Company stated that it would consider jacking or open-cut trenching as a last resort (id.; Tr. 9, at 1244).[55] However, the Company indicated this was unlikely, asserting that the sand and clays underlaying Popponesset Spit are conducive to successful drilling (Exh. MA-54).

The Company stated that, inside Popponesset Bay, it would use floats and shallow draft boats to position the cables prior to jet-plowing, and indicated that the cable-laying barge would not enter Popponesset Bay (Exh. CW-CJN/SBW-2-R at 38; Tr. 9, at 1171). The Company stated that it would also bore an approximately 500-foot long HDD from the entrance point at an upland location at the Mashpee Town Landing landfall to an exit point out on the subtidal area of Popponesset Bay (Exhs. CW-1, at 1-13; EFSB-W-18).

The Company stated that the transitions on the alternative route between jet-plowing and HDDs would be located approximately 300 feet south of Popponesset Spit, 300 feet north of Popponesset Spit, and 500 feet off the landfall location in Mashpee; no transition vaults or other permanent structure would remain, other than the cables themselves (Exhs. CW-1, at 1-13; MA-28). The Company stated that a splice of the cable might be necessary on the alternative route because the length of cable that can be pulled through the HDD conduit may be limited (id.).

The Company stated it would prefer to install the submarine cables April through November to avoid safety concerns associated with unfavorable winter sea and weather conditions (Exhs. EFSB-C-1; EFSB-C-7; EFSB-W-7; CW-CJN/SBW-2-R at 13; EFSB-RR-47). The Company stated that jet plowing would take approximately two to four weeks for each circuit; with an additional two weeks for preparatory work, marine work on the primary route would extend up to ten weeks (Tr. 21, at 2871-76). The Company stated that HDD operations would take two to four weeks, extending marine work on the alternative route to as much as 14 weeks (id.).[56] For both the primary and alternative routes, there would be an additional four

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[55] The Company stated that if jacking or open-cut trenching were used at Popponesset Spit, the Company would restore the spit to its pre-existing condition (Exhs. EFSB-C-5; CW-1, at 1-8).

[56] The Company provided a variety of estimates for the duration of marine construction. At (continued...)

weeks of land-based work in and around the transition vault (id.).

ii. Direct Impacts (Sand and Sediment Disturbance)

(a) Primary Route

The Company stated that jet plowing along the primary route would begin at a point approximately 40 feet seaward of the New Hampshire Avenue landfall and continue seaward through Lewis Bay to the wind farm's ESP, for a distance of approximately 12.2 miles (Exhs. MA-6; CW-CJN/SBW-2-R at 20; EFSB-RR-38; EFSB-RR-84). The Company stated that the seabed along the primary route, including Lewis Bay up to the New Hampshire Avenue landfall, consists predominantly of sand-sized sediment (Tr. 6, at 780). The Company asserted that jet-plowing is a standard method of cable installation where environmental impacts are of concern (Exh. CW-CJN/SBW-2-R at 24; Tr. 7, at 876).

The Company indicated that the surface area directly disturbed by the jet plow as it moves along the seabed is approximately 12 square feet for each foot of cable laid (Exh. EFSB-RR-44). The Company calculated that jet-plowing along the primary route would disturb up to 18 acres of seabed sediment, that the pontoons supporting the jet plow would disturb an additional 18 acres, and that anchoring, positioning and movement of the cable installation barge would disturb approximately 4 acres (Exhs. EFSB-SS-22-S at 5-41; CW-CJN/SBW-2-R at 21). The Company estimated that direct disturbance of seabed sediment would thus encompass up to 40 acres (Exh. EFSB-SS-22-S at 5-42). In addition, the Company estimated that 59 cubic yards of material would be excavated in connection with replacement of the seawall, and 44 cubic yards would be disturbed by hand-jetting (Exh. EFSB-RR-39).

The Company indicated that the trench created by the jet plow would be trapezoidal in cross-section, narrowing from a width of 4 to 6 feet at the seabottom to a width of 2 feet at a depth of 8 feet (Exhs. MA-6; EFSB-RR-44). The Company asserted that using a jet plow is a

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[56] (...continued)
one extreme, the Company stated that construction from the landfall to the ESP would take two to four weeks (Tr. 9, at 1175). For the alternative route, the Company stated at one time that each HDD would take four to six weeks and that they would be done sequentially (Tr. 10, at 1328).

mitigation measure, arguing that jet-plowing disturbs sediment less than mechanical or hydraulic dredging followed by laying of cable and backfilling a trench (Exh. MA-45; Tr. 5, at 788). The Company asserted that the fluidized sediments would remain largely in the trench (Exh. MA-6). The Company indicated that approximately 70% of the suspended sediment would remain within the trenches and that approximately 30% would be distributed vertically in the water column (Exh. EFSB-RR-43(a), Att.). The Company indicated that this would constitute approximately 0.36 cubic yards of suspended sediment injected into the water column for each foot of jet-plowing (Exh. MA-6). The sediment would remain suspended for a period ranging from a few minutes to 48 hours (Exhs. EFSB-SS-22-S at 5-40; EFSB-W-10; EFSB-RR-43(a), Att.).

The Company modeled lateral dispersion of sandy sediments for a scenario of a 0.4-knot current running 45 degrees off the alignment of a jet-plowed trench (Exh. EFSB-RR-43(a), Att.). The Company's modeling showed sediment deposition exceeding 2 centimeters ("cm") would be limited to areas within 30 feet of the jet plow, and deposition exceeding 1 millimeter ("mm") would be limited to areas within 150 feet (id.). The modeling indicates that the maximum concentration of suspended sediment in the water above sandy seabed such as in Lewis Bay would be approximately 120 milligrams per liter ("mg/L"), directly above the trenches, and would be less than 10 mg/L at 1500 feet from the trench (id.).

The Company indicated by comparison that commercial fishing nets may extend as wide as 200 feet, leading to extensive seafloor disturbance and injection of sediment into the water column; the Company asserted that fishing impacts are significant because the activity is recurring (Exh. EFSB-RR-44, at 3, 4; EFSB-RR-44(a), Att). The Company also indicated that waves and currents may typically create near-bottom suspended sediment concentrations of 70 mg/L, and indicated further that suspended sediment concentrations of up to 2500 mg/L in the near-bottom waters of the project area have been reported (Exhs. EFSB-RR-44, at 4; EFSB-SS-22-S at 5-40).[57]

The Company stated that it performed bulk sediment chemical analyses on samples collected in Nantucket Sound and Lewis Bay (Exh. EFSB-W-14). The Company stated that the

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[57] The Company stated that some of the route goes through fields of migratory sand waves 3 to 5 feet high (Tr. 7, at 931-935).

concentrations of the detected constituents are below federally recognized marine sediment benchmarks of the potential for biological effects (id.).[58] Therefore, the Company asserted that biological effects from metals in sediments would not be likely on the primary route (Exh. CW-CJN/SBW-2-R at 41).

The Company stated that construction of the proposed project along the primary route would result in temporary alterations to areas subject to protection under the Massachusetts Wetlands Protection Act, the Barnstable Wetlands Protection Ordinance, and the Yarmouth Wetlands Protection By-Laws and Regulations (Exh. YAR-7). The Company noted that the primary route traverses Land Under the Ocean, a jurisdictional coastal wetland resource area (Exh. CW-1, at 5-30 to 5-31). Overall, the Company indicated that temporary impacts to Land Under the Ocean would affect between 4.2 and 6.1 acres (Exh. EFSB-W-19).

Another category of jurisdictional wetland is Coastal Beach, which extends from the mean low water line landward to the coastal bank line or seaward edge of existing manmade structures (Exh. EFSB-SS-22-S, Att. at 5-50 to 5-51). The Company noted that here, the Coastal Beach is the gently sloping, sandy area extending from the mean low water mark to the concrete seawall that comprises Coastal Bank at the New Hampshire Avenue landfall (id. at 5-51). The Company indicated that the landfall at New Hampshire Avenue does not have some of the sensitive features of other coastal locations (Tr. 6, at 778). The Yarmouth Wetlands Protection Regulations prohibit new structures within 50 feet of Coastal Bank or Coastal Beach (Exh. EFSB-W-28). However, the Company stated that the proposed transmission line and vaults most likely do not qualify as structures under the local definition because they are components of a linear project that cannot avoid the resource areas and the 50-foot wetland

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[58] The single shallow sediment sample from Lewis Bay, VC01-L1-S1 (from zero to five feet below the surface) had reported concentrations of 3.4 milligrams arsenic per kilogram (mg/kg) (compared to a NOAA Effects Range Low ("ERL") of 8.2 mg/kg), 0.16 mg/kg cadmium (compared to an ERL of 1.2 mg/kg), 5.5 mg/kg chromium (compared to an ERL of 81 mg/kg), 2.7 mg/kg copper (compared to an ERL of 34 mg/kg), 2.3 mg/kg lead (compared to an ERL of 46.7 mg/kg), 3.7 mg/kg nickel (compared to an ERL of 20.9), 11 mg/kg vanadium (no ERL), and 8.8 mg/kg zinc (compared to an ERL of 150 mg/kg) (Exh. EFSB-22-S at Fig. 5-16, Table 5-13). This sample had 6250 mg/kg of organic carbon (id.).

buffer setback (id.). The Company indicated that the issue would be more fully explored in the submission of the Notice of Intent to the Yarmouth Conservation Commission (id.).[59]

The Company stated that the proposed construction through certain coastal waterways and tidelands along part of the primary route would require a license under Chapter 91[60] (Exh. EFSB-RR-58, Att.; Tr. 11, at 1580-83). As part of the Chapter 91 licensing process, the Massachusetts Department of Environmental Protection ("MDEP") must determine whether the project is "water-dependent," consistent with its policy regarding infrastructure crossings in 310 CMR § 9.02 (Exh. EFSB-RR-58, Att.). The Company provided correspondence from MDEP indicating that, in this case: (1) a variance will be required for the project under 310 CMR § 9.21, including a determination by MDEP that the project is in the public interest; and (2) the public interest requirement could be satisfied by a finding by the Siting Board that the infrastructure project is needed (id.). MDEP further stated that Cape Wind would need to meet the requirements of 310 CMR § 9.55, including requirements related to alternatives, and noted that such issues would be addressed through the MEPA review process (id.).

The Company stated that its proposed construction in certain coastal waters and lands known as the coastal zone, along the primary route, would require a consistency review under the CZM program[61] (Exh. CW-1, at 1-14 to 1-16). The Company asserted that the proposed transmission lines would be a "coastally dependent" use of the coastal zone, as defined for CZM program purposes, and would be consistent with other applicable CZM policies relating to work in the coastal zone (id. at 1-14 to 1-16, 5-3 to 5-6). The Company explained that the transmission line project would be coastally dependent because it would deliver energy to, from, or within the coastal zone (id. at 1-16). The Company further stated that the proposed marine

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[59] Cape Wind stated that it anticipated that the Notice of Intent would be filed with the Yarmouth and Barnstable Conservation Commissions in the fourth quarter of 2003 (Exh. EFSB-L-20; Tr. 6, at 708). As of this date, the Siting Board has not received the Notice of Intent, nor by association, the subsequent Order of Conditions (Exh. EFSB-RR-33).

