Appendix G
Impact-Producing Factor Tables and Assessment of Resources with Minor (or Lower) Impacts

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Abbreviations and Acronyms

§	Section
°C	degrees Celsius
µg/L	micrograms per liter
µT	microtesla
AC	alternating current
ADLS	aircraft detection lighting system
BA	Biological Assessment
BMP	best management practice
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
Btu	British thermal unit
CAA	Clean Air Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COP	Construction and Operations Plan
CRM	collision risk model
CTV	crew transfer vessel
CWA	Clean Water Act
DC	direct current
DOE	U.S. Department of Energy
EFH	essential fish habitat
EIS	Environmental Impact Statement
EMF	electric and magnetic fields
ESA	Endangered Species Act
ESP	electrical service platform
FAA	Federal Aviation Administration
FAD	fish aggregating device
FCC	Federal Communications Commission
Fed. Reg.	Federal Register
FMP	Fisheries Management Plan
G&G	geological and geophysical
GHG	greenhouse gas
HAP	hazardous air pollutant
HDD	horizontal directional drilling or drill
HDM	hydrodynamic model
HUC	hydrologic unit code
IHA	Incidental Harassment Authorization
IPF	impact-producing factor
IWG	Interagency Working Group on Social Cost of Greenhouse Gases
LME	Large Marine Ecosystem
MARPOL	International Convention for the Prevention of Pollution from Ships
MassDEP	Massachusetts Department of Environmental Protection
MBTA	Migratory Bird Treaty Act
MCT	Marine Commerce Terminal
mg/L	milligrams per liter
MOU	Memorandum of Understanding
MW	megawatt
NA	not applicable
NAAQS	National Ambient Air Quality Standards

NARW	North Atlantic right whale
ND	no data
NEPA	National Environmental Policy Act
NOA	Notice of Availability
NO_x	nitrogen oxide
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unit
O_3	ozone
OCS	Outer Continental Shelf
OECC	offshore export cable corridor
OECR	onshore export cable route
OSRP	oil spill response plan
PDE	Project design envelope
$PM_{2.5}$	particulate matter smaller than 2.5 microns
PM_{10}	particulate matter smaller than 10 microns
ProvPort	Port of Providence
ppb	parts per billion
Project	New England Wind Project
psu	practical salinity unit
PTS	permanent threshold shift
RI/MA Lease Areas	Rhode Island and Massachusetts Lease Areas
RMS	root mean squared
ROW	right-of-way
SAR	search and rescue
SCV	South Coast Variant
SC-GHG	social cost of greenhouse gas
SO_2	sulfur dioxide
SOC	standard operating condition
SOV	service operation vessel
SPL	sound pressure level
SWDA	Southern Wind Development Area
TCP	traditional cultural property
TMP	Traffic Management Plan
TSS	total suspended solids
TTS	temporary threshold shift
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound
WNS	white nose syndrome
WTG	wind turbine generator

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G Impact-Producing Factor Tables and Assessment of Resources with Minor (or Lower) Impacts

This appendix provides tables that discuss the individual impact-producing factors (IPF) that form the basis of the analyses in Chapter 3, Affected Environment and Environmental Consequences, of the Environmental Impact Statement (EIS). It also includes the assessment of resources for which the New England Wind Project (proposed Project) would generate no more than minor impacts.

G.1 Impact-Producing Factor Tables

Table G.1-1: Summary of Activities and the Associated Impact-Producing Factors for Benthic Resources

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases	EIS Section G.2.2, Water Quality, discusses ongoing accidental releases. Accidental releases of hazardous materials occur periodically, mostly consisting of fuels, lubricating oils, and other petroleum compounds. Because most of these materials tend to float in seawater, they rarely contact benthic resources. The chemicals with potential to sink or dissolve rapidly often dilute to non-toxic levels before they affect benthic resources. The corresponding impacts on benthic resources are rarely noticeable. Invasive species are periodically released accidentally during ongoing activities, including the discharge of ballast water and bilge water from marine vessels. The impacts on benthic resources (e.g., competitive disadvantage, smothering) depend on many factors but can be noticeable, widespread, and permanent. Ongoing releases of trash and debris occur from onshore sources; fisheries use; dredged material ocean disposal; marine minerals extraction; marine transportation; navigation and traffic; survey activities; and cables, lines and pipeline laying. However, there does not appear to be evidence that ongoing releases have detectable impacts on benthic resources.	Gradually increasing vessel traffic over the next 33 years would increase the risk of accidental releases. EIS Section G.2.2 discusses water quality. No future activities related to invasive species or releases of trash and debris were identified within the geographic analysis area other than ongoing activities.
Anchoring and gear utilization	Regular vessel anchoring related to ongoing military, survey, commercial, and recreational activities continues to cause temporary to permanent impacts in the immediate area where anchors and chains meet the seafloor. These impacts include increased turbidity levels and the potential for physical contact to cause injury and mortality of benthic resources, as well as physical damage to their habitats. All impacts are localized, turbidity is temporary, injury and mortality are recovered in the short term, and physical damage can be permanent if it occurs in eelgrass beds or hard bottom.	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Cable emplacement and maintenance	Cable emplacement and maintenance activities infrequently disturb benthic resources and cause temporary increases in suspended sediment; these disturbances would be local and limited to the emplacement corridor. In the geographic analysis area, there are six existing power cables (see BOEM 2019a for details). New cables are infrequently added near shore. Cable emplacement and maintenance activities injure and kill benthic resources and result in temporary to long-term habitat alterations. The intensity of impacts depends on the time (season) and place (habitat type) where the activities occur. Ongoing sediment dredging for navigation purposes results in localized, short-term impacts (habitat alteration, injury, and mortality) on benthic resources through seabed profile alterations. For example, the Town of Barnstable and Barnstable County typically undertake 10 to 20 dredging projects per year. Dredging typically occurs only in sandy or silty habitats, which are abundant in the geographic analysis area and quick to recover from disturbance. Therefore, such impacts, while locally intense, have little impact on benthic resources in the geographic analysis area. Ongoing sediment dredging for navigation purposes results in fine sediment deposition. Ongoing cable maintenance activities also infrequently disturb bottom sediments; these disturbances are local and limited to the emplacement corridor. Sediment deposition affect some benthic resources, especially eggs and larvae, including smothering and loss of fitness. Impacts may vary based on season/time of year. The Town of Barnstable and Barnstable County typically undertake 10 to 20 dredging projects per year. Where dredged materials are disposed, benthic resources are smothered. However, such areas are typically recolonized naturally in the short term. Most sediment dredging projects have time-of-year restrictions to minimize impacts on benthic resources. Most benthic resources in the geographic analysis area are adapted to the turbidity and periodic sediment deposition that occur naturally in the geographic analysis area.	No future activities were identified within the geographic analysis area other than ongoing activities. USACE and/or private ports may undertake dredging projects periodically. Where dredged materials are disposed, benthic resources are buried. However, such areas are typically recolonized naturally in the short term. Most benthic resources in the geographic analysis area are adapted to the turbidity and periodic sediment deposition that occur naturally in the geographic analysis area.
Climate change	Ongoing CO_2 emissions causing ocean acidification may contribute to reduced growth or the decline of benthic invertebrates that have calcareous shells, as well as reefs and other habitats formed by shells. Climate change, influenced in part by ongoing GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters, influencing the distributions and migration of benthic species and altering ecological relationships, likely causing permanent changes of unknown intensity gradually over the next 33 years.	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Discharges/intakes	The gradually increasing amount of vessel traffic is increasing the total permitted discharges from vessels. Many discharges are required to comply with permitting standards established to ensure potential impacts on the environment are minimized or mitigated. However, there does not appear to be evidence that the volumes and extents have any impact on benthic resources.	There is the potential for new ocean dumping/dredge disposal sites in the Northeast. Impacts (disturbance, reduction in fitness) of infrequent ocean disposal on benthic resources are short term because spoils are typically recolonized naturally. In addition, the USEPA established dredge spoil criteria, and it regulates the disposal permits issued by USACE; these discharges are required to comply with permitting standards established to ensure potential impacts on the environment are minimized or mitigated.
EMF	EMF continuously emanate from existing telecommunication and electrical power transmission cables. In the geographic analysis area, there are six existing power cables connecting Martha's Vineyard and Nantucket to the mainland. New cables generating EMF are infrequently installed in the geographic analysis area. Some benthic species can detect EMF, although EMF do not appear to present a barrier to movement. The extent of impacts (behavioral changes) is likely less than 50 feet from the cable, and the intensity of impacts on benthic resources is likely undetectable.	No future activities were identified within the geographic analysis area other than ongoing activities.
Noise	Detectable impacts of construction and G&G noise on benthic resources rarely, if ever, overlap from multiple sources. Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or the seabed can cause injury and/or mortality to benthic resources in a small area around each pile and short-term stress and behavioral changes to individuals over a greater area. The extent depends on pile size, hammer energy, and local acoustic conditions. Infrequent trenching activities for pipeline and cable laying, as well as other cable burial methods, emit noise. These disturbances are local, temporary, and extend only a short distance beyond the emplacement corridor. Impacts of this noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.	Detectable impacts of construction and G&G noise on benthic resources would rarely, if ever, overlap from multiple sources. No future pile driving activities were identified within the geographic analysis area other than ongoing activities. New or expanded submarine cables and pipelines are likely to occur in the geographic analysis area. These disturbances would be infrequent over the next 33 years, local, temporary, and extend only a short distance beyond the emplacement corridor. Impacts of this noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.
Port utilization	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance, including dredging. Port utilization is expected to increase over the next 33 years.	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future. In addition, the general trend along the coast from Virginia to Maine is that port activity will increase modestly. The ability of ports to receive the increase may require port modifications, leading to local impacts.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
		Future channel-deepening activities will likely be undertaken. Existing ports have already affected finfish, invertebrates, and EFH, and future port projects would implement BMPs to minimize impacts. Although the degree of impacts on EFH would likely be undetectable outside the immediate vicinity of the ports, impacts on EFH for certain species and/or life stages may lead to impacts on finfish and invertebrates beyond the vicinity of the port.
Presence of structures	Commercial and recreational fishing gear are periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. The lost gear, moved by currents, can disturb, injure, or kill benthic resources, creating short-term and localized impacts. Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables, continuously create uncommon relief and uncommon hard-bottom habitat in a mostly sandy seascape and can affect natural hydrodynamic conditions. Structure-oriented fishes are attracted to these locations. Increased predation upon benthic resources by structure-oriented fishes can affect populations and communities of benthic resources. These impacts are local and permanent. Benthic species dependent on hard-bottom habitat can benefit on a constant basis, although the new habitat can also be colonized by invasive species (e.g., certain tunicate species). Structures are periodically added, resulting in the conversion of existing soft-bottom and hard-bottom habitat to the new hard-structure habitat. The presence of transmission cable infrastructure, especially hard protection atop cables, causes impacts through entanglement/gear loss/damage, fish aggregation, and habitat conversion. Ongoing commercial and recreational regulations for finfish and shellfish implemented and enforced by Massachusetts, towns, and/or NOAA, depending on jurisdiction, affect benthic resources by modifying the nature, distribution, and intensity of fishing-related impacts, including those that disturb the seafloor (trawling, dredge fishing).	Future new cables, perhaps connecting Martha's Vineyard and/or Nantucket to the mainland, would present additional risk of gear loss, resulting in short-term and localized impacts (disturbance, injury). New cables installed in the geographic analysis area over the next 33 years would likely require hard protection atop portions of the route (see the cable emplacement and maintenance IPF in this table). Any new towers, buoy, or piers would also create uncommon relief in a mostly flat, sandy seascape and could alter hydrodynamic conditions. Structure-oriented fishes could be attracted to these locations. Increased predation upon benthic resources by structure-oriented fishes could affect populations and communities of benthic resources. These impacts are expected to be local and permanent as long as the structures remain. Benthic species dependent on hard-bottom habitat could benefit, although the new habitat could also be colonized by invasive species (e.g., certain tunicate species). Soft bottom is the dominant habitat type in the region, and species that rely on this habitat would not likely experience population-level impacts (Guida et al. 2017; Greene et al. 2010). No future activities were identified within the geographic analysis area other than ongoing activities.

BMP = best management practice; BOEM = Bureau of Ocean Energy Management; CO_2 = carbon dioxide; EFH = essential fish habitat; EIS = Environmental Impact Statement; EMF = electromagnetic fields; G&G = geological and geophysical; GHG = greenhouse gas; IPF = impact-producing factor; NOAA = National Oceanic and Atmospheric Administration; OCS = Outer Continental Shelf; USACE = U.S. Army Corps of Engineers; USEPA = U.S. Environmental Protection Agency

Table G.1-2: Summary of Activities and the Associated Impact-Producing Factors for Coastal Habitats and Fauna

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases	Accidental releases of fuel, fluids, and hazardous materials have the potential to cause habitat contamination and harm to the species that build biogenic coastal habitats and fauna (e.g., eelgrass, oysters, mussels, snails, and cordgrass) from releases and/or cleanup activities. Only a portion of the ongoing releases contact coastal habitats and fauna in the geographic analysis area. Impacts are minimal, localized, and temporary. Ongoing releases of trash and debris occur from onshore sources; fisheries use; dredged material ocean disposal; marine minerals extraction; marine transportation; navigation and traffic; survey activities; and cables, lines and pipeline laying. As population and vessel traffic increase, accidental releases of trash and debris may increase. Such materials may be obvious when they come to rest on shorelines; however, there does not appear to be evidence that the volumes and extents would have any detectable impact on coastal habitats and fauna.	No future activities were identified within the geographic analysis area other than ongoing activities.
Anchoring and gear utilization	Vessel anchoring related to ongoing military, survey, commercial, and recreational activities will continue to cause temporary to permanent impacts in the immediate area where anchors and chains meet the seafloor. These impacts include increased turbidity levels and potential for contact to cause physical damage to coastal habitats and fauna. All impacts are localized; turbidity is short term and temporary; physical damage can be permanent if it occurs in eelgrass beds or hard bottom.	No future activities were identified within the geographic analysis area other than ongoing activities.
Cable emplacement and maintenance	There are no existing cables in the geographic analysis area. Any cable emplacement and maintenance activities would infrequently disturb bottom sediments; these disturbances would be local and limited to the emplacement. Ongoing sediment dredging for navigation purposes results in fine sediment deposition within coastal habitats and fauna. Ongoing cable maintenance activities also infrequently disturb bottom sediments; these disturbances are local and limited to the emplacement corridor. Ongoing sediment dredging for navigation purposes also results in localized and short-term impacts on coastal habitats and fauna through seabed profile alterations. For example, the Town of Barnstable and Barnstable County typically undertake multiple dredging projects each year (Barnstable County 2022; CapeCod.com 2019). Dredging typically occurs only in sandy or silty habitats, which are abundant in the geographic analysis area and quick to recover from disturbance. Therefore, such impacts, while locally intense, have little effect on the general character of coastal habitats and fauna.	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	No dredged material disposal sites were identified within the geographic analysis area.	
Climate change	Ongoing CO_2 emissions causing ocean acidification may contribute to reduced growth or the decline of reefs and other habitats formed by shells. Climate change, influenced in part by ongoing GHG emissions, is expected to continue to contribute to a widespread loss of shoreline habitat from rising seas and erosion. In submerged habitats, warming is altering ecological relationships and the distributions of ecosystem engineer species, likely causing permanent changes of unknown intensity gradually over the next 3 years.	No future activities were identified within the geographic analysis area other than ongoing activities.
EMF	EMF continuously emanate from existing telecommunication and electrical power transmission cables. There are no existing cables in the geographic analysis area for coastal habitats and fauna. New cables generating EMF are infrequently installed in the geographic analysis area. EIS Sections 3.4 and 3.6 discuss the nature of potential impacts on benthic resources and finfish, invertebrates, and EFH, respectively. The extent of impacts is likely less than 50 feet from the cable, and the intensity of impacts on coastal habitats and fauna is likely undetectable.	No future activities were identified within the geographic analysis area other than ongoing activities.
Land disturbance	Ongoing development and construction of onshore properties, especially shoreline parcels, periodically causes short-term erosion and sedimentation of coastal habitats, short-term to permanent degradation of onshore coastal habitats, and the conversion of onshore coastal habitats to developed space.	No future activities were identified within the geographic analysis area other than ongoing activities.
Lighting	Navigation lights and deck lights on vessels are a source of ongoing light. EIS Sections 3.4 and 3.6 discuss the nature of potential impacts on benthic resources and finfish, invertebrates, and EFH, respectively. The extent of impacts is limited to the immediate vicinity of the lights, and the intensity of impacts on coastal habitats and fauna is likely undetectable. Existing lights from navigational aids and other structures onshore and nearshore are a source of light. EIS Sections 3.2 and 3.3 discuss the nature of potential impacts. The extent of impacts is likely limited to the immediate vicinity of the lights, and the intensity of impacts on coastal habitats and fauna is likely undetectable.	Light is expected to continue to increase gradually with increasing vessel traffic over the next 33 years. EIS Sections 3.2 and 3.3 discuss the nature of potential impacts. The extent of impacts would likely be limited to the immediate vicinity of the lights, and the intensity of impacts on coastal habitats and fauna would likely be undetectable.
Noise	Ongoing noise from construction occurs frequently near shores of populated areas in New England and the mid-Atlantic but infrequently offshore. Noise from construction near shore is expected to gradually increase over the next 33 years in line with human population growth along the coast of the geographic analysis area. The intensity and extent of noise from construction is	Site characterization surveys and scientific surveys are anticipated to occur infrequently over the next 33 years. Site characterization surveys typically use sub-bottom profiler technologies that generate less-intense sound waves similar to common deep-water echosounders. The intensity and extent of the resulting impacts are difficult to generalize but are likely local and temporary.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	difficult to generalize, but impacts are local and temporary. Site characterization surveys and scientific surveys are ongoing. The intensity and extent of the resulting impacts are difficult to generalize but are local and temporary. Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or the seabed can reach coastal habitats and fauna. The extent depends on pile size, hammer energy, and local acoustic conditions. Rare ongoing trenching for pipeline and cable-laying activities emits noise; cable burial via jet embedment also causes similar noise impacts. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise on coastal habitats and fauna are discountable compared to the impacts of the physical disturbance and sediment suspension.	New or expanded submarine cables and pipelines may occur in the geographic analysis area infrequently over the next 33 years. These disturbances would be temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise on coastal habitats and fauna are discountable compared to the impacts of the physical disturbance and sediment suspension.
Presence of structures	Various structures, including pilings, piers, towers, riprap, buoys, and various means of hard protection, are periodically added to the seascape, creating uncommon vertical relief in a mostly flat seascape and converting previously existing habitat (whether hard bottom or soft bottom) to a type of hard habitat, although it differs from the typical hard-bottom habitat in the geographic analysis area, namely, coarse substrates in a sand matrix. The new habitat may or may not function similarly to hard-bottom habitat typical in the region (Kerckhof et al. 2019; HDR 2019). Soft bottom is the dominant habitat type on the OCS, and structures do not meaningfully reduce the amount of soft-bottom habitat available (Guida et al. 2017; Greene et al. 2010). Structures can also create an artificial reef effect, attracting a different community of organisms. Various means of hard protection atop existing cables can create uncommon hard-bottom habitat. Where cables are buried deeply enough that protection is not used, presence of the cable and infrastructure have no impact on coastal habitats and fauna. There are no existing cables in the geographic analysis area for coastal habitats and fauna.	Any new cable or pipeline installed in the geographic analysis area would likely require hard protection atop portions of the route (see cell to the left). Such protection is anticipated to increase incrementally over the next 33 years. Where cables would be buried deeply enough that protection would not be used, presence of the cable would have no impact on coastal habitats and fauna.

CO_2 = carbon dioxide; EFH = essential fish habitat; EIS = Environmental Impact Statement; EMF = electromagnetic fields; GHG = greenhouse gas; IPF = impact-producing factor; OCS = Outer Continental Shelf

Table G.1-3: Summary of Activities and the Associated Impact-Producing Factors for Finfish, Invertebrates, and Essential Fish Habitat

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases	Releases of fuels, fluids, and hazardous materials are frequent. Impacts, including mortality, decreased fitness, and contamination of habitat, are localized and temporary, and rarely affect populations. Invasive species are periodically released accidentally during ongoing activities, including the discharge of ballast water and bilge water from marine vessels. The impacts on finfish, invertebrates, and EFH depend on many factors, but can be widespread and permanent.	Gradually increasing vessel traffic over the next 33 years would increase the risk of accidental releases. Impacts are unlikely to affect populations.
Anchoring and gear utilization	Vessel anchoring related to ongoing military use and survey, commercial, and recreational activities continues to cause temporary to permanent impacts in the immediate area where anchors and chains meet the seafloor. Impacts on finfish, invertebrates, and EFH are greatest for sensitive EFH (e.g., eelgrass, hard bottom) and sessile or slow-moving species (e.g., corals, sponges, and sedentary shellfish).	Impacts from anchoring may occur on a semi-regular basis over the next 33 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. These impacts would include increased turbidity levels and potential for contact causing mortality of benthic species and, possibly, degradation of sensitive habitats. All impacts would be localized; turbidity would be temporary; and impacts from contact would be recovered in the short term. Degradation of sensitive habitats such as certain types of hard bottom (e.g., boulder piles), if it occurs, could be long term to permanent.
Cable emplacement and maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances are local, limited to the cable corridor (refer to BOEM 2019a for details). New cables are infrequently added near shore. Cable emplacement and maintenance activities disturb, displace, and injure finfish and invertebrates and result in temporary to long-term habitat alterations. The intensity of impacts depends on the time (season) and place (habitat type) where the activities occur. Dredging results in fine sediment deposition. Ongoing cable maintenance activities also infrequently disturb bottom sediments; these disturbances are local, limited to the emplacement corridor. There are also 15 active and 4 inactive/closed dredged material disposal sites within the geographic analysis area (BOEM 2019a). Sediment deposition could have impacts on eggs and larvae, particularly demersal eggs such as longfin squid (*Doryteuthis pealeii*), which are known to have high rates of egg mortality if egg masses are exposed to abrasion or burial. Impacts may vary based on season/time of year.	Future new cables would occasionally disturb the seafloor and cause temporary increases in suspended sediment, resulting in local short-term impacts. The FCC has two pending submarine telecommunication cable applications in the North Atlantic. If the cable routes enter the geographic analysis area for this resource, short-term disturbance would be expected. The intensity of impacts would depend on the time (season) and place (habitat type) where the activities would occur.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Climate change	Continuous CO_2 emissions causing ocean acidification may contribute to reduced growth or the decline of invertebrates that have calcareous shells over the course of the next 33 years. Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters over the next 33 years, influencing the frequencies of various diseases, as well as migration and distributions of finfish, invertebrates, and EFH. This has been shown to affect the distribution of fish in the Northeast, with several species shifting their centers of biomass either northward or to deeper waters (Hare et al. 2016).	No future activities were identified within the geographic analysis area other than ongoing activities.
EMF	EMF emanates continuously from installed telecommunication and electrical power transmission cables. Biologically significant impacts on finfish, invertebrates, and EFH have not been documented for AC cables (CSA Ocean Sciences, Inc. and Exponent 2019; Thomsen et al. 2015), but behavioral impacts have been documented for benthic species (skates and lobster) near operating DC cables (Hutchison et al. 2018). The impacts are localized and affect the animals only while they are within the EMF. There is no evidence to indicate that EMF from undersea AC power cables affects commercially and recreationally important fish species within the southern New England area (CSA Ocean Sciences, Inc. and Exponent 2019).	During operations, future new cables would produce EMF. Submarine power cables in the geographic analysis area for this resource are assumed to be installed with appropriate shielding and burial depth to reduce potential EMF to low levels (MMS 2007). EMF of any two sources would not overlap (even for multiple cables within a single OECC). Although the EMF would exist as long as a cable was in operation, impacts on finfish, invertebrates, and EFH would likely be difficult to detect.
Lighting	Marine vessels have an array of lights including navigational lights and deck lights. There is little downward-focused lighting, and, therefore, only a small fraction of the emitted light enters the water. Light can attract finfish and invertebrates, potentially affecting distributions in a highly localized area. Light may also disrupt natural cycles (e.g., spawning), possibly leading to short-term impacts. Offshore buoys and towers emit light, and onshore structures, including buildings and ports, emit a great deal more on an ongoing basis. Light can attract finfish and invertebrates, potentially affecting distributions in a highly localized area. Light may also disrupt natural cycles (e.g., spawning), possibly leading to short-term impacts. Light from structures is widespread and permanent near the coast but minimal offshore.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast but minimal offshore.
Noise	Noise from aircraft reaches the sea surface on a regular basis. However, aircraft noise is not likely to affect finfish, invertebrates, and EFH, as very little of the aircraft noise propagates through the water. Noise from construction occurs frequently in near shores of populated areas in New England and the mid-Atlantic but infrequently offshore. The intensity and extent of noise from construction is difficult to generalize, but impacts are local and temporary. Ongoing site characterization surveys and scientific	Aircraft noise is likely to continue to increase as commercial air traffic increases. However, aircraft noise is not likely to affect finfish, invertebrates, and EFH. Noise from construction near shores is expected to gradually increase in line with human population growth along the coast of the geographic analysis area for this resource. Site characterization surveys and scientific surveys are anticipated to occur infrequently over

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	surveys produce noise around sites of investigation. These activities can disturb finfish and invertebrates in the immediate vicinity of the investigation and cause temporary behavioral changes. The extent depends on equipment used, noise levels, and local acoustic conditions. Some finfish and invertebrates may be able to hear the continuous underwater noise of operational WTGs. As measured at the Block Island Wind Farm, this low frequency noise barely exceeds ambient levels at 164 feet from the WTG base. Based on the results of Thomsen et al. (2015), SPLs would be at or below ambient levels at relatively short distances (approximately 164 feet) from WTG foundations. These low levels of elevated noise likely have little to no impact. Noise is also created by operations and maintenance of marine minerals extraction and commercial fisheries, each of which has minimal and local impacts. Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or the seabed can cause injury and/or mortality to finfish and invertebrates in a small area around each pile and cause short-term stress and behavioral changes to individuals over a greater area. Eggs, embryos, and larvae of finfish and invertebrates could also experience developmental abnormalities or mortality resulting from this noise, although thresholds of exposure are not known (Weilgart 2018; Hawkins and Popper 2017). Potentially injurious noise could also be considered as rendering EFH temporarily unavailable or unsuitable for the duration of the noise. The extent depends on pile size, hammer energy, and local acoustic conditions. Infrequent trenching activities for pipeline and cable laying, as well as other cable burial methods, emit noise. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of this noise are typically less prominent than the impacts of the physical disturbance and sediment suspension. While ongoing vessel noise may have some impact on behavior, it is likely limited to brief startle and temporary stress responses. Ongoing activities that contribute to this include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels.	the next 33 years. Site characterization surveys typically use sub-bottom profiler technologies that generate less-intense sound waves, similar to common deep-water echosounders. The intensity and extent of the resulting impacts are difficult to generalize but are likely local and temporary. New or expanded marine minerals extraction and commercial fisheries may intermittently increase noise during their operations and maintenance over the next 33 years. Impacts would likely be minimal and local. New or expanded submarine cables and pipelines are likely to occur in the geographic analysis area for this resource. These disturbances would be infrequent over the next 33 years, temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of this noise are typically less prominent than the impacts of the physical disturbance and sediment suspension.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Port utilization	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance, including dredging. Port utilization is expected to increase over the next 33 years.	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future. In addition, the general trend along the coast from Virginia to Maine is that port activity will increase modestly. The ability of ports to receive the increase may require port modifications, leading to local impacts. Future channel-deepening activities will likely be undertaken. Existing ports have already affected finfish, invertebrates, and EFH, and future port projects would implement BMPs to minimize impacts. Although the degree of impacts on EFH would likely be undetectable outside the immediate vicinity of the ports, impacts on EFH for certain species and/or life stages may lead to impacts on finfish and invertebrates beyond the vicinity of the port.
Presence of structures	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. The lost gear, moved by currents, can disturb habitats and potentially harm individuals, creating minimal, localized, and short-term impacts. Human-made structures, especially tall vertical structures such as foundations for towers of various purposes, continuously alter local water flow at a fine scale. Water flow typically returns to background levels within a relatively short distance from the structure. Therefore, impacts on finfish, invertebrates, and EFH are typically undetectable. Impacts of structures influencing primary productivity and higher trophic levels are possible but are not well understood. New structures are periodically added. Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables create uncommon relief in a mostly sandy seascape. Structure-oriented species are attracted to these locations and, thus, benefit on a constant basis (Claisse et al. 2014; Smith et al. 2016); however, the diversity may decline over time as early colonizers are replaced by successional communities dominated by mussels and anemones (Degraer et al. 2019). New surfaces can also be colonized by invasive species (e.g., certain tunicate species) found in hard-bottom habitats on Georges Bank (Frady and Mecray 2004). Structures are periodically added, resulting in the conversion of existing soft-bottom and hard-bottom habitat to the new hard-structure habitat. Soft bottom is the dominant habitat type from Cape Hatteras to the Gulf of Maine (over 60 million acres), and species that rely on this habitat would not likely experience	Tall vertical structures can increase seabed scour and sediment suspension. Impacts would likely be highly localized and difficult to detect. Impacts of structures influencing primary productivity and higher trophic levels are possible but are not well understood. New cables, installed incrementally in the geographic analysis area for finfish, invertebrates, and EFH over the next 20 to 33 years, would likely require hard protection atop portions of the route (see the cable emplacement and maintenance IPF in this table). The impacts of the presence of these structures described for ongoing activities would continue. The infrequent installation of future new structures in the marine environment over the next 33 years may attract finfish and invertebrates that approach the structures during their migrations, which could slow migrations. However, temperature would continue to be a bigger driver of habitat occupation and species movement.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	population-level impacts (Guida et al. 2017; Greene et al. 2010). Human structures in the marine environment (e.g., shipwrecks, artificial reefs, and oil platforms) can attract finfish and invertebrates that approach the structures during their migrations, which could slow migrations. However, temperature is expected to be a bigger driver of habitat occupation and species movement than structure (Moser and Shepherd 2009; Fabrizio et al. 2014; Secor et al. 2018). There is no evidence to suggest that structures pose a barrier to migratory animals. Regulated fishing effort results in the removal of a substantial amount of the annually produced biomass of commercially regulated finfish and invertebrates and can also influence bycatch of non-regulated species. Ongoing commercial and recreational regulations for finfish and shellfish implemented and enforced by states, municipalities, and/or NOAA, depending on jurisdiction, affect finfish, invertebrates, and EFH by modifying the nature, distribution, and intensity of fishing-related impacts, including those that disturb the seafloor (trawling, dredge fishing).	

