facilities at Smith Point County Park and Smith Point Marina, including roadways and parking lots, unless temporarily necessary for safety purposes. Traffic related to construction activities would impact other recreation and tourism areas from disruptions to parking during construction activities and changes to traffic flow. This would have indirect impacts to recreation and tourism areas adjacent to construction activities, as well as recreation and tourism areas where construction is occurring, including but not limited to the Fire Island National Seashore, Otis Pike Wilderness, Fire Island Wilderness Center, Smith Point County Park, the TWA Flight 800 International Memorial, Southaven County Park, Wertheim NWR, and the Brookhaven Fair Grounds. Construction activities would occur along existing roadways, which would include short-term disruptions to parking and traffic flow along the construction route. Traffic would result in minor to moderate impacts to recreation and tourism, which would be short-term, lasting the duration of construction activities, and localized.

Conclusion: The construction of onshore facilities would also result in short-term, minor to moderate adverse impacts to recreation and tourism as a result of increased visible infrastructure, traffic, lighting, land disturbance, and noise.

3.21.5.1.2 Offshore Activities and Facilities

During construction, tourism and recreational offshore uses including boating, fishing, wildlife watching, scuba diving, and sightseeing could experience minor to moderate adverse impacts. Construction activities would lead to boating traffic, construction noise, visual impacts, and changes in public safety requirements for recreational boaters. Construction impacts from the SRWEC could be more significant than the construction of the WTGs as construction activities occur closer to shore. Regardless of location, construction activity would be short-term and transient, having limited short-term potential impacts.

Appendix H (*Mitigation and Monitoring*) describes APMs that would be implemented to mitigate risks to offshore recreation and tourism from construction activities, including but not limited to; scheduling onshore construction at the Smith Point County Park, located in the Fire Island National Seashore and adjacent to the Otis Pike Wilderness Area, outside of the busy tourism season; communication plans with boaters and offshore recreation activities; choice of port; and timing of construction activities. The Smith Point County Park landfall location was chosen in part to help minimize interactions with recreational boating activity in the region and to minimize interactions with mapped shipwrecks viewed by scuba divers.

Anchoring: Anchoring during construction activities related to the Proposed Action would affect recreation and tourism activities in the region by creating an inconvenience to navigation by recreational vessels that must operate around anchored vessels and by contributing to the disturbance of marine species that are important to recreational fishing and wildlife viewing activities. BOEM anticipates that the USCG may establish short-term safety zones around offshore wind construction areas, which would minimize impacts from anchored construction vessels to recreational boaters. Vessel anchoring related to construction of the Proposed Action would have localized, short-term, minor impacts on recreation and tourism due to the navigational challenges it creates for recreational boaters and the disturbance of species important to recreational fishing and wildlife viewing.

Noise: Offshore construction activities of both the SRWF and SRWEC would result in increased noise levels that would have short-term, localized impacts to some fish species, marine mammals, and other marine animals. Fish species avoiding construction areas could result in adverse impacts to recreational fishing in these areas (see Section 3.14 for further discussion of impacts to fisheries). If marine mammals and other marine species, such as sea turtles, avoid construction sites, there would be adverse impacts to offshore wildlife watching recreation (see Sections 3.11 and 3.12 for further discussion of Marine Mammals and Sea Turtles, respectively). Sunrise Wind would implement BMPs during construction to help minimize sound exposure and mitigate these adverse impacts. Increased noise levels could also be a nuisance to recreational boaters near offshore construction areas. However, with the safety zone in place, it is unlikely that boats would be traveling close enough to the construction area to result in significant adverse impacts. The safety zones are anticipated to be 500-yards around each WTG, OCS-DC, and cable while under construction based on the size of safety zones that have been established during previous offshore wind farm construction activities. However, the size of the safety zone could be different for the SRWF. Accordingly, offshore construction noise impacts should be short-term and result in minor adverse impacts to recreation and tourism.

Lighting: When nighttime construction activities occur, lighting would be necessary. However, onshore construction activities are anticipated to occur primarily within areas that are industrial or developed in nature. Project-related construction vessels and in-water equipment for both the WTGs and OCS-DC require USCG-approved navigation lighting so that they are visible to other vessels. Depending upon atmospheric conditions and location onshore, lights may be visible. The majority of recreation and tourism activities occur in the daylight, so adverse impacts from lighting would be negligible, limited and short-term.

Presence of structures: While offshore construction of both the SRWF and SRWEC are occurring, it is likely that construction vessels erecting structures would be visible from some onshore recreation and tourism resources in the GAA. These visual impacts would be limited due to the distance of the offshore construction area from the coast, and short-term for the duration of construction activities. Impacts from visual resources would increase as the distance between recreation and tourism activities becomes closer to the construction activities. Therefore, the visual impacts on offshore recreational users during construction activities are anticipated to be greater due to the closer proximity of these activities. Offshore construction activities could have adverse impacts on viewers who expect to see a pristine, undeveloped ocean landscape, or beneficial impacts on viewers who see the construction and renewable energy development as a positive activity. The preference of the viewer is an important feature in determining the visual impact on recreation and tourism activities. However, changes in the viewshed could have adverse impacts from specific viewpoints or recreational areas but are not expected to have adverse impacts to recreation and tourism in the region as a whole. Visual impacts from construction are expected to be short-term and limited. Visual impacts from the proposed construction of the Project are further discussed in Section 3.22.5. Impacts to recreation and tourism as a result of offshore construction activities would be moderate adverse and short-term.

