Appendix G. Assessment of Resources with Minor (or Lower) Adverse Impacts

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G.1. Introduction

To focus on the impacts of most concern in the main body of this Final Environmental Impact Statement (EIS), BOEM has included the analysis of resources with no greater than **minor** adverse impacts below. These include demographics, employment, and economics; land use and coastal infrastructure; and recreation and tourism. Those resources with potential impact ratings greater than **minor** are included in Final EIS Chapter 3, *Affected Environment and Environmental Consequences*.

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3.5. Bats

This section discusses potential impacts on bat resources from the Proposed Action, alternatives, and ongoing and planned activities in the bat geographic analysis area. The bat geographic analysis area, as described in Appendix F, *Planned Activities Scenarios*, Table F-1 and illustrated on Figure 3.5-1, includes the East Coast from Maine to Florida, and extends 100 miles (161 kilometers) offshore and 5 miles (8 kilometers) inland to capture the movement range for species in this group. The offshore limit was established to capture the migratory movements of most species in this group, while the onshore limits cover onshore habitats used by species that may be affected by onshore and offshore components of the proposed Project.

3.5.1 Description of the Affected Environment for Bats

Detailed descriptions of bats occurring inland and offshore Virginia can be found in the COP (Section 4.2.3.1, Section 2.1 of Appendix O-1, Section 1.2 of Appendix O-2, and Section 2 of Appendix O-3; Dominion Energy 2023. Seventeen bat species are known to occur in Virginia; 14 of these species are thought to have the potential to occur in coastal areas of Virginia either in or adjacent to the proposed Project area (COP, Section 4.2.3.1, Table 4.2-12; Dominion Energy 2023). Two of the 14 bat species are federally listed; the northern long-eared bat (*Myotis septentrionalis*) and the Indiana bat (*Myotis sodalis*). The northern long-eared bat is endangered and is found throughout Virginia. The Indiana bat is endangered and typically does not occur in the eastern part of Virginia (Timpone et al. 2011), but more recent studies have documented its presence, including a maternity colony, in the coastal plain of the state (St. Germain et al. 2017; Silvis et al. 2017; De La Cruz 2020). On September 13, 2022, USFWS announced a proposal to list the tri-colored bat (*Perimyotis subflavus*), as endangered under the ESA. The northern long-eared bat, Indiana bat, and tri-colored bat also are listed as state threatened (northern long-eared) and endangered (Indiana and tri-colored) species, respectively (VDWR 2021). Two other state-listed bat species may also overlap the Project area: little brown bat (*Myotis lucifugus*) and Rafinesque's big-eared bat (*Corynorhinus rafinesquii macrotis*). Bats use a variety of terrestrial environments for foraging and roosting during summer breeding and migration periods. The Onshore Project components would be located primarily in already developed areas, but bats could use other types of nearby undeveloped habitats.

Bat species consist of two distinct groups based on their overwintering strategy: cave-hibernating bats (cave bats) and migratory tree bats (tree bats). Cave-hibernating bats migrate from summer habitat to winter hibernacula in the mid-Atlantic region (Maslo and Leu 2013), while tree bats migrate to southern parts of the United States (Cryan 2003), and some species are likely present year-round in Virginia (Timpone et al. 2011). Of the tree bat species, only the silver-haired bat (*Lasionycteris noctivagans*), eastern red bat (*Lasiurus borealis*), and hoary bat (*Lasiurus cinereus*) are considered migratory in North America due to their seasonal (spring and fall) migrations over several degrees of latitude (Cryan 2003), with the eastern red bat being more likely to occur offshore (Hatch et al. 2013; Sjollema et al. 2014).

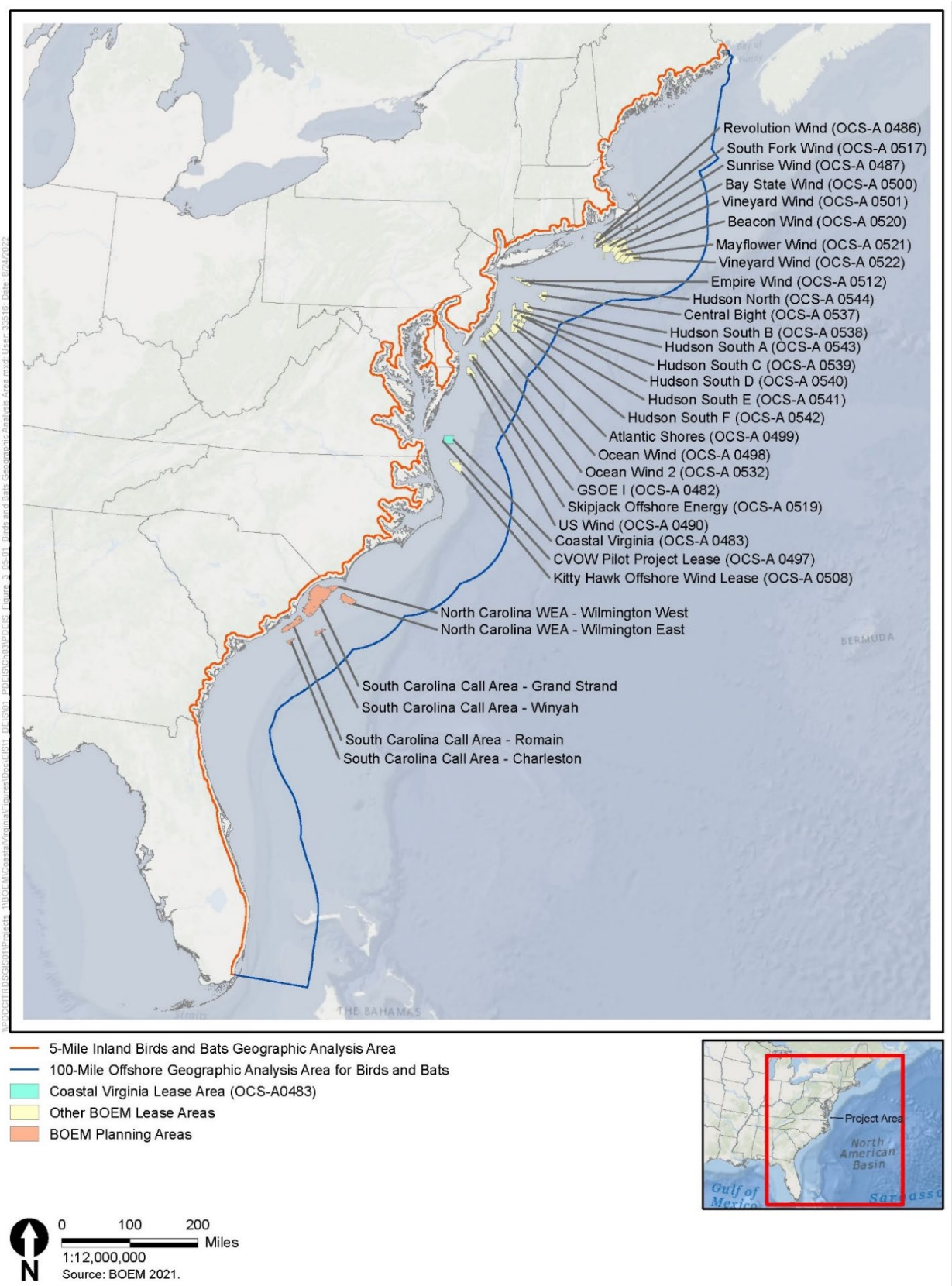

Figure 3.5-1 Birds and Bats Geographic Analysis Area

Bats are terrestrial species that spend almost their entire lives on or over land but can occasionally occur offshore during spring and fall migration and under very specific conditions such as low wind, good visibility, and high temperatures (Smith and McWilliams 2016; True et al. 2021). Generally, bat activity offshore is less than onshore and decreases with increased distance from shore (Brabant et al. 2021; Solick and Newman 2021). Recent studies, combined with historical anecdotal accounts, indicate that tree bats sporadically travel offshore during spring and fall migration, with 80 percent of acoustic detections occurring in August and September (Dowling et al. 2017; Hatch et al. 2013; Pelletier et al. 2013; Petersen 2016). However, unlike tree bats, the likelihood of detecting a *Myotis* species or other cave bat is substantially less in offshore areas because bat activity in the mid-Atlantic decreases 6 miles (20 kilometers) from shore (Pelletier et al. 2013; Sjollema et al. 2014; Petersen 2016). Solick and Newman (2021) reported over 83 percent of *Myotis* species detections occurring less than 5.2 miles (8.3 kilometers) from shore, though there have been rare detections farther offshore in association with research and fishing vessels.

Research based on Block Island and other coastal Rhode Island locations indicated *Myotis* species migrated short distances between the islands and the mainland primarily from July to September (Smith and McWilliams 2016). Acoustic surveys conducted during construction and post-construction at the Block Island Wind Farm did not yield detections of any northern long-eared bats; tri-colored bats were detected only during post-construction and in low numbers (Stantec 2018, 2020). Generally, the post-construction data found relatively low numbers of bats present only during the fall (Stantec 2020). During a long-term study of bat movements conducted from 2012 to 2014 in the coastal, nearshore, and offshore environments of the northeast, mid-Atlantic, and Great Lakes (Stantec 2016; Pelletier et al. 2013), bat calls were detected from 3 to 80 miles (5 to 130 kilometers) offshore. Eastern red bats and other migrants represented the most frequently observed species with peak activity during the spring and fall migrations; very little offshore activity of *Myotis* species in the mid-Atlantic was detected.

Results from the Project offshore bat acoustic survey (COP, Appendix O-2; Dominion Energy 2023) did not document *Myotis* species or any federally listed species in the Offshore Project area. All bat species conclusively identified from the acoustic survey results were long-distance migratory tree bat species (i.e., eastern red bat, Seminole bat [*Lasiurus seminolus*], silver-haired bat, and hoary bat), but some cave-hibernating species may be present among the bats that were unidentified. Overall survey results from April to May 2021 showed a mean of 1.07 bat passes per acoustic detector night, which represented low activity levels across seasons and were concentrated during the fall migration period. Bat passes were distributed across the Offshore Project area and although concentrations of passes occurred, they often represented single nights with multiple bat passes rather than repeated use of the same area over many nights. Additionally, groups of bats were continuously recorded and represented 69 percent of all bat passes recorded, suggesting that a small number of individual bats contributed to large amounts of detected bat activity. Additionally, bats were documented day and night roosting on the vessels in the Offshore Project area. Moreover, post- construction Acoustic and Thermographic Offshore Monitoring of birds and bats for the CVOW-Pilot Project has been underway since April 2021 to collect seasonal information with respect to bat presence at the two WTGs installed for the CVOW-Pilot Project (Dominion Energy 2022). Data through the spring (April 1 to June 15, 2021) and fall (August 15 to October 31, 2021) monitoring seasons showed three bat species were present at the WTGs during both seasons: the silver-haired bat, the eastern red bat, and hoary bat. The number of bat detections was much higher in the fall with 415 calls, compared to in the spring when there were only 4 calls. However, it is important to note that abundance cannot be inferred based on the number of detections as many detections could have been the same individual passing by the detector multiple times. Given these data, the potential exists for some migratory tree bats to encounter offshore facilities during spring and fall migration. BOEM expects this exposure risk to be limited to very few individual tree bats and to occur, if at all, during migration. Given the distance of the Wind Farm Area from shore, BOEM does not expect foraging bats to encounter operating WTGs outside spring and fall migration.

From June 9 to July 2, 2022, a presence/absence mist netting survey was conducted along the Onshore Project area resulting in the capture of 110 bats representing eight species (COP, Appendix O-3; Dominion Energy 2023). Captured bat species included big brown bat (*Eptesicus fuscus*), eastern red bat, southeastern myotis (*Myotis austroriparius*), tri-colored bat, little brown bat, northern long-eared bat, evening bat (*Nycticeius humeralis*), and Rafinesque's big-eared bat. Of the captured species, three lactating female northern long-eared bats were captured and fitted with radio transmitters. One maternity roost was found for one of the lactating females about 374 feet (114 meters) from the proposed onshore export cable route. Two tri-colored bats were captured and then were fitted with transmitters to identify nearby roost sites. One bat was tracked to a roost located approximately 935 feet (285 meters) from the proposed onshore export cable route, and the second roost could not be located due to impassible terrain. Separately, acoustic and mist-netting surveys were conducted from June 21 to July 2, 2022, at Naval Air Station Oceana Dam Neck Annex, which overlaps the cable landing location and a portion of the onshore export cable route (Gilardi and ISIL Engineering 2022). Acoustic analysis confirmed the probable presence of big brown, eastern red, silver-haired, and little brown bats. Mist netting resulted in the capture of 17 bats from six different species including seven eastern red bats, four big brown bats, two little brown bats, two northern long-eared bats, one Rafinesque's big-eared bat, and one Seminole bat. The northern long-eared bats did not have radio transmitters attached, because they were male and the Rafinesque's big-eared bat could not have a radio transmitter attached since it was released due to stress concerns. Previous bat mist netting efforts in the vicinity of the Onshore Project area near the cable landing location did not report captures of any federally listed species, although roost trees and nighttime foraging locations of non-listed species (e.g., tri-colored bat, southeastern myotis) were identified in the forested areas bordering the onshore export cable route along Birdneck Road (Tetra Tech 2019). Acoustic analysis in this same area had no confirmed northern long-eared bat calls, and 16 passes were identified as Indiana bat by KPro software; however, presence was not confirmed during manual vetting (Tetra Tech 2019).

Bats in the geographic analysis area are subject to pressure from ongoing activities generally associated with onshore impacts (e.g., onshore construction and climate change). Onshore construction activities and associated impacts are expected to continue at present trends and have the potential to result in impacts on bat species. Impacts associated with climate change have the potential to reduce reproductive output and increase individual mortality and disease occurrence. Additionally, cave bat species, including the northern long-eared bat, are experiencing drastic declines due to white-nose syndrome (WNS) caused by the fungal pathogen *Pseudogymnoascus destructans*. In Virginia, WNS has resulted in dramatic population declines for the little brown bat, Indiana bat, and tri-colored bat since 2009 (Reynolds 2021). The Proposed Action has the potential to result in impacts on cave bat populations already affected by WNS. While the WNS-related mortality of bats in northeastern North America reduces the likelihood of many individuals being present in the onshore portions of the proposed Project area (Cheng et al. 2021; Reynolds 2021), the biological significance of mortality resulting from the Proposed Action, if any, may be increased given the drastic reduction in cave bat populations in the region. Further, data collected from 2010 to 2019 by the U.S. Geological Survey (USGS) shows that predicted summer occurrence for the northern long-eared, little brown, and tri-colored bats is low along the coast of Virginia, indicating that at least some species are only present in low numbers in the onshore portion of the Offshore Project area (Udell et al. 2022).

3.5.2 Environmental Consequences

3.5.2.1 Impact Level Definitions for Bats

Definitions of impact levels are provided in Table 3.5-1. There are no beneficial impacts on bats.

Table 3.5-1 Impact Level Definitions for Bats

Impact Level	Impact Type	Definition
Negligible	Adverse	Impacts would be so small as to be unmeasurable.
Minor	Adverse	Most impacts would be avoided; if impacts occur, the loss of one or few individuals or temporary alteration of habitat could represent a minor impact, depending on the time of year and number of individuals involved.
Moderate	Adverse	Impacts are unavoidable but would not result in population-level effects or threaten overall habitat function.
Major	Adverse	Impacts would result in severe, long-term habitat or population-level effects on species.

3.5.3 Impacts of the No Action Alternative on Bats

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

3.5.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for bats described in Section 3.5.1, *Description of the Affected Environment for Bats,* would continue to follow current regional trends and respond to IPFs introduced by other ongoing non-offshore wind and offshore wind activities. Ongoing non-offshore wind activities within the geographic analysis area that contribute to impacts on bats are generally associated with onshore construction and climate change. Onshore construction activities and associated impacts are expected to continue at current trends and have the potential to affect bat species through temporary and permanent habitat removal and temporary noise impacts, which could cause avoidance behavior and displacement. Mortality of individual bats could occur, but population-level effects would not be anticipated. Impacts associated with climate change have the potential to reduce reproductive output and increase individual mortality and disease occurrence.

The following ongoing offshore wind activities in the geographic analysis area contribute to impacts on bats.

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

Ongoing O&M of the Block Island and CVOW projects and ongoing construction of the Vineyard Wind 1 and South Fork projects would affect bats through the primary IPFs of noise, presence of structures, and land disturbance. Ongoing offshore wind activities would have the same types of impacts from noise, presence of structures, and land disturbance that are described in detail in Section 3.5.3.2, *Cumulative Impacts of the No Action Alternative*, for planned offshore wind activities, but the impacts would be of lower intensity.

3.5.3.2 Cumulative Impacts of the No Action Alternative

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

Other planned non-offshore wind activities that may affect bats include increasing onshore construction and the infrequent installation of new structures on the OCS (see Appendix F, Section F.2 for a complete description of ongoing and planned activities). These activities may result in temporary and permanent onshore habitat impacts and temporary or permanent displacement and injury of or mortality to individual bats, but population-level effects would not be expected. See Appendix F, Attachment 1, Table F1-2 for a summary of potential impacts associated with ongoing and planned non-offshore wind activities by IPF for bats.

BOEM expects offshore wind activities to affect bats through the following primary IPFs.

Noise: Construction of numerous offshore wind projects is projected between 2023 and 2030 in the geographic analysis area (Appendix F, Table F-3). Construction noise from these other projects, most notably from pile driving, may temporarily cause effects on some migrating bats if they are present during construction periods. However, notable noise impacts are not expected because research indicates that bats may be less sensitive to temporary threshold shifts than other terrestrial mammals; no temporary or permanent hearing loss would be expected (Simmons et al. 2016).

Other noise impacts (i.e., displacement from potentially suitable habitats or migration routes) could occur as a result of construction noise (Schaub et al. 2008), but the likelihood of impact is low because only limited use of the OCS is expected, and the use would occur only during spring and fall migration. Additionally, onshore construction noise also has the potential to result in impacts on bats foraging or roosting in the vicinity of construction activities. BOEM anticipates that these impacts would be temporary and highly localized, and bats would be expected to move to a different roost farther from construction noise. This movement would not be expected to result in any impacts, as frequent roost switching is common among bats (Hann et al. 2017; Whitaker 1998).

Given the temporary and localized nature of potential impacts and the expected biologically insignificant response to those impacts, no individual fitness or population-level impacts would be expected to occur as a result of onshore or offshore noise associated with offshore wind development.

Presence of structures: The primary threat to bats would be from collisions with offshore WTGs. Over 3,154 structures (WTGs, OSSs, and meteorological towers) could be constructed in the geographic analysis area (Appendix F, Table F-3), which could affect migration patterns or pose a collision risk to individual bats.

Although adverse impacts on bats from collisions with operating WTGs cannot be quantified, some level of mortality during operation of offshore wind facilities is assumed. Any new operating wind facility would require a thorough regulatory and environmental review to appropriately site the facility to avoid, minimize, and mitigate adverse impacts on bat species.

Cave bats (including the federally and state listed northern long-eared and Indiana bat) do not tend to fly offshore (even during migrations) and, therefore, exposure to construction vessels during construction or maintenance activities, or the rotor swept zone (RSZ) of operating WTGs in the lease areas is expected to be negligible, if exposure occurs at all (Pelletier et al. 2013; Sjollema et al. 2014; BOEM 2015; Petersen 2016).

Tree bats, include the eastern red bat, the hoary bat, and the silver-haired bat, may pass through the offshore wind lease area during migrations, with limited potential for migrating bats to encounter vessels during construction and conceptual decommissioning of WTGs, OSSs, and offshore export cable corridors, although structure and vessel lighting may attract bats due to increased prey abundance.

Some bats may encounter, or perhaps be attracted to, the offshore wind related structures to opportunistically roost or forage. Several authors, such as Cryan and Barclay (2009), Cryan et al. (2014), and Kunz et al. (2007), discuss several hypotheses as to why bats may be attracted to WTGs. Many of these, including the creation of linear corridors, altered habitat conditions, or thermal inversions, would not apply to WTGs on the Atlantic OCS (Cryan and Barclay 2009; Cryan et al. 2014; Kunz et al. 2007). As such, it is possible that some migrating bats may encounter, and perhaps be attracted to, operational WTGs and interact with turbine blades in the RSZ (Cryan et al. 2014; Cryan and Barclay 2009), in addition to OSSs and non-operational WTG towers, to opportunistically roost or forage. However, bats' echolocation abilities and agility make it unlikely that these stationary objects (OSSs and non-operational WTGs) or moving vessels would pose a collision risk to migrating individuals; this assumption is supported by the evidence that bat carcasses are rarely found at the base of onshore turbine towers (Choi et al. 2020). Offshore operations and maintenance would present a seasonal risk factor to migratory tree bats that may use the offshore habitats during spring or fall migration. While some potential exists for migrating tree bats to encounter operating WTGs during spring or fall migration, the overall occurrence of bats on the OCS is low (COP, Appendix O-2; Dominion Energy 2023; Pelletier et al. 2013; Sjollema et al. 2014; BOEM 2015; Petersen 2016; Deepwater Wind 2020; Dominion Energy 2022).

Given the expected infrequent and limited use of the OCS by migrating tree bats, very few individuals would be expected to encounter operating WTGs or other structures associated with offshore wind development. WTGs for the proposed Project would be spaced approximately 0.75 nautical mile (1.39 kilometers) in an east–west direction and 0.93 nautical mile (1.72 kilometers) in a north–south direction. BOEM assumes that WTGs for other projects would be similarly spaced.

Several factors would reduce potential interactions between bats and operating WTGs, including the proposed spacing between structures associated with offshore wind development and the distribution of anticipated projects. Individual bats migrating over the OCS in the RSZ of projected WTGs would likely fly through project areas with only slight course corrections, if any, to avoid operating WTGs.

Unlike terrestrial migration routes, there are no offshore landscape features that would concentrate migrating tree bats and increase exposure to the offshore wind lease area on the OCS (Baerwald and Barclay 2009; Cryan and Barclay 2009; Fiedler 2004; Hamilton 2012; Smith and McWilliams 2016).

- The potential collision risk to migrating tree bats varies with climatic conditions; for example, bat activity is associated with relatively low wind speeds and warm temperatures (Smith and McWilliams 2016; True et al. 2021). Given the rarity of tree bats in the offshore environment, when combined with broadly spaced turbines and the patchiness of projects, the likelihood of collisions is expected to be low.
- The likelihood of a migrating individual encountering one or more operating WTGs during adverse weather conditions is extremely low, as bats have been shown to suppress activity during periods of strong winds, low temperatures, and rain (Smith and McWilliams 2016; True et al. 2021).

Land disturbance: Onshore construction activities involving land disturbance could result in localized, minor, and temporary impacts on bats, including avoidance, displacement, and habitat loss. These impacts would not be biologically notable, and no population-level effects would occur (Hann et al. 2017; Whitaker 1998).

Onshore land development or port expansion activities could also result in limited loss of roosting or foraging habitat for some bat species. However, such minor impacts would be limited in extent, and would not measurably affect bat population abundance or viability as individual projects would be expected to minimize tree removal if not occurring in previously disturbed habitats. As such, onshore construction activities associated with offshore wind development would not be expected to appreciably contribute to overall impacts on bats.

Other considerations: The federally endangered northern long-eared bat is the only bat species listed under the ESA that may be affected by the proposed Project; the Indiana bat is considered extralimital and rare along coastal areas. The tri-colored bat may be affected by the proposed Project, and on September 13, 2022, USFWS announced a proposal to list the tri-colored bat as endangered under the ESA. Ongoing activities, future non-offshore wind activities, and offshore wind activities other than the proposed Project may also affect the northern long-eared bat. As previously described and discussed further in the Biological Assessment (BA) (BOEM 2022, 2023), the possibility of impacts on the northern long-eared bat would be limited to onshore impacts that would generally be during facilities construction.

3.5.3.3 Conclusions

Impacts of the No Action Alternative. Under the No Action Alternative, bats would continue to be affected by existing environmental trends and ongoing activities.

Ongoing activities are expected to have continuing temporary to long-term impacts (disturbance, displacement, injury, mortality, and habitat loss) on bats primarily through onshore construction impacts, the presence of structures, and climate change. BOEM anticipates that the potential impacts on bats resulting from ongoing activities would be **minor**. In addition to ongoing activities, the impacts of planned actions other than offshore wind development may also contribute to impacts on bats, including increasing onshore construction (Appendix F, Attachment 2), however these impacts would be **negligible**. BOEM expects the combination of ongoing and planned actions other than offshore wind development to result in **minor** impacts on bats.

Cumulative impacts of the No Action Alternative. Under the No Action Alternative, existing environmental trends and ongoing activities would continue, and bats would continue to be affected by natural and human-caused IPFs. Planned activities would contribute to impacts on bats due to habitat loss from increased onshore construction. BOEM anticipates that the cumulative impacts of the No Action Alternative would likely be **negligible** because bat presence in the OCS is anticipated to be limited and onshore bat habitat impacts are expected to be minimal.

Considering all the IPFs together, the overall impacts associated with offshore wind activities in the geographic analysis area would result in **minor** adverse impacts because of ongoing climate change, interactions with operating WTGs on the OCS, and onshore habitat loss. Offshore wind activities are not expected to materially contribute to the IPFs discussed above. Given the infrequent and limited anticipated use of the OCS by migrating tree bats during spring and fall migration and given that cave bats do not typically occur on the OCS, none of the IPFs associated with offshore wind activities that occur offshore would be expected to appreciably contribute to overall impacts on bats. Some potential for temporary disturbance and permanent loss of onshore habitat may occur as a result of offshore wind development. However, habitat removal would be minimal when compared with other past, present, and reasonably foreseeable activities, and any impacts resulting from habitat loss or disturbance would not result in individual fitness or population-level effects in the geographic analysis area.

3.5.4 Relevant Design Parameters and Potential Variances in Impacts

The primary proposed Project design parameters that would influence the magnitude of impact on bats are provided in Appendix E, *Project Design Envelope and Maximum Case Scenario*, and include the following.

- The number, size, and location of WTGs.
- The time of year during which construction occurs.

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

- WTG number, size, and location: the level of hazard related to WTGs is proportional to the number of WTGs installed; fewer WTGs would present less hazard to bats.
- Season of construction: the active season for bats in the geographical analysis area is generally from March through November. Construction outside of this window would have a lesser impact on bats than construction during the active season. However, non-hibernating populations may persist in the area during winter.

3.5.5 Impacts of the Proposed Action on Bats

Noise: Pile-driving noise and onshore and offshore construction noise associated with the Proposed Action alone would not increase the impacts of noise beyond the impacts described under the No Action Alternative (Section 3.5.3, *Impacts of the No Action Alternative on Bats*) and is expected to result in negligible impacts on bats because construction activity would be short term, temporary, and highly localized.

Auditory impacts are not expected to occur as recent research has shown that bats may be less sensitive to temporary threshold shifts than other terrestrial mammals (Simmons et al. 2016). Impacts, if any, are expected to be limited to behavioral avoidance of pile driving or other construction activities and no temporary or permanent hearing loss would be expected (Schaub et al. 2008; Simmons et al. 2016).

Per the Project BA prepared for the U.S. Fish and Wildlife Service (USFWS) (BOEM 2022, 2023), the interconnection cable route would pass through several areas designated as high or very high ecological value and are in areas with documented northern long-eared bat maternity roosts; however, there are no hibernacula present in the vicinity of Onshore Project components. Mist netting conducted in 2022 indicated that nine species of bat occur along and near the onshore export cable route including northern long-eared bat (five individuals captured) and tri-colored bat (two individuals captured) (COP, Appendix O-3; Dominion Energy 2023; Gilardi and ISIL Engineering 2022).

Behavioral impacts from onshore construction activities could occur associated with use of Direct Steerable Pipe Thrusting for the installation of the offshore export cables to the cable landing location, which would result in temporary noise impacts from installation of the cofferdam, from Direct Steerable Pipe Thrusting in the sea-to-shore transition, and at beach work areas and could result in temporary, localized disturbance or displacement of bats. While the total acreage of the cable landing location footprint is 11.1 acres (4.5 hectares), most of the area would be used for equipment laydown, staging and would not require any vegetative clearing or grading, and permanent impacts would only occur within a 2.27-acre (0.92 hectares) area that is a proposed parking lot. Disturbance impacts at the cable landing location would be short term and limited because the landing is located in a proposed parking lot. The onshore export cable predominately follows developed corridors and previously disturbed land to a common location north of Harpers Road. The onshore export cable route would pass through several habitat types, including open space, developed, forested, agricultural, and wetlands (Tables 3.8-2, 3.8-3, and 3.22-3) that may support bat species, resulting in temporary disturbance impacts on bats. From that

point, onshore clearing and construction (and associated noise) would be required at the Harpers Switching Station and for the overhead lines from Harpers Switching Station to Fentress Substation resulting in impacts on varying acreages of wetlands and National Land Cover Database (NLCD) land cover classes, as shown in Tables 3.8-2 and 3.22-3.

Onshore clearing and construction would result in disturbance to bats at the Harpers Switching Station. The Harpers Switching Station would require approximately 5.52 acres (2.23 hectares) for stormwater management facilities; approximately 6.2 acres (2.5 hectares) for relocation of fairways and a maintenance building associated with the Aeropines Golf Club; 0.9 acre (0.4 hectare) for relocation of Dewey Road Drive; and 12.5 acres (5.1 hectares) for workspace, fence relocation, and tree removal. These acreages are included in the overall acreage of 46.5 acres (18.8 hectares) for the Harpers Switching Station (Dominion Energy 2023). While impacts at the Harpers Switching Station would largely be on previously developed areas within the Aeropines Golf Club (Table 3.8-2 and 3.8-3), approximately 27.02 acres (10.93 hectares) of tree clearing would be required to support relocation of fairways, construction of the maintenance building, relocation of Dewey Road, and construction of stormwater management facilities and the footprint of Harpers Switching station. With respect to the interconnection cable route, Interconnection Cable Route Option 1 is approximately 14.3 miles (23.0 kilometers) long and would be installed entirely overhead and result in permanent disturbance impacts on a total of 144.2 acres (58.4 hectares) of wetland and NLCD land cover classes (Tables 3.8-2, 3.8-3, and 3.22-3) and would require 117 acres (47 hectares) of tree clearing. The interconnection cable route would culminate at the onshore substation, which would also require land clearing and result in impacts on wetlands and various NLCD land cover classes (Tables 3.8-2 and 3.22-3) and subsequent disturbance impacts on bats. Overall, noise from onshore clearing and construction would be localized and temporary. If the noise disturbs bats, they would likely temporarily move away, potentially from preferred foraging or roosting habitats. However, BOEM expects that no individual fitness or population-level impacts would be expected to occur resulting in negligible impacts on bats from the Proposed Action, and lasting impacts on local breeding populations are not anticipated. Conceptual decommissioning of the Project would have similar impacts as construction and would likely be conducted under similar seasonal restrictions.

For onshore construction activities, Dominion Energy will comply with the existing 4(d) provisions in accordance with the interim guidance until April 1, 2024. Following implementation of the new regulations, Dominion Energy has committed to complying with two time-of-year restrictions for tree-clearing activity, which will reduce noise impacts on bats. The timeframe restrictions are from December 15 to February 15 when bats are wintering in the trees and the weather is typically too cold for them to be moving; and April 15 to July 30 to provide protection to pups, which are typically born after May 1.

Presence of structures: The various types of impacts on bats that could result from the presence of structures, such as migration disturbance and turbine strikes are described in detail in Section 3.5.1, *Description of the Affected Environment for Bats*. The Proposed Action would add up to 202 new WTGs on the OCS where few currently exist.

There is some correlative evidence from inland studies that bat mortality increases with tower height (Barclay et al. 2007; Georgiakakis et al. 2012). Therefore, the Proposed Action could result in higher probability of bat mortality if 16-MW WTGs are chosen over 14-MW WTGs. However, because the overall occurrence of bats (including listed species) on the OCS is low (COP, Appendix O-2, Dominion Energy 2023; Pelletier et al. 2013; Sjollema et al. 2014; BOEM 2015; Petersen 2016; Deepwater Wind 2020; Dominion Energy 2022), the impacts of the Proposed Action are expected to result in minor long-term impacts in the form of mortality; BOEM anticipates the occurrence of such impacts to be rare. In addition, Dominion Energy would use BMPs identified by BOEM COP guidelines (BOEM 2020) and comply with FAA and USCG requirements for lighting and, to the extent practicable, use lighting

technology (e.g., low-intensity strobe lights, flashing red aviation lights) that minimize impacts on bat species.

Land disturbance: Impacts associated with construction of onshore elements of the Proposed Action could occur if construction activities occur during the active season (generally March through November). Impacts may include injury or mortality of individuals, particularly juveniles who are nonvolant (i.e., unable to fly) and cannot flush from a roost, if occupied by bats at the time of removal.

There would be potential for habitat impacts on bats as a result of the loss of potentially suitable roosting or foraging habitat. However, the cable landing location would be located in a proposed parking lot, which is highly unlikely to provide important habitat for any bat species. Although acoustic analyses using KPro software had no confirmed northern long-eared bat call but identified 16 passes as Indiana bat, the identities could not be confirmed by manual vetting. No Indiana bats were captured during mist netting efforts in the area (Tetra Tech 2019). While bats may be present in habitat adjacent to the onshore export cable route, exposure is expected to be limited (COP, Appendices O-1 and O-3; Dominion Energy 2023; Gilardi and ISIL Engineering 2022) because much of the routing is collocated with existing roads. Mist netting conducted in 2022 indicated that nine species of bat occur along or near the onshore export cable route, including the northern long-eared bat (five individuals captured) and tri-colored bat (two individuals captured) (COP, Appendix O-3; Dominion Energy 2023; Gilardi and ISIL Engineering 2022). However, the onshore substation and switching station would require tree and vegetation clearing on varying acreages of wetlands and various NLCD land cover classes (Tables 3.8-2 and 3.22-3).

Interconnection Cable Route Option 1 would be approximately 14.3 miles (23.0 kilometers) long and would result in approximately 78.3 acres (31.7 hectares) of temporary disturbance to various NLCD land cover classes (Table 3.8-2). Permanent impacts resulting in the loss of potential habitat would be 127.2 acres (51.5 hectares). While the NLCD does include wetland land cover classes, refer to Section 3.22, *Wetlands*, Table 3.22-3 for wetland impacts on the Onshore Project components based on wetland delineation survey data. The portion of the route that passes through the forested and wetland areas associated with the North Landing River likely provides quality roosting and/or foraging habitat for bats.

Approximately 76 percent of Interconnection Cable Route Option 1 would be collocated with existing linear development. Overall, impacts on bat habitat during construction are expected because northern long-eared bat maternity roosts have been documented close to the proposed route, within 0.04 mile (0.06 kilometer), adjacent to the Naval Auxiliary Landing Field Fentress; within 2.57 miles (4.14 kilometers) of the proposed route, there have been acoustic detections of Indiana bats in the region (12 to14 miles [19 to 22 kilometers] from both the cable landing location and Fentress Substation), and bat activity has been documented throughout the year (COP, Appendix O-1; Dominion Energy 2023). Tree/vegetation clearing would occur along the route in various NLCD land cover class types (Table 3.8-2), and clearing activities would follow existing 4(d) provisions in accordance with the interim guidance until April 1, 2024, and would then follow two timeframe restrictions: December 15 to February 15 and April 15 to July 30. Dominion Energy would maintain a minimum no-tree-clearing buffer of 150 feet (45 meters) around any known northern long-eared bat maternity roosts, and Dominion Energy conducted mist-netting surveys along the Onshore Project area. Additionally, due to the potential impacts, monitoring and mitigation during all seasons may be required.

The switching station parcel at Harpers Road (Interconnection Cable Route Option 1) would be built in a semi-developed area within the Aeropines Golf Club (COP, Appendix O-1; Dominion Energy 2023). Because the Harpers Switching Station would be located adjacent to non-disturbed areas, there is potential for impacts on bat habitat due to anticipated tree clearing (27.02 acres [10.93 hectares]) in mixed forest and woody wetland NLCD land cover classes (Table 3.8-2). The Harpers Switching Station would require approximately 5.52 acres (2.23 hectares) for stormwater management facilities, and approximately 6.2 acres (2.5 hectares) for relocation of fairways and a maintenance building associated with the

Aeropines Golf Club, 0.9 acre (0.4 hectare) for relocation of Dewey Road Drive, and 12.5 acres (5.1 hectares) for workspace, fence relocation, and tree removal. These acreages are included in the overall acreage of 46.5 acres (18.8 hectares) for the Harpers Switching Station (Dominion Energy 2022a). The onshore substation parcel (Fentress) is in an existing developed area and is associated with fragmented habitat; expansion of the parcel would require clearing within forested and wetland NLCD land cover classes (Table 3.8-2); therefore, impacts on potentially suitable roosting or foraging habitat would occur but would be limited (COP, Appendix O-1; Dominion Energy 2023; BOEM and Dominion Energy 2022). Refer to Section 3.21, Section 3.14, *Land Use and Coastal Infrastructure*, and Section 3.22, *Wetlands,* for additional details of potential impacts on surface waters, land use, and wetlands.

BOEM anticipates that minor impacts would occur due to adherence to USFWS northern long-eared bat conservation measures; further, these minor habitat impacts would not result in individual fitness or population-level effects given the limited amount of habitat removal. Dominion Energy would likely leave onshore facilities in place for future use. There are no plans to disturb the land surface or terrestrial habitat during conceptual decommissioning of the Proposed Action. Therefore, onshore temporary impacts of conceptual decommissioning would be negligible.

3.5.5.1 Cumulative Impacts of the Proposed Action

The cumulative impacts of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned wind activities. In the context of reasonably foreseeable environmental trends, combined noise impacts on bats from ongoing and planned actions, including the Proposed Action, would likely be negligible. Combined impacts on bats arising from the presence of structures from ongoing and planned actions, including the Proposed Action, would likely be minor given the expected limited use of the OCS by migrating tree bats. As the Proposed Action would account for about 9.6 percent (up to 202 of 3,287) of the new WTGs on the OCS, a majority (approximately 90 percent) of these impacts would occur as a result of structures associated with other offshore wind development and not the Proposed Action. The combined land disturbance impacts from ongoing and planned actions, including the Proposed Action, would likely be minor, as a small amount of habitat loss would be expected.

3.5.5.2 Conclusions

Impacts of the Proposed Action. Construction, installation, operation, and conceptual decommissioning of the Proposed Action alone would have **negligible** to **minor** impacts on bats, especially if tree-clearing activities are conducted outside the active season. The main notable risk would be from operation of the offshore WTGs, which could lead to **minor** long-term impacts in the form of mortality, although BOEM anticipates this to be rare, and from onshore construction, which could lead to **minor** long-term impacts from loss of suitable onshore roosting and/or foraging habitat. The impact conclusions for ongoing and future non-offshore wind activities are presented in Section 3.5.3, *Impacts of the No Action Alternative on Bats*.

Cumulative impacts of the Proposed Action. In the context of reasonably foreseeable environmental trends in the area, impacts of individual IPFs resulting from ongoing and planned actions, including the Proposed Action, would be **negligible** to **minor**. Considering all the IPFs collectively, BOEM anticipates that the impacts from ongoing and planned actions, including the Proposed Action, would result in **minor** impacts on bats in the geographic analysis area. The main drivers for this impact rating are ongoing climate change and onshore habitat loss. The Proposed Action would contribute to the overall impact rating primarily through the permanent but limited impacts attributed to onshore habitat loss. Thus, the overall impacts on bats would likely be **minor** because while most impacts are expected to be avoided due to the limited occurrence of bats in the offshore wind lease area (23.75 nautical miles [44 kilometers] from land), some mortality and a small amount of onshore habitat loss is expected.

3.5.6 Impacts of Alternatives B and C on Bats

BOEM identified a combination of Alternative B (Revised Layout to Accommodate the Fish Haven Area and Navigation) and Alternative D-1 (Interconnection Cable Route Option 1) as the Preferred Alternative. The analysis of the impacts of the Preferred Alternative would be the same as that for Alternative B, as described in this section.

Impacts of Alternatives B and C. With the exception of the number and size of WTGs, impacts of the construction and installation, operations and maintenance, non-routine activities, and conceptual decommissioning under Alternatives B and C would be similar to those described under the Proposed Action. IPFs associated with the construction and installation of up to 176 WTGs plus spare locations under Alternative B (each 14 MW) and up to 172 WTGs under Alternative C (each 14 MW), including pile-driving noise and temporary avoidance and displacement, would be decreased by approximately 14 percent (Alternative B) or up to approximately 16 percent (Alternative C) compared to the Proposed Action. Fewer WTGs under Alternatives B and C when compared the Proposed Action may allow greater opportunity for migrating tree bats (if present) to avoid WTGs. Overall, the expected negligible to minor impacts on bats would not be materially different than those described under the Proposed Action. The use of 14 MW WTGs under Alternatives B and C may have some potential to decrease collision risk in comparison to the largest WTGs contemplated under the Proposed Action (16 MW) based on early studies of terrestrial wind facilities (Barclay et al. 2007; Georgiakakis et al. 2012). However, more recent research indicates there is no correlation between bat fatality rates and wind turbine size (Smallwood 2020). Given the expected limited use of the OCS by migrating tree bats (COP, Appendix O-2; Dominion Energy 2023; Pelletier et al. 2013; Sjollema et al. 2014; BOEM 2015; Petersen 2016; Deepwater Wind 2020; Dominion Energy 2022), impacts would be expected to remain minor.

Cumulative impacts of Alternatives B and C. In context of reasonably foreseeable environmental trends, the contribution of Alternatives B and C to the impacts of ongoing and planned activities would not be materially different from those described under the Proposed Action.

3.5.6.1 Conclusions

Impacts of Alternatives B and C. Alternatives B and C would involve fewer and potentially smaller WTGs, compared to the Proposed Action, which would have an associated decrease in potential collision risk to bats. However, BOEM expects that the impacts resulting from these alternatives would be similar to the Proposed Action with individual IPFs leading to impacts ranging from **negligible** to **minor**.

Cumulative impacts of Alternatives B and C. In the context of reasonably foreseeable environmental trends, the combined impacts on bats from ongoing and planned actions, including Alternatives B and C, would be similar to those described for the Proposed Action, with individual IPFs leading to **negligible** to **minor** impacts. While Alternatives B and C may result in a slightly lower level of impact on bats than described under the Proposed Action, the overall impacts of Alternatives B and C on bats would be the same level as under the Proposed Action: **minor**. This impact rating is derived primarily by ongoing conditions such as climate change, as well as disturbance and habitat removal associated with onshore construction. As described above for the Proposed Action, Dominion Energy's existing commitments to mitigation measures and BOEM's potential additional mitigation measures could further reduce impacts but would not change the impact ratings.

3.5.7 Impacts of Alternative D on Bats

Impacts of Alternative D. All offshore components of Alternative D-1 or D-2 are the same as the Proposed Action (202 WTGs and 3 OSSs for the Proposed Action) and impacts on bats from the Offshore Project components would be the same as evaluated under the Proposed Action. Onshore, BOEM would

approve only Interconnection Cable Route Option 1 (Alternative D-1) or Hybrid Interconnection Cable Route Option 6 (Alternative D-2). The impacts resulting from individual IPFs under Alternative D-1 would be the same as those described under the Proposed Action because the onshore components would stay the same.

In contrast to the Proposed Action, Alternative D-2 involves approval of only Interconnection Cable Route Option 6 (Hybrid Route), which would be approximately 14.3 miles (23.0 kilometers) long and mostly follow the same route as the Proposed Action, with the exception of the switching station. Interconnection Cable Route Option 6 would be installed via a combination of overhead and underground construction methods and installed via open trench, micro tunneling, and HDD. It would follow Interconnection Cable Route Option 1 as an underground transmission line for approximately 4.5 miles (7.2 kilometers) to a point north of Princess Anne Road, where the route would then transition to an overhead transmission line configuration. The Chicory Switching Station would be built north of Princess Anne Road; therefore, no aboveground switching station would be built at Harpers Road. From the Chicory Switching Station, Interconnection Cable Route Option 6 would align with Interconnection Cable Route Option 1 for the remaining 9.8 miles (15.8 kilometers) to the onshore substation (Fentress).

In contrast to the Proposed Action, Alternative D-2 involves approval of only Hybrid Interconnection Cable Route Option 6, which would be approximately 14.3 miles (23.0 kilometers) long and mostly follow the same route as the Proposed Action, with the exception of the switching station. Interconnection Cable Route Option 6 would be installed via a combination of overhead and underground construction methods including open trench, micro tunneling, and HDD. The route would follow Interconnection Cable Route Option 1 as an underground transmission line for approximately 4.5 miles (7.2 kilometers) to a point north of Princess Anne Road, where the route would then transition to an overhead transmission line configuration. The Chicory Switching Station would be built north of Princess Anne Road; therefore, no aboveground switching station would be built at Harpers Road. From the Chicory Switching Station, Interconnection Cable Route Option 6 would align with Interconnection Cable Route Option 1 for the remaining 9.8 miles (15.8 kilometers) to the onshore substation (Fentress).

Noise and land disturbance from onshore construction activities of Interconnection Cable Route Option 6 would result in behavioral and habitat loss/fragmentation impacts on bats as a result of temporary disturbance and clearing of a total of 72.1 acres (29.2 hectares) of NLCD land cover classes (Tables 3.8-4 and 3.8-5), whereas the Proposed Action would result in impacts on 78.3 acres (31.7 hectares) (Table 3.8-2). Permanent impacts resulting in the loss of potential habitat would be 116.3 acres (47.1 hectares) for Interconnection Cable Route Option 6 and 127.2 acres (51.5 hectares) for Interconnection Cable Route Option 1. While the NLCD does include wetland land cover classes, refer to Section 3.22 (Table 3.22-4) for wetland impacts on the Onshore Project components based on wetland delineation survey data. Total estimated tree clearing would be 117 acres (47 hectares) for Interconnection Cable Route Option 1 and 101 acres (41 hectares) for Interconnection Cable Route Option 6. Approximately 76 percent of Interconnection Cable Route Option 1 (Proposed Action) and 70 percent of Interconnection Cable Route Option 6 (Alternative D-2) would be collocated with existing linear development. The Chicory Switching Station (Interconnection Cable Route Option 6) is in an area identified as general ecological integrity (C5), and would be built within a forested parcel, with potential for habitat loss/fragmentation for bats due to tree clearing within multiple forest NLCD land cover classes (Table 3.8-4). The Chicory Switching Station would have a footprint of 35.5 acres (14.4 hectares) but would result in a greater area of impact on undeveloped NLCD land cover classes than the Harpers Switching Station, which would be located entirely within the existing Aeropines Golf Club and permanently affect 35.3 acres (14.3 hectares) of NLCD land cover classes. Overall, impacts at the Chicory Switching Station (Alternative D-2) would predominantly occur on previously undisturbed forest/wetland habitats (Tables 3.8-4 and 3.8-5), whereas impacts at the Harpers Switching Station (Proposed Action) would be on portions of developed areas (Tables 3.8-2 and 3.8-3). Similar to the

Proposed Action, impacts associated with onshore clearing and construction would be localized and temporary. While Alternative D-2 would result in a slight increase in the duration of noise and habitat loss/fragmentation compared to the Proposed Action, BOEM anticipates the difference in potential impacts on bats would be nominal.