AC = alternating current; BMP = best management practice; BOEM = Bureau of Ocean Energy Management; CO_2 = carbon dioxide; DC = direct current; EFH = essential fish habitat; EMF = electromagnetic fields; FCC = Federal Communications Commission; GHG = greenhouse gas; IPF = impact-producing factor; NOAA = National Oceanic and Atmospheric Administration; OCS = Outer Continental Shelf; OECC = offshore export cable corridor; SPL = sound pressure level; WTG = wind turbine generator

Table G.1-4: Summary of Activities and the Associated Impact-Producing Factors for Marine Mammals

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases	Releases of fuel, fluids, and hazardous materials are frequent. Marine mammal exposure to aquatic contaminants and inhalation of fumes from oil spills can result in mortality or sublethal impacts on the individual fitness, including adrenal impacts, hematological impacts, liver impacts, lung disease, poor body condition, skin lesions, and several other health affects attributed to oil exposure (Kellar et al. 2017; Mazet et al. 2001; Mohr et al. 2008; Smith et al. 2017; Sullivan et al. 2019; Takeshita et al. 2017). Additionally, accidental releases may result in impacts on marine mammals due to impacts on prey species. Trash and debris may be accidentally discharged through fisheries use; dredged material ocean disposal; marine minerals extraction; marine transportation; navigation and traffic; survey activities; cables, lines and pipeline laying; and debris carried in river outflows or windblown from onshore. Accidental releases of trash and debris are expected to be low quantity, local, and low-impact events. Worldwide, 62 of 123 (50.4 percent) marine mammal species have been documented ingesting marine litter (Werner et al. 2016). Stranding data indicate potential debris induced	Gradually increasing vessel traffic over the next 33 years would increase the risk of accidental releases of fuel, fluids, hazardous materials, trash, and debris. The impacts described under ongoing activities would continue and increase along with increasing vessel traffic.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	mortality rates of 0 to 22 percent. Mortality has been documented in cases of debris interactions, as well as blockage of the digestive track, disease, injury, and malnutrition (Baulch and Perry 2014). However, it is difficult to link physiological impacts on individuals to population-level impacts (Browne et al. 2015).	
Anchoring and gear utilization	Vessel anchoring related to ongoing military use and survey, commercial, and recreational activities continue to cause temporary to permanent impacts in the immediate area where anchors and chains meet the seafloor. Impacts on marine mammals could include entanglement and/or entrapment.	Impacts from anchoring may occur on a semi-regular basis over the next 33 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. These impacts would include entanglement and/or entrapment. All impacts on marine mammals are expected to be negligible based on the limited number of associated buoy lines, the short duration of sampling events, and low probability for gear entanglement given the short-term, low-intensity, and localized nature of the impacts.
Cable emplacement and maintenance	Cable maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances will be local and generally limited to the emplacement corridor. Data are not available regarding marine mammal avoidance of localized turbidity plumes; however, Todd et al. (2015) suggest that since some marine mammals often live in turbid waters and some species of mysticetes and sirenians employ feeding methods that create sediment plumes, some species of marine mammals have a tolerance for increased turbidity. Similarly, McConnell et al. (1999) documented movements and foraging of gray seals (*Halichoerus grypus*) in the North Sea. One tracked individual was blind in both eyes but otherwise healthy. Despite being blind, observed movements were typical of the other study individuals, indicating that visual cues are not essential for gray seal foraging and movement (McConnell et al. 1999). If elevated turbidity caused any behavioral responses such as avoiding the turbidity zone or changes in foraging behavior, such behaviors would be temporary, and any impacts would be temporary and short term. Turbidity associated with increased sedimentation may result in temporary and short-term impacts on marine mammal prey species.	The FCC has two pending submarine telecommunication cable application in the North Atlantic. The impact on water quality from sediment suspension during cable emplacement would be temporary and short term. If elevated turbidity caused any behavioral responses such as avoidance of the turbidity zone or changes in foraging behavior, such behaviors would be temporary, and any impacts would be temporary and short term.
Climate change	Increased storm frequency could result in increased energetic costs for marine mammals and reduced fitness, particularly for juveniles, calves, and pups. Ocean acidification has the potential to lead to long-term and high-consequence impacts on marine ecosystems by contributing to reduced growth or the decline of invertebrates that have calcareous shells. Altered habitat/ecology has the potential to lead to long-term and high-consequence impacts on marine mammals as a result of changes in distribution, reduced	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	breeding, and/or foraging habitat availability, and disruptions in migration. Altered migration patterns have the potential to lead to long-term and high-consequence impacts on marine mammals. For example, the NARW (*Eubalaena glacialis*) appears to be migrating differently and feeding in different areas in response to changes in prey densities related to climate change (Record et al. 2019; MacLeod 2009; Nunny and Simmonds 2019.) Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters, influencing the frequencies of various diseases of marine mammals, such as Phocine distemper. Climate change is influencing infectious disease dynamics in the marine environment; however, no studies have shown a definitive causal relationship between any components of climate change and increases in infectious disease among marine mammals. This is due in large part to a lack of sufficient data and the likely indirect nature of climate change's impact on these diseases. Climate change could potentially affect the incidence or prevalence of infection, the frequency or magnitude of epizootics, and/or the severity or presence of clinical disease in infected individuals. There are a number of potential proposed mechanisms by which this might occur (see summary in Burge et al. 2014). Increased erosion could impact seal haul outs, reducing their habitat availability, especially as things like sea walls are added, blocking seals access to shore.	
EMF	EMF emanate constantly from installed telecommunication and electrical power transmission cables. In the marine mammal geographic analysis area, there are six existing power cables connecting Martha's Vineyard and Nantucket to the mainland. Marine mammals appear to have a detection threshold for magnetic intensity gradients (i.e., changes in magnetic field levels with distance) of 0.1 percent of the earth's magnetic field or about 0.05 μT (Kirschvink 1990) and are, thus, likely to be very sensitive to minor changes in magnetic fields (Walker et al. 2003). There is a potential for animals to react to local variations of the geomagnetic field caused by power cable EMF. Depending on the magnitude and persistence of the confounding magnetic field, such an impact could cause a trivial temporary change in swim direction or a longer detour during the animal's migration (Gill et al. 2005). Such an impact on marine mammals is more likely to occur with DC cables than with AC cables (Normandeau et al. 2011). However, there are numerous transmission cables installed across the seafloor, and no impacts on marine mammals have been demonstrated from this source of EMF.	During operations, future new cables would produce EMF. Submarine power cables in the marine mammal geographic analysis area are assumed to be installed with appropriate shielding and burial depth to reduce potential EMF to low levels (MMS 2007). EMF of any two sources would not overlap. Although the EMF would exist as long as a cable was in operation, impacts, if any, would likely be difficult to detect, if they occur at all. Marine mammals have the potential to react to submarine cable EMF; however, no impacts from the numerous submarine cables have been observed. Further, EMF would be limited to extremely small portions of the areas used by migrating marine mammals. As such, exposure to EMF would be low; as a result, impacts on marine mammals would not be expected.
Noise	Aircraft routinely travel in the marine mammal geographic analysis area. With the possible exception	Future low altitude aircraft activities such as survey activities and U.S. Navy training

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	of rescue operations, no ongoing aircraft flights would occur at altitudes that would elicit a response from marine mammals. If flights are at a sufficiently low altitude, marine mammals may respond with behavioral changes, including short surface durations, abrupt dives, and percussive behaviors (i.e., breaching and tail slapping) (Patenaude et al. 2002). These brief responses would be expected to dissipate once the aircraft has left the area. Similarly, aircraft have the potential to disturb hauled out seals if aircraft overflights occur within 2,000 feet of a haul out area (Efroymson et al. 2000). However, this disturbance would be temporary, short term, and result in minimal energy expenditure. These brief responses would be expected to dissipate once the aircraft has left the area. Infrequent site characterization surveys and scientific surveys produce high-intensity impulsive noise around sites of investigation. These activities have the potential to result in high-intensity, high-consequence impacts, including auditory injuries, stress, disturbance, and behavioral responses, if present within the ensonified area (NOAA 2018). Survey protocols and underwater noise mitigation procedures are typically implemented to decrease the potential for any marine mammal to be within the area where sound levels are above relevant harassment thresholds associated with an operating sound source to reduce the potential for behavioral responses and injury (PTS/TTS) close to the sound source. The magnitude of impacts, if any, is intrinsically related to many factors, including acoustic signal characteristics, behavioral state (e.g., migrating), biological condition, distance from the source, duration, and level of the sound exposure, as well as environmental and physical conditions that affect acoustic propagation (NOAA 2018). Marine mammals would be able to hear the continuous underwater noise of operational WTGs. As measured at the Block Island Wind Facility, this low frequency noise barely exceeds ambient levels at 164 feet from the WTG base. Based on the results of Thomsen et al. (2015) and Kraus et al. (2016), SPLs would be at or below ambient levels at relatively short distances from the WTG foundations. Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or the seabed can result in high-intensity, low-exposure level, long-term but localized intermittent risk to marine mammals. Impacts would be localized in nearshore waters. Pile-driving activities may affect marine mammals during foraging, orientation, migration, predator detection, social interactions, or other activities (Southall et al. 2007). Noise exposure associated with pile-driving activities can interfere with these functions and have the potential to cause a range of responses, including insignificant behavioral changes, avoidance of the ensonified area,	operations could result in short-term responses of marine mammals to aircraft noise. If flights are at a sufficiently low altitude, marine mammals may respond with behavior changes, including short surface durations, abrupt dives, and percussive behaviors (i.e., breaching and tail slapping) (Patenaude et al. 2002). These brief responses would be expected to dissipate once the aircraft has left the area. Site characterization surveys and scientific surveys are anticipated to occur infrequently over the next 33 years. Site characterization surveys typically use sub-bottom profiler technologies that generate less-intense sound waves similar to common deep-water echosounders. The intensity and extent of the resulting impacts are difficult to generalize but are likely local and temporary. Cable-laying impacts resulting from future non-offshore wind activities would be identical to those described for future offshore wind projects. Any offshore projects that require the use of ocean vessels could potentially result in long-term but infrequent impacts on marine mammals, including temporary startle responses, masking of biologically relevant sounds, physiological stress, and behavioral changes. However, these brief responses of individuals to passing vessels would be unlikely given the patchy distribution of marine mammals, and no stock or population-level impacts would be expected.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	PTS, harassment, and ear injury, depending on the intensity and duration of the exposure. BOEM assumes that all ongoing and potential future activities will be conducted in accordance with a Project-specific IHA to minimize impacts on marine mammals. There is a moderate risk of UXOs being present within the SWDA and OECC. Although the preferred approach for dealing with UXOs is to avoid altogether, they may require physical removal (low-order disposal) or in-situ detonations (high-order disposal). Due to the proposed mitigation and monitoring measures (EIS Appendix H, Mitigation and Monitoring) and the relatively small size of the peak pressure and acoustic impulse threshold ranges compared to PTS and TTS ranges for potential UXO detonations, no non-auditory injury or mortality is expected for any species (JASCO 2022). There is, however, potential for PTS and TTS during this activity particularly for high frequency cetaceans. Ongoing activities that contribute to vessel noise include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels, as well as other construction vessels. The frequency range for vessel noise falls within marine mammals' known range of hearing and would be audible. Noise from vessels presents a long-term and widespread impact on marine mammals across most oceanic regions. While vessel noise may have some impact on marine mammal behavior, it would be limited to brief startle and temporary stress response. Results from studies on acoustic impacts from vessel noise on odontocetes indicate that small vessels at a speed of 5 knots in shallow coastal water can reduce the communication range for bottlenose dolphins within 164 feet of the vessel by 26 percent (Jensen et al. 2009). Pilot whales, in a quieter, deep-water habitat, could experience a 50 percent reduction in communication range from a similar size boat and speed (Jensen et al. 2009). Since lower frequencies propagate farther from the sound source compared to higher frequencies, low frequency cetaceans are at a greater risk of experiencing harassment from vessel traffic.	
Port utilization	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. Port expansion activities are localized to nearshore habitats and are expected to result in temporary and short-term impacts, if any, on marine mammals. Vessel noise may affect marine mammals, but the response would be temporary and short term. The impacts on water quality (and, thus, on marine mammals) from sediment suspension during port expansion activities is temporary, short term, and would be similar to those described under the cable emplacement and maintenance IPF in this table.	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. In addition, the general trend along the coastal region from Virginia to Maine is that port activity will increase modestly. The ability of ports to receive the increase in larger ships will require port modifications. Future channel-deepening activities are being undertaken to accommodate deeper draft vessels for the Panama Canal Locks. The additional traffic and larger vessels could have impacts on water quality (and, thus, on increases in suspended sediments

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
		and the potential for accidental discharges). The increased sediment suspension could be long term, depending on the vessel traffic increase. However, the existing suspended sediment concentrations in Nantucket Sound are already 45-71 mg/L, which is fairly high. Impacts from vessel traffic are likely to be masked by the natural variability. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future. Additional impacts associated with the increased risk of vessel strike could also occur.
Presence of structures	There are more than 130 artificial reefs in the Mid-Atlantic region. Entanglement or ingestion of lost fishing gear may result in long-term and high-intensity impacts, but with low exposure due to localized and geographic spacing of artificial reefs, long term. Currently, bridge foundations and the Block Island Wind Facility may be considered artificial reefs and may have higher levels of recreational fishing, which increases the chances of marine mammals encountering lost fishing gear, resulting in possible ingestions, entanglement, injury, or death of individuals (Moore and van der Hoop 2012) if present near shore where these structures are located. There are very few, if any, areas within the geographic analysis area for marine mammals that would serve to concentrate recreational fishing and increase the likelihood that marine mammals would encounter lost fishing gear. There are more than 130 artificial reefs in the Mid-Atlantic region. Hard-bottom (scour control and rock mattresses) and vertical structures (bridge foundations and Block Inland Wind Facility WTGs) in a soft-bottom habitat can create artificial reefs, thus inducing the reef effect (Taormina et al. 2018; NMFS 2015). The reef effect is usually considered a beneficial impact, associated with higher densities and biomass of fish and decapod crustaceans (Taormina et al. 2018), providing a potential increase in available forage items and shelter for seals and small odontocetes compared to the surrounding soft bottoms. No ongoing activities in the marine mammal geographic analysis area beyond offshore wind facilities are measurably contributing to avoidance/displacement, behavior disruption related to breeding and migration, or displacement into higher risk areas. There may be some impacts resulting from the existing Block Island Wind Facility but given that there are only five WTGs, no measurable impacts are occurring.	The presence of structures associated with non-offshore wind development in nearshore coastal waters have the potential to provide habitat for seals and small odontocetes, as well as preferred prey species. Bridge foundations will continue to provide foraging opportunities for seals and small odontocetes with measurable benefits to some individuals. Hard-bottom (scour control and rock mattresses used to bury the offshore export cables) and vertical structures (i.e., WTG and ESP foundations) in a soft-bottom habitat can create artificial reefs, thus inducing the reef effect (Taormina et al. 2018; Causon and Gill 2018). The reef effect is usually considered a beneficial impact, associated with higher densities and biomass of fish and decapod crustaceans (Taormina et al. 2018), providing a potential increase in available forage items and shelter for marine mammals compared to the surrounding soft bottoms. This reef effect has the potential to result in long-term and low-intensity beneficial impacts.
Traffic	Current activities that are contributing to vessel traffic include port traffic levels, fairways, traffic separation schemes, commercial vessel traffic, recreational and fishing activity, and scientific and academic vessel traffic. Vessel strike is relatively common with	Vessel traffic associated with non-offshore wind development has the potential to result in an increased collision risk. While these impacts would be high consequence, the patchy distribution of marine mammals makes stock or

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	cetaceans (Kraus et al. 2005) and one of the primary causes of death to NARWs, with as many as 75 percent of known anthropogenic mortalities of NARWs likely resulting from collisions with large ships along the U.S. and Canadian eastern seaboard (Kite-Powell et al. 2007). Marine mammals are more vulnerable to vessel strike when they are within the draft of the vessel and beneath the surface and not detectable by visual observers. Some conditions that make marine mammals less detectable include weather conditions with poor visibility (e.g., fog, rain, and wave height) or nighttime operations. Vessels operating at speeds exceeding 10 knots have been associated with the highest risk for vessel strikes of NARWs (Vanderlaan and Taggart 2007). Reported vessel collisions with whales show that serious injury rarely occurs at speeds below 10 knots (Laist et al. 2001). Data show that the probability of a vessel strike increases with the velocity of a vessel (Pace and Silber 2005; Vanderlaan and Taggart 2007).	population-level impacts on most species unlikely (U.S. Navy 2018). However, some species of baleen whales that spend considerable time at the surface, including NARW, are more susceptible to vessel strike. Vessel strike is a primary cause of NARW mortality, and vessel strikes associated with future non-offshore wind activities have some potential for stock or population-level impacts on the species.

µT = microtesla; AC = alternating current; BOEM = Bureau of Ocean Energy Management; DC = direct current; EMF = electromagnetic fields; ESP = electrical service platform; FCC = Federal Communications Commission; GHG = greenhouse gas; IHA = Incidental Harassment Authorization; IPF = impact-producing factor; mg/L = milligrams per liter; NARW = North Atlantic right whale; OCS = Outer Continental Shelf; OECC = offshore export cable corridor; PTS = permanent threshold shift; SPL = sound pressure level; SWDA = Southern Wind Development Area; TTS = temporary threshold shift; WTG = wind turbine generator; UXO = unexploded ordnance

Table G.1-5: Summary of Activities and the Associated Impact-Producing Factors for Sea Turtles

Associated IPF	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases	Releases of fuel, fluids, and hazardous materials occur frequently. Sea turtle exposure to aquatic contaminants and inhalation of fumes from oil spills can result in mortality (Shigenaka et al. 2010) or sublethal impacts on individual fitness, including adrenal impacts, dehydration, hematological impacts, increased disease incidence, liver impacts, poor body condition, skin impacts, skeletomuscular impacts, and several other health impacts that can be attributed to oil exposure (Bembenek-Bailey et al. 2019; Camacho et al. 2013; Mitchelmore et al. 2017; Shigenaka et al. 2010; Vargo et al. 1986). Additionally, accidental releases may result in impacts on sea turtles due to impacts on prey species. Trash and debris may be accidentally discharged through fisheries use; dredged material ocean disposal; marine minerals extraction; marine transportation; navigation and traffic; survey activities; cables, lines, and pipeline laying; and debris carried in river outflows or windblown from onshore. Accidental releases of trash and debris are expected to be low quantity, local, and low-impact events. Direct ingestion of plastic fragments is well documented and has been observed in all species of sea turtles (Bugoni et al. 2001; Hoarau et al. 2014; Nelms et al. 2016; Schuylar et al. 2014). In addition to plastic debris, ingestion of tar, paper, Styrofoam™, wood, reed, feathers, hooks, lines, and net fragments has also been documented (Tomás et al. 2002). Ingestion can also occur	Gradually increasing vessel traffic over the next 33 years would increase the risk of accidental releases of fuel, fluids, hazardous materials, trash, and debris, as well as the associated impacts described for ongoing activities.

Associated IPF	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	when individuals mistake debris for potential prey items (Gregory 2009; Hoarau et al. 2014; Tomás et al. 2002). Potential ingestion of marine debris varies among species and life history stages due to differing feeding strategies (Nelms et al. 2016). Ingestion of plastics and other marine debris can result in both lethal and sublethal impacts on sea turtles, with sublethal impacts more difficult to detect (Gall and Thompson 2015; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014). Long-term sublethal impacts may include dietary dilution, chemical contamination, depressed immune system function, and poor body condition, as well as reduced growth rates, fecundity, and reproductive success. However, these impacts are cryptic, and clear causal links are difficult to identify (Nelms et al. 2016).	
Cable emplacement and maintenance	Cable maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances will be local and generally limited to the emplacement corridor. Data are not available regarding impacts of suspended sediments on adult and juvenile sea turtles, although elevated suspended sediments may cause individuals to alter normal movements and behaviors. However, these changes are expected to be too small to be detected (BOEM 2023). Sea turtles would be expected to swim away from the sediment plume. Elevated turbidity is most likely to affect sea turtles if a plume causes a barrier to normal behaviors, but no impacts would be expected due to swimming through the plume (BOEM 2023). Turbidity associated with increased sedimentation may result in short-term and temporary impacts on sea turtle prey species.	The FCC has two pending submarine telecommunication cable applications in the North Atlantic. The impact on water quality from sediment suspension during cable emplacement is short term and temporary. If elevated turbidity caused any behavioral responses, such as avoidance of the turbidity zone or changes in foraging behavior, such behaviors would be temporary. Any impacts would be short term and temporary. Turbidity associated with increased sedimentation may result in short-term and temporary impacts on some sea turtle prey species.
Climate change	Increased storm frequency could lead to long-term and high-consequence impacts on sea turtle onshore beach nesting habitat, including changes to nesting periods, changes in sex ratios of nestlings, drowned nests, and loss or degradation of nesting beaches. Offshore impacts, including sedimentation of nearshore hard-bottom habitats, have the potential to result in long-term and high-consequence changes to foraging habitat availability for green turtles (*Chelonia mydas*). Ocean acidification has the potential to lead to long-term and high-consequence impacts on marine ecosystems by contributing to reduced growth or the decline of invertebrates that have calcareous shells. Altered habitat/ecology has the potential to lead to long-term and high-consequence impacts on sea turtles by influencing distributions of sea turtles and/or prey resources, as well as sea turtle breeding, foraging, and sheltering habitat use. Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters, influencing the frequencies of various diseases of sea turtles such as fibropapillomatosis. Climate change can also lead to long-term and high-	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPF	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	consequence impacts on sea turtle habitat use and migratory patterns. The proliferation of coastline protections has the potential to result in long-term and high-consequence impacts on sea turtle nesting by eliminating or precluding access to potentially suitable nesting habitat or access to potentially suitable habitat. Sediment erosion and/or deposition in coastal waters have the potential to result in long-term and high-consequence impacts on green sea turtle foraging habitat. Additionally, sediment erosion has the potential to result in the degradation or loss of potentially suitable nesting habitat.	
EMF	EMF emanate constantly from installed telecommunication and electrical power transmission cables. In the geographic analysis area, there are six existing power cables connecting Martha's Vineyard and Nantucket to the mainland. Sea turtles appear to have a detection threshold of magnetosensitivity and behavioral responses to field intensities ranging from 0.0047 to 4,000 µT for loggerhead turtles (*Caretta caretta*), and 29.3 to 200 µT for green turtles, with other species likely similar due to anatomical, behavioral, and life history similarities (Normandeau et al. 2011). Juvenile or adult sea turtles foraging on benthic organisms may be able to detect magnetic fields while they are foraging on the bottom near the cables and potentially up to 82 feet in the water column above the cable. Juvenile and adult sea turtles may detect the EMF over relatively small areas near cables (e.g., when resting on the bottom or foraging on benthic organisms near cables or concrete mattresses). There are no data on sea turtle impacts from EMF generated by underwater cables, although anthropogenic magnetic fields can influence migratory deviations (Luschi et al. 2007; Snoek et al. 2016). However, any potential impacts from AC cables on turtle navigation or orientation would likely be undetectable under natural conditions and, thus, would be insignificant (Normandeau et al. 2011).	During operations, future new cables would produce EMF. Submarine power cables in the geographic analysis area for sea turtles are assumed to be installed with appropriate shielding and burial depth to reduce potential EMF to low levels (MMS 2007). EMF of any two sources would not overlap. Although the EMF would exist as long as a cable was in operation, impacts, if any, would likely be difficult to detect, if they occur at all. Further, EMF would be limited to extremely small portions of the areas used by resident or migrating sea turtles. As such, exposure to EMF would be low; as a result, impacts on sea turtles would not be expected.
Lighting	Ocean vessel, such as ongoing commercial vessel traffic, recreational and fishing activity, and scientific and academic research, traffic have an array of lights including navigational, deck lights, and interior lights. Such lights have some limited potential to attract sea turtles, although the impacts, if any, are expected to be localized and temporary. Artificial lighting on nesting beaches or in nearshore habitats has the potential to result in disorientation to nesting females and hatchling turtles. Artificial lighting on the OCS does not appear to have the same potential for impact. Decades of oil and gas platform operation in the Gulf of Mexico, with considerably more lighting than offshore WTGs, has not resulted in any known impacts on sea turtles (BOEM 2023).	Construction, operations, and decommissioning vessels associated with non-offshore wind activities produce temporary and localized light sources that could result in the attraction or avoidance behavior of sea turtles. These short-term impacts are expected to be of low intensity and occur infrequently. Non-offshore wind activities would not be expected to appreciably contribute to structure lighting. As such, no impact on sea turtles would be expected.