Traffic: Offshore construction would increase vessel traffic in the GAA, but over half of recreational boating occurs within 1-mile of the shore, with few routes occurring in the proposed SRWF location (SeaPlan 2013). Construction could impact long-distance boat sailing races, potentially causing the need for routes to be shifted. Sailboat, distance, and buoy races in or near Rhode Island Sound and Block Island Sound can be found in COP Table 4.7.3-1 (Sunrise Wind 2023), and Sailboat, Distance, and Buoy Races in or Near Long Island Bays and the Atlantic Ocean can be found in COP Table 4.7.3-2 (Sunrise Wind 2023). Construction could impact the navigation of smaller recreational vessels. Safety zones designed in conjunction with the USCG during construction could alter the routes of recreational boaters during the period of offshore construction activities. The safety zones are anticipated to be 500-yards around each WTG, OCS-DC, and cable while under construction based on the size of safety zones that have been established during previous offshore wind farm construction activities. However, the size of the safety zone could be different for the SRWF. Sunrise Wind would also implement a communication plan to inform vessels of construction activities, vessel movements, and how construction activities may affect this area to help reduce adverse impacts to tourism and recreation. Agency and stakeholder outreach would continue to occur throughout the project construction period (COP Table 1.5-1; Sunrise Wind 2023) and the implementation of a fisheries communication plan would help to minimize impacts to recreational activities (COP Appendix B: Fisheries Communication Plan; Ørsted Offshore North America 2021). With these measures implemented, offshore construction of the SRWF is expected to result in limited, short-term, minor adverse impacts to vessel traffic and navigation routes.

3.21.5.2 Operations and Maintenance

3.21.5.2.1 Onshore Activities and Facilities

O&M activities of onshore facilities would result in negligible, variable adverse impacts to recreation and tourism over the lifespan of the Project. O&M activities would be periodic and short-term. The underground onshore transmission cable and onshore interconnection cable would not require maintenance unless there was a failure or malfunction. The OnCS-DC would be located in previously developed, industrial area that has an existing substation, helping minimize the impacts to recreation and tourism as industrial and commercial activity would be expected to occur in the areas where Onshore facilities are located. Limited equipment would be visible at Onshore facilities, and yard lighting at Onshore facilities would be minimal and subject to state and local requirements. O&M of Onshore facilities should result in negligible adverse impacts to recreation and tourism.

O&M would affect onshore recreation and tourism by changing the visual character of the viewshed. Normal operations of the Project would have visible infrastructure in the water and could change the scenic quality for onshore recreation and tourist activities. Impacts to onshore recreation would be lessened as the distance from the Project facilities increases. Visual impacts are further described in Section 3.22.5. O&M of Onshore activities and facilities would have permanent, minor adverse impacts to recreation and tourism.

3.21.5.2.2 Offshore Activities and Facilities

Anchoring: Anchoring during O&M activities would be expected to have less impacts than during construction and decommissioning because there would be less anchored vessels present in the proposed Project Area. Anchored vessels would create navigational challenges for recreational boaters and would disturb wildlife important for recreational fishing and wildlife viewing. However, there would be less anchored vessels present, which would lessen the impacts on recreation and tourism activities. Vessel anchoring during O&M activities would result in impacts ranging from negligible to minor, depending upon the number of vessels present.

Noise: Noise from O&M activities could result in impacts on recreation and tourism. Impacts on recreation and tourism would result along the SRWF and offshore export cable route. Noise would be short-term, and only would occur when some O&M activities are occurring. Depending upon the level of noise, recreation users could have adverse impacts from sounds. Noise from O&M activities would result in short-term, negligible to minor impacts to recreation and tourism.

Lighting: The WTGs associated with the Proposed Action would be equipped with USCG navigation warning lights and aviation obstruction lights as a safety feature to reduce the risk of allision. Impacts to recreation and tourism would depend upon the distance of users from the SRWF, visibility of the SRWF from the location, and the existing visual quality surrounding the SRWF. Additional lighting in the offshore environment could affect tourists and recreational users who are accustomed to experiencing dark nighttime skies. In many places, offshore lighting visibility would be limited due to existing offshore light sources, shoreline light sources, and the distance of the SRWF from the viewer. Sunrise Wind is proposing to implement ADLS on WTGs and comply with any other USCG requirements while minimizing visibility from shore as an APM to minimize impacts from lighting. ADLS would reduce the duration of potential impacts of nighttime aviation lighting to less than 1 percent of the normal operation time that would occur without using ADLS. Offshore recreational activities are limited at nighttime, so the majority of impacts would occur to onshore viewers. Impacts from offshore lighting would be dependent upon the location of the viewer in comparison to the SRWF, but would likely be negligible due to the vast majority of recreation and tourism activities that occur at night happening onshore.

Port utilization: O&M activities would occur at existing port facilities where recreational activities are not expected to occur. However, recreational boating could be impacted in the surrounding region as there would be an increase in vessel traffic moving from the port to areas that would need O&M activities. Port activities would follow any federal, state, and local regulatory guidelines to minimize adverse impacts to recreation and tourism activities in the nearby areas. Therefore, the Proposed Action is anticipated to result in negligible impacts on port utilization.

Presence of structures: Offshore infrastructure, particularly up to 94 11-MW WTGs, have the potential to be visible from the shoreline to a limited number of communities in the GAA. The upper blade tip height would be up to 787 ft (240 m) above mean sea level (AMSL) per the PDE, which would be a significant change to the current viewshed of the undeveloped, open ocean. Recreation and tourist activities could be affected by changes in the viewshed, particularly from undeveloped viewpoints. Recreation activities occur along beaches, bluffs, dunes, open fields, and residential yards that have unobstructed ocean views, and recreational users could experience adverse impacts from the changes in the viewshed if their preference is to have undeveloped open ocean views. The University of Delaware completed a study to evaluate potential impacts of visible offshore WTGs with a rotor diameter of 492 ft (150 m) so that when a blade was at the apex the turbine was 574 ft high (175 m), on beach use. At 15 mi (24.1 km), 68 percent of respondents answered that the WTGs would not improve or worsen their experience, 16 percent answered that the WTGs would improve their beach experience, and 16 percent answered that the WTGs would worsen their beach experience (Parsons and Firestone 2018). Therefore, there is the potential for a range of negligible to moderate beneficial and adverse impacts of the visibility of the WTGs on recreation and tourism activities and experiences. Further discussion on potential visual impacts from the Proposed Action are discussed in Section 3.22.5.