[60] See G.L. c. 91, §§ 1-63; 310 CMR § 9.00 et seq.

[61] G.L. c. 21A, § 4A; 301 CMR §§ 20.00 et seq.; 21.00 et seq.

construction of the transmission lines would be consistent with CZM policies relevant to any disturbance of sand and sediment from such construction, including Habitat Policy #1 and Coastal Hazard Policies #1 and #2 (id. at 5-3, 5-6).[62]

Cape Wind stated that the Secretary of Environmental Affairs, in his Certificate on the Company's ENF, has required the Company to develop a comprehensive environmental monitoring program ("CEMP") for the project area (the area including both the wind farm and the transmission lines) (Exh. EFSB-C-19, and Att). The Company provided a preliminary draft of its CEMP (Exh. EFSB-C-19, Att.).[63] The Company indicated that it developed the preliminary CEMP in consultation with cooperating agencies participating in the Army Corps/MEPA review process, and stated that specific elements of the CEMP, such as monitoring methods, locations, frequency, and duration would be finalized at a later time, based on comments received in response to the DEIS/DEIR/DRI for the combined projects (id. at 1).

Cape Wind stated that, once completed, the CEMP would include surveys of both pre-construction and post-construction conditions in the project area and, in some cases, conditions would be monitored during construction (id.).[64] Cape Wind stated that consistent methods and locations would be used for pre-construction and post-construction monitoring, to allow for comparison of pre- and post-construction conditions (id. at 6). The Company stated that the

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62 See 301 CMR § 20.06; 301 CMR § 21.98: Policy Appendix.

63 The preliminary CEMP is dated April 25, 2003.

64 Cape Wind stated that some pre-construction field monitoring and/or literature review regarding resource conditions has already been conducted (Exh. EFSB-C-19, Att. at 1). The Company stated that pre-construction assessments of seabed conditions, sediment quality, noise, benthic invertebrates, sea turtles, marine mammals, submerged aquatic vegetation, shellfish and fisheries, birds, and upland state-listed rare species have been conducted or will be conducted prior to construction (id. at 1-6). The Company further noted that it has installed a Scientific Measurement Devices Station ("SMDS") in the center of Nantucket Sound (id. at 1). Cape Wind stated that the SMDS contains instrumentation that continuously monitors pre-construction meteorological and oceanographic conditions in Nantucket Sound, including wind, waves, wind and wave correlation, currents, air and water temperature, and sea level variations (id. at 1, 2). The Company stated that the SMDS will remain in place for a minimum of five years (id. at 2).

conditions to be included in pre-construction and post-construction monitoring include: seabed conditions, noise, submerged aquatic vegetation, birds, protected marine species, and upland state-listed rare species (id. at 6-8). The Company stated that the type and scope of environmental monitoring to be conducted during construction would depend, in part, on the final route selected, the type of construction methods and equipment to be used, and the construction schedule for the combined projects (id. at 4).

(b) Alternative Route

(i) Company

The Company stated that the alternative route is approximately 10 miles in length from the proposed Mashpee Town Landing landfall to the wind farm ESP (Exh. CW-1, at 1-12). The Company stated that the majority of the cable along the alternative route would be installed by jet-plowing (id. at Fig. 4-3).

The Company asserted that the stability of Popponesset Spit would not be adversely affected because the HDD would be deep below the spit and would not disturb the shoreline or intertidal area (Exhs. MA-33; CW-CJN/SBW-2-R at 29). The Company predicted that the cable would not be exposed, based on its belief that the configuration of Popponesset Spit has been stable for the last 150 years (Tr. 2, at 295).

The Company stated that the seabed in Popponesset Bay along the alternative route consists predominantly of fine-grained, silty sediment (Exh. CW-2, at Fig. 7.2, Table 7.3; Tr. 9, at 1286-1287). The Company modeled lateral sediment dispersion under conditions of a 0.3-knot current running 5 degrees off parallel to the jet-plowed trench (Exh. EFSB-RR-43(a), Att.). The Company's modeling indicated that sediment deposition exceeding 2 cm would be limited to areas within 35 feet of the jet plow in Popponesset Bay and deposition exceeding 1 mm would be limited to areas within 200 feet (id.). The modeling indicates that the maximum concentration of suspended sediment in Popponesset Bay would be approximately 5500 mg/L directly above the trenches (id.). The Company stated that the sediments in Popponesset Bay have a higher organic content and lower dissolved oxygen than sediments on the primary route; consequently, sediment disturbance may be more likely to reduce oxygen levels in surface water

along the alternative route than along the primary route (Exh. EFSB-RR-42; Tr. 8, at 1100-1111).

The Company stated that it performed bulk sediment chemical analyses on samples collected in Popponesset Bay (Exh. EFSB-W-31). The Company stated that the concentrations of the detected constituents are below levels federally recognized as marine sediment benchmarks of the potential for biological effects (id.).[65] Therefore, the Company asserted that metals in sediments on the Popponesset Bay route would likely cause no adverse biological effects (Exh. CW-CJN/SBW-2-R at 41). The Company stated that the alternative route likely has higher sulfide concentrations in sediments than the primary route, and that this might negatively affect organisms should the sediments be disturbed (Tr. 11, at 1574-1575, 1578).

The Company noted that the following jurisdictional coastal wetland resource areas occur at the Mashpee Town Landing landfall and in Popponesset Bay: Land Under the Ocean, Barrier Beach, Coastal Beach, Coastal Dune, and Salt Marsh (Exh. CW-1, at 5-33 to 5-34). The Company asserted that use of HDD at the Mashpee landfall would allow it to avoid impacts to Coastal Beach and Coastal Bank resource areas (id. at 1-12 to 1-13; Tr. 6, at 810-811).

The Company stated that boring beneath Popponesset Spit would avoid any direct impacts to the spit, its shoreline, or the intertidal area and would avoid impacts to wildlife that may nest there (Exhs. EFSB-C-(B), Att; MA-28; MA-32; MA-33). However, construction would likely include digging out HDD receiving pits and stabilizing the pits with cofferdams (Exh. CW-CJN/SBW-2-R at 43).

(ii) Intervenors

Mr. Mark Weissman, a witness for the Alliance, indicated that jet-plowing may cause more turbidity than mechanical plowing in locations of very fine-grained material (Tr. 12,

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[65] Among the two shallow sediment samples from Popponesset Bay, VC01-PB1-S1 and VC01-PB2-S2 (both zero to five feet), the higher reported concentrations were 7.0 mg/kg arsenic (compared to an ERL of 8.2 mg/kg), 0.76 mg/kg cadmium (compared to an ERL of 1.2 mg/kg), 26 mg/kg chromium (compared to an ERL of 81 mg/kg), 11 mg/kg copper (compared to an ERL of 34 mg/kg), 9.5 mg/kg lead (compared to an ERL of 46.7 mg/kg), 17 mg/kg nickel (compared to an ERL of 20.9), 43 mg/kg vanadium (no ERL), and 44 mg/kg zinc (compared to an ERL of 150 mg/kg) (Exh. EFSB-22-S at Fig. 5-16, Table 5-13). These samples had 27,300 and 21,500 mg/kg of organic carbon (id.).

at 1700).

Mr. Stanley M. Humphries, a witness for Mass Audubon, stated that Popponesset Spit, especially its northern end, has historically moved landward and that it is typically expected that barrier beaches will continue to move landward (Tr. 13, at 1773, 1805). However, he indicated that an HDD would have little to no effect on the stability of the spit (id. at 1782). Mr. Humphries recommended that open-cut trenching be considered only as a last resort (id. at 1813).

Mr. Peter J. Williams, P.E., a witness for Save Popponesset Bay, raised questions about the impact of jet-plowing within Popponesset Bay. Mr. Williams stated that Popponesset Spit is a "dynamic and complex barrier island system" and, as such, it is susceptible to breaching by storm surge and waves during severe storms (Exh. SPB-PJW at 7). He stated that a breach at the location of the submarine cable crossing could damage the cable and would require the removal and re-installation of the cable, likely causing significant construction impacts to Popponesset Spit and Popponesset Bay (id.). He provided information generated in 1993 by the Army Corps of Engineers stating that Popponesset Spit has been breached several times in the last 200 years, and asserting that a breach was likely to occur in connection with a storm event within the next 10 years, and possibly within the next 2 to 5 years (id.; Exh. SPB-PJW, Bulk Att.). Mr. Williams stated that information on how the cable alignment will be designed to avoid future barrier island breaches and potential impacts of a cable removal and re-installation should be provided (Exh. SPB-PJW at 7).

The Company responded that the most likely breach location on Popponesset Spit is one-half mile from the alternative route, but that if there were a breach directly over the cables, it would not affect the cables which would be installed deep below the spit (Exh. CW-CJN/SBW-2-R at 32).

Mr. Williams noted that the concentration of metals in bottom sediments is typically two to three times higher in Popponesset Bay than in Lewis Bay, and argued that re-suspension of these sediments has a greater potential for adverse impacts on fish and shellfish than resuspension of sediments in Lewis Bay (Exh. SPB-PJW at 4-5).

(c) Analysis

Jet-plowing would be the predominant construction method for the marine portion of the primary route. Near the landfall at New Hampshire Avenue, construction methods would include hand jetting and direct excavation. Construction along the primary route would require removing and replacing the existing concrete seawall at the end of New Hampshire Avenue. Marine construction impacts, from jet-plowing and direct excavation, would be reviewed by the Yarmouth and Barnstable Conservation Commissions under state and municipal wetlands protection programs, by MDEP under the Chapter 91 program and the Section 401 Water Quality Certification Program,[66] and by the CZM program office.

The record indicates that jet-plowing would inject 0.36 cubic yards of sediment into the water column for each foot of cable installation. With two circuits extending 12.2 miles each, the project would inject approximately 46,800 cubic yards of sediment into the water column.[67] However, jet-plowing has an advantage over alternative methods such as dredging, in that the sediment is disturbed only once in the installation process. The proceeding has not revealed that any other cable embedment technique would have fewer environmental impacts in sandy-bottom open-water areas than jet-plowing. Also, the record shows that the amount of sediment entrainment would be roughly comparable to some commercial fishing and natural processes except that project construction would be of limited duration. The Company has indicated that pre-construction and post-construction monitoring of seabed conditions will be conducted.

Consequently, the Siting Board finds that jet-plowing would minimize the extent of sediment disturbance for deep installation of the submarine cable. Overall, the Siting Board finds that impacts associated with disturbance of marine sediments along the primary route would be minimized.