Associated IPF	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Noise	Aircraft routinely travel in the geographic analysis area for sea turtles. With the possible exception of rescue operations, no ongoing aircraft flights would occur at altitudes that would elicit a response from sea turtles. If flights are at a sufficiently low altitude, sea turtles may respond with a startle response (diving or swimming away), altered submergence patterns, and a temporary stress response (NSF and USGS 2011; Samuel et al. 2005). These brief responses would be expected to dissipate once the aircraft has left the area. Infrequent site characterization surveys and scientific surveys produce high-intensity impulsive noise around sites of investigation. These activities have the potential to result in some impacts, including potential auditory injuries, short-term disturbance, behavioral responses, and short-term displacement of feeding or migrating leatherback sea turtles (*Dermochelys coriacea*) and possibly loggerhead sea turtles, if present within the ensonified area (NSF and USGS 2011). The potential for PTS and TTS is considered possible in proximity to G&G surveys, but impacts are unlikely, as turtles would be expected to avoid such exposure, and survey vessels would pass quickly (NSF and USGS 2011). No significant impacts would be expected at the population level. Site characterization surveys typically use sub-bottom profiler technologies that generate less-intense sound waves similar to common deep-water echosounders. The intensity and extent of the resulting impacts are difficult to generalize but are likely local and temporary. Sea turtles would be able to hear the continuous underwater noise of operational WTGs. As measured at the Block Island Wind Facility, this low frequency noise barely exceeds ambient levels at 164 feet from the WTG base (Miller and Potty 2017). Based on the results of Thomsen et al. (2015) and Kraus et al. (2016), SPLs would be at or below ambient levels at relatively short distances from the WTG foundations. Furthermore, no information suggests that such noise would affect turtles. Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or the seabed can result in high-intensity, low-exposure levels, and long-term but localized intermittent risk to sea turtles. Impacts, potentially including behavioral responses, masking, TTS, and PTS, would be localized in nearshore waters. Data regarding threshold levels for impacts on sea turtles from sound exposure during pile driving are very limited, and no regulatory threshold criteria have been established for sea turtles. BOEM and NMFS have adopted the following thresholds based on current literature: • Potential mortal injury: 210 dB cumulative SPL or greater than 207 dB peak SPL (Popper et al. 2014)	Future low altitude aircraft activities such as survey activities and U.S. Navy training operations could result in short-term responses of sea turtles to aircraft noise, similar to those described for ongoing activities. Site characterization surveys and scientific surveys are anticipated to occur infrequently over the next 33 years. Impacts of these activities would be similar to those described for ongoing activities. Cable-laying impacts resulting from future non-offshore wind activities would be identical to those described for future offshore wind projects (EIS Section 3.8, Sea Turtles). Any offshore projects that require the use of ocean vessels could potentially result in long-term but infrequent impacts on sea turtles, including temporary startle responses, masking of biologically relevant sounds, physiological stress, and behavioral changes, especially their submergence patterns (NSF and USGS 2011; Samuel et al. 2005). However, these brief responses of individuals to passing vessels would be unlikely given the patchy distribution of sea turtles, and no stock or population-level impacts would be expected.

Associated IPF	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	• Behavioral disturbance: 166 dB referenced to 1 µPa RMS The frequency range for vessel noise (10 to 1,000 Hz; MMS 2007) overlaps with sea turtles' known hearing range (less than 1,000 Hz with maximum sensitivity between 200 to 700 Hz; Bartol 1999) and would, therefore, be audible. However, Hazel et al. (2007) suggested that sea turtles' ability to detect approaching vessels is primarily vision-dependent, not acoustic. Sea turtles may respond to vessel approach and/or noise with a startle response (diving or swimming away) and a temporary stress response (NSF and USGS 2011). Samuel et al. (2005) indicated that vessel noise could affect sea turtle behavior, especially their submergence patterns.	
Port utilization	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. Port expansion activities are localized to nearshore habitats and are expected to result in short-term and temporary impacts, if any, on sea turtles. Vessel noise may affect sea turtles, but response would likely be short term and temporary. The impact on water quality from sediment suspension during port expansion activities is short term and temporary and would be similar to those described under the cable emplacement and maintenance IPF in this table.	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. In addition, the general trend along the coastal region from Virginia to Maine is that port activity will increase modestly. The ability of ports to receive the increase in larger ships will require port modifications. Future channel-deepening activities are being undertaken to accommodate deeper draft vessels for the Panama Canal Locks. The additional traffic and larger vessels could have impacts on water quality through increases in suspended sediments and the potential for accidental discharges. The increased sediment suspension could be long term depending on the vessel traffic increase. However, the existing suspended sediment concentrations in Nantucket Sound are already 45 to 71 mg/L, which is fairly high. Impacts from vessel traffic are likely to be masked by the natural variability. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future. Additional impacts associated with the increased risk of vessel strikes could also occur.
Presence of structures	The Mid-Atlantic region has more than 130 artificial reefs. Entanglement or ingestion of lost fishing gear may result in long-term and high-intensity impacts, but with low exposure due to localized and geographic spacing of artificial reefs. Currently, bridge foundations and the Block Island Wind Facility may be considered artificial reefs and may have higher levels of recreational fishing, which increases the chances of sea turtles encountering lost fishing gear, resulting in possible ingestions, entanglement, injury, or death of individuals (Berreiros and Raykov 2014; Gregory 2009; Vegter et al. 2014) if present near shore, where these structures are located. There are very few, if any, areas in the geographic	The presence of structures associated with non-offshore wind development in nearshore coastal waters has the potential to provide habitat for sea turtles, as well as preferred prey species. This reef effect has the potential to result in long-term and low-intensity beneficial impacts. Bridge foundations will continue to provide foraging opportunities for sea turtles with measurable benefits to some individuals.

Associated IPF	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	analysis area for sea turtles that would serve to concentrate recreational fishing and increase the likelihood that sea turtles would encounter lost fishing gear. The Mid-Atlantic region has more than 130 artificial reefs. Hard-bottom (scour control and rock mattresses) and vertical structures (bridge foundations and Block Inland Wind Facility WTGs) in a soft-bottom habitat can create artificial reefs, thus inducing the reef effect (Taormina et al. 2018). The reef effect is usually considered a beneficial impact, associated with higher densities and biomass of fish and decapod crustaceans (Taormina et al. 2018), providing a potential increase in available forage items and shelter for sea turtles compared to the surrounding soft bottoms. No ongoing activities in the geographic analysis area for sea turtles beyond offshore wind facilities are measurably contributing to avoidance/displacement. There may be some impacts resulting from the existing Block Island Wind Facility, but given that there are only five WTGs, no measurable impacts are occurring. No ongoing activities in the geographic analysis area for sea turtles beyond offshore wind facilities are measurably contributing to behavioral disruption related to breeding and migration or displacement into higher risk areas.	
Traffic	Current activities contributing to vessel collisions include port traffic levels, fairways, traffic separation schemes, commercial vessel traffic, recreational and fishing activity, and scientific and academic vessel traffic. Propeller and collision injuries from boats and ships are common in sea turtles. Vessel strike is an increasing concern for sea turtles, especially in the southeastern United States, where development along the coast is likely to result in increased recreational boat traffic. In the United States, the percentage of strandings of loggerhead sea turtles that were attributed to vessel strikes increased from approximately 10 percent in the 1980s to a record high of 20.5 percent in 2004 (NMFS and USFWS 2007). Sea turtles are most susceptible to vessel collisions in coastal waters, where they forage from May through November. Vessel speed may exceed 10 knots in such waters, and those vessels traveling at greater than 10 knots would pose the greatest threat to sea turtles.	Vessel traffic associated with non-offshore wind development has the potential to result in an increased collision risk. Sea turtles are most susceptible to vessel collisions in coastal waters, where they forage from May through November. Vessel speed may exceed 10 knots in such waters, and those vessels traveling at greater than 10 knots would pose the greatest threat to sea turtles.

µT = microtesla; AC = alternating current; BOEM = Bureau of Ocean Energy Management; dB = decibel; EIS = Environmental Impact Statement; EMF = electromagnetic fields; FCC = Federal Communications Commission; G&G = geological and geophysical; GHG = greenhouse gas; Hz = hertz; IPF = impact-producing factor; mg/L = milligrams per liter; NMFS = National Marine Fisheries Service; OCS = Outer Continental Shelf; PTS = permanent threshold shift; RMS = root mean squared; SPL = sound pressure level; TTS = temporary threshold shift; WTG = wind turbine generator

Table G.1-6: Summary of Activities and the Associated Impact-Producing Factors for Commercial Fisheries and For-Hire Recreational Fishing

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Anchoring and gear utilization	Impacts from anchoring occur due to ongoing military, survey, commercial, and recreational activities. The short-term and localized impact on this resource is the presence of a navigational hazard (anchored vessel) to fishing vessels.	Impacts from anchoring may occur on a semi-regular basis over the next 33 years due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. Anchoring could pose a temporary (hours to days), localized (within hundreds of feet of anchored vessel) navigational hazard to fishing vessels.
Cable emplacement and maintenance	Cable emplacement and infrequent cable maintenance activities disturb the seafloor, increase suspended sediment, and cause temporary displacement of fishing vessels. These disturbances would be local and limited to the emplacement corridor. In the geographic analysis area for this resource, there are six existing power cables (BOEM 2019a).	Future cable emplacement and maintenance, perhaps connecting Martha's Vineyard and/or Nantucket to the mainland, would occasionally disturb the seafloor and cause temporary displacement in fishing vessels and increases in suspended sediment resulting in local and short-term impacts. The FCC has two pending submarine telecommunication cable applications in the North Atlantic. If the cable routes enter the geographic analysis area for this resource, short-term disruption of fishing activities would be expected.
Climate change	Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters, influencing the distributions of species important for commercial and for-hire recreational fisheries. If the distribution of important fish stocks changes, it could affect where commercial and for-hire recreational fisheries are located and potentially increase the cost of fishing if transiting time increases. Continuous CO_2 emissions causing ocean acidification may contribute to reduced growth, or the decline of, invertebrates that have calcareous shells over the course of the next 33 years. Over time, this could potentially directly affect species that are important for commercial and for-hire recreational fisheries or their prey species.	No future activities were identified within the geographic analysis area other than ongoing activities.
Noise	Noise from construction occurs frequently in coastal habitats in populated areas in New England and the mid-Atlantic but infrequently offshore. The intensity and extent of noise from construction is difficult to generalize, but impacts are local and temporary. Infrequent offshore trenching could occur in connection with cable installation. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Low levels of elevated noise from operational WTGs likely have low to no impacts on fish and no impacts at a fishery level. Noise is also created by operations and maintenance of marine minerals extraction, which has minimal and local impacts on fish but likely no impacts at a fishery level. Ongoing site characterization surveys and scientific surveys produce noise around investigation sites. These activities can disturb fish and invertebrates in the	Noise from nearshore construction is expected to gradually increase in line with human population growth along the coast of the geographic analysis area for this resource. Noise from dredging and sand and gravel mining could occur. New or expanded marine minerals extraction may increase noise during operations and maintenance over the next 33 years. Impacts from construction, operations, and maintenance would likely be minimal and local on fish and not seen at a fishery level. Periodic trenching would be needed for repair or new installation of underground infrastructure. These disturbances would be temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise on commercial fish species are typically less prominent than the impacts of

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	immediate vicinity of the investigation and cause temporary behavioral changes. The extent depends on equipment used, noise levels, and local acoustic conditions. Noise from pile driving occurs periodically in nearshore areas when ports or marinas, piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water and/or the seabed can cause injury and/or mortality to finfish and invertebrates in a small area around each pile and short-term stress and behavioral changes to individuals over a greater area, leading to temporary local impacts on commercial fisheries and for-hire recreational fishing. The extent depends on pile size, hammer energy, and local acoustic conditions. Vessel noise is anticipated to continue at levels similar to current levels. While vessel noise may have some impact on behavior, it is likely limited to brief startle and temporary stress responses. Ongoing activities that contribute to vessel noise include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels (EIS Section 3.10, Commercial Fisheries and For-Hire Recreational Fishing).	physical disturbance and sediment suspension. Therefore, fishery-level impacts are unlikely. Site characterization surveys and scientific surveys are anticipated to occur infrequently over the next 33 years. Site characterization surveys typically use sub-bottom profiler technologies that generate sound waves similar to common deep-water echosounders. The intensity and extent of the resulting impacts are difficult to generalize but are likely local and temporary. Planned new barge route and dredging disposal sites would generate vessel noise when implemented (EIS Section 3.10).
Port utilization	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance, including dredging. Port utilization is expected to increase over the next 33 years.	Ports would need to perform maintenance and upgrades to ensure that they can still receive the projected future volume of vessels visiting their ports and be able to host larger deep draft vessels as they continue to increase in size. Port utilization is expected to increase over the next 33 years, with increased activity during construction. The ability of ports to receive the increase in vessel traffic may require port modifications, such as channel deepening, leading to local impacts on fish populations. Port expansions could also increase vessel traffic and competition for dockside services, which could affect fishing vessels.
Presence of structures	Structures within and near the cumulative lease areas that pose potential navigation hazards include the Block Island Wind Farm WTGs, buoys, and shoreline developments such as docks and ports. An allision occurs when a moving vessel strikes a stationary object. The stationary object can be a buoy, a port feature, or another anchored vessel. Two types of allisions occur: drift and powered. A drift allision generally occurs when a vessel is powered down due to operator choice or power failure. A powered allision generally occurs when an operator fails to adequately control their vessel movements or is distracted. Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. The lost gear, moved by currents, can disturb habitats and potentially harm individuals, creating minimal, localized, short-	No known planned structures are proposed to be located in the geographic analysis area that could affect commercial fisheries. Vessel allisions with non-offshore wind stationary objects should not increase meaningfully without a substantial increase in vessel congestion. New cables, installed incrementally in the geographic analysis area over the next 20 to 33 years, would likely require hard protection atop portions of the route (see cable emplacement and maintenance IPF in this table). Any new towers, buoys, or piers would also create uncommon vertical relief in a mostly flat seascape. Structure-oriented species could be attracted to these locations. Structure-oriented species would benefit (Claisse et al. 2014; Smith et al. 2016). This may lead to more and larger structure-oriented fish communities and larger

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	term impacts on fish but likely no impacts at a fishery level. Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables, create uncommon vertical relief in a mostly sandy seascape. A large portion is homogeneous sandy seascape, but there is some hard and/or complex habitat. Structures are periodically added, resulting in the conversion of existing soft-bottom and hard-bottom habitat to the new hard-structure habitat. Structure-oriented fishes are attracted to these locations. These impacts are local and can be short term to permanent. Fish aggregation may be considered adverse, beneficial, or neither. Commercial and for-hire recreational fishing can occur near these structures. For-hire recreational fishing is more popular, as commercial mobile fishing gear risk snagging on the structures. Human structures in the marine environment (e.g., shipwrecks, artificial reefs, buoys, and oil platforms) can attract finfish and invertebrates that approach the structures during their migrations. This could slow species migrations. However, temperature is expected to be a bigger driver of habitat occupation and species movement than structure (Fabrizio et al. 2014; Moser and Shepherd 2009; Secor et al. 2018). There is no evidence to suggest that structures pose a barrier to migratory animals. Current structures do not result in space use conflicts. The existing offshore cable infrastructure supports the economy by transmitting electric power and communications between mainland and islands. Two subsea cables cross the far western portion of OCS-A 0487. These cables are associated with a larger network of subsea cables that make landfall near Charlestown, Massachusetts. These cables are near the Block Island Wind Farm and cross the Block Island Wind Farm export cable. Shoreline developments are ongoing and include docks, ports, and other commercial, industrial, and residential structures. Commercial and recreational regulations for finfish and shellfish, implemented and enforced by NOAA Fisheries and coastal states, affect how the commercial and for-hire recreational fisheries operate. Commercial and recreational for-hire fisheries are managed by FMPs, which are established to manage fisheries to avoid overfishing through catch quotas, special management areas, and closed area regulations. These can reduce or increase the size of available landings to commercial and for-hire recreational fisheries.	predators opportunistically feeding on the communities, as well as increased private and for-hire recreational fishing opportunities. Soft bottom is the dominant habitat type in the region, and species that rely on this habitat would not likely experience population-level impacts (Greene et al. 2010; Guida et al. 2017). These impacts are expected to be local and may be long term. The infrequent installation of future new structures in the marine environment over the next 33 years may attract finfish and invertebrates that approach the structures during their migrations. This could slow species migrations. However, temperature is expected to be a bigger driver of habitat occupation and species movement (Fabrizio et al. 2014; Moser and Shepherd 2009; Secor et al. 2018). Migratory animals would likely be able to proceed from structures unimpeded. Therefore, fishery-level impacts are not anticipated. Planned fishery management actions include measures to reduce the risk of interactions between fishing gear and the NARW by 60 percent (McCreary and Brooks 2019). This would likely have a significant impact on fishing effort in the lobster and Jonah crab (*Cancer borealis)* fisheries in the geographic analysis area for this resource.
Traffic	No substantial changes are anticipated to the vessel traffic volumes. The geographic analysis area would continue to have numerous ports, and the extensive marine traffic related to shipping, fishing, and recreation would continue to be important to the region's economy. The region's substantial marine traffic may	New vessel traffic in the geographic analysis area would consistently be generated by proposed barge routes and dredging demolition sites. Marine commerce and related industries would continue to be important to the regional economy.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	result in occasional collisions. Vessels need to navigate around structures to avoid allisions. When multiple vessels need to navigate around a structure, navigation is more complex, as the vessels need to avoid both the structure and each other. The risk for collisions is ongoing but infrequent.	

BOEM = Bureau of Ocean Energy Management; CO_2 = carbon dioxide; EIS = Environmental Impact Statement; FCC = Federal Communications Commission; FMP = Fisheries Management Plan; GHG = greenhouse gas; IPF = impact-producing factor; NARW = North Atlantic right whale; NOAA = National Oceanic and Atmospheric Administration; WTG = wind turbine generator

Table G.1-7: Summary of Activities and the Associated Impact-Producing Factors for Cultural Resources

Associated IPF	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases	Accidental releases of fuel, fluids, hazardous materials, trash, and debris occur during vessel use for recreational, fisheries, marine transportation, or military purposes, and other ongoing activities. Both released fluids and cleanup activities that require the removal of contaminated soils and/or seafloor sediments can cause impacts on cultural resources because resources are impacted by the released chemicals, as well as the ensuing cleanup activities. Accidental releases of trash and debris occur during vessel use for recreational, fisheries, marine transportation, or military purposes and other ongoing activities. While the released trash and debris can directly affect cultural resources, the majority of impacts associated with accidental releases occur during cleanup activities, especially if soil or sediment removed during cleanup affect known and undiscovered archaeological resources. In addition, the presence of large amounts of trash on shorelines or the ocean surface can impact the cultural value of TCPs for stakeholders. State and federal laws prohibiting large releases of trash would limit the size of any individual release, and ongoing local, state, and federal efforts to clean up trash on beaches and waterways would continue to mitigate the impacts of small-scale accidental releases of trash.	Gradually increasing vessel traffic over the next 33 years would increase the risk of accidental releases within the geographic analysis area for cultural resources, increasing the frequency of small releases. Although the majority of anticipated accidental releases would be minimal, resulting in small-scale impacts on cultural resources, a single, large-scale accidental release such as an oil spill could have significant impacts on marine and coastal cultural resources. A large-scale release would require extensive cleanup activities to remove contaminated materials, resulting in damage to or the complete removal of terrestrial and marine cultural resources. In addition, the accidentally released materials in deep-water settings could settle on seafloor cultural resources such as wreck sites, accelerating their decomposition and/or covering them and making them inaccessible/ unrecognizable to researchers, resulting in a significant loss of historic information. As a result, although considered unlikely, a large-scale accidental release and associated cleanup could result in permanent, geographically extensive, and large-scale impacts on cultural resources. Future activities with the potential to result in accidental releases include construction and operations of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications). Accidental releases would continue at current rates along the Northeast Atlantic coast.
Anchoring and gear utilization	The use of vessel anchoring and gear (i.e., wire ropes, cables, chain, and sweep on the seafloor) that disturbs the seafloor, such as bottom trawls and anchors, by military, recreational, industrial, and commercial vessels can affect cultural resources by physically damaging maritime archaeological resources such as shipwrecks and debris fields.	Future activities with the potential to result in anchoring/gear utilization include construction and operations of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); military use; marine transportation; and fisheries use and management. These activities are likely to continue to occur at current rates along the entire coast of the eastern United States.

Associated IPF	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Cable emplacement and maintenance	Current offshore construction activity is limited to subsea fiber optic and electrical transmission cables, including six existing power cables in the geographic analysis area. Activities associated with dredge operations and activities could damage marine archaeological resources. Ongoing activities identified by BOEM with the potential to result in dredging impacts include construction and operations of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); tidal energy projects; marine minerals use and ocean-dredged material disposal; military use; marine transportation; and fisheries use and management.	Future activities with the potential to result in seafloor disturbances similar to offshore impacts include construction and operations of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); tidal energy projects; marine minerals use and ocean-dredged material disposal; and military use. Such activities could cause impacts on submerged archaeological resources including shipwrecks and formerly subaerially exposed pre-contact Native American archaeological sites. Dredging activities would gradually increase through time as new offshore infrastructure is built, such as gas pipelines and electrical lines, and as ports and harbors are expanded or maintained.
Climate change	Sea level rise and increased storm severity and frequency would result in impacts on archaeological, historic structural, and TCP resources. Increased storm frequency and severity would also result in damage to and/or destruction of historic structures. Sea level rise would increase erosion-related impacts on archaeological and historic structural resources, while sea level rise would inundate archaeological, historic structural, and TCP resources. Altered habitat/ecology and migration patterns related to warming seas and sea level rise would impact the ability of Native Americans and other communities to use maritime TCPs for traditional fishing, shell fishing, and fowling activities. Sea level rise and increased storm severity and frequency would result in impacts on archaeological, historic structural, and TCP resources. Increased storm frequency and severity would result in damage to and/or destruction of historic structures. Sea level rise would increase erosion-related impacts on archaeological and historic structural resources, while sea level rise would inundate archaeological, historical structure, and TCP resources. Installation of protective measures such as barriers and sea walls would impact archaeological resources during associated ground-disturbing activities. Construction of these modern protective structures would alter the viewsheds from historic properties and/or TCPs, resulting in impacts on the historic and/or cultural significance of resources. Sea level rise and increased storm severity and frequency would result in impacts on archaeological, historical structure, and TCP resources. Increased storm frequency and severity would result in damage to and/or destruction of historic structures. Sea level rise would increase erosion-related impacts on archaeological and historic structure resources, while sea level rise would inundate archaeological, historic structure, and TCP resources.	Sea level rise and storm severity/frequency would increase due to the impacts of climate change. The rate of change to habitats/ecology, migratory animal patterns, and property and infrastructure damage would increase as a result of climate change. Climate change would necessitate increased installation of coastal protective measures.

Associated IPF	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Land disturbance	Onshore construction activities can impact archaeological resources by damaging and/or removing resources.	Future activities that could result in terrestrial land disturbance impacts include onshore residential, commercial, industrial, and military development activities in central Cape Cod, particularly those proximate to OECRs and interconnection facilities. Onshore construction would continue at current rates.
Lighting	Light associated with military, commercial, or construction vessel traffic can temporarily affect coastal historic structures and TCP resources when the addition of intrusive, modern lighting changes the physical environment ("setting") of cultural resources. The impacts of construction and operations lighting would be limited to cultural resources on the southern shores of Martha's Vineyard, Nantucket, and possibly portions of Cape Cod, for which a nighttime sky is a contributing element to historical integrity. This excludes resources that are closed to stakeholders at night, such as historic buildings, lighthouses, and battlefields, and resources that generate their own nighttime light, such as historic districts. Offshore construction activities that require increased vessel traffic, construction vessels stationed offshore, and construction area lighting for prolonged periods can cause more sustained and significant visual impacts on coastal historic structure and TCP resources. Construction of new structures that introduce new light sources into the setting of historic standing structures or TCPs can result in impacts, particularly if the historic and/or cultural significance of the resource is associated with uninterrupted nighttime skies or periods of darkness. Any tall structure (e.g., commercial building, radio antenna, large satellite dishes) requiring nighttime hazard lighting to prevent aircraft collision can cause these types of impacts.	Future activities with the potential to result in vessel lighting impacts include construction and operations of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); marine minerals use and ocean-dredged material disposal; military use; marine transportation; and fisheries use and management. Light pollution from vessel traffic would continue at the current intensity along the Northeast coast, with a slight increase due to population increase and development over time. Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast but minimal offshore.
Port utilization	Major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. The MCT was upgraded by the Port of New Bedford specifically to support the construction of offshore wind facilities. Expansion of port facilities can introduce large, modern port infrastructure into the viewsheds of nearby historic properties, impacting their setting and historical significance.	Future activities with the potential to result in port expansion impacts include construction and operation of undersea transmission lines, gas pipelines, and other submarine cables (e.g., telecommunications); tidal energy projects; marine minerals use and ocean-dredged material disposal; military use; marine transportation; and fisheries use and management. Port expansion would continue at current levels, which reflect efforts to capture business associated with the offshore wind industry (irrespective of specific projects).
Presence of structures	The only existing offshore structures within the viewshed of the geographic analysis area are minor features such as buoys.	Non-offshore wind structures that could be viewed would be limited to meteorological towers. Marine activity would also occur within the marine viewshed of the geographic analysis area.