The impacts resulting from noise and land disturbance under Alternative D-1 would be the same as those described under the Proposed Action. Alternative D-2 would have a slightly increased potential to permanently affect forested and wetland habitats when compared to the Proposed Action. As described for the Proposed Action, and based on wetland and NLCD cover class mapping, Alternative D-1 (Interconnection Cable Route Option 1) would have the least potential to permanently affect forested and wetland habitats as compared to Alternative D-2 (Hybrid Interconnection Cable Route Option 6). No individual fitness or population-level effects would be expected from onshore construction and associated loss/fragmentation of foraging associated with Alternatives D-1 or D-2, and, as a result, BOEM anticipates minor impacts. While Alternative D-2 would result in an increase in the duration of noise and habitat loss/fragmentation compared to the Proposed Action, BOEM anticipates impacts of Alternatives D-1 or D-2 to be similar on bats to those described under the Proposed Action: negligible to moderate impacts with overall moderate impacts on bats.

Cumulative impacts of Alternative D. In context of reasonably foreseeable environmental trends, the contribution of Alternatives D-1 or D-2 to the impacts of ongoing and planned activities would not be materially different from those described under the Proposed Action.

3.5.7.1 Conclusions

Impacts of Alternative D. The Proposed Action only considers Interconnection Cable Route Option 1 while Alternative D considers Interconnection Cable Route Option 1 (Alternative D-1) or Interconnection Cable Route Option 6 (Alternative D-2). BOEM anticipates the impacts on bats resulting from Alternative D-1 to be the same as the Proposed Action. Impacts under Alternative D-2 would be slightly greater than under the Proposed Action due to construction and clearing occurring on a larger area of undisturbed forest/wetland habitats; however, the impacts are not expected to change under Alternatives D-1 or D-2 relative to the Proposed Action. Impacts on bats would range from **negligible** to **minor**. Impact ratings associated with individual IPFs would not change.

Cumulative impacts of Alternative D. In the context of reasonably foreseeable environmental trends, the combined impacts on bats from ongoing and planned actions, including Alternative D-1 or D-2, would be similar to those described for the Proposed Action, with individual IPFs leading to **negligible** to **minor** impacts that range from temporary to long term. While Alternative D-1 would result in the same level of impact on bats and Alternative D-2 may result in a slightly higher level of impact on bats than described under the Proposed Action, the overall impacts of Alternatives D-1 or D-2 on bats would be the same as under the Proposed Action: **minor**. This impact rating is derived primarily by ongoing conditions such as climate change, as well as disturbance and habitat removal associated with onshore construction. As described for the Proposed Action, Dominion Energy's existing commitments to mitigation measures and BOEM's potential additional mitigation measures could further reduce impacts but would not change the impact ratings.

3.5.8 Agency-Required Mitigation Measures

The measures listed in Table 3.5-2 are recommended for inclusion in the Preferred Alternative. If the measures analyzed below are adopted by BOEM or cooperating agencies, some adverse impacts could be further reduced.

Table 3.5-2 Measures Resulting from Consultations: Bats[1]

Measure	Description	Effect
Adaptive mitigation for birds and bats	BOEM will require that Dominion Energy develops and implements a Post-Construction Monitoring (PCM) plan based on Dominion Energy's Proposed Bird and Bat Monitoring Framework in coordination with USFWS and other relevant regulatory agencies. Annual monitoring reports will be used to determine the need for adjustments to monitoring approaches, consideration of new monitoring technologies, and/or additional periods of monitoring. Prior to commencing offshore construction activities, Dominion Energy must submit the PCM for BOEM and USFWS review. BOEM and USFWS will review the PCM and provide any comments on the plan within 30 calendar days of its submittal. Dominion Energy must resolve all comments on the PCM to BOEM and USFWS's satisfaction before implementing the plan. a. Monitoring. Dominion Energy must conduct monitoring as outlined in Dominion Energy's Proposed Bird and Bat Monitoring Framework, which will include acoustic monitoring of bat presence, the use of motus receivers and tags to monitor bird and bat movements, and others TBD. b. Annual Monitoring Reports. Dominion Energy must submit to BOEM (at renewable_reporting@boem.gov), USFWS, and BSEE (at OSWSubmittals@bsee.gov) a comprehensive report after each full year of monitoring (pre- and post-construction) within 6 months of completion of the last avian survey. The report must include all data, analyses, and summaries regarding ESA-listed and non-ESA-listed birds and bats. BOEM, USFWS, and BSEE will use the annual monitoring reports to assess the need for reasonable revisions (based on	If the reported post-construction bat monitoring results indicate bat impacts deviate substantially from the impact analysis included in this EIS, then Dominion Energy must make recommendations for new mitigation measures or monitoring methods.

Measure	Description	Effect
	subject matter expert analysis) to the PCM. BOEM, BSEE, and USFWS reserve the right to require reasonable revisions to the PCM and may require new technologies as they become available for use in offshore environments. c. Post-Construction Quarterly Progress Reports. Dominion Energy must submit quarterly progress reports during the implementation of the PCM to BOEM (at renewable_reporting@boem.gov) and the USFWS by the 15th day of the month following the end of each quarter during the first full year that the Project is operational. The progress reports must include a summary of all work performed, an explanation of overall progress, and any technical problems encountered. d. Monitoring Plan Revisions. Within 15 calendar days of submitting the annual monitoring report, Dominion Energy must meet with BOEM and USFWS to discuss the following: the monitoring results; the potential need for revisions to the PCM, including technical refinements or additional monitoring; and the potential need for any additional efforts to reduce impacts. If BOEM or USFWS determines after this discussion that revisions to the PCM are necessary, BOEM may require Dominion Energy to modify the PCM. If the reported monitoring results deviate substantially from the impact analysis included in the Final BA, Dominion Energy must transmit to BOEM recommendations for new mitigation measures and/or monitoring methods. e. Operational Reporting (Operations). Dominion Energy must submit to BOEM (at renewable_reporting@boem.gov) and BSEE (at OSWSubmittals@bsee.gov) an	

Measure	Description	Effect
	annual report summarizing monthly operational data calculated from 10-minute SCADA data for all turbines together in tabular format: the proportion of time the turbines were operational (spinning at >x rpm) each month, the average rotor speed (monthly rpm) of spinning turbines plus 1 standard deviation, and the average pitch angle of blades (degrees relative to rotor plane) plus 1 standard deviation. BOEM and BSEE will use this information as inputs for avian collision risk models to assess whether the results deviate substantially from the impact analysis included in the Final BA. f. Raw data. The Lessee must store the raw data from all avian and bat surveys and monitoring activities according to accepted archiving practices. Such data must remain accessible to BOEM, BSEE and USFWS, upon request for the duration of the Lease. The Lessee must work with BOEM to ensure the data are publicly available. USFWS may specify third-party data repositories that must be used, such as the Motus Wildlife Tracking System or MoveBank, and such parties and associated data standards may change over the duration of the monitoring plan.	
Annual bird and bat mortality reporting	Dominion Energy must provide an annual report to BOEM and USFWS documenting any dead (or injured) birds or bats found on vessels and structures during construction, operations, and decommissioning. The report must contain the following information: the name of species, date found, location, a picture to confirm species identity (if possible), and any other relevant information. Carcasses with federal or research bands must be reported to the United States Geological Survey Bird Band Laboratory, available at https://www.pwrc.usgs.gov/bbl/. Any	Annual bat mortality reporting can inform the Avian and Bat Post-Construction Monitoring Plan (see previous measure), which could lead to Dominion Energy recommending new mitigation measures or monitoring methods to reduce impacts on bats. In addition, mortality data can inform future BOEM offshore wind EIS analyses for proposed wind farms on the Atlantic OCS.

Measure	Description	Effect
	occurrence of a dead ESA-listed bird or bat must be reported to BOEM, BSEE, and USFWS as soon as practicable (taking into account crew and vessel safety), but no later than 24 hours after the sighting, and, if practicable, the dead specimen will be carefully collected and preserved in the best possible state.	
Surveys, Avoidance, and Minimization (bat acoustic surveys)	To minimize potential impacts on northern long-eared bats and Indiana bats, which may be present year-round, Dominion Energy has conducted surveys (mist-net) and is developing avoidance and minimization measures, including adhering to the existing requirements for tree clearing under 4(d) provisions prior to implementation of the new regulations on April 1, 2024 and adhering to the year-round time of year restrictions for suitable habitat included in the new regulation in coordination with BOEM, USFWS, and VDWR.	This measure could result in additional impact reduction on ESA-listed bats and non-protected bats.

[1] Also Identified in Appendix H, Table H-2.

3.5.8.1 Effect of Measures Incorporated into the Preferred Alternative

Mitigation measures required through completed consultations, authorizations, and permits listed in Table 3.5-2 and Appendix H, *Mitigation and Monitoring*, Table H-2 are incorporated in the Preferred Alternative. These measures, if adopted, would further define how the effectiveness and enforcement of APMs would be ensured and improve accountability for compliance with APMs by requiring monitoring, reporting, and adaptive management of potential bat impacts on the OCS. However, given the infrequent and limited anticipated use of the OCS by migrating tree bats during spring and fall migration, and given that cave bats do not typically occur on the OCS, offshore wind activities are unlikely to appreciably contribute to impacts on bats regardless of measures intended to address potential offshore bat impacts. In the onshore environment, conducting pre-construction surveys and coordinating with VDWR and USFWS would ensure impacts on bats and their habitats would be avoided and minimized to the extent practicable. Because these measures ensure the effectiveness of and compliance with APMs that are already analyzed as part of the Proposed Action, implementation of these measures would not further reduce the impact level of the Proposed Action from what is described in Section 3.5.2, *Environmental Consequences*.

3.11. Demographics, Employment, and Economics

This section discusses potential impacts on demographics, employment, and economics from the proposed Project, alternatives, and ongoing and planned activities in the geographic analysis area. The geographic analysis area, as described in Appendix F, *Planned Activities Scenario*, Table F-1, and shown on Figure 3.11-1, includes the cities where proposed onshore infrastructure and potential port cities are located, as well as the cities closest to the Wind Farm Area: Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, and Virginia Beach Cities, Virginia. All incorporated cities in Virginia are classified as independent cities and considered as county equivalents by the U.S. Census Bureau for the purposes of data collection.

3.11.1 Description of the Affected Environment for Demographics, Employment, and Economics

The cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, and Virginia Beach are notable for coastal activities such as swimming, fishing, surfing, and sailing along Virginia's ocean beaches from Grandview Beach in Hampton to False Cape State Park in Virginia Beach. Coastal communities provide hospitality, entertainment, and recreation for many visitors each year and benefit from high tourism employment. In 2019, travel to Virginia Beach yielded $1.6 billion in spending to employ 13,000 people (COP, Section 4.4.5; Table 4.4-17; Dominion Energy 2023a). The geographic analysis area is part of the Virginia Beach–Norfolk–Newport News VA-NC Metropolitan Statistical Area (MSA) (also known as the Hampton Roads MSA), which had a total estimated population of 1,768,901 in 2019. The Hampton Roads region is known for its maritime industry, large military installations, and tourism industry, which is dominated by cultural history and coastal recreation (COP, Section 4.4.1.1; Dominion Energy 2023a). Data on population and demographics for the state of Virginia and for the cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, and Virginia Beach are provided in Table 3.11-1 and Table 3.11-2. The population of Hampton, Newport News, and Portsmouth declined between 2010 and 2019, while the population of Virginia and Chesapeake, Norfolk, and Virginial Beach increased. The U.S. Census Bureau estimated the 2019 population of Norfolk at about 240,000 residents. Norfolk has the lowest percentage of residents over age 65 and the lowest median age. The population of Chesapeake City grew at the highest rate, 9.4 percent from 2010 to 2019, followed by Virginia Beach with 3.3 percent and Norfolk with 1 percent; while, the population of Newport News, Portsmouth, and Hampton declined by 1.2 percent, 1.7 percent, and 2.9 percent, respectively. The population of the six cities are all younger than or the same as, on average, Virginia, with a higher percentage of residents aged 65 or older and a higher median age.

Table 3.11-1 Demographic Trends (2010–2019)

Jurisdiction	2010 Population	2019 Population	2010–2019 Percent Population Change	2019 Percent Population 18–64	2019 Percent Population 65 or Older	2019 Median Age
Virginia	7,841,754	8,454,463	7.8	62.9	15	38.2
Chesapeake city	219,268	239,982	9.4	62.8	13	36.9
Hampton city	139,046	135,041	-2.9	63.9	15	36.2
Newport News city	181,822	179,673	-1.2	64.1	12.7	33.5
Norfolk city	242,143	244,601	1.0	69.4	10.9	30.7
Portsmouth city	96,785	95,097	-1.7	62.1	14.5	35.3
Virginia Beach city	435,996	450,201	3.3	64.0	13.7	36.2

Source: U.S. Census Bureau 2021a, 2021b.

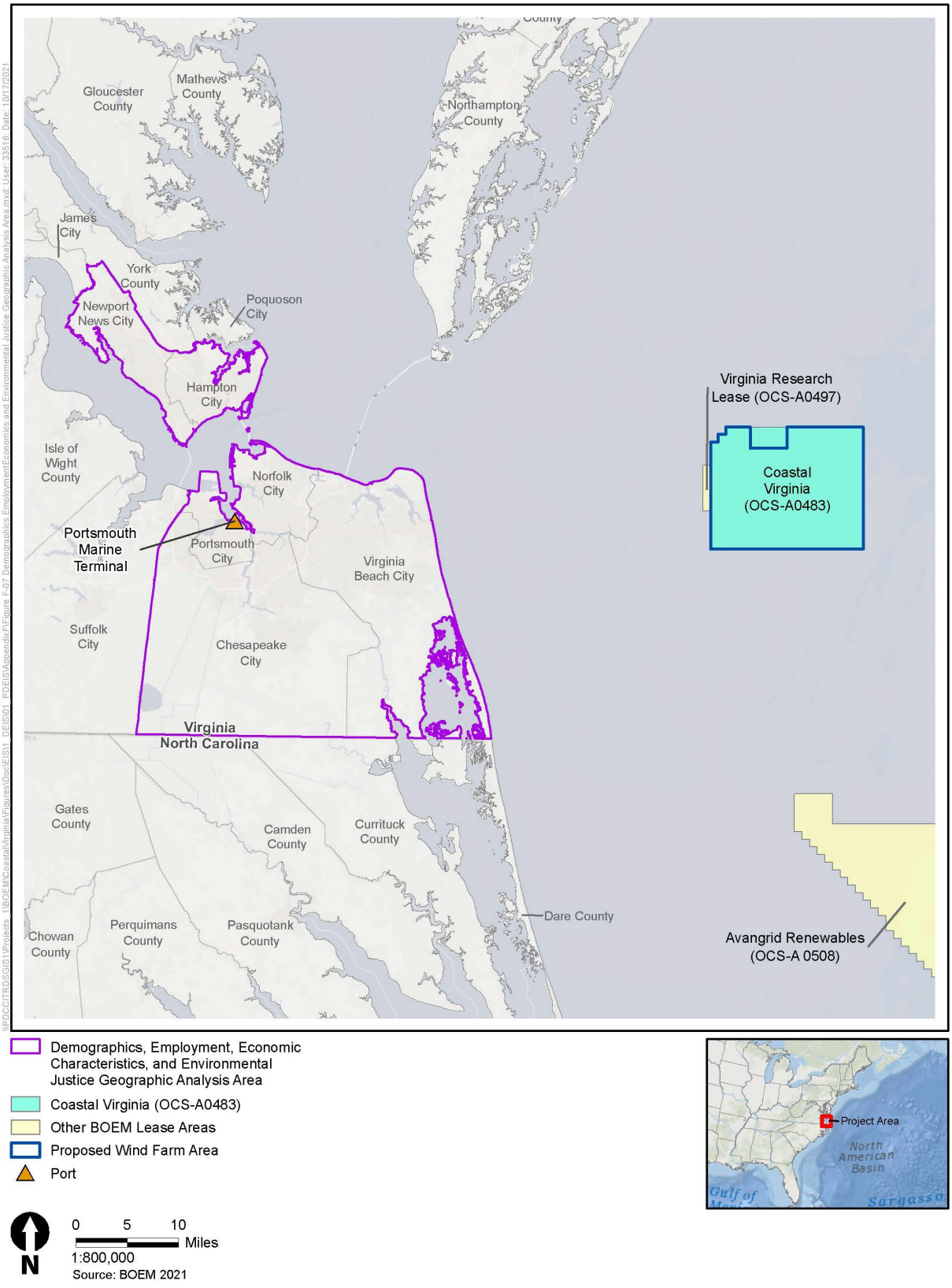

Figure 3.11-1 Demographics, Employment, Economic Characteristics, and Environmental Justice Geographic Analysis Area

Table 3.11-2 Demographic Data (2019)

Jurisdiction	Population	Population Density (persons per mi²)[1]	Per Capita Income (in USD)	Total Employment	Unemployment Rate (percent)
Virginia	8,454,463	214.1	39,278	4,156,018	4
Chesapeake city	239,982	703.8	35,536	111,227	5.2
Hampton city	135,041	990.8	30,135	61,782	5.6
Newport News city	179,673	1502.3	28,294	81,407	6.4
Norfolk city	244,601	2537.4	29,830	104,945	6
Portsmouth city	95,097	2037.2	26,312	41,396	5.1
Virginia Beach city	450,201	905.8	37,776	221,998	4.1

Source: U.S. Census Bureau 2021c; 2021d.
mi² = square mile; USD = U.S. dollars.

Chesapeake occupies about 341 square miles (883 square kilometers) of land. Hampton occupies about 136 square miles (352 square kilometers) of land in the coastal region of Virginia. Newport News occupies about 120 square miles (311 square kilometers) of land bordering the Chesapeake Bay and the James River. Norfolk occupies about 96 miles (155 kilometers) of land in the coastal region of Virginia. Portsmouth occupies about 47 miles (76 kilometers) of land, and the Portsmouth Marine Terminal (PMT) resides in Portsmouth County. Virginia Beach, occupies around 497 square miles (1,287 square kilometers) of land and is where the onshore cable route would be located. Virginia Beach is composed of 38 miles (61 kilometers) of shoreline and 3 miles (5 kilometers) of boardwalk, which are important to Virginia Beach's economy (Section 3.18, *Recreation and Tourism*).

The percentage of housing units for seasonal, recreational, or occasional use in Virginia Beach is highest at 1.7 percent compared to 0.1 percent in Chesapeake, 0.4 percent in Norfolk, 0.2 percent in Portsmouth, 0.4 percent in Hampton, and 0.2 percent in Newport News in comparison to 2.3 percent in Virginia as a whole (U.S. Census Bureau 2022b; COP, Section 4.4.1.1; Table 4.4-3; Dominion Energy 2023a). Virginia Beach relies on tourism and visitors to its economy and has the closest proportion of seasonal housing to Virginia as a whole. Table 3.11-3 includes housing data for the geographic analysis area. Throughout Virginia, 2.5 percent of housing units are seasonally occupied; (COP, Section 4.4.1.1; Table 4.4-3) 450,201 residents lived in Virginia Beach County in 2019. More than 19 million people visited Virginia Beach in 2017 (City of Virginia Beach 2017).

Table 3.11-3 Housing Data (2019)

Jurisdiction	Housing Units	Seasonal Vacant Units	Vacant Units (Total)	Vacancy Rate (percent)	Median Value (Owner-Occupied, USD)	Median Monthly Rent (Renter-Occupied, USD)
Virginia	3,537,788	82,998	353,667	10.0	282,800	1,257
Chesapeake city	91,707	52	5,183	5.7	286,000	1,300
Hampton city	60,145	234	5,298	8.8	188,600	1,115
Newport News city	77,851	133	7,475	9.6	194,700	1,075
Norfolk city	98,142	397	8,744	8.9	215,800	1,077
Portsmouth city	40,879	78	4,229	10.3	174,200	1,083
Virginia Beach city	185,735	3,156	13,283	7.2	287,400	1,380

Source: U.S. Census Bureau 2022a, 2022b.

Table 3.11-4 includes data on the industries where residents in these cities work. The industries that employ workers reflect recreation and tourism's importance to Hampton, Newport News, Norfolk, and Virginia Beach. A greater or equal proportion of residents in these cities work jobs in arts, entertainment, recreation, and accommodation and food services (9.3 percent in Hampton, 10.6 percent in Newport News, 12.8 in Norfolk, and 11.1 percent in Virginia Beach) than in Virginia as a whole (8.9 percent) (U.S. Census Bureau 2021c). Table 3.11-5 contains data on at-place employment by industry in the geographic areas of interest. A greater proportion of jobs in these cities is generally in health care and social assistance (18.8 percent in Hampton, 17 percent in Newport News, 19.4 percent in Norfolk, and 28.3 percent in Portsmouth); whereas, accommodation and food services comprise the largest employment by industry for Virginia Beach (16 percent), and retail services comprises the largest employment by industry for Chesapeake (16 percent) (Table 3.11 5). In 2019, unemployment was 5.2 percent in Chesapeake, 5.6 percent in Hampton, 6.4 percent in Newport News, 6 percent in Norfolk, 5.1 percent in Portsmouth, and 4.1 percent in Virginia Beach, compared to 4 percent overall in Virginia.

NOAA tracks economic activity dependent upon the ocean in its "Ocean Economy" data, which generally include, among other categories, commercial fishing and seafood processing, marine construction, commercial shipping and cargo-handling facilities, ship and boat building, marine minerals, harbor and port authorities, passenger transportation, boat dealers, and coastal tourism and recreation. In Newport News and Virginia Beach Counties, tourism and recreation account for 67.5 percent and 95.0 percent, respectively, of the overall Ocean Economy gross domestic product (GDP) (NOAA 2021). The "living resource" sector of the Ocean Economy is smaller but contributes to the identity of local communities and tourism. This includes commercial fishing, aquaculture, seafood processing, and seafood markets. Among Newport News and Portsmouth Counties, there are 17 living resources fisheries (NOAA 2021).

Table 3.11-4 Employment of Residents by Industry (2019)

Industry	Virginia	Chesapeake	Hampton	Newport News	Norfolk	Portsmouth	Virginia Beach
Agriculture, forestry, fishing and hunting, and mining	0.9%	0.20%	0.5%	0.3%	0.1%	0.4%	0.3%
Construction	6.6%	6.7%	6.3%	5.5%	7.0%	6.9%	6.5%
Manufacturing	7.1%	8.1%	12.6%	13.7%	7.1%	10.3%	5.5%
Wholesale trade	1.8%	1.5%	1.6%	2.1%	1.6%	2.3%	2.0%
Retail trade	10.4%	10.5%	10.4%	11.8%	11.2%	13.4%	11.5%
Transportation and warehousing, and utilities	4.4%	5.3%	4.4%	4.3%	4.9%	5.8%	4.2%
Information	1.9%	2.2%	1.1%	1.4%	1.7%	1.3%	1.7%
Finance and insurance, and real estate and rental and leasing	6.3%	7.0%	5.1%	3.5%	5.7%	4.3%	7.7%
Professional, scientific, and management, and administrative and waste management services	15.5%	11.8%	12.6%	10.7%	11.7%	9.4%	12.8%
Educational services, and health care and social assistance	22.2%	24.1%	22.0%	23.4%	23.1%	24.5%	22.9%
Arts, entertainment, and recreation, and accommodation and food services	8.9%	7.7%	9.3%	10.6%	12.8%	8.4%	11.1%
Other services, except public administration	5.3%	5.4%	4.5%	4.5%	4.4%	4.2%	4.6%
Public administration	8.8%	9.5%	9.6%	8.2%	8.7%	8.8%	9.2%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: U.S. Census Bureau 2021c.

Table 3.11-5 At-Place Employment by Industry (2019)

Industry	Virginia	Chesapeake	Hampton	Newport News	Norfolk	Portsmouth	Virginia Beach
Agriculture, forestry, fishing	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Mining, quarrying, oil and gas	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Utilities	0.4%	0.1%	0.0%	0.1%	0.0%	0.1%	0.2%
Construction	5.6%	9.1%	4.4%	3.0%	3.6%	8.4%	6.7%
Manufacturing	7.0%	5.0%	4.9%	30.2%	6.4%	3.4%	3.8%
Wholesale trade	3.1%	4.2%	1.8%	2.3%	3.9%	2.3%	2.4%
Retail trade	12.5%	16.1%	15.4%	10.8%	10.7%	12.4%	15.3%
Transportation and warehousing	3.3%	4.8%	1.3%	1.6%	6.5%	7.0%	1.2%
Information	2.9%	2.5%	2.0%	1.9%	2.1%	0.5%	2.2%
Finance and insurance	4.8%	4.7%	2.1%	1.8%	4.1%	1.5%	7.4%
Real estate	1.6%	1.7%	1.8%	1.5%	3.3%	1.5%	3.4%
Professional services	14.3%	9.5%	12.2%	4.9%	10.4%	5.2%	9.7%
Management	2.4%	2.8%	0.3%	2.8%	2.4%	1.1%	1.6%
Administrative, business support, waste management	8.1%	9.1%	9.8%	6.7%	8.1%	8.7%	7.2%
Educational services	2.4%	1.7%	4.5%	1.2%	1.9%	0.8%	2.5%
Health care and social assistance	13.6%	10.6%	18.8%	17.0%	19.4%	28.3%	13.3%
Arts, entertainment, and recreation	1.9%	1.4%	1.3%	1.3%	1.4%	0.9%	2.3%
Accommodation and food services	10.8%	11.6%	14.7%	9.6%	11.1%	10.8%	16.0%
Other services (e.g., public administration)	5.0%	4.9%	4.4%	3.1%	4.3%	7.0%	4.8%
Industries not classified	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: U.S. Census Bureau 2021e.

3.11.1.1 Chesapeake and Virginia Beach

U.S. Census Bureau data indicate that over 70 percent of Virginia Beach's workforce resides in Virginia Beach and over 9 percent resides in both Chesapeake and Norfolk, suggesting significant economic linkages between the cities (COP, Section 4.4.1.1, Table 4.4-1; Dominion Energy 2023a). The population of Chesapeake grew over 9 percent from 2010 to 2019 while the population of Virginia Beach only grew about 3 percent. The share of Virginia's population in Chesapeake and Virginia Beach is roughly 8 percent. Median age in Chesapeake (36.9) and Virginia Beach (36.2) is slightly younger than Virginia as a whole (38.2 years) (Table 3.11-1).

Onshore recreational and tourism uses include beachgoing and other water borne activities, waterfront festivals, biking, freshwater fishing, and general use of open park spaces (COP, Section 4.4.5; Dominion Energy 2023a). Chesapeake is less dependent on tourism than Virginia Beach. The percentage of housing units for seasonal, recreational, or occasional use in Virginia Beach is 2.3 percent compared to less than 0.1 percent in Chesapeake (COP, Section 4.4.1.1; Table 4-4.3; Dominion Energy 2023a). Accommodation and food services comprises the largest employment by industry for Virginia Beach (16 percent) and retail services comprises the largest employment by industry for Chesapeake (16 percent) (Table 3.11-5).

3.11.1.2 Norfolk and Portsmouth

Norfolk and Portsmouth are key contributors to the Port of Virginia. From 2010 to 2019, Norfolk's population grew by 1.0 percent and Portsmouth's population decreased by 1.7 percent, while the population of Virginia grew by 7.8 percent (Table 3.11-1). Norfolk and Portsmouth's populations are much younger than Virginia's, 30.7 and 35.3, respectively. Compared to Virginia as a whole, Norfolk and Portsmouth have a higher portion of residents who work in health care and social assistance (19.4 percent and 28.3 percent) than Virginia (13.6 percent) (Table 3.11-5).

3.11.1.3 Hampton and Newport News

Across the inlet from Norfolk and Portsmouth are the cities of Hampton and Newport News. From 2010 to 2019, both Hampton and Newport News' population decreased by 2.9 and 1.2 percent, respectively, while Virginia grew by 7.8 percent (Table 3.11-1). Hampton and Newport News' populations are much younger than Virginia's median age of 38.2, 36.2, and 33.5, respectively. Compared to Virginia as a whole, Hampton and Newport News have a higher portion of residents who work in health care and social assistance (18.8 percent and 17 percent) than Virginia as a whole (13.6 percent) (Table 3.11-5).

3.11.2 Environmental Consequences

3.11.2.1 Impact Level Definitions for Demographics, Employment, and Economics

Definitions of impact levels are provided in Table 3.11-6.

Table 3.11-6 Impact Level Definitions for Demographics, Employment, and Economics

Impact Level	Impact Type	Definition
Negligible	Adverse	No impacts would occur, or impacts would be so small as to be unmeasurable.
	Beneficial	Either no effect or no measurable benefit.

Impact Level	Impact Type	Definition
Minor	Adverse	Impacts on the affected activity or geographic place would not disrupt the normal or routine functions of the affected activity or geographic place.
	Beneficial	Small but measurable benefit on demographics, employment, or economic activity.
Moderate	Adverse	The affected activity or geographic place would have to adjust somewhat to account for disruptions due to impacts of the Project.
	Beneficial	Notable and measurable benefit on demographics, employment, or economic activity.
Major	Adverse	The affected activity or geographic place would experience unavoidable disruptions to a degree beyond what is normally acceptable.
	Beneficial	Large local or notable regional benefit to the economy as a whole.

3.11.3 Impacts of the No Action Alternative on Demographics, Employment, and Economics

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

Impacts of the No Action Alternative Under the No Action Alternative, the baseline conditions demographics, employment, and economics of the geographic analysis area described in Section 3.11.1, *Description of the Affected Environment for Demographics,* would continue to follow current regional trends and respond to IPFs introduced by other ongoing non-offshore wind and offshore wind activities. Tourism, recreation, and marine industries (e.g., fishing) would continue to be important components of the regional economy. Ongoing non-offshore wind activities in the geographic analysis area that would contribute to impacts on demographics, employment, and economics include continued commercial shipping and commercial fishing; ongoing port maintenance and upgrades; periodic channel dredging; maintenance of piers, pilings, seawalls, and buoys; and the use of small-scale, onshore renewable energy. Planned activities for coastal and marine activity, other than offshore wind, include development of diversified, small-scale, onshore renewable energy sources; ongoing onshore development at or near current rates; continued increases in the size of commercial vessels; potential port expansion and channel-deepening activities; and efforts to protect against potential increased storm damage and sea level rise (see Appendix F, Section F.2 for a description of ongoing and planned activities).

3.11.3.1 Cumulative Impacts of the No Action Alternative

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

Offshore wind could become a new industry for the Atlantic states and the nation. Although most offshore wind component manufacturing and installation capacity exists outside of the United States, some studies acknowledge that domestic capacity is poised to increase. This EIS uses available data, analysis, and projections to make informed conclusions on offshore wind's potential economic and employment impacts in the geographic analysis area.

The BVG Associates Limited (2017) study estimated that the percentage of jobs sourced in the United States during the initial implementation of offshore wind projects along the Northeast coast would range from 35 percent to 55 percent of jobs. As the offshore wind energy industry grows in the United States, this proportion of jobs would increase because of growth of a supply chain in the East Coast along with a growing number of maintenance and local operations jobs for established wind facilities. The proportion of jobs associated with offshore wind projected to be within the United States is approximately 65 to 75 percent from 2030 through 2056. Overseas manufacturers of components and specialized ships based overseas that are contracted for installation of foundations and WTGs would compose the rest of the jobs outside the United States (BVG Associates Limited 2017).

The American Wind Energy Association (AWEA) estimates that the offshore wind industry will invest between $80 and $106 billion in U.S. offshore wind development by 2030, of which $28 to $57 billion will be invested in the United States. This figure depends on installation levels and supply chain growth, as other investment would occur in countries manufacturing or assembling wind energy components for U.S.-based projects. While most economic and employment impacts would be concentrated in Atlantic coastal states where offshore wind development will occur—there are over $1.3 billion of announced domestic investments in wind energy manufacturing facilities, ports, and vessel construction—there would be nationwide effects as well (AWEA 2020). The AWEA report analyzes base and high scenarios for offshore wind direct impacts, turbine and supply chain impacts, and induced impacts. The base scenario assumes 20 gigawatts (GW) of offshore wind power by 2030 and domestic content increasing to 30 percent in 2025 and 50 percent in 2030. The high scenario assumes 30 GW of offshore wind power by 2030 and domestic content increasing to 40 percent in 2025 and 60 percent in 2030. Offshore wind energy development would support $14.2 billion in economic output and $7 billion in value added by 2030 under the base scenario. Offshore wind energy development would support $25.4 billion in economic output and $12.5 billion in value added under the high scenario. It is unclear where in the U.S. supply chain growth would occur.

The University of Delaware projects that offshore wind power will generate 30 GW along the Atlantic coast through 2030. This initiative would require capital expenditures of $100.1 billion by 2030 (University of Delaware 2021). Although the industry supply chain is global and foreign sources would be responsible for some expenditures, more U.S. suppliers are expected to enter the industry.

Compared to the $14.2 to $25.4 billion in offshore wind economic output (AWEA 2020), the 2020 annual GDP for states with offshore wind projects (Connecticut, Massachusetts, Rhode Island, New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina) ranged from $60.6 billion in Rhode Island to $1.72 trillion in New York (U.S. Bureau of Economic Analysis 2021) and totaled nearly $4.3 trillion. The $14.2 to $25.4 billion in offshore wind industry output would represent 0.3 to 0.6 percent of the combined GDP of these states.

AWEA estimates that in 2030, offshore wind would support 45,500 (base scenario) to 82,500 (high scenario) full-time equivalent (FTE) jobs nationwide, including direct, supply chain, and induced jobs. Most offshore wind jobs (about 60 percent) would be created during the temporary construction phase while the remaining 40 percent would be long-term O&M jobs. The Responsible Offshore Development Alliance (RODA) in 2020 estimated that offshore wind projects would create 55,989 to 86,138 job through 2030 in construction and 5,003 to 6,994 long-term jobs in O&M (Georgetown Economic Services 2020). These estimates are generally consistent with the AWEA study in total jobs supported, although the RODA study concludes that a greater proportion of jobs would be in the construction phase. The two studies conclude that states hosting offshore wind projects would have more offshore wind energy jobs, while states with manufacturing and other supply chain activities may generate additional jobs.

In 2019, employment in Virginia was 4.1 million (Table 3.11-2). While the extent to which there would be impacts on the geographic analysis area is unclear due to the geographic versatility of offshore wind jobs, a substantial portion of the planned offshore wind projects in Virginia would likely be within commuting distance of ports in Hampton, Newport News, Norfolk, and Portsmouth for offshore wind staging, construction, and operations.

In addition to the regional economic impact of a growing offshore wind industry, BOEM expects planned offshore wind development to affect demographics, employment, and economics through the following primary IPFs.

Energy generation and security: Once built, offshore wind energy projects could produce energy at long-term fixed costs. These projects could provide reliable prices once built compared to the volatility of fossil fuel prices. Kitty Hawk Offshore Wind North would consist of up to 69 WTGs and Kitty Hawk Offshore Wind South would have up to 121 WTGs; a total nameplate capacity has not yet been determined for the projects (Appendix F, Table F2-1). The economic impacts of future offshore wind activities (including associated energy storage and capacity projects) on energy generation and energy security cannot be quantified, but could be long term and beneficial.

Light: Offshore WTGs require aviation warning lighting that could have economic impacts on certain locations. Aviation hazard lighting from up to 190 WTGs and three OSSs could be visible from some beaches, coastlines, and elevated inland areas, depending on vegetation, topography, weather, and atmospheric conditions (Appendix F, Table F2-1). Visitors may make different decisions on coastal locations to visit, and potential residents may choose to select different residences because of nighttime views of lights on offshore wind energy structures. These lights would be incrementally added over the construction period and would be visible for the operating lives of future offshore wind activities. Distance from shore, topography, and atmospheric conditions would affect light visibility.

If implemented, an Aircraft Detection Lighting System would reduce the amount of time that WTG lighting is visible. Visibility would depend on distance from shore, topography, and atmospheric conditions. Such systems would likely reduce impacts on demographics, employment, and economics associated with lighting. Lighting for transit or construction could occur during nighttime transit or work activities. Vessel lights would be visible from coastal businesses, especially near the ports used to support offshore wind construction. However, vessel traffic is common along the Atlantic coast, and frequent ship traffic is especially common in the geographic analysis area (COP, Appendix I-1, Section I-1.5.5.1; Dominion Energy 2023a).

New cable emplacement and maintenance: Cable installation could temporarily cause commercial fishing vessels, static gear fishing vessels, and recreational vessels based in the geographic analysis area to relocate away from work areas and disrupt fish stocks, thereby potentially reducing income of commercial fishing vessels. Fishing vessels are not likely to access affected areas during active construction, as about 130,145[1] acres (52,667.8 hectares) of seafloor disturbance would occur associated with offshore cable and inter-array cable installation as a result of the Kitty Hawk Offshore Wind Projects (Appendix F, Table F2-2). In the long term, concrete mattresses covering cables in hard-bottom areas could hinder commercial trawlers and dredgers. Assuming similar installation procedures as under the Proposed Action, the duration and range of impacts would be limited, and the disturbance to marine species important to recreational fishing and sightseeing would recover following the disturbance. Impacts from onshore cable installation would depend on the specific location but could temporarily

[1] Kitty Hawk South has 3 export cables (92 kilometers to Virginia, 322 kilometers to North Carolina, and an additional 154 kilometers of inshore export cable to North Carolina) for a total of 568 kilometers (352.9 miles), and corridor widths between 1,520-mile-wide corridor to Virginia and 1,000-mile-wide corridors to North Carolina to allow for optimal routing of the cables.

disrupt beaches and other recreational coastal areas. Disruptions may result in conflict over other fishing grounds, increased operating costs for vessels, and lower revenue. Seafood processing and wholesaling businesses could also experience short-term reductions in productivity.

Noise: Noise from O&M, pile driving, cable laying and trenching, and vessel traffic could result in temporary impacts on demographics, employment, and economics due to impacts on commercial/for-hire fishing businesses, recreational businesses, and marine sightseeing activities based in the geographic analysis area.

Assuming other offshore wind facilities generate vessel traffic similar to the Proposed Action vessel trips, construction of each offshore wind project would generate about 46 daily vessel trips during the entire construction period and a maximum of 95 daily vessel trips during peak construction periods (Section 3.16, *Navigation and Vessel Traffic*). Noise from vessel traffic during the maintenance and construction phases could affect species important to commercial/for-hire fishing, recreational fishing, and marine sightseeing activities (COP, Section 4.2.5; Dominion Energy 2023a). This noise may also make these facilities less attractive to fishing operators and recreational boaters. Similarly, noise from pile driving from offshore wind activities would affect fish populations that are crucial to commercial fishing and marine recreational businesses (COP, Section 4.4.6.3; Dominion Energy 2023a). These impacts would be greater if multiple construction activities occur in close spatial and temporal proximity. An estimated 193 foundations (190 WTGs and three substations) would be installed in the North Carolina lease areas between 2024 and 2030 (Appendix F, Table F-3).

Onshore construction noise could possibly result in a short-term reduction of economic activity for businesses near installation sites for onshore cables or substations, temporarily inconveniencing workers, residents, and visitors. Noise would have intermittent and short-term impacts on demographics, employment, and economics.

Port utilization: Offshore wind installation would require port facilities for berthing, staging, and loadout. Development activities would bolster port investment and employment while also supporting jobs and businesses in supporting industries. Future offshore wind development would also support planned expansions and modifications at ports in the geographic analysis area, including the PMT. While simultaneous construction or decommissioning (and, to a lesser degree, operation) activities for multiple offshore wind projects in the geographic analysis area could stress port capacity, it would also generate considerable economic activity and benefit the regional economy and infrastructure investment.

Port utilization would require a trained workforce for the offshore wind industry including additional shore-based and marine workers that would contribute to local and regional economic activity. Improvements to existing ports and channels would be beneficial to other port activity. Port utilization in the geographic analysis area would occur primarily during development and construction projects, anticipated to occur primarily between 2026 and 2028. Ongoing O&M activities would sustain port activity and employment at a lower level after construction.

Offshore wind activities and associated port investment and usage would have long-term, beneficial impacts on employment and economic activity by providing employment and industries, such as marine construction, ship construction and servicing, and related manufacturing. The greatest benefits would occur during offshore wind project construction between 2026 and 2028. If offshore wind construction results in competition for scarce berthing space and port service, port usage could have short- to medium-term adverse impacts on commercial shipping.

Presence of structures: The presence of up to 190 WTGs, hard cover for scour and cable protection, and up to 81 acres (32.7 hectares) of hard coverage (Appendix F, Table F2-2) would increase the risk of gear loss connected with cable mattresses and structures along the East Coast. These offshore facilities would

also pose allision and height hazard risks, creating obstructions and navigational complexity for marine vessels, which would impose fuel costs, time, and risk and require adequate technological aids and trained personnel for safe navigation (Appendix F, Table F2-1 and Table F2-2). In the event of an allision, vessel damage and spills could result in both direct and indirect costs for commercial/for-hire recreational fishing.

WTGs could encourage fish aggregation and generate reef effects that attract recreational fishing vessels from the geographic analysis area (COP, Section 4.4.6.3; Dominion Energy 2023a). Fish aggregation could increase human fishing activities, but this attraction would likely be limited to recreational fishing vessels that already travel as far from the shore as the wind energy facilities. Fish aggregation could potentially result in increases to recreational fishing activities if these effects are widespread enough to encourage more participants to travel farther from shore.

The offshore wind structures could attract various wildlife and consequently increase the number of vessels conducting ecotourism trips from the geographic analysis area. As a result, the presence of the offshore wind structures could increase economic activity associated with ecotourism.

As a result of fish aggregation and reef effects associated with the presence of offshore wind structures, there would be long-term impacts on commercial fishing operations and support businesses, such as seafood processing. The fishing industry is expected to be able to adapt its fishing practices over time in response to these changes. These effects could simultaneously provide new business opportunities, such as fishing and tourism. Overall, the presence of offshore wind structures would have continuous, long-term impacts on demographics, employment, and economics.

Vessel traffic: Offshore wind construction and decommissioning and, to a lesser extent, offshore wind operations would generate increased vessel traffic. This additional traffic would support increased employment and economic activity for marine transportation and supporting businesses and investment in ports. Assuming other offshore wind facilities generate vessel traffic similar to the projected Proposed Action vessel trips, construction of each offshore wind project would generate about 46 daily vessel trips during the entire construction period and a maximum of 95 daily vessel trips during peak construction periods (Section 3.16, *Navigation and Vessel Traffic*). Construction of two future offshore wind projects could occur in the Virginia and North Carolina lease areas between 2024 and 2027, with a maximum of three projects under construction concurrently (Appendix F, Table F2-1; Dominion Energy 2023b). Increased vessel traffic would have continuous, beneficial impacts during all project phases, with stronger impacts during construction and decommissioning.

Impacts of short-term, increased vessel traffic during construction could include increased vessel traffic congestion, delays at ports, and a risk for collisions between vessels. Increased vessel traffic would be localized near affected ports and offshore construction areas. Congestion and delays could increase fuel costs (i.e., for vessels forced to wait for port traffic to pass) and decrease productivity for commercial shipping, fishing, and recreational vessel businesses, whose income depends on the ability to spend time out of port. Collisions could lead to vessel damage and spills, which could have direct costs (i.e., vessel repairs and spill cleanup), as well as indirect costs from damage caused by spills.

Vessel traffic would occur among ports (outside the demographics, employment, and economic geographic analysis area) and offshore wind work areas. COP, Section 3.4.1.5, Table 3.4-5 (Dominion Energy 2023a) summarizes the anticipated Project-related vessel traffic during construction of the Proposed Action. Construction vessel trips will likely originate or terminate at Portsmouth, Virginia.

Land disturbance: Land disturbance could result in localized, temporary disturbances of businesses near cable routes and construction sites for substations and other electrical infrastructure, due to typical construction impacts such as increased noise, traffic, and road disturbances. These impacts would be

similar in character and duration to other common construction projects, such as utility installations, road repairs, and industrial site construction. Impacts on employment would be localized, temporary, and both beneficial (jobs and revenues to local businesses that participate in onshore construction) and adverse (lost revenue due to construction disturbances).

Climate change: Climate change could affect demographics, employment, and economics in the geographic analysis area. Sea level rise and increased storm frequency and severity could result in property or infrastructure damage, increase insurance costs, and reduce the economic viability of coastal communities. Impacts on marine life due to ocean acidification, altered habitats and migration patterns, and disease frequency would affect industries that rely on these marine species. There would likely be a net reduction in GHG emissions, which contribute to climate change, and no collective adverse impact on climate change as a result of offshore wind projects.

3.11.3.2 Conclusions

Impacts of the No Action Alternative. Under the No Action Alternative, the geographic analysis area would continue to be influenced by regional demographic and economic trends and ongoing activities. Ongoing activities are expected to have continuing temporary and permanent impacts on demographics, employment, and economics. Future non-offshore wind activities, and future offshore wind activities would continue to sustain and support economic activity and growth in the geographic analysis area based on anticipated population growth and ongoing development of businesses and industry. Tourism and recreation would continue to be important to the economies of the coastal areas, especially in Newport News and Virginia Beach. Marine industries, such as commercial fishing and shipping, would continue to be active and important components of the regional economy. Counties in the geographic analysis area would continue to seek to diversify their economies—including maintaining or increasing their year-round population—and protect environmental resources.

BOEM anticipates that ongoing activities in the geographic analysis area (continued commercial shipping and commercial fishing; ongoing port maintenance and upgrades; periodic channel dredging; maintenance of piers, pilings, seawalls, and buoys; and the use of small-scale, onshore renewable energy) would have **minor** adverse and **minor beneficial** impacts on demographics, employment, and economics. Planned activities for coastal and marine activity, other than offshore wind, include development of diversified, small-scale, onshore renewable energy sources; ongoing onshore development at or near current rates; continued increases in the size of commercial vessels; potential port expansion and channel-deepening activities; and efforts to protect against potential increased storm damage and sea level rise. BOEM anticipates that there would be **minor** adverse and **minor beneficial** impacts on demographics, employment, and economics from these planned activities. BOEM expects the combination of ongoing and planned non-offshore wind activities to result in **minor** adverse impacts and **minor beneficial** impacts on ocean-based employment and economics, driven primarily by the continued operation of existing marine industries, especially commercial fishing, recreation/tourism, and shipping; increased pressure for environmental protection of coastal resources; the need for port maintenance and upgrades; and the risks of storm damage and sea level rise. Increased investment in land and marine ports, shipping, and logistics capability is expected to result along with component laydown and assembly facilities, job training, and other services and infrastructure necessary for offshore wind construction and operations. Additional manufacturing and servicing businesses would result either in the geographic analysis area or other locations in the United States if supply chains develop as expected. While it is not possible to estimate the extent of job growth and economic output in the geographic analysis area specifically, there would be notable and measurable benefits to employment, economic output, infrastructure improvements, and community services, especially job training, because of offshore wind development.