The record shows that use of jet plowing to install the offshore portion of the proposed

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66 A Section 401 Water Quality Certification is required under the federal Clean Water Act [33 USC §§ 1341 et seq.] for certain activities in wetlands and waters. MDEP implements the Section 401 Water Quality Certification Program in Massachusetts. See 33 USC 1341 et seq.; G.L. c. 21, §§ 26-53; 314 CMR §§ 9.00, 4.00.

67 Hand-jetting near shore would not add appreciably to the estimate of 46,800 cubic yards.

submarine cables would have similar impacts on the seabed along the primary and alternative routes. However, in the near-shore area, the sediment data indicate that Popponesset Bay sediments are finer-grained than sediments in Lewis Bay, and that the Popponesset Bay sediments contain a higher proportion of organic material. The record shows that the finer-grained sediments of Popponesset Bay would be more widely dispersed by jet-plowing than sandier sediments of Lewis Bay. The Siting Board notes that the finer-grained material from Popponesset Bay would likely remain suspended in the water column for a longer period of time as well. The record shows that high concentrations of organic materials in Popponesset Bay sediments could reduce the oxygen content of the water column, if entrained into the waters of the Bay. The Siting Board recognizes that some organisms are sensitive to high turbidity and/or low oxygen levels. Therefore, the risk that disturbing the sediments with a jet plow could adversely affect organisms is higher in Popponesset Bay than in Lewis Bay.

The record shows that sediment disturbed by jet plowing along the alternative route would have higher concentrations of metals. However, it is not clear that the higher measured concentrations in Popponesset Bay reflect anything but finer-grained material in the sample, and it has not been demonstrated that these sediment constituents would pose a risk to marine life.

Use of the alternative route poses a greater risk of adversely affecting water quality. Because there would be three underwater pits excavated for the ends of HDDs on the alternative route, the alternative route would require excavation of a greater volume of seabed sediment than would the preferred route; also, there is an opportunity for leakage of bentonite from drilling operations on the alternative route. In addition, the Company did not wholly resolve what would happen in the event that Popponesset Spit migrated away from the location of deep burial by HDD. Accordingly, the Siting Board finds that the primary route would be preferable to the alternative route with respect to disturbance of sediments.

iii. Eelgrass and Other Submerged Aquatic Vegetation

(a) Company

The Company stated that eelgrass (*Zostera marina*) is the only submerged aquatic vegetation found in colonies in the vicinity of the primary or alternative routes (Tr. 9,

at 1134-35).[68] Specifically, the Company asserted that the seabed along the primary route is not conducive to kelp beds, and that it did not observe any kelp beds during its field investigations (Exh. CW-CJN/SBW-2-R at 26). The Company indicated that MDEP has mapped no eelgrass along the alternative route (Exh. MA-44; Exh. EFSB-5(a)).

The Company indicated that in July 2003 it observed a small area of eelgrass adjacent to the Egg Island sandbar in Lewis Bay, approximately 70 feet away from the preferred route at its closest point (Exh. EFSB-W-21-S and Att). The Company stated that this area would not be directly affected by cable installation work, and that indirect impacts would be avoided by maintaining an appropriate distance between construction activities and mapped eelgrass beds (Exhs. EFSB-W-21; EFSB-W-21-S).

The Company stated that it will not anchor vessels or perform cable installation work in areas where eelgrass beds are located (Exh. EFSB-RR-83). The Company asserted that the location of eelgrass beds near the Egg Island sandbar is relatively stable (Tr. 20, at 2790-2791). Nonetheless, the Company stated that a survey dive would be done to confirm the limits of eelgrass beds prior to the commencement of cable installation in the same calendar year preceding construction, and that divers also would be used to confirm correct placement of work vessel anchors (Tr. 21, at 2850-2857). The Company also stated that, if the project were to disturb eelgrass during construction, the Company would replant the eelgrass (Exh. EFSB-RR-83; Tr. 21, at 2841-2845).

The Company stated that the proposed transmission lines would be consistent with CZM policies relevant to eelgrass, including Habitat Policy #1 (Exh. CW-1, at 5-3, 5-6). The Company also stated that its CEMP would include pre-construction and post-construction monitoring of submerged aquatic vegetation such as eelgrass (Exh EFSB-C-19, att.).

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[68] Massachusetts Wetland Protection Act regulations include restrictions on adversely affecting marine fisheries habitat by destruction of eelgrass beds. 310 CMR § 10.25(6).

(b) Intervenors

Robert N. Buchsbaum, Ph.D., a witness for Mass Audubon, stated that eelgrass is potentially sensitive not only to direct construction impacts, but also to dragging of anchor chains, boat wakes, and siltation (Tr. 17, at 2204-2205, 2213). He stated that eelgrass performs a number of valuable ecological functions, including stabilizing coastal sediment and providing protective habitat for juvenile fish and shellfish, and he asserted that it is therefore critical that the proposed submarine cables avoid negative impacts on eelgrass (Exh. MA-RNB, Att. B at 3; Tr. 17, at 2228). Dr. Buchsbaum testified that eelgrass has declined in recent years in a number of bays and estuaries along the south side of the Cape, due to nutrient enrichment of the shallow waters from on-land development (Exh. MA-RNB, Att. B at 3). He stated that eelgrass is protected under federal regulations as a "special aquatic site" and that, as a result, dredging projects that affect eelgrass usually are required to carry out mitigation (id.).

Dr. Buchsbaum testified that an eelgrass study conducted by MDEP in 1995 identified no eelgrass beds in the locations of either the primary or alternative submarine cable routes (id.). He stated that there appears to have been eelgrass near the Egg Island sandbar, based on a 2001 orthophoto provided by the Company (and designated as Exhibit MA-3), but he indicated that eelgrass near the proposed route is limited to a relatively small patch (id.). Dr. Buchsbaum testified that it is not unusual for eelgrass to vary in extent or even to disappear from an area and to recolonize at a later date (id.; Tr. 17, at 2210-2211). Dr. Buchsbaum stated that one element that may affect the distribution of eelgrass is excess sedimentation, and that, based on sediment modeling provided by the Company, the depth of sedimentation on top of eelgrass growing closest to the jet-plow trench would approximate the depth of sedimentation to which eelgrass may be sensitive (Tr. 17, at 2213-2215). He stated that the Company should be required to examine and present information from available historical aerial photographs to determine whether eelgrass was once more abundant along the two proposed routes (Exh. MA-RNB, Att. B at 3). He stated that mapping is best done in late July, when eelgrass beds reach their maximum extent, and indicated that he would consider any map outdated after three years, at which point re-mapping would be needed (Tr. 17, at 2250-2251, 2229-2230).

Dr. Buchsbaum stated that the Company also should determine whether any seaweed

communities, such as kelp forests, exist along the primary and alternative routes (Exh. MA-RNB, Att. B at 4). He stated that these communities serve a nursery function similar to that of eelgrass, and are particularly valuable to juvenile lobsters (id.). He stated that these areas could be affected either directly by the jet plow or indirectly by the sediment plume created by the jet plow (id.).

Dr. Buchsbaum recommended that the Company be required to monitor the area along the path of the jet plow, both before and after its use, to evaluate impacts on subtidal habitat (id.). He recommended that the Company be required to commit to remediation of habitat that is disturbed and does not recover within a certain time period (id.).

(c) Analysis

The record indicates that the primary route would come in close proximity to a small bed of eelgrass located near Egg Island in Lewis Bay. The record shows that eelgrass may be sensitive to direct and indirect impacts of jet-plowing and that eelgrass performs valuable ecological functions. The Company has stated that it intends to avoid impacts to eelgrass beds by conducting a survey dive prior to the commencement of cable installation, and by using divers to confirm correct placement of work vessel anchors. In addition, the Company will perform pre- and post-construction monitoring of seabed impacts, and will replace any eelgrass that is lost. Together, these measures should be adequate to minimize impacts on eelgrass. However, the record indicates that, while eelgrass beds reach their maximum extent in July, eelgrass is able to re-colonize seabed areas over longer time periods, so the July 2003 MDEP eelgrass survey may become less accurate over time. Accordingly, the Siting Board directs the Company to aerially photograph the entrance to Lewis Bay in the month of July immediately prior to jet-plowing, under conditions conducive to documenting the extent of eelgrass beds, to use the photographs in finalizing the exact location of jet-plowing, and to provide such photographs to the Siting Board. The Siting Board finds that, with compliance with this eelgrass documentation condition, eelgrass impacts of the proposed transmission lines along the primary route would be minimized.

The record shows that, while eelgrass recently has been mapped in close proximity to the primary route, no eelgrass has been identified near the alternative route. Consequently, the Siting

Board finds that the alternative route is preferable to the primary route with respect to eelgrass impacts.

iv. Shellfish

(a) Primary Route

(i) Company

The Company provided information showing that the majority of the waters in Lewis Bay have been designated by the Massachusetts Division of Marine Fisheries ("MDMF") as approved shellfish growing areas (Exhs. EFSB-W-2, at 2; EFSB-W-1(d)).[69] The Company stated that Yarmouth's shellfish constable has indicated that Lewis Bay contains quahogs, soft-shell clams, sea scallops, and a limited number of eastern oysters (Exh. EFSB-W-2, at 2).

The Company indicated that approximately 500 feet of the preferred route crosses through a designated recreational shellfish growing area in Lewis Bay which extends from Colonial Acres, near the mouth of Mill Creek, southeasterly along the Yarmouth shore of Lewis Bay to the Englewood breakwater ("Englewood recreational shellfishing area") (Exhs. CW-1, at 5-26, EFSB-W-1(b), Att.; EFSB-W-2; EFSB-W-24). According to the Company, Yarmouth's shellfish constable considers the Englewood recreational shellfishing area to be an important quahog growing area (Exh. EFSB-W-2). The Town of Yarmouth stocks the area with seed shellfish and with shellfish from contaminated areas around Fall River and New Bedford (Exhs. CW-1, at 5-27; EFSB-W-1(b), Att.; EFSB-W-2; EFSB-W-24, at 3). The Englewood recreational shellfishing area is conditionally open for recreational shellfishing only, and only on Sundays; the Company indicated that the area is normally closed for a year every other year after shellfish

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69 The Company stated that *approved* shellfish areas are open for harvest of shellfish for direct human consumption, that conditionally approved areas are open for harvest of shellfish for human consumption during particular periods of time, typically based on water quality and shellfish availability, and that prohibited shellfish areas are closed for harvest of shellfish, most commonly due to contamination concerns (Exh. EFSB-W-24, at 2).

from contaminated areas are stocked (Exhs. EFSB-W-2; EFSB-W-24, at 3).[70]

The Company stated that deeper waters of Nantucket Sound support sea clams and whelk, both of which are harvested commercially (Tr. 7, at 910; Tr. 9, at 1161).[71] The Company asserted that marine organisms in offshore areas traversed by the route are already adapted to a mobile seabed and to high suspended sediment concentrations associated with tidal currents, wind waves in shallow waters, and ocean swells (Exhs. CW-CJN/SBW-2-R at 12; EFSB-RR-44, at 3, 5). The Company indicated that clams can tolerate sediment deposition of at least 5 mm; higher deposition would be limited to areas within 100 feet of jet-plowing (Exh. EFSB-RR-44, at 2). Additional mortality is expected within the trench, where there would be significant shear forces from water injection (id.). The Company stated that quahogs would tend to settle deeper below the seabed in the fluidized trench due to their size and weight (Tr. 9, at 1160).