BOEM = Bureau of Ocean Energy Management; IPF = impact-producing factor; MCT = Marine Commerce Terminal; OECR = onshore export cable route; TCP = traditional cultural property

Table G.1-8: Summary of Activities and the Associated Impact-Producing Factors for Demographics, Employment, and Economics

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Cable emplacement and maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances would be local and limited to emplacement corridors. In the geographic analysis area for demographics, employment, and economics, there are six existing power cables.	The FCC has two pending submarine telecommunication cable applications in the North Atlantic. Future new cables, perhaps including those connecting Martha's Vineyard and/or Nantucket to the mainland, would disturb the seafloor and cause temporary increases in suspended sediment resulting in infrequent, localized, short-term impacts over the next 33 years.
Climate change	Climate models predict climate change if current trends continue. Climate change has 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, increased disease frequency, and sedimentation, among other factors. In 2018, Massachusetts energy production totaled 125.2 trillion Btu, of which 72.4 trillion Btu were from renewable sources, including geothermal, hydroelectric, wind, solar, and biomass (U.S. Energy Information Administration 2019).	Onshore projects that reduce air emissions could contribute to the effort to limit climate change. Onshore solar and wind energy projects, although producing less energy than potential offshore wind developments, would also provide incremental reductions. Ongoing development of onshore solar and wind energy would provide diversified, small-scale energy generation. State and regional energy markets would require additional peaker plants and energy storage to meet the electricity needs when utility scale renewables are not producing.
Land disturbance	Onshore development activities support local population growth, employment, and economies. Disturbances can cause temporary, localized traffic delays and restricted access to adjacent properties. The rate of onshore land disturbance is expected to continue at or near current rates.	Onshore development projects would be ongoing in accordance with local government land use plans and regulations.
Lighting	Offshore buoys and towers emit low-intensity light, while onshore structures, including houses and ports, emit substantially more light on an ongoing basis. Ocean vessels have an array of lights including navigational lights and deck lights.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast but minimal offshore. Anticipated modest growth in vessel traffic would result in some growth in the nighttime traffic of vessels with lighting.
Noise	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. These disturbances are temporary, local, and extend only a short distance beyond the work area. Infrequent trenching for pipeline and cable-laying activities emit noise. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise are typically less prominent than the impacts of the physical disturbance and sediment suspension. Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to vessel noise include commercial shipping, recreational and fishing vessels, and scientific and academic	Periodic trenching would be needed over the next 33 years for repair or installation of underground infrastructure. Planned new barge route and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	research vessels. Vessel noise is anticipated to continue at or near current levels.	
Port utilization	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. The MCT at the Port of New Bedford, among other ports in the geographic analysis area, was upgraded by the port specifically to support the construction of offshore wind energy facilities. As ports expand, maintenance dredging of shipping channels is expected to increase.	Ports would need to perform maintenance and upgrade facilities over the next 33 years to ensure that they can still receive the projected future volume of vessels visiting their ports and are able to host larger deep draft vessels as they continue to increase in size.
Presence of structures	An allision occurs when a moving vessel strikes a stationary object. The stationary object can be a buoy, a port feature, or another anchored vessel. The likelihood of allisions is expected to continue at or near current levels. Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. Such loss and damage are costs for gear owners and are expected to continue at or near current levels. Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables, create uncommon relief in a mostly flat seascape. Structure-oriented fishes are attracted to these locations, which may be known as FADs. Recreational and commercial fishing can occur near the FADs, although recreational fishing is more popular because commercial mobile fishing gear is more likely to snag on FADs. Vessels need to navigate around structures to avoid allisions, especially in nearshore areas. This navigation becomes more complex when multiple vessels must navigate around a structure, as vessels need to avoid both the structure and each other. Current structures do not result in space use conflicts. No existing offshore structures are within the viewshed of the SWDA except buoys. The existing offshore cable infrastructure supports the economy by transmitting electric power and communications between mainland and islands. Additional communication cables run between the U.S. East Coast and European countries along the eastern Atlantic.	Vessel allisions with non-offshore wind stationary objects should not increase meaningfully without a substantial increase in vessel congestion.
Traffic	Ports and marine traffic related to shipping, fishing, and recreation in the geographic analysis area are important to the region's economy. No substantial changes are anticipated to existing vessel traffic volumes. The region's substantial marine traffic may result in occasional vessel collisions, which would result in costs to the vessels involved. The likelihood of	New vessel traffic near the geographic analysis area would be generated by proposed barge routes and dredging demolition sites over the next 33 years. Marine commerce and related industries would continue to be important to the geographic analysis area economy. No substantial changes anticipated.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	collisions is expected to continue at or near current rates.	

Btu = British thermal unit; FAD = fish aggregating device; FCC = Federal Communications Commission; IPF = impact-producing factor; MCT = Marine Commerce Terminal; SWDA = Southern Wind Development Area

Table G.1-9: Summary of Activities and the Associated Impact-Producing Factors for Environmental Justice

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Air emissions	Ongoing population growth and new development within the geographic analysis area is likely to increase traffic with resulting increase in emissions from motor vehicles. Some new industrial development may result in emissions-producing uses. At the same time, many industrial waterfront areas near environmental justice communities are losing industrial uses and converting to more commercial or residential uses.	New development may include emissions-producing industry and new development that would increase emissions from motor vehicles. Some historically industrial waterfront locations will continue to lose industrial uses, with no new industrial development to replace it. Cities such as New Bedford are promoting start-up space and commercial uses to re-use industrial space.
Cable emplacement and maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances would be local and limited to emplacement corridors. Six existing power cables are in the geographic analysis area. Refer to EIS Appendix A, Required Environmental Permits and Consultations, for details.	The FCC has two pending submarine telecommunication cable applications in the North Atlantic. Future new cables, perhaps including those connecting Martha's Vineyard and/or Nantucket to the mainland, would disturb the seafloor and cause temporary increases in suspended sediment, resulting in infrequent, localized, short-term impacts over the next 33 years.
Land disturbance	Potential erosion and sedimentation from development and construction is controlled by local and state development regulations. Onshore development supports local population growth, employment, and economics. Onshore development would result in changes in land use in accordance with local government land use plans and regulations.	New development activities would be subject to erosion and sedimentation regulations. Onshore development would continue in accordance with local government land use plans and regulations. Development of onshore solar and wind energy would provide diversified, small-scale energy generation.
Lighting	Offshore buoys and towers emit low-intensity light, while onshore structures, including houses and ports, emit substantially more light on an ongoing basis.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast but minimal offshore.
Noise	Offshore operations and maintenance of existing wind energy projects generates negligible amounts of noise. Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. These disturbances are temporary, local, and extend only a short distance beyond the work area. Infrequent trenching for pipeline and cable-laying activities emits noise. These disturbances are temporary, local, and extend only a short distance beyond the emplacement corridor. Impacts of trenching noise are	Periodic trenching would be needed over the next 33 years for repair or installation of underground infrastructure. Planned new barge route and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	typically less prominent than the impacts of the physical disturbance and sediment suspension. Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to vessel noise include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Vessel noise is anticipated to continue at or near current levels.	
Port utilization	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. The MCT at the Port of New Bedford is a completed facility developed by the port specifically to support the construction of offshore wind facilities.	Ports would need to perform maintenance and upgrade facilities to ensure that they can still receive the projected future volume of vessels visiting their ports and are able to host larger deep draft vessels as they continue to increase in size.
Presence of structures	Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. Such loss and damage are costs for gear owners and are expected to continue at or near current levels. Vessels need to navigate around structures to avoid collisions, especially in nearshore areas. This navigation becomes more complex when multiple vessels must navigate around a structure, as vessels need to avoid both the structure and each other. Current structures do not result in space use conflicts. There are no existing offshore structures within the viewshed of the SWDA except buoys. Two subsea cables cross the far western portion of OCS-A 0487. These cables are associated with a larger network of subsea cables south of the lease areas and make landfall near Charlestown, Massachusetts. These cables are located near the Block Island Wind Farm and cross the Block Island Wind Farm export cable.	Vessel traffic is generally not expected to meaningfully increase over the next 33 years. The presence of navigation hazards is expected to continue at or near current levels. Existing cable operations and maintenance activities would continue within and offshore from the geographic analysis area.
Traffic	Ports and marine traffic related to shipping, fishing, and recreation in the geographic analysis area are important to the region's economy. No substantial changes are anticipated to existing vessel traffic volumes.	New vessel traffic near the geographic analysis area would be generated by proposed barge routes and dredging demolition sites over the next 33 years. Marine commerce and related industries would continue to be important to the geographic analysis area employment.

EIS = Environmental Impact Statement; FCC = Federal Communications Commission; IPF = impact-producing factor; MCT = Marine Commerce Terminal; SWDA = Southern Wind Development Area

Table G.1-10: Summary of Activities and the Associated Impact-Producing Factors for Navigation and Vessel Traffic

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Anchoring and gear utilization	Larger commercial vessels (specifically tankers) sometimes anchor outside major ports to transfer their cargo to smaller vessels for transport into port, an operation known as lightering. These anchors have deeper ground penetration and are under higher stresses.	Lightering and anchoring operations are expected to continue at or near current levels, with the expectation of moderate increase commensurate with any increase in tankers visiting ports. Deep draft visits to major ports

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	Smaller vessels (commercial fishing or recreational vessels) would anchor for fishing and other recreational activities. These activities cause temporary to short-term impacts on navigation and vessel traffic in the immediate anchorage area. All vessels may anchor if they lose power to prevent them from drifting and creating navigational hazards for other vessels or for drifting into structures.	are also expected to increase, expanding the potential for an individual vessel to lose power and need to anchor, creating navigational hazards for other vessels or for drifting into structures. Recreational activity and commercial fishing activity would likely stay the same related to anchoring.
Cable emplacement and maintenance	Within the geographic analysis area for navigation and vessel traffic, existing cables may require access for maintenance activities. Infrequent cable maintenance activities may cause temporary increases in vessel traffic and navigational complexity. Six existing power cables are currently in the geographic analysis area for navigation and vessel traffic.	The FCC has two pending submarine telecommunication cable applications in the North Atlantic. Future new cables, perhaps including those connecting Martha's Vineyard and/or Nantucket to the mainland, would cause temporary increases in vessel traffic during construction or operations, resulting in infrequent, localized, short-term impacts over the next 33 years. Care would need to be taken by vessels that are crossing the cable routes during these activities.
Port utilization	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. Impacts from these activities would be short term and could include congestion in ports, delays, and changes in port usage by some fishing or recreational vessel operators.	Ports would need to perform maintenance and perform upgrades to ensure that they can still receive the projected future volume of vessels visiting their ports and are able to host larger deep draft vessels as they continue to increase in size. Impacts would be short term and could include congestion in ports, delays, and changes in port usage by some fishing or recreational vessel operators.
Presence of structures	An allision occurs when a moving vessel strikes a stationary object. The stationary object can be a buoy, a port feature, or another anchored vessel. There are two types of allisions that occur: drift and powered. A drift allision generally occurs when a vessel is powered down due to operator choice or power failure. A powered allision generally occurs when an operator fails to adequately control their vessel movements or is distracted. Items in the water, such as ghost fishing gear, buoys, and energy platform foundations, can create an artificial reef effect, aggregating fish. Recreational and commercial fishing can occur near the artificial reefs. Recreational fishing is more popular than commercial near artificial reefs as commercial mobile fishing gear can risk snagging on the artificial reef structure. Equipment in the ocean can create a substrate for mollusks to attach to, and fish eggs to settle nearby. This can create a reef-like habitat and benefit structure-oriented species on a constant basis. Noise-producing activities, such as pile driving and vessel traffic, may interfere and affect marine mammals during foraging, orientation, migration, response to predators, social interactions, or other activities. Marine mammals may also be sensitive to changes in magnetic	Absent other information, and because total vessel transits in the area have remained relatively stable since 2010, BOEM does not anticipate vessel traffic to greatly increase over the next 33 years. Vessel allisions with non-offshore wind stationary objects should not increase meaningfully without a substantial increase in vessel congestion. Fishing near artificial reefs is not expected to change meaningfully over the next 33 years. Absent other information, and because total vessel transits in the area have remained relatively stable since 2010, BOEM does not anticipate vessel traffic to greatly increase over the next 33 years. Even with increased port visits by deep draft vessels, this is still a relatively small adjustment when considering the whole of New England vessel traffic. The presence of navigation hazards is expected to continue at or near current levels.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	field levels. The presence of structures and operation noise could cause mammals to avoid areas. Vessels need to navigate around structures to avoid allisions. When multiple vessels need to navigate around a structure, navigation is made more complex, as the vessels need to avoid both the structure and each other. Currently, the offshore area is occupied by marine trade, stationary and mobile fishing, and survey activities. Some deep draft and tug/towing vessels transit between the Narragansett/Buzzards Bay traffic separation scheme precautionary area and points north/east by way of the Nantucket-Ambrose Fairway and can cross through the southern portion of the RI/MA Lease Areas, particularly through OCS-A 0500 and 0501.	
Traffic	Current vessel traffic includes commercial and other activity concentrated in designated navigation corridors, as well as commercial and recreational fishing activity, USCG maritime SAR, military vessel activity, and scientific and academic vessel traffic. The likelihood of collisions, allisions, and other incidents is expected to continue at or near current rates. No substantial changes are anticipated to existing air and vessel traffic volumes.	New vessel traffic, along with collisions, allisions, and other incidents in the geographic analysis area would be generated by increased overall commercial, SAR, and other vessel activity, as well as proposed barge routes and dredging demolition sites over the next 33 years.

BOEM = Bureau of Ocean Energy Management; FCC = Federal Communications Commission; IPF = impact-producing factor; RI/MA Lease Areas = Rhode Island and Massachusetts Lease Areas; SAR = search and rescue; USCG = U.S. Coast Guard

Table G.1-11: Summary of Activities and the Associated Impact-Producing Factors for Other Uses

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Presence of structures	Existing stationary facilities within the geographic analysis area that present navigational hazards, including allision risks, include the five WTGs in the Block Island Wind Farm, onshore wind turbines, communication towers, dock facilities, and other onshore and offshore commercial, industrial, and residential structures. The Block Island Wind Farm WTGs also support fish aggregation. Eight existing submarine cables are in the geographic analysis area, including submarine power cables between the mainland and Nantucket and Martha's Vineyard, as well as two cables that cross the far western side of OCS-A 0487.	Onshore, development activities are anticipated to continue with additional proposed communications towers and onshore commercial, industrial, and residential developments. Submarine cables would remain in current locations with infrequent maintenance continuing along those cable routes for the foreseeable future.
Traffic	Existing air traffic include commercial aviation, general aviation, USCG SAR activity, military training, and aircraft used for scientific and academic surveys in marine environments. Current vessel traffic includes commercial and other activity concentrated in designated navigation corridors, as well as commercial and recreational fishing activity, USCG maritime SAR, military vessel activity, and scientific and academic vessel traffic.	New vessel traffic in the geographic analysis area would be generated by increased overall commercial and other vessel activity, as well as proposed barge routes and dredging demolition sites over the next 33 years. Marine commerce and related industries would continue to be important to the geographic analysis area economy. No substantial changes anticipated.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	The likelihood of collisions, allisions, and other incidents is expected to continue at or near current rates. No substantial changes are anticipated to existing air and vessel traffic volumes.	

IPF = impact-producing factor; SAR = search and rescue; USCG = U.S. Coast Guard; WTG = wind turbine generator

Table G.1-12: Summary of Activities and the Associated Impact-Producing Factors for Recreation and Tourism

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Anchoring and gear utilization	Anchoring occurs due to ongoing military, survey, commercial, and recreational activities.	Impacts from anchoring would continue and may increase due to offshore military operations, survey activities, commercial vessel traffic, and/or recreational vessel traffic. Modest growth in vessel traffic could increase the temporary and localized impacts of navigational hazards, increased turbidity levels, and potential for direct contact causing mortality of benthic resources.
Cable emplacement and maintenance	Infrequent cable maintenance activities disturb the seafloor and cause temporary increases in suspended sediment; these disturbances would be local and limited to emplacement corridors. In the geographic analysis area for recreation and tourism, there are six existing power cables.	Cable maintenance or replacement of existing cables in the geographic analysis area would occur infrequently and generate short-term disturbances.
Lighting	Ocean vessels have an array of lights including navigational lights and deck lights. Offshore buoys and towers emit low-intensity light. Onshore structures, including houses and ports, emit substantially more light on an ongoing basis.	Anticipated modest growth in vessel traffic would result in some growth in the nighttime traffic of vessels with lighting. Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast but minimal offshore.
Noise	The Block Island Wind Farm is the only operating facility that could generate operational noise within the geographic analysis area for recreation and tourism. Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. These disturbances are temporary, local, and extend only a short distance beyond the work area. Offshore trenching occurs periodically in connection with cable installation or sand and gravel mining. Vessel noise occurs offshore and more frequently near ports and docks. Ongoing activities that contribute to vessel noise include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Vessel noise is anticipated to continue at or near current levels.	Planned new barge routes and dredging disposal sites would generate vessel noise when implemented. The number and location of such routes are uncertain.
Port utilization	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and	Ports would need to perform maintenance and upgrade facilities over the next 33 years to ensure that they can still receive the projected

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	maintenance. Several ports (e.g., the MCT at the Port of New Bedford and the Port of Bridgeport) have been or are being upgraded specifically to support the construction of offshore wind energy facilities. Nearly all ports and harbors in the geographic analysis area for recreation and tourism require periodic maintenance dredging.	future volume of vessels visiting their ports and are able to host larger deep draft vessels as they continue to increase in size. Ongoing maintenance and dredging of harbors on Martha's Vineyard, Nantucket, and Cape Cod will continue as needed. No specific projects are known.
Presence of structures	The likelihood of allisions is expected to continue at or near current levels. Commercial and recreational fishing gear is periodically lost due to entanglement with existing buoys, pilings, hard protection, and other structures. Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables, create uncommon relief in a mostly flat seascape. Structure-oriented fishes and other species are attracted to these locations. Recreational and commercial fishing can occur near these aggregation locations, although recreational fishing is more popular, as commercial mobile fishing gear is more likely to snag on structures. Vessels need to navigate around structures to avoid allisions, especially in nearshore areas. This navigation becomes more complex when multiple vessels must navigate around a structure, as vessels need to avoid both the structure and each other. Current structures do not result in space use conflicts. The only existing offshore structures within the viewshed of the proposed Project are minor features such as buoys.	Vessel allisions with non-offshore wind stationary objects should not increase meaningfully without a substantial increase in vessel congestion. Vessel traffic, overall, is not expected to meaningfully increase over the next 33 years. The presence of navigation hazards is expected to continue at or near current levels. Non-offshore wind structures that could be viewed in conjunction with the offshore components of the proposed Project would be limited to meteorological towers. Marine activity would also occur within the marine viewshed.
Traffic	Ports and marine traffic related to shipping, fishing, and recreation in the geographic analysis area are important to the region's economy. No substantial changes are anticipated to existing vessel traffic volumes. The region's substantial marine traffic may result in occasional vessel collisions, which would result in costs to the vessels involved. The likelihood of collisions is expected to continue at or near current rates.	New vessel traffic near the geographic analysis area would be generated by proposed barge routes and dredging demolition sites over the next 33 years. Marine commerce and related industries would continue to be important to the geographic analysis area economy. An increased risk of collisions is not anticipated from future activities.

IPF = impact-producing factor; MCT = Marine Commerce Terminal

Table G.1-13: Summary of Activities and the Associated Impact-Producing Factors for Scenic and Visual Resources

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Cable emplacement and maintenance	Infrequent cable maintenance activities generate vessel traffic that may be visible to observers on shore and at sea.	Cable maintenance or replacement of existing cables in the geographic analysis area would occur infrequently.
Lighting	Ocean vessels have an array of lights including navigational lights and deck lights that may be visible from locations on land and at sea. The maximum theoretical distance at which lights near the surface may	The anticipated modest growth in regional vessel traffic would marginally increase the number of vessels operating at night with lighting.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	be visible is approximately 48 miles, reflecting curvature of the earth and the coefficient of refraction (COP Appendix III-H.a; Epsilon 2023). Actual viewing distances are typically significantly shorter, due to the presence of obstructions (i.e., topography, vegetation, structures, and waves), as well as weather and atmospheric conditions that restrict visibility (i.e., fog, haze, sea spray, clouds, precipitation, and sun angle and intensity). Offshore buoys and towers include vessel navigation safety lighting and may include aviation hazard lighting. Onshore structures, including houses and ports, emit substantially more light on an ongoing basis.	Light from onshore structures is expected to gradually increase in line with human population growth along the coast. This increase is expected to be widespread and permanent near the coast but minimal offshore. The number of offshore structures other than those from offshore wind projects is expected to remain relatively constant.
Presence of structures	The only existing offshore structures within the viewshed of the proposed Project are minor features such as buoys.	Non-offshore wind structures that could be viewed in conjunction with the offshore components of the proposed Project would be limited to meteorological towers and buoys. The number of these offshore structures is expected to remain relatively constant.
Traffic	Vessel traffic related to shipping, fishing, and recreation are common, constant elements of seaward views.	Vessel traffic not associated with offshore wind is expected to increase along with increases in coastal population and marine-related economic activity.

COP = Construction and Operations Plan; IPF = impact-producing factor

Table G.1-14: Summary of Activities and the Associated Impact-Producing Factors for Air Quality

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases	Accidental releases of air toxics HAPs are due to potential chemical spills. Ongoing releases occur in low frequencies. These may lead to short-term periods of toxic pollutant emissions through surface evaporation. The DOE reports that 31,000 barrels of petroleum are spilled into U.S. waters from vessels and pipelines in a typical year. Globally, approximately 43.8 million barrels of oil were lost as a result of tanker incidents from 1970 to 2021, although this includes only 175,000 barrels from 2010 to 2021, indicative of significant reductions in spills over time (ITOPF 2022).	Accidental releases of air toxics or HAPs would be due to potential chemical spills. Gradually increasing vessel traffic over the next 33 years would increase the risk of accidental releases. These may lead to short-term periods of toxic pollutant emissions through evaporation. Air quality impacts would be short term and limited to the local area at and around the accidental release location.
Air emissions	Air emissions originate from combustion engines and electric power generated by burning fuel. These activities are regulated under the CAA to meet set standards. Air quality has improved over the last 30 years; however, some areas in the Northeast have experienced a recent decline in air quality. Some areas of the Atlantic coast remain in nonattainment for ozone, primarily from power generation. Many of these states (including Massachusetts and Connecticut, among others) have committed to clean energy goals to improve air quality and address climate change and have specifically included wind and solar energy generation as part of these goals. Primary processes and activities that can affect the air quality impacts are expansions and	The largest air quality impacts over the next 33 years would occur during the construction stage of any project; however, project construction would be required to comply with the CAA. During the construction and decommissioning stages, emissions above *de minimis* thresholds would require offsets and mitigation. Primary emission sources include increased commercial vehicular traffic, air traffic, public vehicular traffic, and combustion emissions from construction equipment and fugitive emissions from construction-generated dust. As wind, solar, and other non-fossil fuel energy projects come online, power generation

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	modifications to existing fossil fuel power plants, onshore and offshore activities involving renewable energy facilities, and various construction activities.	emissions overall would decline and the industry as a whole would have a net benefit on air quality. Activities associated with operations and maintenance of onshore wind, solar, and other non-fossil fuel projects would have a proportionally minimal contribution to emissions compared to the construction and decommissioning activities over the next 33 years. Emissions would largely be due to commercial vehicular traffic and operation of emergency diesel generators. Such activity would result in short-term, intermittent, and widely dispersed emissions and minimal air quality impacts. Many Atlantic states (including Massachusetts and Connecticut, among others) have committed to clean energy goals, and have committed to wind, solar, and other non-fossil fuel sources to achieve these goals. In the absence of future offshore wind projects, power generation from non-fossil fuel sources would likely result in decreased air quality impacts regionally due to the avoidance or replacement of emissions from natural gas-, coal-, or oil-fired plants. Remaining fossil fuel facilities would likely have larger and continuous emissions and result in greater regional scale impacts on air quality.
Climate change	Activities that consume fossil fuels (such as construction, operations, and decommissioning of power generation and manufacturing facilities, as well as residential and commercial development) would produce GHG emissions (nearly all CO_2) that can contribute to climate change. CO_2 is relatively stable in the atmosphere and generally mixed uniformly throughout the troposphere and stratosphere. As a result, the impact of GHG emissions does not depend upon the source location. Increasing energy production from clean energy projects (reflecting state and national commitments) would likely decrease GHG emissions by replacing energy from fossil fuels.	Development of future onshore wind, solar, and other non-fossil fuel projects marginally increase GHG emissions over the next 33 years. However, these contributions would be minimal compared to aggregate global emissions. The impact on climate change from these activities would be negligible. As more clean energy projects come online, some reduction in GHG emissions would occur. Overall, it is anticipated that there would be no collective adverse impact on global warming as a from onshore clean energy project activities.