Cumulative impacts of the No Action Alternative. Under the No Action Alternative, existing environmental trends and ongoing activities would continue, and demographics, employment, and

economics would continue to be affected by natural and human-caused IPFs. Planned activities would contribute to impacts on demographics, employment, and economics, due to increased onshore and offshore construction and operations. Many of the jobs generated by offshore wind projects are temporary construction jobs. The combination of these jobs over multiple activities and projects will create notable benefits during the construction phases of these projects. This will particularly be the case as the domestic supply chain for offshore wind evolves over time. Offshore wind projects also support long-term O&M jobs (25 to 35 years); long-term tax revenues; long-term economic benefits of improved ports and other industrial land areas; diversification of marine industries, especially in areas currently dominated by recreation and tourism; and growth in a skilled marine construction workforce. Therefore, BOEM anticipates that there would be overall **minor beneficial** impacts from future offshore wind activities in the geographic analysis area, combined with ongoing activities and planned activities other than offshore wind.

BOEM also anticipates **minor** adverse impacts associated with future offshore wind activities combined with ongoing activities, reasonably foreseeable environmental trends, and planned activities other than offshore wind. Future offshore wind activities are expected to affect commercial and for-hire fishing businesses and marine recreational businesses (tour boats, marine suppliers) primarily through cable emplacement, noise and vessel traffic during construction, and the presence of offshore structures during operations. These IPFs would temporarily disturb marine species and displace commercial or for-hire fishing vessels, which could cause conflicts over other fishing grounds, increased operating costs, and lower revenue for marine industries and supporting businesses. The long-term presence of offshore wind structures would also lead to increased navigational constraints and risks and potential gear entanglement and loss.

3.11.4 Relevant Design Parameters and Potential Variances in Impacts

This EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than those described in the sections below. The following PDE parameters (Appendix E, *Project Design Envelope and Maximum-Case Scenario*) would influence the magnitude of the impacts on demographics, employment, or economics.

- The extent to which Dominion Energy hires local residents and obtains supplies and services from local vendors.
- The port(s) selected to support construction, installation, and decommissioning and the port(s) selected to support O&M.
- The design parameters that could affect commercial fishing and recreation and tourism because impacts on these activities affect employment and economic activity.

The size of the proposed Project would affect the overall investment and economic impacts; fewer WTGs would mean less materials purchased, fewer vessels, and less labor and equipment required. Beneficial economic impacts in the geographic analysis area would depend on the proportion of workers, materials, vessels, equipment, and services that could be locally sourced and the specific ports used by the Project.

3.11.5 Impacts of the Proposed Action on Demographics, Employment, and Economics

Within the SMR, the Onshore Export Cable Route Corridor crosses under Lake Christine via HDD, which also serves as a fishing and boating area. In addition to the above-mentioned resources, there are two elementary schools near the General Booth Boulevard and South Birdneck Road intersection, which have athletic fields and passive open space on their properties. A public bikeway/trail also travels along the

Onshore Export Cable Route Corridor on Oceana Boulevard (COP, Section 4.4.5; Dominion Energy 2023a).

The Proposed Actions beneficial impacts on demographics, employment, and economics depend on what proportion of workers, materials, vessels, equipment, and services can be locally sourced. In a study conducted by BW Research Partnership on behalf of E2, a national, nonpartisan group of advocates for policies that benefit both the economy and environment, every $1.00 spent building an offshore wind farm is estimated to generate $1.73 for Virginia's economy (E2 2018).

Dominion Energy's economic impact study estimates that the Proposed Action, through $8 billion of direct investment from Dominion Energy and up to a $40 million contribution from the State of Virginia for site improvement and readiness at the PMT, would support about 900 direct, indirect, and induced Virginia jobs[2] annually (about 60 percent in Hampton Roads), from 2020 through the end of 2026. Beginning in 2027, once construction is completed, it is estimated that O&M of the PMT facility would support 200 direct FTE jobs and 910 indirect and induced jobs annually in Hampton Roads over the 33-year operational life for the Proposed Action (COP, Figure 4.4-4, Table 4.4-7, Appendix EE-1, and Section 3.6; Dominion Energy 2023a).

The Proposed Action would generate employment during construction and installation, O&M, and decommissioning of the Project. The Proposed Action would support a range of positions for professionals such as engineers, environmental scientists, and financial analysts; administrative personnel; trade workers such as electricians, technicians, steel workers, welders, and ship workers; and other construction jobs during construction and installation. O&M would create jobs for maintenance crews, substation and turbine technicians, and other support roles. The decommissioning phase would also generate professional and trade jobs and support roles. Therefore, all phases of the Proposed Action would lead increases in local employment and economic activity.

Assuming that market conditions would be similar to those of the Massachusetts Vineyard Wind Project, job compensation (including benefits) is estimated to average between $88,000 and $96,000 for the construction phase, with occupations including engineers, construction managers, trade workers, and construction technicians. O&M occupations would consist of turbine technicians, plant managers, water transportation workers, and engineers, with average annual compensation of approximately $99,000 (BOEM 2021). A study from the New York Workforce Development Institute provided salary estimates for jobs in the wind energy industry that concur with the Vineyard Wind Project's projections. The expected salary range for trade workers and technicians ranges from $43,000 to $96,000, $65,000 to $73,000 for ships' crew and officers, and $64,000 to $150,000 for managers and engineers (Gould and Cresswell 2017).

Hiring local workers would stimulate economic activity through increased demand on housing, food, transportation, entertainment, and other goods and services. A large number of seasonal housing units are available in the vicinity of the Project. During the summer, competition for temporary accommodations may arise, leading to higher rents. However, this effect would be temporary during the active construction period and could be reduced if construction is scheduled outside the busy summer season. Permanent workers are expected to reside locally; there is adequate housing supply to accommodate the increase in the local workforce (COP, Section 4.4.1.2; Dominion Energy 2023a).Tax revenues for state and local governments would increase as a result of the proposed Project. Equipment, fuel, and some construction materials would likely be purchased from local or regional vendors. These purchases would result in short-term impacts on local businesses by generating additional revenues and contributing to the tax base.

[2] Direct employment refers to jobs created by the direct hiring of workers. Indirect employment refers to jobs created through increased demand for materials, equipment, and services. Induced employment refers to jobs created at businesses where offshore wind industry workers would spend their incomes.

Dominion Energy's economic impact study estimated total state and local taxes generated would be $41.7 million during construction and $10.6 million annually during operations (COP, Section 4.4.1.2; Dominion Energy 2023a). Once the proposed Project is operational, property taxes would be assessed on the value of the Dominion Wind facilities. The increased tax base during operations would be a long-term, beneficial impact on local governments in the Project area.

Additionally, Dominion Energy has stated that in September 2021, it signed a Memorandum of Understanding (MOU) with the North America's Building Trades Unions and its state affiliate to identify opportunities to use union labor. Since the Project would require skilled and qualified workers in Hampton Roads, the MOU also includes commitments to using local workers; the hiring, apprenticeship, and training of veterans; and using workers from historically economically disadvantaged communities. These commitments were included in the MOU because Dominion Energy is working to satisfy the provisions of the Virginia Clean Economy Act, which calls for the priority hiring of veterans, local workers, and individuals from economically disadvantaged communities. To meet these requirements, Dominion Energy has met with hundreds of businesses, chambers of commerce, minority serving institutions, workers, educational institutions and students. In addition, the company has hosted and will continue to host local events and open houses specific to potential business suppliers and workers to learn about working in the offshore wind industry. Through these efforts, Dominion Energy is in the process of establishing a Project Labor Agreement with North America's Building Trades Union in collaboration with DEME and Siemens Gamesa Renewable Energy. Dominion Energy does not currently have any Community Workforce Agreements in place (Dominion Energy 2023b).

The reasonably foreseeable environmental trends and impacts of the Proposed Action in addition to ongoing activities, future non-offshore wind activities, and future offshore wind activities are described by IPF below.

Energy generation and security: The Proposed Action would produce up to 3,000 MW of electricity, or 7.5 percent of the estimated 40,201 MW of reasonably foreseeable offshore wind generation potential for the East Coast (Appendix E, Table E-2) (Appendix F, Table F2-1); 5,496 MW of this capacity is estimated to occur in the Virginia and North Carolina offshore areas (Appendix F, Table F2-1). Offshore wind energy projects could produce energy at long-term fixed costs, which could provide stability against fossil fuel price volatility, once built. Therefore, the Proposed Action would provide long-term beneficial contributions to energy security and resilience through a stable supply of energy. Impacts related to energy generation and security would have long-term, regional, and minor beneficial impacts on demographics, employment, and economics.

Light: Both onshore and offshore structures emit light that could be visible from some beaches, coastlines, and elevated inland areas, depending on vegetation, topography, weather, and atmospheric conditions. Dominion Energy is committed to using ADLS to automatically turn the aviation obstruction lights on and off in response to the presence of aircraft in proximity to the wind farm. Such a system may reduce the amount of time that the lights are on, thereby potentially minimizing the visibility of the WTGs from shore and related effects on the local economy. Impacts related to structure lighting would have localized, long-term, and negligible impacts on demographics, employment, and economics.

Lighting from vessels would occur during nighttime Project construction or maintenance or during transit to/from the ports. This lighting would be visible from coastal businesses, but is not anticipated to discourage tourist-related activities and would not affect other businesses; therefore, the impact of vessel lighting would be short term and negligible.

Between 2025 and 2028, there may be three offshore wind projects in the Virginia and North Carolina lease areas, including as many as two projects under construction concurrently from 2025 through 2030 (CVOW-C and the Kitty Hawk Offshore Wind Projects) (Appendix F, Table F2-1; Dominion Energy

2023a). WTG lighting in future offshore wind activities would be visible from the same locations as the Proposed Action in addition to Virginia coastal locations.

New cable emplacement and maintenance: The Proposed Action cable emplacement would generate vessel anchoring and dredging at the worksite, requiring recreational vessels to avoid and navigate around the worksites and resulting in short-term disturbance to species important to recreation and tourism, with potential adverse effects on employment and income. Construction vessel trips would average 46 trips per day through the duration of construction activities (2023–2027). Daily estimated vessel trips would be dependent on the construction period and activity but are anticipated to range from a minimum of 3 trips per day to a maximum of 95 trips per day. Operation and maintenance activities are anticipated to consist of 26 annual round tips to port for service operation vessels and each crew transfer vessel (COP, Section 3.4.1.5 and Section 3.5.1; Dominion Energy 2023a).

The approximate 6,036.6 acres (2,443.7 hectares) of seafloor disturbance (COP, Section 3.4.1.4, Table 3.4-4; Dominion Energy 2023a) could hinder commercial trawlers/dredgers, potentially reducing income and increasing costs for affected businesses over the long term. Cable installation would have localized, short-term, minor impacts on demographics, employment, and economics, while maintenance of new cables and other existing submarine cables would have intermittent, long-term, negligible impacts under the Proposed Action.

Noise: Vessel noise traffic would indirectly affect commercial fishing businesses and recreational businesses due to impacts on species important to commercial/for-hire fishing, recreational fishing, and marine sightseeing activities (COP, Section 4.4.11.2; Dominion Energy 2023a). Noise from O&M activities would have localized, intermittent, long-term, negligible impacts on demographics, employment, and economics. Vessel noise could affect marine species relied upon by commercial fishing businesses, marine recreational businesses, recreational boaters, and marine sightseeing activities. The number of vessels in the Offshore Project area is expected to temporarily increase during construction of the Project. Project-related vessels would use existing transit lanes and fairways, as required, while in transit (COP, Section 4.4.6.3; Dominion Energy 2023a). Noise from vessels would have short-term, intermittent, negligible impacts on demographics, employment, and economics.

The estimated 202 foundations (WTGs and substations) related to the Proposed Action would generate noise from pile driving, one of the most impactful noises on marine species, especially if multiple project construction activities occur in spatial and temporal proximity to the proposed Project (COP, Section 4.1.5.3, Dominion Energy 2023a). These disturbances would be temporary and localized and would extend only a short distance beyond the work area. Pile driving and associated noise would have localized, short-term, and minor impacts on demographics, employment, and economics. Infrequent trenching, cable-laying activities, and construction activities of onshore components would emit noise. This noise could temporarily disrupt commercial fishing, marine recreational businesses, and onshore recreational businesses and residences. Noise from trenching and trenchless technology would affect marine life populations, which would, in turn, affect commercial and recreational fishing businesses. Cable laying and trenching would have localized, intermittent, short-term, and negligible impacts on demographics, employment, and economics.

The Proposed Action is anticipated to overlap in time with construction of the Kitty Hawk Offshore Wind North Project (Appendix F, Table F2-1). While operational activity would overlap, indirect noise impacts during operations would be far less than during construction.

Port utilization: The Proposed Action would support port investment and employment and would also support jobs and businesses in supporting industries and commerce in the geographic analysis area. The Proposed Action would use facilities at the PMT as a construction management, O&M, and cable-staging base (COP, Sections 3.2 and 3.5; Dominion Energy 2023a). The port would require a trained workforce

for the offshore wind industry including additional shore-based and marine workers that would contribute to local and regional economic activity.

The economic benefits would be greatest during construction when the most jobs and most economic activity at ports supporting the Proposed Action would occur. During operations, activities would be concentrated in the Hampton Roads, Virginia Region where the proposed Project's onshore O&M facility would be located; Dominion Energy's selected lease location for the O&M facility is Lambert's Point, now named Fairwinds Landing, in Norfolk, Virginia (COP, Section 3.5; Dominion Energy 2023a). Dominion Energy estimated that 200 permanent jobs would support operations in Virginia (COP, Section 4.4.1.2; Dominion Energy). The O&M facility would help diversify the local economy by providing a source of skilled, year-round jobs. Overall, operation of the Proposed Action would generate 3,756 job-years of skilled permanent labor (direct job-years) and 6,360 total job-years created (direct job-years plus indirect and induced job creation) (COP, Section 4.4.1.2; Dominion Energy 2023a). The Proposed Action would have a minor beneficial impact on demographics, employment, and economics due to greater economic activity and increased employment at ports used by the proposed Project.

Other offshore wind energy activities would provide business activities at the same ports as the proposed Project, as well as other ports in the geographic analysis area. Port investments are ongoing and planned in response to offshore wind activity. Maintenance and dredging of shipping channels are expected to increase, which would benefit other port users.

Presence of structures: The Proposed Action would add up to 202 offshore wind structures that could affect marine-based businesses (i.e., commercial and for-hire recreational fishing businesses, offshore recreational businesses, and related businesses) through impacts such as entanglement and gear loss/damage, navigational hazard and risk of allisions, fish aggregation, habitat alteration, and conflicting use of space. These structures may cause vessel operators to reroute, which would affect fuel costs, operating time, and revenue. Due to the risk of gear entanglement, fisheries using bottom gear may be permanently disrupted, which would increase economic impacts on the commercial and for-hire recreational fishing industries. This would have continuous, long-term, and minor impacts on demographics, employment, and economics.

Offshore wind structures could encourage fish aggregation and generate reef effects that attract recreational fishing vessels capable of reaching the offshore wind energy facilities. This would have long-term, negligible benefits on demographics, employment, and economics. The proposed Project structures could increase economic activity associated with offshore sightseeing because these structures create foraging opportunities for harbor and gray seals, sea turtles, bats, northern gannets, loons, and peregrine falcons. These forms of marine life could attract private or commercial recreational sightseeing vessels (COP, Section 4.4.2.2; Dominion Energy 2023a). This would have long-term, negligible beneficial impacts on demographics, employment, and economics.

Views of WTGs could have impacts on businesses serving the recreation and tourism industry. It is expected that the presence of WTGs in the Offshore Project area may change marine recreational usage; however, some of these impacts may be beneficial because WTGs have served as tourism and recreational fishing destinations in other regions, which can lead to opportunities for tours and chartered trips (COP, Section 4.4.5.2; Dominion Energy 2023a). Portions of the WTGs and substations are expected to have limited visibility from onshore viewpoints based on location of WTGs, curvature of the earth, topography, wave height, and atmospheric conditions (COP, Section 4.3.4.2 and 4.3.4.3; Dominion Energy 2023a). These structures would be visible to recreational boaters who could avoid waters where structures are visible. This would have continuous, long-term, negligible impacts on demographics, employment, and economics.

Across the Virginia and North Carolina lease areas, up to 403 offshore structures, including those of the Proposed Action, would affect employment and economics by affecting marine-based businesses (Appendix F, Table F2-2). The presence of these structures would have both beneficial impacts, such as providing sightseeing opportunities and fish aggregation that benefit recreational businesses, and adverse effects, such as causing fishing gear loss, navigational hazards, and viewshed impacts that could affect business operations and income.

Traffic: The Proposed Action would generate vessel traffic in the Project area and to and from the ports supporting Project construction, O&M, and decommissioning. Dominion Energy estimates that construction activity would generate 46 daily vessel trips during the entire construction period and a maximum of 95 daily vessel trips during peak construction periods. During operations, the Proposed Action would generate approximately 52 annual round trip vessel trips to port (refer to Section 3.16, *Navigation and Vessel Traffic*, for additional information regarding anticipated vessel traffic). Increased vessel traffic would increase the use of port and marine businesses, including tug services, dockage, fueling, inspection/repairs, and provisioning. Vessel traffic generated by the Proposed Action alone would result in increased business for marine transportation and supporting services in the geographic analysis area with continuous, short-term, and minor beneficial impacts during construction and decommissioning, and negligible beneficial impacts during operations. Vessel traffic associated with the Proposed Action could also result in temporary, periodic congestion within and near ports, leading to potential delays and an increased risk for collisions between vessels, which would result in economic costs for vessel owners. There may also be roadway traffic impacts such as lane closures, shifted traffic patterns, or closed roadways with temporary detours. Traffic impacts would be limited to the immediate construction vicinity. After construction, roadways would be returned to pre-construction conditions. Dominion would also implement a Traffic Management Plan to offset any traffic-related impacts (COP, Section 4.4.4.2; Dominion Energy 2023a). As a result of potential delays from increased congestion and increased risk of damage from collisions, and the impacts from vehicle related traffic, the Proposed Action or would have continuous, short-term, and minor impacts during construction and negligible impacts during operations.

Land disturbance: Construction of the Proposed Action would require onshore cable installation and substation construction. The employment and economic impact of the Proposed Action caused by disturbance of businesses near the onshore cable route and substation construction site would result in localized, short-term, minor impacts. The extent of land disturbance associated with other projects would depend on the locations of landfall, onshore transmission cable routes, and onshore substations for future offshore wind energy projects.

Climate change: Climate models predict climate change if current trends continue. Climate change has adverse implications for demographics and economic health of coastal communities due, in part, to the costs of resultant damage to property and infrastructure, fisheries, and other natural resources, among other factors. It is anticipated that there would be a net reduction in GHG emissions, which contribute to climate change, and no collective adverse impact on climate change as a result of offshore wind projects. To the degree that offshore wind facilities contribute to the overall effort to limit climate change, these projects would reduce the socioeconomic impacts associated with the effects of climate change. The Proposed Action would have long-term, negligible beneficial impacts on demographics, employment, and economics from this IPF due to the anticipated carbon dioxide reductions resulting from the displacement of electricity generated from fossil fuel-powered plants. Future offshore wind activities would have similar contributions as the Proposed Action but at a larger scale.

3.11.5.1 Cumulative Impacts of the Proposed Action

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

In context of reasonably foreseeable environmental trends, the Proposed Action would contribute to lighting impacts from ongoing and planned activities, but the impacts on demographics, employment, and economics are anticipated to be negligible.

In context of reasonably foreseeable trends, the new cable emplacement and cable maintenance when combined with ongoing and planned activities would have localized, short-term, minor impacts on demographics, employment, and economics, while maintenance of new cables and other existing submarine cables would have intermittent, long-term, negligible impacts.

In context of reasonably foreseeable environmental trends, the contribution of the Proposed Action would contribute a noticeable increment to the combined noise impacts on demographics, employment, and economics from ongoing and planned activities including offshore wind, which would be short term and negligible.

In context of reasonably foreseeable environmental trends, the Proposed Action and other ongoing and planned activities would have combined long-term, minor beneficial impacts on demographics, employment, and economics resulting from port utilization and the associated trained and skilled offshore wind workforce that would contribute to localized increases in economic activity and the region as a whole.

In context of reasonably foreseeable environmental trends, the Proposed Action and other ongoing and planned activities would have a long-term, minor impact on demographics, employment, and economics, due to impacts on commercial and for-hire recreational fishing, for-hire recreational boating, and associated businesses.

In context of reasonably foreseeable environmental trends, increased vessel traffic from the Proposed Action and other ongoing and planned activities would produce demand for supporting marine services, with beneficial impacts on employment and economics during all Project phases, including minor beneficial impacts during construction and decommissioning and negligible beneficial impacts during operations. In context of reasonably foreseeable environmental trends, increased vessel traffic congestion and collision risk from the Proposed Action and other ongoing and planned activities would have long-term, continuous impacts on marine businesses during all Project phases, with minor impacts during construction and decommissioning and negligible impacts during operations.

In context of reasonably foreseeable environmental trends, the contribution of the Proposed Action to the combined land disturbance impacts on demographics, employment, and economics from ongoing and planned activities would be short term and minor due to the short-term and localized disruption of onshore businesses.

In context of reasonably foreseeable environmental trends, the contribution of the Proposed Action to the combined impacts from ongoing and planned activities would have a long-term, minor benefit.

3.11.5.2 Conclusions

Impacts of the Proposed Action. BOEM anticipates that the Proposed Action would have **negligible** impacts on demographics in the geographic analysis area. While it is likely that some workers would relocate to the area due to the proposed Project, this volume of workers would not be substantial compared to the current population and housing supply.

The Proposed Action would affect employment and economics through job creation, expenditures on local businesses, tax revenues, grant funds, and support for additional regional offshore wind development, which would have **minor beneficial** impacts. Construction would have a **minor beneficial** impact on employment and economics due to jobs and revenue creation during the construction period.

The beneficial impact of employment and expenditures during O&M would have a modest magnitude over the 37-year duration of the proposed Project (4 years of construction and commissioning, and a 33-year Project lifespan). Although tax revenues and grant funds would be modest in magnitude, they also would provide a beneficial impact on public expenditures and local workforce and supply chain development for offshore wind. The impacts on demographics, employment, and economics from decommissioning would be short term, **minor,** and **beneficial** due to the construction activity necessary to remove wind facility structures and equipment. After decommissioning, the Proposed Action would no longer affect employment or produce other offshore wind-related revenues.

While the proposed Project investments in wind energy would largely benefit the local and regional economies through job creation, workforce development, and income and tax revenue, adverse impacts on individual businesses and communities would also occur. Short-term increases in noise during construction, cable emplacement, land disturbance, and the long-term presence of offshore lighting and structures would have **negligible** to **minor** adverse impacts on demographics, employment, and economics. The commercial fishing industry and other businesses that depend on local seafood production would experience impacts during construction. Overall, the impacts on commercial fishing and onshore seafood businesses would have **minor** impacts on demographics, employment, and economics for this component of the geographic analysis area's economy. Although commercial fishing is a small component of the regional economy, it is important to the identity of local communities in the region. The IPFs associated with the Proposed Action alone would also result in impacts on certain recreation and tourism businesses that range from **negligible** to **minor**, with an overall **minor** impact on employment and economic activity for this component of the geographic analysis area's economy.

Cumulative impacts of the Proposed Action. In context of other reasonably foreseeable environmental trends, the contribution of the Proposed Action to the impacts of individual IPFs resulting from ongoing and planned activities would range from **negligible** to **minor** adverse impacts and **negligible** to **moderate beneficial** impacts. Overall, BOEM anticipates that the Proposed Action and ongoing and planned activities would result in **minor** adverse impacts and **moderate beneficial** impacts on demographics, employment, and economics in the geographic analysis area. The **moderate beneficial** impacts primarily would be associated with the investment in offshore wind, job creation and workforce development, income and tax revenue, and infrastructure improvements, while the **minor** adverse effects would result from aviation hazard lighting on WTGs, new cable emplacement and maintenance, the presence of structures, vessel traffic and collisions during construction, and land disturbance. Impacts on commercial and for-hire recreational fishing are anticipated to be **minor**. Because they are not expected to disrupt normal demographic, employment, and economic trends, overall impacts in the geographic analysis area likely would be **minor**. In addition, in context of reasonably foreseeable environmental trends, the Proposed Action and ongoing and planned activities would have a notable and measurable benefit from construction and operations employment and would have **minor beneficial** impacts on demographics, employment, and economics.

3.11.6 Impacts of Alternative B on Demographics, Employment, and Economics

BOEM identified a combination of Alternative B (Revised Layout to Accommodate the Fish Haven Area and Navigation) and Alternative D-1 (Interconnection Cable Route Option 1) as the Preferred Alternative. The analysis of the impacts of the Preferred Alternative would be the same as that for Alternative B, which is described in this section.

Impacts of Alternative B. Alternative B would result in a slight reduction in both adverse and beneficial impacts on demographics, employment, and economics compared to the Proposed Action, but the overall impact magnitudes would be the same. Alternative B would construct 29 fewer WTGs and fewer associated inter-array cables than the Proposed Action. Alternative B would also use only 14 MW turbines (up to 14.7 MW each using power boost capability), resulting in a total Project capacity of

approximately 2,587 MW; a reduction of 413 MW in total power-generating output compared to the Proposed Action. As a result, Alternative B would slightly reduce the offshore construction impact footprint and installation period. Construction of fewer WTGs would result in a shorter duration of noise impacts and less vessel traffic, which would reduce impacts on commercial and for-hire recreational fishing. Because Alternative B would produce less energy, it would also offset fewer GHG emissions from fossil-fueled power generation compared to the Proposed Action, further reducing beneficial impacts. A reduced number of WTGs would slightly reduce port utilization and reduce expenditures, generating less economic activity at ports in general. However, the change in these impacts would not alter the overall impact rating compared to the Proposed Action.

This reduction in number and size of WTGs would also slightly reduce visual and light impacts from shore when compared to the Proposed Action, thereby reducing potential impacts on the tourism, recreation, and real estate businesses that are sensitive to viewshed impacts from WTGs. However, because most of the WTGs would still be visible, localized, long-term, minor impacts are still anticipated. Fewer WTGs and the avoidance of the Fish Haven area in the northern portion of the lease area could reduce reef effects and fish aggregation compared to the Proposed Action but are anticipated to reduce potential displacement of mobile target species from construction noise and the presence of structures. The reduction in WTGs would also reduce the impact of new cable emplacement and maintenance by requiring fewer worksites, slightly reducing the short-term disturbance to species important to recreation and tourism. However, because most of the WTGs would still be built, intermittent, long-term, negligible impacts are still anticipated. Fewer WTGs would reduce the risk of allisions and the need for vessels to reroute, which would reduce travel time, fuel costs, and other associated costs.

Cumulative impacts of Alternative B. In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative B to the impacts from ongoing and planned activities including offshore wind would be similar to those described under the Proposed Action.

3.11.6.1 Conclusions

Impacts of Alternative B. Alternative B would reduce the overall offshore footprint of the Project. The impacts resulting from individual IPFs associated with Alternative B would result in slightly lower adverse impacts and slightly lower beneficial impacts compared to the Proposed Action, but would not change the overall impact magnitudes, which are anticipated to range from **negligible** to **minor** adverse impacts and **minor beneficial** impacts on demographics, employment, and economics.

Cumulative impacts of Alternative B. In context of reasonably foreseeable environmental trends, the contribution of Alternative B to the impacts from ongoing and planned activities would be the same as under the Proposed Action: **negligible** to **minor** adverse impacts and **negligible** to **moderate beneficial** impacts.

3.11.7 Impacts of Alternative C on Demographics, Employment, and Economics

Impacts of Alternative C. Alternative C would install 33 fewer WTGs and associated inter-array cables, which would slightly reduce the construction impact footprint and installation period. Alternative C could potentially reduce localized impacts on marine species that local commercial/for-hire and recreational fishing use for seafood production compared to the Proposed Action, but the overall impact magnitudes would not change. Alternative C would reduce impacts in priority sand ridge habitats, resulting in fewer impacts on species dependent on those habitat types while also reducing the potential for commercial fishing and recreational vessel allisions in the southern portion of the lease area. In addition, reduced underwater noise from pile driving and vessels during construction activities, and reduced habitat alteration, vessel strikes, artificial lighting, and decommissioning activities, would lessen the potential for displacement of marine species and associated impacts on commercial and recreational vessels.

Construction of fewer WTGs would result in a shorter duration of noise impacts and less vessel traffic, which could reduce impacts on commercial and for-hire recreational fishing. The reduced number of WTGs would also mean that the Project would generate less energy—with the removal of 33 WTGs, Alternative C would result in an expected total power output of 2,528 MW compared to 3,000 MW under the Proposed Action—and would therefore result in slightly lower beneficial impacts associated with delivering a reliable supply of energy and reduced GHG emissions from offsetting fossil-fueled power generation. A reduced number of WTGs would also generate less economic activity, which would reduce port utilization and result in lower expenditures in general. However, the change in these impacts would all be slight and would not alter the overall impact rating compared to the Proposed Action.

Cumulative impacts of Alternative C. In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative C to the impacts from ongoing and planned activities including offshore wind would be similar to those described under the Proposed Action.

3.11.7.1 Conclusions

Impacts of Alternative C. Alternative C would result in slightly reduced impacts on demographics, employment, and economics compared to the Proposed Action, but the overall impact magnitude would not change. The removal of 33 WTGs under Alternative C would result in fewer impacts on marine species and, by extension, fewer impacts on commercial and for-hire recreational fisheries. Energy generation and associated beneficial impacts would be reduced under Alternative C because there would be fewer WTGs. Impacts under Alternative C are anticipated to be short term and range from **negligible** to **minor** adverse impacts and **minor beneficial** on demographics, employment, and economics.

Cumulative impacts of Alternative C. In context of reasonably foreseeable environmental trends, the impacts resulting from individual IPFs would be the same as those of the Proposed Action: **minor** adverse impacts and **moderate beneficial** impacts. Considering all the IPFs together, BOEM anticipates that the overall impacts on demographics, employment, and economics associated with Alternative C when combined with the impacts from ongoing and planned activities including offshore wind would be **negligible** to **minor** adverse and **negligible** to **moderate beneficial**.

3.11.8 Impacts of Alternative D on Demographics, Employment, and Economics

Impacts of Alternative D. The impacts of Alternative D on demographics, employment, and economics would be similar to those of the Proposed Action. Alternative D would have the same offshore layout of Project components and number of WTGs; however, Alternative D would consider two onshore interconnection cable route options. Under Alternative D, BOEM would approve only Interconnection Cable Route Option 1 (Alternative D-1) or Hybrid Interconnection Cable Route Option 6 (Alternative D-2). The overall length of Alternative D-1 or Alternative D-2 would be the same (14.3 miles [23.0 kilometers]). However, portions of Alternative D-2 would be installed via underground methods, while portions of Alternative D-1 would be installed entirely overhead. Overall, BOEM anticipates land disturbance and visual impacts on onshore businesses and residents from interconnection cable construction and operation under Alternative D to be the same as the Proposed Action.

The impacts on demographics, employment, and employment of Alternative D and the Proposed Action would be substantively the same, and the overall impact magnitude would not change. In context of reasonably foreseeable environmental trends, the contribution of Alternative D to the impacts of ongoing and planned activities would not be materially different from those described under the Proposed Action.

Cumulative impacts of Alternative D. In context of reasonably foreseeable environmental trends, the incremental impacts contributed by Alternative D to the impacts from ongoing and planned activities including offshore wind would be the same as those described under the Proposed Action.

3.11.8.1 Conclusions

Impacts of Alternative D. Alternative D would result in the same impacts on demographics, employment, and economics as the Proposed Action. All offshore components under Alternative D and the associated beneficial impacts from energy generation would be the same as described for the Proposed Action. While Alternative D could reduce impacts on sensitive onshore habitats, including wetlands, when compared to the Proposed Action, the impacts resulting from individual IPFs associated with Alternative D are anticipated to be similar because the same interconnection cable route option could be selected under the Proposed Action. Impacts on demographics, employment, and economics under Alternative D are anticipated to be **negligible** to **minor** adverse and **negligible** to **moderate beneficial**.

Cumulative impacts of Alternative D. In context of reasonably foreseeable environmental trends, the contribution of Alternative D to the impacts resulting from individual IPFs associated with ongoing and planned activities would be the same as the Proposed Action: short term and ranging from **negligible** to **minor** adverse impacts and **negligible** to **moderate beneficial** impacts. The overall impacts of Alternative D combined with ongoing and planned activities on demographics, employment, and economics would be the same as the Proposed Action: **negligible** to **minor** adverse impacts and **negligible** to **moderate beneficial** impacts.

3.11.9 Agency-Required Mitigation Measures

No additional measures to mitigate impacts on demographics, employment, and economics have been proposed for analysis.

3.14. Land Use and Coastal Infrastructure

This section discusses potential impacts on land use and coastal infrastructure from the proposed Project, alternatives, and ongoing and planned activities in the geographic analysis area. The geographic analysis area, as described in Appendix F, *Planned Activities Scenario*, Table F-1, and shown on Figure 3.14-1, includes the City of Chesapeake; City of Hampton; City of Newport News; City of Norfolk; City of Portsmouth; and City of Virginia Beach, and municipal boundaries surrounding the ports that may be used for the Project.

3.14.1 Description of the Affected Environment for Land Use and Coastal Infrastructure

Within the Project area (subset of City of Virginia Beach and Chesapeake City), land use is diverse, including open water, wetlands, shrub/scrub, forest, and developed and undeveloped land uses.

The proposed cable landing location would be on a proposed[1] surface parking lot that is designated as commercial land use and adjacent to an SMR, which is owned by the Commonwealth of Virginia and primarily used for on-site training for the Virginia National Guard.

The onshore export cable route corridor would be installed underground from the cable landing location to a common location north of Harpers Road, Virginia Beach. The dominant land uses along the onshore export cable route corridor include low-, medium-, and high-intensity developed lands and open space. In addition, the route follows a relatively limited passage through cultivated cropland, deciduous forestland, emergent herbaceous wetlands, evergreen forestland, pastureland, open water, and herbaceous and woody wetlands. The route corridor crosses Lake Christine, General Booth Boulevard, and a tidal tributary area west of General Booth Boulevard (COP, Section 4.4.3.1; Dominion Energy 2023).

The switching station would be located at either a location north of Harpers Road (City of Virginia Beach) (Harpers Road switching station) or a location north of Princess Anne Road (City of Virginia Beach) (Chicory Switching Station) (COP, Section 2.1.2.3; Dominion Energy 2023). Only one switching station will be constructed. The switching station potentially located north of Harpers Road would be located on a mix of forestland, developed open space, and low- and medium-intensity development. The area surrounding the Harpers Switching Station parcel is also made up of the same land classifications, with cultivated crop land to the north, east, and west, and woody wetlands to the south. The switching station potentially located north of Princess Anne Road would be located on a parcel classified as woody wetlands and mixed forest surrounded by woody wetlands, mixed forest, and evergreen forest with low-intensity development to the north and existing roadway to the southwest (COP, Section 4.4.3.1; Dominion Energy 2023). The Harpers Switching Station would require approximately 5.52 acres (2.2 hectares) for stormwater management facilities, approximately 6.1 acres (2.5 hectares) for relocation of fairways and a maintenance building associated with the adjacent golf course, and 0.93 acre (0.4 hectare) for relocation of Dewey Drive. These acreages are included in the overall acreage of 46.5 acres (18.8 hectares) for the Harpers Switching Station. The operational footprint of the Chicory Switching Station would be approximately 35.5 acres (14.4 hectares) (COP, Section 3.3.2.3; Dominion Energy 2023).

[1] The SMR plans to independently build the parking lot. The parking lot is not expected to be developed as part of the proposed Project. The operational footprint for the cable landing location is anticipated to be approximately 2.27 acres (0.92 hectare).

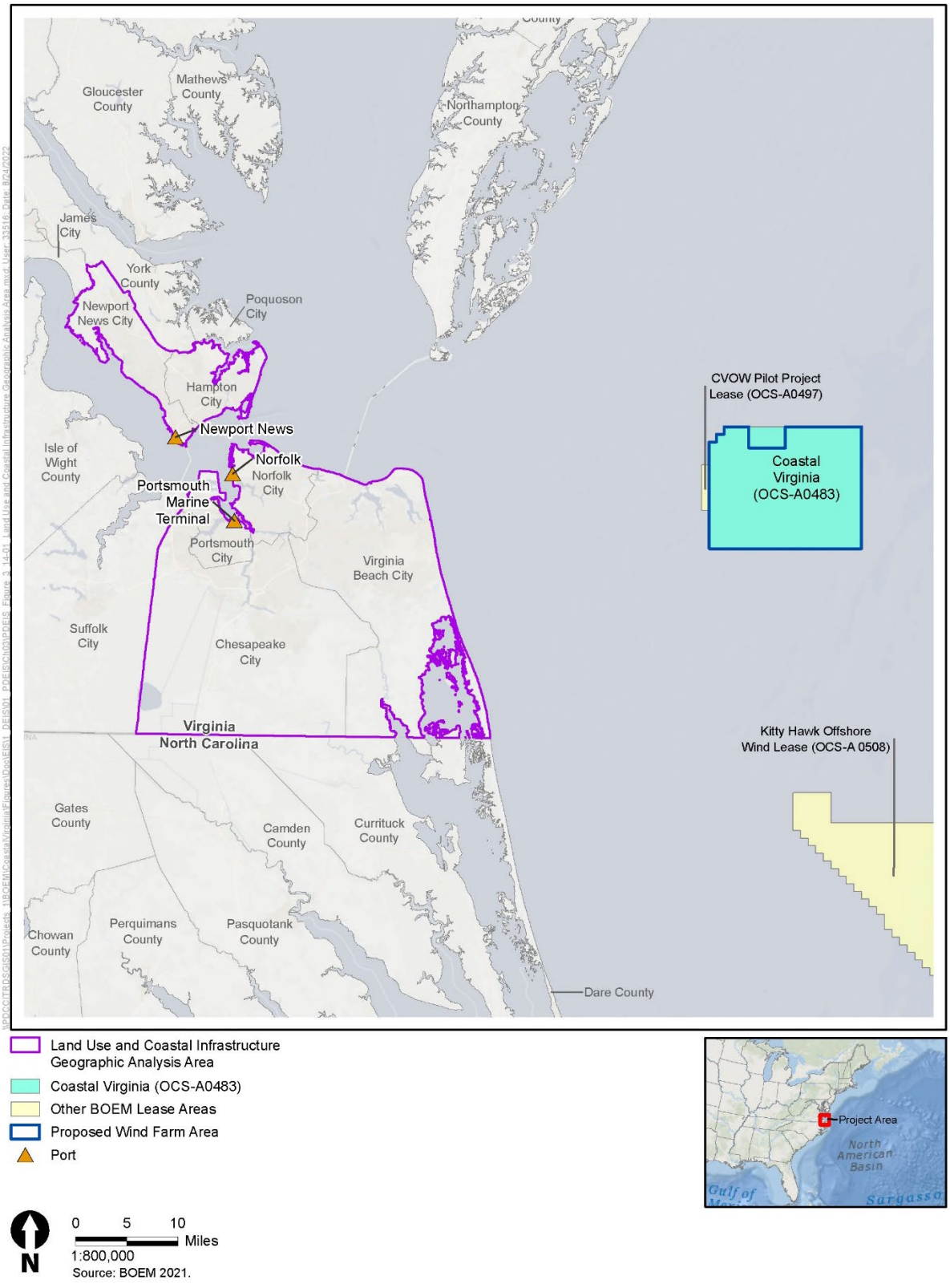

Figure 3.14-1 Land Use and Coastal Infrastructure Geographic Analysis Area

The onshore substation would be located off of Fentress Loop on a site that is currently designated as low density residential. As this site already has an existing substation, the upgrades/expansion to the onshore substation would be consistent with the existing site uses. The parcel is partially developed but surrounded by wooded and wetland areas to the north, east, south, and west. Forested wetlands are present in the west and north. Existing residential neighborhoods with large, single-family homes have been sited to the north, south, and west, with agricultural land to the east. There are also existing overhead transmission lines to the north and northeast of the onshore substation site (COP, Section 4.4.3.1; Dominion Energy 2023).

The interconnection cable routes lie within portions of the heavily developed cities of Virginia Beach and Chesapeake and include portions of the Gum Swamp, associated with the North Landing River wetlands complex, and more rural areas in the south. The two interconnection cable route options are located within areas containing very dense residential and commercial developments, large and numerous publicly owned lands, forested wetlands, major watercourses and associated floodplains, the Intracoastal Waterway, agricultural fields, military airport facilities, sports complexes, and golf courses (COP, Section 4.4.3.1; Dominion Energy 2023).

Important landscape features in the Project area include a combination of natural views such as beaches, shorelines, and scenic vistas, and human-made views such as unique buildings, landscaping, parks, and other cultural features.

3.14.2 Environmental Consequences

3.14.2.1. Impact Level Definitions for Land Use and Coastal Infrastructure

Definitions of potential impact levels are provided in Table 3.14-1.

Table 3.14-1 Impact Level Definitions for Land Use and Coastal Infrastructure

Impact Level	Impact Type	Definition
Negligible	Adverse	Adverse impacts on area land use would not be detectable.
	Beneficial	Beneficial impacts on area land use would not be detectable.
Minor	Adverse	Adverse impacts would be detectable but would be short term and localized.
	Beneficial	Beneficial impacts would be detectable but would be short term and localized.
Moderate	Adverse	Adverse impacts would be detectable and broad based, affecting a variety of land uses, but would be short term and would not result in long-term change.
	Beneficial	Beneficial impacts would be detectable and broad based, affecting a variety of land uses, but would be short term and would not result in long-term change.
Major	Adverse	Adverse impacts would be detectable, long term, and extensive, and result in permanent land use change.
	Beneficial	Beneficial impacts would be detectable, long term, and extensive, and result in permanent land use change.

3.14.3 Impacts of the No Action Alternative on Land Use and Coastal Infrastructure

When analyzing the impacts of the No Action Alternative on land use and coastal infrastructure, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind and ongoing offshore wind activities, on the baseline conditions for land use. The cumulative impacts of the No Action

Alternative considered the impacts of the No Action Alternative in combination with other planned non-offshore wind and offshore wind activities, as described in Appendix F.

3.14.3.1. Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for land use and coastal infrastructure described in Section 3.14.1, *Description of the Affected Environment for Land Use and Coastal Infrastructure*, would continue to follow current regional trends and respond to IPFs introduced by other ongoing and non-offshore wind and offshore wind activities. Ongoing non-offshore wind activities within the geographic analysis area that contribute to impacts on land use and coastal infrastructure are generally associated with onshore construction. Onshore construction activities and associated impacts are expected to continue at current trends and have the potential to affect land use and coastal infrastructure through temporary and permanent land use change, development projects, and port expansion.

The geographic analysis area lies within developed communities that would experience continued commerce and development activity in accordance with established land use patterns and regulations. Most construction projects in the geographic analysis area would likely affect land that has already been disturbed from past development, although some development on undeveloped land may also occur. Ports in the geographic analysis area would continue to serve marine traffic and industries and experience periodic dredging and improvement projects to meet ongoing needs. A channel-deepening project at the Port of Virginia is currently underway and is anticipated to be completed in 2024 (Virginia Port Authority 2019). Dredging and port improvements would allow larger vessels to use the port and may result in increased port use and conversion of surrounding land use if the ports are expanded. See Appendix F, Table F1-12 for a summary of potential impacts associated with ongoing and planned non-offshore wind activities by IPF for land use and coastal infrastructure.

There are no ongoing offshore wind activities within the geographic analysis area that contribute to impacts on land use and coastal infrastructure.

3.14.3.2. Cumulative Impacts of the No Action Alternative

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

BOEM expects future offshore wind development activities to affect land use and coastal infrastructure through the following primary IPFs.

Accidental releases: Accidental releases of fuel/fluids/hazardous materials may increase because of future offshore wind activities. Accidental release risks would be highest during construction, but would still pose a risk during operation and decommissioning of offshore wind facilities. BOEM assumes all projects and activities would comply with laws and regulations to minimize releases. The overall impact of accidental releases on land use and coastal infrastructure is anticipated to be localized and short term and could result in temporary restrictions on use of adjacent properties and coastal infrastructure during the cleanup process. The extent of impacts would depend on the locations of landfall, substations, and cable routes, as well as the ports that support future offshore wind energy projects. The impacts of accidental releases on land use and coastal infrastructure would be localized and short term (except in the case of very large spills that affect a large land or coastal area).

Lighting: As described in Section 3.20, *Scenic and Visual Resources*, aviation hazard lighting on portions of Kitty Hawk Offshore Wind Projects (encompassing 190 WTGs) could be visible from beaches and coastal areas in the geographic analysis area. A University of Delaware study evaluating the impacts of visible offshore WTGs on beach use found that WTGs visible more than 15 miles from the viewer would

have negligible impacts on businesses dependent on recreation and tourism activity (Parsons and Firestone 2018). The majority of the WTG positions associated with other offshore wind activities would be more than 15 miles (24.1 kilometers) from coastal locations with views of the WTGs.

Nighttime lighting from onshore electrical substations could affect the ability to use nearby properties or decisions about where to establish permanent or temporary residences. Nighttime lighting impacts would be localized, constant, and long term. However, it is likely that other offshore wind projects would expand or construct new substations near existing substations, or would construct new substations in areas where land development regulations (i.e., zoning and land use plan designations) allow such uses. For new or expanded substations in business or industrial areas, lighting would have no adverse impacts on land uses. Lighting impacts would depend on the proposed substation locations, but would generally be negligible.

Port utilization: Offshore wind energy projects would make productive use of port facilities for shipping, berthing, and staging throughout construction, operations, and decommissioning. Offshore wind would likely increase port utilization, and ports would experience beneficial impacts, such as greater economic activity and increased employment due to demand for vessel maintenance services and related supplies, vessel berthing, loading and unloading, warehousing and fabrication facilities for offshore wind components, and other business activity related to offshore wind. In particular, the Virginia Port Authority is planning improvements to the PMT to support broadscale offshore wind development (COP, Section 3.3.2.6; Dominion Energy 2023).