The Company stated that it has reached an agreement with the Town of Yarmouth with respect to shellfish resource area mitigation (Exh. EFSB-RR-53). The Company stated that any affected shellfish beds would be replaced by re-seeding the affected portion of the recreational shellfishing area with two shellfish per square foot, rather than by a relay or transport program (Tr. 7, at 919). According to the Company, the Yarmouth Shellfish Constable has recommended that submarine cable installation not occur on Sundays in Lewis Bay during the recreational shellfish harvesting season (primarily summer) to avoid interference with recreational shellfishing (Exh. EFSB-W-24).

The Company stated that the proposed transmission lines would be consistent with CZM policies relevant to shellfish, including Habitat Policy # 1 (Exh. CW-1, at 5-3, 5-6). The Company indicated in its preliminary CEMP that it has conducted pre-construction monitoring of shellfish resources, and that it does not intend to perform any additional pre-construction

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[70] The Company also indicated that there are several privately-operated shellfish aquaculture grant or lease sites from the Town of Yarmouth along the southeast shores of Lewis Bay; however, these are not within the pathway of the proposed transmission line (Exhs. CW-1, at 5-27; EFSB-W-1(c), Att.; EFSB-W-2).

[71] The Company stated that Nantucket Sound does not support a major lobster fishery (Tr. 7, at 851).

monitoring; the CEMP does not provide for shellfish monitoring during construction or post-construction (Exh. EFSB-C-19, Att.).

(ii) Intervenors

Dr. Buchsbaum, a witness for Mass Audubon, stated that jet plowing would cause a temporary disturbance of marine organisms within the footprint of the trenches (Exh. MA-RNB, Att. B at 1). He stated that the disruption could consist of direct removal by the jet plow or smothering by the sediment plume created by the plow (id. at 1-2). Dr. Buchsbaum identified sea clams, whelk, lady crabs, horseshoe crabs, and sand shrimps as subtidal organisms that could be displaced during project construction (id. at 2). Dr. Buchsbaum testified that the Company has not provided sufficient information regarding potential shellfish and benthic impacts, and that additional analyses are needed to properly evaluate, avoid, minimize, and mitigate such impacts (id. at 1).

Richard S. LeGore, Ph.D., a witness for the Alliance, stated that changing the mixture of grain size would change the biological community in the area that is jet-plowed (Tr. 17, at 2157). Dr. LeGore also expressed concern about turbidity and lowered oxygen levels caused by jet plowing having an adverse effect on shellfish spawn survival (id. at 2177). Dr. LeGore stated that the Company's benthic surveys used partial samples, lacked replicates, and were not coordinated with sediment profiles of adequate precision; he asserted that the Company's data and analysis are inadequate to properly assess the project's potential benthic impacts (id. at 2157-2161).

(b) Alternative Route

(i) Company

The Company indicated that MDMF has designated waters in Popponesset Bay seaward of Gooseberry Island as an approved shellfish growing area (Exhs. EFSB-W-1(g), Att.; EFSB-W-24). The Company stated that Popponesset Bay contains quahogs, soft-shell clams, and ribbed mussels, and that it has been seeded with scallops (Exh. CW-1, at 5-28). Seed shellfish are grown in trays away from the alternative route by the Town of Mashpee, prior to

being planted elsewhere in Popponesset Bay (Exh. EFSB-W-24, at 3). The Company stated that the Town maintains designated recreational shellfish growing areas for use by town residents, which the town has seeded with quahogs (Exhs. CW-1, at 5-28; EFSB-W-2, at 3). The Company indicated that one of the two such areas in Popponesset Bay is the Thatch Island recreational shellfishing area, located on the west side of Popponesset Spit; this area lies within the path of the alternative route but would be avoided by the use of HDD (Exhs. CW-1, at 5-28; EFSB-W-1(e), Att.; EFSB-W-2, at 3; EFSB-W-24, at 4).

The Company stated that, in addition to the Town shellfishing areas, two private shellfish grants are located in Town of Mashpee waters (Exhs. CW-1, at 5-28; EFSB-W-1(f), Att.; EFSB-W-2, at 3). The Company stated that one grant is located near Little Thatch Island, and is within the path of the alternative route (Exhs. CW-1, at 5-28; EFSB-W-2, at 3). The Company stated that the second grant is located near Gooseberry Island, immediately adjacent to the alternative route in Popponesset Bay (Exhs. CW-1, at 5-28; EFSB-W-1(f), Att.; EFSB-W-2, at 3).

The Company stated that offshore portions of the primary and alternative submarine cable routes have similar shellfish resources and are equal with respect to impacts to offshore shellfish resources (Exh. CW-1, at 5-29). However, the Company stated that turbidity impacts on shellfish would be more pronounced in Popponesset Bay than in Lewis Bay due to the finer grain size of the sediments in Popponesset Bay (Tr. 9, at 1138).

The Company stated that if the alternative route is selected, it would work with the Town of Mashpee to identify the location and extent of expected shellfish disturbance and would develop a plan acceptable to the Town to avoid and minimize impacts, including moving and re-seeding of affected shellfish (Exhs. EFSB-W-24; EFSB-SS-22-S, Att. at 5-58).

(ii) Intervenors

Mr. Williams, a witness for Save Popponesset Bay, stated that due to the shallow depth of Popponesset Bay (1 to 2 feet), the small mean tide range (2.3 feet) and the large draft (24 feet) of the work boats to be used for submarine cable installation, the proposed project would likely have a significant impact on shellfish resources in Popponesset Bay (Exh. SPB-PJW at 2-3).

(c) Analysis

The record shows that the primary route would pass through a significant amount of approved or conditionally approved shellfish growing area, including approximately 500 feet of recreational shellfish area in Yarmouth. No privately managed shellfish grants in Lewis Bay would be directly affected.

Jet plow operations would create high shear forces from nozzle water velocities above 140 feet per second, and would cause deep burial of heavier shellfish; thus, the project would likely destroy much of the benthic life, including shellfish, within the trapezoidal trough fluidized by the jet plow. The sediments may be restratified in the trough, but the area would be available for recolonization by other species after construction. The record indicates that some sediments from the trench would be entrained in the water column, then settle outside the trench. The record suggests that shellfish and other benthic life outside the trench are likely adapted to the shifting sands along the unstable seabed found on much of the primary route, although quahogs within 100 feet of the jet plow could be adversely affected by burial in excess sediment. Some additional impacts to shellfish would be expected from dragging the jet plow pontoons over the bottom and from anchor drag. The record suggests that the sediment entrainment and anchor drag effects of project construction would be comparable to effects of dragging fishing nets along the seabed.

The Company's CEMP does not provide for additional pre-construction monitoring of shellfish resources, and does not provide for post-construction monitoring (Exh. EFSB-C-19, att). However, Cape Wind has conducted certain pre-construction shellfish surveys and it has entered into an agreement with the Town of Yarmouth regarding mitigation for impacts to shellfish resources. Consequently, the Siting Board finds that shellfish impacts of the proposed transmission lines along the primary route would be minimized.

The alternative route traverses approved shellfish growing areas in Popponesset Bay, including a recreational shellfish area on the landward side of Popponesset Spit, and passes a private shellfish grant near Thatch Island. The alternative route also would be located directly adjacent to the private shellfish grant near Gooseberry Island.

The record indicates that disturbance of the fine sediments in Popponesset Bay on the

alternative route may adversely affect shellfish along the route and in adjacent areas, whereas the primary route is characterized more by sandier sediments, the disturbance of which would not affect as large an area of shellfish habitat. However, the record contains little information on the relative abundance, extent, or importance of the various types of shellfish found in Lewis Bay and in Popponesset Bay. Therefore, while the alternative route poses a greater chance of asphyxiating clams by stirring up sediments with the jet plow, as discussed in Section II.C.2.a.ii, above, it is not possible to rank the potential benthic impacts of the primary and alternative routes. Consequently, the Siting Board finds that the primary and alternative routes would be comparable with respect to shellfish impacts.

v. Fish

(a) Primary Route

(i) Company

The Company indicated that the proposed transmission lines lie within an area of Nantucket Sound that is designated as Essential Fish Habitat ("EFH"), pursuant to the federal Magnuson-Stevens Fishery Conservation and Management Act,[72] for 18 species of finfish and invertebrate species, including Atlantic cod (*Gadus morhua*), scup (*Stenotomus chrysops*), black sea bass (*Centropistus striata*), Atlantic mackerel (*Scomber scombrus*), fluke (summer flounder; *Paralichthys dentatus*), winter flounder (*Pleuronectes americanus*), long-finned squid (*Loligo pealei*), and sea clam (*Spisula solidissima*) (Exh. CW-2, at 7-16 and Table 7.6).[73] The Company identified six dominant species of commercially harvested fish and invertebrate species in Nantucket Sound: long-finned squid, Atlantic mackerel, scup, black sea bass, fluke, and channeled whelk (*Busycon canaliculatum*) (id. at 7-31, 7-35). The Company identified bluefish (*Pomatomus saltatrix*) and striped bass (*Morone saxatilis*) as the dominant recreationally fished

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[72] 16 USC §§ 1801 et seq.

[73] EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growing to maturity (Exh. APNS-MW at 5; see also, 18 USC § 1802 (10)). A full listing of EFH species is provided in Section V.E.4.b, below.

species (id. at 7-35 and Table 7.12).[74] The Company stated that both Lewis Bay and Popponesset Bay provide important winter flounder habitat and serve as important nursery grounds for several finfish species (Exh. CW-1, at 5-19).

The Company stated that project construction is not expected to cause significant impacts to fish, including EFH species, because adult and juvenile fish are mobile in the water column and are adapted to avoid disturbance, and because the principal method to be used for submarine cable installation (jet plowing) was specifically selected for its ability to minimize disturbance to sediment and other marine habitat (Exhs. CW-2, at 7-19; EFSB-SS-22-S2, Att., App. 5-I, at 24-31). The Company acknowledged that larval and egg life stages of fish may be more affected by marine construction than juvenile or adult fish due to their lower mobility (Exh. CW-2, at 7-19). The Company stated that the existing level of ambient underwater noise in Nantucket Sound is relatively high due to commercial and recreational boat traffic, and that, because jet plowing would produce similar noise levels, noise from cable installation would not be expected to adversely affect fish (Exh. EFSB-W-12).