CAA = Clean Air Act; CO_2 = carbon dioxide; DOE = U.S. Department of Energy; GHG = greenhouse gas; HAP = hazardous air pollutant; IPF = impact-producing factor

Table G.1-15: Summary of Activities and the Associated Impact-Producing Factors for Water Quality

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases	Accidental releases of fuels and fluids occur during vessel usage for dredged material ocean disposal, fisheries use, marine transportation, military use, survey activities, and submarine cable-, lines-, and pipeline-laying activities. According to the DOE, 31,000 barrels of petroleum are spilled into U.S. waters	Future accidental releases of fuels and fluids from offshore vessel usage, spills, and consumption would likely continue on a similar trend. Impacts are unlikely to affect water quality.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	from vessels and pipelines in a typical year. Globally, approximately 43.8 million barrels of oil were lost as a result of tanker incidents from 1970 to 2021, although this includes only 175,000 barrels from 2010 to 2021, indicative of significant reductions in spills over time (ITOPF 2022). Trash and debris may be accidentally discharged through fisheries use; dredged material ocean disposal; marine minerals extraction; marine transportation; navigation and traffic; survey activities; and cables, lines, and pipeline laying. Accidental releases of trash and debris are expected to be low-probability events. BOEM assumes operator compliance with federal and international requirements for management of shipboard trash; such events also have a limited spatial impact.	As population and vessel traffic increase gradually over the next 33 years, accidental release of trash and debris may increase. However, there does not appear to be evidence that the volumes and extents anticipated would affect water quality.
Anchoring and gear utilization	Impacts from anchoring occur due to ongoing military use and survey, commercial, and recreational activities.	Impacts from anchoring may occur semi-regularly over the next 33 years due to offshore military operations or survey activities. These impacts would include increased seabed disturbance, resulting in increased turbidity levels. All impacts would be localized, short term, and temporary.
Cable emplacement and maintenance	Suspended sediment concentrations between 45 and 71 mg/L can occur in Nantucket Sound under natural tidal conditions and increase during storms, trawling, and vessel propulsion. Survey activities and cable- and pipeline-laying activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances would be short term, and either be limited to the emplacement corridor or localized.	Suspension of sediments may continue to occur infrequently over the next 33 years due to survey activities, as well as submarine cable-, lines-, and pipeline-laying activities. Future new cables, perhaps connecting Martha's Vineyard and/or Nantucket to the mainland, would occasionally disturb the seafloor and cause short-term increases in turbidity and minor alterations in localized currents, resulting in local short-term impacts. The FCC has two pending submarine telecommunication cable applications in the North Atlantic. If the cable routes enter the water quality geographic analysis area, short-term disturbance in the form of increased suspended sediment and turbidity would be expected.
Discharges/intakes	Discharges affect water quality by introducing nutrients, chemicals, and sediments to the water. There are regulatory requirements related to prevention and control of discharges, the prevention and control of accidental spills, and the prevention and control of nonindigenous species.	Increased coastal development on Cape Cod is causing increased nutrient pollution in communities, approximately 80 percent of which is due to groundwater contamination by septic systems. In addition, ocean disposal activity in the North and Mid-Atlantic is expected to gradually decrease or remain stable. Impacts of ocean disposal on water quality would be minimized because the USEPA established dredge spoil criteria and regulates the disposal permits issued by USACE. The impact on water quality from sediment suspension during future activities would be short term and localized.
Land disturbance	Ground-disturbing activities may lead to unvegetated or otherwise unstable soils. Precipitation events could potentially mobilize the soils into nearby surface waters,	Ground disturbance associated with construction of onshore components could lead to unvegetated or unstable soils. Precipitation events could

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	leading to potential erosion and sedimentation impacts and subsequent increased turbidity. Onshore construction activities may lead to unvegetated or otherwise unstable soils, as well as soil contamination due to leaks or spills from construction equipment. Precipitation events could potentially mobilize the soils into nearby surface waters, leading to increased turbidity and alteration of water quality.	mobilize these soils, leading to erosion and sedimentation impacts and turbidity. Impacts from future offshore wind would be staggered in time and localized. The impacts would be short term and localized with an increased likelihood of impacts limited to onshore construction periods. The general trend along coastal regions is that port activity will likely increase modestly in the future. This increase in activity includes expansion needed to meet commercial, industrial, and recreational demand. Modifications to cargo handling equipment and conversion of some undeveloped land to meet port demand would be required to receive the increase in larger ships.
Port utilization	Between 1992 and 2012, global shipping traffic increased fourfold (Tournadre 2014). The U.S. OCS is no exception to this trend, and growth is expected to continue as human population increases. In addition, the general trend along the coastal region from Virginia to Maine is that port activity will increase modestly. The ability of ports to receive the increase in larger ships will require port modifications, which, along with additional vessel traffic, could affect water quality through increases in suspended sediments and the potential for accidental discharges. The increased sediment suspension could be long term depending on the vessel traffic increase. However, the existing suspended sediment concentrations in Nantucket Sound are already 45 to 71 mg/L; therefore, impacts from vessel traffic are likely to be masked by the natural variability. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future.	The general trend along the coastal region from Virginia to Maine is that port activity will increase modestly over the next 33 years. Port modifications and channel-deepening activities are being undertaken to accommodate the increase in vessel traffic and deeper draft vessels that transit the Panama Canal Locks. The additional traffic and larger vessels could affect water quality through increases in suspended sediments and the potential for accidental discharges. However, the existing suspended sediment concentrations in Nantucket Sound are already 45 to 71 mg/L, so impacts from vessel traffic are likely to be masked by the natural variability. Certain types of vessel traffic have increased recently (e.g., ferry use and cruise industry) and may continue to increase in the foreseeable future.
Presence of structures	Installation of onshore and offshore structures leads to alteration of local water currents. These disturbances would be local but, depending on the hydrologic conditions, have the potential to affect water quality through the formation of sediment plumes.	Impacts associated with the presence of structures includes temporary sediment disturbance during maintenance. This sediment suspension would lead to short-term and localized impacts.

BOEM = Bureau of Ocean Energy Management; DOE = U.S. Department of Energy; FCC = Federal Communications Commission; IPF = impact-producing factor; mg/L = milligrams per liter; OCS = Outer Continental Shelf; USACE = U.S. Army Corps of Engineers; USEPA = U.S. Environmental Protection Agency

Table G.1-16: Summary of Activities and the Associated Impact-Producing Factors for Bats

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Climate change	Increased storm activity during breeding and roosting season can reduce productivity and increase mortality. Intensity of this impact is speculative. Disease can weaken, lower reproductive output, and/or kill individuals. Some tropical diseases could move northward due to climate change. Extent and intensity of this impact is highly speculative.	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Land disturbance	Onshore construction activities are expected to continue at current trends. Potential impacts on individuals may occur if construction activities include tree removal when bats are potentially present. Injury or mortality may occur if trees being removed are occupied at the time of removal. Of particular sensitivity are juveniles that are unable to flush from the roost. While there is some potential for habitat impacts associated with habitat loss, no individual or population-level impacts would be expected.	Future non-offshore wind development would continue to occur at the current rate. This development has the potential to result in habitat loss but would not be expected to result in injury or mortality of individuals.
Noise	Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. This would result in high-intensity, low-exposure level, long-term, but localized intermittent risk to bats in nearshore waters. Auditory impacts are not expected to occur, as recent research has shown that bats may be less sensitive to TTS than other terrestrial mammals (Simmons et al. 2016). Habitat impacts (i.e., displacement from potentially suitable habitats) could occur as a result of construction activities, which could generate noise sufficient to cause avoidance behavior (Schaub et al. 2008). Construction activity would be temporary and highly localized. Onshore construction occurs regularly for infrastructure projects in the geographic analysis area. There is a potential for displacement caused by equipment if construction occurs at night (Schaub et al. 2008). Displacement, if any, would be temporary. No individual or population-level impacts would be expected. Bats roosting in the vicinity of construction activities may be disturbed during construction but would be expected to move to a different roost farther from construction noise. No impacts would be expected, as frequent roost switching is a common component of a bat's life history (Hann et al. 2017; Whitaker 1998).	Similar to ongoing activities, noise associated with pile-driving activities would be limited to nearshore waters, and these high-intensity but low-exposure risks would likely not result in auditory impacts. Some habitat impacts (i.e., displacement from potentially suitable foraging and/or roosting habitats) could occur as a result of construction activities, which could generate noise sufficient to cause avoidance behavior (Schaub et al. 2008). Construction activity would be temporary and highly localized, and no population-level impacts would be expected. Onshore construction is expected to continue at current trends. Behavioral responses and avoidance of construction areas may occur (Schaub et al. 2008). However, no injury or mortality of individuals would be expected.
Presence of structures	Few structures are scattered throughout the offshore portion of the geographic analysis area. There is an assortment of navigation and weather buoys and a handful of light towers (BOEM 2022a). Migrating bats can easily fly around or over these sparsely distributed structures, and no migration disturbance would be expected. Bat use of offshore areas is limited and generally restricted to spring and fall migration. Very few bats would be expected to encounter structures on the OCS, and no individual or population-level impacts would be expected. Few structures are in the offshore bat geographic analysis area. There is an assortment of navigation and weather buoys plus a handful of light towers (NOAA 2020). Migrating tree bats can easily fly around or over these sparsely distributed structures, and no turbine strikes would be expected.	The infrequent installation of future new structures in the marine environment over the next 33 years is expected to continue. These structures would not be expected to cause disturbance to migrating tree bats. The infrequent installation of future new structures in the marine environment of the next 33 years is expected to continue. These structures would not be expected to result in increased collision risk to migrating tree bats in the marine environment.

IPF = impact-producing factor; OCS = Outer Continental Shelf; TTS = temporary threshold shift

Table G.1-17: Summary of Activities and the Associated Impact-Producing Factors for Birds

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases	Ongoing releases of fuels and fluids are frequent/chronic. Ingestion of hydrocarbons can lead to morbidity and mortality due to decreased hematological function, dehydration, drowning, hypothermia, starvation, and weight loss (Briggs et al. 1997; Haney et al. 2017; Paruk et al. 2016). Additionally, even small exposures that result in feather oiling can lead to sublethal impacts that include changes in flight efficiencies and result in increased energy expenditure during daily and seasonal activities, including chick provisioning, commuting, courtship, foraging, long-distance migration, predator evasion, and territory defense (Maggini et al. 2017). These impacts rarely result in population-level impacts. Trash and debris are accidentally discharged through onshore sources; fisheries use; dredged material ocean disposal; marine minerals extraction; marine transportation, navigation, and traffic; survey activities; and cables, lines, and pipeline laying on an ongoing basis. In a study from 2010, students at sea collected more than 520,000 bits of plastic debris per square mile. In addition, many fragments come from consumer products blown out of landfills or tossed out as litter (Law et al. 2010). Birds may accidentally ingest trash mistaken for prey. Mortality is typically a result of blockages caused by both hard and soft plastic debris (Roman et al. 2019).	Gradually increasing vessel traffic over the next 33 years would increase the potential risk of accidental releases of fuels and fluids and associated impacts, including mortality, decreased fitness, and health impacts on individuals. Impacts are unlikely to affect populations. As population and vessel traffic increase gradually over the next 33 years, accidental release of trash and debris may increase. This may result in increased injury or mortality of individuals. However, there does not appear to be evidence that the volumes and extents would have any impact on bird populations.
Cable emplacement and maintenance	Cable emplacement and maintenance activities disturb bottom sediments and cause temporary increases in suspended sediment; these disturbances will be temporary and generally limited to the emplacement corridor. In the geographic analysis area, there are six existing power cables (see BOEM 2019a for details). Impacts from suspended sediment include reduced foraging success, as vision is an important component of seabird foraging activity (Cook and Burton 2010). Additionally, impacts may occur as a result of impacts on prey species. However, given the localized nature of the potential impacts, individuals would be expected to successfully forage in nearby areas not affected by increased sedimentation, and no biologically significant impacts on individuals or populations would be expected.	Future new cables, perhaps connecting Martha's Vineyard and/or Nantucket to the mainland, would occasionally disturb the seafloor and cause temporary increases in suspended sediment, resulting in localized and short-term impacts. The FCC has two pending submarine telecommunications cable applications in the North Atlantic. Impacts would be temporary and localized, with no biologically significant impacts on individuals or populations.
Climate change	Increased storm frequency and severity during the breeding season can reduce productivity of bird nesting colonies and kill adults, eggs, and chicks. Increasing ocean acidification may affect prey species upon which some birds feed and could lead to shifts in prey distribution and abundance. Intensity of impacts on birds is speculative. Climate change, influenced in part by GHG emissions, is expected to continue to contribute to a gradual warming of ocean waters over the next 33 years, influencing the frequencies and distributions of various	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	diseases of birds, as well as the distribution of bird prey resources. Birds rely on cues from the weather to start migration. Wind direction and speed influence the amount of energy used during migration. For nocturnal migrants, wind assistance is projected to increase across eastern portions of the continent (0.7 mile per hour; 9.6 percent) during spring migration by 2091, and wind assistance is projected to decrease within eastern portions of the continent (0.4 mile per hour; 6.6 percent) during autumn migration (La Sorte et al. 2019). The proliferation of coastline protections has the potential to result in long-term and high-consequence, impacts on bird nesting habitat.	
Land disturbance	Onshore construction activity will continue at current trends. There is some potential for impacts associated with habitat loss and fragmentation. No individual or population-level impacts would be expected.	Future non-offshore wind development would continue to occur at the current rate. This development has the potential to result in habitat loss but would not be expected to result in injury or mortality of individuals.
Lighting	Ocean vessels have an array of lights including navigational lights, deck lights, and interior lights. Such lights can attract some birds. The impact is localized and temporary. This attraction would not be expected to result in an increased risk of collision with vessels but may lead to accidental trash ingestion (see accidental releases). Population-level impacts would not be expected. Offshore buoys and towers emit light, and onshore structures, including houses and ports, emit a great deal more light on an ongoing basis. Buoys, towers, and onshore structures with lights can attract birds. This attraction has the potential to result in an increased risk of collision with lighted structures (Hűppop et al. 2006). Light from structures is widespread and permanent near the coast but minimal offshore.	Gradually increasing vessel traffic over the next 33 years would increase the potential for bird and vessel interactions. While birds may be attracted to vessel lights, this attraction would not be expected to result in increased risk of collision with vessels but may lead to accidental trash ingestion (see accidental releases). No population-level impacts would be expected. Light from onshore structures is expected to gradually increase in proportion with human population growth along the coast. This increase is expected to be widespread and permanent near the coast but minimal offshore.
Noise	Aircraft routinely travel in the geographic analysis area. With the possible exception of rescue operations and survey aircraft, no ongoing aircraft flights would occur at altitudes that would elicit a response from birds. If flights are at a sufficiently low altitude, birds may flush, resulting in non-biologically significant increased energy expenditure. Disturbance, if any, would be localized and temporary, and impacts would be expected to dissipate once the aircraft has left the area. Infrequent site characterization surveys and scientific surveys produce high-intensity impulsive noise around sites of investigation. These activities could result in impacts on diving birds due to displacement by the use of active acoustic equipment and other active acoustic equipment. Non-diving birds would be unaffected. Any displacement would only be temporary during non-migratory periods, but impacts could be greater if	Aircraft noise is likely to continue to increase as commercial air traffic increases; however, very few flights would be expected to be at a sufficiently low altitude to elicit a response from birds. If flights are at a sufficiently low altitude, birds may flush, resulting in non-biologically significant increased energy expenditure. Disturbance, if any, would be localized and temporary, and impacts would be expected to dissipate once the aircraft has left the area. The impact of future site characterization surveys and pile driving would be the same as ongoing activities. Onshore construction will continue at current trends. Some behavior responses could range from escape behavior to mild annoyance, but no individual injury or mortality would be expected.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	displacement were to occur in preferred feeding areas during seasonal migration periods. Noise from pile driving occurs periodically in nearshore areas when piers, bridges, pilings, and seawalls are installed or upgraded. Noise transmitted through water could result in intermittent, temporary, and localized impacts on diving birds due to displacement from foraging areas if birds are present in the vicinity of pile-driving activity. The extent of these impacts depends on pile size, hammer energy, and local acoustic conditions. No biologically significant impacts on individuals or populations would be expected. Onshore construction is routinely used in infrastructure projects. Equipment could potentially cause displacement. Any displacement would only be temporary, and no individual fitness or population-level impacts would be expected. Ongoing vessel noise activities that contribute to this IPF include commercial shipping, recreational and fishing vessels, and scientific and academic research vessels. Subsurface noise from vessels could disturb diving birds foraging for prey below the surface. The impact on birds would be similar to noise from G&G but likely less because noise levels are lower.	
Presence of structures	Each year, 2,551 seabirds die from interactions with U.S. commercial fisheries on the Atlantic (Sigourney et al. 2019). Even more die due to abandoned commercial fishing gear (nets); a reduction in derelict fishing gear has a beneficial impact on bird populations (Regular et al. 2013). In addition, recreational fishing gear (hooks and lines) is periodically lost on existing buoys, pilings, hard protection, and other structures and has the potential to entangle birds. Structures, including tower foundations, scour protection around foundations, and various means of hard protection atop cables, create uncommon relief in a mostly flat seascape. Structure-oriented fishes are attracted to these locations. These impacts are local and can be short term to permanent. These fish aggregations can provide localized, short-term to permanent, beneficial impacts on some bird species due to increased prey species availability. Likewise, structures may attract recreational fishing. The area includes an assortment of navigation and weather buoys plus a handful of light towers (BOEM 2022a). Migrating birds can easily fly around or over these sparely distributed structures. Given the limited number of structures currently in the geographic analysis area, individual- and population-level impacts due to displacement from current foraging habitat would not be expected. Stationary structures in the offshore environment would not be expected to pose a collision risk to birds. Some birds like cormorants and gulls may	New cables installed incrementally in the geographic analysis area for birds over the next 20 to 33 years would likely require hard protection atop portions of the cables (see cable emplacement and maintenance row). Any new towers, buoys, or piers would also create uncommon relief in a mostly flat seascape. Structure-oriented fishes could be attracted to these locations. Abundance of certain fishes may increase. These impacts are expected to be local and may be short term to permanent. These fish aggregations can provide localized, short-term to permanent beneficial impacts on some bird species due to increased prey species availability. The infrequent installation of future new structures in the marine environment over the next 33 years would not be expected to result in migration disturbances or an increase in collision risk or result in displacement. Some potential for attraction and opportunistic roosting exists but would be limited given the limited anticipated number of structures.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	be attracted to these structures and opportunistically roost on these structures.	
Traffic	General aviation accounts for approximately two bird strikes per 100,000 flights (Dolbeer et al. 2019). Additionally, aircraft are used for scientific and academic surveys in marine environments.	Bird fatalities associated with general aviation would be expected to increase with the current trend in commercial air travel. Aircraft would continue to be used to conduct scientific research studies, as well as wildlife monitoring and pre-construction surveys. These flights would be well below the 100,000 flights, and no bird strikes would be expected to occur.

BOEM = Bureau of Ocean Energy Management; FCC = Federal Communications Commission; G&G = geological and geophysical; GHG = greenhouse gas; IPF = impact-producing factor

Table G.1-18: Summary of Activities and the Associated Impact-Producing Factors for Terrestrial Habitats and Fauna

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Climate change	Climate change, influenced in part by GHG emissions, is altering the seasonal timing and patterns of species distributions and ecological relationships, likely causing permanent changes of unknown intensity gradually over the next 33 years.	No future activities were identified within the geographic analysis area other than ongoing activities.
Land disturbance	Periodic ground-disturbing activities contribute to elevated levels of erosion and sedimentation but usually not to a degree that affects terrestrial habitats and fauna, assuming that industry standard BMPs are implemented. Periodic clearing of shrubs and tree saplings along existing utility ROWs causes disturbance and temporary displacement of mobile species and may cause direct injury or mortality of less-mobile species, resulting in short-term impacts that are less than noticeable. Continual development of residential, commercial, industrial, solar, transmission, gas pipeline, onshore wind turbine, and cell tower projects also causes disturbance, displacement, and potential injury and/or mortality of fauna, resulting in localized, temporary impacts. Periodically, undeveloped parcels are cleared and developed for human uses, permanently changing the condition of those parcels as habitat for terrestrial fauna. Continual development of residential, commercial, industrial, solar, transmission, gas pipeline, onshore wind turbine, transportation infrastructure, sewer infrastructure, and cell tower projects could permanently convert various areas.	No future activities were identified within the geographic analysis area other than ongoing activities.
Noise	Periodically, construction noise and vibration associated with new development and maintenance occurs, potentially leading to the disturbance and temporary displacement of mobile species. These impacts are likely minimal in the context of existing	No future activities were identified within the geographic analysis area other than ongoing activities.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
	vehicle, commercial, and industrial noises in the geographic analysis area.	

BMP = best management practice; GHG = greenhouse gas; IPF = impact-producing factor; ROW = right-of-way

Table G.1-19: Summary of Activities and the Associated Impact-Producing Factors for Non-Tidal Waters and Wetlands

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases	Accidental releases of fuel, fluids, and hazardous materials have the potential to cause contamination and harm to water resources from releases and/or cleanup activities. Activities will not occur within 100 feet of wetlands, waterbodies, or known private or community potable wells. A spill prevention, control, and countermeasure plan, in accordance with applicable requirements, will outline spill prevention plans and measures to contain and clean up spills if they were to occur. Impacts are localized, temporary, and negligible.	No future activities were identified within the geographic analysis area other than ongoing activities.
Climate change	Climate change, influenced in part by ongoing GHG emissions, is expected to continue to contribute to impacts on wetlands due to changes in temperature and in the frequency and amount of precipitation. Impacts are uncertain but expected to be minor.	No future activities were identified within the geographic analysis area other than ongoing activities.
Land disturbance	Ongoing development of onshore properties, especially the OECR and onshore substation, has the potential to cause an increase in sedimentation in the geographic analysis area. Impacts are localized, temporary, and negligible. This development could also degrade water quality in non-tidal waters and wetlands. Different crossing methods could be utilized to minimize impacts on the Centerville River or other wetlands. Impacts are localized, temporary, and negligible.	No future activities were identified within the geographic analysis area other than ongoing activities.

GHG = greenhouse gas; IPF = impact-producing factor; OECR = onshore export cable route

Table G.1-20: Summary of Activities and the Associated Impact-Producing Factors for Land Use and Coastal Infrastructure

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Accidental releases	Various ongoing onshore and coastal construction projects include vehicles and equipment that contain fuel, fluids, and hazardous materials that could result in an accidental release.	Ongoing onshore construction projects involve vehicles and equipment that use fuel, fluids, or hazardous materials that could result in an accidental release. Intensity and extent would vary, depending on the size, location, and materials involved in the release.
Land disturbance	Onshore construction supports local population growth, employment, and economics, which, in turn, could lead to new development or redevelopment that disturbs land. New development or redevelopment would result in changes in land use in accordance with local government land use plans and regulations.	Onshore development would continue in accordance with local government land use plans and regulations and is, thus, anticipated to reinforce existing land use patterns, based on local government planning documents.

Associated IPFs	Ongoing Activities	Future Non-Offshore Wind Activities Intensity/Extent
Lighting	Various ongoing onshore and coastal construction projects have nighttime activities, as well as existing structures, facilities, and vehicles, which would use nighttime lighting.	Ongoing onshore construction projects involving nighttime activity could generate nighttime lighting. Intensity and extent would vary, depending on the location, type, direction, and duration of nighttime lighting.
Port utilization	The major ports in the United States are seeing increased vessel visits, as vessel size also increases. Ports are also going through continual upgrades and maintenance. The MCT at the Port of New Bedford is a completed facility developed by the port specifically to support the construction of offshore wind facilities.	Ports would need to perform maintenance and upgrade facilities to ensure that they can still receive the projected future volume of vessels visiting their ports and are able to host larger deep draft vessels as they continue to increase in size.
Presence of structures	The only existing offshore structures within the offshore viewshed of the proposed Project are minor features such as buoys. Onshore buried transmission cables are present in the area near the proposed Project onshore and offshore improvements. Onshore activities would only occur where permitted by local land use authorities, which would avoid long-term land use conflicts.	Non-offshore wind structures that could be viewed in conjunction with the offshore components would be limited to meteorological towers. Marine activity would also occur within the marine viewshed.

IPF = impact-producing factor; MCT = Marine Commerce Terminal

G.3 References

Ainley, D.G., E. Porzig, D. Zajanc, and L.B. Spear. 2015. "Seabird flight behavior in response to altered wind strength and direction." Marine Ornithology 43:25-36.

Arnett, E.B., K. Brown, W.P. Erickson, J. Fiedler, B.L. Hamilton, T.H. Henry, A. Jain, G.D. Johnson, J. Kerns, R.R. Kolford, C.P. Nicholson, T. O'Connell, M. Piorkowski, and R. Tankersley, Jr. 2008. "Patterns of Bat Fatalities at Wind Energy Facilities in North America." Journal of Wildlife Management, Vol. 72:61–78.

Baerwald, E.F., and R.M.R. Barclay. 2009. "Geographic Variation in Activity and Fatality of Migratory Bats at Wind Energy Facilities." Journal of Mammalogy, Vol. 90:1341–1349. Accessed: March 16, 2022. Retrieved from: https://academic.oup.com/jmammal/article/90/6/1341/898849.

Band, B. 2012. Using a Collision Risk Model to Assess Bird Collision Risks for Offshore Windfarms. Report to the Crown Estate Strategic Ornithological Support Services (SOSS), SOSS-02. Accessed: April 15, 2022. Retrieved from: https://www.bto.org/sites/default/files/u28/downloads/Projects/Final_Report_SOSS02_Band1ModelGuidance.pdf

Barnstable County. 2022. "Dredge Facts." Accessed: June 17, 2022. Retrieved from: https://www.capecod.gov/departments/dredge-program/dredge-facts/

Bartol, S.M. 1999. "Auditory Evoked Potentials of the Loggerhead Sea Turtle (*Caretta caretta*)." Master's Thesis, College of William and Mary–Virginia Institute of Marine Science. Accessed: February 24, 2022. Retrieved from: https://scholarworks.wm.edu/cgi/viewcontent.cgi?article=2805&context=etd

Baulch, S., and C. Perry. 2014. "Evaluating the Impacts of Marine Debris on Cetaceans." *Marine Pollution Bulletin* 80:210–221.

Bejarano, A.C., J. Michel, J. Rowe, Z. Li, D. French McCay, L. McStay, and D.S. Etkin. 2013. *Environmental Risks, Fate and Effects of Chemicals Associated with Wind Turbines on the Atlantic Outer Continental Shelf.* U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Herndon, VA. OCS Study BOEM 2013-213.

Bembenek-Bailey, S.A., J.N. Niemuth, P.D. McClellan-Green, M.H. Godfrey, C.A. Harms, H. Gracz, and M.K. Stoskopf. 2019. "NMR Metabolomics Analysis of Skeletal Muscle, Heart, and Liver of Hatchling Loggerhead Sea Turtles (*Caretta caretta*) Experimentally Exposed to Crude Oil and/or Corexit." *Metabolites*, 9(2):21. Accessed February 24, 2022. Retrieved from: https://doi.org/10.3390/metabo9020021

Berreiros, J.P., and V.S. Raykov. 2014. "Lethal Lesions and Amputation Caused by Plastic Debris and Fishing Gear on the Loggerhead Turtle *Caretta caretta* (Linnaeus, 1758). Three case reports from Terceira Island, Azores (NE Atlantic)." *Marine Pollution Bulletin* 86:518-522.

Blehart, D.S., A.C. Hicks, M. Behr, C.U. Meteyer, B.M. Berlowski-Zier, E.L. Buckles, J.T.H. Coleman, S.R. Darling, A. Gargas, R. Niver, J.C. Okoniewski, R.J. Judd, and W.B. Stone. 2009. "Bat White-Nose Syndrome: An Emerging Fungal Pathogen?" Science 323: 227. Accessed: March 16, 2022. Retrieved from: https://www.science.org/doi/10.1126/science.1163874

Blodget, B.C. 2002. Bird list for the commonwealth of Massachussetts. Massachussetts Div Fish Wildlife. Accessed: April 15, 2022. Retrieved from: https://www.mass.gov/doc/bird-list/download

BOEM (Bureau of Ocean Energy Management). Undated. "Renewable Energy Research." Accessed: April 15, 2022. Retrieved from: https://www.boem.gov/environment/environmental-studies/renewable-energy-research-ongoing-studies

BOEM (Bureau of Ocean Energy Management). 2012. Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore Massachusetts: Environmental Assessment. OCS EIS/EA BOEM 2012-087. Accessed: April 15, 2022. Retrieved from: https://www.boem.gov/sites/default/files/uploadedFiles/BOEM/BOEM_Newsroom/Library/Publications/2012/BOEM-2012-087.pdf

BOEM (Bureau of Ocean Energy Management). 2014. Atlantic OCS Proposed Geological and Geophysical Activities: Final Programmatic Environmental Impact Statement. Mid-Atlantic and South Atlantic Planning Areas. Office of Renewable Energy Programs. OCS EIS/EA BOEM 2014-001. February 2014. Accessed: April 15, 2022. Retrieved from: https://www.boem.gov/oil-gas-energy/atlantic-geological-and-geophysical-gg-activities-programmatic-environmental-impact

BOEM (Bureau of Ocean Energy Management). 2015. Virginia Offshore Wind Technology Advancement Project on the Atlantic Outer Continental Shelf Offshore Virginia: Revised Environmental Assessment. Office of Renewable Energy Programs. OCS EIS/EA BOEM 2015-031. Accessed: March 16, 2022. Retrieved from: https://www.boem.gov/sites/default/files/renewable%1eenergy%1eprogram/State%1eActivities/VA/VOWTAP%1eEA.pdf%20

BOEM (Bureau of Ocean Energy Management). 2019a. National Environmental Policy Act Documentation for Impact-Producing Factors in the Offshore Wind Cumulative Impacts Scenario on the North Atlantic Continental Shelf. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Sterling, VA. OCS Study BOEM 2019- 036. May 2019. Accessed: March 16, 2022. Retrieved from: https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Renewable-Energy/IPFs-in-the-Offshore-Wind-Cumulative-Impacts-Scenario-on-the-N-OCS.pdf

BOEM (Bureau of Ocean Energy Management). 2019b. Draft Proposed Guidelines for Providing Information on Lighting and Marking of Structures Supporting Renewable Energy Development. October 2019.