Operation of the SRWF could have the potential for positive effects to recreation and tourism. There is the potential for wind farm related sightseeing and tourism activities, similar to offshore tours of the Block Island Wind Farm (Block Island Ferry 2022). The presence of in-water structures could also act as artificial reef habitat and shelter for fish, providing benefits to the recreational fishing industry (Webster and Porter 2020). The increased number of fish have the potential to result in other benefits to recreation and tourism, as there could be wildlife watching opportunities for species that would forage on the fish, or potential for additional scuba diving opportunities to view the wildlife near the WTGs. The in-water infrastructure could result in potential beneficial impacts related to changes to the natural resources.

Cox Ledge has been identified as one of the most popular recreation fishing spots in Southern New England (Kneebone and Capizzano 2020). Project infrastructure overlapping with the complex habitat in this region could potentially adversely impact cod and its spawning habitat (see Section 3.10 *Finfish, Invertebrate, and EFH* and Section 3.14 *Commercial Fisheries and For-hire Recreational Fishing* for more details). Recreational fishers are permitted to catch up to 10 cod per day in this area (NOAA 2021). However, at this distance offshore, recreational fishing predominantly targets highly migratory species like bluefin tuna (*Thunnus thynnus*) and mahi mahi (*Coryphaena hippurus)* (Kneebone and Capizzano 2020). Therefore, it is not expected that the Proposed Action would have significant impacts on the recreational fishing of cod.

Traffic: O&M of offshore Project facilities would result in restricted recreational boat traffic around the SRWF through permanent navigation exclusion areas. Safety zones, that are anticipated to be 500-yards around each WTG, OCS-DC, and cable while under construction based on the size of safety zones that have been established during previous offshore wind farm construction activities, may be established during O&M activities, resulting in limited, short-term disruptions for recreation and tourism activities that occur in close proximity to the SRWF. Sunrise Wind would maintain communication methods to help minimize adverse impacts related to recreational boating traffic. A summary of anticipated routine maintenance activities and the regularity at which they are expected to occur can be found in COP Table 3.5.2-1, Table 3.5.3-1, and Table 3.5.4-1 (Sunrise Wind 2023).

Vessel traffic associated with O&M of the SRWF and SRWEC would be less than during construction activities, but still would result in an increase in vessel traffic in the GAA. It is not anticipated that maintenance would be needed for the SRWEC unless there is fault or failure of Project facilities. Depending upon the location of the necessary maintenance, O&M activities may transect routes used for distance sailing races or recreational boating, and could result in short-term, limited effects to recreation and tourism. For typical O&M activities, it is anticipated that smaller vessels would be used than those needed for construction-related activities. However, the type and number of vessels would vary depending upon the required work. Helicopters may also be used during O&M activities. Operation of vessels and helicopters could result in noise impacts to recreation and tourism activities. These impacts would decrease as the distance away from O&M increases. The increase in vessel traffic and potential changes in routes could result in minor, long-term adverse impacts to recreation and tourism.

3.21.5.3 Conceptual Decommissioning

3.21.5.3.1 Onshore Activities and Facilities

Conceptual decommissioning would have similar, short-term minor and moderate adverse impacts to recreation and tourism as described under construction. The same APMs, including developing an MPT Plan, would be implemented to limit adverse effects to traffic and onshore construction occurring outside of the summer season.

3.21.5.3.2 Offshore Activities and Facilities

Recreational boaters would experience similar short-term, minor to moderate adverse impacts from conceptual decommissioning of offshore Project components and offshore Project construction. Sunrise Wind would implement the same APMs for conceptual decommissioning as they propose for construction. This would include a comprehensive communication plan with outreach to stakeholders in the offshore recreation and tourism industry to help minimize adverse impacts.

3.21.5.4 Cumulative Impacts of the Proposed Action

The cumulative impacts of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned activities. The cumulative impacts of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned wind activities. Ongoing and planned non-offshore wind activities related to the installation of undersea transmission lines, gas pipeline, and other submarine cables, marine mineral use, ocean-dredged material disposal, military uses, dredging activities, and port improvements would contribute to impacts on recreation and tourism through the primary IPFs of vessel traffic, noise, lighting, and cable installation. The construction, O&M, and decommissioning of both onshore and offshore infrastructure for offshore wind activities across the GAA would also contribute to the primary IPFs of traffic, presence of structures, lighting, noise, anchoring, port utilization, and land disturbance. In context of reasonably foreseeable environmental trends, the Proposed Action would contribute incrementally to the cumulative IPFs and impacts on recreation and tourism. BOEM anticipates that the cumulative impacts of the Proposed Action would likely be minor to moderate adverse and minor beneficial.

Anchoring: The Proposed Action would contribute a noticeable increment to the cumulative anchoring impacts on recreational boating, which BOEM anticipates would be localized, short-term, minor impacts during construction and decommissioning of offshore wind projects in the GAA. When multiple offshore wind projects are under construction simultaneously in the recreation and tourism GAA, impacts could be moderate to recreation and tourism due to the increased amount of anchoring.

Noise: The Proposed Action would contribute a noticeable increment to the cumulative noise impacts on recreation activities. Impacts from noise on recreation and tourism would be anticipated to be short-term, localized and minor for offshore recreation and tourism activities and short-term, localized, and minor to moderate for onshore recreation and tourism activities.

Land disturbance: The Proposed Action would contribute a noticeable increment to the cumulative land disturbance impacts on recreation and tourism, with impacts that would be localized, short-term, and moderate. The extent of land disturbance associated with other projects and impacts to recreation and tourism would depend upon the locations of landfall, onshore transmission cable routes, and onshore substations for other offshore wind energy projects.