There are two additional planned offshore wind projects (Kitty Hawk Offshore Wind Projects) in the geographic analysis area that would overlap with construction of the Proposed Action (Appendix F, Table F2-1). Offshore wind energy projects that are constructed at the same time and rely on the same ports have the potential to stress port resources and could increase the marine and road traffic, noise, and air pollution in the area. Overall, the No Action Alternative would have constant, long-term, beneficial impacts on port utilization due to the productive use of ports designated for offshore wind activity, as well as localized, short-term, adverse impacts in cases where individual ports are stressed due to simultaneous project activity. The Kitty Hawk Offshore Wind Projects would use ports in the Lower Chesapeake Bay area for staging project components and construction vessels (Kitty Hawk Offshore Wind North 2021: Section 3.1.1; Kitty Hawk Offshore Wind South 2022: Section 3.1.1). Improvements may be made to these ports to accommodate offshore wind construction and staging activities; port improvements and the associated permitting activities will support multiple projects up and down the Eastern Seaboard and will be the responsibility of port owners/operators (Kitty Hawk Offshore Wind North 2021: Section 3.1.11; Kitty Hawk Offshore Wind South 2022: Section 3.1.1).

Presence of structures: During operations, the views of offshore wind WTGs from coastal locations on the coastlines of Northampton County and the City of Virginia Beach, Virginia could have effects on land use through impacts on recreation, tourism, and property values, if the views influence visitors in selecting coastal locations to visit or buy. While WTGs could be visible from shoreline areas of the Delmarva Peninsula, Virginia Beach, and the Carova and Corolla Beach areas of North Carolina, visual impacts are expected to range from negligible to moderate (COP, Section 4.3.4.3; Dominion Energy 2023). Visibility would vary with distance from shore, topography, and atmospheric conditions and impacts would generally be localized, constant, and long term.

The presence of onshore infrastructure is anticipated to have minor long-term impacts on land use. BOEM anticipates that new substations for offshore wind projects would be within or near existing substations, or in locations designated for such uses. Transmission cables would most likely be above or below ground and collocated with roads or other utilities. As a result, onshore infrastructure would affect existing and planned land uses for the local area.

Land disturbance: Future offshore wind installation would require installation of onshore transmission cable infrastructure that would require land-disturbing activities and could temporarily affect access to adjacent properties. These impacts would only last through construction and occasionally during maintenance events. The exact extent of impacts would depend on the locations of landfall and onshore transmission cable routes for future offshore wind energy projects.

Noise: Future offshore wind projects would generate noise, primarily associated with onshore cable trenching and switching station or substation construction. Noise from offshore wind construction activities is not expected to reach the geographic analysis area. This IPF may affect land use if noise levels influence business activity or residents' and visitors' decisions on where to visit or live. Ongoing noise from human activity (e.g., transportation, construction projects) occurs frequently in populated areas in the Mid-Atlantic states. The intensity and extent of noise from construction are difficult to generalize, but impacts would be local and temporary. Noise from onshore construction activity is anticipated to be similar to noise from other ongoing construction projects in the geographic analysis area and would be temporary.

Traffic: Future offshore wind projects could result in increased road traffic and congestion that may affect land use and coastal infrastructure because traffic volumes may dictate where residents and businesses choose to locate. Onshore construction of cables and switching stations for future offshore wind projects would likely disrupt road traffic for a short period of time. Occasional, temporary traffic delays would result from repairs and maintenance. The extent of impacts would depend on the locations of landfall and onshore transmission cable routes for future offshore wind energy projects.

3.14.3.3. Conclusions

Impacts of the No Action Alternative. Under the No Action Alternative, land use and coastal infrastructure would continue to be affected by existing environmental trends and ongoing activities. Ongoing activities are expected to have continuing temporary and permanent impacts on land use and coastal infrastructure. These effects are primarily driven by onshore construction impacts and the presence of structures.

BOEM expects ongoing activities, future non-offshore wind activities, and future offshore wind activities to have continuing temporary and permanent impacts on land use and coastal infrastructure. The identified IPFs relevant to land use and coastal infrastructure are accidental releases, nighttime lighting of onshore construction activity and structures, port utilization and expansion, viewshed impacts of offshore structures, presence of onshore infrastructure, and land disturbance, noise, and traffic from construction.

BOEM anticipates that the impacts of ongoing activities, especially onshore and coastal commerce, industry, and construction projects, would have both **minor beneficial** and **minor** adverse impacts on land use in the geographic analysis area. Accidental releases and land disturbances could have temporary adverse impacts on local land uses, but overall, ongoing use and development sustains the region's diverse mix of land uses and provides support for continued maintenance and improvement of coastal infrastructure.

Cumulative impacts of the No Action Alternative. Under the No Action Alternative, existing environmental trends and ongoing activities would continue, and land use and coastal infrastructure would continue to be affected by natural and human-caused IPFs. Planned activities other than offshore wind, primarily increased port maintenance and expansion and construction activity, would have impacts similar to those of ongoing activities, with **minor beneficial** and **minor** adverse impacts. BOEM expects the combination of ongoing and planned activities other than offshore wind to result in **minor beneficial** and **minor** adverse impacts on the IPFs affecting land use and coastal infrastructure.

Considering all the IPFs together, BOEM anticipates that the overall impacts associated with future offshore wind activities near the geographic analysis area, combined with ongoing and planned activities other than offshore wind, would result in **minor** adverse impacts and **minor beneficial** impacts. Future offshore wind would adversely affect land use through land disturbance (during installation of onshore cable, switching stations, and substations) and accidental releases during onshore construction, as well as through the presence of offshore lighting on wind energy structures and views of the structures themselves that could affect the use and value of onshore properties. Beneficial impacts on land use and coastal infrastructure would result because the development of offshore wind would support the productive use of ports and related infrastructure designed or appropriate for future offshore wind activity (including construction and installation, O&M, and decommissioning).

3.14.4 Relevant Design Parameters and Potential Variances in Impacts

This EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than those described in the sections below. The following proposed PDE parameters (Appendix E, *Project Design Envelope and Maximum-Case Scenario*) would influence the magnitude of the impacts on land use and coastal infrastructure.

- The number, size, and design of the turbines. The appearance of the turbines and the offshore component of the Project as a whole could affect property use and value.
- The location of the switching station. The proposed Harpers Road switching station is located on and around more disturbed land than the proposed Chicory Switching Station.
- Interconnection cable route paths. The onshore interconnection cable routing and switching station variants in the Onshore Project area cross different land uses and important landscapes, such as the Gum Swamp.
- The time of year during which construction occurs. The Project area experiences a peak tourism season in the summer. If Project construction were to occur during this season, impacts on roads and land uses during the busy tourist season would be exacerbated.

Changes to the turbine design capacity could alter the maximum potential impacts on land use and coastal infrastructure for the Project because the capacity could affect onshore infrastructure or port utilization. For example, turbines with a higher capacity would require a greater turbine height, which may affect port utilization by increasing construction duration and intensity.

3.14.5 Impacts of the Proposed Action on Land Use and Coastal Infrastructure

The Proposed Action would likely result in localized impacts that would lead to minor alterations to the overall character of land use and coastal infrastructure in the geographic analysis area. The most impactful IPFs would likely include land use change from switching station construction and substation expansion; land disturbance during cable installation; the visual impact of offshore WTGs; and the utilization of ports.[2] Dominion Energy has indicated that the Virginia Port Authority is planning to improve the PMT to support broadscale offshore wind development and anticipates that the port upgrades would meet the needs for construction of the Project (COP, Section 3.3.2.6; Dominion Energy 2023). Other IPFs would likely contribute impacts of lesser intensity and extent and would occur primarily during construction but may also occur during operations and decommissioning.

Accidental releases: Accidental releases from the Proposed Action could include release of fuel/fluids/hazardous materials as a result of port usage, installation of the onshore cables, switching

[2] The Proposed Action includes no port expansion activities but would use ports that would expand to support the wind energy industry generally.

station, and substation, and substation operation. Potential contamination may occur from unforeseen spills or accidents, and any such occurrence would be reported and addressed in accordance with the local authority. The impact of accidental releases on land use and coastal infrastructure could result in temporary restriction on use of adjacent properties and coastal infrastructure during the cleanup process. Accordingly, accidental releases from the Proposed Action alone would have localized, short-term, negligible to minor impacts on land use.

Lighting: The Proposed Action would include the installation and continuous use of aviation hazard avoidance lighting on WTGs and OSSs during low-light and nighttime conditions. At onshore facilities, downward-projecting lights and lights triggered by motion sensors would be used to mitigate light pollution (COP, Section 4.2.2.2; Dominion Energy 2023). During operations, lighting from the Proposed Action's up to 202 WTGs could be visible from certain coastal and elevated locations in the geographic analysis area. Field observations associated with visibility of FAA hazard lighting under clear-sky conditions indicate that FAA hazard lighting may be visible at 40 miles (64 kilometers) or more from the viewer. Darker-sky conditions may increase this distance due to increased contrast of the light dome (reflections from the ocean) and cloud reflections caused by the hazard lights. As a result, WTG lighting of the Proposed Action alone would have a long-term, continuous, negligible to minor impact on land use and coastal infrastructure in the geographic analysis area, due to potential effects on property use and value.

Port utilization: The Proposed Action includes no port expansion activities but would use ports that would expand to support the wind energy industry generally. Port upgrades and expansions may occur independent of the Proposed Action. For instance, the Virginia Port Authority is planning improvements to the PMT to support broadscale offshore wind development (COP, Section 3.3.2.6; Dominion Energy 2023).

Land uses and coastal infrastructure affected by construction of offshore components includes the PMT, which would be used to support component and construction vessel staging. The Proposed Action would also involve temporary construction laydown area(s) at port(s) in Europe or North America (COP, Section 3.1; Dominion Energy 2023). These ports are expected to be used during construction but have independent utility and would not be dedicated to the Proposed Action. Proposed uses at existing port facilities would be consistent with the current land uses occurring at these locations.

Activities associated with the Proposed Action construction would generate noise, vibration, and vehicular traffic at the ports temporarily used for construction described above. These impacts are typical for industrial ports and would not hinder other nearby land uses or use of coastal infrastructure.

Dominion Energy has evaluated several options to lease portions of existing facilities in the Hampton Roads, Virginia Region for an O&M facility for the Proposed Action. The selected lease location for an onshore O&M facility for the Proposed Action is Fairwinds Landing, which is on a brownfield site in Norfolk, Virginia (COP, Section 3.3.2.6; Dominion Energy 2023). Fairwinds Landing is an existing port facility operated by Norfolk Southern. Dominion Energy anticipates that they would require approximately 8 acres (3.2 hectares) with a building covering an area of up to approximately 0.8 acre (0.3 hectare), and a height of up to approximately 45 feet (13.7 meters) to meet the needs of an O&M facility for an offshore wind farm off the coast of Virginia (COP, Section 3.3.2.6; Dominion Energy 2023).

O&M of the Proposed Action offshore components would require daily activity at the chosen O&M facility. The increased activity at the chosen port and nearby areas would be consistent with current land uses and provide a source of investment in the coastal infrastructure.

Overall, the construction and installation of offshore components, O&M, and decommissioning for the Proposed Action alone would have minor beneficial impacts on land use and coastal infrastructure by supporting designated uses and infrastructure improvements at ports.

Presence of structures: WTGs could be visible from certain coastal and elevated mainland areas, depending on vegetation, topography, and atmospheric conditions for both the Proposed Action. WTGs would not dominate offshore views as a result of their proposed distance from shore, even under ideal weather and atmospheric conditions for viewing. The Proposed Action alone would have a long-term, continuous, minor impact on land use and coastal infrastructure in the geographic analysis area due to views of WTGs and the potential effects on property use and value.

The visual impacts of the WTGs from the Proposed Action, as well as other future offshore wind development, visible from coastlines and elevated inland locations, could have long-term impacts on land use if the views influence visitor decisions on locations or properties to visit or purchase. Portions of up to 202 WTGs from the Proposed Action and portions of the Kitty Hawk Offshore Wind Projects could be visible from coastal and elevated locations near the geographic analysis area. As noted in Section 3.18, *Recreation and Tourism*, impacts on recreation and tourism activities would be minor. Accordingly, in context of reasonably foreseeable environmental trends, the contribution of the Proposed Action to the combined visual impacts on land use and coastal infrastructure from ongoing and planned activities is anticipated to be localized, long term, and minor to moderate.

The cable landing location of the Proposed Action is located on a proposed surface parking lot that is on an SMR.[3] The onshore cable route crosses several water bodies, including Lake Christine, where HDD would be used for construction. The entry and exit pits for the HDD construction would be located on previously disturbed lands and along roadways, to the extent practicable, which would minimize impacts to land use. The Proposed Action interconnection cable infrastructure would be installed either fully overhead (Interconnection Cable Route Option 1) or via a hybrid of overhead and underground installation methods (Interconnection Cable Route Option 6). The interconnection cable route variations cross federal property in some areas and also city-owned land, including the Virginia Beach National Golf Club; however, installation corridors would be predominantly located within existing roadways to minimize impacts on existing land use. Because the offshore export cable route and interconnection cable routes would follow mostly existing road rights-of-way, there would be minimal impacts on existing land uses. Where the onshore cable routes would cross currently undeveloped areas, there would be a permanent conversion of land to utility right-of-way or easement. The height of the overhead cables for all interconnection cable route option would be between 75 feet (22.9 meters) and 170 feet (51.8 meters), which would be well above the minimum height required by Virginia Administrative Code (Code of Virginia § 33.2-210) and sight lines.

The Harpers Switching Station would require approximately 5.5 acres (2.2 hectares) for stormwater management facilities, approximately 6.1 acres (2.5 hectares) for relocation of fairways and a maintenance building associated with the adjacent golf course, and 0.93 acre (0.4 hectare) for relocation of Dewey Drive. These acreages are included in the overall acreage of 46.5 acres (18.8 hectares) for the Harpers Switching Station (COP, Section 3.3.2.3; Dominion Energy 2023). Approximately 27.02 acres (10.9 hectares) of tree clearing would be required to support relocation of the fairways, construction of the maintenance building, relocation of Dewey Road, construction of stormwater management facilities, and the footprint of Harpers Switching Station. However, the location of the Harpers Switching Station is on and near previously disturbed land and would result in minimal or no changes to existing land use. The onshore substation would be developed through upgrades and expansion of an existing substation. The

[3] The SMR plans to independently build the parking lot. The parking lot is not expected to be developed as part of the proposed Project. The operational footprint for the cable landing location is anticipated to be approximately 2.8 acres (1.1 hectares).

parcel identified for the onshore substation contains forested land, and some vegetation removal would be necessary to accommodate the proposed upgrades/expansion of the onshore substation. However, the proposed upgrades/expansion of the onshore substation would be consistent with existing uses due to the presence of an existing substation, as well as transmission lines to the north and northeast of the onshore substation site (COP, Section 4.4.3.1; Dominion Energy 2023).

Landfall construction methods would minimize land use impacts and areas would be restored to their previous condition after construction. Temporarily increased noise levels, lighting, and traffic during construction may affect local sensitive receptors (e.g., schools, medical facilities), but would be minimized through BMPs and would not change existing land uses. Dominion Energy has committed to implementing a construction schedule to minimize impacts to the extent practicable where appropriate and as deemed necessary by local authorities (COP, Section 4.4.4.2; Dominion Energy 2023). This would include coordination with localities, including the Virginia SMR.

Land disturbance: Based on the existing conditions along the proposed onshore export cable route, the Project would use a combination of open trenches, HDD, and duct banks at varying depths along the selected route (COP, Section 3.4.2.1; Dominion Energy 2023). Construction and installation of the interconnection cable would include a combination of vibrated/driven pipe piles and open trench interconnect ducting depending on the interconnection cable route option.

Installation of the cable landfall sites, cable routes, and construction and expansion of the switching station and substation would temporarily disturb neighboring land uses through construction noise, vibration, dust, and travel delays along the affected roads. These impacts are anticipated to last for the duration of construction; following construction, the cable route corridors and temporary staging areas for switching station and substation construction would be returned to their previous condition and use. In particular, the portion of the parcel not required for long-term operation of the substation would be restored to previous conditions (COP, Section 4.4.3.2; Dominion Energy 2023). The corridors would be maintained through regular vegetation trimming and herbicide application. Installation of the onshore export and interconnection cables would occur within temporary construction corridors. The maximum area of temporary disturbance for the onshore export cable is approximately 26.6 acres (10.8 hectares) (COP, Section 4.4.3.2; Dominion Energy 2023).

Permanent disturbance: The total permanent disturbance for Interconnection Cable Route Option 1 to accommodate new permanent structures (i.e., transmission towers) would be 1.0 acre (0.4 hectare) (COP, Section 4.4.3.2; Dominion Energy 2023). O&M would not result in land disturbance except in the event that cable maintenance or replacement is required. Land use impacts would be minimized through the use of existing rights-of-way, co-locating Project components, using land that is primarily zoned for commercial or industrial development, and restoring areas to pre-disturbed conditions following construction (COP, Section 4.4.3.1; Dominion Energy 2023).

The Harpers Switching Station is located in industrial district. The onshore substation parcel is zoned A-1 Agricultural and R-15S Residential. Interconnection Cable Route Option 1 would travel from a common location north of Harpers Road to the onshore substation and would traverse mainly industrial, business, office, planned developments, residential, and agricultural districts (COP, Section 4.4.3.1; Dominion Energy 2023; City of Virginia Beach 2008, 2017). The construction of the interconnection cable route, new switching station, and expansion of the onshore substation would result in temporary and permanent impacts to land use. In order to implement a zoning use in a district that currently does not allow a specific use, a Conditional Use Permit is typically submitted to the local zoning department for review and approval. Under Virginia law, if a public utility is granted a Certificate of Public Convenience and Necessity from the Virginia State Corporation Commission, the Certificate of Public Convenience and Necessity approval shall be deemed to satisfy the requirements of all local zoning ordinance (COP, Section 4.4.3.1; Dominion Energy 2023; Code of Virginia § 56-265.2).

Noise: The Proposed Action would comply with Virginia Beach City and Chesapeake City Code noise regulations (COP, Section 4.1.4.1; Dominion Energy 2023), to the extent practicable, to minimize impacts on nearby communities. Typical construction equipment ranges from a generator or refrigerator unit at 73 A-weighted decibels (dBA) at 50 feet to an impact pile driver at 101 dBA at 50 feet. Given the extended distances between the Offshore Project area and coastal shorelines (approximately 28 and 42 miles [45 and 67 kilometers]), noise from offshore construction is not expected to result in negative impacts in the Onshore Project area (COP, Section 4.1.4.2; Dominion Energy 2023). Temporarily increased noise levels during construction of onshore components may affect local sensitive receptors (such as religious locations, recreational areas, schools, and other places that are particularly sensitive to construction) but would be minimized through BMPs and would not change existing land uses.

Traffic: Cable installation within the roadway under the Proposed Action could result in temporary traffic impacts such as lane closures, shifted traffic patterns, or closed roadways with temporary detours. Best management practices and maintenance of traffic plans would be developed and coordinated with local and state agencies. Traffic impacts would be limited to the immediate construction area. Roadways would be returned to pre-construction conditions and changes to the existing land use would not result. Prior to beginning construction, Dominion Energy would develop a Traffic Management Plan to offset any traffic-related impacts as applicable to offset any anticipated traffic-related impacts. Traffic-related impacts include Project-related construction, temporary modifications to roadway traffic patterns during construction, and an increase in O&M vehicle traffic. The Traffic Management Plan would include, but would not be limited to, highly visible markings, signage, and lighting of active construction sites construction parking areas, and development of vehicular travel routes to and from construction sites (COP, Section 4.4.4.2; Dominion Energy 2023).

3.14.5.1. Cumulative Impacts of the Proposed Action

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

In context of reasonably foreseeable environmental trends, the contribution of the Proposed Action to the accidental release impacts on land use and coastal infrastructure from ongoing and planned activities would increase the risk of (and, thus, the potential impacts from) accidental releases of fuel/fluids/hazardous materials in the geographic analysis area and would result in localized, short-term, negligible to minor impacts on land use and coastal infrastructure.

In context of reasonably foreseeable environmental trends, the contribution of the Proposed Action to WTG lighting impacts on land use and coastal infrastructure from ongoing and planned activities would be continuous, long term and negligible.

In context of reasonably foreseeable environmental trends, the contribution of the Proposed Action to the combined impacts on land use and coastal infrastructure from ongoing and planned activities would have long-term, minor beneficial impacts. Future offshore wind development, including the Proposed Action, would require port facilities for shipping, berthing, and staging, and development activities would support ongoing or new activity at authorized ports.

In context of reasonably foreseeable environmental trends, the incremental contributions of the Proposed Action to the combined onshore transmission cable infrastructure impacts on land use and coastal infrastructure from ongoing and planned activities are anticipated to be minor. Assuming that new switching stations or substations for offshore wind projects would be in locations designated for industrial or utility uses, and above or belowground cable conduits would primarily be co-located with roads or other utilities, operation of switching stations, substations and cable conduits would not affect the established and planned land uses for a local area.

In context of reasonably foreseeable environmental trends, the contribution of the Proposed Action to the land disturbance impacts on land use and coastal infrastructure from ongoing and planned activities is anticipated to be minor due to construction-related disturbance, access limitations along the cable routes, and land use changes due to the construction of the switching station and onshore substation expansion. Impacts on land use and coastal infrastructure would be additive if land disturbance associated with one or more other projects occurs in close spatial and temporal proximity.

Construction of onshore components of new offshore wind projects near the geographic analysis area would be required to comply with the same or similar noise regulations as the Proposed Action and noise levels are anticipated to be similar to noise levels from other ongoing activities.

Impacts on land use and coastal infrastructure would be additive only if construction associated with one or more other projects generates traffic in close spatial and temporal proximity. In context of reasonably foreseeable environmental trends, the contribution of the Proposed Action to traffic impacts on land use and coastal infrastructure from ongoing and planned activities is anticipated to be minor, localized, and short term.

3.14.5.2. Conclusions

Impacts of the Proposed Action. In summary, BOEM anticipates that impacts on land use and coastal infrastructure from the Proposed Action alone would range from **negligible** to **minor** with **minor** beneficial impacts. The Proposed Action would have minor beneficial impacts resulting from port utilization, minor impacts resulting from land disturbance during onshore installation of the cable route and resulting from land use changes from the construction and expansion of the switching station and substation, and negligible to minor impacts resulting from accidental spills. Noise and traffic from onshore construction would have localized, short-term, minor impacts on land use and coastal infrastructure.

Cumulative impacts of the Proposed Action. In the context of other reasonably foreseeable environmental trends in the area, impacts resulting from individual IPFs would range from **negligible** to **minor** adverse and **negligible** to **minor beneficial** impacts. Considering all of the IPFs collectively, BOEM anticipates that the contribution of the Proposed Action to the impacts associated with ongoing and planned activities would result in **minor** adverse impacts and **minor** beneficial impacts on land use and coastal infrastructure in the geographic analysis area. The main drivers for this impact rating are the beneficial impacts of port utilization, minor impacts on the viewshed due to the presence of offshore structures, and minor impacts of land disturbance and land use change. The Proposed Action would contribute to the overall impact rating primarily through short-term impacts from onshore landfall, cable, switching station, and substation installation, as well as beneficial impacts due to the use of port facilities designated for offshore wind activity.

3.14.6 Impacts of Alternatives B and C on Land Use and Coastal Infrastructure

BOEM identified a combination of Alternative B (Revised Layout to Accommodate the Fish Haven Area and Navigation) and Alternative D-1 (Interconnection Cable Route Option 1) as the Preferred Alternative. The analysis of the impacts of the Preferred Alternative would be the same as that for Alternative B, described in this section.

Impacts of Alternatives B and C. The impacts resulting from individual IPFs on land use and coastal infrastructure under Alternatives B and C would be the same as those described under the Proposed Action except for the presence of structures. Compared to the Proposed Action, Alternative B would remove 29 WTGs (for a total of up to 176 WTGs with seven locations identified as spares). Alternative C would remove 33 WTGs (for a total of up to 172 WTGs) from the Offshore Project area. All other

offshore and onshore projects components would stay the same. As a result, Alternatives B and C would slightly modify the visibility of the WTGs from coastal and elevated onshore areas in the geographic analysis area, which could affect the potential effects on property use and values compared to the Proposed Action. However, as under the Proposed Action, the majority of the WTGs would still be visible, and there would be no meaningful difference in impacts on land use and coastal infrastructure.

Cumulative impacts of Alternatives B and C. In context of reasonably foreseeable environmental trends, the contribution of Alternatives B and C to the impacts resulting from individual IPFs associated with ongoing and planned activities would be the same as that of the Proposed Action.

3.14.6.1. Conclusions

Impacts of Alternatives B and C. Alternatives B and C would decrease the number of WTGs, resulting in slightly decreased visual impacts of WTGs on coastal communities compared to the Proposed Action but would not change the overall impact magnitudes. Impacts on land use and coastal infrastructure would be long-term and range from **negligible** to **minor** with **minor** beneficial impacts. Impact ratings associated with individual IPFs would not change.

Cumulative impacts of Alternatives B and C. In context of reasonably foreseeable environmental trends, the contribution of Alternatives B and C to the impacts resulting from individual IPFs associated with ongoing and planned activities would be the same as that of the Proposed Action, ranging from **negligible** to **minor** impacts for onshore land use and infrastructure and **minor beneficial** impacts. The overall impacts of Alternative B and C combined with ongoing and planned activities on land use would be similar to those of the Proposed Action: **minor** adverse impacts and **minor beneficial** impacts. This impact rating is primarily driven by impacts from installation of onshore infrastructure and port utilization, which would not change.

3.14.7 Impacts of Alternative D on Land Use and Coastal Infrastructure

Impacts of Alternative D. The impacts resulting from the majority of IPFs on land use and coastal infrastructure under Alternative D would be the same as those described under the Proposed Action except for land disturbance. Alternative D-2 would approve only the Hybrid Interconnection Cable Route Option 6, which would connect with the switching station north of Princess Anne Road (Chicory Switching Station). Alternative D-1 would approve only Interconnection Cable Route Option 1, which would connect with the Harpers Switching Station. The Chicory Switching Station would be located in agricultural and residential districts and would have a smaller total footprint at 35.5 acres (14.4 hectares) than the Harpers Switching Station (46.5 acres or 18.8 hectares), which would be located within an industrial district (COP, Section 3.3.2.3; Dominion Energy 2023). The temporary construction and installation corridors for Interconnection Cable Route Option 1 (Alternative D-1) and Hybrid Interconnection Cable Route Option 6 (Alternative D-2) is anticipated to be the same: 29.0 acres (11.7 hectares), inclusive of existing and proposed rights-of-way and access roads (COP, Section 3.4.2.3; Dominion Energy 2023). However, the Chicory Switching Station location associated with Hybrid Interconnection Cable Route Option 6 (Alternative D-2) would be in a less-disturbed area than the Harpers Switching Station associated with overhead Interconnection Cable Route Option 1 (Alternative D-1). Overall, Alternative D-1 would result in the fewer land-disturbing impacts from construction of the onshore components followed by Hybrid Interconnection Cable Route Option 6 (Alternative D-2).

Cumulative impacts of Alternative D. In context of reasonably foreseeable environmental trends, the contribution of Alternative D to the impacts resulting from individual IPFs associated with ongoing and planned activities would be the same as the Proposed Action.

3.14.7.1. Conclusions

Impacts of Alternative D. The Proposed Action and Alternative D considers two interconnection cable route options. The Chicory Switching Station location associated with Hybrid Interconnection Cable Route Option 6 (Alternative D-2) covers a smaller footprint but would be in a less disturbed area than the Harpers Switching Station associated with overhead Interconnection Cable Route Option 1 (Alternative D-1). Impacts on land use and coastal infrastructure would range from **negligible** to **minor** with **minor beneficial** impacts. Impact ratings associated with individual IPFs would not change.

Cumulative impacts of Alternative D. In context of reasonably foreseeable environmental trends, the contribution of Alternative D to the impacts resulting from individual IPFs associated with ongoing and planned activities would be the same as the Proposed Action, long-term and ranging from **negligible** to **minor** impacts for onshore land use and infrastructure and **minor beneficial** impacts. The overall impacts of Alternative D combined with ongoing and planned activities for land use would also be the same as those of the Proposed Action: long-term **minor** adverse impacts and **minor beneficial** impacts. This impact rating is primarily driven by impacts from installation of onshore infrastructure and port utilization, which would not change.

3.14.8 Agency-Required Mitigation Measures

No measures to mitigate impacts on land use have been proposed for analysis.

3.18. Recreation and Tourism

This section discusses potential impacts on recreation and tourism resources from the proposed Project, alternatives, and ongoing and planned activities in the recreation and tourism geographic analysis area. The geographic analysis area, as described in Appendix F, *Planned Activities Scenario*, Table F-1, and shown on Figure 3.18-1, includes the 40-mile (64.4-kilometer) visual analysis area measured from the borders of the Wind Farm Area. The geographic analysis area encompasses parts of Accomack County, Northampton County, the City of Norfolk, the City of Virginia Beach, and Chesapeake City, Virginia, and Currituck and Dare Counties, North Carolina. Section 3.11, *Demographics, Employment, and Economics*, discusses the economic aspects of recreation and tourism in the Project area.

3.18.1 Description of the Affected Environment for Recreation and Tourism

3.18.1.1 Regional Setting

Proposed Project facilities would be within and off the coast of Virginia and North Carolina. The coastal areas support ocean-based recreation and tourist activities that include boating, swimming, surfing, scuba diving, sailing, and paddle sports. As indicated in Section 3.11, *Demographics, Employment, and Economics*, recreation and tourism contribute substantially to the economies of Virginia and North Carolina's coastal counties. Tourism in Virginia's coastal communities is a multibillion-dollar industry. More than 19 million people visited Virginia Beach in 2017, generating about $1.7 billion annually in total expenditures (City of Virginia Beach 2017; COP, Section 4.4.5.1; Dominion Energy 2023).

Coastal Virginia and North Carolina have a wide range of visual characteristics, with communities and landscapes ranging from large cities to small towns, suburbs, rural areas, and wildlife preserves. As a result of the proximity of the Atlantic Ocean, as well as the views associated with the shoreline, the Virginia and North Carolina shore has been extensively developed for water-based recreation and tourism.

The scenic quality of the coastal environment is important to the identity, attraction, and economic health of many of the coastal communities. Additionally, the visual qualities of these historic coastal towns, which include marine activities within small-scale harbors, and the ability to view birds and marine life are important community characteristics.

3.18.1.2 Project Area

Recreational and tourist-oriented activities are concentrated in the coastal communities in the City of Virginia Beach and the City of Chesapeake. Coastal communities provide hospitality, entertainment, and recreation for hundreds of thousands of visitors each year. Although many of the coastal and ocean amenities, such as beaches, that attract visitors to these regions are accessible to the public for free and, thus, do not directly generate employment, these nonmarket features function as key drivers for recreation and tourism businesses.

Water-oriented recreational activities in the Project area include boating, visiting beaches, diving, fishing tournaments, and wildlife viewing. Boating covers a wide range of activities, from ocean-going vessels to small boats used by residents and tourists in sheltered waters, and includes sailing, sailboat races, fishing, shellfishing, kayaking, canoeing, and paddleboarding.

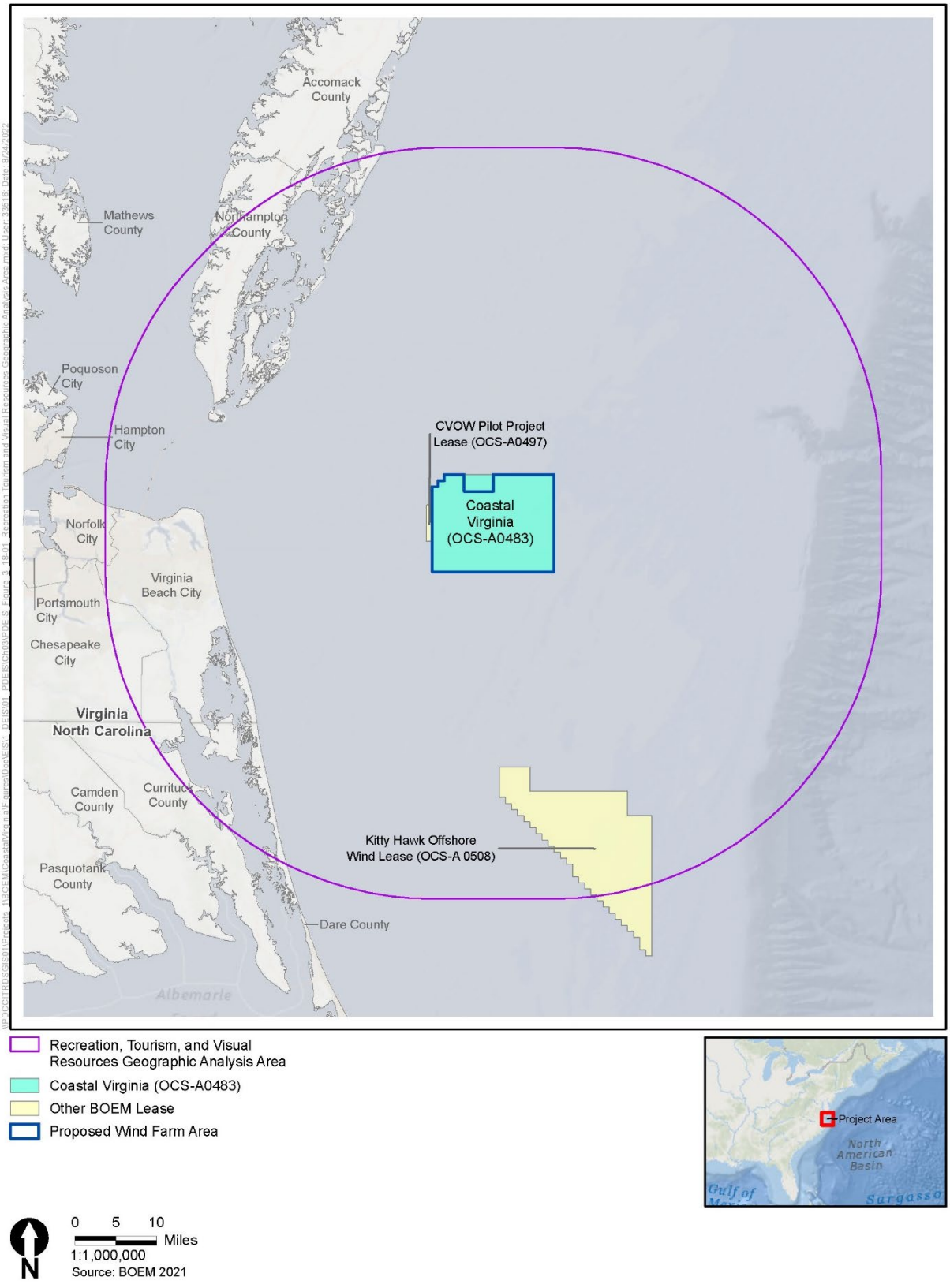

Figure 3.18-1 Recreation, Tourism, and Visual Resources Geographic Analysis Area

Commercial businesses offer boat rentals, private charter boats for fishing, whale watching and other wildlife viewing, and tours with canoes and kayaks. As discussed in Section 3.11, *Demographics, Employment, and Economics*, recreation and hospitality are major sectors of the economy in the City of Virginia Beach and the City of Chesapeake, supported by ocean-based recreation uses.

Inland recreational facilities are also popular but have less of a relationship to possible impacts of the Project; this section does not address these facilities in detail, except where Project components would intersect with these facilities. These include inland waters such as ponds and rivers, wildlife sanctuaries, golf courses, athletic facilities, parks, and picnic grounds.

3.18.1.2.1 Coastal and Offshore Recreation

Many marine recreational activities, such as swimming, surfing, kayaking, paddle boarding, wind surfing, fishing, sailing, and boating, occur along the coast of Virginia almost all year-round. Scuba diving and snorkeling are identified as a dominant use offshore from the Virginia coast year-round with dive sites that include shipwrecks, artificial reefs, and other structures. Recreational boating and sailing are very popular and primarily occur in nearshore coastal waters rather than offshore waters (COP, Sections 4.4.6.2 and 4.4.11.1; Dominion Energy 2023).

There is a large and robust recreational fishing industry in Virginia and North Carolina. In 2018, there were about 6.4 million recreational saltwater angler trips (i.e., charter, party, private/rental, and shore boats) in Virginia and about 16.6 million trips in North Carolina. The popular recreational saltwater species caught in the area include, but are not limited to, sciaenid drums including Atlantic croaker (*Micropogonias undulatus*) and seatrout, bluefish, tuna/mackerel, cartilaginous fishes (sharks, skates, and rays), porgies, jacks, and black sea bass (COP, Section 4.4.6.2; Dominion Energy 2023). There are also annual recreational fishing tournaments held in coastal towns in Virginia and North Carolina. Saltwater fishing tournaments target a variety of fish including billfish, tuna, seabass, shark, grouper, and others. Tournaments for specific highly migratory species occur from late June to early September (COP, Sections 4.4.6.2 and 4.4.11.1; Dominion Energy 2023).

Recreational shellfishing is important to the region and occurs primarily in state waters and not in the Offshore Project area, commonly targeting blue crabs, scallops, quahogs, Atlantic surf clams, and softshell clams. Spearfishing occurs in portions of the Offshore Project area and often targets fish at offshore structures, the Triangle wrecks, and surface structures, such as buoys (COP, Section 4.4.6.2; Dominion Energy 2023).

3.18.1.2.1.1 Accomack County

Accomack County lies on the Delmarva Peninsula, on the northern part of Virginia's eastern shore, and encompasses approximately 1,310 square miles (3,393 square kilometers). The county is known for its 45-mile (72-kilometer) stretch of oceanside barrier islands, which are kept in their natural state and can be accessed by the public (Accomack County 2021). Aside from its barrier islands, bays, and inlets, there are eight public beaches, one yacht club, 29 public boating access sites, and 40 miles (64 kilometers) of shoreline on both the Chesapeake Bay and the Atlantic Ocean (BOEM 2012). Popular marine recreational activities in the county include swimming in the Atlantic Ocean, surfing, fishing, boating, and wildlife viewing off the shore. There are many businesses that offer boat and fishing tours and rentals, and there are many public piers at which fishing tournaments, crabbing, and clamming take place. Scenic boat cruises are popular among tourists and take place through the Chincoteague and Assateague Channels and along the Assateague Island National Seashore (Chincoteague Chamber of Commerce 2021).

3.18.1.2.1.2 Northampton County

Northampton County is located on the southern part of the Delmarva Peninsula on Virginia's eastern shore and encompasses 795 square miles (2,095 square kilometers). The county is known for its over 100 miles (161 kilometers) of shoreline on the Chesapeake Bay and Atlantic Ocean, and it has three public beaches and two marinas (BOEM 2012). Popular recreational activities include kayaking, fishing on the piers, renting yachts, and visiting the uninhabited barrier islands. There are 12 barrier islands, which are open to the public for non-commercial recreational day use, such as hiking, bird watching, fishing, hunting, crabbing, and clamming (Northampton County 2019). Private ecotours and sunrise/sunset cruises that go between the sandy beaches and islands are very popular (Cape Charles Harbor 2020).

3.18.1.2.1.3 City of Norfolk

The City of Norfolk encompasses 66 square miles (106 square kilometers), is located is southeastern Virginia, and is bordered by Chesapeake Bay. It has 7 miles (11 kilometers) of Chesapeake Bay beachfront, and all of the beaches are public. Popular recreational activities include sailing, kayaking, swimming, jogging and walking along the shoreline, surfing, and canoeing. There is a harbor for ocean-going cruise vessels of up to 3,000 passengers, and there is the East Ocean View Community Center Pier, which hosts anglers and boaters (City of Norfolk 2021). A lot of recreational diving that occurs along the Virginia coast is supported by several dive companies in the city that offer charters to artificial reefs, shipwrecks, ledges, and other sites in the Offshore Project area (COP, Section 4.4.11.1; Dominion Energy 2023).

3.18.1.2.1.4 City of Virginia Beach

The City of Virginia Beach is in southeastern Virginia and encompasses 310 square miles (499 square kilometers). It has 28 miles (45 kilometers) of public beach, 38 miles (61 kilometers) of shoreline, and 29 miles (74 kilometers) of scenic waterways (City of Virginia Beach 2017). There are about six public beaches, nine marinas, and 13 yacht clubs. The shorefront is one of the most popular attractions, where people partake in swimming, annual surfing championships, fishing, paragliding, and sailing (BOEM 2012). The city is also known for its 3-mile Virginia Beach Boardwalk, which is lined with hotels and restaurants, and for its guided boat tours of the Back Bay and Atlantic Ocean (Visit Virginia Beach 2021).

Several dive companies in Virginia Beach, such as Chesapeake Bay Diving Center and Lynnhaven Dive Center, support recreational scuba and free dives by offering charters to artificial reefs, shipwrecks, ledges, and other sites of interest in the Offshore Project area (COP, Section 4.4.11.1; Dominion Energy 2023). Recreational fishing vessels are supported by the ports of Rudee Inlet and Lynnhaven, from where fishermen travel to areas of "hard bottom" seabed structures and other structures near the Offshore Project area. Virginia Beach also hosts a number of very popular fishing tournaments for highly migratory species, which occur from late June to early September (COP, Section 4.4.6.2; Dominion Energy 2023). Whale-watching tours are also popular in coastal Virginia between late November and March but occur year-round in Virginia Beach. Dolphin tours take place between June and late October (COP, Section 4.4.11.1; Dominion Energy 2023).

3.18.1.2.1.5 Chesapeake City

The City of Chesapeake encompasses 353 miles and is adjacent to Virginia Beach City (City of Chesapeake 2021). Since it is surrounded by land, it does not offer as many opportunities for coastal recreation, as does Virginia Beach City.

3.18.1.2.1.6 Currituck County

Currituck County encompasses 526 miles (847 kilometers) and is located in the northeastern-most corner of North Carolina (United States Census Bureau 2010). It has six public beaches, 20 miles (32 kilometers) of shoreline, one marina, and two yacht clubs (BOEM 2012). The county is known for its sandy beaches, where tourists partake in surfing, fishing, kayaking, parasailing, paddleboarding, kiteboarding, and walking along the shore (Currituck County 2021). Fishing and crabbing are also popular activities in the Currituck Sound (Currituck County Tourism 2021). In 2009, there were 65 ocean-related establishments that directly employed 451 people (BOEM 2012).

3.18.1.2.1.7 Dare County

Dare County is in northeastern North Carolina, adjacent to the Atlantic Ocean, and it encompasses 1,563 square miles (2,515 square kilometers). It has 110 miles (177 kilometers) of shoreline, known as the Outer Banks (Dare County 2021). The county is known for its beaches, which offer sailing tours, fishing, snorkeling, water sports, and horseback riding (Outer Banks 2021). It has two public beaches, 10 marinas, and 13 yacht clubs. In 2009, there were 269 ocean-related establishments, which employed 3,746 people directly. Popular attractions include the Cape Hatteras Lighthouse and the Bodie Island Lighthouse (BOEM 2012).

3.18.1.2.2 Onshore Recreation

3.18.1.2.2.1 Accomack County

Accomack County is home to myriad habitats, such as farmland, marshes, forests, and wetlands. The 9,000-acre (3,642-hectare) Chincoteague National Wildlife Refuge is located in the north portion of the county and has opportunities for swimming, hiking, fishing, and bird watching. The beaches and salt marshes are particularly popular for viewing shorebirds, seabirds, and other migrating waterfowl. The Accomack County Department of Parks and Recreation takes care of three parks: Arcadia Park (25 acres (10 hectares]), Wachapreague Park (15 acres [6 hectares]), and Nandua Middle Park (Accomack County 2021). Along the nature trails, tourists partake in bird watching of over 300 species of migratory birds, pony watching, and biking (Chincoteague Chamber of Commerce 2021).

The main areas of tourism in the county are nature, agriculture, and beach and recreational resorts. Tourists partake in wine tours, horseback riding, and golfing. In 2010, domestic travelers spent about $145.08 million in the county, and there were 116 establishments dedicated to leisure and hospitality. Approximately 23 percent of all housing units in Accomack County are for seasonal, recreational, or occasional use (BOEM 2012).

3.18.1.2.2.2 Northampton County

Northampton County is known for its undeveloped coastal landscapes that allow for many recreational activities, such as wildlife viewing, hiking, and cycling. The county is home to two wildlife refuges: the Eastern Shore of Virginia National Wildlife Refuge (1,200 acres [486 hectares]) and Fisherman Island National Wildlife Refuge (1,850 acres [749 hectares]) (BOEM 2012). Tourists enjoy bird watching along the Eastern Seaboard during spring and fall migration and enjoy the variety of artist markets, galleries, and film festivals more inland (Northampton County 2019). In 2010, domestic travelers spent $63.26 million, and there were 43 establishments dedicated to leisure and hospitality (BOEM 2012).

3.18.1.2.2.3 City of Norfolk

Inland Norfolk is home to three beach parks, museums, the National Maritime Center, art festivals, and the Norfolk Botanical Garden. Popular activities in the parks include walking, hiking, and wildlife

viewing (City of Norfolk 2021). There are also many bike lanes and trails, such as the 10.5-mile (16.9-kilometer) Elizabeth River Trail, which are popular among cyclists. Tourists also partake in kayaking and fishing the Lafayette River (Visit Norfolk n.d.).

3.18.1.2.2.4 City of Virginia Beach

Virginia Beach is home to 255 local parks (covering 4,500 acres), several state parks, and one national wildlife refuge: the Back Bay National Wildlife Refuge (10,000 acres [4,047 hectares]) (BOEM 2012). Popular inland activities include traversing the Sandbridge dunes, hiking and cycling along the 200 miles (322 kilometers) of bikeways and trails, and kayaking and fishing in the 120 miles (193 kilometers) of waterways. First Landing State Park is a 2,888-acre park with 1.25 miles (2.01 kilometers) of beach, and 19 miles (31 kilometers) of hiking trails through salt marsh habitat, freshwater ponds, dunes, forests, tidal marshes, and cypress swamps. Other popular attractions include museums; Pungo, an 8,000-acre (3,237-hectare) farmland community; breweries; Atlantic Fun Park; and Cape Henry Light House (Visit Virginia Beach 2021). In 2010, domestic travelers spent $1.13 billion in the city, and there were 1,266 establishments for leisure and hospitality (BOEM 2012).

3.18.1.2.2.5 Chesapeake City

The City of Chesapeake is home to the Great Dismal Swamp National Wildlife Refuge, which is a protected area of more than 112,000 acres (45,325 hectares) and contains 200 species of birds, 100 species of butterfly, and other rare native mammals. The refuge has freshwater marshes, cypress swamps, and barrier islands. The city is also home to Lake Drummond, a 3,100-acre (1,255-hectare) lake popular among anglers. Popular activities in the city include hiking, camping, fishing, and birdwatching along the Virginia Birding and Wildlife Trail, which is home to over 213 species of birds (Visit Chesapeake 2021).