BOEM (Bureau of Ocean Energy Management). 2019c. *Vineyard Wind Offshore Wind Energy Project Biological Assessment.* For the U.S. Fish and Wildlife Service.

BOEM (Bureau of Ocean Energy Management). 2021a. *Vineyard Wind 1 Offshore Wind Energy Project Final Environmental Impact Statement Volume II*. OCS EIS/EA BOEM 2021-0012. 642 pp. Accessed: March 7, 2022. Retrieved from: https://www.boem.gov/vineyard-wind

BOEM (Bureau of Ocean Energy Management). 2021b. *Hydrodynamic Modeling, Particle Tracking and Agent-Based Modeling of Larvae in the U.S. Mid-Atlantic Bight*. OCS Study BOEM 2021-0049. 232 pp. Accessed: May 23, 2022. Retrieved from: https://espis.boem.gov/final%20reports/BOEM_2021-049.pdf

BOEM (Bureau of Ocean Energy Management). 2022a. *New England Wind Project Biological Assessment.* For the U.S. Fish and Wildlife Service.

BOEM (Bureau of Ocean Energy Management). 2022b. *Supporting National Environmental Policy Act Documentation for Offshore Wind Energy Development Related to High Voltage Direct Current Cooling Systems*. OCS Study BOEM 2022-023. Accessed: August 24, 2022. Retrieved from: https://www.boem.gov/sites/default/files/documents/renewable-energy/state-activities/HVDC%20Cooling%20Systems%20White%20Paper.pdf

BOEM (Bureau of Ocean Energy Management). 2023. *New England Wind Project Biological Assessment.* For the National Marine Fisheries Service. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs.

Brabant, R, Y. Laurent, B. Jonge Poerink, and S. Degraer. 2021."The Relation between Migratory Activity of *Pipistrellus* Bats at Sea and Weather Conditions Offers Possibilities to Reduce Offshore Wind Farm Effects." *Animals* 2021, 11, 3457. doi.org/10.3390/ani11123457. Accessed: June 22, 2022. Retrieved from: https://www.mdpi.com/2076-2615/11/12/3457

Brack, V., Jr., and J.O. Whitaker, Jr. 2001. "Foods of the Northern Myotis, *Myotis septentrionalis*, from Missouri and Indiana, with Notes on Foraging." *Acta Chiropterologica* 3, no. 2: 203-210.

Briggs, K.T., M.E. Gershwin, and D.W. Anderson. 1997. "Consequences of petrochemical ingestion and stress on the immune system of seabirds." *ICES Journal of Marine Science* 54:718-725.

Broders, H.G., G.J. Forbes, S. Woodley, and I.D. Thompson. 2006. "Range Extent and Stand Selection for Roosting and Foraging in Forest-Dwelling Northern Long-eared Bats and Little Brown Bats in the Greater Fundy Ecosystem, New Brunswick." Journal of Wildlife Management 70, no. 5: 1174-1184.

Browne, M.A., A.J. Underwood, M.G. Chapman, R. Williams, R.C. Thompson, and J.A. van Franeker. 2015. "Linking Effects of Anthropogenic Debris to Ecological Impacts." *Proceedings of the Royal Society B,* Vol. 282: 20142929.

Bugoni, L., L. Krause, and M.V. Petry. 2001. "Marine Debris and Human Impacts on Sea Turtles in Southern Brazil." *Marine Pollution Bulletin,* 42(12):1330-1334.

Buonocore, J.J., K.F. Lambert, D. Burtraw, S. Sekar, and C.T. Driscoll. 2016. "Correction: An Analysis of Costs and Health Co-Benefits for a U.S. Power Plant Carbon Standard." *PLOS ONE* 11(6): e0158792. Accessed: March 15, 2022. Retrieved from: https://doi.org/10.1371/journal.pone.0158792

Burge, C.A., C.M. Eakin, C.S. Friedman, B. Froelich, P.K. Hershberger, E.E. Hofmann, L.E. Petes, K.C. Prager, E. Weil, B.L. Willis, S.E. Ford, and C.D. Harvell. 2014. "Climate Change Influences on Marine Infectious Diseases: Implications for Management and Society." *Annual Review of Marine Science* 6:249-277.

Buzzards Bay Coalition. 2021. "Bay Health New Bedford Harbor." Accessed: May 23, 2022. Retrieved from: https://www.savebuzzardsbay.org/bay-health/waterway/new-bedford-harbor/

Camacho, M., O.P. Luzardo, L.D. Boada, L.F.L. Jurado, M. Medina, M. Zumbado, and J. Orós. 2013. "Potential Adverse Health Effects of Persistent Organic Pollutants on Sea Turtles: Evidence from a Cross-Sectional Study on Cape Verde Loggerhead Sea Turtles." *Science of the Total Environment* 458-460:283-289.

CapeCod.com. 2019. "New Dredge Coming to Barnstable County." June 28, 2019. Accessed: July 13, 2022. Retrieved from: https://www.capecod.com/newscenter/new-dredge-coming-to-barnstable-county/

Cape Cod Commission. 2013. Cape Cod Rail Trail Extension Yarmouth/Barnstable. Presentation, Barnstable and Yarmouth Public Meetings. Accessed: February 14, 2022. Retrieved from: https://capecodcommission.org/resource-library/file/?url=/dept/commission/team/Website_Resources/transportation/CapeCodRailTrailExtension_%20PublicMeeting021213.pdf

Cape Cod Commission. 2021. *Cape Cod Regional Policy Plan*. December 2018; amended effective March 30, 2021. Accessed: January 2022. Retrieved from: https://www.capecodcommission.org/resource-library/file/?url=/dept/commission/team/Website_Resources/RPP/2018_Cape_Cod_Regional_Policy_Plan_for_web.pdf

Causon, P.D., and A.B. Gill. 2018. "Linking Ecosystem Services with Epibenthic Biodiversity Change Following Installation of Offshore Wind Farms." Environmental Science and Policy 89: 340-347.

Center for Coastal Studies. 2020. Water quality monitoring data file. Accessed: December 15, 2021. Retrieved from: http://www.capecodbay-monitor.org/

Choi, D.Y., T.W. Wittig, and B.M. Kluever. 2020. "An Evaluation of Bird and Bat Mortality at Wind Turbines in the Northeastern United States." PLoS ON*E*, Vol. 15(8): e0238034. Accessed: March 16, 2022. Retrieved from: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0238034

City of Bridgeport. 2017. *Waterfront Bridgeport: Waterfront Master Plan*. Accessed: January 2022. Retrieved from: https://www.bridgeportct.gov/filestorage/341650/341652/346105/342427/20170221_Waterfront_Bridgeport_Plan_combined_report_med.pdf

City of Bridgeport. 2018. *City of Bridgeport: Zoning Map*. Accessed: January 14, 2022. Retrieved from: https://www.bridgeportct.gov/filestorage/341650/341652/345965/343658/Zoning_Map.pdf

City of Bridgeport. 2019. *Plan Bridgeport*. Produced by Fitzgerald and Halliday, Inc. Accessed: January 28, 2022. Retrieved from: http://planbridgeport.com/documents/plan.pdf

City of Salem. 2021. Vineyard Wind Partnership for Salem Harbor Port. September 30, 2021. Accessed: January 28, 2022. Retrieved from: https://www.salem.com/home/news/vineyard-wind-partnership-salem-harbor-port

Claisse, J.T., D.J. Pondella II, M. Love, L.A. Zahn, C.M. Williams, J.P. Williams, and A.S. Bull. 2014. "Oil Platforms Off California are among the Most Productive Marine Fish Habitats Globally." *Proceedings of the National Academy of Sciences of the United States of America* 111(43):15462-15467. Accessed: April 16, 2022. Retrieved from: https://www.pnas.org/doi/pdf/10.1073/pnas.1411477111

Commonwealth of Massachusetts. 2016. *Pitch Pine-Oak Forest Woodland*. Division of Fisheries & Wildlife, Natural Heritage & Endangered Species Program. Accessed: January 25, 2022. Retrieved from: https://web.archive.org/web/20180714110520/https://www.mass.gov/files/documents/2016/08/uw/pitch-pine-oak-forest-woodland-fs.pdf

Commonwealth of Massachusetts. 2022. "Rare Species Viewer." Accessed: January 25, 2022. Retrieved from: https://www.mass.gov/info-details/rare-species-viewer

Cook, A.S.C.P., and N.H.K. Burton. 2010. *A Review of Potential Impacts of Marine Aggregate Extraction on Seabirds.* Marine Environment Protection Fund Project 09/P130. Accessed: April 15, 2022. Retrieved from: https://www.bto.org/sites/default/files/shared_documents/publications/research-reports/2010/rr563.pdf

Cryan, P.M. 2008. "Mating Behavior as a Possible Cause of Bat Fatalities at Wind Turbines." Journal of Wildlife Management, Vol. 72(3):845–849; 2008). Accessed: March 16, 2022. Retrieved from: https://bioone.org/journals/journal-of-wildlife-management/volume-72/issue-3/2007-371/Mating-Behavior-as-a-Possible-Cause-of-Bat-Fatalities-at/10.2193/2007-371.short

Cryan, P.M., and R.M.R. Barclay. 2009. "Causes of Bat Fatalities at Wind Turbines: Hypotheses and Predictions." Journal of Mammalogy 90:1330-1340.

Cryan P.M., M. Gorresen, C.D. Hein, M.R. Schirmacher, R.H. Diehld, M.M. Husoe, D.T.S. Hayman, P.D. Fricker, F.J. Bonaccorso, D.H. Johnson, K. Heist, and D.C. Dalton. 2014. "Behavior of Bats at Wind Turbines." Proceedings of the National Academy of Sciences. 11(42): 15126-15131.

CSA Ocean Sciences Inc. and Exponent. 2019. *Evaluation of Potential EMF Effects on Fish Species of Commercial or Recreational Fishing Importance in Southern New England.* Sterling, VA: U.S. Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2019-049. Accessed: January 25, 2022. Retrieved from: https://espis.boem.gov/final%20reports/BOEM_2019-049.pdf

Curtice, C., J. Cleary, E. Shumchenia, and P. Halpin. 2019. Marine-Life Data and Analysis Team (MDAT) Technical Report on the Methods and Development of Marine-Life Data to Support Regional Ocean Planning and Management. Prepared on behalf of the Marine-life Data and Analysis Team (MDAT). Accessed: April 15, 2022. Retrieved from: https://seamap.env.duke.edu/models/mdat/MDAT-Technical-Report.pdf

DeGraaf, R., and M. Yamasaki. 2001. *New England Wildlife: Habitat, Natural History, and Distribution*. Hanover, NH: University Press of New England.

Degraer, S., R. Brabant, B. Rumes, and L. Vigin. 2019. *Environmental Impacts of Offshore Wind Farms in the Belgian Part of the North Sea: Marking a Decade of Monitoring, Research, and Innovation*. Brussels: Royal Belgian Institute of Natural Sciences, 134 pp. Accessed: July 12, 2022. Retrieved from: https://tethys.pnnl.gov/publications/environmental-impacts-offshore-wind-farms-belgian-part-north-sea-marking-decade

Desholm, M. 2006. *Wind Farm Related Mortality Among Avian Migrants—a Remote Sensing Study and Model Analysis.* PhD thesis. Dept. of Wildlife Ecology and Biodiversity, NERI, and Dept. of Population Biology, University of Copenhagen. National Environmental Research Institute, Denmark. 128 pp.

Desholm, M., and J. Kahlert. 2005. "Avian Collision Risk at an Offshore Wind Farm." Biology Letters 1, no. 3: 296–298. doi:10.1098/rsbl.2005.0336.

Dierschke, V., R.W. Furness, and S. Garthe. 2016. "Seabirds and Offshore Wind Farms in European Waters: Avoidance and Attraction." Biological Conservation 202:59-68.

Dolbeer, R.A., M.J. Begier, P.R. Miller, J.R. Weller, and A.L. Anderson. 2019. *Wildlife Strikes to Civil Aircraft in the United States, 1990–2018.* Federal Aviation Administration National Wildlife Strike Database Serial Report Number 25. 95 pp. + Appendices.

Donovan, C. 2017. *Stochastic Band CRM–GUI User Manual (Draft V1.0).* Marine Scotland. 25 pp. Accessed: April 15, 2022. Retrieved from: https://www2.gov.scot/Resource/0053/00535991.pdf

Dowling, Z., P.R. Sievert, E. Baldwin, L. Johnson, S. von Oettingen, and J. Reichard. 2017. *Flight Activity and Offshore Movements of Nano-Tagged Bats on Martha's Vineyard, MA.* U.S. Department of the Interior, BOEM, Office of Renewable Energy Programs, Sterling, Virginia. OCS Study BOEM 2017-054. Accessed: March 16, 2022. Retrieved from: https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Renewable-Energy/Flight-Activity-and-Offshore-Movements-of-Nano-Tagged-Bats-on-Martha%27s-Vineyard%2C-MA.pdf

Drewitt, Allan L., and Rowena H.W. Langston. 2006. "Assessing the Impacts of Wind Farms on Birds." Ibis 148: 29-42. Retrieved from: https://doi.org/10.1111/j.1474-919X.2006.00516.x

Durakovic, A. 2021. Park City Wind Homeports in Connecticut. offshoreWIND.biz. Accessed: January 14, 2022. Retrieved from: https://www.offshorewind.biz/2021/05/20/park-city-wind-homeports-in-connecticut/

eBird. 2022. "An Online Database of Bird Distribution and Abundance." The Cornell Lab of Ornithology. Accessed: April 15, 2022. Retrieved from: https://ebird.org/home

Efroymson, R.A., W. Hodge Rose, S. Nemth, and G.W. Suter II. 2000. *Ecological Risk Assessment Framework for Low Altitude Overflights by Fixed-Wing and Rotary-Wing Military Aircraft.* Research sponsored by Strategic Environmental Research and Development Program of the U.S. Department of Defense under Interagency Agreement 2107-N218-S1. Publication No. 5010, Environmental Sciences Division, ORNL.

English, P.A., T.I. Mason, J.T. Backstrom, B.J. Tibbles, A.A. Mackay, M.J. Smith, and T. Mitchell. 2017. *Improving Efficiencies of National Environmental Policy Act Documentation for Offshore Wind Facilities Case Studies Report*. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs. OCS Study BOEM 2017-026.

Epsilon (Epsilon Associates, Inc.). 2023. *Draft New England Wind Construction and Operations Plan for Lease Area OCS-A 0534*. New England Wind Project. Retrieved from: https://www.boem.gov/renewable-energy/state-activities/new-england-wind-ocs-0534-construction-and-operations-plan

Erickson, W.P., G.D. Johnson, M.D. Strickland, D.P. Young, Jr., K.J. Sernka, R.E. Good, M. Bourassa, K. Bay, and K. Sernka. 2002. *Synthesis and Comparison of Baseline Avian and Bat Use, Raptor Nesting and Mortality Information from Proposed and Existing Wind Developments*. Bonneville Power Administration, Portland, Oregon, USA.

Erickson, W.P., M.M. Wolfe, K.J. Bay, D.H. Johnson, and J.L. Gehring. 2014. "A Comprehensive Analysis of Small-passerine Fatalities from Collision with Turbines at Wind Energy Facilities." PLoS ONE 9(9): e107491.

ESS Group, Inc. 2014. Cape Wind Avian and Bat Pre-Construction Monitoring Report: 2013-2014. Unpublished Report to Cape Wind Associates.

Fabrizio, M.C., J.P. Manderson, and J.P. Pessutti. 2014. "Home Range and Seasonal Movements of Black Sea Bass (Centropristis striata) During their Inshore Residency at a Reef in the Mid-Atlantic Bight." *Fishery Bulletin* 112:82–97. doi: 10.7755/FB.112.1.5.

Fiedler, J.K. 2004. "Assessment of Bat Mortality and Activity at Buffalo Mountain Windfarm, Eastern Tennessee." Master's Thesis, University of Tennessee, 2004. Accessed: March 16, 2022. Retrieved from: https://trace.tennessee.edu/cgi/viewcontent.cgi?article=3488&context=utk_gradthes

Fox, A.D., M. Desholm, J. Kahlert, T. Kjaer Christensen, and I.K. Peterson. 2006. "Information Needs to Support Environmental Impact Assessment of the Effects of European Marine Offshore Wind Farms on Birds." Ibis 148: 129-144.

Frady, T., and E. Mecray. 2004. "Invasive Sea Squirt Alive and Well on Georges Bank." NOAA NMFS Northeast Fisheries Science Center. Accessed: April 16, 2022. Retrieved from: https://web.archive.org/web/20170521042859/https://www.nefsc.noaa.gov/press_release/2004/news04.19.pdf

Friggens, Megan M., Mary I. Williams, Karen E. Bagne, Tosha T. Wixom, and Samuel A. Cushman. 2018. "Chapter 9: Effects of Climate Change on Terrestrial Animals." Climate Change Vulnerability and Adaptation in the Intermountain Region. USDA Forest Service RMRS-GTR-375.

Furness, B. and H. Wade. 2012. *Vulnerability of Scottish seabirds to offshore wind turbines*. Marine Scotland Report. Accessed: April 15, 2022. Retrieved from: https://tethys.pnnl.gov/sites/default/files/publications/Furness%20and%20Wade%202012.pdf

Furness, R.W., H.M. Wade, and E. Masden. 2013. "Assessing vulnerability of marine bird populations to offshore wind farms." *Journal of Environmental Management* 119:56–66.

Furness, R.W., S. Garthe, M. Trinder, J. Matthiopoulos, S. Wanless, and J. Jeglinski. 2018. Nocturnal Flight Activity of Northern Gannets Morus bassanus and Implications for Modeling Collision Risk at Offshore Wind Farms, Environmental Impact Assessment Review, Volume 73, Pages 1-6. Accessed: April 15, 2022. Retrieved from: https://doi.org/10.1016/j.eiar.2018.06.006

Gall, S.C., and R.C. Thompson. 2015. "The Impact of Marine Debris on Marine Life." *Marine Pollution Bulletin* 92:170-179.

Gargas, A., M.T. Trest, M. Christensen, T.J. Volk, and D.S. Blehert. 2009. "*Geomyces destructans* sp. nov. Associated with Bat White-Nose Syndrome." *Mycotaxon* 108: 147-154.

Garthe, S., and O. Hűppop. 2004. "Scaling possible adverse effects of marine wind farms on seabirds: developing and applying a vulnerability index." *Journal of Applied Ecology*, 41, 724–734.

GE (GE Renewable Energy). 2019. Press Release: GE Renewable Energy unveils the first Haliade-X 12 MW, the world's most powerful offshore wind turbine. Accessed: April 15, 2022. Retrieved from: https://www.ge.com/news/press-releases/ge-renewable-energy-unveils-first-haliade-x-12-mw-worlds-most-powerful-offshore-wind

Gibbons, S. 2015. "Gone with the Wind: Valuing the Visual Impacts of Wind Turbines through House Prices." *Journal of Environmental Economics and Management*, Vol. 72, 177-196. Accessed: January 14, 2022. Retrieved from: http://eprints.lse.ac.uk/62880/1/__lse.ac.uk_storage_LIBRARY_Secondary_libfile_shared_repository_Content_Gibbons,%20S_Gone%20with%20wind_Gibbons_Gone%20with%20wind_2015.pdf

Gill, A.B., I. Gloyne-Phillips, K.J. Neal, and J.A. Kimber. 2005. *The Potential Effects of Electromagnetic Fields Generated by Sub-Sea Power Cables Associated with Offshore Wind Farm Developments on Electrically and Magnetically Sensitive Marine Organisms–A Review*. Collaborative Offshore Wind Research into the Environment (COWRIE), Ltd, UK. COWRIE-EM FIELD 2-06-2004. Accessed: February 20, 2022. Retrieved from: https://tethys.pnnl.gov/sites/default/files/publications/The_Potential_Effects_of_Electromagnetic_Fields_Generated_by_Sub_Sea_Power_Cables.pdf

GMI (Geo-Marine, Inc.). 2010. *Ocean/Wind Power Ecological Baseline Studies: January 2008 - December 2009*. Final Report prepared for the New Jersey Department of Environmental Protection, Office of Science, Trenton, New Jersey. 2824 pp. Accessed: April 15, 2022. Retrieved from: https://www.nj.gov/dep/dsr/ocean-wind/

Goodale, M.W., and A. Millman. 2016. "Cumulative Adverse Effects of Offshore Wind Energy Development on Wildlife." Journal of Environmental Planning and Management 59, no. 1: 1-29. doi: 10.1080/09640568.2014.973483.

Goyert, H.F., B. Gardner, R. Sollmann, R.R. Veit, A.T. Gilbert, E.E. Connelly, and K.A. Williams. 2016. "Predicting the Offshore Distribution and Abundance of Marine Birds with a Hierarchical Community Distance Sampling Model." Ecological Applications 26, 1797–1815. Accessed: April 15, 2022. Retrieved from: https://esajournals.onlinelibrary.wiley.com/doi/full/10.1890/15-1955.1

Greene, J, M. Anderson, J. Odell, and N. Steinberg. 2010. *The Northwest Atlantic Marine Ecoregional Assessment: Species, Habitats and Ecosystems. Phase One.* Boston, MA: The Nature Conservancy, Eastern U.S. Division. Accessed: January 25, 2020. Retrieved from: https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/Documents/namera-phase1-fullreport.pdf

Gregory, M.R. 2009. "Environmental Implications of Plastic Debris in Marine Setting –Entanglement, Ingestion, Smothering, Hangers-on, Hitch-hiking, and Alien Invasion." *Philosophical Transactions of the Royal Society B* 364:2013-2025.

Guida, V., A. Drohan, H. Welch, J. McHenry, D. Johnson, V. Kentner, J. Brink, D. Timmons, and E. Estela-Gomez. 2017. *Habitat Mapping and Assessment of Northeast Wind Energy Areas.* Sterling, VA: U.S. Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2017-088. 312 p. Accessed: January 25, 2022. Retrieved from: https://espis.boem.gov/final%20reports/5647.pdf

Gulf of Maine Census. 2018. Gulf of Maine Currents. Accessed: February 14, 2022.

Hamilton, R.M. 2012. "Spatial and Temporal Activity of Migratory Bats at Landscape Features." Electronic Thesis and Dissertation Repository. 886.

Haney, J.C., P.G.R. Jodice, W.A. Montevecchi, and D.C. Evers. 2017. "Challenges to oil spill assessments for seabirds in the deep ocean." *Archives of Environmental Contamination and Toxicology* 73:33-39.

Hann, Z.A., M.J. Hosler, and P.R. Mooseman, Jr. 2017. "Roosting Habits of Two *Lasiurus borealis* (eastern red bat) in the Blue Ridge Mountains of Virginia." Northeastern Naturalist Vol. 24 (2): N15-N18.

Hare, J.A., W.E. Morrison, M.W. Nelson, M.M. Stachura, E.J. Teeters, R.B. Griffis, M.A. Alexander, J.D. Scott, L. Alade, R.J. Bell, A.S. Chute, K.L. Curti, T.H. Curtis, D. Kircheis, J.F. Kocik, S. M. Lucey, C.T. McCandless, L.M. Milke, D.E. Richardson, E. Robillard, H.J. Walsh, M.C. McManus, K.E. Marancik, and C.A. Griswold. 2016. "A Vulnerability Assessment of Fish and Invertebrates to Climate Change on the Northeast U.S. Continental Shelf." *PLoS ONE* 11(2):e0146756. Accessed: January 27, 2022. Retrieved from: https://doi.org/10.1371/journal.pone.0146756

Harris, J., R. Whitehouse, and J. Sutherland. 2011. "Marine Scour and Offshore Wind: Lessons Learnt and Future Challenges. Proceedings of the International Conference on Offshore Mechanics and Arctic Engineering" OMAE. 5. DOI: 10.1115/OMAE2011-50117.

Hatch, S.A. 2017. "Comprehensive estimates of seabird-fishery interaction for the US Northeast Atlantic and mid-Atlantic." *Aquatic Conservation: Marine and Freshwater Ecosystems* 28(1): 182-193.

Hatch, S.K., E.E. Connelly, T.J. Divoll, I.J. Stenhouse, and K.A. Williams. 2013. "Offshore Observations of Eastern Red Bats (*Lasiurus borealis*) in the Mid-Atlantic United States Using Multiple Survey Methods." *PLoS ONE*, Vol. 8(12): e83803.

Hawkins, A., and A. Popper. 2017. "A Sound Approach to Assessing the Impact of Underwater Noise on Marine Fishes and Invertebrates." *ICES Journal of Marine Science* 74(3):635-651. Accessed: January 28, 2022. Retrieved from: https://doi.org/10.1093/icesjms/fsw205

Hazel, J., I.R. Lawler, H. Marsh, and S. Robson. 2007. "Vessel Speed Increases Collision Risk for the Green Turtle *Chelonia mydas*." *Endangered Species Research* 3:105-113.

HDR. 2019. *Benthic Monitoring During Wind Turbine Installation and Operation at the Block Island Wind Farm, Rhode Island–Year 2*. Final Report to the U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs. OCS Study BOEM 2019-019. Accessed: July 13, 2022. Retrieved from: https://espis.boem.gov/final%20reports/BOEM_2019-019.pdf

Henderson, L.E., and H.G. Broders. 2008. "Movements and Resource Selection of the Northern Long-eared Myotis (*Myotis septentrionalis*) in a Forest-agricultural Landscape." Journal of Mammalogy 89(4): 952-963.

Hoarau, L., L. Ainley, C. Jean, and S. Ciccione. 2014. "Ingestion and Defecation of Marine Debris by Loggerhead Sea Turtles, from By-catches in the South-West Indian Ocean." *Marine Pollution Bulletin* 84:90-96.