Port utilization: The Proposed Action would result in negligible cumulative port utilization impacts on recreation and tourism.

Presence of structures: Structures from other planned offshore wind development would result in comparable impacts on recreation and tourism of the Proposed Action alone. The extent of the impacts would increase as additional offshore wind projects are constructed, but the level of impacts would likely be the same. Portions of the 94 WTGs from the Proposed Action combined with future offshore wind projects for a total of 1,038 WTGs in the GAA could potentially be visible from coastal and elevated locations in the GAA and contribute to impacts on recreation and tourism. Section 3.22, *Scenic and Visual Resources*, provides further discussion of the potential visibility of structures and impacts. The Proposed Action would contribute a noticeable increment to the cumulative impacts on recreation and tourism from ongoing and planned activities, which would result in moderate impacts.

Traffic: The Proposed Action would contribute a marginal increment to the cumulative vessel traffic impacts on marine recreation and tourism activities, which would likely be localized and minor to moderate during construction, and long-term and negligible to minor during operation. Overlapping construction schedules of offshore wind projects in the GAA would increase vessel traffic between ports and work areas, which would require for recreational or tourism-related boaters to be more alert and could result in minor adjustments to routes or activities.

The Proposed Action would contribute a noticeable increment to the cumulative vehicle traffic impacts on onshore recreation and tourism activities. The extent of vehicle traffic from other projects and impacts to recreation and tourism would depend upon the locations of landfall, onshore transmission cable routes, and onshore substations for other offshore wind energy projects. Vehicle traffic would be localized, short-term, and minor to moderate during construction activities.

Lighting: The Proposed Action would result in negligible cumulative lighting impacts on recreation and tourism.

3.21.5.5 Conclusions

Impacts of Proposed Action

BOEM anticipates the construction, operation and maintenance, and conceptual decommissioning of the Proposed Action would have **moderate** adverse and **minor beneficial** impacts to recreation and tourism. Construction and decommissioning activities would result in increases in vehicle traffic, vessel anchoring, vessel traffic, noise, lighting, visible construction activities to recreational users and tourists, and land disturbance in areas used for recreation and tourism and construction areas adjacent or in close proximity to recreation and tourism areas. Impacts to recreation and tourism from port utilization and lighting during construction activities would be negligible. Impacts from noise, onshore traffic, offshore traffic, and anchoring would be minor. Impacts to recreation and tourism from land disturbance, offshore traffic, and the presence of structures during construction activities would range from **minor** to moderate adverse. These activities would result in short-term adverse impacts to recreation and tourism and would be partially mitigated by the proposed APMs. Project O&M would result in both short-term and long-term IPFs from vessel traffic, vessel anchoring noise, lighting, and visible infrastructure. The impacts of O&M activities associated with the Proposed Alternative would range from negligible to moderate adverse and minor beneficial impacts to recreation and tourism. Port utilization would have negligible impacts. During O&M activities, anchoring and noise would have negligible to minor impacts to recreation and tourism. Traffic would result in minor impacts and the presence of structures would result in minor beneficial to moderate adverse impacts. The overall effect of the Proposed Action on recreation and tourism would be expected to be **moderate** adverse and **minor beneficial** impacts, as recreation and tourism activities are expected to continue with most impacts being avoided with APMs in place.

Cumulative Impacts of the Proposed Action

BOEM anticipates that the cumulative impacts on recreation and tourism in the GAA would be **moderate** adverse with **minor beneficial** impacts. In the context of reasonably foreseeable environmental trends, the incremental impacts contributed by the Proposed Action would be marginal. Short-term impacts from construction and conceptual decommissioning activities would include noise, lighting, anchored vessels, and changes in navigational routes. Long-term impacts include the presence of visible infrastructure in the GAA during operations impacting the visual quality of the area, the presence of buried cable structures impacting anchoring, and changes to vessel navigation to avoid allision. Beneficial impacts would result from offshore wind farm sightseeing opportunities and from the potential reef effect and shelter that the infrastructure would provide. The majority of the impacts to recreation and tourism from the Proposed Action could be avoided with APMs in place.

3.21.6 Alternative C-1 – Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions

3.21.6.1 Construction and Installation

3.21.6.1.1 Onshore Activities and Facilities

Alternative C-1 would not affect the Project’s onshore facilities and activities. Alternative C-1 would also not change construction activities that could impact onshore activities. There would be similar levels of noise, lighting, and visible construction equipment, and impacts to traffic for onshore activities when compared to the Proposed Action. Therefore, direct and indirect effects to onshore recreation and tourism would be the same as the Proposed Action. Impacts would be adverse and short-term and would be expected to range from negligible to moderate adverse impacts to minor beneficial impacts.

3.21.6.1.2 Offshore Activities and Facilities

Impacts to offshore activities and facilities during construction would be similar to those described under the Proposed Action and would be negligible to moderate and short-term. Offshore construction activities would result in impacts to recreational boating, fishing, wildlife watching, scuba diving, and sightseeing. Traffic, noise, lighting, and visible infrastructures would be the IPFs that would affect recreation and tourism associated with Alternative C-1. Under this alternative, sensitive benthic habitats would be avoided that may be important for recreational fishing activities. Impacts would be short-term and would be expected to range from negligible to moderate.

3.21.6.2 Operations and Maintenance

3.21.6.2.1 Onshore Activities and Facilities

Alternative C-1 would not affect the Project's onshore facilities and should result in very similar O&M needs as the Proposed Action. Therefore, impacts to onshore recreation and tourism would be the same as described under the Proposed Action. The impacts would be adverse long-term and range from negligible to moderate.