The Company stated that a mapped anadromous fish run in Mill Creek empties into Lewis Bay; this fish run is used primarily by migrating river herring such as alewife, with spring migration typically occurring between March 15 and June 15 (Exhs. CW-1, at 5-19; EFSB-W-3A; EFSB-W-25; Tr. 7, at 852). The Company characterized Lewis Bay as a relatively large bay, with a fairly broad reach of water at the entrance to the fish run, which would allow migrating adult fish to successfully avoid cable installation activities (Exh. CW-1, at 5-19). The Company stated that potential impacts to anadromous fish from submarine cable installation would result from direct or indirect sediment disturbance, and would be localized, temporary and short-term (Exh. EFSB-W-25). The Company stated that spawning of anadromous fish would occur well upriver, so spawning adults and eggs should be unaffected by jet plowing (id. at 2).

The Company stated that it would coordinate with appropriate state and federal agencies on measures to prevent or mitigate any fisheries impacts, including the imposition of seasonal

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[74] The record does not indicate that any of the species identified by the Company as occurring in Nantucket Sound within the project area is a state-listed or federally-listed protected species. See 321 CMR § 10.61(4); 50 CFR § 17.11.

restrictions prohibiting marine construction during certain times of the year, such as the spring migration period (Exhs. EFSB-G-9; EFSB-W-25). However, the preliminary CEMP states that no further pre-construction assessment of fish and fisheries resources is planned, and the CEMP does not provide for construction monitoring or post-construction monitoring of fish and fisheries (Exh. EFSB-C-19, Att.).

(ii) Intervenors

Dr. Buchsbaum, a witness for Mass Audubon, stated that dredging projects in Massachusetts are often restricted to periods when winter flounder are not spawning, and that the Company's marine construction methods and schedule should be carefully defined to avoid winter flounder spawning (Exh. MA-RNB, Att. B at 2). Dr. Buchsbaum stated that the Company should consult with MDMF and comply with any seasonal construction restrictions requested by MDMF to avoid fish spawning and migration periods (id. at 3). Mr. Weissman, witness for the Alliance, stated that construction activities, particularly jet plowing, would raise a large amount of sediment and the resultant turbidity of the water would suffocate benthic fauna and juvenile fish; interfere with feeding and spawning; destroy eggs; and disperse juvenile and adult fish and invertebrates, thereby reducing the number of fish that would survive to maturity (Exh. APNS-MW at 18; Tr. 12, at 1686-1688). Mr. Weissman stated that, overall, some loss of fisheries production would occur, but that recovery time is unknown, as are long-term effects (Exh. APNS-MW at 18). In conclusion, Mr. Weissman stated that the impact of the wind farm project and the transmission project on fisheries must be viewed as unknown, since some impacts may be detrimental, some may be beneficial, many are unknown, and some, given the complexity of the ecosystem, may be unknowable (id.). He stated that, in his opinion, additional studies of existing fish populations, habitat, and potential mitigation measures should be conducted (id. at 22-24).

(b) Alternative Route

The Company indicated that the alternative route in Popponesset Bay contains two mapped anadromous fish runs: one in the Landing River and one in Shoestring Bay, both of

which empty into Popponesset Bay (Exhs. CW-1, at 5-19; EFSB-W-3B; EFSB-W-25). The Company stated that river herring are the predominant species of anadromous fish using the Popponesset Bay fish runs, and that migration typically occurs between March 15 and June 15 (Exh. EFSB-W-25; Tr. 7, at 852). The Company characterized Popponesset Bay as a narrow, linear and fairly restricted bay, which may make it more difficult for fish to avoid cable installation activities (Exh. CW-1, at 5-19).[75] The Company stated that if it were to use the alternative route, it would conduct no jet plow activity in Popponesset Bay between April 1 and May 15, to prevent or minimize potential impacts to anadromous fish (Exh. CW-5).

(c) Analysis

The record indicates that the primary route would be located within or close to EFH for 18 fish species. The Company has selected jet plowing as its principal marine construction method in order to minimize disturbance to bottom sediment and other habitat. Construction impacts to adult and juvenile fish likely would be minimal, since fish are able to swim to avoid construction activities; however, some impacts may be expected to fish larvae and eggs.

The record shows that an anadromous fish run used primarily by migrating river herring empties into Lewis Bay, and that the spring migration typically occurs between March 15 and June 15. The Company has not proposed specific seasonal restrictions for work in Lewis Bay, arguing that the broad reach of water at the entrance to the fish run should allow migrating adult fish to avoid cable installation activities. However, the Company has agreed to consult with relevant state and local agencies to develop measures (including seasonal restrictions, if necessary) to prevent or mitigate fisheries impacts. Accordingly, the Siting Board finds that impacts of the proposed transmission lines on fisheries along the primary route would be minimized.

The record does not indicate any significant difference in fisheries impacts along the marine segments of the primary and alternative routes. The marine portion of the alternative route is approximately two miles shorter, and thus may be slightly preferable with respect to the

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[75] The Company stated that the entrance to Popponesset Bay is 300 feet wide (Exh. CW-1, at 5-49).

potential for fisheries impacts. However, as discussed in Section II.C.2.a.ii, above, the sediment in Popponesset Bay is finer-grained and has a higher concentration of organic materials than the sediment in Lewis Bay; as a result, it would likely remain suspended in the water column longer than the sandier sediment of Lewis Bay, and it may cause a drop of oxygen content in the water, due to the greater presence of organic materials.

The record shows that Popponesset Bay has two anadromous fish runs, and that the entrance to Popponesset Bay is more constricted than the entrance to Lewis Bay. Thus, if project construction were to occur in Popponesset Bay during seasonal fish migration, impacts on fish and fisheries likely would be greater along the alternative route than along the primary route. However, the Company has agreed not to conduct jet plowing in Popponesset Bay between April 1 and May 15, a period which covers approximately six weeks of the twelve-week (March 15 to June 15) fish-migration period identified by the Company. In summary, Popponesset Bay has two mapped fish runs and is more naturally constrained than Lewis Bay, and its sediments are likely to have greater impacts on fish when the sediments are disturbed during jet plowing. The slightly shorter length of the alternative route and the Company's proposed 6-week seasonal restriction do not outweigh these elements. Accordingly, the Siting Board finds that the primary route is preferable to the alternative route with respect to impacts on fish.

vi. Protected Marine Species

(a) Description

The Company stated that rare whale, seal, and turtle species may occur in Nantucket Sound (Exhs. CW-2, at 7-26; EFSB-SS-22-S2, Bulk Att., App. 5-G, 5-H). The Company identified the humpback whale (*Megaptera novaeangliae*), fin whale (*Balaenoptera physalus*), and northern right whale (*Eubalaena glacialis*) as potential users of Nantucket Sound (Exh. CW-2, at 7-29). Each of these is a state-listed endangered species under the Massachusetts Endangered Species Act,[76] and a federally-listed endangered species under the Federal

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[76] See G.L. c. 131A et seq.; 310 CMR § 10.61(4).

Endangered Species Act.[77] However, the Company's environmental consultants stated that, historically and at present, Nantucket Sound is not an important area for whales (id. at 7-27; Exh. EFSB-SS-22-S2, Bulk Att., App.5-H, at 10-11).[78]

The Company stated that MDFW has identified the gray seal (*Halichoerus grypus*) as a species of special concern (Exh. CW-2, at 7-27).[79] According to the Company's environmental consultants, the western North Atlantic population of gray seals is centered on Sable Island, Nova Scotia, but ranges from Labrador to New England (Exh. EFSB-SS-22-S2, Bulk Att., App. 5-G at 1). The Company stated that the southernmost breeding colony of gray seals is on Monomoy and Muskeget Islands, located 10.5 nautical miles and 7.0 nautical miles, respectively, from the proposed wind farm site (Exh. EFSB-SS-22-S2 Bulk Att., App.5-G at 1, 3). It stated that gray seal pupping occurs on land or ice from late December through mid-February (Exh. EFSB-SS-22-S Bulk Att., App. 5-G at 1). The Company provided information that the principal known cause of human-induced gray seal mortality in U.S. waters is by drowning in gill nets, and that few if any are listed as killed in the course of marine construction work (Exh. EFSB-SS-22-S2 Bulk Att., App. 5-G at 4).[80]

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77 See 16 USC §§ 1531-1534; 50 CFR § 17.11.

78 Single humpback whales were observed in Nantucket Sound in 1757 and in 1825 (Exh. EFSB-SS-22-S2 Bulk Att., App. 5-H at 10-11). Since 1697, a small number of finback whales has been observed; since 1854, a small number of northern right whales has been observed (id. at 19, 26).

79 The Massachusetts NHESP is responsible for the inventory of rare animal and plant species in the Commonwealth, and for maintaining records of rare species locations. 321 CMR § 10.02. The gray seal does not appear on the most recent list of Massachusetts rare species issued by NHESP. See 321 CMR § 10.61(4) (rev. August 1, 2003).

80 The ENF also discusses harbor seals (*Phoca vitulina concolor*), although it does not identify the harbor seal as a rare species. The ENF states that harbor seals generally are present in Nantucket Sound only in the winter months (Exh. CW-2, at 7-27). The Company stated that no pupping areas have been identified in southern New England (Exh. EFSB-SS-22-S2 Bulk Att., App. 5-G at 5). The U.S. Fish & Wildlife Service ("USFWS") has identified Muskeget and Tuckernuck Islands as favorite haul-out spots for the harbor seal population; these islands are all located at least 8.5 miles from the

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The Company stated that any seals present in the project area during construction would be capable of moving away from localized turbidity and vessel traffic (Exh. EFSB-SS-22-S2 Bulk Att., App. 5-G at 5). The Company reported on findings that seals habituate to most anthropogenic noises and activities, including pile driving during construction of the Näsrevet wind farm in Sweden (Exh. EFSB-SS-22-S2 Bulk Att., App. 5-G at 7). The Company asserted that seals can easily avoid slow moving vessels, such as the tugs and barges that would be used on the project (Exh. EFSB-SS-22-S2 Bulk Att., App.5-G at 5).

The Company identified loggerhead turtles (*Caretta caretta*), Kemp's ridley turtles (*Lepidochelys kempii*), and leatherback turtles (*Dermochelys coriacea*) as potential users of Nantucket Sound (Exh. CW-2, at 7-28). The loggerhead turtle is a State-listed threatened species, and both the Kemp's ridley turtle and the leatherback turtle are state-listed endangered species. 321 CMR § 10.61 (4). The Company stated that sea turtles are highly migratory, preferring more temperate waters than those of Nantucket Sound, and therefore would most likely be present in the Sound during summer (Exh. CW-2, at 7-28). The Company stated that leatherback turtles may be present in the fall as well, but that sightings of leatherback turtles in Nantucket Sound are extremely rare (id.). The Company asserted that sea turtles should be able to avoid slow moving vessels such as those that would be used for the project (Exh. EFSB-SS-22-S2 Bulk Att., App. 5-H at 47). The Company's CEMP states that certain pre-construction surveys have been conducted, but that no additional pre-construction monitoring of protected marine species is planned; the CEMP does, however, provide for the monitoring of protected marine species during and after construction (Exh. EFSB-C-19, Att.).