Hűppop, O., J. Dierschke, K. Exo, E. Frerich, and R. Hill. 2006. "Bird Migration and Potential Collision Risk with Offshore Wind Turbines." *Ibis* 148: 90-109.

Hutchison, Z.L., P. Sigray, H. He, A.B. Gill, J. King, and C. Gibson. 2018. *Electromagnetic Field (EMF) Impacts on Elasmobranch (Shark, Rays, and Skates) and American Lobster Movement and Migration from Direct Current Cables*. Sterling, VA: U.S. Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2018-003. Accessed: January 28, 2022. Retrieved from: https://espis.boem.gov/final%20reports/5659.pdf

ITOPF (International Tanker Owners Pollution Federation). 2022. *Oil Tanker Spill Statistics 2021*. Accessed June 17, 2022. Retrieved from: https://www.itopf.org/fileadmin/uploads/itopf/data/Documents/Company_Lit/Oil_Spill_Stats_2021.pdf

IWG (Interagency Working Group on Social Cost of Greenhouse Gases). 2021. *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990*. Accessed: January 2024. Retrieved from: https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf

JASCO (JASCO Applied Sciences). 2022. *New England Wind Offshore Wind Farm: Application for Marine Mammal Protection Act (MMPA) Rulemaking and Letter of Authorization*. Submitted to Permits and Conservation Division, Office of Protected Resources, NOAA Fisheries.

Jensen, J.H., L. Bejder, M. Wahlberg, N. Aguilar Solo, M. Johnson, and P.T. Madsen. 2009. "Vessel Noise Effects on Delphinid Communication." *Marine Ecology Progress Series* 395:161–175.

Johnston, A., A.S.C.P. Cook, L.J. Wright, E.M. Humphreys, and N.H.K. Burton. 2014. "Modeling Flight Heights of Marine Birds to More Accurately Assess Collision Risk with Offshore Wind Turbines." Journal of Applied Ecology 51, 31-41.

Kaplan, B. 2011. Literature Synthesis for the North and Central Atlantic Ocean. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement. Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEMRE 2011-012. Accessed: December 15, 2021. Retrieved from: https://espis.boem.gov/final%20reports/5139.pdf

Katzenstein, W. and J. Apt. 2009. "Air Emissions Due To Wind and Solar Power." *Environmental Science and Technology*, Vol. 43, 253–258. Accessed: March 15, 2022. Retrieved from: https://docs.wind-watch.org/Katzenstein-Apt-Emissions-EST-2009-43-253.pdf

Kellar, N.M., Speakman, T.R., Smith, C.R., Lane, S.M., Balmer, B.C., Trego, M.L., Catelani, K.N., Robbins, M.N., Allen, C.D., Wells, R.S., Zolman, E.S., Rowles, T.K., and Schwacke, L.H. 2017. "Low Reproductive Success Rates of Common Bottlenose Dolphins *Tursiops truncatus* in the Northern Gulf of Mexico Following the Deepwater Horizon Disaster (2010–2015)." *Endangered Species Research* 33:1432–158. Accessed: July 13, 2022. Retrieved from: https://www.int-res.com/articles/esr2017/33/n033p143.pdf

Kempton, W., J. Firestone, J Lilley, T. Rouleau, and P. Whitaker. 2005. "The Offshore Wind Power Debate: Views from Cape Cod." *Coastal Management*, Vol. 33(2), 119-149. Accessed: March 15, 2022. Retrieved from: https://www.tandfonline.com/doi/abs/10.1080/08920750590917530

Kerckhof, F., B. Rumes, and S. Degraer. 2019. "About 'Mytilisation' and 'Slimeification': A Decade of Succession of the Fouling Assemblages on Wind Turbines off the Belgian Coast." In: *Memoirs on the Marine Environment: Environmental Impacts of Offshore Wind Farms in the Belgian Part of the North Sea*. S. Degraer, R. Brabant, B. Rumes, and L. Vigin, eds. 73-84. Brussels: Royal Belgian Institute of Natural Sciences, OD Natural Environment, Marine Ecology and Management. Accessed: February 12, 2020. Retrieved from: https://odnature.naturalsciences.be/downloads/mumm/windfarms/winmon_report_2019_final.pdf

Kerlinger, P., J.L. Gehring, W.P. Erickson, R. Curry, A. Jain, and J. Guarnaccia. 2010. "Night Migrant Fatalities and Obstruction Lighting at Wind Turbines in North America." *The Wilson Journal of Ornithology* 122 (4): 744-754.

Kerns, J., W.P. Erickson, and E.B. Arnett. 2005. "Bat and bird fatality at wind energy facilities in Pennsylvania and West Virginia." Pages 24–95 In. B. Arnett, editor. Relationships Between Bats and Wind Turbines in Pennsylvania and West Virginia: An Assessment of Bat Fatality Search Protocols, Patterns of Fatality, and Behavioral Interactions with Wind Turbines. A final report submitted to the Bats and Wind Energy Cooperative, pp 24–95. B. Arnett, editor. Bat Conservation International, Austin, Texas, USA. Accessed: March 16, 2022. Retrieved from: https://tethys.pnnl.gov/sites/default/files/publications/Arnett_et_al_2005.pdf

Kight, C.R., and P. Swaddle. 2011. "How and Why Environmental Noise Impacts Animals: an Integrative, Mechanistic Review." *Ecology Letters*, (2011) 14: 1052–1061.

Kirchgeorg, T., I. Weinberg, M. Hornig, R. Baier, M.J. Schmid, and B. Brockmeyer. 2018. "Emissions from corrosion protection systems of offshore wind farms: Evaluation of the potential impact on the marine environment." Marine Pollution Bulletin. 136: 257-268. Accessed: June 20, 2022. Retrieved from: https://www.sciencedirect.com/science/article/pii/S0025326X18306301

Kirschvink, J.L. 1990. "Geomagnetic Sensitivity in Cetaceans: an Update with Live,Stranding Records in the United States." In *Sensory Abilities of Cetaceans*, Edited by J. Thomas and R. Kastelein, 639-649. New York: Plenum Press. Accessed: February 20, 2022. Retrieved from: http://web.gps.caltech.edu/~jkirschvink/pdfs/Kirschvink1990_Chapter_GeomagneticSensitivityInCetace.pdf

Kite-Powell, H.L., A. Knowlton, and M. Brown. 2007. *Modeling the Effect of Vessel Speed on Right Whale Ship Strike Risk.* Unpublished Report for NOAA/NMFS Project NA04NMF47202394. Accessed: February 20, 2022. Retrieved from: https://tethys.pnnl.gov/publications/modeling-effect-vessel-speed-right-whale-ship-strike-risk#:~:text=Vesselspeedrestrictionshavethree,theeventofacollision

Kraus, S.D., M.W. Brown, H. Caswell, C.W. Clark, M. Fujiwara, P.H. Hamilton, R.D. Kenney, A.R. Knowlton, S. Landry, C.A. Mayo, W.A. McLellan, M.J. Moore, D.P. Nowacek, D.A. Pabst, A.J. Read, and R.M. Rolland. 2005. "North Atlantic Right Whales in Crisis." *Science* 309:561–562.

Kraus, S.D., S. Leiter, K. Stone, B. Wikgren, C. Mayo, P. Hughes, R.D. Kenney, C.W. Clark, A.N. Rice, B. Estabrook, and J. Tielens. 2016. *Northeast Large Pelagic Survey Collaborative Aerial and Acoustic Surveys for Large Whales and Sea Turtles. Final Report.* Sterling, VA: U.S. Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2016-054. Accessed: February 24, 2022. Retrieved from: https://www.boem.gov/sites/default/files/environmental-stewardship/Environmental-Studies/Renewable-Energy/Northeast-Large-Pelagic-Survey-Collaborative-Aerial-and-Acoustic-Surveys-for-Large-Whales-and-Sea-Turtles.pdf

Kunz, T.H., E.B. Arnett, W.P. Erickson, A.R. Hoar, G.D. Johnson, R.P. Larkin, M.D. Strickland, R.W. Thresher, and M.D. Tuttle. 2007. "Ecological Impacts of Wind Energy Development on Bats: Questions, Research Needs, and Hypotheses." Frontiers in Ecology and the Environment 5:315–324.

Lacki, M.J., D.R. Cox, L.E. Dodd, and M.B. Dickinson. 2009. "Response of Northern Bats (*Mytois septentrionlalis*) to Prescribed Fires in Eastern Kentucky Forests." Journal of Mammalogy, Vol. 90(5): 1165-1175.

Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet, and M. Podesta. 2001. "Collisions between Ships and Whales." *Marine Mammal Science* 17(1):35-75.

Law, K.L., S. Morét-Ferguson, N. A. Maximenko, G. Proskurowski, E.E. Peacock, J. Hafner, and C.M. Reddy. 2010. "Plastic Accumulation in the North Atlantic Subtropical Gyre." Sciencexpress 19 August 2010, 10.1126/science.1192321.

La Sorte, F.A., K.G. Horton, C. Nilsson, A.M. Dokter. 2019. Projected Changes in Assistance under Climate Change for Nocturnally Migrating Bird Populations. Global Change Biology 25: 589-601.

Leopold, M.F., E.M. Dijkman, and L. Teal. 2011. *Local Birds in and around the Offshore Wind Farm Egmond aan Zee* (OWEZ) (T-0 & T-1, 2002-2010). Report C187/11. IMARES Wageningen UR, Texel, the Netherlands. Appendices.

Leopold, M.F., R.S.A. van Bemmelen, and A.F. Zuur. 2013. *Responses of Local Birds to the Offshore Wind Farms PAWP and OWEZ off the Dutch mainland coast*. Report C151/12. IMARES Wageningen UR, Texel, the Netherlands.

Lindeboom, H.J., H.J. Kouwenhoven, M.J.N. Bergman, S. Bouma, S. Brasseur, R. Daan, R.C. Fijn, D. de Haan, S. Dirksen, R. van Hal, R. Hille Ris Lambers, R. ter Hofstede, K.L. Krijgsveld, M. Leopold, and M. Scheidat. 2011. "Short-term Ecological Effects of an Offshore Wind Farm in the Dutch Coastal Zone; a compilation." Environmental Research Letters 6: 1-13.

LMEHub. 2022. "Large Marine Ecosystems Hub: A Regional Perspective on the World's Oceans." Accessed: April 15, 2022. Retrieved from: https://www.lmehub.net/

Loring, P.H., P.W.C. Paton, J.D. McLaren, H. Bai, R. Janaswamy, H.F. Goyert, C.R. Griffin, and P.R. Sievert. 2019. *Tracking Offshore Occurrence of Common Terns, Endangered Roseate Terns, and Threatened Piping Plovers with VHF Arrays*. Sterling (VA): U.S. Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2019-017. 140 pp. Accessed: April 15, 2022. Retrieved from: https://espis.boem.gov/final%20reports/BOEM_2019-017.pdf

Loss, S.R., T. Will, and P.P. Marra. 2013. "Estimates of Bird Collision Mortality at Wind Facilities in the Contiguous United States." Biological Conservation 168: Pages 201-209. Accessed: April 15, 2022. Retrieved from: https://doi.org/10.1016/j.biocon.2013.10.007

Luschi, P., S. Benhamou, C. Girard, S. Ciccione, D. Roos, J. Sudre, and S. Benvenuti. 2007. "Marine Turtles Use Geomagnetic Cues during Open Sea Homing." *Current Biology* 17:126-133.

Lutzeyer, S., D.J. Phaneuf, L.O. Taylor. 2017. *The Amenity Costs of Offshore Windfarms: Evidence from a Choice Experiment*. North Carolina State University, Center for Environmental and Resource Economic Policy Working Paper Series: No. 17-017. Accessed: January 14, 2022. Retrieved from: https://cenrep.ncsu.edu/cenrep/wp-content/uploads/2016/03/WP-2017-017.pdf

MacLeod, C.D. 2009. "Global Climate Change, Range Changes and Potential Implications for the Conservation of Marine Cetaceans: A Review and Synthesis." Endangered Species Research 7, no. 2: 125-136. doi: 10.3354/esr00197.

Maggini, I., L.V. Kennedy, A. Macmillan, K.H. Elliot, K. Dean, and C.G. Guglielmo. 2017. "Light oiling of feathers increases flight energy expenditure in a migratory shorebird*." Journal of Experimental Biology* 220: 2372-2379.

Martha's Vineyard Commission. 2010. Island Plan: Charting the Future of the Vineyard. Accessed: March 21, 2022. Retrieved from: https://www.mvcommission.org/sites/default/files/docs/islandplanwebversion.pdf

MassDEP (Massachusetts Department of Environmental Protection). 2019. *Inland and Coastal Wetlands of Massachusetts.* Accessed: April 5, 2022. Retrieved from: https://www.mass.gov/doc/inland-and-coastal-wetlands-of-massachusetts-status-and-trends/download

MassDEP (Massachusetts Department of Environmental Protection). 2022. "Wetlands Loss Maps Q&A." Accessed: March 28, 2022. Retrieved from: https://www.mass.gov/guides/wetlands-loss-maps-qa#-what-is-the-purpose-of-the-wetlands-loss-project

Mass Wildlife (Massachusetts Division of Fisheries & Wildlife). 2015a. *Eastern Small-footed Bat Myotis leibii.* Natural Heritage & Endangered Species Program. Accessed: March 16, 2022. Retrieved from: https://www.mass.gov/files/documents/2016/08/vm/myotis-leibii.pdf

Mass Wildlife (Massachusetts Division of Fisheries & Wildlife). 2015b. *Little Brown Myotis lucifugus*. Natural Heritage & Endangered Species Program. Accessed: March 16, 2022. Retrieved from: https://www.mass.gov/files/documents/2016/08/qd/myotis-lucifugus.pdf

Mass Wildlife (Massachusetts Division of Fisheries & Wildlife). 2015c. *Tricolored Bat Perimyotis subflavus*. Natural Heritage & Endangered Species Program. Accessed: March 16, 2022. Retrieved from: https://www.mass.gov/files/documents/2016/08/wh/perimyotis-subflavus.pdf

Mazet, J.A.K., Gardner, I.A., Jessup, D.A., and Lowenstine, L.J. 2001. "Effects of Petroleum on Mink Applied as a Model for Reproductive Success in Sea Otters." *Journal of Wildlife Diseases* 37(4):686–692. Accessed: July 13, 2022. Retrieved from: https://www.jwildlifedis.org/doi/pdf/10.7589/0090-3558-37.4.686

McConnell, B.J., M.A. Fedak, P. Lovell, and P.S. Hammond. 1999. "Movements and Foraging Areas of Grey Seals in the North Sea." *Journal of Applied Ecology* 36:573–590. Accessed: July 13, 2022. Retrieved from: https://besjournals.onlinelibrary.wiley.com/doi/epdf/10.1046/j.1365-2664.1999.00429.x

McCreary, S., and B. Brooks. 2019. Atlantic Large Whale Take Reduction Team Meeting: Key Outcomes Memorandum. April 23-26, 2019. Providence, Rhode Island. Accessed: February 4, 2022. Retrieved from: https://media.fisheries.noaa.gov/dam-migration/final--atlantic_large_whale_take_reduction_team_meeting_april23-26_kom_(508).pdf

McGregor, R.M., S. King, C.R. Donovan, B. Caneco, and A. Webb. 2018. *A Stochastic Collision Risk Model for Seabirds in Flight.* Marine Scotland. 59 p. Accessed: April 15, 2022. Retrieved from: https://tethys.pnnl.gov/sites/default/files/publications/McGregor-2018-Stochastic.pdf

Metrocog. 2015. *Reconnect Region: A Comprehensive Plan for the Metrocog Region*. Connecticut Metropolitan Council of Governments. Accessed: January 14, 2022. Retrieved from: https://metrocog-website.s3.us-east-2.amazonaws.com/GBRC-Draft-Plan-HQ-ADOPTED-December-17-2015.pdf

Miller, J.H., and G.R. Potty. 2017. "Overview of Underwater Acoustic and Seismic Measurements of the Construction and Operation of the Block Island Wind Farm." *Journal of the Acoustical Society of America* 141(5):3993–3993. doi:10.1121/1.4989144. Accessed: February 24, 2022. Retrieved from: https://asa.scitation.org/doi/10.1121/1.4989144

Mitchelmore, C.L., C.A. Bishop, and T.K. Collier. 2017. "Toxicological Estimation of Mortality of Oceanic Sea Turtles Oiled during the Deepwater Horizon Oil Spill." *Endangered Species Research* 33: 39-50.

MMS (Minerals Management Service). 2007. *Programmatic Environmental Impact Statement for Alternative Energy Development and Production and Alternate Use of Facilities on the Outer Continental Shelf: Final Environmental Impact Statement*. OCS Report MMS 2007-046 (Chapters I, II, III, and IV). Accessed: April 15, 2022. Retrieved from: https://www.boem.gov/Guide-To-EIS/

MMS (Minerals Management Service). 2008. *Cape Wind Energy Project Nantucket Sound: Biological Assessment*. Accessed: March 16, 2022. Retrieved from: https://www.boem.gov/Renewable-Energy-Program/Studies/FEIS/Appendix-G---May-2008-Cape-Wind-Final-BA.aspx

MMS-USFWS (Minerals Management Service-U.S. Fish and Wildlife Service). 2009. Memorandum of Understanding Between the U.S. Department of the Interior, Minerals Management Service [now BOEM] and the U.S. Department of the Interior, U.S. Fish and Wildlife Service Regarding Implementation of Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds. Accessed: April 15, 2022. Retrieved from: https://www.boem.gov/sites/default/files/renewable-energy-program/MMS-FWS_MBTA_MOU_6-4-09.pdf

MNHESP (Massachusetts Natural Heritage and Endangered Species Program). 2016. *Northern Red-bellied Cooter Pseudemys rubriventris pop.1*. Accessed March 31, 2022. Retrieved from: https://www.mass.gov/doc/northern-red-bellied-cooter-factsheet/download

Mohr, F.C., B. Lasely, and S. Bursian. 2008. "Chronic Oral Exposure to Bunker C Fuel Oil Causes Adrenal Insufficiency in Ranch Mink." *Archive of Environmental Contamination and Toxicology*, Vol. 54:337–347. Accessed: July 13, 2022. Retrieved from: https://www.academia.edu/14790871/Chronic_Oral_Exposure_to_Bunker_C_Fuel_Oil_Causes_Adrenal_Insufficiency_in_Ranch_Mink_Mustela_vison_

Moore, M.J., and J.M. van der Hoop. 2012. "The Painful Side of Trap and Fixed Net Fisheries: Chronic Entanglement of Large Whales." *Journal of Marine Biology* 2012: 230653. Accessed: July 13, 2022. Retrieved from: https://www.researchgate.net/publication/258382826_The_Painful_Side_of_Trap_and_Fixed_Net_Fisheries_Chronic_Entanglement_of_Large_Whales

Moser, J., and G.R. Shepherd. 2009. "Seasonal Distribution and Movement of Black Sea Bass (Centropristis striata) in the Northwest Atlantic as Determined from a Mark-Recapture Experiment." *Journal of Northwest Atlantic Fisheries Science* 40:17–28. Accessed: January 28, 2022. Retrieved from: https://doi.org/10.2960/J.v40.m638

MRLC (Multi-Resolution Land Characteristics Consortium). 2021. National Land Cover Database EVA (Enhanced Visualization and Analysis). Accessed: January 14, 2022. Retrieved from: https://www.mrlc.gov/eva/

NABCI (North American Bird Conservation Initiative, U.S. Committee). 2016. *The State of the Birds 2016: Report on Public Lands and Waters*. U.S. Department of the Interior. Washington, DC. Accessed: March 29, 2022. Retrieved from: https://www.stateofthebirds.org/2016/wp-content/uploads/2016/05/SoNAB-ENGLISH-web.pdf

Nelms, S.E., E.M. Duncan, A.C. Broderick, T.S. Galloway, M.H. Godfrey, M. Hamann, P.K. Lindeque, and B.J. Godley. 2016. "Plastic and Marine Turtles: a Review and Call for Research." *ICES Journal of Marine Science* 73(2): 165-181.

Nisbet, I.C., R.R. Veit, S.A. Auer, and T.P. White. 2013. Marine birds of the eastern United States and the Bay of Fundy: Distribution, numbers, trends, threats, and management. Nuttall Ornithological Club, Cambridge, MA.

NJB Magazine. 2021. Ocean Wind, EEW Begin Construction of Manufacturing Facility at Port of Paulsboro. April 19, 2021. Accessed: January 28, 2022. Retrieved from: https://njbmagazine.com/njb-news-now/ocean-wind-eew

NMFS (National Marine Fisheries Service). 2015. *Biological Opinion: Deepwater Wind: Block Island Wind Farm and Transmission System*.

NMFS and USFWS (National Marine Fisheries Service and U.S. Fish and Wildlife Service). 2007. *Green Sea Turtle (Chelonia mydas) 5 Year Review: Summary and Evaluation*. Silver Spring, MMD and Jacksonville, FL National Marine Fisheries Service, Office of Protected Resources and U.S. Fish and Wildlife Service, Southeast Region. Accessed February 24, 2022. Retrieved from: https://repository.library.noaa.gov/view/noaa/17044

NOAA (National Oceanic and Atmospheric Administration). 2010. *Northeast Regional Land Cover Change Report: 1996 to 2010*. Accessed: January 12, 2022. Retrieved from: https://coast.noaa.gov/data/digitalcoast/pdf/landcover-report-northeast.pdf

NOAA (National Oceanic and Atmospheric Administration). 2018. "2017–2019 Minke Whale Unusual Mortality Event Along the Atlantic Coast." Accessed: July 13, 2022. Retrieved from: https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2018-minke-whale-unusual-mortality-event-along-atlantic-coast

NOAA (National Oceanic and Atmospheric Administration). 2021. "Climate Change in the Northeast U.S. Shelf Ecosystem." Accessed: January 5, 2022. Retrieved from: https://www.fisheries.noaa.gov/new-england-mid-atlantic/climate/climate-change-northeast-us-shelf-ecosystem

NOAA (National Oceanic and Atmospheric Administration). 2022. "National Buoy Data Center." Accessed: July 13, 2022. Retrieved from: https://www.ndbc.noaa.gov/

Normandeau (Normandeau Associates Inc.). 2011. *Effects of EMFs from Undersea Power Cables on Elasmobranch and Other Marine Species. Camarillo, CA: U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement.* Camarillo, CA: U.S. Department of the Interior, Bureau of Ocean Energy Management, Pacific OCS Region. OCS Study BOEMRE 2011-09. Accessed: February 24, 2022. Retrieved from: https://tethys.pnnl.gov/sites/default/files/publications/Tricas-Gill-2011.pdf

Normandeau (Normandeau Associates, Inc.). 2019. Digital Aerial Baseline Survey of Marine Wildlife in Support of Offshore Wind Energy Summer 2016 through Fall 2017 Third Interim Report. 131 p. Accessed: April 15, 2022. Retrieved from: https://remote.normandeau.com/docs/NYSERDA_2016-2017_3rd_Semi-Annual_report.pdf

Normandeau (Normandeau Associates, Inc). 2022. "Remote Marine and Onshore Technology: NYSERDA Metocean Buoys." Accessed: June 20, 2022. Retrieved from: https://remote.normandeau.com/portal_buoy_data.php?pj=21&public=1

Northeast Ocean Data. 2019. "Marine Life & Habitat: Birds Stressor Groups." Accessed: April 15, 2022. Retrieved from: https://www.northeastoceandata.org/data-explorer/?birds|stressor-groups

NSF and USGS (National Science Foundation and U.S. Geological Survey). 2011. *Final Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey*. Arlington, VA and Reston, VA: National Science Foundation and U.S. Geological Survey. Accessed: February 24, 2022. Retrieved from: https://www.nsf.gov/geo/oce/envcomp/usgs-nsf-marine-seismic-research/nsf-usgs-final-eis-oeis_3june2011.pdf

Nunny, L., and M.P. Simmonds. 2019. Climate Change and Cetaceans: an update. International Whaling Commission. May.

O'Connell, A.F., B. Gardner, A.T. Gilbert, and K. Laurent. 2009. Compendium of Avian Occurrence Information for the Continental Shelf Waters along the Atlantic Coast of the United States, Final Report (Database Section—Seabirds). Prepared by the USGS Patuxent Wildlife Research Center, Beltsville, MD. U.S. Department of the Interior, Geological Survey, and Bureau of Ocean Energy Management Headquarters, OCS Study BOEM 2012-076. Accessed: April 15, 2022. Retrieved from: https://espis.boem.gov/final%20reports/5209.pdf

Orr, Terry L., Susan M. Herz, and Darrell L. Oakley. 2013. *Evaluation of Lighting Schemes for Offshore Wind Facilities and Impacts to Local Environments*. Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Herndon, VA. OCS Study BOEM 2013-0116. Accessed: April 15, 2022. Retrieved from: https://espis.boem.gov/final%20reports/5298.pdf

Oviatt, C. A. 2004. "The Changing Ecology of Temperate Coastal Waters During a Warming Trend." Estuaries 27, no. 6: 895-904.

Owen, S.F., M.A. Menzel, W.M. Ford, J.W. Edwards, B.R. Chapman, K.V. Miller, and P.B. Wood. 2002. *Roost Tree Selection by Maternal Colonies of Northern Long-eared Myotis in an Intensively Managed Forest*. General Technical Report NE-292. U.S. Forest Service, Newton Square, PA.

Pace, R.M., and G.K. Silber. 2005. "Simple Analysis of Ship and Large Whale Collisions: Does Speed Kill?" Presentation at the *Sixteenth Biennial Conference on the Biology of Marine Mammals*, San Diego, CA, December 2005.

Panuccio, M., G. Dell'Omo, G. Bogliani, C. Catoni, and N. Sapir. 2019. "Migrating Birds Avoid Flying Through Fog and Low Clouds." *International Journal of Biometeorology* 63, 231–239. January 28, 2019. Retrieved from: https://doi.org/10.1007/s00484-018-01656-z

Parsons, G., and J. Firestone. 2018. *Atlantic Offshore Wind Energy Development: Values and Implications for Recreation and Tourism.* OCS Study BOEM 2018-013. University of Delaware, Newark, DE 19716-0099. Accessed: March 17, 2022. Retrieved from: https://espis.boem.gov/final%20reports/5662.pdf

Paruk, J.D., E.M. Adams, H. Uher-Koch, K.A. Kovach, D. Long, IV, C. Perkins, N. Schoch, and D.C. Evers. 2016. "Polycylic aromatic hydrocarbons in blood related to lower body mass in common loons." *Science of the Total Environment* 565: 360-368.