3.21.6.2.2 Offshore Activities and Facilities

O&M activities under Alternative C-1 to offshore facilities would be similar to those described under the Proposed Action. There would be potential impacts from noise, lighting, visible infrastructure, and traffic. However, Alternative C-1 involves removing 8 11-MW WTGs from Priority Areas 1, 2, 3, and/or 4 to minimize impacts to fisheries habitat. Depending on where the WTGs are removed from, there could be less impacts to recreation and tourism. For example, Cox Ledge has been identified as one of the most popular recreation fishing spots in Southern New England and protecting this complex habitat could help mitigate adverse impacts to cod in the region (Kneebone and Capizzano 2020). All other impacts are anticipated to be similar to those described under the Proposed Action and would range from negligible to moderate adverse impacts to minor beneficial impacts.

3.21.6.3 Conceptual Decommissioning

3.21.6.3.1 Onshore Activities and Facilities

The Fisheries Habitat Impact Minimization Alternative would not affect the Project's onshore facilities and activities. Alternative C-1 would also not change conceptual decommissioning activities that could impact onshore activities. There would be similar levels of noise, lighting, and visible construction equipment, and impacts to traffic for onshore activities. Therefore, direct and indirect effects to onshore recreation and tourism would be the same as the Proposed Action. Impacts would be short-term and would be expected to range from adverse negligible to moderate.

3.21.6.3.2 Offshore Activities and Facilities

Impacts to offshore activities and facilities during conceptual decommissioning would be similar to those described under the Proposed Action and would be adverse negligible to moderate and short-term. Offshore conceptual decommissioning activities would result in impacts to recreational boating, fishing, wildlife watching, scuba diving, and sightseeing. Traffic, noise, lighting, and visible infrastructures IPFs would affect recreation and tourism associated with Alternative C-1. Impacts would be short-term and would be expected to range from adverse negligible to moderate.

3.21.6.4 Cumulative Impacts of Alternative C-1

The cumulative impacts on recreation and tourism would likely be negligible to moderate adverse to minor beneficial. In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 and the cumulative impacts on recreation and tourism would be similar to those described under the Proposed Action.

3.21.6.5 Conclusions

Impacts of Alternative C-1

Alternative C-1 could result in reduced impacts to recreational fishing, as WTGs would be relocated from complex fish habitat. This could improve recreational experiences by helping protect fish species that are targeted by recreational fishing vessels. This area is part of cod spawning habitat, and recreational fishers are permitted to catch up to 10 cod per day in this area (NOAA 2021). However, at this distance offshore, recreational fishing predominantly targets highly migratory species (Kneebone and Capizzano 2020). Therefore, it is not expected that impacts would be significantly different from Alternative C-1 to the Proposed Action on recreation and tourism. As a result, BOEM expects that the impacts from Alternative C-1 to recreation and tourism would be similar, but potentially less, to the Proposed Action. All other impacts are anticipated to be similar to those described under the Proposed Action and would be **moderate** adverse with **minor beneficial** impacts.

Cumulative Impacts of Alternative C-1

In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 to the cumulative impacts on recreation and tourism would be marginal. BOEM anticipates that the cumulative impacts of Alternative C-1 would be **moderate** adverse impacts with **minor beneficial** impacts. This impact rating is driven by ongoing and planned activities as well as short-term and permanent disturbance associated with both onshore and offshore construction, O&M and decommissioning of the Alternative.

3.21.7 Alternative C-2 – Reduced Layout from Priority Areas via Exclusion of up to 8 WTG Positions and Relocation of up to 12 WTG Positions to the Eastern Side of the Lease Area

Alternative C-2 was developed to potentially reduce impacts to fisheries habitat within the Lease Area by removing up to 8 WTGs from Priority Areas 1, 2, 3, and/or 4 and relocating up to an additional 12 WTGs to currently unoccupied positions along the eastern side of the Lease Area. Under Alternative C-2, the 11-MW WTGs and OCS-DC would occur within the range of design parameters outlined in the COP.

3.21.7.1 Construction and Installation

3.21.7.1.1 Onshore Activities and Facilities

Impacts of Alternative C-2 to recreation and tourism resources during construction activities would be similar to those described under the Proposed Action. Impacts would be short-term and would be expected to range from negligible to moderate adverse impacts to minor beneficial impacts.

3.21.7.1.2 Offshore Activities and Facilities

Impacts of Alternative C-2 to recreation and tourism resources during construction activities from traffic, noise, lighting, and presence of structures would be similar to those described under the Proposed Action. Impacts would be short-term and would be expected to range from negligible to moderate.

3.21.7.2 Operations and Maintenance

3.21.7.2.1 Onshore Activities and Facilities

Impacts of Alternative C-2 to recreation and tourism resources from O&M activities of onshore facilities would be similar to those described under the Proposed Action. Impacts would be long-term and range from negligible to moderate.

3.21.7.2.2 Offshore Activities and Facilities

O&M activities under Alternative C-2 to offshore facilities would be similar to those described under the Proposed Action. Under Alternative C-2, up to 20 11-MW WTGs would be removed from Priority Areas 1, 2, 3, and/or 4 (up to 8 removed and 12 relocated). Up to 12 WTGs would be relocated to currently unoccupied positions along the eastern side of the Lease Area. Under Alternative C-2, the same number of WTGs would be installed, the same as under the Proposed Action. The different locations of the WTGs could result in less impacts to recreational fishing. For example, Cox Ledge has been identified as one of the most popular recreation fishing spots in Southern New England, and protecting this complex habitat could lessen adverse impacts to recreational fishing in the region (Kneebone and Capizzano 2020). All other impacts are anticipated to be similar to those of the Proposed Action and would range from negligible to moderate adverse impacts to minor beneficial impacts.

3.21.7.3 Conceptual Decommissioning

3.21.7.3.1 Onshore Activities and Facilities

Impacts of Alternative C-2 to recreation and tourism resources during decommissioning activities would be similar to those described under the Proposed Action. Impacts would be short-term and would be expected to range from adverse negligible to moderate.