3.18.1.2.2.6 Currituck County

There are two wildlife refuges in Currituck County: Currituck National Wildlife Refuge (8,501 acres) and part of Mackay Island National Wildlife Refuge (8,219 acres [3,326 hectares] on Knotts Island). People partake in bird watching, hiking, kayaking, and cycling (BOEM 2012). Tourists also enjoy wildlife viewing due to the population of Corolla Wild Horses in the Currituck Outer Banks (Currituck County 2021). The county is also famous for its Historic Corolla Park and the Currituck Beach Lighthouse (Currituck County Tourism 2021). In 2010, domestic visitors spent $117.12 million in the county, and there were 87 establishments dedicated to leisure and hospitality. Approximately 31.8 percent of housing units in the county are for seasonal, recreational, or occasional use (BOEM 2012).

3.18.1.2.2.7 Dare County

Dare County has five national protected areas, including the Pea Island National Wildlife Refuge (6,000 acres) and the Alligator National Wildlife Refuge (152,000 acres [61,512 hectares]), which is home to songbirds, raptors, and ducks (BOEM 2012; Dare County 2021; Outer Banks 2021). Popular activities include golfing, touring gardens, visiting historic sites and museums, bird-watching festivals, and traversing fresh and saltwater habitats. Tourism provides more than 13,800 jobs in the county, employing one-third of the county's residents. Annually, tourism generates more than $116.5 million in state and local tax revenue, and visitor spending is over $1.27 billion (Outer Banks 2021). In 2009, there were 381 establishments dedicated to leisure and hospitality. Approximately 44 percent of housing units are for seasonal, recreational, or occasional use (BOEM 2012).

3.18.1.3 Visual Resources

As discussed in Section 3.20, *Scenic and Visual Resources*, the proposed Project's Offshore Components, including the WTGs, inter-array cables, and OSSs would be in federal waters within the Lease Area. The

boundary of the Lease Area is 20.45 nautical miles (37.87 kilometers) from the northwest corner to the Eastern Shore Peninsula and 23.75 nautical miles (43.99 kilometers) from Virginia Beach, Virginia. Existing visual intrusions offshore include buoys, channel markers, marine vessel traffic, the Chesapeake Light Tower, and the two existing WTGs of the CVOW-Pilot Project. These features are visible during daytime hours, and safety and warning lights are visible during nighttime hours from certain viewing locations. Air traffic (including nighttime safety lighting on aircraft) arriving and departing from military and civilian airports is also commonly seen in the Offshore Project area. Elevated boardwalks, jetties, and seawalls afford greater visibility of offshore elements for viewers in tidal beach areas. Nighttime views toward the ocean from the beach and adjacent inland areas are diminished by ambient light levels and glare of shorefront developments (COP, Section 4.3.4.2; Dominion Energy 2023).

Within the 40-mile-radius geographic analysis area, the distance from coastal viewpoints to the Project would vary from slightly more than 25 miles (40 kilometers) to nearly 40 miles (64 kilometers) to the nearest WTG. The most apparent views of WTGs were found to be within 27 to 28 miles (43.5 to 45.1 kilometers) from the Lease Area, where views are oriented toward the ocean and horizon. Within these areas, beach/shoreline and elevated viewpoints, such as multi-story buildings and/or lighthouses with ocean views, would have the most conspicuous views of the WTGs (COP, Section 4.3.4.3; Dominion Energy 2023).

3.18.2 Environmental Consequences

3.18.2.1 Impact Level Definitions for Recreation and Tourism

Definitions of impact levels are provided in Table 3.18-1.

Table 3.18-1 Impact Level Definitions for Recreation and Tourism

Impact Level	Impact Type	Definition
Negligible	Adverse	Impacts on the recreation setting, recreation opportunities, or recreation experiences would be so small as to be unmeasurable.
	Beneficial	No effect or measurable impact.
Minor	Adverse	Impacts would not disrupt the normal functions of the affected activities and communities.
	Beneficial	A small and measurable improvement to infrastructure/facilities and community services, or benefit for tourism.
Moderate	Adverse	The affected activity or community would have to adjust somewhat to account for disruptions due to the Project.
	Beneficial	A notable and measurable improvement to infrastructure/facilities and community services, or benefit for tourism.
Major	Adverse	The affected activity or community would have to adjust to significant disruptions due to large local or notable regional adverse impacts of the Project.
	Beneficial	A large local, or notable regional improvement to infrastructure/facilities and community services, or benefit for tourism.

3.18.3 Impacts of the No Action Alternative on Recreation and Tourism

When analyzing the impacts of the No Action Alternative on recreation and tourism, BOEM considered the impacts of ongoing activities, including ongoing non-offshore wind activities and ongoing offshore wind activities, on the baseline conditions for recreation and tourism. The cumulative impacts of the No

Action Alternative considered the impacts of the No Action Alternative in combination with other planned non-offshore wind and offshore wind activities, as described in Appendix F.

3.18.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for recreation and tourism in the geographic analysis area described in Section 3.18.1, *Description of the Affected Environment for Recreation and Tourism*, would continue to follow current regional trends and respond to IPFs introduced by other ongoing non-offshore wind and offshore wind activities. Ongoing activities within the geographic analysis area that contribute to impacts on recreation and tourism include ongoing vessel traffic; noise and trenching from periodic maintenance or installation of piers, pilings, seawalls, and offshore cables; and onshore development activities. These activities would contribute to periodic disruptions to recreational and tourism activities but are a typical part of daily life along the Virginia and North Carolina coastline and would not substantially affect recreational enjoyment in the geographic analysis area. Visitors would continue to pursue activities that rely on the area's coastal and ocean environment, scenic qualities, natural resources, and establishments that provide services for tourism and recreation. The geographic analysis area has a strong tourism industry and abundant coastal and offshore recreational facilities, many of which are associated with scenic views. The beach, and by proxy the ocean, is a primary concern for the local jurisdictions' tourism industry (City of Virginia Beach 2017). There is one ongoing offshore wind activity within the geographic analysis area that could contribute to impacts on recreation and tourism.

3.18.3.2 Cumulative Impacts of the No Action Alternative

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

BOEM expects future offshore wind activities to affect recreation and tourism through the following primary IPFs.

Anchoring: This IPF would potentially affect recreational boating through both the presence of an increased number of anchored vessels in the geographic analysis area and the creation of offshore areas with scour protection where recreational vessels may experience limitations or difficulty in anchoring.

Future offshore wind development in the geographic analysis area is anticipated to result in increased survey activity and overlapping construction periods beginning in 2024, with two other projects (Kitty Hawk Offshore Wind Projects) under construction at one time during 2024 through 2027 (Appendix F, Table F3). Increased vessel anchoring during future offshore wind development between 2024 and 2030 would affect recreational boaters. The greatest volume of anchored vessels would occur in offshore work areas during construction. Future offshore wind projects may generate similar numbers of active and anchored vessels to the Proposed Action, depending on project size and construction schedule: the CVOW-C Project would have an estimated average of 46 daily vessel trips generated throughout the duration of construction, ranging from a minimum of 3 trips per day to a maximum of 95 trips per day (COP, Section 3.4.1.5; Dominion Energy 2023). Anchored construction-related vessels may be within temporary safety zones established in coordination with USCG for active construction areas (COP, Section 4.4.9.2; Dominion Energy 2023).

Vessel anchoring would also occur during maintenance and monitoring activities. Following construction of planned offshore wind projects (if approved), the presence of operating offshore wind projects in the geographic analysis area would result in a long-term increase in the number of vessels anchored during periodic maintenance and monitoring. One ongoing offshore wind project, the CVOW-Pilot Project, is

currently in the operations phase. There are only two WTGs, so the long-term increase in the number of vessels during period maintenance and monitoring would be small.

Anchored construction, survey, or service vessels would have localized, temporary impacts on recreational boating. Recreational vessels could navigate around anchored vessels with only brief inconvenience. The temporary turbidity from anchoring would briefly alter the behavior of species important to recreational fishing (Section 3.13, *Finfish, Invertebrates, and Essential Fish Habitat*) and sightseeing (primarily whales, but also dolphins and seals) (Section 3.15, *Marine Mammals*). Inconvenience and navigational complexity for recreational vessels would be localized, variable, and long term, with increased frequency of anchored vessels during surveying and construction and reduced frequency of anchored vessels during operations.

Land disturbance: Future offshore wind development for Kitty Hawk Offshore Wind Projects would require installation of onshore transmission cable infrastructure, which would cause temporary traffic delays and could temporarily affect access to adjacent properties, resulting in localized, temporary disturbances of recreational activity or tourism-based businesses near cable routes and construction sites for substations and other electrical infrastructure. These impacts would only occur during construction and occasionally during maintenance events. The impacts during maintenance of the ongoing two-WTG CVOW-Pilot Project would be similar. The extent of impacts would depend on the locations of landfall and onshore transmission cable routes for future offshore wind energy projects; however, the No Action Alternative would generally have localized, short-term impacts during construction or maintenance and would not have long-term impacts on recreation and tourism use.

Lighting: Construction-related nighttime vessel lighting would be used if future offshore wind development projects include nighttime, dusk, or early morning construction or material transport. In a maximum-case scenario, lights could be active throughout nighttime hours for two future offshore wind projects (Kitty Hawk Offshore Wind Projects) in the geographic analysis area during the project's active construction phase. Vessel lighting would enable recreational boaters to safely avoid nighttime construction areas. The impact on recreational boaters would be localized, sporadic, short term, and minimized by the limited offshore recreational activities that occur at night.

Permanent aviation warning lighting required on the WTGs would be visible from beaches and coastlines in the geographic analysis area and could have impacts on recreation and tourism in certain locations if the lighting influences visitor decisions in selecting coastal locations to visit. FAA hazard lighting systems would be in use for the duration of O&M for up to 71 WTGs. The amassing of these WTGs and associated synchronized flashing strobe lights affixed with red flashing lights at the mid-section of each tower and one at the top of each WTG nacelle within the offshore wind lease areas would have long-term negligible to major impacts on sensitive onshore and offshore viewing locations, based on viewer distance and angle of view and assuming no obstructions. Atmospheric and environmental factors such as haze and fog would influence visibility and perception of hazard lighting from sensitive viewing locations (COP, Section 4.3.4.3; Dominion Energy 2023).

A University of Delaware study evaluating the impacts of visible offshore WTGs on beach use found that WTGs visible more than 15 miles from the viewer would have negligible impacts on businesses dependent on recreation and tourism activity (Parsons and Firestone 2018). The study participants viewed visual simulations of WTGs in clear, hazy, and nighttime conditions (without ADLS). A 2017 visual preference study conducted by North Carolina State University evaluated the impact of offshore wind facilities on vacation rental prices. The study found that nighttime views of aviation hazard lighting (without ADLS) for WTGs close to shore (5 to 8 miles [8 to 13 kilometers]) would adversely affect the rental price of properties with ocean views (Lutzeyer et al. 2017). It did not specifically address the relationship between lighting, nighttime views, and tourism for WTGs 15 or more miles (24.1 or more

kilometers) from shore. All of the WTG positions envisioned in the geographic analysis area would be more than 15 miles (24.1 kilometers) from coastal locations with views of the WTGs.

The Virginia and North Carolina shore are within the viewshed of the WTGs and have been extensively developed for recreation and tourism. Because of the high development density, existing nighttime lighting is prevalent. Elevated boardwalks, jetties, and seawalls afford greater visibility of offshore elements for viewers in tidal beach areas. Nighttime views toward the ocean from the beach and adjacent inland areas are diminished by ambient light levels and glare of shorefront developments. Visible aviation warning lighting would add a developed/industrial visual element to views that were previously characterized by dark, open ocean, broken only by transient lighted vessels and aircraft passing through the view.

In addition to recreational fishing, some recreational boating in the region involves whale watching and other wildlife-viewing activities. A 2013 BOEM study evaluated the impacts of WTG lighting on birds, bats, marine mammals, sea turtles, and fish. The study found that existing guidelines "appear to provide for the marking and lighting of [WTGs] that will pose minimal if any impacts on birds, bats, marine mammals, sea turtles or fish" (Orr et al. 2013). By extension, existing lighting guidelines or ADLS (if implemented) would impose a minimal impact on recreational fishing or wildlife viewing.

As a result, although lighting on WTGs would have a continuous, long-term, adverse impact on recreation and tourism, the impact in the geographic analysis area is likely to be limited to individual decisions by visitors to the Virginia and North Carolina shore and elevated areas, with less impact on the recreation and tourism industry as a whole.

The implementation of ADLS would activate the hazard lighting system in response to detection of nearby aircraft. The synchronized flashing of the navigational lights, if ADLS is implemented, would result in shorter-duration night sky impacts on the seascape, landscape, and viewers. The shorter-duration synchronized flashing of the ADLS is anticipated to have reduced visual impacts at night as compared to the standard continuous, medium-intensity red strobe FAA warning system due to the duration of activation. Based on historical air traffic data, activation of the ADLS, if implemented, would occur for about 25 hours and 33 minutes over a 1-year period, as compared to standard continuous FAA hazard lighting (COP, Appendix T; Dominion Energy 2023). It is anticipated that an ADLS-controlled obstruction lighting system could result in over a 99 percent reduction in system-activated duration as compared to a traditional always-on obstruction lighting system.

Cable emplacement and maintenance: Under the No Action Alternative, future offshore wind export cables from the Kitty Hawk Offshore Wind Projects could total approximately 453 miles (729 kilometers), while inter-array cables could total approximately 349 miles (562 kilometers) (Appendix F, Table F2-1). One existing offshore wind project (CVOW-Pilot Project) has approximately 24 miles (44.5 kilometers) of offshore export cable installed. Specific cable locations associated with future offshore wind projects are unknown and, therefore, have not been identified in the geographic analysis area. Cables for other future offshore wind projects would likely be emplaced in the geographic analysis area between 2024 and 2030. Based on the assumptions in Appendix F, these cables could affect up to 130,145[1] acres (52,667.8 hectares) (Appendix F, Table F2-2).

Offshore cable emplacement for future offshore wind development projects would have temporary, localized, adverse impacts on recreational boating while cables are being installed, because vessels would

[1] Kitty Hawk Wind South has three export cables (92 kilometers to Virginia, 322 kilometers to North Carolina, and an additional 154 kilometers of inshore export cable to North Carolina) for a total of 568 kilometers (352.9 miles), and corridor widths between 1,520-foot-wide corridor to Virginia and 1,000-foot-wide corridors to North Carolina to allow for optimal routing of the cables.

need to navigate around work areas, and recreational boaters would likely prefer to avoid the noise and disruption caused by installation. Cable installation could also have temporary impacts on fish and invertebrates of interest for recreational fishing, due to the required dredging, turbulence, and disturbance; however, species would recover upon completion (Section 3.13, *Finfish, Invertebrates, and Essential Fish Habitat*). The degree of temporal and geographic overlap of each cable is unknown, although cables for some projects could be installed simultaneously. Active work and restricted areas would only occur over the cable segment being emplaced at a given time. Once installed, cables would affect recreational boating only during maintenance operations, except that the mattresses covering cables in hard-bottom areas could hinder anchoring and result in gear entanglement or loss.

Impacts of cable emplacement and maintenance on recreational boating and tourism would be short term, continuous, adverse, and localized.

Noise: Noise from construction, pile driving, HRG survey activities, trenching, O&M, and vessels could result in adverse impacts on recreation and tourism.

Onshore construction noise from cable installation at the landfall sites, and inland if cable routes are near parkland, recreation areas, or other areas of public interest, would temporarily disturb the quiet enjoyment of the site (in locations where such quiet is an expected or typical condition). Similarly, offshore noise from HRG survey activities, pile driving, trenching, and construction-related vessels would intrude upon the natural sounds of the marine environment. This noise could cause some boaters to avoid areas of noise-generating activity, although some of the most intense noise could be within safety zones that USCG may establish for areas of active construction, which would be off-limits to boaters. Noise from pile driving is estimated to produce sound power levels of 87 dBA in-air at 400 feet (122 meters) (COP, Section 4.1.4.2; Dominion Energy 2023). BOEM conducted a qualitative analysis of impacts on recreational fisheries for the construction phases of offshore wind development in the Atlantic OCS region. Results showed the construction phase is expected to have a slightly negative to neutral impact on recreational fisheries due to both direct exclusion of fishing activities and displacement of mobile target species by the construction noise (Kirkpatrick et al. 2017).

During operations, the continuous noise generated by WTG operation is not expected to produce sound in excess of background levels at any onshore locations (COP, Section 4.1.4.2; Dominion Energy 2023). Accordingly, the impact of noise on recreation and tourism during construction would be adverse, intense, and disruptive, but short term and localized. Multiple construction projects at the same time would increase the number of locations in the geographic analysis area that experience noise disruptions. The impact of noise during O&M would be localized, continuous, and long term, with brief, more-intensive noise during occasional repair activities.

Adverse impacts of noise on recreation and tourism would also result from the adverse impacts on species important to recreational fishing and sightseeing in the lease areas and along cable routes, as discussed in Sections 3.9, *Commercial Fisheries and For-Hire Recreational Fishing,* 3.13, *Finfish, Invertebrates, and Essential Fish Habitat,* and 3.15, *Marine Mammals*. Because most recreational fishing takes place closer to shore than the Lease Area, only a small proportion of recreational fishing would be affected by construction in the Lease Area, where most of the noise impacts would occur. Recreational fishing such as for tuna, shark, and marlin is more likely to be affected, as these fisheries are farther offshore than most fisheries and, therefore, more likely to experience temporary impacts resulting from the noise generated by future offshore wind construction. Construction noise could contribute to temporary impacts on marine mammals, with resulting impacts on marine sightseeing that relies on the presence of mammals, primarily whales. However, as noted in Section 3.15, *Marine Mammals,* future projects are expected to comply with mitigation measures (e.g., exclusion zones, protected species observers) that would avoid and minimize underwater noise impacts on marine mammals.

Noise from operational WTGs would be expected to have little effect on finfish, invertebrates, and marine mammals and, therefore, little effect on recreational fishing or sightseeing.

Future offshore wind surveying and construction would occur in the geographic analysis area between 2024 and 2030. Future offshore wind construction would result in short-term, localized, adverse impacts on recreational fishing and marine sightseeing related to fish and marine mammal populations. Multiple construction projects would increase the spatial and temporal extent of temporary disturbance to marine species in the geographic analysis area. BOEM's assumed construction schedule for future offshore wind projects in Appendix F, Table F-3 indicates the possibility of two other wind projects under development in the Lease Area. As indicated in Appendix F, up to 190 offshore WTGs and three OSSs could be installed within a 6-year period in the Lease Area, not including the Proposed Action. No long-term, adverse impacts are anticipated that would result in population-level harm to fish and marine mammal populations.

Port utilization: The geographic analysis area for recreation and tourism contains the PMT and Newport News Marine Terminal, which would be used by the Proposed Action (COP, Section 3.3.2.6; Dominion Energy 2023). Areas outside the geographic analysis area for recreation and tourism that are likely to be used for staging and construction, such as the ports that would be used by the Proposed Action, may provide facilities for recreational vessels or may be on waterways shared with recreational marinas, and may experience increased activity and undergo expansion and dredging. The ports listed above and other regional ports suitable for staging and construction of future offshore wind development are primarily industrial in character, with recreational activity as a secondary use.

Port improvements could result in short-term delays and crowding during construction but could provide long-term benefits to recreational boating if the improvements result in increased berths and amenities for recreational vessels, or improved navigational channels.

Presence of structures: The placement of 190 WTGs and three OSSs in the Lease Area in the geographic analysis area would contribute to impacts on recreational fishing and boating. The offshore structures would have long-term, adverse impacts on recreational boating and fishing through the risk of allision; risk of gear entanglement, damage, or loss; navigational hazards; space use conflicts; presence of cable infrastructure; and visual impacts. However, future offshore wind structures could have beneficial impacts on recreation through fish aggregation and reef effects.

The WTGs and OSSs installed in the Wind Farm Area are expected to serve as additional artificial reef structures, providing additional locations for recreational for-hire fishing trips, potentially increasing the number of trips and revenue. The increased number of fishing trips out of nearby ports could also support increased angler expenditures at local bait shops, gas stations, and other shore-side dependents (COP, Sections 4.2.4.3, 4.4.11.2, and 4.4.6.3; Dominion Energy 2023).

The presence of future offshore wind structures would increase the risk of allision or collision with other vessels and the complexity of navigation in the Lease Area. Generally, the vessels more likely to allide with WTGs or OSSs would be smaller vessels moving within and near wind installations, such as recreational vessels. USCG would need to adjust its SAR planning and search patterns to allow aircraft to fly over the geographic analysis area, leading to a less-optimized search pattern and a lower probability of success, as described in greater detail in Section 3.17, *Other Uses (Marine Minerals, Military Use, Aviation).*

Future offshore wind development could require adjustment of routes for recreational boaters, anglers, sailboat races, and sightseeing boats, but the adverse impact of the future offshore wind structures on recreational boating would be limited by the distance of the wind turbines offshore. AIS data from 2018 show that there is typically very low recreational activity from craft/sailing vessels within and directly

adjacent to the Lease Area (COP, Section 4.4.7.1; Dominion Energy 2023). In addition, sailing in the geographic analysis area primarily occurs nearshore, just along the coastline, rather than farther offshore (COP, Section 4.4.11.1; Dominion Energy 2023).

The geographic analysis area would have an estimated 403 foundations with scour protection and 240 acres (97 hectares) of hard protection for export and inter-array cables, which results in an increased risk of entanglement (Appendix F, Table F2-2). The cable protection would also present a hazard for anchoring, as anchors could have difficulty holding or become snagged and lost. Accurate marine charts could make operators of recreational vessels aware of the locations of the cable protection and scour protection. If the hazards are not noted on charts, operators may lose anchors, leading to increased risks associated with drifting vessels that are not securely anchored. Lessees in the geographic analysis area continue to engage with both USCG and NOAA in developing a comprehensive aid to navigation plan for the entire Lease Area (COP, Section 4.4.7.1; Dominion Energy 2023). Buried offshore cables would not pose a risk for most recreational vessels, as smaller-vessel anchors would not penetrate to the target burial depth for the cables. Because anchoring is uncommon in water depths where the WTGs for future offshore wind projects excluding the proposed Project would be installed, anchoring risk is more likely to be an impact over export cables in shallower water closer to coastlines. The risk to recreational boating would be localized, continuous, and long term.

Future offshore wind structures could provide new opportunities for offshore tourism by attracting recreational fishing and sightseeing. The wind structures could produce artificial reef effects. The "reef effect" refers to the introduction of a new hard-bottom habitat that has been shown to attract numerous species of algae, shellfish, finfish, and sea turtles to new benthic habitat (COP, Sections 4.2.4.2, 4.4.11.2, and 4.4.6.3; Dominion Energy 2023). The reef effect could attract species of interest for recreational fishing and result in an increase in recreational boaters and sightseeing vessels traveling farther from shore to fish in the Lease Area. Although the likelihood of recreational vessels visiting the offshore WTG foundations would diminish with distance from shore, increasing numbers of offshore structures may encourage a greater volume of recreational vessels to travel to the offshore wind lease areas. Additional fishing and tourism activity generated by the presence of structures could also increase the likelihood of allisions and collisions involving recreational fishing or sightseeing vessels, as well as commercial fishing vessels (Section 3.9, *Commercial Fisheries and For-Hire Fishing*).

As it relates to the visual impacts of structures, the vertical presence of WTGs on the offshore horizon may affect recreational experience and tourism in the geographic analysis area. Section 3.20, *Scenic and Visual Resources*, describes the visual impacts from offshore wind infrastructure. If the purpose of the viewer's sightseeing excursion is to observe the mass and scale of the WTGs' offshore presence, then the increasing visual dominance would benefit the recreation/tourism experience as the viewer navigates toward the WTGs. However, if experiencing a vast pristine ocean condition is the purpose of the viewer's sightseeing excursion, then the increasing visual dominance may detract from the viewer's recreation/tourism experience.

Studies and surveys that have evaluated the impacts of offshore wind facilities on tourism found that established offshore wind facilities in Europe did not result in decreased tourist numbers, tourist experience, or tourist revenue, and that Block Island Wind Farm's WTGs provide excellent sites for fishing and shellfishing (Smythe et al. 2018). A survey-based study found that, for prospective offshore wind facilities (based on visual simulations), proximity of WTGs to shore is correlated to the share of respondents who would expect a worsened experience visiting the coast (Parsons and Firestone 2018).

- At 15 miles (24.1 kilometers), the percentage of respondents who reported that their beach experience would be worsened by the visibility of WTGs was about the same as the percentage of those who reported that their experience would be improved (e.g., by knowledge of the benefits of offshore wind).

- About 68 percent of respondents indicated that the visibility of WTGs would neither improve nor worsen their experience.
- Reported trip loss (respondents who stated that they would visit a different beach without offshore wind development) averaged 8 percent when wind projects were 12.5 miles (20 kilometers) offshore, 6 percent when 15 miles (24.1 kilometers) offshore, and 5 percent when 20 miles (32 kilometers) offshore.
- About 2.6 percent of respondents were more likely to visit a beach with visible offshore wind facilities at any distance.

A study focused on the changes to the vacation rental market after the construction of Block Island Wind Farm found that Block Island Wind Farm led to significantly increased nightly reservations, occupancy rates, and monthly revenues for properties in Block Island during peak tourism season in July and August (Carr-Harris and Lang 2019). The study estimates that the Block Island Wind Farm caused a 7-night increase in reservations, a 19 percent increase in occupancy rates, and a $3,490 increase in rental property revenue during July and August. Outside of peak tourism season, the Block Island Wind Farm did not have an impact on the vacation rental market.

However, a 2003 survey focused on tourists' feelings about potential offshore wind development in Cape Cod, Massachusetts found that, based on visual simulations of prospective offshore wind facilities, 3.2 percent of tourists said they would spend an average of 2.9 fewer days in Cape Cod, and a further 1.8 percent said they would not visit at all if the wind turbines were built (Haughton et al. 2003).

A 2019 survey of 553 coastal recreation users in New Hampshire included participants in water-based recreation activities such as fishing from shore and boats, motorized and non-motorized boating, beach activities, and surfing at the New Hampshire seacoast. Most (77 percent) supported offshore wind development along the New Hampshire coast, while 12 percent opposed it and 11 percent were neutral. Regarding the impact on their outdoor recreation experience, 43 percent anticipated that offshore wind development would have a beneficial impact, 31 percent anticipated a neutral impact, and 26 percent anticipated an adverse impact (BOEM 2021).

The wind turbines used for the visual simulations in the studies cited above used smaller WTGs than are proposed for the planned offshore wind projects in the region, including the Proposed Action. The studies cited in the Final EIS used 579-foot (176.5-meter) WTGs that would be visible out to 32.4 miles (52.1 kilometers). The 869-foot (265-meter) CVOW-C Project WTGs would be visible out to 39 miles (62.8 kilometers). Greater eye-level heights would increase the visible distance in both cases. Both the WTGs used in the studies and the WTGs proposed as part of the CVOW-C Project would have the WTG hubs, nacelles, navigation lights, and rotor blades visible to viewers on the nearest beach. The visibility of the WTGs would be variable, depending on current meteorological, moonlight, and sunlight conditions. In views seaward, there would be periods of high, moderate, low and no visibility. Therefore, in both the 2018 Parsons and Firestone studies and for the CVOW-C Project, the WTGs' hubs, nacelles, navigation lights, and rotor blades would be visible to viewers on the nearest beach. The taller CVOW-C Project WTGs would result in increased numbers of WTGs visible in the wind farm. Such additional WTGs would be seen as lower than or below the tops of the forward row of WTGs and would be increasingly obscured by those intervening in the view. The wind farm would be perceived as a mass of WTGs, rather than as individual WTGs.

As described under the IPF for light, the Virginia and North Carolina shore within the viewshed of the WTGs is highly developed. Public beaches and tourism attractions in this area are highly valued for scenic, historic, and recreational qualities and draw large numbers of daytime visitors during the summertime tourism seasons. When visible (i.e., on clear days, in locations with unobstructed ocean

views), WTGs would add a developed/industrial visual element to ocean views that were previously characterized by open ocean, broken only by transient vessels and aircraft passing through the view.

Based on currently available studies, portions of the 190 WTGs associated with the No Action Alternative could be visible from shorelines (depending on vegetation, topography, weather, atmospheric conditions, and the viewers' visual acuity). WTGs visible from some shoreline locations in the geographic analysis area would have adverse impacts on visual resources when discernable due to the introduction of industrial elements in previously undeveloped views. Based on the relationship between visual impacts and impacts on recreational experience, the impact of visible WTGs on recreation would be long term, continuous, and adverse. Seaside locations could experience some reduced recreational and tourism activity, but the visible presence of WTGs would be unlikely to affect shore-based or marine recreation and tourism in the geographic analysis area as a whole.

Traffic: Future offshore wind project construction and decommissioning and, to a lesser extent, future offshore wind project operation would generate increased vessel traffic that could inconvenience recreational vessel traffic in the geographic analysis area. The impacts would occur primarily during construction, along routes between ports and the future offshore wind construction areas.

Vessel traffic for two planned projects in the geographic analysis area (Kitty Hawk Offshore Wind Projects) is not known but is anticipated to be similar to that of the Proposed Action, which is projected to generate an average of 46 daily vessel trips between ports and offshore work areas over the entire construction phase and a maximum of 95 vessel trips daily during peak construction activity (COP, Section 3.4.1.5; Dominion Energy 2023). As shown in Appendix F, Table F-3, between 2024 and 2030 two offshore wind projects (not including the Proposed Action) could be under construction simultaneously (in 2024–2027). During such periods, assuming similar vessel counts as under the Proposed Action, construction of offshore wind projects would generate an average of 46 vessel trips daily from Atlantic Coast ports to worksites along the Virginia and North Carolina Lease Area, with as many as 95 vessels present (either underway or at anchor) during times of peak construction.

Establishment of two future offshore wind projects could occur in the Geographic Analysis Area between 2024 and 2030. O&M activities for the project are anticipated to generate an average of 46 vessel trips per day between a port and the Wind Farm Areas. Based on the estimates for the proposed projects, the cumulative No Action Alternative would generate an average of 46 vessel trips per day.

Increased vessel traffic would require increased alertness on the part of recreational or tourist-related vessels and would result in minor delays or route adjustments. The likelihood of vessel collisions would increase as a result of the higher volumes of vessel traffic during construction. The possibility of delays and risk of collisions would increase if more than one future offshore wind facility is under construction at the same time. Vessel traffic associated with future offshore wind would have long-term, variable, adverse impacts on vessel traffic related to recreation and tourism. Higher volumes during construction would result in greater inconvenience, disruption of the natural marine environment, and risk of collision. Vessel traffic during operations would represent only a modest increase in the background volumes of vessel traffic, with minimal impacts on recreational vessels.

3.18.3.3 Conclusions

Impacts of the No Action Alternative. Under the No Action Alternative, recreation and tourism would continue to be affected by existing environmental trends and ongoing activities. Ongoing activities are expected to have continuing temporary and permanent, **minor** impacts on recreation and tourism.

Cumulative impacts of the No Action Alternative. Under the No Action Alternative, existing environmental trends and ongoing activities would continue, and recreation and tourism would continue

to be affected by natural and human-caused IPFs. Planned activities would contribute to impacts on recreation and tourism due to noise, presence of structures, vessel traffic, and port utilization from increased onshore and offshore construction and operation.

BOEM expects ongoing activities, future non-offshore wind activities, and future offshore wind activities to have continuing impacts on recreation and tourism. BOEM anticipates that the impacts of ongoing activities, including ongoing vessel traffic and the noise and trenching from periodic maintenance or installation of piers, pilings, seawalls, or offshore cables, would be **negligible**. In addition to ongoing offshore wind activities, planned activities other than offshore wind may also contribute to impacts on recreation and tourism. Offshore activities other than offshore wind would have localized, temporary impacts on recreational boating and would not affect the area's scenic quality. BOEM anticipates that the impacts of planned activities other than offshore wind would be **minor**. BOEM expects the combination of ongoing and planned activities other than offshore wind to result in **minor** impacts on recreation and tourism, driven primarily by marine construction and dredging to install and maintain offshore cables, piers, seawalls, and harbors.

Considering all of the IPFs together, BOEM anticipates that the overall impacts associated with future offshore wind activities in the geographic analysis area combined with ongoing activities, reasonably foreseeable environmental trends, and planned activities other than offshore wind would result in **minor** adverse impacts and **minor beneficial** impacts. Future offshore wind activities are expected to contribute considerably to several IPFs, the most prominent being noise and vessel traffic during construction and the presence of offshore structures during operations. Noise and vessel traffic would have impacts on visitors, who may avoid onshore and offshore noise sources and vessels, and on recreational fishing and sightseeing as a result of the impacts on fish, invertebrates, and marine mammals. The long-term presence of offshore wind structures would result in increased navigational constraints and risks, potential entanglement and loss, and visual impacts from offshore structures. BOEM also anticipates that the future offshore wind activities in the geographic analysis area would result in **minor beneficial** impacts due to the presence of offshore structures and scour protection, which could provide opportunities for fishing and sightseeing.

3.18.4 Relevant Design Parameters and Potential Variances in Impacts

This EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than described in the sections below. The following proposed PDE parameters (Appendix E, *Project Design Envelope and Maximum-Case Scenario*) would influence the magnitude of the impacts on recreation and tourism.

- The Project layout including the number, type, height, and placement of the WTGs and OSSs, and the design and visibility of lighting on the structures.
- The arrangement of WTGs, as it affects accessibility of the Wind Farm Area to recreational boaters.
- The time of year during which onshore and nearshore construction occurs.

Variability of the proposed Project design exists as outlined in Appendix E, *Project Design Envelope and Maximum-Case Scenario*. Below is a summary of potential variances in impacts.

- **WTG number, size, location, and lighting:** More WTGs and larger, 16-MW turbines located within the Lease Area but closer to shore could increase visual impacts that affect onshore recreation and tourism, as well as recreational boaters. Arrangement and type of lighting systems would affect nighttime visibility of WTGs onshore.
- **WTG arrangement and orientation:** Different arrangements of WTG arrays may affect navigational patterns and safety of recreational boaters.

- **Time of construction:** Tourism and recreational activities in the geographic analysis area tend to be higher from May through September, and especially from June through August (Parsons and Firestone 2018). Impacts on recreation and tourism would be greater if Project construction were to occur during this season.

3.18.5 Impacts of the Proposed Action on Recreation and Tourism

The Proposed Action would have long-term, minor impacts on recreation and tourism in the geographic analysis area due to the visual impact of the up-to 202 WTGs from coastal locations and the greater navigational risks for recreational vessels in the Wind Farm Area. It would also have long-term, minor beneficial impacts due to the fish aggregation effects associated with the WTGs and OSSs, resulting in new fishing and sightseeing opportunities. The Proposed Action would have short-term, minor impacts during construction due to the temporary impacts of noise and vessel traffic on recreational vessel traffic, the natural environment, and species important for recreational fishing and sightseeing.

Anchoring: Anchoring by construction and maintenance vessels would contribute to disturbance of marine species and inconvenience recreational vessels that must navigate around the anchored vessels. The Proposed Action would generate an average of 46 daily vessel trips during the entire construction period and a maximum of 95 daily vessel trips during peak construction periods in the Wind Farm Area (COP, Section 3.4.1.5; Dominion Energy 2023). BOEM anticipates that USCG may establish temporary safety zones around offshore wind construction areas, which would minimize the potential for recreational boater interaction with anchored construction vessels in these areas. Vessel anchoring for construction of the Proposed Action would have localized, short-term, minor impacts on tourism and recreation due to the need to navigate around vessels and work areas and the disturbance of species important to recreational fishing (COP, Sections 4.2.4.3 and 4.4.9.2; Dominion Energy 2023).

Land disturbance: Onshore construction and installation of the export cables would affect recreation and tourism where construction activity interferes with access to recreation sites or increases traffic, noise, or temporary emissions that degrade the recreational experience.

The entirety of the 46.48 acres (18.8 hectare) footprint of the proposed Harpers Switching Station would overlap with the Aeropines Golf Club in Virginia Beach, Virginia. Within that footprint, the relocation of fairways and a maintenance building would occur on 6.1 acres (2.5 hectares). Construction of the switching station would result in a temporary disruption of access to these facilities until they are relocated. Another golf course, the Battlefield Golf Club, is adjacent to the existing Fentress Substation in Chesapeake, Virginia. Construction activities to upgrade the Fentress Substation may result in temporary impacts on the golf course, such as increases in traffic, noise, or temporary emissions; however, no long-term, permanent impacts on nearby recreational facilities are anticipated. Additionally, construction of the onshore interconnection cable along Dam Neck Road could result in temporary, construction-related impacts on the Princess Anne Athletic Complex in Virginia Beach, Virginia. Because the onshore interconnection cable corridor would use existing ROW to the maximum extent possible and the Princess Anne Athletic Complex is set off the road, long-term impacts are not anticipated.

As discussed in Section 3.11, *Demographics, Employment, and Economics*, the employment and economic impact would be localized, short term, and minor. As discussed in Section 3.14, *Land Use and Coastal Infrastructure*, technologies may be used to minimize impacts on land disturbance. Dominion Energy has committed to implementing a construction schedule to minimize activities in the onshore export cable route during the peak recreation and tourism season and to coordinate with local municipalities to minimize impacts on popular events in the area during construction, to the extent practicable (COP, Section 4.4.3.3; Dominion Energy 2023). These measures would minimize impacts on recreation and tourism from construction activities.

Light: When nighttime construction occurs, the vessel lighting for vessels traveling to and working at the Proposed Action's offshore construction areas may be visible from onshore locations depending on the distance from shore, vessel height, and atmospheric conditions. Visibility would be sporadic and variable. Although most construction is expected to occur during daylight hours, construction vessels would use work lights to improve visibility during night or poor visibility, in accordance with USCG requirements.

During operations, the Proposed Action would have a discrete contribution to nighttime visibility of the WTGs due to required aviation hazard lighting. FAA lighting from all of the Proposed Action's WTGs could be visible up to 36.2 miles away depending on weather and viewing conditions (COP, Section 4.3.4.3; Dominion Energy 2023). Dominion Energy has committed to implementing ADLS as an APM that would activate the Proposed Action's WTG lighting only when aircraft approach the WTGs (COP, Section 4.3.4.3; Dominion Energy 2023). The implementation of ADLS would reduce the duration of the potential impacts of nighttime aviation lighting to less than 1 percent of the normal operating time that would occur without using ADLS. During times when the Proposed Action's aviation warning lighting is visible, this lighting would add a developed/industrial visual element to views that were previously characterized by dark, open ocean. Due to the limited duration and frequency of such events and the distance of the Proposed Action's WTGs from shore, visible aviation hazard lighting for the Proposed Action would result in a long-term, intermittent, negligible impact on recreation and tourism. Onshore, Dominion Energy would implement lighting-reduction measures, such as downward projecting lights, lights triggered by motion sensors, and limiting artificial light to the extent practicable (COP, Section 4.2.2.3; Dominion Energy 2023).

New cable emplacement and maintenance: The Proposed Action's cable emplacement would generate vessel anchoring and dredging at the worksite, requiring recreational vessels to avoid and navigate around the worksites and resulting in short-term disturbance to species important to recreation and tourism. The Proposed Action would require up to 416.9 miles (671 kilometers) of total length of offshore export cables and up to 300 miles (484 kilometers) total length of inter-array cables (COP, Section 1.2, Table 1.2-1; Dominion Energy 2023). Array cable installation would require a maximum of 10 vessels (three main laying, two burial, four support vessels, and one post-installation survey vessel) (COP, Section 3.4.1.5; Dominion Energy 2023). Offshore export cable installation would require a maximum of 11 vessels (three main laying, three main cable jointing, three burial, and two support vessels) (COP, Section 3.4.1.5; Dominion Energy 2023). Recreational vessels traveling near the offshore export cable routes would need to navigate around vessels and access-restricted areas associated with the offshore export cable installation. Dominion Energy has committed to coordinate with USCG through the use of Local Notices to Mariners to communicate with recreational fishers, among others, of construction and maintenance activities and vessel movements, which would minimize potential adverse impacts associated with cable emplacement and maintenance activity (COP, Section 4.4.7.3; Dominion Energy 2023). The localized, temporary need for changes in navigation routes due to Proposed Action construction would constitute a minor impact.

Cable installation could also affect species of interest for recreational fishing and sightseeing through turbidity resulting from cable installation, although species would recover upon completion (Sections 3.19, *Sea Turtles*, and 3.16, *Navigation and Vessel Traffic*), resulting in localized, short-term, minor impacts on recreation and tourism (COP, Sections 4.2.4.3, 4.2.5.2, and 4.4.6.3; Dominion Energy 2023).

Specific cable locations associated with future offshore wind projects have not been identified in the geographic analysis area. In context of reasonably foreseeable environmental trends, the contribution of the Proposed Action to the impacts of cable emplacement and maintenance on recreational marine activities from ongoing and planned activities would likely be short term and minor.

Noise: Noise from O&M, pile driving, trenching, and vessels could result in impacts on recreation and tourism. Temporary impacts on recreation and tourism would result from impacts in the Wind Farm Area

and along the offshore export cable route on species important to recreational fishing and marine sightseeing (COP, Sections 4.4.5.2, 4.1.5.3 and 4.2.4.3; Dominion Energy 2023). The temporary behavioral disruptions of offshore fish, shellfish, and whales due to startle responses or avoidance of the ensonified area during construction (Sections 3.13, *Finfish, Invertebrates, and Essential Fish Habitat*, and 3.15, *Marine Mammals*) would have a minor impact on recreational fishing or marine sightseeing.

In addition to the temporary disruption to fish and shellfish, noise generated by offshore construction and onshore cable installation would have impacts on the recreational enjoyment of the marine and coastal environments, with minor impacts on recreation and tourism. Offshore construction noise would occur from vessels, trenching, and pile driving along the offshore export cable route and in the Wind Farm Area. Noise from pile driving is estimated to produce sound power levels of 87 dBA in-air at 400 feet (122 meters) (COP, Section 4.1.4.2; Dominion Energy 2023). Where areas within or near the offshore export cable route and Wind Farm Area are available for recreational boating during construction, increased noise from construction would temporarily inconvenience recreational boaters.

Overall, construction noise from the Proposed Action alone would have localized, short-term, minor impacts on recreation and tourism. Offshore operational noise from the WTGs would be similar to the noise described for other projects under the No Action Alternative and would, therefore, have continuous, long-term, negligible impacts.

Port utilization: Within the geographic analysis area, the Proposed Action would use facilities at PMT and Newport News Marine Terminal to support the staging of components and construction vessels for the Project. Planned upgrades to the PMT will derive from roughly $8 billion of direct investment by Dominion Energy and a contribution of up to a $40 million from the Commonwealth of Virginia for site improvement and readiness (Chapter 2, *Proposed Action and Alternatives*; COP, Section 4.4.1.2; Dominion Energy 2023). Increased vessel traffic and construction activity during upgrades at PMT and Newport News Marine Terminal may result in short-term delays and crowding during construction. The Proposed Action would have a short-term, negligible impact on recreation and tourism due to port utilization within the geographic analysis area.

Presence of structures: The Proposed Action's up-to 202 WTGs and three OSSs would affect recreation and tourism through increased navigational complexity; risk of allision or collision; attraction of recreational vessels to offshore wind structures for fishing and sightseeing; the adjustment of vessel routes used for sightseeing and recreational fishing; the risk of fishing gear loss or damage by entanglement due to scour or cable protection; and potential difficulties in anchoring over scour or cable protection.

Construction and installation, expected to begin in 2023 and be completed in 2027, would affect recreational boaters. Risk of allision with anchored vessels would increase incrementally during construction, because more anchored vessels would be in the geographic analysis area (Appendix F, Table F-3). Dominion Energy has committed to marking potential hazards in coordination with USCG, developing Local Notices to Mariners that would include locations of partially installed structures, and advising mariners of safety zones around all Offshore Project components, which would minimize potential adverse impacts associated with structure construction activities (COP, Section 4.4.7.2; Dominion Energy 2023). AIS data from 2019 show that there is typically very low recreational activity from craft/sailing vessels within and directly adjacent to the Lease Area (COP, Section 4.4.7.1; Dominion Energy 2023). In addition, sailing in the geographic analysis area primarily occurs nearshore, just along the coastline, rather than farther offshore (COP, Section 4.4.11.1; Dominion Energy 2023). Impacts would be mitigated through the use of navigation-related measures.

During O&M of the Proposed Action, the permanent presence of WTGs would create obstacles for recreational vessels. At their lowest point, WTG blade tips would be 82 feet (24 meters) above the surface (COP, Table 3.3-1; Dominion Energy 2023). At this height, larger sailboats would need to navigate

around the Wind Farm Area, while smaller vessels could navigate unobstructed (except for the WTG monopiles).

Outside of avoiding certain operations during the construction phase, there are no planned or enforceable restrictions to vessels operating in the Wind Farm Area. USCG would need to adjust its SAR planning and search patterns to allow aircraft to fly within the geographic analysis area, leading to a less-optimized search pattern and a lower probability of success. Between 2010 and 2019, 18 SAR incidents were recorded in the geographic analysis area: 14 involved material failure or malfunction while three involved injury to personnel. Also during this time were 26 SAR incidents in the export cable geographic analysis area: 10 involved material failure or malfunction and five involved personnel injury, four of which were considered serious incidents (COP, Appendix S, Section 9.1.2; Dominion Energy 2023).

Recreational anglers may avoid fishing in the Wind Farm Area due to concerns about their ability to safely fish within or navigate through the area. Navigational hazards and scour/cable protection due to the presence of structures from ongoing and planned activities, including the Proposed Action, would result in major adverse impacts on commercial fisheries and moderate adverse impacts on for-hire recreational fishing; minimal beneficial impacts on for-hire recreational fishing due to the artificial reef effect may be long term. BOEM does not anticipate that fish aggregation due to the presence of structures would result in considerable changes in fish distributions across the geographic analysis area. For-hire fishing operations are part of the recreation and tourism industry and are included in the impacts on recreational boating and fishing anticipated in this section. The detailed discussion of impacts on for-hire fishing activities provided in Section 3.9, *Commercial Fisheries and For-Hire Recreational Fishing*, may also be applicable to impacts on recreational fishing in general. Overall, the impacts on recreational fishing, boating, and sailing generally would be negligible, while the impacts on for-hire fishing would be minor because these enterprises are more likely to be materially affected by displacement.

Although some recreational anglers would avoid the Wind Farm Area, the scour protection around the WTG foundations would likely attract forage fish and game fish, which could provide new opportunities for certain recreational anglers. Evidence from Block Island Wind Farm indicates an increase in recreational fishing near the WTGs (Smythe et al. 2018). The fish aggregation and reef effects of the Proposed Action could also create foraging opportunities for marine species and mammals, such as seals and harbor porpoises, possibly attracting recreational boaters and sightseeing vessels (Glarou et al. 2020). In addition, future offshore wind development could attract sightseeing boats offering tours of the wind facilities. Based on the impacts of the WTGs and OSSs on navigation and fishing, the potential reef effects of these structures, and the risks to anchoring and gear loss associated with scour or cable protection, the Proposed Action would have long-term, continuous, minor beneficial and minor adverse impacts on recreation and tourism (COP, Sections 4.2.5.2, 4.4.11.2, and 4.4.6.3; Dominion Energy 2023).