(b) Analysis

The Company has produced evidence indicating the potential presence in Nantucket Sound of several species of protected marine mammals and sea turtles. However, there is no

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[80] (...continued)
project area (Exhs. CW-2, at 7-27; EFSB-SS-22-S Att., App. 5-G at 5). According to USFWS, some strandings of harbor seals in southern New England have been attributed to vessel strikes (Exh. EFSB-SS-22-S Att., App. 5-G at 5).

evidence to suggest that these species are more likely to be found in the project area, or along the path of the proposed submarine cables, than in other areas of Nantucket Sound. There also is no evidence to suggest that protected marine species would be more likely to occur along the primary route than along the alternative route.

The record indicates that a very small number of any rare whale or turtle species is likely to occur within Nantucket Sound. The gray seal breeding grounds are sufficiently distant from the proposed cable-laying to support a conclusion that project-related work will not affect existing gray seal populations. The harbor seal is not a listed rare species and there is no evidence in the record to support a conclusion that harbor seals are likely to be affected by construction of the proposed transmission lines. The Company has indicated its intention to monitor the presence of rare marine species during and after construction.

Consequently, the Siting Board finds that impacts of the proposed transmission lines on protected marine species along the primary route would be minimized. The Siting Board also finds that the primary and alternative routes would be comparable with respect to impacts on protected marine species.

vii. Protected Coastal Shorebirds

(a) Primary Route

(i) Company

The Company provided information from NHESP stating that four species of protected coastal shorebirds have been identified in the vicinity of the transmission project: the roseate tern (a state and federally-listed endangered species); the piping plover (a state-listed threatened species); and the least tern and common tern (state-listed species of concern) (Exhs. CW-2, at 7-22, 7-24; EFSB-RR-45-S, Att.; MA-12).[81] Cape Wind asserted that cable installation along the primary route would not have a direct impact on any protected species nesting sites along the

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[81] Pursuant to the regulations implementing the Massachusetts Endangered Species Act, an endangered species is a species of plant or animal in danger of extinction; a threatened species is one likely to become endangered within the foreseeable future; and a species of concern is one that has suffered a decline that could threaten the species if allowed to continue unchecked. See 10 CMR § 10.03.

route, due to: the distance of the identified nesting sites (on Great Island and Kalmus Beach) from the proposed construction; the location of the main navigational channel into Hyannis Harbor in between the identified nesting sites and the proposed marine construction; the short duration of the construction; and the similarity between the work boats that would be used during construction and the types of recreational and commercial boats traffic that travel through the area (Exh. CW-CJN/SBW-2-R at 35).

The Company provided maps indicating the location of its proposed work areas, and the distances between the proposed cable-laying activities and three identified areas of coastal bird habitat in Lewis Bay: Smith's Point (on Great Island), Kalmus Beach (in Barnstable), and the Egg Island sandbar (Exh. EFSB-RR-83, Bulk Att.). The record indicates that work vessels associated with installation of the proposed cables would come within approximately 1000 feet of the Smith's Point habitat area and within roughly 650 feet of the Kalmus Beach habitat area (id.). The maps show that construction work would occur in very close proximity to the western side of the Egg Island sandbar (id.).

Cape Wind maintained that marine construction activities along the primary route would be sufficiently far from protected bird nesting habitat that a seasonal work restriction may not be necessary (Exh. CW-CJN/SBW-2-R at 35). However, the Company proposed to avoid performing marine construction during shorebirds' "courting, breeding and nesting season" (Exh. MA-19). The Company asserted that mid-March through April is the period when piping plovers are courting and are most sensitive, and that, once their eggs have been laid, plovers would not be disturbed by the Company's proposed construction activities (Tr. 11, at 1548-1549). The Company indicated that it would consult with appropriate agencies regarding the need for seasonal restrictions (Exhs. CW-CJN/SBW-2-R at 35-36; MA-8). Cape Wind stated that its preliminary CEMP includes provisions for pre-construction and post-construction monitoring of state-listed rare species within the footprint of the on-land portion of the proposed cable route, but the CEMP does not include express provisions for pre-construction, construction, or post-construction monitoring of state- or federally-listed bird species along the marine portion

of the route (id.).[82]

(ii) Intervenors

Andrea Jones, Director of Mass Audubon's Coastal Shorebird Program, testified that several important nesting sites for protected coastal shorebirds are located at the entrance to Lewis Bay (Exhs. MA-ALJ, Att. B at 4; EFSB-RR-83, Bulk Att.). She stated that six pairs of piping plovers were recorded in 2002 at Great Island on Smith's Point and that seven pairs of piping plovers and four pairs of least terns were recorded in 2002 at Kalmus Beach Park (Exhs. MA-ALJ, Att. B at 4; EFSB-RR-62). She stated that Egg Island, which is located in Lewis Bay between Kalmus Beach Park and Great Island, is exposed during low tides and is frequently used by terns for rest between foraging forays (Exhs. MA-ALJ, Att. B at 4; RR-83, Bulk Att.).[83]

Ms. Jones testified that migratory shorebirds such as terns and plovers need to rest and feed in order to gain fat during spring and fall migration, and that beaches along the southern shore of Cape Cod provide essential shorebird habitat during such migration (Exh. MA-ALJ, Att. B at 3). She stated that disturbance to birds while resting and feeding (e.g., by humans, pets, or vehicles) causes the birds to expend stored energy required for successful migration (id.). She stated that even short disturbances, such as "flushing" birds (causing birds to fly), can cause them to expend energy unnecessarily (id.).

Ms. Jones testified that the spring courting, breeding and nesting season for piping plovers occurs between late March and late August (Exh. MA-ALJ, Att. B at 3). Ms. Jones stated that piping plovers begin arriving on Massachusetts beaches to nest in late March, and eggs may be laid as early as April 19 (id.). She stated that eggs are incubated for a minimum of

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[82] The preliminary CEMP provides for pre-construction and construction monitoring of "birds". However, when read in context, this category appears to reference surveys of avian species in Nantucket Sound generally, rather than the specialized monitoring of rare or endangered coastal shorebirds.

[83] Ms. Jones stated that piping plovers, common terns and least terns currently are nesting at Kalmus Beach Park, and that piping plovers and a pair of American oystercatchers are nesting at Great Island (Tr. 13, at 1826).

26 days, and that hatch dates occur between May 23 and July 26 (id.; Exh. EFSB-RR-61). She testified that fledge dates occur between June 16 and August 20, and that parents may continue to care for young in their nesting areas as late as August 30 (Exh. MA-ALJ, Att. B at 3). Ms. Jones testified that piping plovers typically begin their migratory movements in early-to-late August and leave Massachusetts by late August (id.). Ms. Jones stated that, depending on its level and frequency, noise could adversely affect plovers throughout the species' breeding season (Tr. 13, at 1835). She stated that disturbance in the form of human activity or noise could disrupt plover courting, and that noise or activity during incubation could cause nesting birds to become agitated and to abandon their eggs (id. at 1834). She stated that during the period when the chicks have hatched but not yet fledged, necessary communication between chicks and parents could be disrupted by noise (id. at 1834-1835). Ms. Jones did indicate, however, that if plovers have begun laying their eggs and are disturbed by a storm or by predation, they may re-nest (id. at 1823).

Ms. Jones stated that restrictions on public access to beaches with protected coastal shorebird nesting areas are common in Massachusetts during the nesting and breeding season (id. at 1829-1830). She stated that state guidelines provide for 50 yards of protective fencing surrounding piping plover nests to prevent humans and vehicles from approaching the nests (id.). She said that the primary purpose of the fencing is to protect the chicks, and that the initial 50-yard radius of the fencing often is expanded once the chicks have hatched (id.).

Ms. Jones testified that seasonal restrictions on the Company's proposed marine construction activities are necessary to protect endangered piping plover and tern populations known to breed and to stage migration in the project area (Exh. MA-ALJ, Att. B at 3). She testified that construction activities should be avoided from early May to mid-September when terns are present in Lewis Bay (id.).

(b) Alternative Route

(i) Company

The Company introduced evidence showing that two protected coastal shorebird species occur on Popponesset Spit: the piping plover and the least tern (Exhs. CW-1, at 5-14;

EFSB-L-21). The Company estimated that construction activities (HDD) could come within 300 feet of Popponesset Spit, that maximum HDD sound levels of 63 decibels on the A-weighted scale ("dBA") would occur at the spit from work performed at this distance, and that noise from existing boat traffic is in the range of 50 to 80 dBA (Exh. EFSB-RR-29; Tr. 11, at 1550-1551). The Company stated that HDD cable installation under Popponesset Spit would require approximately two to four weeks and would be conducted for 20 to 24 hours a day (Exhs. EFSB-C-1; CW-CJN/SBW-2-R at 35; EFSB-RR-30; Tr. 13, at 1849-1850).

In order to limit impacts to piping plovers, Cape Wind agreed it would not conduct HDD under Popponesset Spit between April 1[84] and June 30, unless field observations by the USFWS confirmed the absence of nesting piping plovers on Popponesset Spit, and confirmed that any piping plover eggs had already hatched (Exh. CW-5; Tr. 21, at 2830).[85] The Company also agreed to maintain a distance of at least 300 feet between piping plover habitat and any construction work (Exh. CW-5). The Company agreed that during installation of the transmission cables, any plovers present on the spit would be monitored, and that work would cease if it were determined that the plovers were being disturbed (id.).

(ii) Intervenors

Ms. Jones testified that piping plovers have nested regularly at Popponesset Spit in recent years (Exh. MA-ALJ, Att. B at 2). She testified that four pairs nested on the spit in 2000, and that three pairs nested there in 2001, 2002, and 2003 (id. at 3).

Ms. Jones testified that least terns maintained a small breeding colony on the spit during the 1990s, but that no terns have nested there in the past five years (id.). However, she stated that terns do use the spit and surrounding shoals at low tide during spring migration, summer feeding,

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[84] The record is unclear whether the Company has agreed to use April 1 or March 15 as the date to start its proposed HDD restriction (Exh. CW-5; Tr. 21, at 2838, 2893; Company Brief at 151).