3.21.7.3.2 Offshore Activities and Facilities

Impacts to offshore activities and facilities during conceptual decommissioning would be similar to those described under the Proposed Action and would be adverse negligible to moderate and short-term. Offshore conceptual decommissioning activities would result in impacts to recreational boating, fishing, wildlife watching, scuba diving, and sightseeing. Traffic, noise, lighting, and visible infrastructures IPFs would affect recreation and tourism associated with Alternative C-2. Impacts would be short-term and would be expected to range from adverse negligible to moderate.

3.21.7.4 Cumulative Impacts of Alternative C-2

The cumulative impacts on recreation and tourism would likely be **negligible** to **moderate** adverse to **minor beneficial**. In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-2 and the cumulative impacts on recreation and tourism would be similar to those described under the Proposed Action.

3.21.7.5 Conclusions

Impacts of Alternative C-2

Alternative C-2 could result in reduced impacts to recreational fishing, as WTGs would be relocated from complex fish habitat. This could improve recreational experiences by helping protect fish species that are targeted by recreational fishing vessels. This area is part of cod spawning habitat, and recreational fishers are permitted to catch up to 10 cod per day in this area (NOAA 2021). However, at this distance offshore, recreational fishing predominantly targets highly migratory species (Kneebone and Capizzano 2020). Therefore, it is not expected that impacts would be significantly different from Alternative C-2 to the Proposed Action on recreation and tourism. As a result, BOEM expects that the impacts from Alternative C-2 to recreation and tourism would be similar, but potentially less, to the Proposed Action. All other impacts are anticipated to be similar to those described under the Proposed Action and would be **moderate** adverse with **minor beneficial** impacts.

Cumulative Impacts of Alternative C-2

In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 to the cumulative impacts on recreation and tourism would be marginal. BOEM anticipates that the cumulative impacts of Alternative C-1 would be **moderate** adverse with **minor beneficial** impacts. This impact rating is driven by ongoing and planned activities as well as short-term and permanent disturbance associated with both onshore and offshore construction, O&M and decommissioning of the Alternative.

3.21.8 Alternative C-3 - Reduced Layout from Priority Areas Considering Feasibility due to Glauconite Sands

Under the Fisheries Habitat Impact Minimization Alternative C-3, the construction, O&M, and eventual decommissioning of the 11-MW WTGs and an OCS within the proposed Project Area and associated inter-array and export cables would occur within the range of design parameters outlined in the COP, subject to applicable mitigation measures. However, Alternative C-3 was developed to address concerns regarding pile refusal due to glauconite sands in the southeastern portion of the Lease Area while still minimizing impacts to benthic and fisheries resources. Alternative C-3a, C-3b, and C-3c described in Section 3.7.8, *Benthic Resources*, consider different WTG configurations to avoid sensitive habitats and engineering constraints while still meeting the NYSERDA OREC. This alternative only considered removal of WTGs from Priority Area 1 based on consultation with NMFS. Areas with high density of boulder, complex habitat, and data suggesting Atlantic cod aggregation and spawning was considered when determining which WTGs to remove.

3.21.8.1 Construction and Installation

3.21.8.1.1 Onshore Activities and Facilities

Impacts of Alternative C-3 to recreation and tourism resources during construction activities would be similar to those described under the Proposed Action. Impacts would be short-term and would be expected to range from negligible to moderate adverse impacts to minor beneficial impacts.

3.21.8.1.2 Offshore Activities and Facilities

Impacts of Alternative C-3 to recreation and tourism resources during construction activities from traffic, noise, lighting, and presence of structures would be similar to those described under the Proposed Action. Impacts would be short-term and would be expected to range from negligible to moderate.

3.21.8.2 Operations and Maintenance

3.21.8.2.1 Onshore Activities and Facilities

Impacts of Alternative C-3 to recreation and tourism resources from O&M activities of onshore facilities would be similar to those described under the Proposed Action. Impacts would be long-term and range from negligible to moderate.

3.21.8.2.2 Offshore Activities and Facilities

O&M activities under Alternative C-3 to offshore facilities would be similar to those described under the Proposed Action. Under Alternative C-3a, up to 87 11-MW WTGs would be installed in the 87 potential positions, 7 WTGs less than considered in the Proposed Action. Under Alternative C-3b, up to 84 WTGs would be installed in the 87 potential positions, 10 WTGs less than considered in the Proposed Action. Under Alternative C-3c, 80 WTGs would be installed in the 87 potential positions, 14 less WTGs that considered in the Proposed Action. Less WTGs installed and in different locations compared to the Proposed Action could result in less impacts to recreational fishing. All other impacts are anticipated to be similar to those of the Proposed Action and would range from negligible to moderate adverse impacts to minor beneficial impacts.

3.21.8.3 Conceptual Decommissioning

3.21.8.3.1 Onshore Activities and Facilities

Impacts of Alternative C-3a, C-3b, C-3c to recreation and tourism resources during decommissioning activities would be similar to those described under the Proposed Action. Impacts would be short-term and would be expected to range from adverse negligible to moderate.

3.21.8.3.2 Offshore Activities and Facilities

Impacts to offshore activities and facilities during conceptual decommissioning would be similar to those described under the Proposed Action and would be adverse negligible to moderate and short-term. Offshore conceptual decommissioning activities would result in impacts to recreational boating, fishing, wildlife watching, scuba diving, and sightseeing. Traffic, noise, lighting, and visible infrastructures IPFs would affect recreation and tourism associated with Alternative C-3a, C-3b, C-3c. Impacts would be short-term and would be expected to range from adverse negligible to moderate.

3.21.8.4 Cumulative Impacts of Alternative C-3

The cumulative impacts on recreation and tourism would likely be negligible to moderate adverse to minor beneficial. In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-3 and the cumulative impacts on recreation and tourism would be similar to those described under the Proposed Action.