Structures from other planned offshore wind development would generate comparable types of impacts as the Proposed Action alone. The geographic extent of impacts would increase as additional offshore wind projects are constructed, but the level of impacts would likely be the same: minor adverse impacts on recreational fishing, recreational sailing and boating, and for-hire recreational fishing, as well as minor beneficial impacts. A lack of a common turbine spacing and layout throughout all wind projects within the geographic analysis area could make it more difficult for SAR aircraft to perform operations in the Lease Area. In context of reasonably foreseeable environmental trends, the contribution of the Proposed Action to the impacts of offshore structures on marine recreational activities from ongoing and planned activities would be minor due to the increased number of offshore structures and reduction of SAR capacity based on the layout of the WTG and OSSs, and minor beneficial impacts would occur due to the opportunity for fishing and sightseeing provided by WTGs.

As it relates to visual impacts of presence of structures, the Proposed Action's 202 WTGs would also affect recreation and tourism through visual impacts. During construction, viewers in certain locations

along the Virginia and North Carolina shore would see increased vessel traffic transporting components from fabrication and manufacturing facilities to the Project area. Vessel traffic is commensurate along the Atlantic Coast and vessel use for construction would be similar to existing vessel traffic in the area. Based on the duration of construction activity, visual contrast associated with construction of the Proposed Action would have a temporary, negligible impact on recreation and tourism.

The WTGs would be in open ocean approximately 27 statute miles east of Virginia Beach. The maximum-case WTGs would have a height of 869 feet (265 meters) at the tip of the rotor blade, a hub height at 489 feet (149 meters) (COP, Appendix I-1, Figure I-1-2 and Section I-1.2.3; Dominion Energy 2023). At 31 miles (49.9 kilometers), the tip of the rotor blade (in the upright position) would be above the horizon line (COP, Appendix I-1, Section I-1.4.1; Dominion Energy 2023). Between 28.1 and 35.8 miles, only the WTG blades would be potentially visible above the horizon from the perspective of a beach-elevation viewer (COP, Appendix I-1, Section I-1.4.1, Figure I-1-7; Dominion Energy 2023). Dominion Energy has voluntarily committed to using ADLS and non-reflective pure white (RAL Number 9010) or light gray (RAL Number 7035) paint colors as described in Appendix I, *Environmental and Physical Settings*, to reduce impacts. Additionally, the lower sections of each WTG would be marked with high-visibility (RAL Number 1023) yellow paint from the water line to a minimum height of 50 feet (15 meters) (COP, Appendix I-1, Section I-1.2.3; Dominion Energy 2023).

The visual impact of future offshore wind structures could affect recreation and tourism. The visual contrast created by the WTGs could have a beneficial, adverse, or neutral impact on the quality of the recreation and tourism experience depending on the viewer's orientation, activity, and purpose for visiting the area. As discussed in Section 3.20, *Scenic and Visual Resources*, the magnitude of impact is defined by the contrast, scale of the change, prominence, field of view (FOV), viewer experience, geographical extent, and duration, correlated against the sensitivity of the receptor, as simulated from onshore KOPs. The seascape character units, open ocean character unit, landscape character unit, and viewer experiences would be affected during construction, O&M, and decommissioning by the Project's features, applicable distances, horizontal and vertical FOV extents, view framing or intervening foregrounds, and form, line, color, and texture contrasts, scale of change, and prominence. These assessments are in Appendix M.

BOEM expects the impact of visible WTGs on the use and enjoyment of recreation and tourist facilities and activities during O&M of the Proposed Action to be long term, continuous, and minor. Beaches with views of WTGs could gain trips from the estimated 2.5 percent of beach visitors for whom viewing the WTGs would be a positive result, offsetting some lost trips from visitors who consider views of WTGs to be negative (Parsons and Firestone 2018).

Portions of 392 WTGs from the Proposed Action combined with future offshore wind projects could be visible from coastal and elevated locations in the geographic analysis area. The simulations prepared by Dominion Energy show anticipated views in clear conditions of future offshore wind projects associated with the No Action Alternative combined with the Proposed Action (COP, Appendix I, Attachment I-1-5; Dominion Energy 2023). The WTGs would be discernable on a clear day, with the color and irregular forms of the WTGs contrasting with the uninterrupted horizontal horizon line associated with the open ocean. As shown in the simulations, the Proposed Action WTGs would contribute the most from the closest locations, such as Virginia Beach. Atmospheric conditions could limit the number of WTGs discernable during daylight hours for a significant portion of the year (COP, Appendix I, Section I-1.4.1; Dominion Energy 2023).

Traffic: The Proposed Action would contribute to increased vessel traffic and associated vessel collision risk, primarily during Project construction and decommissioning, along routes between ports and the offshore construction areas. The Proposed Action would generate an average of 46 and a maximum of 95 vessel trips during the construction period (COP, Section 3.4.1.5; Dominion Energy 2023).

Recreational vessels may experience delays within the ports serving construction (outside the geographic analysis area), but most recreational boaters in the geographic analysis area would experience only minor inconvenience from construction-related vessel traffic. Vessel travel requiring a specific route that crosses or approaches the offshore export cable routes could experience minor impacts (COP, Section 4.4.7.2; Dominion Energy 2023).

For regularly scheduled maintenance and inspections, Dominion Energy anticipates that, on average, the Proposed Action would generate approximately 46 trips daily. Operation of the Proposed Action would have localized, long-term, intermittent, minor impacts on recreational vessel traffic near ports and in open waters due to the periodic and limited nature of regularly scheduled maintenance. Impacts during decommissioning would be similar to the impacts during construction and installation.

Activities requiring repair of WTGs, equipment or cables, or spills from maintenance or repair vessels would generally require intense, temporary activity to address emergency conditions or respond to an oil spill. Non-routine activities could temporarily prevent or deter recreation or tourist activities near the site of a given non-routine event. With implementation of the navigation-related APMs, the impacts of non-routine activities on recreation and tourism would be minor.

3.18.5.1 Cumulative Impacts of the Proposed Action

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

The contribution of the Proposed Action to the anchoring impacts on recreational boating from ongoing and planned activities would likely be localized, short term, and minor during the period in which offshore wind projects are being constructed in the geographic analysis area. A greater number of vessels would be anchored when multiple offshore wind projects are under construction at one time within the Lease Area, potentially resulting in minor impacts.

The exact extent of land disturbance associated with other projects would depend on the locations of landfall, onshore transmission cable routes, and onshore substations for future offshore wind energy projects. Therefore, in context of reasonably foreseeable environmental trends, the contribution of the Proposed Action to the combined land disturbance impacts on recreation and tourism from ongoing and planned activities would be localized, short term, and minor, as impacts are expected to be similar to those of other common construction projects.

Future offshore wind projects could cause aviation hazard lighting from 190 additional WTGs (392 total WTGs, including the Proposed Action) to be potentially visible in the geographic analysis area. Without the use of ADLS, lighting from future offshore wind projects other than the Proposed Action would include red flashing lights on top of WTG nacelles and at the midpoint of WTG towers. In context of reasonably foreseeable environmental trends, ADLS would reduce the nighttime impact significance from minor to negligible due to substantially limited hours of lighting (COP, Section 4.3.4.3; Dominion Energy 2023).

In context of reasonably foreseeable environmental trends, the contribution of the Proposed Action to the noise impacts on marine recreational activities from ongoing and planned activities would likely be localized, short term, and minor during construction, and long term and negligible during operation.

In context of reasonably foreseeable environmental trends, the contribution of the Proposed Action to port utilization impacts on recreation and tourism from ongoing and planned activities would be negligible.

The combined visual impacts on recreation and tourism from ongoing and planned activities, including the Proposed Action, would likely be continuous, long term, and minor in the overall geographic analysis

area, with minor impacts on the closest locations. Impacts would be reduced when atmospheric conditions limit the number of WTGs discernable from any one viewing location.

The Proposed Action is anticipated to be under construction concurrently with two other projects: Kitty Hawk Offshore Wind North and South, OCS-A 0508. During anticipated concurrent construction periods, construction vessel traffic would increase between the proposed ports and the Lease Areas or cable installation work areas associated with each wind project, requiring increased alertness on the part of recreational or tourist-related vessels, and possibly resulting in a greater number of minor delays or route adjustments. The risk of vessel collisions would increase as a result of the higher volumes of vessel traffic during construction. Modest levels of vessel traffic are anticipated from offshore wind operations (COP, Section 4.4.7.2; Dominion Energy 2023). In context of reasonably foreseeable environmental trends, combined vessel traffic impacts on recreation and tourism from ongoing and planned activities, including the Proposed Action, would be short term, variable, and minor during construction and long term, intermittent, localized, and negligible during operations.

3.18.5.2 Conclusions

Impacts of the Proposed Action. In summary, the impacts resulting from individual IPFs associated with the Proposed Action alone would range from **negligible** to **minor** and **negligible** to **minor beneficial**. Impacts would result from short-term impacts during construction: noise, anchored vessels, and hindrances to navigation from the installation of the export cable and WTGs; and the long-term presence of scour protection and structures in the Wind Farm Area during operations, with resulting impacts on recreational vessel navigation and visual quality. Beneficial impacts would result from the reef effect and sightseeing attraction of offshore wind energy structures.

Cumulative impacts of the Proposed Action. In context of other reasonably foreseeable environmental trends in the area, the contribution of the Proposed Action to the impacts of individual IPFs resulting from ongoing and planned activities would range from **negligible** to **minor** with **negligible** to **minor beneficial** impacts. Considering all of the IPFs together, BOEM anticipates that the contribution of the Proposed Action to the impacts associated with ongoing and planned activities would result in **minor** impacts with **minor beneficial** impacts. The main drivers for this impact rating are the minor visual impacts associated with the presence of structures and lighting; impacts on fishing and other recreational activity from noise, vessel traffic, and cable emplacement during construction; and beneficial impacts on fishing from the reef effect.

3.18.6 Impacts of Alternatives B and C on Recreation and Tourism

BOEM identified a combination of Alternative B (Revised Layout to Accommodate the Fish Haven Area and Navigation) and Alternative D-1 (Interconnection Cable Route Option 1) as the Preferred Alternative. The analysis of the impacts of the Preferred Alternative would be the same as that for Alternative B, as described in this section.

Impacts of Alternatives B and C. The impacts of Alternatives B and C on recreation and tourism would be the same as those of the Proposed Action except for the impact of the presence of structures. The impacts resulting from individual IPFs associated with construction and installation, O&M, and decommissioning of the Project under Alternatives B and C would be similar to those described under the Proposed Action. Construction of Alternative B or C would install fewer WTGs—up to 176 WTGs (inclusive of three spare WTG positions)—and construction of Alternative C would install up to 172 WTGs (inclusive of two spare WTG positions) and their associated inter-array cables, which would reduce the construction impact footprint and installation period. Turbine sizes under Alternatives B and C would also be reduced by using only 14-MW WTGs, whereas the Proposed Action would allow for up to 16-MW WTGs. Alternatives B and C would also align the three OSSs with the common grid layout of the

WTGs, similar to the Proposed Action. Lastly, Alternative C would also allow for the removal of four WTGs within priority sand ridge habitat as well as the relocation of one WTG and associated inter-array cables. The removal and relocation of these WTGs would allow for a reconfiguration of inter-array cabling to minimize linear seafloor impacts on priority sand ridge habitat. All other design parameters and potential variability in the design would be the same as under the Proposed Action.

The removal of structures under Alternative B to avoid the Fish Haven area and under Alternative C to further avoid priority sand ridge habitats would decrease the risk of recreational or commercial fishing gear loss or damage due to entanglement on the scour protection and inter-array and export cable hard protection. Navigation would also be improved and the risk of allisions or collisions with other vessels would be reduced by aligning the three OSSs with the common grid layout of WTGs. Though minimized, the risk of allision and collisions would still exist under Alternatives B and C and could discourage recreational boaters traveling to and through the Wind Farm Area.

The exclusion zone would minimize impacts on commercial and recreational fisheries resources in the area. Fishing activities could continue, and mobile target species would be less likely to be displaced by construction noise and presence of structures. However, recreational fishing could see a slight decrease in fish due to fewer structures providing reef habitat for targeted species.

Construction of fewer WTGs proposed under Alternatives B and C would result in fewer vessels and vessel trips during construction as compared to the Proposed Action, which would reduce the risk of discharges, fuel spills, and trash in the area and decrease the risk of collision with marine mammals and sea turtles (Sections 3.15, *Marine Mammals*, and 3.19, *Sea Turtles*).

Alternative C's avoidance of priority sand ridge habitats in the southern portion of the Lease Area would protect soft-bottom habitat and benthic species of interest from disturbance, injury, or mortality; reduce changes in water quality; and reduce underwater noise and vibration during construction. Alternative C would also avoid shipwrecks, which may be of interest to recreational divers.

The removal of 29 WTGs for Alternative B and 33 WTGs for Alternative C would result in negligible impacts on the viewshed from the shore when compared to the Proposed Action. As described in Section 3.20, *Scenic and Visual Resources*, the visual differences between the WTG array of Alternatives B and C and the Proposed Action WTG array would not be noticeable to the casual viewer standing on the Virginia Beach oceanfront and would not have a substantive effect on recreation and tourism.

Cumulative impacts of Alternatives B and C. In context of reasonably foreseeable environmental trends, the contribution of Alternatives B and C to the impacts from ongoing and planned activities would be the same as under the Proposed Action.

3.18.6.1 Conclusions

Impacts of Alternatives B and C. Alternatives B and C would reduce the overall offshore footprint of the Project. Alternatives B and C would remove WTG positions without relocation and reduce turbine sizes, slightly reducing the visual impact of WTGs and reducing the impacts associated with construction and installation, O&M, and decommissioning. Alternatives B and C would also exclude the Fish Haven area in the northern portion of the Lease Area to reduce impacts on fisheries resources. Alternative C would avoid complex habitat through micrositing and relocation and removal of structures. Accordingly, the impacts resulting from individual IPFs associated with Alternatives B and C would be reduced in comparison to the impacts associated with the Proposed Action but would not change the overall impact magnitudes, which are anticipated to be short term and range from **negligible** to **minor** and **negligible** to **minor beneficial** on recreation and tourism.

Cumulative impacts of Alternatives B and C. In context of reasonably foreseeable environmental trends, the contribution of Alternatives B and C to the impacts from ongoing and planned activities would be the same as under the Proposed Action: **negligible** to **minor** adverse impacts with **negligible** to **minor beneficial** impacts.

3.18.7 Impacts of Alternative D on Recreation and Tourism

Impacts of Alternative D. Alternative D would have the same number of WTGs and the same offshore cable route as the Proposed Action and, therefore, the same anticipated impacts on offshore recreation and tourism. Alternative D has two potential cable routes. Under Alternative D, BOEM would approve only Interconnection Cable Route Option 1 (Alternative D-1) or Hybrid Interconnection Cable Route Option 6 (Alternative D-2). Alternative D-2 would follow the same route as Interconnection Cable Route Option 6, except for the switching station. Alternative D-1 would be installed entirely overhead. The overall length of Alternative D-1 and Alternative D-2 would be the same (14.3 miles [23.0 kilometers]). However, portions of Alternative D-2 would be installed via underground methods, while Alternative D-1 would be installed entirely overhead.

The Chicory Switching Station associated with Alternative D-2, Interconnection Cable Route Option 6, would cover a larger operational footprint than the Harpers Switching Station; however, this is not anticipated to result in additional impacts on recreation and tourism. Trenching required for underground installation of portions of the interconnection cable route under Alternative D-2 may have potential short-term implications for recreational beach users, such as temporary beach closures. No long-term implications are anticipated. Therefore, land disturbance and visual impacts associated with recreational activities and tourism from interconnection cable construction and operation would be slightly less under Alternative D in comparison to the Proposed Action. Overall, the differences in impacts on recreation and tourism between Alternative D and the Proposed Action would be negligible.

Cumulative impacts of Alternative D. In context of reasonably foreseeable environmental trends, the contribution of Alternative D to the impacts of ongoing and planned activities would not be materially different from those described under the Proposed Action.

3.18.7.1 Conclusions

Impacts of Alternative D. No long-term implications are anticipated. Therefore, land disturbance and visual impacts associated with recreational activities and tourism from interconnection cable construction and operation would be slightly less under Alternative D in comparison to the Proposed Action. Overall, the differences in impacts on recreation and tourism between Alternative D and the Proposed Action would be negligible.

Cumulative impacts of Alternative D. In context of reasonably foreseeable environmental trends, the contribution of Alternative D to the impacts resulting from individual IPFs associated with ongoing and planned activities would be the same as the Proposed Action: short-term impacts ranging from **negligible** to **minor** adverse impacts and **negligible** to **minor beneficial** impacts. The overall impacts of Alternative D combined with ongoing and planned activities on recreation and tourism would be the same as the Proposed Action: **negligible** to **minor** adverse impacts and **negligible** to **minor beneficial** impacts.

3.18.8 Agency-Required Mitigation Measures

The mitigation measure listed in Table 3.18-2 is recommended for inclusion in the Preferred Alternative.

Table 3.18-2 Additional Agency-Required Measures: Recreation and Tourism[1]

Measure	Description	Effect
Lighting	Dominion Energy will comply with BOEM's detailed Lighting and Marking Guidelines and NPS sustainable lighting best practices.	Compliance with BOEM's lighting and marking guidelines and NPS sustainable lighting best practices could reduce the impact of the Proposed Action on onshore parks and wildlife refuges where nighttime dark sky is a defining characteristic.

[1] Also Identified in Appendix H, Table H-3.

3.18.8.1 Effect of Measures Incorporated into the Preferred Alternative

No mitigation measures for recreation and tourism are required through completed consultations, authorizations, or permits as listed Appendix H, *Mitigation and Monitoring*, Table H-2. BOEM has identified the following additional mitigation measure in Table 3.18-2 and Appendix H, Table H-3 as incorporated in the Preferred Alternative: Lighting. If adopted, this mitigation measure would require Dominion Energy to comply with BOEM's detailed Lighting and Marking Guidelines and NPS sustainable lighting best practices. This mitigation measure has the potential to reduce impacts described under the Light IPF for the Proposed Action. If implemented, this mitigation measure could reduce the impact of WTG lighting on onshore parks and wildlife refuges where nighttime dark sky is a defining characteristic of the park and would be distributed by the Proposed Action.

3.19 Sea Turtles

This section discusses potential impacts on sea turtles likely to be present in the proposed Project area resulting from the Proposed Action, alternatives, and ongoing and planned activities in the sea turtle geographic analysis area. The sea turtle geographic analysis area, as shown on Figure 3.19-1, encompasses two LMEs, namely the Northeast U.S. OCS and Southeast U.S. OCS LMEs. These LMEs capture most of the movement range of sea turtles within the U.S. Atlantic Ocean waters. Due to the large size of the geographic analysis area, analysis in this EIS focuses on sea turtles that would likely occur in the proposed Project area and be affected by Project activities. The geographic analysis area does not include all areas that could be transited by Project vessels (e.g., it does not consider vessel transits from Europe).

3.19.1 Description of the Affected Environment for Sea Turtles

This section discusses potential impacts on sea turtle species from the proposed Project, alternatives, and ongoing and planned activities in the sea turtle geographic analysis area as described in Appendix F, *Planned Activities Scenario*, Table F-1, and shown on Figure 3.19-1. The geographic analysis area for sea turtles includes LMEs along the Northeast and Southeast Atlantic OCS that capture the majority of habitats in the United States and movement for sea turtle species.

This section also summarizes information on sea turtles occurring offshore Virginia that is provided in the COP (Section 4.2.6, Appendix R, Table 4.2-26, Figure 4.2-37; Dominion Energy 2023) as well as BOEM wind project documents (e.g., BOEM 2012, 2014), the *Biological Assessment for Data Collection and Site Survey Activities for Renewable Energy on the Atlantic Outer Continental Shelf* (Baker and Howsen 2021), the Ocean Biodiversity Information System (OBIS 2021), and the most recent recovery plans and 5-year reviews available for each species. The CVOW-C COP (Dominion Energy 2023) Section 4.2.6.1 provides detailed descriptions of sea turtle occurrence, ecology, and distribution within the Project area; these sections may be incorporated by reference within this analysis or summarized, as applicable, for the effects determinations presented in the EIS. Information applicable to the analysis but not included in the COP is also provided in this section.

Five sea turtle species have reported occurrences along the East Coast in both coastal and offshore waters. They are the loggerhead sea turtle (*Caretta caretta*), leatherback sea turtle (*Dermochelys coriacea*), green sea turtle (*Chelonia mydas*), Kemp's ridley sea turtle (*Lepidochelys kempii*), and hawksbill sea turtle (*Eretmochelys imbricata*). All five species are listed as either threatened or endangered under the Endangered Species Act and are also identified as threatened or endangered by Virginia Department of Wildlife Resources (2021a).

Except for the polar regions, sea turtles occupy all oceans, with higher densities and most nesting occurring in tropical and subtropical seas and foraging well into temperate regions. Sea turtles can remain underwater for extended periods, which allows them to spend as little as 3 to 6 percent of their time at the water surface (Lutcavage et al. 1997; NSF and USGS 2011). However, sea turtles may remain at the surface for long periods of time resting or basking. Freitas et al. (2019) found that tagged juvenile loggerhead sea turtles spent roughly one third of the time at the surface (0 to 3 feet [0 to 1 meter] deep), specifically, spending 43 percent of the time at the surface during the day and 29 percent of the time during the night. Therefore, while sea turtles have the capability for spending long periods submerged, dive patterns will vary with activity, temperature, life stage, and environment. Sea turtles in the Atlantic often travel long distances between temperate foraging areas, offshore nursery areas, and tropical or sub-tropical nesting beaches (Cailouet et al. 2020; Evans et al. 2019; Mansfield et al. 2021; Meylan 1995; Patel et al. 2021), making them a common fauna group found in offshore and nearshore environments of Virginia.

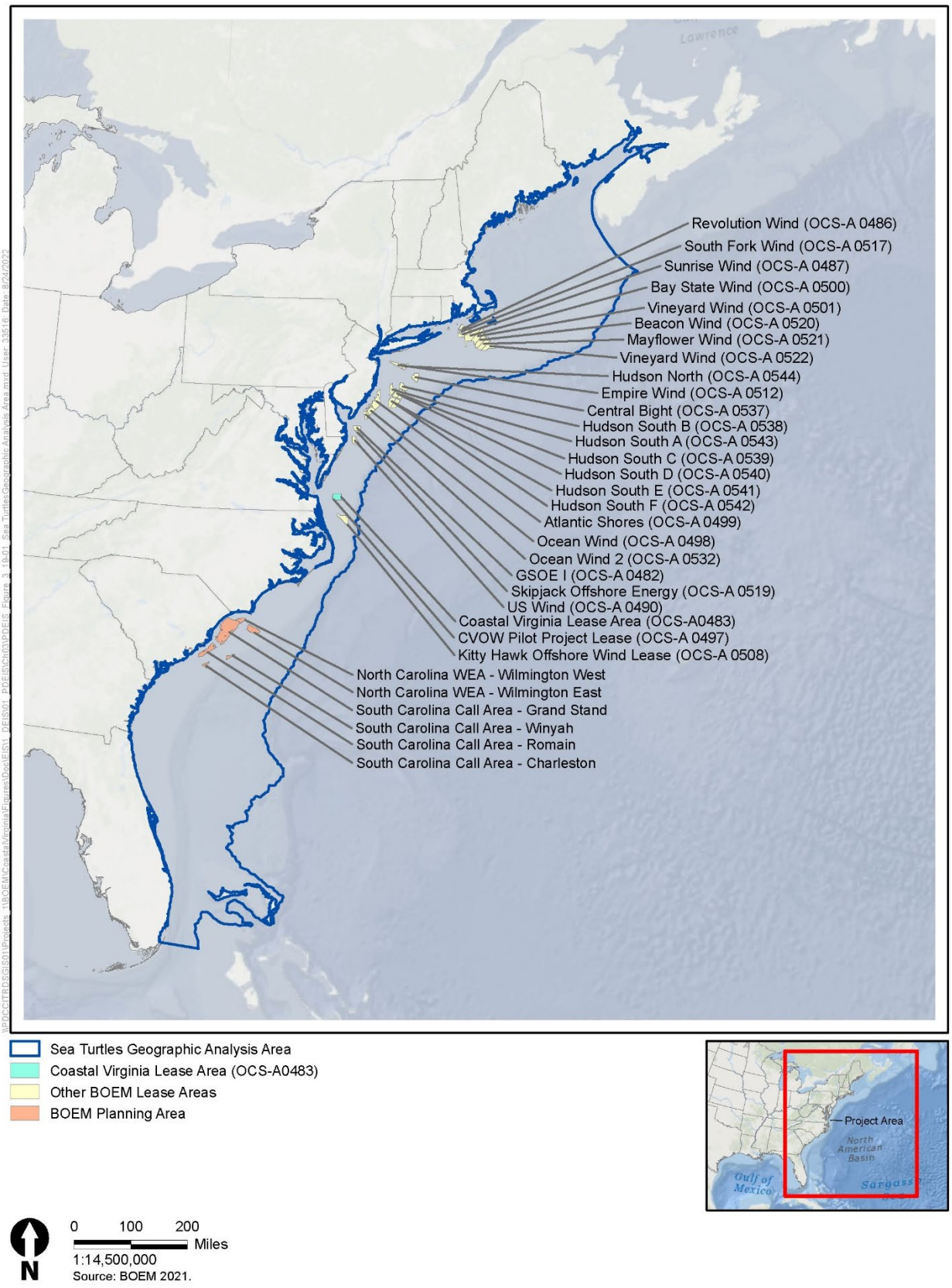

Figure 3.19-1 Sea Turtles Geographic Analysis Area

Sea turtle species distribution and presence in the Project area are summarized in Table 3.19-1 based on a review of protected species observer data, the NMFS sea turtle directory, Ocean Biodiversity Information System data (OBIS 2021), USFWS information for planning and consultation (USFWS 2021), VDWR (2021b) information, the Virginia Natural Heritage Data Explorer (Virginia Department of Conservation and Recreation 2021), and other available reports and literature.

The species most likely to occur in the Project area are loggerhead, Kemp's ridley, leatherback sea turtles, and green sea turtles. Visual survey and PSO sightings data indicate loggerhead and leatherback sea turtles are expected to be most common in waters offshore Virginia, while Kemp's ridley and green, though seen regularly, are observed in lower numbers offshore (COP, Section 4.2.6.1; Dominion Energy 2023; OBIS 2021; Virginia Institute of Marine Science 2021). Only two records of hawksbill sea turtles have been reported offshore Virginia since 1979 and they were considered an extralimital occurrence (Virginia Institute of Marine Science 2021). Hawksbill sea turtles typically prefers tropical habitats and occurrence in Virginia's offshore waters is considered extralimital (COP, Section 4.2.6.1, Dominion Energy 2023; OBIS 2021; Virginia Institute of Marine Science 2021).

There is no designated sea turtle critical habitat offshore Virginia (NMFS 2021), although sargassum critical habitat for loggerhead sea turtles extends into oceanic waters east of Virginia, beyond the OCS. Loggerhead sea turtles are commonly documented nesting in Virginia (Parker 2020), but there have been documented records of green sea turtles nesting in Croatan Beach in July 2021 just south of Virginia Beach (Croatan Civic League 2021), and records of green and Kemp's ridley sea turtles nesting or attempting to nest on Dam Neck Annex Beach just south of Virginia Beach starting around 2015 (Wright 2015; Wollam 2023). In cooler months when sea turtles face the risk of colder water temperatures decreasing their overall body temperature, sea turtles will spend significant time basking at the water surface to counteract this effect (Sapsford and van der Riet 1979; Dodge et al. 2014; Freitas et al. 2019). Lower water temperatures can also result in cold stunning of turtles, which causes them to become lethargic and float to the surface, making them more vulnerable to predators, anthropogenic effects, and strandings (NMFS 2021). Although these cold stunning events typically occur in coastal and inshore waters, temperature conditions anywhere in the Project area may affect sea turtle surface activities. Therefore, during cooler sea temperatures in the temperate ocean conditions offshore Virginia, sea turtles can raise their body temperatures by basking at the water surface, which may make them more vulnerable to vessel strikes. However, there is limited published data regarding basking behavior in all species of sea turtles in relation to sea temperatures or air temperatures. Published data that are available show more surface basking behavior off Nova Scotia than in Massachusetts (Dodge et al. 2014), inferring potentially more frequent or longer surface periods with increasing latitude. This suggests that while sea turtles may be more available for vessel strike in northern waters during cold conditions, this may not hold true for more temperate waters off Virginia.

Sea turtles are wide-ranging and long-lived, making population estimates difficult; population abundance estimation and visual survey methods vary depending on species and location (TEWG 2007; NMFS and USFWS 2013, 2015, 2019). Nesting data are widely used to estimate abundance, though nesting data may lag significantly in representing population increases or decreases. Leatherback sea turtle regional nesting trends were negative across three different temporal scenarios and became more negative as the time series became shorter (Northwest Atlantic Leatherback Working Group 2018).

Table 3.19-1 Presence, Distribution, and Population Status of Sea Turtle Species Known to Occur in Coastal and Offshore Waters of Virginia Around the Project Area

Common Name	Scientific Name	Distinct Population Segment	Estimated Population Abundance	Distribution Around Project Area	Relative Occurrence in Project Area[1]	Seasonality	Federal Population Status	Virginia Population Status
Loggerhead sea turtle	*Caretta caretta*	Northwestern Atlantic	588,000	Throughout; offshore and nearshore	Common	Year-round	Threatened	Threatened
Leatherback sea turtle	*Dermochelys coriacea*	N/A	65,000	Predominantly offshore	Common	Year-round	Endangered	Endangered
Green sea turtle	*Chelonia mydas*	North Atlantic	215,000	Predominantly nearshore	Uncommon	Year-round	Threatened	Threatened
Kemp's ridley sea turtle	*Lepidochelys kempii*	N/A	284,300	Predominantly nearshore	Common	Year-round	Endangered	Endangered
Hawksbill sea turtle	*Eretmochelys imbricata*	N/A	19,000	Extralimital	Extralimital	Spring/Summer	Endangered	Endangered

N/A = not applicable to species.
[1] Relative occurrence defined as:

- Common: Project area within typical range of the species, and species sightings are regularly documented.
- Uncommon: Project area within typical range of the species, but species sightings are only occasionally documented.
- Extralimital: Project area considered outside the typical range of the species, and few species sightings have been documented.

For loggerhead sea turtle, progress toward recovery has been made since publication of the *2008 Loggerhead Sea Turtle Recovery Plan*, but recovery units have not met most of the critical benchmark recovery criteria (NMFS and USFWS 2019). Recent models indicate a persistent reduction in survival, recruitment, or both to the nesting population of Kemp's ridley sea turtle, suggesting that the population is not recovering to historical levels (NMFS and USFWS 2015). The most recent status review for the North Atlantic distinct population segment of green sea turtle estimates that nesting trends are generally increasing (Seminoff et al. 2015). However, a study by Ceriani et al. (2019) has indicated that using nest counts as a direct proxy for adult female population status can be misleading and is not evidence of a strong population recovery.

In addition to the complexity relating nesting trends to population trends, sea turtles can also have large geographic ranges that may vary by life stage or season; therefore, trends in one region may not fully reflect species distribution or occurrence within the specific Project area. The current conditions and trends of sea turtle populations are affected by factors present in the geographic analysis area, but key details about sea turtle foraging and nesting that are important to assessing sea turtle impacts within the specific Project area include the following:

- Loggerhead sea turtle:
  - Predominantly carnivores that feed on a variety of floating prey during their open ocean life phase as hatchlings and young juveniles; they feed mainly on benthic species such as whelks, other mollusks, horseshoe crabs, and decapod crabs during their late juvenile and adult phases when they have migrated to nearshore coastal habitats (NMFS 2021).
  - Primary nesting habitats in the United States are in Florida, Georgia, South Carolina, and North Carolina, but nests have been observed on beaches in Virginia, Maryland, and Delaware (Bies 2018; Parker 2020; Pomeroy 2020).
  - No critical habitat has been designated for this species in or near the Project area, but their *Sargassum* critical habitat occurs beyond the OCS from Florida to New Jersey over deeper waters of the continental slope, migratory critical habitat has been identified off the coast of North Carolina, overwintering critical habitat has been identified in offshore southern North Carolina, breeding critical habitat has been identified in offshore Florida, and there are areas of nearshore reproductive critical habitat extending from Florida to North Carolina (NMFS 2021).
- Kemp's ridley sea turtle:
  - Hatchlings inhabit the open ocean where they use *Sargassum* algae as a refuge to rest and forage on small animals and plants; adults travel to nearshore coastal areas where their preferred prey are crab species (NMFS 2021).
  - The main nesting habitat for this species is in the Gulf of Mexico; however, they have also been observed nesting in coastal areas of Georgia, South Carolina, and North Carolina, as well as the Atlantic coast of Florida (NMFS 2021). Though rare, there have been a few Kemp's ridley nests reported in Virginia since 2012 (Virginia State Parks 2012; USFWS 2012; Wright 2015; Wollam 2023).
  - The Chesapeake Bay estuary system supports one of the largest non-nesting populations of Kemp's ridley sea turtle in the world during summer months (VIMS 2023).
  - No critical habitat has been designated for this species.
- Leatherback sea turtle:
  - Preferred prey include soft-bodied animals such as jellyfish and salps (NMFS 2021).

  - In the western Atlantic, leatherbacks nest from North Carolina to Brazil. In the U.S., leatherbacks nest almost exclusively on the east coast of Florida (Florida Fish and Wildlife Commission 2023).
  - Critical habitat has been designated for this species around their main nesting habitat in the U.S. Virgin Islands (NMFS 2021).
- Green sea turtle:
  - Green sea turtles are the only herbivorous species feeding mainly on seagrass, although they will occasionally feed on sponges and invertebrates (NMFS 2021).
  - The primary nesting habitats for green sea turtles are in Costa Rica, Mexico, Cuba, and the Southeast U.S. including Florida, Georgia, South Carolina, and North Carolina (NMFS 2021). Though rare, there have been reports of green sea turtles nesting in Virginia (Croatan Civic League 2021; Wollam 2023).
  - Critical habitat has been designated for this species off Puerto Rico outside the Project area (NMFS 2021).
- Hawksbill sea turtle:
  - Hawksbills are omnivorous foragers whose preferred prey in most habitats are sponges, but they will also prey on marine algae, bivalves, and crustaceans (NMFS 2021).
  - Primary nesting habitats are in the Caribbean; nesting events for this species in the U.S. are rare and have been limited to southeast Florida and the Florida Keys (NMFS 2021).
  - Critical habitat has been designated for this species off Puerto Rico outside the Project area (NMFS 2021).

Risks to sea turtle populations include fisheries bycatch, marine debris, habitat loss, vessel traffic, underwater noise, EMFs, and artificial lighting, but fisheries bycatch, marine debris, and vessel traffic are the three IPFs that are most likely to affect population viability (NMFS 2021; NMFS and USFWS 2013, 2014, 2015, 2019). Globally, entanglement in and ingestion of human-made debris is a substantial threat to sea turtles and it is believed that entanglements are underestimated (i.e., not all are reported) (Duncan et al. 2017). Research by Duncan et al. (2017) estimated that globally, over 1,200 entangled sea turtles are encountered per year with just over a 90 percent mortality rate. Commercial fisheries operating in the geographic analysis area include bottom trawl, midwater trawl, dredge, gillnet, longline, and pots and traps. Commercial vessel traffic in the region is variable depending on location and vessel type.

3.19.2 Environmental Consequences

3.19.2.1 Impact Level Definitions for Sea Turtles

Definitions of impact levels are provided in Table 3.19-2.

Table 3.19-2 Impact Level Definitions for Sea Turtles

Impact Level	Impact Type	Definition
Negligible	Adverse	Impacts on sea turtles would be undetectable or barely measurable, with no consequences to individuals or populations.
	Beneficial	Impacts on sea turtles would be undetectable or barely measurable, with no consequences to individuals or populations.

Impact Level	Impact Type	Definition
Minor	Adverse	Impacts on sea turtles would be detectable and measurable, but of low intensity, highly localized, and temporary or short term in duration. Impacts may include injury or loss of individuals, but these impacts would not result in population-level effects.
	Beneficial	Impacts on sea turtles would be detectable and measurable, but of low intensity, highly localized, and temporary or short term in duration. Impacts could increase survival and fitness, but would not result in population-level effects.
Moderate	Adverse	Impacts on sea turtles would be detectable and measurable and could result in population-level effects that would likely be recoverable and would not affect the continued existence of any population or DPS.
	Beneficial	Impacts on sea turtles would be detectable and measurable and could result in population-level effects. Impacts would be measurable at the population level.
Major	Adverse	Impacts on sea turtles would be significant and extensive and long term in duration, and could have population-level effects that are not recoverable, even with mitigation.
	Beneficial	Impacts would be significant and extensive and contribute to population or DPS recovery.

3.19.3 Impacts of the No Action Alternative on Sea Turtles

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

3.19.3.1 Impacts of the No Action Alternative

Under the No Action Alternative, baseline conditions for sea turtles described in Section 3.19.1, *Description of the Affected Environment for Sea Turtles*, would continue to follow current regional trends and respond to IPFs introduced by other ongoing and planned non-offshore wind activities. The primary IPFs for sea turtles within the geographic analysis area are generally associated with noise and vessel strikes, the presence of structures, and ongoing climate change. Fuel spills and releases of trash and debris have lesser potential impact on sea turtles due to their low probability of occurrence and relatively limited spatial impact. Land use and coastal development affect sea turtles mostly through habitat loss from development near sea turtle nesting areas, which occur outside of the Project area. Specific non-offshore wind activities that may affect sea turtles include commercial fisheries bycatch; ingestion of or entanglement in marine debris; marine transportation (vessel strikes); military use; oil and gas activities; undersea transmission lines, gas pipelines, and other submarine cables; tidal energy projects; dredging and port improvement; marine mineral use and ocean dredged material disposal; and global climate change (see Appendix F, Section F.2, for a complete description of ongoing and planned activities). Most of these activities would only likely result in temporary displacement and behavioral changes; however, vessel strikes and entanglement in marine debris could result in potential injury or mortality of individuals. Global climate change could also result in population-level impacts on sea turtle species by displacement of prey species, changes in sea temperatures and circulations, changes in *Sargassum*

abundance or distribution, fisheries displacement, and changes to sex determination ratios on nesting beaches, all of which may alter population dynamics and mortality rates.

Ongoing offshore wind activities within the geographic analysis area that contribute to impacts on sea turtles include:

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

Ongoing construction and O&M of the Block Island and CVOW-Pilot projects and ongoing construction of the Vineyard Wind 1 and South Fork projects would affect sea turtles through the primary IPFs of noise, presence of structures, and vessel traffic. Ongoing offshore wind activities would have the same types of impacts from noise, presence of structures, and traffic that are described in detail in Section 3.5.3.2 for planned offshore wind activities, but the risk of impacts would cover a smaller spatial and temporal scale given the relative number of ongoing projects compared to the planned offshore wind projects.

3.19.3.2 Cumulative Impacts of the No Action Alternative

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

Under the No Action Alternative, BOEM would not approve Dominion Energy's COP and impacts from IPFs during construction, operation, and maintenance directly associated with the Project would not occur. Existing environmental trends within the geographic analysis area would continue, potentially influenced by the development of planned future activities on the OCS and associated coastal areas over the coming decade. These include other offshore wind and renewable energy projects, and potential port improvements to support the development of this industry regionwide (see Appendix F).

BOEM expects future offshore wind activities to affect sea turtles through the following primary IPFs: accidental releases, discharges, EMFs, new cable emplacement/maintenance, noise, port utilization, the presence of structures, and vessel traffic. Offshore wind activities have the potential to produce impacts from site characterization studies, site assessment data collection activities that involve installation of meteorological towers or buoys, and installation and operation of turbine structures.

This section provides a general description of the IPF mechanisms resulting from future offshore wind development within the sea turtle geographic analysis area. However, the extent and significance of potential effects on cumulative conditions cannot be fully quantified for projects that are in the conceptual or proposal stage and have not been fully designed or permitted. Where appropriate, potential effects resulting from future offshore wind development activities are characterized through comparison to effects resulting from the Proposed Action that are likely to be similar in nature or significance. The intent of this section is to provide a general overview of how future activities might influence future environmental conditions. Should any or all of the future activities described in Appendix F proceed, each would be subject to independent NEPA analyses of environmental effects and regulatory approvals.

Accidental releases: Trash and debris or water quality contaminants could be accidentally released as a result of increased human activity associated with future offshore wind development activities. All species of sea turtles have been documented ingesting plastic debris (Bugoni et al. 2001; Hoarau et al. 2014; Nelms et al. 2016), as well as a variety of other anthropogenic waste (Tomás et al. 2002), likely

mistaking debris for potential prey items (Schyuler et al. 2014). Ingesting trash or exposure to aquatic contaminants could result in lethal or sublethal effects including depressed immune system function; poor body condition; and reduced growth rates, fecundity, and reproductive success (Gall and Thompson 2015; Hoarau et al. 2014; Nelms et al. 2016; Schuyler et al. 2014). Additionally, entanglement in lost fishing gear and other marine debris is the primary anthropogenic cause of mortality in both juvenile and adult sea turtles (NMFS 2023a; National Research Council 1990 as cited in Shigenaka et al. 2010). Furthermore, accidental releases of contaminants may indirectly affect sea turtles through effects on prey species (see Section 3.13.1.1 for more details). Recognizing these risks, all vessels associated with offshore wind development projects would comply with USCG regulations and BOEM regulations designed to avoid and minimize accidental release of trash, debris, or other contaminants. Therefore, the release of solid trash or other debris into offshore waters would be extremely rare, and potential impacts from released trash and debris, though possibly injurious on an individual level, would not affect species on the population level. Each project would also be expected to have its own oil spill response plan to implement in the case of accidental releases. Therefore, potential accidental release volumes would not appreciably contribute to adverse impacts on sea turtles, and no population-level impacts are expected for any species.

Electromagnetic fields: Under the No Action Alternative, the future development of planned offshore wind projects would result in up to 5,595 miles (9,004 kilometers) of new submarine electrical transmission cables in the geographic analysis area for sea turtles (Appendix F, Table F2-1). Each cable would generate EMF potentially detectable by sea turtles in the immediate area around the cable (Klimley et al. 2021). Sea turtles are known to be geomagnetic-sensitive, but not electrosensitive (Normandeau et al. 2011). Sea turtles use their magneto-sensitivity for orientation, navigation, and migration; they use the Earth's magnetic fields for directional (compass-type) information to maintain a heading in a particular direction and for positional (map-type) information to assess a position relative to a specific geographical destination (Lohmann et al. 1997). Additional non-magnetic cues are also likely used by sea turtles during navigation and migration. Multiple studies have demonstrated magneto-sensitivity and behavioral responses to field intensities ranging from 0.0047 to 4000 μT for loggerhead turtles and 29.3 to 200 μT for green turtles (Normandeau et al. 2011). However, based on a review by Normandeau et al. (2011), sea turtles are unlikely to detect alternating current magnetic fields below 50 mG (5 μT) due to their magnetite-based detection mechanism. Hatchling sea turtles are known to use the Earth's magnetic field (and other cues) to orient and navigate from their natal beaches to their offshore habitat (Lohmann et al. 1997). Juvenile and adult sea turtles may detect EMFs when foraging on benthic prey or resting on the bottom in relatively close proximity to cables. Confounding EMF effects on sea turtles could range from trivial changes in swim direction to more significant migration alterations; the extent and magnitude of these potential effects are unclear, however, and may be compensated against to some degree by sea turtle's use of non-magnetic spatial cues. Overall, potential EMF effects would be reduced by cable shielding and burial to an appropriate depth, and new submarine cables would be installed to maintain a minimum separation of at least 330 feet (101 meters) from other known cables to avoid damaging existing infrastructure during installation. This separation distance would avoid additive EMF effects from adjacent cables. While artificial EMF effects on sea turtles are not well studied, current construction and mitigation methods would limit projected EMF effects to below levels that are expected to cause measurable biological effects. Short-term displacement of individual turtles from the Project area or deviations in their migrations would be small and would not be expected to substantially affect energy expenditure in sea turtles.

Light: Nighttime lighting associated with offshore structures and vessels could represent a source of attraction, avoidance, or other behavioral responses in sea turtles. Although responses to light have been studied in various species and life stages of sea turtles, the effects are expected to be negligible (BOEM 2019). Shoreline development is the predominant existing artificial lighting source in the nearshore component of the geographic analysis area while vessels, mainly fishing vessels, are the

predominant source of artificial lighting offshore. Future wind energy development would contribute additional light sources to the offshore component of the geographic analysis area; onshore components of offshore wind projects are not expected to produce a substantial amount of light or be present in areas where sea turtles are expected. Offshore sources of light consist of short-term lighting from vessels used during construction and the long-term use of navigational lighting on new WTGs and OSSs. Over 3,287 structures are forecasted for construction in the geographic analysis area. Each structure would have minimal yellow flashing navigational lighting, as well as red flashing Federal Aviation Administration hazard lights in accordance with BOEM (2019) lighting and marking guidelines. Artificial light in coastal environments is an established stressor for juvenile sea turtles, which use light to aid in navigation and dispersal and can become disoriented when exposed to artificial lighting sources; however the significance of artificial light in offshore environments is less clear (Gless et al. 2008). Data from oil and gas platform operation in the Gulf of Mexico, which can have considerably more lighting than offshore WTGs, have not resulted in any known impacts on sea turtles (BOEM 2019) and no long-term or population-level impacts from offshore lighting produced by offshore wind projects is expected.

New cable emplacement/maintenance: Future offshore wind projects could disturb over 177,718[1] acres (719 square kilometers) of seabed while installing associated undersea cables, causing an increase in suspended sediment and seafloor disturbance (Appendix F, Table F2-2). This disturbance would be localized and temporary. Data are not available regarding effects 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 limited in extent, short term in duration, and likely too small to be detected (NOAA 2021). Seafloor disturbance during construction of future offshore wind projects may affect sea turtle foraging success or prey species distribution; however, impacts would be temporary and generally localized to the cable corridor. Traditional dredging methods (e.g., trailing suction hopper dredgers) are not anticipated during installation of offshore wind projects; therefore, no significant entrainment risk to sea turtles is expected from cable emplacement activities (Ramirez et al. 2017). Given the likelihood of this activity occurring and the small time and spatial scale over which these activities would occur, no population-level effects on sea turtles would be expected.

Noise: Human activities would continue to generate underwater noise with potential to affect sea turtles. Several wind energy projects could be developed between 2023 and 2030 with overlapping construction periods that add several new sources of underwater noise to the ambient soundscape through pile driving and vessel traffic (Appendix F, Table F-3). As discussed in Appendix F, some projects could be constructed concurrently at multiple locations on the OCS, which could result in larger or overlapping areas of increased underwater anthropogenic noise.