[85] Earlier in the proceeding, Cape Wind had proposed to restrict marine construction along the alternative route to the period "outside the spring courting, breeding, and nesting season"; however, the Company had indicated that it was prepared to avoid only mid-March to mid-April (Exhs. MA-45; Tr. 11, at 1545-1546).

and fall pre-migratory staging (id.). Ms. Jones stated that approximately 200 terns are regularly counted on the landward side of the spit at low tide (id.). She stated that, in mid- through late May, approximately twenty percent of the terns observed are roseate terns, and the remainder are common terns and least terns (id.). She stated that terns (primarily common terns) are observed through the summer months, and that terns continue to be present in the fall until departure in mid-September (id.). Ms. Jones stated that the nesting season for terns ranges from mid-May, when egg-laying begins, to August, when fledging occurs (Tr. 13, at 1826-1827).

Ms. Jones testified that disturbance of Popponesset Spit and the adjacent intertidal zone should be prohibited during the piping plover breeding season (late March through late August) and during coastal fall migration (late summer through late October) (Exh. MA-ALJ, Att. B at 3). On brief, Mass Audubon argued that Cape Wind should agree not to perform HDD drilling or other activities near or under Popponesset Spit from March 15 to August 30 (Audubon Reply Brief at 2).

(c) Analysis

The record indicates that construction activities along the primary route would pass within approximately 1000 feet of Smith's Point (habitat for piping plover), within approximately 650 feet of Kalmus Beach (habitat for piping plover and least terns), and in close proximity to Egg Island, a sandbar exposed at low tide on which terns regularly rest.

Both Cape Wind and Mass Audubon agree that a seasonal work restriction along the primary route would be appropriate, although the lengths and timing of the work restrictions they have proposed differ significantly. Mass Audubon advocates a work restriction from early May to mid-September, a period encompassing the nesting and breeding seasons, as well as pre-migration staging, for rare terns.[86] Cape Wind has proposed a seasonal restriction for the

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[86] Mass Audubon proposed a somewhat different seasonal work restriction for the protection of piping plovers (from late March through late August (nesting and breeding) and continuing through late October (fall migration)) in the context of its testimony regarding the alternative route. The Siting Board recognizes that these recommendations may extend to work along the primary route, since the restriction is biologically based

(continued...)

protection of birds, and bird habitat, only from mid-March to mid-to-late April. The Company's preliminary CEMP provides for monitoring of protected marine mammals and upland rare species, but does not provide for monitoring of rare bird species known to exist near the marine portion of the proposed cable route. While acknowledging the preliminary nature of the CEMP, we are nonetheless concerned by this omission. However, Cape Wind has indicated that it would consult with appropriate agencies regarding the need for a seasonal work restriction to protect such species.

The existing record does not permit the Siting Board to determine which of the seasonal restrictions urged by the parties – if any – would adequately protect rare coastal shorebirds and balance the protection of these birds with other likely conditions on project construction, such as seasonal restrictions for the protection of anadromous fish and shellfish, and the Company's desire to avoid marine construction in the winter months for safety reasons. In addition, it is critical that any necessary seasonal restrictions be developed in consultation with those federal and state agencies that have particular expertise in the protection of rare species and of fisheries resources. Accordingly, the Siting Board directs the Company to work with the ACOE, NHESP, and MDMF, and with Mass Audubon, if Mass Audubon wishes to participate: (1) to determine whether seasonal restrictions, or some other protective measures, are appropriate to minimize potential impacts on protected coastal shorebirds and their habitat along the primary route and, if so, to develop appropriate seasonal restrictions and/or other protective measures; and (2) to determine whether protected coastal shorebirds should be included in the Company's comprehensive environmental monitoring plan and, if so, to develop an appropriate monitoring protocol. The Company shall file with the Siting Board, prior to the commencement of marine construction, documentation of the seasonal restrictions, any additional protective measures, and the monitoring protocol. With this mitigation, the Siting Board finds that impacts on protected coastal shorebird along the primary route would be minimized.

While construction activities along the primary route occur within 1000 feet of Smith's

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[86] (...continued)
(corresponding to the birds' nesting, breeding and migration cycles), not geographically based.

Point and within 650 feet of Kalmus Beach, the alternative route passes directly under Popponesset Spit, where piping plovers regularly nest. Additionally, the record shows that construction along the alternative route would require two HDDs, one of which would include entry and exit points within 300 feet of the spit. HDD work would be conducted up to 24 hours per day, for two to four weeks, and would produce substantial noise near the spit. Accordingly, the Siting Board finds that the primary route is preferable to the alternative route with respect to impacts on protected coastal shorebirds.

viii. Marine Archeology

(a) Description

The Company stated that no submerged prehistoric archeological sites have been reported in the area of the proposed transmission project (Exh. EFSB-SS-22-S2 Att. at 6). The Company stated that it has conducted a preliminary geophysical survey along the primary and alternative cable routes, the purpose of which was to identify potential underwater obstructions and cultural resources (Exh. CW-1, at 5-39). The Company stated that the geophysical survey included the use of side-scan sonar to evaluate seabed sediments and obstructions, and the use of magnetometers to identify ferrous objects (Exh. CW-2, at 7-37). The Company stated that the locations of detected anomalies were identified using the Global Positioning System ("GPS") (id.). The Company stated that the preliminary survey data would be reviewed by the project's marine archeologist to identify potential cultural resources, and that the results of that review would be submitted to the Massachusetts Board of Underwater Archeological Resources ("MBUAR") and the Massachusetts Historical Commission ("MHC") (Exh. CW-1, at 5-41).

The Company stated that the preliminary survey indicated no significant underwater features along the primary route (id.). The Company stated that one "sizeable" magnetic anomaly was detected, but that no shipwrecks were identified and that most of the features detected by sonar were likely geological features of the sea bottom, such as sand waves, glacial till, or patches of gravel (id.).

The Company stated that one charted shipwreck has been mapped near the alternative route (Exh. CW-1, at 5-44). The Company stated that the shipwreck is located approximately

3000 feet northeast of the alternative route, approximately one mile offshore of Cotuit Highlands (id. at 5-42). The preliminary survey also detected three large submerged magnetic anomalies in Popponesset Bay, between Popponesset Highlands and Meadow Point in Cotuit, which the Company stated "may represent an obstruction in a constrained area" (id. at 5-42 to 5-44).

The Company stated that, following selection of the submarine cable route, a more detailed underwater archeological survey will be developed in consultation with the Company's underwater archeology consultants, together with MBUAR, MHC and the ACOE (id. at 5-39). The Company stated that the archeological survey would be conducted under a permit issued by MBUAR (id.).[87]

(b) Analysis

Cape Wind has conducted a preliminary geophysical survey to identify potential underwater obstructions and cultural resources along the primary and alternative routes. This preliminary survey indicates the presence of one underwater anomaly, and no shipwrecks, in the vicinity of the primary route. Once the marine routing of the proposed transmission lines has been finalized, the Company will carry out a marine archeological survey in consultation with relevant federal and state agencies, under a permit issued by MBUAR. Accordingly, the Siting Board finds that impacts of the proposed transmission lines on marine archeological resources along the primary route would be minimized.

The Company's preliminary geophysical survey indicates the presence of a potentially significant underwater obstacle and a mapped shipwreck in the vicinity of the alternative route, as compared with one underwater anomaly, and no shipwrecks, in the vicinity of the primary route. Accordingly, the Siting Board finds that the primary route is slightly preferable to the alternative route with respect to impacts on marine archeological resources.

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[87] The MBUAR issues two types of permits: Reconnaissance Permits, to conduct non-destructive inspection and identification of underwater archeological resources, and Excavation Permits, to uncover or remove underwater archeological resources. See G.L. c. 6, §§ 179-189; G.L. c. 91, § 63; 312 CMR §§ 2.00 et seq.

ix. Navigation

(a) Primary Route

Installation of the submarine cables along the primary route will require work in Nantucket Sound and in Lewis Bay (Exh. CW-1, at 5-45). The Company stated that any impacts on recreational or commercial navigation associated with installation of the submarine cables in these areas would be temporary (because the cables would be buried at least six feet below the seabed once installed) and of limited duration (because cable installation will require only two to four weeks) (Exhs. CW-1, at 5-44, 5-45).[88] The Company stated that peak use of Nantucket Sound by recreational boaters is generally from April through October (id.).

The Company stated that there are two main shipping lanes in Nantucket Sound: the Main Channel, located south of Horseshoe Shoal, which, the Company stated, is used by most of the boats traveling through the Sound, and the North Channel, which runs along the north side of Nantucket Sound, north of Horseshoe Shoal, and which is used primarily by boats headed for the south shore of Cape Cod (id.). The Company's maps indicated that the primary route would travel within the North Channel for approximately 12,000 feet (Exhs. EFSB-T-7; EFSB-T(8), Att.). The Company stated that both the cable-laying barge and support boats would be in the North Channel for one to two days (Tr. 9, at 1167-1168). The Company stated that, in addition to the shipping channels, privately and federally maintained channels are located at the approaches to Centerville Harbor and Hyannis Harbor (Exh. EFSB-T-8(B), Att.). The Company stated that the Hyannis Harbor channel is the main navigational channel into Lewis Bay, and that no marine construction would take place within that channel (Tr. 9, at 1167).

The Company stated that approximately 91% of Horseshoe Shoal has charted water depths of 30 feet below mean lower low water ("MLLW") or less, which limits the types of

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88 The Company stated that, once the submarine cable is installed, it will be mapped and designated as a transmission line area on NOAA's National Ocean Service nautical chart for the area, and the designation will be published in the U.S. Coast Guard's Coastal Pilot and Local Notice to Mariners (Exh. CW-1, at 5-51). The Company stated that such transmission line designations do not restrict or preclude vessel traffic or general navigation in the areas where they are located (id.).

vessels that can operate in the area (Exhs. APNS-N-35, Bulk Att. at ii; EFSB-T-8(A), Att.).[89] The Company stated that the area between the Main Channel and the Cape Cod shoreline, including Horseshoe Shoal, is designated as an anchorage ground (Exh. CW-1, at 5-46).

The Company stated that passenger and freight ferries, including high-speed ferries, serving both Nantucket and Martha's Vineyard operate out of Hyannis Inner Harbor (id.). The Company provided maps indicating that, within Lewis Bay, the primary route would lie in close proximity to both ferry routes, and would cross the Nantucket route (Exh. EFSB-T-7). The Company asserted that the entrance to Lewis Bay is wide enough to allow access for its cable-laying vessel and indicated that no shallow shoals or obstructions are located there that would hinder ferry navigation (Exh. CW-1, at 5-48). The Company indicated that the work boats used for cable installation would be similar to typical fishing and recreational boats, and that the tug boats would be smaller and have lower horsepower than the ferries used in the vicinity (Exh. MA-42).

The Company indicated that the details of its marine construction would be closely coordinated with the Coast Guard and published in the Coastal Pilot, and that a Notice to Mariners would be posted as required, most likely on a daily basis (Exhs. SPB-15; CW-1, at 5-51). The Company stated that it would mitigate impacts to ferry travel by involving the Steamship Authority and private ferry operators in discussions, filing the Notice to Mariners with the Coast Guard, and maintaining radio communication during construction (Exh. EFSB-T-12). Further, all anchors and cables would be marked with construction buoys, as appropriate (id.).