3.21.8.5 Conclusions

Impacts of Alternative C-3

Alternative C-3 is not expected to result in impacts that would be significantly different from the Proposed Action on recreation and tourism. As a result, BOEM expects that the impacts from Alternative C-3 to recreation and tourism would be similar to the Proposed Action. All other impacts are anticipated to be similar to those described under the Proposed Action and would be **moderate** adverse with **minor beneficial** impacts.

Cumulative Impacts of Alternative C-3

In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-3 to the cumulative impacts on recreation and tourism would be marginal. BOEM anticipates that the cumulative impacts of Alternative C-3 would be **moderate** adverse with **minor beneficial** impacts. This impact rating is driven by ongoing and planned activities as well as short-term and permanent disturbance associated with both onshore and offshore construction, O&M, and decommissioning of the Alternative.

3.21.9 Comparison of Alternatives

Construction, O&M, and decommissioning of Alternatives B, C-1, C-2, and C-3 would have the same overall negligible to moderate adverse impacts and minor beneficial impacts on recreation and tourism. Table 3.21-3 provides an overall summary of alternative impacts.

Table 3.21-3. Comparison of Impacts on Recreation and Tourism

No Action Alternative (Alternative A)	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)	Fisheries Habitat Minimization Considering Feasibility Due to Glauconite Sands (Alternative C-3)
No Action Alternative: BOEM anticipates that the No Action Alternative would have **moderate** adverse impacts and **minor beneficial** impacts to recreation and tourism. Recreation and tourism would continue to be affected by existing environmental trends and ongoing activities in the GAA, including vessel traffic, noise and trenching from periodic maintenance or installation of coastal and nearshore infrastructure, and onshore development activities. *Cumulative Impacts of the No Action Alternative:* In context of reasonably foreseeable environmental trends, the No Action	*Proposed Action:* BOEM anticipates the construction, operation and maintenance, and conceptual decommissioning of the Proposed Action would have **moderate** adverse and **minor beneficial** impacts to recreation and tourism. The overall effect of the Proposed Action on recreation and tourism would be expected to be **moderate** adverse and **minor beneficial** impacts, as recreation and tourism activities are expected to continue with most impacts being avoided with APMs in place. *Cumulative Impacts of the Proposed Action:* BOEM anticipates that the cumulative impacts on recreation and tourism in the GAA would be	*Alternative C-1:* BOEM expects that the impacts from Alternative C-1 to recreation and tourism would be similar, but potentially less, to the Proposed Action. All other impacts are anticipated to be similar to those described under the Proposed Action and would be **moderate** adverse with **minor beneficial** impacts. *Cumulative Impacts of Alternative C-1:* In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-1 to the cumulative impacts on recreation and tourism would be marginal. BOEM anticipates that the cumulative impacts of Alternative C-1 would be **moderate**	*Alternative C-2:* BOEM expects that the impacts from Alternative C-2 to recreation and tourism would be similar, but potentially less than the Proposed Action. All other impacts are anticipated to be similar to those described under the Proposed Action and would be **moderate** adverse with **minor beneficial** impacts. *Cumulative Impacts of Alternative C-2:* In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-2 to the cumulative impacts on recreation and tourism would be marginal. BOEM anticipates that the cumulative impacts of Alternative C-2 would be **moderate**	*Alternative C-3:* BOEM expects that the impacts from Alternative C-3 to recreation and tourism would be similar to the Proposed Action and would range from **be moderate** adverse with **minor beneficial** impacts. *Cumulative Impacts of Alternative C-3:* In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C-3 to the cumulative impacts on recreation and tourism would be marginal. BOEM anticipates that the cumulative impacts of Alternative C-3 would be **moderate** adverse with **minor beneficial** impacts. This impact rating is driven by ongoing and planned activities

No Action Alternative (Alternative A)	Proposed Action (Alternative B)	Fisheries Habitat Minimization (Alternative C-1)	Fisheries Habitat Minimization (Alternative C-2)	Fisheries Habitat Minimization Considering Feasibility Due to Glauconite Sands (Alternative C-3)
Alternative's impacts on recreation and tourism would be marginal. The cumulative impacts on recreation and tourism would be **moderate** adverse and **minor beneficial** impacts.	**moderate** adverse impacts and **minor beneficial** impacts. In the context of reasonably foreseeable environmental trends, the incremental impacts contributed by the Proposed Action would be marginal.	adverse with **minor beneficial** impacts. This impact rating is driven by ongoing and planned activities as well as short-term and permanent disturbance associated with both onshore and offshore construction, O&M and decommissioning of the Alternative.	adverse with **minor beneficial** impacts. This impact rating is driven by ongoing and planned activities as well as short-term and permanent disturbance associated with both onshore and offshore construction, O&M and decommissioning of the Alternative.	as well as short-term and permanent disturbance associated with both onshore and offshore construction, O&M, and decommissioning of the Alternative.

3.21.10 Summary of Impacts of the Preferred Alternative

BOEM has identified Alternative C-3b as the Preferred Alternative as depicted in Figure 2.1-10. Alternative C-3b would include installation of up to 84 WTGs, which is 10 fewer WTGs than the maximum WTGs proposed under the PDE of the Proposed Action. Construction and decommissioning activities would result in increases in vehicle traffic, vessel anchoring, vessel traffic, noise, lighting, visible construction activities to recreational users and tourists, and land disturbance in areas used to recreation and tourism and construction areas adjacent or in close proximity to recreation and tourism areas. Project O&M would result in both short-term and long-term IPFs from vessel traffic, vessel anchoring noise, lighting, and visible infrastructure.

3.21.11 Proposed Mitigation Measures

The mitigation measures listed in Table 3.21-4 are recommended for inclusion in the Preferred Alternative.