A description of sea turtle hearing anatomy and perception of underwater sound is provided in Appendix J, Section J.2.6.2. Potential impacts on sea turtles from underwater noise include PTS, TTS, and behavioral disturbances, and the potential for the type of impacts would vary by phase and activity. Acoustic thresholds, which represent the estimated sound level at which the onset of a particular effect may occur, that are recommended by Finneran et al. (2017) for all sea turtle species by impact are listed in Table 3.19-3. Data are currently only available for sea turtle behavioral responses to impulsive sound sources (described in Section 3.15.1.1, *Future Offshore Wind Activities [without Proposed Action]*), so these thresholds are assumed to apply to all noise categories.

[1] Kitty Hawk Wind South has three export cables (57 miles [92 kilometers] to Virginia, 200 miles [322 kilometers] to North Carolina, and an additional 96 miles [154 kilometers] of inshore export cable to North Carolina) for a total of 352.9 miles (568 kilometers). Corridor widths range from the 1,520-mile-wide (2,414-kilometer-wide) corridor to Virginia and the 1,000-mile-wide (1,609-kilometer-wide) corridors to North Carolina to allow for optimal routing of the cables.

Table 3.19-3 Acoustic Thresholds for Sea Turtles for Each Type of Impact and Noise Category

Impact	Impulsive Noise Threshold	Non-impulsive Noise Thresholds
PTS	$L_{p,pk}$ 232 dB re 1 µPa	$L_{E,24hr}$: 220 dB re 1 µPa^2 s
	$L_{E,24hr}$: 204 dB re 1 µPa^2 s	
TTS	$L_{p,pk}$: 226 dB re 1 µPa	$L_{E,24hr}$: 200 dB re 1 µPa^2 s
	$L_{E,24hr}$: 189 dB re 1 µPa^2 s	
Behavioral disturbance	L_P: 175 dB re 1 µPa	

Source: Finneran et al. 2017.
µPa = micropascal; µPa^2 s = micropascal square second; dB = decibel; $L_{E,24hr}$ = sound exposure level over 24 hours; $L_{p,pk}$ = peak sound pressure level; L_P = root-mean-square sound pressure level.

There are few studies reporting sound production in sea turtles, despite their ability to hear sounds in both air and water. While the general importance of sound to the ecology of sea turtles is not well understood, there is a growing body of knowledge suggesting that sea turtles may use sound in a multitude of ways. Sea turtle embryos and hatchlings have been reported to make airborne sounds, thought to be produced for synchronizing hatching and nest emergence (Montiero et al. 2019; Ferrara et al. 2014a, 2014b, 2019; McKenna et al. 2019). Charrier et al. (2022) noted the production of 10 different underwater sounds in juvenile green sea turtles, including those within and above the frequency range of hearing reported for this species. A more comprehensive understanding of sound production and hearing is needed in sea turtles; however, the limited but growing information available suggests environmental acoustic cues are likely to be important to these animals.

3.19.3.2.1 HRG Surveys

The active acoustic sources used in site characterization surveys introduce noise into the water during site investigations. See Appendix J for a physical description of these sounds. Only a subset of geophysical sources (e.g., boomers, sparkers) are likely to be audible by sea turtles, given the frequency range of the sounds and the hearing range of turtles. Given the right context, these sounds may cause short-term behavioral disturbance, avoidance, or stress (NSF and USGS 2011). Recently, BOEM and USGS characterized underwater sounds produced by high-resolution geophysical sources and their potential to affect marine animals, including sea turtles (Ruppel et al. 2022). In addition to frequency range, other characteristics of the sources like the source level, duty cycle, and beamwidth make it very unlikely that these sources would result in behavioral disturbance of sea turtles, even without mitigation (Ruppel et al. 2022). Given the intensity of noise generated by this equipment (Crocker and Frantantonio 2016; Crocker et al. 2019) and short duration of proposed surveys, it is unlikely that PTS or TTS will occur in any turtle species as a result of being exposed to HRG survey noise. Although temporary displacement or behavioral responses may occur, they would not result in biologically notable consequences; impacts on sea turtles would be minor and would have no stock or population-level effects. Likewise, geotechnical surveys may introduce low-level, intermittent, broadband noise into the marine environment, though these sounds are unlikely to result in behavioral disturbance, given their low source levels and intermittent use.

3.19.3.2.2 Impact and Vibratory Pile Driving

Impulsive noise from impact pile driving during planned offshore wind development represents the highest risk of noise exposure and potential for adverse auditory effects on sea turtles in the geographic analysis area due to the anticipated frequency of pile driving activities and the spatial extent of effect. While these potential effects are acknowledged, their biological significance is unclear because sea turtle sensitivity and behavioral responses to pile-driving noise are not well known based on available studies. However, several studies conducted on responses to seismic airguns, an impulsive signal that can serve as a general proxy to other high intensity impulsive sources like pile driving, have shown that a range of

behavioral effects are possible (McCauley et al. 2000; U.S. Department of the Navy 2018). In some seismic studies, observations of caged and free-swimming sea turtles exposed to airgun operations were reported as reacting to the sounds by initiating a startle dive (Weir 2007; DeRuiter and Doukara 2012), rising to the surface (Lenhardt 1994), and altering swimming patterns (McCauley et al. 2000). In other studies, sea turtles avoided the airgun source initially, but authors suggested that animals likely habituated to the source over time (Moein et al. 1994; Lenhardt 2002; Hazel et al. 2007). This type of noise habituation has been demonstrated even when the repeated exposures were separated by several days (Bartol and Bartol 2012; U.S. Department of the Navy 2018). The accumulated stress and energetic costs of avoiding repeated exposures to pile-driving noise over a season or life stage could have long-term effects on survival and fitness (U.S. Department of the Navy 2018).

Vibratory pile driving may be used prior to impact pile driving to reduce the risk of pile run for some offshore wind projects and during export cable installation and port facility construction. The term pile run refers to the quick penetration of a pile into the seabed as a result of its high self-weight and low resistance from the seabed. A physical description of vibratory pile-driving noise can be found in Appendix J. Typical noise levels generated by vibratory pile driving are lower than noise levels produced by impact pile driving. Available measurements indicate the SPL was, on average, 165 dB re 1 µPa at 33 feet (10 meters) and decreased to 140 dB re 1 µPa when measured 656 feet (200 meters) away (Illingworth and Rodkin 2017). These measurements are based on smaller piles in shallower water locations, appropriate for export cable installation activities, and it is expected that vibratory pile driving conducted for the foundations prior to impact pile driving will produce a greater area of ensonification. However, based on these sound levels, it is still not expected that the PTS thresholds (Finneran et al. 2017) would be exceeded more than 328 feet (100 meters) from the pile, even in deeper water environments. Ranges to the behavioral disturbance threshold for sea turtles (Finneran et al. 2017) may extend further; however, the behavioral disturbance threshold is an SPL of 175 dB re 1 µPa and would not be exceeded beyond 1,640 feet (500 meters) from the source. Additionally, vibratory pile driving activities would be relatively short-term, occurring over approximately 4 hours per pile for the foundations, and over several days for export cable installation.

Sea turtles that are exposed to pile driving noise have the potential to experience auditory impacts such as TTS or PTS. Reduced hearing sensitivity could limit the ability to detect predators, prey, or suitable habitat and reduce the survival and fitness of affected individuals; however, the role and importance of auditory cues in these biological functions for sea turtles remains poorly understood (Lavender et al. 2014).

Based on the available information provided above and in Appendix J, impacts on sea turtles from construction-related pile driving noise would be limited to effects on a small number of individuals. Auditory threshold shifts (TTS, PTS) are not likely to occur due to the short exposure times expected during piling; however, the risk of TTS and PTS cannot be fully eliminated. Therefore, given the number of projects anticipated within the geographic analysis area (Appendix D), impact pile driving would have minor impacts on sea turtles due to the potential for severe effects on individuals but no effects on population viability for any species. Vibratory pile driving is expected to have a reduced impact for sea turtles and would result in detectable impacts that are minor and would not result in population-level effects.

3.19.3.2.3 Vessel Noise

Vessel noise associated with non-offshore wind activities is likely to be present throughout the sea turtle geographical analysis area at a nearly continuous rate due to the prevalence of commercial shipping, fishing, and recreational boating activities that are ongoing and would be expected to continue in the geographic analysis area. During both the construction and operational phases of planned offshore wind projects, several types of vessels would be used to transport crew and supplies, and, during construction,

dynamic positioning systems may be used to keep the pile-driving vessel in place. A description of the physical qualities of vessel noise can be found in Appendix J. Construction and operational vessel noises are the most broadly distributed sources of non-impulsive noise associated with offshore wind projects. Sea turtle exposure to underwater vessel noise would incrementally increase as a result of ongoing and planned offshore wind projects, especially during construction periods (Appendix F). Sea turtles are less sensitive to sound as compared to faunal groups like marine mammals, as evidenced by the higher auditory threshold criteria (NMFS 2023b). No injury or behavioral effects from vessel noise are anticipated for planned offshore wind projects. It is unlikely that received levels of underwater noise from vessel activities would exceed PTS thresholds for sea turtles, as the PTS threshold for non-impulsive sources is an SEL_{24h} of 200 dB re 1 μPa^2 s (NMFS 2023b), which is comparable to the maximum source level reported for large shipping vessels (Appendix J). Hazel et al. (2007) demonstrated that sea turtles only appear to respond behaviorally to vessels at approximately 33 feet (10 meters) or closer.

Vessel noise effects for planned offshore wind projects are expected to be broadly similar to noise levels from existing vessel traffic in the region. Nonetheless, periodic localized, short-term behavioral impacts on sea turtles could occur; however, sea turtle behavioral disturbances are anticipated only to occur within a relatively small area around the vessels and are expected to return to normal when the vessel moves away. Therefore, the effects of vessel noise from planned offshore wind activities would be minor. No population-level effects are expected to occur.

3.19.3.2.4 Cable Laying and Trenching

Preparing a lease area for turbine installation and cable-laying may require jetting, plowing, or removal of soft sediments, as well as the excavation of rock and other material through various cable emplacement methods. Cable installation vessels are likely to use dynamic positioning systems while laying the cables. The sound associated with dynamic positioning generally dominates over other sound sources present, especially in relation to dredging, trenching, and cable-laying activities. A description of the physical qualities of these sound sources can be found in Appendix J. Given the estimated source levels (Appendix J) and transitory nature of these sources, exceedance of PTS and TTS sound levels are not likely for sea turtles (Heinis et al. 2013), and behavioral disturbances would likely be low-intensity, localized, and result in negligible impacts on sea turtles.

3.19.3.2.5 WTG Operations

No biologically notable effects on sea turtles are anticipated from noise produced by WTG operation. Noise associated with operational WTGs would be expected to attenuate below ambient levels at a relatively short distance from WTG foundations (Miller and Potty 2017; Thomsen et al. 2015; Tougaard et al. 2009). Maximum anticipated noise levels produced by operational WTGs are estimated to be between 125 and 130 dB re 1 µPa m (Lindeboom et al. 2011; Tougaard et al. 2009). HDR (2019) measured SPL below 120 dB re 1 µPa at 164 feet (50 meters) from operating turbines at the Block Island Wind Farm, which are below the sound level thresholds expected to cause sea turtle PTS, TTS, and behavioral disturbance (NMFS 2023b). Additionally, current generation WTGs use direct drive motors that could result in a sound decrease of approximately 10 dB from WTG using gear boxes that were considered in prior studies (Stöber and Thomsen 2021). However, a review of published literature also identified an increase in underwater source levels (up to 177 dB re 1 µPa) with increasing power size with a nominal 10 MW WTG (Stöber and Thomsen 2021). Given the number of foundations expected within the sea turtle geographic analysis area (Appendix F), the presence of WTG operational noise would be a persistent presence throughout the sea turtle geographic analysis area. Impacts on sea turtles would, therefore, be minor as the behavioral responses would be detectable but would not be expected to result in any population-level effects.

Port utilization: Port expansions could increase the total amount of disturbed benthic habitat and result in impacts on some sea turtle prey species. However, given that port expansions would likely occur in subprime areas for foraging and the disturbance would be relatively small in comparison to the overall sea turtle foraging areas in the geographic analysis area, port expansions are not expected to affect sea turtles. Dredging for port facility improvement could lead to additional impacts on turtles from incidental entrainment, impingement, or capture. Dredging impacts on sea turtles are relatively uncommon; most observed injury and mortality events in the U.S. were associated with hopper dredging in and around core habitat areas in the southern portion of the geographic analysis area and in the Gulf of Mexico outside the geographic analysis area (Michel et al. 2013; USACE 2020). Ongoing maintenance dredging of these facilities may incrementally increase related risks to individual turtles over the lifetime of the facilities; however, typical mitigation measures such as timing restrictions should minimize this potential. Additionally, the size, scope, and location of the dredging activities conducted for offshore wind projects would be less than that identified for other projects such as beach nourishment or port deepening, and the type of equipment used reduces the risk of entrainment or impingement. Compared to the dredging activities for planned offshore wind projects, navigation dredging projects, which occur primarily in channels close to shore, generally pose a greater risk of entrainment of sea turtles because of their tendency to concentrate in channels (Ramirez et al. 2017). For example, the number of sea turtles entrained by hopper dredging in BOEM offshore borrow areas has historically been relatively low when compared to navigation channel dredging (Ramirez et al. 2017). Between 1995 and 2015, there were 69 reported sea turtle takes in the North Atlantic (i.e., north of North Carolina) by trailing suction hopper dredges, versus approximately 260 taken in hopper dredges operating in the South Atlantic. The takes per project across the entire South Atlantic were estimated to be 0.96 (the North Atlantic was not analyzed). Therefore, given the extent of and location of navigation projects using hopper dredges, the limited amount of dredging conducted as part of the Proposed Action is not expected to result in population effects as few to no takes of sea turtles would reasonably be expected. The risk of injury or mortality to individual sea turtles resulting from dredging associated with future offshore wind projects exclusive of the Proposed Action is low and population-level effects are unlikely to occur.

Presence of structures: The addition of over 3,287 new offshore structures (WTGs, OSSs, and meteorological tower) in the geographic analysis area could increase sea turtle prey availability through the creation of new hard-bottom habitat, increasing pelagic productivity in local areas, or promoting fish aggregations at foundations (Bailey et al. 2014 cited in English et al. 2017). Section 3.13, *Finfish, Invertebrates, and Essential Fish Habitat*, discusses reef creation and the potential for anthropogenic structures to attract fish. Fish aggregations around new wind farm structures can provide additional foraging opportunities for sea turtles that may result in negligible or minor beneficial impacts given the broad geographic range of species during their annual foraging migrations. However, the presence of structures may indirectly concentrate recreational fishing around foundations, which could indirectly increase the potential for sea turtle entanglement in both lines and nets and result in minor adverse impacts on sea turtles given their proclivity for entanglement in lost fishing gear (Nelms et al. 2016; Gall and Thompson 2015; Shigenaka et al. 2010).

Human-made structures, especially tall vertical structures like WTG and OSS foundations, alter local water flow at a fine scale and could result in localized impacts on sea turtle prey distribution and abundance. A discussion of the effects of altered water flow can be found in Section 3.13, *Finfish, Invertebrates, and Essential Fish Habitat*. The presence of many WTG structures could affect oceanographic and atmospheric conditions in ways that alter local environments and potentially increasing primary productivity in the vicinity of these structures (Carpenter et al. 2016; Schultze et al. 2020). However, this may not translate to a beneficial increase in sea turtle prey abundance if the increase in primary productivity is consumed by filter feeders (e.g., mussels) that colonize the surface of the structures (Slavik et al. 2019).

The long-term effects of offshore structure development on ocean productivity and sea turtle prey species; therefore, sea turtles are difficult to predict with certainty because they are expected to vary by location, season, and year depending on broader ecosystem dynamics. For example, the presence of new hard surfaces could increase the abundance of associated organisms (e.g., mussels, crustaceans) on and around the structures, providing a prey resource for sea turtles. Increased primary and secondary productivity in proximity to hard-bottom structures could increase the abundance of prey species like jellyfish (English et al. 2017). Additionally, hard-bottom (scour control, cable protection) and vertical structures (WTG and OSS foundations) in a soft-bottom habitat can create a 3-dimensional artificial reef structure, thus inducing the "reef effect" and resulting in higher densities and biomass of mollusks, fish, and decapod crustaceans (Causon and Gill 2018; Taormina et al. 2018). Recent studies have found increased biomass for benthic fish and invertebrates, and possibly for pelagic fish, sea turtles, and birds as well (Raoux et al. 2017; Pezy et al. 2018; Wang et al. 2019) indicating that offshore wind facilities can generate beneficial long-term impacts on local ecosystems, translating to increased foraging opportunities for sea turtle species. Sea turtles may also use vertical structures for shelter from strong currents to conserve energy and for cleaning their shells (Barnette 2017). In contrast, increased fish biomass around the structures could attract commercial and recreational fishing activity, creating an increased risk of injury or mortality from gear entanglement and ingestion of debris (Berreiros and Raykov 2014; Gregory 2009; Vegter et al. 2014).

Some level of displacement of sea turtles from future wind farm lease areas into areas with a higher potential for interactions with ships or fishing gear could occur. However, the addition of structures could locally increase pelagic productivity and prey availability for sea turtles and decrease the likelihood of long-term displacement from the wind farm lease areas. While the effect would be present long term throughout the life of future offshore wind projects, the overall impact of displacement on sea turtles is not expected to be biologically notable.

Vessel traffic: Vessel strikes are a concern for sea turtles. The percentage of loggerhead sea turtles with reported strandings due to vessel strikes increased from approximately 10 percent in the 1980s to 20.5 percent in 2004 (NMFS and USFWS 2007). Sea turtle strandings reported to have vessel strike injuries have been reported to be as high as 25 percent in Chesapeake Bay, Virginia (Barco et al. 2016), and Foley et al. (2019) reported that roughly one-third of stranded sea turtles in Florida had injuries indicative of a vessel strike. Sea turtles are expected to be most susceptible to vessel strikes in shelf waters where they forage (Barkaszi et al. 2021). Furthermore, they cannot reliably avoid being struck by vessels traveling in excess of 2 knots (Hazel et al. 2007); typical vessel speeds in the geographic analysis area may exceed 10 knots. Up to 207 vessels associated with offshore wind development may be operating in the geographic analysis area during the peak construction period in 2025 (BOEM 2019) (Appendix F, Table F1-14). Increased vessel traffic could result in a higher number of vessel strikes, resulting in injury or mortality of individual sea turtles. However, despite the potential for individual fatalities, potential impacts are localized and no population-level impacts on sea turtles are expected. It is expected that planned offshore wind projects will adhere to vessel speed restrictions and visual monitoring, which, while geared primarily towards marine mammals, will help reduce the risk of a strike occurring that results in a serious injury or mortality. PSO sightings data indicate sighting rates for sea turtles during vessel operations were approximately 13 sea turtle detections per 100 hours of vessel effort (Marine Ventures International, Inc. 2022; RPS 2021). These detection rates are relatively high, and even with these high detection rates there were only 18 vessel strike mitigation actions required (2.8 percent of all sea turtle detections) and no strikes reported. However, there are limited measures that have been proven to be effective at reducing collisions between sea turtles and vessels (Schoeman et al. 2020). The relatively small size of sea turtles makes detection very difficult when turtles are at the surface, during which time only a small portion of their body (e.g., head, top of carapace) is visible for detection at any distance that is reasonable for avoidance measures to be taken. Avoidance of vessels by sea turtles is not well documented but is expected to be initiated visually rather than acoustically (Hazel et al. 2007) and

vessel strike probability increases significantly for vessels traveling greater than 4 knots (Hazel et al. 2007). Therefore, implementation of mitigation would not fully eliminate the risk of vessel strikes on sea turtles, but could help reduce it, and the seasonal patterns of sea turtles in the region would result in a reduction in risk during the early spring and winter months when sea turtle abundances in the area are expected to be lower (Section 3.19.1, *Description of the Affected Environment for Sea Turtles*). Vessel strikes are particularly lethal for sea turtles due to their size, and mortality risk increases with size and speed of the vessel. Therefore, the risk of vessel strikes on individuals cannot be discounted, and impacts are not expected to have population-level effects and so they are classified as minor.

Fishing gear utilization (biological/fisheries monitoring surveys): A primary threat to sea turtles is their unintended capture in fishing gear, which can result in drowning or cause injuries that lead to injury and mortality (e.g., swallowing hooks). For example, trawl fishing is among the greatest continuing primary threats to the loggerhead turtle (NMFS and USFWS 2019), and sea turtles are also caught as bycatch in other fishing gear including longlines, gillnets, hook and line, pound nets, pot/traps, and dredge fisheries. A substantial impact of commercial fishing on sea turtles is the entrapment or entanglement that occurs with a variety of fishing gear. Although the requirement for the use of bycatch mitigation measures—such as requirements for "turtle excluder devices" in trawl fishing gear in the southeastern U.S. shrimp fisheries (NMFS 2023c)—has reduced sea turtle bycatch, Finkbeiner et al. (2011) compiled data on sea turtle bycatch in U.S. fisheries and found that in the Atlantic, a mean estimate of 137,700 interactions, 4,500 of which were lethal, occurred annually since implementation of bycatch mitigation measures. The impacts of gear use associated with fisheries on sea turtles may result in the injury or mortality of individual sea turtles of any species that may occur within sampled area(s). These impacts are expected to be localized and short term in duration (limited to active sampling periods only). Loss or injuries of individual turtles resulting from these activities are not expected to result in population-level effects on any species and are, therefore, expected to be minor. A reduction of sea turtle interactions with fisheries is a priority for sea turtle recovery.

Climate change: Global climate change is an ongoing potential risk to sea turtles, although the associated impact mechanisms are complex, not fully understood, and difficult to predict with certainty. Possible impacts on sea turtles due to climate change include increased storm severity and frequency; increased erosion and sediment deposition; increased disease frequency; ocean acidification; and altered habitat, prey availability, ecology, and migration patterns. Over time, climate change, in combination with coastal development, would alter existing nearshore and coastal (nesting beach) habitats and render some areas unsuitable for some species and more suitable for others. Furthermore, regarding the effects of temperature on nesting sea turtles, termed 'temperature-dependent sex determination' or TSD, increased temperatures could result in skewed and even lethal incubation conditions, which would result in impacts on turtle species, hatchling success (the proportion of eggs that produce viable hatchlings), hatchling size and locomotory performance, the prevalence of scute abnormalities, and possibly infectious disease outbreaks (National Ocean Service 2023; Laloë and Hays 2023; Patrício et al. 2021). However, the introduction of planned offshore wind projects would be expected to help slow the progression of climate change. Therefore, these activities would not contribute to the risks of climate change faced by sea turtles and may result in beneficial changes for sea turtles through operations of planned offshore wind projects. Beneficial effects may be offset by derelict or abandoned fishing gear or fishing line.

3.19.3.3 Conclusions

Impacts of the No Action Alternative. Under the No Action Alternative, sea turtle species would continue to be affected by existing environmental trends and ongoing activities. Ongoing activities are expected to have continuing temporary and permanent impacts (disturbance, displacement, injury, mortality, and habitat conversion) on sea turtles. These effects are primarily driven by offshore construction and operation impact, presence of structures, noise, and traffic.

BOEM expects ongoing activities and future offshore wind activities to have continuing temporary to permanent impacts on sea turtles, primarily through construction-related lighting, noise, habitat alteration, risk of vessel strikes, and artificial reef effect. In addition to ongoing activities, planned activities other than offshore wind development include increasing vessel traffic, new submarine cables and pipelines, maintenance dredging, channel-deepening activities, military activities, biological/fisheries monitoring surveys, and the installation of new towers, buoys, and piers (Appendix F).

Potential impacts on sea turtles from ongoing activities, particularly the risk of accidental releases of trash and debris and vessel strikes, would be **minor** for sea turtles. Additionally, impacts on sea turtles could occur from planned actions from non-offshore wind activities, which would likely incrementally increase the number of vessels in the water and may, therefore, increase the risk of accidental releases and vessel strikes. However, the incremental increase would not result in population-level impacts on sea turtles; therefore, impacts would remain **minor**. The combination of ongoing activities and reasonably foreseeable non-offshore wind activities would result in **minor** impacts on sea turtles in the geographic analysis area.

Cumulative impacts of the No Action Alternative. Under the No Action Alternative, existing environmental trends and ongoing activities would continue, and sea turtles would continue to be affected by natural and human-caused IPFs. Planned activities would contribute to impacts on sea turtles due to habitat loss from increased offshore construction and operations.

Considering all IPFs collectively, future offshore wind activities in the geographic analysis area would result in **minor adverse** impacts overall, particularly from pile driving, vessel strike risk, or entanglement risk posed by the presence of structures. They would also result in **minor beneficial** impacts throughout the life of the projects due to 'reef effect' associated with the presence of the structures. Beneficial effects may be offset by the risk of entanglement due to derelict or abandoned fishing gear or fishing line. Most of the structures in the geographic analysis area would be attributable to offshore wind development. Sea turtles present in these project areas during construction would be exposed to increased underwater noise levels during pile driving of new WTG and OSS foundations and would be at risk of vessel strikes from project vessels used throughout all phases of development. These impacts are expected to be localized to the project area of a given wind farm project, and impacts would not be biologically notable on the regional population or species level.

3.19.4 Relevant Design Parameters and Potential Variances in Impacts

This EIS analyzes the maximum-case scenario; any potential variances in the proposed Project build-out as defined in the PDE would result in impacts similar to or less than those described in the sections below. The primary PDE parameters (Appendix E, *Project Design Envelope and Maximum-Case Scenario*) that would influence the magnitude of the impacts on sea turtles:

- Noise associated with the construction of Project structures (e.g., pile driving and construction vessels), which could have behavioral and physiological effects or cause auditory injury to sea turtles;
- Vessel traffic, which could increase collision risk to sea turtles due to increased recreational fishing vessels and vessels transiting to and from the Wind Farm Area during construction, operations, and decommissioning; and
- The presence of structures, which could cause both beneficial and adverse impacts on sea turtles through localized changes to hydrodynamic disturbance, prey aggregation and associated increase in foraging opportunities, incidental hooking from recreational fishing around foundations, entanglement in lost and discarded fishing gear, migration disturbances, and displacement.

Variability of the proposed Project design exists as outlined in Appendix E. The following is a summary of potential variances in impacts:

- **Foundation type:** The potential acoustic impacts on sea turtles differ among the foundation types that the Project would use, which is up to 3 piled jacket foundations or monopile foundations for OSS and up to 98 monopile foundations for WTGs. Construction of the jacket-type foundation would have a higher acoustic impact than construction of the monopile foundation due to the increased risk of exposure because of the longer time required to install more piles (up to four 9.8-foot [3-meter] pin piles per jacket).
- **Monopile diameter:** The potential acoustic impacts on sea turtles differ among the WTG monopile diameters that may be used. The Project would use monopiles with a maximum diameter between 25 feet (8 meters) and 34 feet (11 meters). The acoustic modeling associated with construction of a monopile with a diameter of 34 feet (10.3 meters) differs from the acoustic modeling associated with construction of a monopile with a diameter of 30 feet (9 meters).
- **The WTG number:** All potential impacts would be lessened with a decrease in number of WTGs built.
- **Onshore export cable routes:** The route chosen (including variants within the general route) would determine the amount of habitat affected. Sections 3.19.3 through 3.19.6 detail the pertinent differences among the options with respect to sea turtles.
- **Season of construction:** Sea turtles may occur in Virginia waters year-round, but highest abundances occur from May through November (DiMatteo et al. 2023). Construction outside of the May–November window would have a lesser impact on sea turtles compared to construction during peak abundance periods.

Although some variation is expected in the design parameters, the impact assessment on sea turtles in this section analyzes the maximum-case scenario.

3.19.5 Impacts of the Proposed Action on Sea Turtles

Accidental releases: During construction, operation, and conceptual decommissioning of the Project there could be a short-term risk of sanitary and other waste fluids or fuels and other petrochemicals accidentally entering the water from vessels operating during Project activities. If sea turtles were exposed to an oil spill or discharge of waste material, potential impacts would be the same as those discussed in Section 3.19.3.2, *Cumulative Impacts of the No Action Alternative*. Any non-routine spills or accidental releases that could result in negligible and short-term impacts on surface water resources would be avoided or minimized through the implementation of the Project Oil Spill Response Plan and other environmental protection measures (COP, Section 4.2.6.3, Table 4.2-51; Dominion Energy 2023). Impacts on sea turtles from accidental spills or pollutant releases are considered minor because of the low probability of accidents and mitigation measures that will be implemented. Trash and debris from Project-related vessels that enter the water also represents a risk factor to sea turtles because they could ingest or become entangled in debris, causing lethal or injurious impacts. Plastic materials (e.g., plastic bags) are often mistaken for prey (e.g., jellyfish, salps) and ingested, which can block the turtles' intestinal tracts, causing injury or mortality. Personnel working offshore would receive training on sea turtle awareness and marine debris awareness (COP, Section 4.2.6.3, Table 4.2-51; Dominion Energy 2023). Other proposed measures that would be implemented include strict adherence to regulations specified in separate Annexes of MARPOL (the International Convention for the Prevention of Pollution from Ships), which would lower the probability of such a risk (USCG 2023). Therefore, impacts from accidental releases on sea turtles are expected to be negligible for the Proposed Action.

Electromagnetic fields: EMFs would be produced by the inter-array and offshore export cables throughout the life of the Project. These effects would be most intense directly above the cables at locations where they could not be buried to the full proposed burial depth and are laid on the seafloor beneath stone or concrete mattresses. Approximately 300 miles (484 kilometers) of inter-array cable and 417 miles (671 kilometers) of export cable in the offshore portion of the preferred cable route would be installed (COP, Table 1.2-1; Dominion Energy 2023). Estimated EMF levels modeled by Exponent for the COP (Appendix AA; Dominion Energy 2023) predict a maximum magnetic field from the inter-array cable of 68 milligauss, and 112 milligauss from the export cable at the seabed. However, the magnetic field is reduced to 5.2 and 8.7 milligauss for the inter-array and export cable, respectively, at 3 feet (1 meter) above the seafloor; similar reductions are expected at increasing horizontal distance from the cables (COP, Appendix AA; Dominion Energy 2023). BOEM has conducted literature reviews and analyses of potential EMF effects from offshore renewable energy projects on indigenous fauna (CSA Ocean Sciences and Exponent 2019; Normandeau et al. 2011). These and other available reviews and studies (Gill et al. 2005; Kilfoyle et al. 2018) suggest that most marine species cannot sense very low intensity electric or magnetic fields at the typical AC power transmission frequencies associated with offshore renewable energy projects. As discussed in Section 3.19.3.2, sea turtles are likely magnetosensitive and orient to Earth's magnetic field for navigation, but they are unlikely to detect magnetic fields below 50 milligauss (Normandeau et al. 2011). The transmission cables used during Project operations may exceed 50 milligauss at locations where full burial is not possible, but these areas would be limited (i.e., the magnetic field above 50 milligauss would be limited to the area immediately above the cables) (COP, Appendix AA; Dominion Energy 2023). This indicates that sea turtles would only be able to detect induced magnetic fields within a few meters of the exposed cables or immediately above buried cables. Given the lack of sensitive life stages of sea turtles present in the Project area, the limited extent of detectable magnetic field levels, and limited potential for sea turtles to encounter field levels above detectable levels for extended periods of time, the effects of Project-related EMF exposure on sea turtles would be negligible for the Proposed Action.

Light: Lights would be required on vessels and heavy equipment during construction and conceptual decommissioning, and would also include a variety of operational lighting, including navigational lighting for mariners, obstruction lighting for aviators, and vessel/work lighting for maintenance and operations. As discussed in Section 3.19.3.2, behavioral responses to artificial lighting of offshore structures and vessels have been observed in sea turtles; however, none of these responses are expected to result in long-term or biologically notable impacts. Additionally, typical migrating or foraging behavior of sea turtles (i.e., remaining predominantly submerged) limits their exposure to operational lighting, and lighting would be limited to the minimum required for by regulation for safety. Based on available information and Project design parameters (Appendix E, *Project Design Envelope and Maximum-Case Scenario*), it is expected the impact of Project-related lighting on sea turtles would be negligible for the Proposed Action.

New cable emplacement/maintenance: Sea turtles in or near the Project area would likely be foraging or migrating between foraging and nesting habitats. Prey items within the Project area could include benthic species that could be affected by seabed disturbance associated with installation of the offshore export cables and inter-array cables. This disturbance would be short-term and prey species would be expected to return to the area once the cables are installed (Section 3.13.3). Similar levels of impact would be realized during cable maintenance. While trailing hopper suction dredgers are being considered for use for the Proposed Action, it is not definite and potential risks of sea turtle entrainment would be low as discussed in Section 3.19.3.2. Because impacts during cable installation or maintenance would be temporary and localized, the impact of Project activities on sea turtles would be negligible for the Proposed Action.

Noise: A short-term increase in underwater noise is the most likely IPF that could affect sea turtles, predominantly during installation of the WTG and OSS foundations, cofferdams, and nearshore structures

during Project construction. The Project PDE includes both impact and vibratory pile driving as an option for installation of the WTG monopile foundations and OSS jacket foundations, as well as vibratory pile driving, which would be used to install the cofferdams and impact pile driving of the goal post piles (COP, Appendix Z; Dominion Energy 2023). All these activities have potential to produce noise above recommended sea turtle acoustic thresholds (Table 3.19-3). Underwater acoustic modeling was conducted for the COP (Appendix Z; Dominion Energy 2023) for both activities, and the results are summarized in Table 3.19-4. For the purposes of this assessment, the deep modeling location using the maximum hammer energy with the noise attenuation proposed for each activity based on the LOA application (Tetra Tech 2022) is provided for each modeled scenario.

Table 3.19-4 Summary of Underwater Acoustic Modeling Conducted for the Coastal Virginia Offshore Wind Project Construction and Operations Plan

Scenario	Noise Attenuation (dB)	Distance (m) to PTS Threshold ($L_{p,pk}$)	Distance (m) to PTS Threshold ($L_{E,24hr}$)	Distance (m) to TTS Threshold ($L_{p,pk}$)	Distance (m) to TTS Threshold ($L_{E,24hr}$)	Distance (m) to Behavioral Threshold (L_P)
Standard Driving Installation – Impact Pile Driving	10	10	1,044	67	3,575	2,146
Standard Driving Installation – Vibratory Pile Driving	10	N/A	6	NA	179	82
Hard-to-Drive Installation – Impact Pile Driving	10	10	1,142	67	3,902	2,146
Hard-to-Drive Installation – Vibratory Pile Driving	10	N/A	0	NA	132	82
One Standard and One Hard-to-Drive Installation – Impact Pile Driving	10	10	1,410	67	4,812	2,146
One Standard and One Hard-to-Drive Installation – Vibratory Pile Driving	10	N/A	8	NA	200	82
OSS Piled Jacket – Impact Pile Driving	10	0	653	0	2,303	742
OSS Piled Jacket – Vibratory Pile Driving	10	N/A	0	NA	94	7
Cofferdam Installation – Vibratory Pile Driving	0	N/A	0	NA	NA	0

Scenario	Noise Attenuation (dB)	Distance (m) to PTS Threshold ($L_{p,pk}$)	Distance (m) to PTS Threshold ($L_{E,24hr}$)	Distance (m) to TTS Threshold ($L_{p,pk}$)	Distance (m) to TTS Threshold ($L_{E,24hr}$)	Distance (m) to Behavioral Threshold (L_P)
Goal Post Pile Installation – Impact Pile Driving	0	0	0	NA	NA	0

Source: Tetra Tech 2022.

As discussed in Section 3.19.3.2, the low-frequency noise associated with impact and vibratory pile driving during installation of the WTG and OSS foundations is within the estimated hearing range of sea turtles. Results of the modeling show there is some risk of exposure to noise above the PTS threshold during impact pile driving given the maximum range to the threshold may extend to 0.9 mile (1.4 kilometers) with 10 dB noise attenuation (Table 3.19-4). However, the PTS threshold is represented as a sound exposure level over 24 hours ($L_{E,24hr}$) indicating that the duration of the exposure is just as important as the level of the noise an animal is exposed to. The $L_{E,24hr}$ assumes an individual is exposed to noise at or above the threshold for the entire duration of the pile installation for the onset of PTS to occur, so if an animal moves away from the noise before accumulating enough sound to meet the threshold they are not likely to develop PTS. It is expected that sea turtles will swim away from the ensonified area during construction, which reduces the risk of PTS occurring. Additionally, mitigation measures such as soft start, pre-clearance, and shutdown procedures, while geared primarily towards marine mammals, will help ensure that the amount of time the Project area is ensonified above the thresholds and the amount of time an animal is present within the ensonified area is reduced, further reducing the risk of PTS being realized. The modeled behavioral threshold isopleths, with 10 dB noise mitigation, for sea turtles resulting from impact pile driving range from 2,434 to 7,041 feet (742 to 2,146 meters); the modeled TTS threshold isopleths with 10 dB noise mitigation range from 7,555 to 15,787 feet (2,303 to 4,812 meters). The behavioral threshold ranges use the SPL metric, which is based on the acoustic energy produced by a single hammer strike on the pile, while the TTS ranges are based on the $L_{E,24hr}$ metric, which requires accumulation of acoustic energy for the full duration of the pile installation. Therefore, while it appears animals would reach TTS thresholds prior to reaching behavioral thresholds, the time consideration in the TTS metric renders these ranges not fully comparable to the SPL ranges since the approach used assumes any given animal would be stationary for the full pile installation period, which is not representative of how an animal would be expected to behave in the wild. A shorter modeled time exposure, a single strike exposure for TTS, or modeled TTS exposure ranges that account for animal movement and behavior may provide more comparable results; however, these are not available in the modeling report and would not be expected to change the effects determinations. As discussed previously, TTS is a form of auditory fatigue that, unlike PTS, is non-permanent and reversible. As mentioned previously, very little is known about the onset of TTS in sea turtles and this metric is rarely used to assess potential impacts from impact pile driving beyond a few hammer strikes at the highest hammer energy. This metric is more often applied to sources such as underwater explosions where exposure to high sound energy could result in TTS when behavioral responses are unlikely to occur. Additionally, as discussed for behavioral responses, onset of TTS does not equate to an individual being removed from a population or facing any long-term restrictions on critical behaviors, as TTS is recoverable. As discussed for PTS, the proposed mitigation measures will help reduce the overall duration sea turtles may be exposed to above-threshold noise. If sea turtles avoid the ensonified area during pile driving that may represent a loss of foraging habitat during the construction period; however, this would not be expected to be a long-term behavioral disturbance as sea turtles would regain access to this habitat after pile driving, and there are likely to be ample foraging opportunities outside the Project area, so no impacts that would affect the viability of any sea turtle population are expected. Because of the risk of PTS for potentially large numbers of sea turtles of all

species known to occur within the Project area, as well as temporary avoidance of these animals from the ensonified area, minor impacts on sea turtles are expected to result from the Proposed Action.

Vibratory pile driving during installation of the cofferdams is not expected to exceed PTS or behavioral thresholds at any distance (Table 3.19-4). Therefore, vibratory pile driving associated with cofferdam installation is expected to result in a negligible impact on sea turtles from the Proposed Action; it is more likely sea turtles would respond to noise from construction vessels staging on site prior to vibratory pile driving.

Impact pile driving during installation of the goal post piles used to support trenchless installation of the export cable is similarly not expected to result in any PTS-onset or behavioral disturbances. Though impact pile driving produces louder noise than vibratory pile driving, the size of the piles, location of the activity, and duration of the pile driving for the goal posts make this less likely to produce above-threshold noise for sea turtles. Modeling shows that PTS and behavioral thresholds will not be met or exceeded at any distance from the source (Table 3.19-4), and impacts on sea turtles during goal post installation under the Proposed Action would, therefore, result in negligible impacts.

Underwater noise levels produced by construction, maintenance, and decommissioning vessels throughout the life of the Project are not expected to exceed PTS thresholds for sea turtles. The main frequency range of vessels (10 to 1,000 Hz) overlaps with the frequency range of sea turtle hearing (100 to 1,200 Hz) (Ketten and Bartol 2006; Lavender et al. 2014); sea turtles can detect vessel noise and could respond with a startle or temporary stress response (NSF and USCG 2011). However, sea turtles may also habituate to vessel traffic associated with the Project as they inhabit areas that experience regular marine traffic (Hazel et al. 2007). A conservative assumption is that Project construction and support vessels could elicit behavioral changes in individual sea turtles present in the Project area during vessel operations, but these changes would be limited to evasive maneuvers such as diving, changes in swimming direction, or changes in swimming speed. These changes are not expected to be biologically notable and impacts on sea turtles from Project vessel noise would, therefore, be negligible for the Proposed Action.

The most likely cable burial methods being considered as part of the Proposed Action include jet plow, jet trenching, hydroplow (simultaneous lay and burial), and mechanical plowing (simultaneous lay and burial) (COP Section 3.4, Dominion Energy 2023), which produce low sound levels, as discussed in 3.15.3.2, *Cumulative Impacts of the No Action Alternative*. Potential impacts would be limited to behavioral disturbances that are short term and localized around the immediate area surrounding the cable installation activities and would, therefore, be negligible for sea turtles.

HRG survey equipment would likely be used during pre-construction surveys to support design finalization. This equipment produces noise in the 1.1 to 200 kHz frequency range at sound levels that may exceed sea turtle behavioral thresholds. No injurious impacts are expected for sea turtles from any HRG survey equipment (Baker and Howsen 2021). Behavioral disturbances may occur up to 295 feet (90 meters) from impulsive sources and up to 7 feet (2 meters) from non-impulsive sources assuming equipment are operating at the highest power settings (Baker and Howsen 2021). However, as discussed in Section 3.19.3.2, the assessment conducted by Ruppel et al. (2022) indicated that, even without mitigation, behavioral disturbances were unlikely to occur for sea turtles during operation of most HRG equipment, given the source levels and frequency range of the sources. Some low-level behavioral disturbances could potentially occur during Project-related HRG surveys; however, implementation of mitigation measures (Appendix H, *Mitigation and Monitoring*) and the relatively short duration of these surveys would reduce the risk of exposure. Impacts from HRG surveys on sea turtles are, therefore, expected to be negligible for the Proposed Action.

Sea turtles would likely be able to hear the continuous underwater noise of operational WTGs throughout the life of the proposed Project. Sea turtle hearing (frequencies less than 1,200 Hz) is within the frequency range for operational WTG (less than 500 Hz) (Popper et al. 2014; Thomsen et al. 2006; Tougaard et al. 2009, 2020). Thus, it is possible that WTG noise may influence sea turtle behavior. Potential responses to WTG noise generated during normal operations may be behavioral and include avoidance of the noise source, disorientation, and disturbance of normal behaviors such as feeding (MMS 2007). Noise generated during normal operations might affect many individuals and for a much longer time period (MMS 2007). As discussed previously for marine mammals in Section 3.15.3, operational WTGs can produce L_P ranging from 92 to 137 dB referenced to 1 micropascal at distances of 65 to 656 feet (20 to 200 meters) from the source (Tougaard et al. 2020). However, though WTG noise may exceed ambient sound levels present within the Project area, they are not expected to exceed noise produced by vessel traffic out to 0.6 mile (1 kilometer) (Tougaard et al. 2020) and impacts would, therefore, be similar to those described for vessel noise under *Cumulative Impacts of the No Action Alternative* and would be expected to be negligible.

Port utilization: No dredging activities related to port modifications are directly proposed under the Proposed Action, so sea turtles in the Project area would not be exposed to dredging activities under the Proposed Action. Additionally, most sea turtle nesting locations in this area are north of the Project switching station in military reserves and national wildlife refuges, outside the area of effect (Section 3.19.1). Therefore, dredging impacts on sea turtles from port utilization during Project construction would be negligible for the Proposed Action.

Presence of structures: The Proposed Action would alter approximately 203.3 acres (0.82 square kilometer) of seafloor, with 202 WTG and up to three OSS foundations with associated scour protection and over the life of the Project (COP, Table 4.2-17; Dominion Energy 2023). The alteration of the seafloor under the Proposed Action would result in a long-term conversion of existing benthic habitat to new, stable, hard structures. The presence of the foundations poses a potential risk for sea turtle displacement which would result in lost foraging opportunities or reduced access to foraging and breeding habitat. However, there is no designated critical habitat for any sea turtles in the Project area so there is not expected to be any substantial loss of foraging opportunities that could have population-level effects. Based on the best available information, negligible impacts, if any, are anticipated for the Proposed Action. Sea turtles would be expected to use habitat in between the WTGs, as well as around structures for feeding, breeding, resting, and migrating for short periods, but residency times around structures may increase with the age of structures if benthic communities develop on and around foundations. Although migrating sea turtles could make temporary stops to rest and feed during migrations, the presence of structures is not expected to result in noticeable changes to overall migratory patterns in sea turtles. However, presence of these structures is also expected to attract fishing activity, which may increase the risk of accidental releases of trash and debris or entanglement in fishing gear. Interactions with lost fishing gear, such as hook and line or gill net gear around WTG foundations is another potential long-term risk and may result in hooking, entanglement, ingestion, injury, and death of individual turtles (Berreiros and Raykov 2014; Gregory 2009; Vegter et al. 2014). Given sea turtle proclivity for using anthropogenic structures and documented effects of discarded fishing gear on sea turtles (Barnette 2017), it is likely that impacts from entanglement associated with the Proposed Action on sea turtles would be minor, as impacts would be detectable and measurable. These impacts may include injury or loss of individuals, but these impacts would not result in population-level effects.

Once construction is complete, these surfaces would be available for colonization by sessile organisms and would draw other species that are typically attracted to hard-bottom habitats (Causon and Gill 2018; Langhamer 2012). This phenomenon is known as the reef effect as discussed in Section 3.19.3.2. Additional information about the reef effect on sea turtle prey species can be found in Section 3.13.3. The Project foundations could result in localized increased primary production and zooplankton abundance,

which could serve as food for some sea turtle species, as well as some sea turtle prey species. This may result in minor beneficial impacts from the presence of foundations for the Proposed Action.

Within the context of other available habitats along the OCS and expected future offshore wind projects (Appendix F, *Planned Activities Scenario*), habitat availability due to presence of WTG and OSS foundations, including the Proposed Action, would result in minor adverse impacts on sea turtles. The presence of structures, which would attract fish, may attract fishing vessels around the wind farms, which increases the risk of lost gear being present where sea turtles are foraging or migrating. However, the increased fish presence and potential primary productivity rates around these structures would also provide additional foraging opportunities, and the structures themselves provide shelter for sea turtles which may result in minor beneficial effects on sea turtles. However, it must be noted that these minor beneficial effects may be offset due to the risk of entanglement due to derelict or abandoned fishing gear or fishing line.