Patenaude, N.J., W.J. Richardson, M.A. Smultea, W.R. Koski, and G.W. Miller. 2002. "Aircraft Sound and Disturbance to Bowhead and Beluga Whales during Spring Migration in the Alaskan Beaufort Sea." *Marine Mammal Science*18(2):309-335. Accessed: July 13, 2022. Retrieved from: https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1748-7692.2002.tb01040.x

Paton, P., K. Winiarski, C. Trocki, and S. McWilliams. 2010. Spatial Distribution, Abundance, and Flight Ecology of Birds in Nearshore and Offshore Waters of Rhode Island. Interim Technical report for the Rhode Island Ocean Special Area Management Plan 2010. University of Rhode Island. Accessed: April 15, 2022. Retrieved from: http://seagrant.gso.uri.edu/oceansamp/pdf/appendix/11a-PatonAvianRept.pdf

Pelletier, S.K., K. Omland, K.S. Watrous, and T.S. Peterson. 2013. *Information Synthesis on the Potential for Bat Interactions with Offshore Wind Facilities.* Final Report. U.S. Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM No. 2013- 01163. Accessed: March 16, 2022. Retrieved from: https://tethys.pnnl.gov/sites/default/files/publications/BOEM_Bat_Wind_2013.pdf

Pennycuick, C.J. 1990. "Predicting Wingbeat Frequency and Wavelength of Birds." J. Exp. Biol. 150, 171-185.

Pennycuick, C.J., S. A°kesson, and A. Hedenstro¨m. 2013. "Air Speeds of Migrating Birds Observed by Ornithodolite and COMPARED with predictions from Flight Theory." J R Soc Interface 10: 20130419. Accessed: April 15, 2022. Retrieved from: https://royalsocietypublishing.org/doi/pdf/10.1098/rsif.2013.0419

Petersen, I.K., T. Kjær Christensen, J. Kahlert, M. Desholm, and A. D. Fox. 2006. *Final Results of Bird Studies at the Offshore Wind Farms at Nysted and Horns Rev, Denmark*. National Environmental Research Institute, Ministry of the Environment, Denmark. Accessed: April 15, 2022. Retrieved from: https://tethys.pnnl.gov/sites/default/files/publications/NERI_Bird_Studies.pdf

Pettersson, J. 2005. The Impact of Offshore Wind Farms on Bird Life in Southern Kalmar Sound, Sweden: a Final Report Based on Studies 1999–2003. Report for the Swedish Energy Agency, Lund University, Lund, Sweden.

Pezy, J.P., A. Raoux, J.C. Dauvin, and Steven Degraer. 2018. "An Ecosystem Approach for Studying the Impact of Offshore Wind Farms: A French Case Study." ICES Journal of Marine Science, fsy125, September 12, 2018.

Plonczkier, P., and I.C. Simms. 2012. "Radar Monitoring of Migrating Pink-footed Geese: Behavioral Responses to Offshore Wind Farm Development." Journal of Applied Ecology 49: 1187-1194.

Popper, A.N., A.D. Hawkins, R.R. Fay, D.A. Mann, S. Bartol, T.J. Carlson, S. Coombs, W.T. Ellison, R.L. Gentry, M.B. Halvorsen, S. Løkkeborg, P.H. Rogers, B.L. Southall, D.G. Zeddies, and W.N. Tavolga. 2014. *Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report*. Prepared by ANSI, Accredited Standards Committee S3/SC1 and Registered with ANSI. Cham, Switzerland: ASAPress/Springer. ASA S3/SC1.4 TR-2014. Accessed: January 24, 2022. Retrieved from: https://doi.org/10.1007/978-3-319-06659-2_7

Raoux, A., S. Tecchio, J.P. Pezy, G. Lassalle, S. Degraer, S. Wilhelmsson, M. Cachera, B. Ernande, C. Le Guen, M. Haraldsson, K. Grangere, F. Le Loc'h, J.C. Dauvin, and N. Niquil. 2017. "Benthic and Fish Aggregation Inside an Offshore Wind Farm: Which Effects on the Trophic Web Functioning?" Ecological Indicators 72: 33-46.

Record, N.R., J.A. Runge, D.E. Pendleton, W.M. Balch, K.T.A. Davies, A.J. Pershing, C.L. Johnson, K. Stamieszkin, Z. Feng, S.D. Kraus, R.D. Kenney, C.A. Hudak, C.A. Mayo, C. Chen, J.E. Salisbury, and C.R.S. Thompson. 2019. "Rapid Climate-driven Circulation Changes Threaten Conservation of Endangered North Atlantic Right Whales." Oceanography 32(2): 162-196.

Regular, P., W. Montevecchi, A. Hedd, G. Roberson, and S. Wilhelm. 2013. "Canadian Fisheries Closure Provides a Large-scale Test of the Impact of Gillnet Bycatch on Seabird Populations." Biology Letters 9(4): 20130088. Accessed: April 15, 2022. Retrieved from: https://royalsocietypublishing.org/doi/pdf/10.1098/rsbl.2013.0088

Roberts, A.J. 2019. *Atlantic Flyway Harvest and Population Survey Data Book*. U.S. Fish and Wildlife Service, Laurel, MD.

Robinson Willmott, J., G. Forcey, and A. Kent. 2013. The Relative Vulnerability of Migratory Bird Species to Offshore Wind Energy Projects on the Atlantic Outer Continental Shelf: An Assessment Method Database. Final report to the U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs. OCS Study BOEM 2013-207. Accessed: April 15, 2022. Retrieved from: https://espis.boem.gov/final%20reports/5319.pdf

Robinson Willmott, J., and G. Forcey. 2014. *Acoustic Monitoring of Temporal and Spatial Abundance of Birds near Outer Continental Shelf Structures: Synthesis Report*. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Herndon, VA. BOEM 2014-004. 172 pp. Accessed: April 15, 2022. Retrieved from: https://espis.boem.gov/final%20reports/5349.pdf

Roman, L., B.D. Hardesty, M.A. Hindell, and C. Wilcox. 2019. "A Quantitative Analysis Linking Seabird Mortality and Marine Debris Ingestion." *Scientific Reports* 9(1): 1-7.

Royal Haskoning. 2013. *Thanet Offshore Wind Farm Ornithological Monitoring 2012-2013*. Final Report to Report to Thanet Offshore Wind Ltd. 66 pp.

Samuel, Y., S.J. Morreale, C.W. Clark, C.H. Greene, and M.E. Richmond. 2005. "Underwater, Low-frequency Noise in a Coastal Sea Turtle Habitat." *Journal of the Acoustical Society of America* 117(3):1465-1472.

Schaub, A., J. Ostwald, and B.M. Siemers. 2008. "Foraging Bats Avoid Noise." Journal of Experimental Biology, Vol. 211:3147-3180.

Schuyler, Q.A., C. Wilcox, K. Townsend, B.D. Hardesty, and N.J. Marshall. 2014. "Mistaken Identity? Visual Similarities of Marine Debris to Natural Prey Items of Sea Turtles." *BMC Ecology* 14:14.

Secor, D.H., F. Zhang, M.H.P. O'Brien, and M. Li. 2018. "Ocean Destratification and Fish Evacuation Caused by a Mid-Atlantic Tropical Storm." *ICES Journal of Marine Science* 76(2):573-584. Accessed: January 28, 2022. Retrieved from: https://doi.org/10.1093/icesjms/fsx241

Shearman, R.K. and S.J. Lentz. 2010. "Long-Term Sea Surface Temperature Variability along the U.S. East Coast." *Journal of Physical Oceanograph*y, Vol. 40: 1004 -1017.

Shigenaka, G., S. Milton, P. Lutz, R. Hoff, R. Yender, and A. Mearns. 2010. *Oil and Sea Turtles: Biology, Planning, and Response.* Reprinted in 2010. NOAA Office of Restoration and Response Publication.

Sigourney, D.B., C.D. Orphanides, and J.M. Hatch. 2019. *Estimates of Seabird Bycatch in Commercial Fisheries off the East Coast of the United States from 2015-2016*. NOAA Technical Memorandum NMFS-NE-252. Woods Hole, Massachusetts. 27 pp.

Simmons, A.M., K.N. Horn, M. Warnecke, and J.A. Simmons. 2016. "Broadband Noise Exposure Does Not Affect Hearing Sensitivity in Big Brown Bats (*Eptesicus fuscus*)." *Journal of Experimental Biology*, Vol. 219: 1031-1040.

Sjollema, A.L., J.E. Gates, R.H. Hilderbrand, and J. Sherwell. 2014. "Offshore activity of bats along the Mid-Atlantic coast." *Northeastern Naturalist* 21(2):154–163.

Skov, H., S. Heinanen, T. Norman, R.M. Ward, S. Mendez-Roldan, and I. Ellis. 2018. *ORJIP Bird Collision and Avoidance Study*. Final report. The Carbon Trust. United Kingdom. April 2018.

Smith, A., and S. McWilliams. 2016. "Bat Activity During Autumn Relates to Atmospheric Conditions: Implications for Coastal Wind Energy Development." Journal of Mammalogy, Vol. 97(6), 1565-1577.

Smith, C.R., Rowles, T.K., Hart, L.B., Townsend, F.I., Wells, R.S., Zolman, E.S., Balmer, B.C., Quigley, B., Ivnacic, M., McKercher, W., Tumlin, M.C., Mullin, K.D., Adams, J.D., Wu, Q., McFee, W., Collier, T.K., and Schwacke, L.H. 2017. "Slow Recovery of Barataria Bay Dolphin Health Following the Deepwater Horizon Oil Spill (2013–2014), with Evidence of Persistent Lung Disease and Impaired Stress Response." *Endangered Species Research* 33:127–142.

Smith, J., M. Lowry, C. Champion, and I. Suthers. 2016. "A Designed Artificial Reef is Among the Most Productive Marine Fish Habitats: New Metrics to Address 'Production Versus Attraction'." *Marine Biology* 163:188. Accessed: April 16, 2022. Retrieved from: https://doi.org/10.1007/s00227-016-2967-y

Snoek, R., R. de Swart, K. Didderen, W. Lengkeek, and M. Teunis. 2016. *Potential Effects of Electromagnetic Fields in the Dutch North Sea. Phase 1 – Desk Study*. Final Report submitted to Rijkswaterstaat Water, Verkeer en Leefmgeving. Accessed February 24, 2022. Retrieved from: https://www.buwa.nl/fileadmin/buwa_upload/Bureau_Waardenburg_rapporten/16-101_BuWareport_potential_effects_of_electromagnetic_fields_in_the_dutch_north_sea.pdf

Southall, B.J., A.E. Bowles, W.T. Ellison, J.J. Finneran, R.L. Gentry, C.R. Greene Jr., D. Kastak, D.R. Ketten, J.H. Miller, P.E. Nachtigall, W.J. Richardson, J.A. Thomas, and P.L. Tyack. 2007. "Marine mammal noise exposure criteria: Initial scientific recommendations." *Aquatic Mammals* 33(44):411-521.

Stabile, Frank A., Gregory J. Watkins-Colwell, Jon A. Moore, Michael Vecchione, and Edward H. Burtt Jr. 2017. "Observations of Passerines and a Falcon from a Research Vessel in the Western North Atlantic Ocean." The Wilson Journal of Ornithology 129, no. 2: 349-353. Accessed: September 6, 2022. Retrieved from: https://www.jstor.org/stable/pdf/26429799.pdf

Stantec (Stantec Consulting Services). 2016. Long-Term Bat Monitoring on Islands, Offshore Structures, and Coastal Sites in the Gulf of Maine, Mid-Atlantic, and Great Lakes—Final Report. Prepared for the U.S. Department of Energy. Accessed: March 16, 2022. Retrieved from: https://tethys.pnnl.gov/sites/default/files/publications/Stantec-2016-Bat-Monitoring.pdf

Sullivan, L., Brosnan, T., Rowles, T.K., Schwacke, L., Simeone, C., and Collier, T.K. 2019. *Guidelines for Assessing Exposure and Impacts of Oil Spills on Marine Mammals.* NOAA Technical Memorandum NMFS-OPR-62. Accessed: February 20, 2022. https://repository.library.noaa.gov/view/noaa/22425

Takeshita, R., Sullivan, L., Smith, C., Collier, T., Hall, A., Brosnan, T., Rowles, T., and Schwacke, L. 2017. "The *Deepwater Horizon* Oil Spill Marine Mammal Injury Assessment." *Endangered Species Research* 33:96– 106.

Taormina, B., J. Bald, A. Want, G. Thouzeau, M. Lejart, N. Desroy, and A. Carlier. 2018. "A Review of Potential Impacts of Submarine Cables on the Marine Environment: Knowledge Gaps, Recommendations, and Future Directions." *Renewable and Sustainable Energy Reviews* 96:380–391. Accessed: February 24, 2022. Retrieved from: https://hal.archives-ouvertes.fr/hal-02405630/document

TetraTech (Tetra Tech, Inc.). 2012. *Pre-Construction Avian and Bat Assessment: 2009-2011, Block Island Wind Farm, Rhode Island State Waters.* Accessed: March 16, 2022. Retrieved from: https://offshore windhub.org/sites/default/files/resources/deepwater_9-27-2012_biwfbitserappendixo.pdf

Thomsen, F., A.B. Gill, M. Kosecka, M. Andersson, M. André, S. Degraer, T. Folegot, J. Gabriel, A. Judd, T. Neumann, A. Norro, D. Risch, P. Sigray, D. Wood, and B. Wilson. 2015. MaRVEN – *Environmental Impacts of Noise, Vibrations and Electromagnetic Emissions from Marine Renewable Energy*. RTD- KI-NA-27-738-EN-N. Final Study Report. Brussels, Belgium: European Commission. Accessed: January 28, 2022. Retrieved from: https://tethys.pnnl.gov/sites/default/files/publications/Marven-Report-2015.pdf

Todd, V.L.G., I.B. Todd, J.C. Gardiner, E.C.N. Morrin, N.A. MacPherson, N.A. DiMarzio, and F. Thomsen. 2015. "A Review of Impacts on Marine Dredging Activities on Marine Mammals." *ICES Journal of Marine Science* 72(2):328-340.

Tomás, J., R. Guitart, R. Mateo, and J.A. Raga. 2002. "Marine Debris Ingestion in Loggerhead Turtles, *Caretta*, from the Western Mediterranean." *Marine Pollution Bulletin* 44:211-216.

Tournadre, J., 2014. "Anthropogenic Pressure on the Open Ocean: The Growth of Ship Traffic Revealed by Altimeter Data Analysis." *Geophysical Research Letters* 41(22):7924-7932. Accessed: July 13, 2022. Retrieved from: https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1002/2014GL061786

Town of Barnstable. 2010. T*own of Barnstable Comprehensive Plan 2010: Seven Villages – One Community*. Accessed: December 2021. Retrieved from: https://town.barnstable.ma.us/Departments/ComprehensivePlanning/pageview.asp?file=Plans_and_Documents%5CLocal-Comprehensive-Plan-2010.html&title=Local%20Comprehensive%20Plan%202010&exp=Plans_and_Documents

Town of Barnstable. 2018. *Town of Barnstable Open Space and Recreation Plan*. Accessed January 2022. Retrieved from: https://tobweb.town.barnstable.ma.us/Departments/planninganddevelopment/Plans_and_Projects/Open-Space-and-Recreation-Plan-2018-Update.pdf?tm=1/4/2022%2011:22:41%20AM

Town of Barnstable. 2021. *Zoning Map of the Town of Barnstable, Massachusetts*. Amended February 4, 2021. Accessed: December 2021. Retrieved from: https://www.town.barnstable.ma.us/Departments/GIS/Zoning_Maps/Town-wide-Zoning-Map.pdf?tm=12/30/2021%202:09:02%20PM

Town of Barnstable. 2022a. GIS Property Maps. Accessed: May 2022. Retrieved from: https://gis.townofbarnstable.us/Html5Viewer/Index.html?viewer=propertymaps

Town of Barnstable. 2022b. Letter from Charles S. McLaughlin, Jr., Senior Counsel, Town of Barnstable, to Bethany A. Card, Secretary of the Executive Office of Energy and Environmental Affairs, Massachusetts EPA, with regard to the New England Wind 2 Connector, Environmental Notification Form EEA #16611. Accessed: June 2023. Retrieved from: https://tobweb.town.barnstable.ma.us/TownmanagerCommunicatrions/2022-12-01%20TMReport%20-%20attachment%20Town%20of%20Barnstable%20Comments%20ENF%20EEA%2016611%20New%20England%20Wind%202%20Connector.pdf

Turner, G.G., D.M. Reeder, and J.T.H. Coleman. 2011. "A Five-Year Assessment of the Mortality and Geographic Spread of White-Nose Syndrome in North American Bats and a Look to the Future." Bat Research News, Vol. 52, no.2: 13-27.

U.S. Energy Information Administration. 2014. "Oil Tanker Sizes Range from General Purpose to Ultra-Large Crude Carriers on AFRA Scale." September 16, 2014. Accessed: March 2, 2020. Retrieved from: https://www.eia.gov/todayinenergy/detail.php?id=17991

U.S. Energy Information Administration. 2019. Table P5B. Primary Production Estimates, Renewable and Total Energy, in Trillion BTU, Ranked by State, 2018. State Energy Data 2018.

U.S. Navy (U.S. Department of the Navy). 2018. *Hawaii-Southern California Training and Testing EIS/OEIS*. Accessed: July 13, 2022. Retrieved from: https://www.hstteis.com/Documents/2018-Hawaii-Southern-California-Training-and-Testing-Final-EIS-OEIS/Final-EIS-OEIS

USDA (U.S. Department of Agriculture). 2006. *Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin.* U.S. Department of Agriculture Handbook 296. Natural Resources Conservation Service. Accessed: January 25, 2022. Retrieved from: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_050898.pdf

USEPA (U.S. Environmental Protection Agency). 2000. *Ambient Aquatic Life Water Quality Criteria for Dissolved Oxygen (Saltwater): Cape Cod to Cape Hatteras*. Office of Water. EPA-822-R-00-012. Accessed: December 15, 2021. Retrieved from: https://nepis.epa.gov/Exe/ZyPDF.cgi/20003HYA.PDF?Dockey=20003HYA.PDF

USEPA (U.S. Environmental Protection Agency). 2021. "AVoided Emissions and geneRation Tool (AVERT)." Accessed: February 2022. Retrieved from: https://www.epa.gov/avert

USEPA (U.S. Environmental Protection Agency). 2021a. *National Coastal Condition Assessment: A Collaborative Survey of the Nation's Estuaries and Great Lakes Nearshore Waters*. EPA 841-R-21-001. Accessed: January 5, 2022. Retrieved from: https://www.epa.gov/system/files/documents/2021-09/nccareport_final_2021-09-01.pdf

USEPA (U.S. Environmental Protection Agency). 2021b. *U.S. EPA National Coastal Condition Assessment 2015*. Accessed: January 5, 2022. Retrieved from: https://coastalcondition.epa.gov/?&view=indicator&studypop=e&subpop=epa+region+1&label=none&condition=good&diff=1v3

USEPA (U.S. Environmental Protection Agency). 2022. "Nonattainment Areas for Criteria Pollutants (Green Book)." Accessed: February 2022. Retrieved from: https://www.epa.gov/green-book

USFWS (U.S. Fish and Wildlife Service). 2011. "Bald Eagle Management Guidelines and Conservation Measures: Bald Eagle Natural History and Sensitivity to Human Activity Information."

USFWS (U.S. Fish and Wildlife Service). 2022. *White Nose Syndrome: The Devastating Disease of Hibernating Bats in North America.* Updated March 2022. Accessed: March 16, 2022. Retrieved from: https://www.whitenosesyndrome.org/mmedia-education/white-nose-syndrome-fact-sheet-june-2018

USFWS (U.S. Fish and Wildlife Service). 2023. IPaC NLEB Consistency Letter. New England Ecological Services Field Office.

USGS (U.S. Geological Survey). 2018. "Turbidity and Water." Accessed: December 15, 2021. Retrieved from: https://www.usgs.gov/special-topics/water-science-school/science/turbidity-and-water

USGS (United States Geological Survey). 2020. "Science in Your Watershed, Locate Your Watershed." Accessed: March 28, 2022. Retrieved from: https://water.usgs.gov/wsc/cat/01090002.html

Vanasse Hangen Brustlin, Inc. 2010. *New Bedford 2020: A City Master Plan*. Accessed: January 28, 2022. Retrieved from: http://s3.amazonaws.com/newbedford-ma/wp-content/uploads/sites/46/20191219215710/NewBedford2020_ACityMasterPlan_2010.pdf

Vanderlaan, A.S.M., and C.T. Taggart. 2007. "Vessel Collisions with Whales: The Probability of Lethal Injury Based on Vessel Speed." *Marine Mammal Science* 23(1):144-156. Accessed: July 13, 2022. Retrieved from: https://www.phys.ocean.dal.ca/~taggart/Publications/Vanderlaan_Taggart_MarMamSci-23_2007.pdf

Vargo, S., P. Lutz, D. Odell, E. Van Vleet, and G. Bossart. 1986. *Study of the Effects of Oil on Marine Turtles. Volume 2. Technical Report.* Final Report prepared for the Minerals Management Service (MMS). OCS Study MMS 86-0070. Accessed: February 24, 2022. Retrieved from: http://www.seaturtle.org/PDF/VargoS_1986a_MMSTechReport.pdf

Vegter, A.C., M. Barletta, C. Beck, J. Borrero, H. Burton, M.L. Campbell, M.F. Costa, M. Eriksen, C. Eriksson, A. Estrades, K.V.K. Gilardi, B.D. Hardesty, J.A. Ivar do Sul, J.L. Lavers, B. Lazar, L. Lebreton, W.J. Nichols, C.A. Ribic, P.G. Ryan, Q.A. Schuyler, S.D.A. Smith, H. Takada, K.A. Townsend, C.C.C. Wabnitz, C. Wilcox, L.C. Young, and M. Hamann. 2014. "Global Research Priorities to Mitigate Plastic Pollution Impacts on Marine Wildlife." *Endangered Species Research* 25:225-247.

Veit, R.R., H. F. Goyert, T.P. White, M. Martin, L.L. Manne, and A. Gilbert. 2015. *Pelagic Seabirds off the East Coast of the United States 2008-2013*. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Sterling, VA. OCS Study BOEM 2015-024. Accessed: April 15, 2022. Retrieved from: https://tethys.pnnl.gov/sites/default/files/publications/Veit-et-al-2015.pdf

Veit, Richard R., Timothy P. White, Simon A. Perkins, and Shannon Curley. 2016. *Abundance and Distribution of Seabirds off Southeastern Massachusetts, 2011-2015: Final Report*. U.S. Department of the Interior, Bureau of Ocean Energy Management, Sterling, Virginia. OCS Study BOEM 2016-067. Accessed: April 15, 2022. Retrieved from: https://www.boem.gov/RI-MA-Seabirds/

Vilela, R., C. Burger C, A. Diederichs A, F. E. Bachl FE, L. Szostek L, A. Freund A, A. Braasch A, J. Bellebaum J, B. Beckers B, W. Piper, W and G. Nehls. G. 2021. "Use of an INLA Latent Gaussian Modeling Approach to Assess Bird Population Changes Due to the Development of Offshore Wind Farms." *Frontiers in Marine Science*. 8:701332. doi: 10.3389/fmars.2021.701332. Accessed: June 20, 2022. Retrieved from: https://www.frontiersin.org/articles/10.3389/fmars.2021.701332/full

Vlietstra, L.S. 2008. *Common and roseate tern exposure to the Massachusetts Maritime Academy wind turbine: 2006 and 2007*. Report to the Massachusetts Division of Fisheries and Wildlife, Natural Heritage Program, Westborough, MA. In Burger, J.C., G.L. Niles, J. Newman, G. Forcey, and L. Vliestra. 2011. Risk evaluation for federally listed (roseate tern, Piping Plover) or candidate (Red Knot) bird species in offshore waters: A first step for managing the potential impacts of wind facility development on the Atlantic Outer Continental Shelf in Normandeau Associates, Inc. 2011. New insights and new tools regarding risk to roseate terns, Piping Plovers, and Red Knots from wind facility operations on the Atlantic Outer Continental Shelf. A Final Report for the U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement, Report No. BOEMRE 048-2011. Contract No. M08PC20060.

Walker, M.M., C.E. Diebel, and J.L. Kirschvink. 2003. "Detection and Use of the Earth's Magnetic Field by Aquatic Vertebrates." In *Sensory Processing in Aquatic Environments,* edited by S.P. Collin and N.J. Marshall, pp. 53-74. New York: Springer-Verlag.

Wang, J., X. Zou, W. Yu, D. Zhang, and T. Wang. 2019. "Effects of Established Offshore Wind Farms on Energy Flow of Coastal Ecosystems: A Case Study of the Rudong Offshore Wind Farms in China." *Ocean & Coastal Management*, 171: 111-118. Accessed: September 6, 2022. Retrieved from: https://kd.nsfc.gov.cn/paperDownload/ZD25281935.pdf

Watts, Bryan D. 2010. Wind and Waterbirds: Establishing Sustainable Mortality Limits within the Atlantic Flyway. Center for Conservation Biology Technical Report Series, CCBTR-10-15. College of William and Mary/Virginia Commonwealth University, Williamsburg, VA. 43 pp. Accessed: April 15, 2022. Retrieved from: https://www.ccbbirds.org/wp-content/uploads/2013/12/ccbtr-10-05_Watts-Wind-and-waterbirds-Establishing-sustainable-mortality-limits-within-the-Atlantic-Flyway.pdf

Weilgart, L.S. 2018. *The Impact of Ocean Noise Pollution on Fish and Invertebrates*. Wadenswill, Switzerland: Ocean Care and Dalhousie University. Accessed: January 28, 2022. Retrieved from: https://www.oceancare.org/wp-content/uploads/2017/10/OceanNoise_FishInvertebrates_May2018.pdf

Werner, S., A. Budziak, J. van Franeker, F. Galgani, G. Hanke, T. Maes, M. Matiddi, P. Nilsson, L. Oosterbaan, E. Priestland, R. Thompson, J. Veiga, and T. Vlachogianni. 2016. *Harm Caused by Marine Litter.* MSFD GES TG Marine Litter–Thematic Report; JRC Technical report; EUR 28317 EN. Chilworth, Southampton, UK: Xodus Group. doi:10.2788/690366.

Whitaker, J.O., Jr. 1998. "Life History and Roost Switching in Six Summer Colonies of Eastern Pipistrelles in Buildings." Journal of Mammalogy, Vol. 79, no.2: 651-659.

White, T.P., and R.R. Veit. 2020. "Spatial Ecology of Long-tailed Ducks and White-winged Scoters Wintering on Nantucket Shoals." Ecosphere 11(1):e03002. 10.1002/ecs2.3002. Accessed: April 15, 2022. Retrieved from: https://esajournals.onlinelibrary.wiley.com/doi/epdf/10.1002/ecs2.3002

Winship, A.J., B.P. Kinlan, T.P. White, J.B. Leirness, and J. Christensen. 2018. *Modeling At-Sea Density of Marine Birds to Support Atlantic Marine Renewable Energy Planning: Final Report*. OCS Study BOEM 2018-010. Sterling, VA. 67 pp. Accessed: April 15, 2022. Retrieved from: https://coastalscience.noaa.gov/data_reports/modeling-at-sea-density-of-marine-birds-to-support-atlantic-marine-renewable-energy-planning-final-report/