Table 3.21-4. Additional Proposed Measures: Recreation and Tourism

Measure	Description	Effect
Safety Plan, Communication Plan, and Noise	BOEM and BSEE would ensure that Sunrise Wind coordinates with the National Park Service and Fire Island National Seashore in advance of construction activities for the development of the	These plans would help minimize adverse impacts from

Measure	Description	Effect
Mitigation Measures	Project's Safety Plan, Communications Plan, and Noise Mitigation Measures for construction activities that could adversely impact NPS areas and noise sensitive areas adjacent to construction activities such as the Otis Pike Fire Island High Dune Wilderness. These plans would consider measures and BMPs included in: US Department of the Interior Director's Order #47: Soundscape Preservation and Noise Management, effective December 1, 2000; NPS Soundscape Management Policy 4.9, effective 2006; US Department of the Interior Director's Order #41: Wilderness Stewardship, effective May 13, 2013; NPS Reference Manual 41: Wilderness Stewardship, effective 2006; NPS Policies Chapter 6 – Wilderness Preservation and Management, effective 2006; and the 1964 Wilderness Act, that states that federal agencies like the NPS are responsible for preserving the wilderness character of wilderness areas, including Opportunities for Solitude or Primitive and Unconfined Recreation.	construction activities and help ensure that to the extent possible, the primitive nature of these areas is maintained.
Federal Survey Mitigation Strategy	The Federal Survey Mitigation Strategy is intended to guide the development and implementation of a program to mitigate impacts of wind energy development on fisheries surveys over the expected full duration (30+ years) of wind energy development in the Northeast U.S. (Mitigation Program). The Mitigation Program would include survey-specific mitigation plans for each impacted survey, including both vessel and aerial surveys (Survey-Specific Mitigation Plans). This Strategy plan aims to: 1. Mitigate impacts of offshore wind energy development on NOAA Fisheries surveys; 2. Evaluate and integrate, where feasible, wind energy development monitoring studies with NOAA Fisheries surveys; 3. Collaboratively plan and implement NOAA Fisheries survey mitigation with partners, stakeholders, and other ocean users using the principles of best scientific information available and co-production of knowledge, including fishermen's local ecological knowledge and indigenous traditional ecological knowledge; 4. Adaptively implement this Strategy recognizing the long-term nature of the surveys and the dynamic nature of wind energy development, survey technology approaches, marine ecosystems, and human-uses of marine ecosystems; 5. Advance coordination between NOAA Fisheries and BOEM in the execution of this Strategy and share experiences and lessons-learned with other regions and countries where offshore wind energy development is being planned and underway. Full plan can be viewed here: https://repository.library.noaa.gov/view/noaa/47925	This Strategy would help minimize adverse impacts to recreational fishing in the vicinity of the SRWF by mitigating impacts of wind energy development on fisheries surveys.

Measure	Description	Effect
Compensation for Gear Loss and Damage	The Lessee shall implement a gear loss and damage compensation program consistent with BOEM's draft guidance for Mitigating Impacts to Commercial and Recreational Fisheries on the Outer Continental Shelf Pursuant to 30 CFR 585 or as modified in response to public comment.	A compensation program for gear loss and damage would minimize impacts to recreational fisheries in the waters surrounding the SRWF.
Mobile Gear Friendly Cable Protection Measures	Cable protection measures should reflect the pre-existing conditions at the site. This mitigation measure chiefly ensures that seafloor cable protection does not introduce new hangs for mobile fishing gear. Thus, the cable protection measures should be trawl-friendly with tapered/sloped edges. If cable protection is necessary in "non-trawable" habitat, such as rocky habitat, then the Lessee should consider using materials that mirror the benthic environment.	This measure would help mitigate impacts to recreational fishing.
Mariner Communication and Outreach Plan	Sunrise Wind would develop and implement a comprehensive Marine Communication and Outreach Plan that covers all project phases from pre-construction to decommissioning. The proposed fisheries communication and outreach plan would be expanded to include coordination with other mariners, including the commercial shipping industry and other recreational users who would also benefit from this coordination and may not be captured in the currently proposed plan. The mariner communication plan would include the following: • Pre-Construction consultation with potentially affected stakeholders on initial routing and results of the draft Navigation Safety Risk Assessment; • During Project design, coordinating in-water construction activities to avoid and minimize disruptions; • At least 90 days prior to commencing in-water construction activities in any construction season, consultation with stakeholders on an approximate schedule of activities and existing uses within the Project area. • Following COP approval, notice of proposed changes which have the potential to impact fishing or maritime resources or activities; • Notices to commence construction activities, conduct maintenance activities, and commence decommissioning; • Status reports during construction with specific information on construction activities and locations for upcoming activities in the next 1-2 weeks; and • Sunrise Wind would report fishing gear and anchor strike incidents that fall below or are not captured by the regulatory thresholds outlined in 30 CFR 285.832 and 285.833. Reports would be filed annually during construction and decommissioning, and every 5 years during operations.	A comprehensive Marine Communication and Outreach Plan would minimize impacts to recreational fishing and other recreational users by informing recreational users of construction, O&M and decommissioning activities and informing users of proposed changes that have the potential to impact existing uses, which would help minimize impacts.

3.21.11.1 Effect of Measures Incorporated into the Preferred Alternative

The mitigation measures listed in Table 3.21-4 are recommended for inclusion in the Preferred Alternative. Sunrise Wind would coordinate with the NPS and Fire Island National Seashore to ensure that measures are taken to minimize noise and direct impacts to recreational users and tourists during construction and decommissioning activities This coordination would help minimize impacts to recreation and tourism activities that occur on the NPS land adjacent and in close proximity to proposed construction areas. These measures, if adopted, would have the effect of minimizing the overall impacts to recreation and tourism from the Preferred Alternative to **negligible** to **moderate** with **minor beneficial** impacts.