Vessel traffic: Vessels associated with Project construction, O&M, and conceptual decommissioning during the Proposed Action would result in a nominal increase in vessel traffic relative to the overall existing volume of vessel traffic offshore Virginia and within the OCS in general (Appendix F, Table F1-14). Larger vessels used during construction would largely transit to the Project work site and remain there for most of the construction period. Smaller support vessels are expected to make more frequent trips between Project ports and the work site to deliver supplies and crew members. Regular trips would also be made by Project vessels throughout operations and maintenance for routine maintenance of Project components. Increased vessel traffic from Project activities presents a vessel strike risk to individual sea turtles of the species identified as potentially occurring in the Project area, all of which are listed as threatened or endangered under the Endangered Species Act; a strike that results in serious injury or mortality could have severe consequences. Sea turtle stranding data reported that stranded sea turtles with evidence of vessel strike injury were as high as 25 percent in the Chesapeake Bay, Virginia (Barco et al. 2016). Similarly, Foley et al. (2019) reported that roughly one-third of stranded loggerhead, leatherback, and green sea turtles in Florida had injuries indicative of a vessel strike. However, all Project vessels would implement mitigation measures outlined in the COP (Section 4.2.6.3, Table 4.2-63; Dominion Energy 2023) following guidance from both NOAA and BOEM to reduce the likelihood of vessel strike on sea turtles. Mitigation measures such as vessel speed restrictions and protected species monitoring, while geared towards marine mammals, will subsequently benefit sea turtles by reducing the risk of a vessel strike occurring. PSOs for offshore wind site investigation surveys have reported sightings of sea turtles during vessel transits and survey operations (Marine Ventures International, Inc. 2022; RPS 2021). RPS (2021) recorded 75 leatherback sea turtles, 470 loggerhead sea turtles, and 83 unidentified turtles over a 2-year period totaling roughly 4,893 observation hours, which equates to approximately 13 sea turtle detections per 100 hours of survey and vessel effort. These detection rates are relatively high, and even with these high detection rates there were only 18 vessel strike mitigation actions required (2.8 percent of all sea turtle detections) and no strikes reported. Therefore, with the implementation of vessel strike avoidance measures such as visual monitoring, impacts from vessel traffic on sea turtles would be minor under the Proposed Action, including conceptual decommissioning.

Fishing gear utilization (biological/fisheries monitoring surveys): Under the Proposed Action, fisheries monitoring surveys would be conducted for whelk, black sea bass, and Atlantic surf clam (Appendix H, Table H-2). These survey activities would include use of trap/pot fishing gear for the welk and black sea bass and dredging for the Atlantic surf clam which would post a risk of entrainment or unintended capture for sea turtles. However, the Proposed Action also includes a number of mitigation and monitoring measures, such as removing all sampling gear from the water at least once every 30 days; recovering lost survey gear; having at least one onboard staff member who has completed the Northeast Fisheries Observer Program observer training (within the last 5 years) or other training in protected species identification and safe handling; and having adequate disentanglement equipment (i.e., knife and

boathook) onboard vessels deploying fixed gear (Appendix H). Given the limited duration and spatial extent of all fisheries monitoring survey efforts and the implementation of the monitoring and mitigation measures (Appendix H), the effects from monitoring surveys (e.g., entanglement, reductions in prey) on sea turtles are considered extremely unlikely to occur and though they would be detectable and measurable, would not lead to population-level effects. The impact of survey gear utilization on sea turtles as a result of the Proposed Action, therefore, is expected to be minor.

3.19.5.1 Cumulative Impacts of the Proposed Action

The cumulative impacts of the Proposed Action considered the impacts of the Proposed Action in combination with other ongoing and planned wind activities. Ongoing and planned non-offshore wind activities within the geographic analysis area that contribute to cumulative impacts on sea turtles include but are not limited to various coastal development projects. As the Proposed Action would account for about 9.6 percent (up to 202 of 3,287) of the new WTGs on the OCS, a majority (approximately 90 percent) of these impacts would occur as a result of structures associated with other offshore wind development and not the Proposed Action.

Accidental releases: In the context of reasonably foreseeable environmental trends, the combined impacts from this IPF from ongoing and planned actions, including the Proposed Action, and conceptual decommissioning activities would be minor. Entanglement in lost fishing gear is the primary anthropogenic cause of mortality in both juvenile and adult sea turtles (National Research Council 1990 as cited in Shigenaka et al. 2010) and is expected to be the primary source of risk to sea turtles from accidental releases of trash and debris from ongoing and planned activities.

Electromagnetic fields: In the context of reasonably foreseeable environmental trends, the combined impacts from this IPF from ongoing and planned actions, including the Proposed Action, would be expected to be negligible. New subsea cable installation would be predominantly attributed to future offshore wind development, which would result in up to 5,595 miles (9,004 kilometers) of export cables and 5,554 miles (8,938 kilometers) of inter-array cables installed between 2023 and 2030, within which the Proposed Action comprises a relatively small portion of the overall length of the cables (Appendix F, Table F2-1). While each cable would generate EMF effects in the immediate surrounding area, only sea turtles at or directly above the seafloor near the cables would likely be able to detect it, and impacts would be limited to negligible, short-term behavioral responses.

Light: The expected negligible impact of the Proposed Action alone would not noticeably increase the overall impacts of light beyond the impacts described under the No Action Alternative (Section 3.19.3). Under the expanded planned action scenario, over 3,287 offshore structures would have lights, and these would be incrementally added over time beginning in 2023 and continuing through 2030 (Appendix F, Table F2-1). Lighting of turbines and other structures would be minimal (navigation and aviation hazard lights) and in accordance with BOEM (2021) guidance. In the context of reasonably foreseeable environmental trends, combined lighting impacts on sea turtles from ongoing and planned actions, including the Proposed Action would be expected to have negligible, non-measurable impacts on sea turtles. Ongoing and future non-offshore wind activities are not expected to cause permanent impacts, primarily driven by light from offshore structures and short-term and localized impacts from vessel lights.

New cable emplacement/maintenance: The expected negligible incremental impact of the Proposed Action or combined with ongoing and planned actions would result in seafloor disturbance from the offshore export cable and inter-array cables. In the context of reasonably foreseeable environmental trends, the combined cable emplacement impacts from ongoing and planned actions, including the Proposed Action, could occur if impacts are in close temporal and spatial proximity. However, these impacts from cable emplacement would be expected to be negligible and would not be expected to be biologically notable.

Noise: In the context of reasonably foreseeable environmental trends, the combined impacts from this IPF from ongoing and planned actions, including the Proposed Action, would be expected to be minor for sea turtles. The main activity that would result in adverse effects on sea turtles is impact pile driving during installation of WTG and OSS foundations. The expected minor incremental impact of the impact pile driving under the Proposed Action, combined with future offshore wind activities, would result in increased underwater noise levels during construction starting in 2023 and continuing through 2030, but the effects of this activity would cease once pile driving stopped (Appendix F, Table F2-1). All other noise-producing activities under the Proposed Action, including conceptual decommissioning, are expected to result in negligible impacts on sea turtles, and combined impacts with ongoing and planned actions would similarly be negligible. Impacts from other noise producing activities are lower in intensity relative to impact pile driving, and impacts would be localized, temporary, and not biologically notable for sea turtle populations.

Port utilization: In the context of reasonably foreseeable environmental trends, the combined impacts from this IPF from ongoing and planned actions, including the Proposed Action, would be expected to be similar to the impacts under the No Action Alternative and would be expected to be negligible.

Presence of structures: The Proposed Action would contribute to the cumulative impacts of structures on sea turtles, which are expected to minor.

Vessel traffic: In the context of reasonably foreseeable environmental trends, the combined vessel traffic impacts from ongoing and planned actions, including the Proposed Action, and conceptual decommissioning, would be expected to be similar to the impacts under the No Action Alternative and would be expected to be minor.

Fishing gear utilization (biological/fisheries monitoring surveys): In the context of reasonably foreseeable environmental trends, the combined fishing gear utilization impacts from ongoing and planned actions, including the Proposed Action, and conceptual decommissioning, would be expected to be similar to the impacts under the No Action Alternative and would be expected to be minor.

3.19.5.2 Conclusions

Impacts of the Proposed Action. Project construction, operations and maintenance, and conceptual decommissioning would likely result in habitat disturbance, underwater noise, vessel traffic, artificial lighting, and potential accidental discharges or spills and trash. BOEM anticipates the impacts resulting from the Proposed Action would range from **negligible** to **minor**. Therefore, the overall impacts on sea turtles are expected to be **minor**, as the overall effect would be notable, but the resource is expected to recover completely with remedial or mitigating action.

Cumulative impacts of the Proposed Action. In the context of reasonably foreseeable environmental trends in the area, impacts of individual IPFs resulting from ongoing and planned actions, including the Proposed Action, would range from **negligible** to **minor**. The Proposed Action could also result in **minor beneficial** impacts that may be offset by the risk of entanglement in derelict or abandoned fishing gear or fishing line. Considering all the IPFs collectively, impacts from ongoing and planned actions, including the Proposed Action, would result in **minor** impacts on sea turtles in the geographic analysis area. The main driver for this impact rating is underwater noise from impact pile driving (rated as a minor impact). Considering the fact that all sea turtle species in the region are currently listed as endangered or threatened under the ESA, the overall rating reflects this highest, or most severe rating from individual IPFs. The Proposed Action would contribute to the overall impact rating primarily through additional impact pile driving, vessel traffic, and WTG/OSS structures that would be present in the region during Project construction and operations and maintenance. Therefore, overall impacts on sea turtles are

expected to be **minor** because a measurable impact is anticipated, but the resource would likely recover completely when activities cease or remedial or mitigating actions are taken.

3.19.6 Impacts of Alternatives B and C on Sea Turtles

BOEM identified a combination of Alternative B (Revised Layout to Accommodate the Fish Haven Area and Navigation) and Alternative D-1 (Interconnection Cable Route Option 1) as the Preferred Alternative. The analysis of the impacts of the Preferred Alternative would be the same as that for Alternative B, as described in this section.

Impacts of Alternatives B and C. Alternatives B and C would reduce the number of proposed WTGs but would lead to the same types of impacts on sea turtles from construction and installation, O&M, and conceptual decommissioning activities as described for the Proposed Action. However, Alternatives B and C would remove 29 and 33 turbines, respectively; therefore, there would be a smaller area of seabed disturbance and water column disturbance and a shorter duration of noise impacts. The area of seabed disturbed by Alternatives B and C would be decreased by approximately 14 percent and 17 percent compared to the Proposed Action, respectively. Although this would decrease the overall duration of impact pile driving expected during the construction period, the noise produced per pile would be expected to be similar to that described under the Proposed Action and impacts on sea turtles would be expected to remain minor.

Operational impacts of reduced WTGs on sea turtles under Alternatives B and C would be minimally decreased compared to the Proposed Action due to the fewer number of WTGs and subsequent smaller area of impact. Less habitat would be altered and affected by WTG operational noise, artificial lighting, and EMF from the inter-array cable. However, in the vicinity of the Project, effects would not be measurably different from those of the Proposed Action.

If Alternative B or Alternative C were approved, associated risks to sea turtles, particularly related to pile-driving noise, would be less than those expected under the Proposed Action.

Cumulative impacts of Alternatives B and C. In the context of reasonably foreseeable environmental trends, the combined impacts on sea turtles from ongoing and planned actions, including Alternatives B and C, would be similar to those described under the Proposed Action.

3.19.6.1 Conclusions

Impacts of Alternatives B and C. Although Alternatives B and C would decrease the number of WTGs and their associated inter-array cables, BOEM expects that the impacts resulting from Alternatives B and C alone would be similar to those of the Proposed Action and would range from **negligible** to **minor**.

Cumulative impacts of Alternatives B and C. In the context of reasonably foreseeable environmental trends, the combined impacts on sea turtles from ongoing and planned actions, including Alternatives B and C, would be similar to those described under the Proposed Action, with individual IPFs leading to **negligible** to **minor** impacts, and with the potential for **minor beneficial** impacts to be offset by the risk of entanglement in derelict or abandoned fishing gear or fishing line. While Alternatives B and C may result in a slightly lower risk of impacts on sea turtles than described under the Proposed Action, the overall impacts of Alternatives B and C on sea turtles would be the same as under the Proposed Action and would remain **minor**. This impact rating is determined primarily by ongoing activities such as those that produce underwater noise and vessel activities. As described for the Proposed Action, Dominion Energy's existing commitments to mitigation measures and BOEM's potential additional mitigation measures could further reduce impacts but would not change the impact ratings.

3.19.7 Impacts of Alternative D on Sea Turtles

Impacts of Alternative D. Alternative D would result in the same types of impacts on sea turtles from construction, O&M, and decommissioning as the Proposed Action. The scope of construction and installation activities and their associated IPFs under Alternative D are designed to reduce the impact on onshore habitats but, as described in Section 3.19.1, sea turtles around the Project area are primarily expected to remain offshore in the Project area. Loggerhead sea turtles, green sea turtles, and Kemp's ridley sea turtles have been documented nesting in Virginia (USFWS 2005; Wright 2015; Parker 2020; Wollam 2023) but, given the availability of nest beaches relative to the proposed onshore cable construction footprint, no biologically relevant impacts on breeding for this population are expected under Alternative D. The primary IPFs that would affect sea turtles are underwater noise and vessel traffic, which would not differ from that described under the Proposed Action, and impacts on sea turtles would be expected to remain negligible to minor.

Cumulative impacts of Alternative D. In the context of reasonably foreseeable environmental trends, the combined impacts on sea turtles from ongoing and planned actions, including Alternative D, would be the same as those described under the Proposed Action.

3.19.7.1 Conclusions

Impacts of Alternative D. Although Alternative D would minimize impacts on onshore habitats, this is not expected to result in a notable benefit for sea turtles in this region, and overall potential impacts would be the same as under the Proposed Action and would range from **negligible** to **minor**.

Cumulative impacts of Alternative D. In the context of reasonably foreseeable environmental trends, the combined impacts on sea turtles from ongoing and planned actions, including Alternative D, would be the same as those described under the Proposed Action, with individual IPFs leading to **negligible** to **minor** impacts, and would also result in **minor beneficial** impacts. However, it is important to note that these benefits may be offset by the risk of entanglement in derelict fishing gear. While Alternative D is designed to minimize impacts on onshore habitats, the overall impacts of Alternative D on sea turtles would be the same as under the Proposed Action and would remain **minor**. This impact rating is determined primarily by ongoing activities, such as those that produce underwater noise and vessel activities. As described for the Proposed Action, Dominion Energy's existing commitments to mitigation measures and BOEM's potential additional mitigation measures could further reduce impacts but would not change the impact ratings.

3.19.8 Agency-Required Mitigation Measures

The mitigation measures listed in Table 3.19-5 are recommended for inclusion in the preferred alternative. If one or more of the measures analyzed below are adopted, the risk for some adverse impacts could be further reduced. There are no additional agency-required mitigation measures identified as relevant for sea turtles (Appendix H, Table H-3).

Table 3.19-5 Measures Resulting from Consultations[1]

Measure	Description	Effect
Vessel strike avoidance procedures	Applicant proposed measures plus: • As part of vessel strike avoidance, a training program will be implemented. The training program will be provided to NMFS for review and approval prior to the start of surveys. Confirmation of the training and understanding of the requirements will be documented on a training course log sheet.	This measure would ensure effective monitoring and separation distances from sea turtles, which will reduce potential interactions between

Measure	Description	Effect
	Signing the log sheet will certify that the crew members understand and will comply with the necessary requirements throughout the survey event. Vessel operators and crew must maintain a vigilant watch for marine mammals and sea turtles by slowing down or stopping their vessels to avoid striking these protected species. Vessel crew members responsible for navigation duties will receive site-specific training on marine mammal sighting/reporting and vessel strike avoidance measures.	Project-related vessels and sea turtles.
BOEM PDCs and BMPs	BOEM will require Dominion Energy comply with all the Project Design Criteria and BMP for Protected Species at https://www.boem.gov/sites/default/files/documents//PDCs%20and%20BMPs%20for%20Atlantic%20Data%20Collection%2011222021.pdf, that implement the integrated requirements for threatened and endangered species resulting from the June 29, 2021, programmatic consultation under the ESA, revised September 1, 2021. This requirement also applies to non-ESA-listed marine mammals that are found in that document. Consultation conditions occurring in State waters outside of BOEM jurisdiction may apply to co-action agencies issuing permits and authorizations under this consultation	Compliance with PDCs and BMPs for protected species would minimize risk to sea turtles during site characterization and site assessment surveys.
Look out for sea turtles and reporting	a. For all vessels operating north of the Virginia/North Carolina border, between June 1 and November 30, Dominion Energy would have a trained lookout posted on all vessel transits during all phases of the project to observe for sea turtles. The trained lookout would communicate any sightings, in real time, to the captain so that the requirements in I below can be implemented. b. For all vessels operating south of the Virginia/North Carolina border, year-round, Dominion Energy would have a trained lookout posted on all vessel transits during all phases of the project to observe for sea turtles. The trained lookout would communicate any sightings, in real time, to the captain so that the requirements II below can be implemented. This requirement is in place year-round for any vessels transiting south of Virginia, as sea turtles are present year-round in those waters. c. The trained lookout would monitor https://seaturtlesightings.org/ prior to each trip and report any observations of sea turtles in the vicinity of the planned transit to all vessel operators/captains and lookouts on duty that day. d. If a sea turtle is sighted within 330 feet (100 meters) or less of the operating vessel's forward path, the vessel operator would slow down to 4	Maintains safe operating distances to minimize vessel interactions with sea turtles. This measure would further clarify the distance at which vessels would divert their path and the distance at which vessels would reduce speed and shift to neutral.

Measure	Description	Effect
	knots (unless unsafe to do so) and then proceed away from the turtle at a speed of 4 knots or less until there is a separation distance of at least 330 feet (100 meters), at which time the vessel may resume normal operations. If a sea turtle is sighted within 164 feet (50 meters) of the forward path of the operating vessel, the vessel operator would shift to neutral when safe to do so and then proceed away from the turtle at a speed of 4 knots. The vessel may resume normal operations once it has passed the turtle. e. Vessel captains/operators would avoid transiting through areas of visible jellyfish aggregations or floating sargassum lines or mats. In the event that operational safety prevents avoidance of such areas, vessels would slow to 4 knots while transiting through such areas. f. All vessel crew members would be briefed in the identification of sea turtles and in regulations and best practices for avoiding vessel collisions. Reference materials would be available aboard all project vessels for identification of sea turtles. The expectation and process for reporting of sea turtles (including live, entangled, and dead individuals) would be clearly communicated and posted in highly visible locations aboard all project vessels, so that there is an expectation for reporting to the designated vessel contact (such as the lookout or the vessel captain), as well as a communication channel and process for crew members to do so. g. The only exception is when the safety of the vessel or crew necessitates deviation from these requirements on an emergency basis. If any such incidents occur, they would be reported to NMFS within 24 hours. h. If a vessel is carrying a PSO or trained lookout for the purposes of maintaining watch for NARWs, an additional lookout is not required and this PSO or trained lookout would maintain watch for marine mammals and sea turtles. Vessel transits to and from the Offshore Project area, that require PSOs will maintain a speed commensurate with weather conditions and effectively detecting sea turtles prior to reaching the 330 feet (100 meters) avoidance measure.	
Marine debris awareness training	Dominion Energy would ensure that vessel operators, employees, and contractors engaged in offshore activities pursuant to the approved COP complete marine trash and debris awareness training annually. The training consists of two parts: (1) viewing a marine trash and debris training video or slide show (described below); and (2) receiving an explanation from management personnel that emphasizes their	Marine debris and trash awareness training would minimize the risk of sea turtle ingestion of or entanglement in marine debris.

Measure	Description	Effect
	commitment to the requirements. The marine trash and debris training videos, training slide packs, and other marine debris related educational material may be obtained at https://www.bsee.gov/debris or by contacting BSEE. The training videos, slides, and related material may be downloaded directly from the website. Operators engaged in marine survey activities would continue to develop and use a marine trash and debris awareness training and certification process that reasonably assures that their employees and contractors are in fact trained. The training process would include the following elements: • Viewing of either a video or slide show by the personnel specified above; • An explanation from management personnel that emphasizes their commitment to the requirements; • Attendance measures (initial and annual); and • Record keeping and the availability of records for inspection by DOI. By January 31 of each year, Dominion Energy would submit to DOI an annual report that describes its marine trash and debris awareness training process and certifies that the training process has been followed for the previous calendar year. Dominion Energy would send the reports via email to BOEM (at renewable_reporting@boem.gov) and to BSEE (at marinedebris@bsee.gov).	
BOEM/NMFS meeting requirements for sea turtle take documentation	To facilitate monitoring of the incidental take exemption for sea turtles, through the first year of operations, BOEM and NMFS would meet twice annually to review sea turtle observation records. These meetings/conference calls would be bi-annually) and would use the best available information on sea turtle presence, distribution, and abundance, project vessel activity, and observations to estimate the total number of sea turtle vessel strikes in the action area that are attributable to project operations. These meetings would continue on an annual basis following year one of operations. Upon mutual agreement of NMFS and BOEM, the frequency of these meetings can be changed.	Reporting requirements to document take would improve accountability for documenting and reviewing sea turtle take associated with the Proposed Action.
Data Collection BA BMPs	BOEM would ensure that all PDC and BMPs incorporated in the Atlantic Data Collection consultation for Offshore Wind Activities (June 2021) shall be applied to activities associated with the construction, maintenance and operations of the Dominion Energy project as applicable.	Compliance with PDCs and BMPs for protected species would minimize risk to sea turtles during site characterization and site assessment surveys during all Project phases.

Measure	Description	Effect
BOEM COP PDCs and BMPs	Use standard underwater cables that have electrical shielding to control the intensity of electromagnetic fields (EMF).	This measure would decrease the area and intensity of EMF effects.
BOEM COP PDCs and BMPs	Vessels related to project planning, construction, and operation should travel at reduced speeds when assemblages of cetaceans are observed. Vessels also should maintain a reasonable distance from whales, small cetaceans, and sea turtles, and these should be determined during site-specific consultations.	This measure would minimize the potential of vessel strikes for sea turtles from Project-related vessels.
BOEM COP PDCs and BMPs	Lessees and grantees should minimize potential vessel effects on marine mammals and sea turtles by having project-related vessels follow the NMFS Regional Viewing Guidelines while in transit. Operators should undergo training on applicable vessel guidelines.	This measure would minimize the potential of vessel strikes for sea turtles from Project-related vessels.
BOEM COP PDCs and BMPs	Lessees and grantees should take efforts to minimize disruption and disturbance to marine life from sound emissions, such as pile driving, during construction activities.	This measure would minimize the potential and severity of noise-related effects.
BOEM COP PDCs and BMPs	Lessees and grantees should avoid and minimize effects on marine species and habitats in the Action Area by posting a qualified observer on site during construction activities. This observer should be approved by BOEM and NMFS.	This measure would increase accountability and ensure the effectiveness of mitigation and monitoring measures
Periodic Underwater Surveys, Reporting of Monofilament and Other Fishing Gear Around WTG Foundations	Dominion Energy must monitor indirect effects associated with charter and recreational fishing gear lost from expected increases in fishing around WTG foundations by surveying at least 10 of the WTGs located closest to shore in the Dominion Energy Lease Area (OCS-A 0483) annually. Survey design and effort may be modified with review and concurrence by DOI. Dominion Energy may conduct surveys by remotely operated vehicles, divers, or other means to determine the frequency and locations of marine debris. Dominion Energy must report the results of the surveys to BOEM (at renewable_reporting@boem.gov) and BSEE (at marinedebris@bsee.gov) in an annual report, submitted by April 30, for the preceding calendar year. Annual reports must be submitted in Word format. Photographic and videographic materials must be provided on a portable drive in a lossless format such as TIFF or Motion JPEG 2000. Annual reports must include survey reports that include: the survey date; contact information of the operator; the location and pile identification number; photographic, video documentation, or both of the survey and debris encountered; any animals sighted; and the disposition of any located debris (i.e., removed or left in place).	This measure would establish requirement for monitoring and reporting of lost monofilament and other fishing gear around WTGs, which would reduce the risk of entanglement associated with the presence of structures.

Measure	Description	Effect
	Annual reports must also include claim data attributable to the Project from Dominion Energy corporate gear loss compensation policy and procedures. Required data and reports may be archived, analyzed, published, and disseminated by BOEM.	
PAM Plan	BOEM and USACE would ensure that Dominion Energy prepares a PAM Plan that describes all proposed equipment, deployment locations, detection review methodology and other procedures, and protocols related to the proposed uses of PAM for mitigation and long-term monitoring. This plan would be submitted to NMFS and BOEM for review and concurrence at least 120 days prior to the planned start of activities requiring PAM.	This measure would ensure the efficacy of PAM placement for appropriate monitoring.
Pile driving monitoring plan	BOEM would ensure that Dominion Energy prepare and submit a Pile Driving Monitoring Plan to BOEM, BSEE, and NMFS for review and concurrence at least 90 days before start of pile driving. The plan would detail all plans and procedures for sound attenuation as well as for monitoring ESA-listed whales and sea turtles during all impact and vibratory pile driving. The plan would also describe how BOEM and Dominion Energy would determine the number of whales exposed to noise above the Level B harassment threshold during pile driving with the vibratory hammer to install the cofferdam at the sea to shore transition. Dominion Energy would obtain NMFS' concurrence with this plan prior to starting any pile driving.	This measure would ensure adequate monitoring and mitigation is in place during pile driving, which would minimize the potential for Level A or Level B exposures to marine mammals during foundation installation.
PSO Coverage	BOEM and USACE would ensure that PSO coverage is sufficient to reliably detect marine mammals and sea turtles at the surface in the identified clearance and shutdown zones to execute any pile driving delays or shutdown requirements during foundation installation. This will include a PSO/ PAM team on the construction vessel and two additional PSO vessels each with a visual monitoring team. The following equipment and personnel will be on each associated vessel: ***Construction Vessel:*** • 2, visual PSOs on watch • 2, (7x) or (10x) reticle binoculars calibrated for observer height off the water. • 2 (25x or similar) mounted "big eye" binoculars if vessel is deemed appropriate to provide a platform in which use of the big eye binoculars would be effective. • 1, PAM operator on duty • 1, mounted thermal/IR camera system • 2, (25x or similar) "big eye" binoculars mounted 180 deg apart	This measure ensures adequate monitoring of zones during foundation installation to reduce risk to sea turtles.

Measure	Description	Effect
	• 1, monitoring station for real-time PAM system • 2, handheld or wearable NVDs with IR spotlights • 1, Data collection software system • 2, PSO-dedicated VHF radios • 1, digital single lens reflex camera equipped with a 300-mm lens **Each Additional PSO Vessels (2):** • 2, visual PSOs on watch • 2, (7x) or (10x) reticle binoculars calibrated for observer height off the water. • 1, (25x or similar) mounted "big eye" binoculars if vessel is deemed appropriate to provide a platform in which use of the big eye binoculars would be effective. • 1, mounted thermal/IR camera system • 1, handheld or wearable NVD with IR spotlight • 1, Data collection software system • 2, PSO-dedicated VHF radios • 1, digital single lens reflex camera equipped with a 300-mm lens If, at any point prior to or during construction, the PSO coverage that is included as part of the Proposed Action is determined not to be sufficient to reliably detect ESA-listed whales and sea turtles within the clearance and shutdown zones, additional PSOs, platforms, or both would be deployed. Determinations prior to construction would be based on review of the Pile Driving Monitoring Plan. Determinations during construction would be based on review of the weekly pile driving reports and other information, as appropriate.	
Sound Field Verification Plan	BOEM would require Dominion Energy to develop an operational sound field verification plan to determine the operational noises emitted from the Offshore Project area. The plan would be reviewed and approved by BOEM and NMFS. The plan will include measurement procedures and results reporting that meet ISO standard 18406:2017 (Underwater acoustics – Measurement of radiated underwater sound from percussive pile driving)	This measure would establish requirements for operational noise monitoring.
Sound field verification	Applicant proposed measures plus: BOEM and USACE would ensure that if the clearance, shutdown zones, or both are expanded due to the verification of sound fields from Project activities, PSO coverage is sufficient to reliably monitor the expanded clearance, shutdown zones, or both. Additional observers would be deployed on additional platforms for every 4,921 feet (1,500 meters) that a clearance or shutdown zone is	This measure would ensure adequate monitoring of clearance zones in order to minimize noise-related effects on sea turtles.

Measure	Description	Effect
	expanded beyond the distances modeled prior to verification.	
Adaptive shutdown zones	BOEM and USACE may consider reductions in the shutdown zones for sei, fin or sperm whales based on sound field verification of a minimum of 3 piles; however, BOEM/USACE would ensure that the shutdown zone for sei whales, fin whales, blue whales, and sperm whales is not reduced to less than 3,280 feet (1,000 meters), or 1,640 feet (500 meters) for sea turtles. No reductions in the clearance or shutdown zones for NARWs would be considered regardless of the results of sound field verification of a minimum of three piles.	This measure would ensure that shut down zones are sufficiently conservative in order to minimize noise-related effects on sea turtles.
Minimum visibility requirement	• In order to commence pile driving at foundations, PSOs must be able to visually monitor a 5,741-foot (1,750-meter) radius from their observation points for at least 60 minutes immediately prior to piling commencement. • In order to commence pile driving at trenchless installation sites, PSOs must be able to visually monitor a 3,280-foot (1,000-meter) from their observation points for at least 30 minutes immediately prior to piling commencement. Acceptable visibility will be determined by the Lead PSO.	This measure would ensure adequate monitoring of zones, which would minimize noise-related effects on sea turtles.
Monitoring zone for sea turtles	Applicant proposed measures plus: BOEM and USACE would ensure that Dominion Energy monitors the full extent of the area where noise would exceed the root-mean-square sound pressure level (SPL) 175 dB re 1 µPa behavioral disturbance threshold for turtles for the full duration of all pile driving activities and for 30 minutes following the cessation of pile driving activities and record all observations in order to ensure that all take that occurs is documented.	This measure would ensure accurate monitoring of sea turtle take in order to ensure that all take that occurs is documented.
Alternative Monitoring Plan (AMP) for Pile Driving	Dominion Energy must not conduct pile driving operations at any time when lighting or weather conditions (e.g., darkness, rain, fog, sea state) prevent visual monitoring of the full extent of the clearance and shutdown zones. • Dominion Energy must submit an AMP to BOEM and NMFS for review and approval at least 6 months prior to the planned start of pile-driving. This plan may include deploying additional observers, alternative monitoring technologies such as night vision, thermal, and infrared technologies, or use of PAM and must demonstrate the ability and effectiveness to maintain all clearance and shutdown zones during daytime as outlined below in Part 1 and nighttime as outlined in Part 2 to BOEM's and NMFS's satisfaction.	This measure would establish requirements for nighttime and low-visibility impact pile driving approval, which would serve to decrease the potential for noise-related impacts to occur during those conditions.

Measure	Description	Effect

	• The AMP must include two stand-alone components as described below:
	  ○ Part 1 – Daytime when lighting or weather (e.g., fog, rain, sea state) conditions prevent visual monitoring of the full extent of the clearance and shutdown zones. Daytime being defined as 1 hour after civil sunrise to 1.5 hours before civil sunset.
	  ○ Part 2 – Nighttime inclusive of weather conditions (e.g., fog, rain, sea state). Nighttime being defined as 1.5 hours before civil sunset to 1 hour after civil sunrise.
	• If a protected marine mammal or sea turtle is observed entering or found within the shutdown zones after impact pile-driving has commenced, Dominion Energy would follow the shutdown procedures outlined in Table 1-7 of the NMFS Biological Assessment. Dominion Energy would notify BOEM and NMFS of any shutdown occurrence during piling driving operations with 24 hours of the occurrence unless otherwise authorized by BOEM and NMFS.
	• The AMP should include, but is not limited to the following information:
	  ○ Identification of night vision devices (e.g., mounted thermal/infrared camera systems, hand-held or wearable NVDs, infrared spotlights), if proposed for use to detect protected marine mammal and sea turtle species.
	  ○ The AMP must demonstrate (through empirical evidence) the capability of the proposed monitoring methodology to detect marine mammals and sea turtles within the full extent of the established clearance and shutdown zones (i.e., species can be detected at the same distances and with similar confidence) with the same effectiveness as daytime visual monitoring (i.e., same detection probability). Only devices and methods demonstrated as being capable of detecting marine mammals and sea turtles to the maximum extent of the clearance and shutdown zones will be acceptable.
	  ○ Evidence and discussion of the efficacy (range and accuracy) of each device proposed for low visibility monitoring must include an assessment of the results of field studies (e.g., Thayer Mahan demonstration), as well as supporting documentation regarding the efficacy of all proposed alternative monitoring methods (e.g., best scientific data available).	

Measure	Description	Effect
	○ Reporting procedures, contacts and timeframes. BOEM may request additional information, when appropriate, to assess the efficacy of the AMP.	
Sampling gear	All sampling gear would be hauled at least once every 30 days, and all gear would be removed from the water and stored on land between survey seasons to minimize risk of entanglement.	The regular hauling of sampling gear would reduce risk of entanglement for sea turtles.
Gear identification	To facilitate identification of gear on any entangled animals, all trap/pot gear used in the surveys would be uniquely marked to distinguish it from other commercial or recreational gear. Using black and yellow striped duct tape, place a 3-foot-long mark within 2 fathoms of a buoy. In addition, using black and white paint or duct tape, place 3 additional marks on the top, middle and bottom of the line. These gear marking colors are proposed as they are not gear markings used in other fisheries and are, therefore, distinct. Any changes in marking would not be made without notification and approval from NMFS.	Gear identification would improve accountability in the case of gear loss and distinguish survey gear from other commercial or recreational gear.
Lost survey gear	If any survey gear is lost, all reasonable efforts that do not compromise human safety would be undertaken to recover the gear. All lost gear would be reported to NMFS (mailto:nmfs.gar.incidental-take@noaa.gov) within 24 hours of the documented time of missing or lost gear. This report would include information on any markings on the gear and any efforts undertaken or planned to recover the gear.	This measure would promote the recovery of lost gear, which would reduce risk of entanglement for sea turtles.
Sea turtle disentanglement	Vessels deploying fixed gear (e.g., pots/traps) would have adequate disentanglement equipment (i.e., knife and boathook) onboard. Any disentanglement would occur consistent with the Northeast Atlantic Coast STDN Disentanglement Guidelines at https://www.reginfo.gov/public/do/DownloadDocument?objectID=102486501 and the procedures described in "Careful Release Protocols for Sea Turtle Release with Minimal Injury" (NOAA Technical Memorandum 580; https://repository.library.noaa.gov/view/noaa/3773).	This measure would promote safe handling and release of sea turtles, which would improve survivability of entangled and released individuals.
Sea turtle/ESA-fish identification and data collection	Any sea turtles or ESA-fish caught, retrieved, or both in any fisheries survey gear would first be identified to species or species group. Each ESA-listed species caught, retrieved, or both would then be properly documented using appropriate equipment and data collection forms. Biological data, samples, and tagging would occur as outlined below. Live, uninjured animals should be returned to the water as quickly as possible after completing the required handling and documentation. • The Sturgeon and Sea Turtle Take Standard Operating Procedures would be followed	This measure would require standard data collection and documentation of any sea turtles caught during surveys.

Measure	Description	Effect
	(download at: https://media.fisheries.noaa.gov/2021-11/Sturgeon%20%26%20Sea%20Turtle%20Take%20SOPs_external_11032021.pdf). • Survey vessels would have a passive integrated transponder (PIT) tag reader onboard capable of reading 134.2 kHz and 125 kHz encrypted tags (e.g., Biomark GPR Plus Handheld PIT Tag Reader) and this reader be used to scan any captured sea turtles and sturgeon for tags. Any recorded tags would be recorded on the take reporting form (see below). • Genetic samples would be taken from all captured ESA-fish (alive or dead) to allow for identification of the DPS of origin of captured individuals and tracking of the amount of incidental take. This would be done in accordance with the Procedures for Obtaining Sturgeon Fin Clips (download at: https://media.fisheries.noaa.gov/2021-11/Sturgeon%20%26%20Sea%20Turtle%20Take%20SOPs_external_11032021.pdf). ○ Fin clips would be sent to a NMFS approved laboratory capable of performing genetic analysis and assignment to DPS of origin. To the extent authorized by law, BOEM is responsible for the cost of the genetic analysis. Arrangements would be made for shipping and analysis in advance of submission of any samples; these arrangements would be confirmed in writing to NMFS within 60 days of the receipt of this ITS. Results of genetic analysis, including assigned DPS of origin would be submitted to NMFS within 6 months of the sample collection. ○ Subsamples of all fin clips and accompanying metadata forms would be held and submitted to a tissue repository (e.g., the Atlantic Coast Sturgeon Tissue Research Repository) on a quarterly basis. The Sturgeon Genetic Sample Submission Form is available for download at: https://media.fisheries.noaa.gov/2021-02/Sturgeon%20Genetic%20Sample%20Submission%20sheet%20for%20S7_v1.1_Form%20to%20Use.xlsx?null. All captured sea turtles and ESA-fish would be documented with required measurements and photographs. The animal's condition and any marks or injuries would be described. This information would be entered as part of the record for each incidental take. A NMFS Take Report Form would be filled out for each individual sturgeon and sea turtle (download at: https://media.fisheries.noaa.gov/2021-07/Take%20Report%20Form%2007162021.pdf?null)	

Measure	Description	Effect
	and submitted to NMFS as described below.	
Sea turtle/ESA-fish handling and resuscitation guidelines	Any sea turtles or ESA-fish caught and retrieved in gear used in fisheries surveys would be handled and resuscitated (if unresponsive) according to established protocols and whenever at-sea conditions are safe for those handling and resuscitating the animal(s) to do so. Specifically: • Priority would be given to the handling and resuscitation of any sea turtles or ESA-fish that are captured in the gear being used, if conditions at sea are safe to do so. Handling times for these species should be minimized (i.e., kept to 15 minutes or less) to limit the amount of stress placed on the animals. • All survey vessels would have copies of the sea turtle handling and resuscitation requirements found at 50 CFR 223.206(d)(1) prior to the commencement of any on-water activity (download at: https://media.fisheries.noaa.gov/dam-migration/sea_turtle_handling_and_resuscitation_measures.pdf). These handling and resuscitation procedures would be carried out any time a sea turtle is incidentally captured and brought onboard the vessel during the Proposed Actions. • If any sea turtles that appear injured, sick, or distressed, are caught and retrieved in fisheries survey gear, survey staff would immediately contact the Greater Atlantic Region Marine Animal Hotline at 866-755-6622 for further instructions and guidance on handling the animal, and potential coordination of transfer to a rehabilitation facility. If unable to contact the hotline (e.g., due to distance from shore or lack of ability to communicate via phone), the USCG should be contacted via VHF marine radio on Channel 16. If required, hard-shelled sea turtles (i.e., non-leatherbacks) may be held on board for up to 24 hours following handling instructions provided by the Hotline, prior to transfer to a rehabilitation facility. • Attempts would be made to resuscitate any ESA-fish that are unresponsive or comatose by providing a running source of water over the gills as described in the Sturgeon Resuscitation Guidelines (download at: https://media.fisheries.noaa.gov/dam-migration/sturgeon_resuscitation_card_06122020_508.pdf). • Provided that appropriate cold storage facilities are available on the survey vessel, following the report of a dead sea turtle or sturgeon to NMFS, and if NMFS requests, any dead sea turtle or ESA-fish would be retained on board the survey vessel for transfer to an appropriately permitted partner or	This measure would promote safe handling and release of sea turtles, which would improve survivability of entangled and released individuals.

Measure	Description	Effect
	facility on shore as safe to do so. Any live sea turtles or ESA-fish caught and retrieved in gear used in any fisheries survey would ultimately be released according to established protocols and whenever at-sea conditions are safe for those releasing the animal(s) to do so.	
Take notification	GARFO PRD would be notified as soon as possible of all observed takes of sea turtles and ESA-fish occurring as a result of any fisheries survey. Specifically: • GARFO PRD would be notified within 24 hours of any interaction with a sea turtle or ESA-fish (nmfs.gar.incidental-take@noaa.gov). The report would include at a minimum (1) survey name and applicable information (e.g., vessel name, station number); (2) GPS coordinates describing the location of the interaction (in decimal degrees); (3) gear type involved (e.g., bottom trawl, gillnet, longline); (4) soak time, gear configuration and any other pertinent gear information; (5) time and date of the interaction; and (6) identification of the animal to the species level. Additionally, the email would transmit a copy of the NMFS Take Report Form (download at: https://media.fisheries.noaa.gov/2021-07/Take%20Report%20Form%2007162021.pdf?null) and a link to or acknowledgement that a clear photograph or video of the animal was taken (multiple photographs are suggested, including at least one photograph of the head scutes). If reporting within 24 hours is not possible due to distance from shore or lack of ability to communicate via phone, fax, or email, reports would be submitted as soon as possible; late reports would be submitted with an explanation for the delay. At the end of each survey season, a report would be sent to NMFS that compiles all information on any observations and interactions with ESA-listed species. This report would also contain information on all survey activities that took place during the season including location of gear set, duration of soak/trawl, and total effort. The report on survey activities would be comprehensive of all activities, regardless of whether ESA-listed species were observed.	Reporting requirements to document take would improve accountability for documenting sea turtle take associated with the Proposed Action.
Monthly/annual reporting	Applicant proposed measures plus: BOEM would ensure that Dominion Energy implements the following reporting requirements necessary to document the amount or extent of take that occurs during all phases of the Proposed Action: • All reports would be sent to: nmfs.gar.incidental-take@noaa.gov.	Reporting requirements to document take would improve accountability for documenting sea turtle take associated with the Proposed Action.

Measure	Description	Effect
	• During the construction phase and for the first year of operations, Dominion Energy would compile and submit monthly reports that include a summary of all project activities carried out in the previous month, including vessel transits (number, type of vessel, and route), and piles installed, and all observations of ESA-listed species. Monthly reports are due on the 15th of the month for the previous month. Beginning in year two of operations, Dominion Energy would compile and submit annual reports that include a summary of all project activities carried out in the previous year, including vessel transits (number, type of vessel, and route), repair and maintenance activities, survey activities, and all observations of ESA-listed species. These reports are due by April 1 of each year (i.e., the 2026 report is due by April 1, 2027). Upon mutual agreement of NMFS and BOEM, the frequency of reports can be changed.	
Reporting	Dominion Energy will report to BOEM and BSEE within 24 hours of confirmation any incidental take of an endangered or threatened species.	Reporting requirements to document take would improve accountability for documenting sea turtle take associated with the Proposed Action.

[1] Also Identified in Appendix H, Table H-2.
BMP = best management practice; BOEM = Bureau of Ocean Energy Management; BSEE = Bureau of Safety and Environmental Enforcement; COP = Construction and Operations Plan; DMA = Dynamic Management Area; DOI = Department of the Interior; DPS = distinct population segment; ESA = Endangered Species Act; GARFO PRD = Greater Atlantic Regional Fisheries Office Protected Resources Division; IR = infrared; ITS = incidental take statement; NARW = North Atlantic right whale; NMFS = National Marine Fisheries Service; NVD = night vision device; O&M = operations and maintenance; PAM = passive acoustic monitoring; PDC = project design criteria; PSO = protected species observer; SMA = Seasonal Management Area; USACE = U.S. Army Corps of Engineers; VHF = very high-frequency; WTG = wind turbine generator.

3.19.8.1 Effect of Measures Incorporated into the Preferred Alternative

Mitigation measures required through completed consultations, authorizations, and permits listed in Table 3.19-5 and Appendix H, Table H-2 are incorporated into the preferred alternative. There are no additional agency-required mitigation measures identified as relevant for sea turtles (Appendix H, Table H-3). These measures, if adopted, would serve to reduce impacts on sea turtles and are broadly categorized as follows.

- **Vessel strike avoidance and look out for sea turtles and reporting:** Measures to minimize vessel interactions would reduce the risk of vessel strike. While adoption of this measure would reduce risk to sea turtles under the Proposed Action, it would not alter the impact determination.
- **BOEM PDCs and BMPs for data collection activities:** Compliance with project design criteria and BMPs for protected species would minimize risk to sea turtles during site characterization and site assessment activities. While adoption of this measure would decrease risk to sea turtles under the Proposed Action, it would not alter the impact determination.
- **BOEM COP PDCs and BMPs to minimize vessel interactions and EMF, noise, and habitat effects:** Compliance with project design criteria to minimize vessel interactions would reduce the risk

of vessel strike. Compliance with project design criteria to minimize EMF, noise, and habitat effects would minimize the potential and severity of effects for sea turtles. While adoption of this measure would reduce risk to sea turtles under the Proposed Action, it would not alter the impact determinations.

- **Marine debris awareness training:** Marine debris and trash awareness training would minimize the risk of sea turtle ingestion of or entanglement in marine debris. While adoption of this measure would decrease risk to sea turtles under the Proposed Action, it would not alter the impact determination.
- Passive Acoustic Monitoring Plan, Pile-Driving Monitoring Plan, adaptive shutdown zones, minimum visibility requirements, Alternative Monitoring Plan, protected species observer coverage, sound field verification, shutdown zones, and monitoring zones for sea turtles: The development of an Alternative Monitoring Plan, adaptive shutdown zones, minimum visibility requirements, protected species observer coverage, shutdown zones, and monitoring zones for sea turtles would minimize the potential for exposure to sound levels above recommended thresholds during impact pile driving. The development of a Pile-Driving Monitoring Plan and sound field verification would increase the accountability of underwater noise mitigation during pile driving. While adoption of these measures would decrease risk to sea turtles during impact pile driving or increase accountability during this construction activity under the Proposed Action, it would not alter the impact determination.
- **Operational Sound Field Verification Plan:** The development of an Operational Sound Field Verification Plan would allow BOEM to confirm that impacts of operating WTG noise do not exceed predicted impacts based on existing monitoring data and modeling efforts. While adoption of this measure would improve accountability of WTG operational noise under the Proposed Action, it would not alter the impact determination.
- **Periodic underwater surveys, and reporting of monofilament and other fishing gear around WTG foundations:** Periodic underwater surveys and reporting of monofilament and other fishing gear around WTG foundations would reduce the risk of entanglement associated with the presence of structures. While adoption of this measure would reduce risk to sea turtles under the Proposed Action, it would not alter the impact determination.
- **Sampling gear, gear identification, lost survey gear, survey training, sea turtle disentanglement, sea turtle identification and data collection, sea turtle handling and resuscitation guidelines, and take notification:** The regular hauling of sampling gear, survey staff training, sea turtle disentanglement, and handling and resuscitation guidelines would reduce risk of entanglement or effects of entanglement in fisheries survey gear. Gear identification and lost survey gear would improve accountability in the case of gear loss. Sea turtle identification and data collection and take notification would improve accountability for documenting take associated with fisheries surveys. While adoption of these measures would reduce risk and improve accountability under the Proposed Action, it would not alter the impact determination.
- **Incidental take, monthly, and annual reporting requirements and meeting requirements for sea turtle take documentation:** Reporting requirements and meeting requirements to document take would improve accountability for documenting take associated with the Proposed Action. While adoption of these measures would improve accountability, it would not alter the overall impact determinations.