(b) Alternative Route

(i) Company

Installation of the submarine cables will require work in Nantucket Sound and in Popponesset Bay (Exh. CW-1, at 44-45). Cape Wind stated that it considered all mapped

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89 The Company has prepared a Navigational Risk Assessment for the ACOE (Exh. APNS-N-35, Bulk Att.). The primary focus of the Navigational Risk Assessment is the 130 wind farm turbines, but the report contains information regarding the shallow depth of waters in the area of Horseshoe Shoal and the corresponding limitations on the size of boats able to navigate there (id. at 1-9).

navigation channels in Popponesset Bay when assessing the potential navigation impacts of submarine cable installation there (Exh.CW-CJN/SBW-2-R at 44). The Company stated that the alternative route would not cross or be located near any mapped federal channels (id. at 31). Cape Wind stated that where the jet plow crosses any privately maintained channel, the cables would be buried a minimum of 6 feet below the bottom of the channel and thus would not interfere with continued use of the channel (id.). In response to assertions by Mr. Williams, witness for Save Popponesset Bay, that jet plowing would likely cause the walls of existing channels in Popponesset Bay to slump and partially fill the channel bottom (thus reducing the navigable depth of the channel) the Company indicated that it would take into account the maintenance of existing channel depths in the design and engineering of its final work plan (id.).

Maps provided by the Company indicate that the alternative route would cross the Steamship Authority ferry route to Martha's Vineyard in federal waters (Exh. EFSB-T-7). The Company also identified a mapped channel at the entrance to Cotuit Bay (Exh. EFSB-T-8(B), Att.). Cape Wind noted that the HDD operation required to install cable below Popponesset Spit would require use of a jack-up barge, which would create a temporary navigational obstacle inside Popponesset Bay during the two to four weeks of HDD work (Exh. CW-1, at 5-50).

(ii) Intervenors

Save Popponesset Bay's witness, Mr. Williams, testified that Popponesset Bay contains "a significant network of existing and planned navigational channels" (Exh. SPB-PJW at 5 and Fig. 1). He stated that these channels are relatively narrow, and that the proposed submarine cables will cross a number of them (id. at 6). Mr. Williams stated that the fluidizing of bottom sediments by the jet plow will likely cause the slopes of the channels to slump and partially fill in the bottom of the channels at the cable crossings, thus reducing the navigable depth of the channels and restricting tidal flows (id.). Mr. Williams stated that methods to avoid and to mitigate channel side-slumping should be identified (id.). Mr. Williams also raised questions regarding how cable burial depths would be verified, noting that placement of the cables at the required depth is critical to avoid damage to the cable and vessels from groundings and anchor drag (id. at 3).

Mr. Williams stated that cable installation work in the summer months would significantly impact navigation, since the landward staging area for the HDD cable installation under Popponesset Spit would block the navigational channel used by boaters from Popponesset Creek (id. at 4; Tr. 16, at 2139-2142). In addition, Save Popponesset Bay argued that the floating cable installation process, whereby each of four cables is floated across Popponesset Bay prior to jet plowing, would block boat traffic, specifically noting that recreational boaters from Popponesset Island and Popponesset Creek could not access Nantucket Sound (SPB Brief at 11).

(c) Analysis

The record indicates that significant commercial and recreational boating occurs in Nantucket Sound, including Lewis Bay and Popponesset Bay and other areas off the southern shores of Cape Cod. Installation of the Company's proposed submarine cables along either the primary or alternative route therefore can be expected to have impacts on navigation in this area while marine construction is taking place.

With respect to testimony that jet plowing may cause "slumping" of navigational channels at cable-crossings, Cape Wind has stated that it will include the maintenance of current channel depths in the Company's marine construction work plans.

The record indicates that marine construction of approximately 12,000 feet of the primary route would take place directly within the North Channel, and that the primary route would cross the path of the Nantucket ferries. The Company has indicated that its marine construction activities would be closely coordinated with the Coast Guard, the Steamship Authority and private ferry operators. This consultation should be effective in minimizing impacts on much of the existing commercial navigation in Lewis Bay. However, to help ensure that potential navigational impacts on all individuals or groups, including commercial fishermen and recreational boaters, would be avoided or minimized, the Siting Board directs the Company to also consult with the Harbormasters of the Towns of Barnstable and Yarmouth, in order to coordinate the scheduling of marine construction activities, or to arrange other mitigation measures. With the implementation of this consultation condition, the Siting Board finds that navigational impacts of the proposed transmission lines along the primary route would be

minimized.

The record indicates that, because of its shallow depths and narrow entrance (300 feet), Popponesset Bay is more navigationally constrained than Lewis Bay. While the record does not indicate the duration of the proposed floating-cable installation work in Popponesset Bay, it appears possible that this work could significantly, or even entirely, obstruct navigation through the bay, particularly for boaters attempting to leave from or return to Popponesset Island and Popponesset Creek. The exact location of the jack-up barge in relation to the entrance to the Popponesset Bay is not in evidence; therefore, it is not possible to determine whether boaters would, or would not, be able to navigate around it. However, at a minimum, it appears likely that the presence of the barge in the vicinity of the narrow entrance to the bay for a period of several weeks would impair navigation in the area to some degree. Consequently, the Siting Board finds that the primary route is preferable to the alternative route with respect to navigational impacts.

x. Conclusions on Marine Construction Impacts

In Sections III.C.2.a.ii to ix, above, the Siting Board has found that: (1) impacts associated with disturbance of marine sediments along the primary route would be minimized, and that the primary route would be preferable to the alternative route with respect to disturbance of sediments; (2) with implementation of the eelgrass documentation condition, eelgrass impacts of the proposed transmission lines along the primary route would be minimized, and that the alternative route would be preferable to the primary route with respect to eelgrass impacts; (3) shellfish impacts of the proposed transmission lines along the primary route would be minimized, and that the primary and alternative routes would be comparable with respect to shellfish impacts; (4) impacts of the proposed transmission lines on fish would be minimized, and that the primary route would be preferable to the alternative route with respect to fish impacts; (5) impacts of the proposed transmission lines on protected marine species would be minimized, and that the primary and alternative routes would be comparable with respect to protected marine species impacts; (6) with implementation of the protected birds condition, impacts of the proposed transmission lines on protected coastal shorebirds would be minimized, and that the primary route would be preferable to the alternative route with respect to protected

bird impacts; (7) impacts of the proposed transmission lines on marine archeological resources along the primary route would be minimized, and that the primary route would be preferable to the alternative route with respect to marine archeological impacts; and (8) with implementation of the navigation condition, impacts of the proposed transmission lines on navigation along the primary route would be minimized, and that the primary route would be preferable to the alternative route with respect to navigation impacts. Accordingly, the Siting Board finds that, with the implementation of the stated conditions, the marine construction impacts of the proposed transmission lines along the primary route would be minimized, and that the primary route would be preferable to the alternative route with respect to marine construction impacts.

b. Land Construction Impacts

In this section, the Siting Board reviews the environmental impacts associated primarily with construction of the land portion of the proposed transmission lines. These impacts include impacts on wetlands and water resources, land resource impacts, traffic impacts, and noise impacts.

i. Wetlands and Water Resources

(a) Primary Route

The Company stated that the proposed project along the primary route would result in temporary alterations to areas subject to protection under the Massachusetts Wetlands Protection Act, the Barnstable Wetlands Protection Ordinance, and the Yarmouth Wetlands Protection By-Laws and Regulations (Exh. YAR-7). In addition to coastal wetlands located at or near the New Hampshire Avenue landfall (see Section III.C.2.a.ii(a), above), the Company identified six inland resource areas located within 100 feet of the primary route (Exhs. EFSB-W-15; EFSB-SS-22-S, Att. at 5-52 to 5-55). The Company stated that the inland resource areas include vegetated wetlands, ponds, brooks, and Riverfront Areas (Exh. CW-1, at 5-31 to 5-32).[90] The Company indicated that the NSTAR ROW lies within the 100-foot buffer zone of one of the inland

[90] Temporary impacts to the 200-foot Riverfront Area would affect approximately 0.08 acres (Exh. EFSB-W-19).

wetlands; however, there are no wetlands, streams, or water resources within the NSTAR ROW (Exh. EFSB-W-15; Tr. 6, at 743).

The Company stated that any impacts to wetland resource areas would be temporary, and asserted that impacts to inland wetlands would be avoided by installing the transmission lines in paved streets and maintained ROWs, and avoiding regulated culverts during construction (Exhs. EFSB-W-19; YAR-16). The Company stated that all areas disturbed by trenching and installation of the underground lines would be backfilled and restored to existing conditions (Exh. YAR-7). In addition, indirect impacts to down-gradient salt marsh and inland wetlands would be avoided by the installation of erosion and sediment controls prior to construction (id.; Exh. YAR-16).

The Company asserted that construction of the proposed transmission lines would not result in changes to surface or groundwater hydrology (Exh. EFSB-L-10). Cape Wind has agreed to provide the Town of Yarmouth Department of Public Works ("DPW") with documentation showing that its transmission lines would not degrade or cause galvanic corrosion to the Town's water system along the route (Exh. CW-CO-2, at 4).

The primary route travels through the Zone I wellhead protection areas of three public water supply wells (Exh. CW-1, at 5-9).[91] MDEP has stated that it would typically prefer that utilities be installed outside of Zone I areas; however, the Company noted that MDEP staff have indicated they would allow the installation as long as alternative routes have been evaluated and the areas affected were minimized to the extent possible (Exh. EFSB-L-12). The Town of Yarmouth has agreed to allow the installation of the transmission lines through any designated Zone I areas, subject to Cape Wind complying with the applicable MDEP laws and regulations and receiving authorization from the MDEP regarding the Zone I wellhead protection regulations (Exh. CW-CO-2, at 2, 4).

The primary route also crosses through MDEP Zone II wellhead protection areas,

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[91] The Company stated that the Zone I area is the area within a 400-foot radius around a well that pumps more than 100,000 gallons per day (Exhs. CW-1, at 5-9; EFSB-L-12).

(Exhs. CW-1, at 5-9; EFSB-L-12).[92] The Company stated none of the restrictions for siting various land uses within Zone II areas would affect the proposed project along the primary route (Exh. EFSB-L-12).

The northern portion of the primary route (north of Jabinette's Pond) would be located within a zone of contribution to the Town of Yarmouth's water supply wells and aquifer protection district (Exhs. CW-1, at 5-7; EFSB-L-9). The boundaries of the aquifer protection district are based upon the delineation of the zones of contribution to public supply wells, pursuant to the Yarmouth Zoning By-laws (Exh. EFSB-L-9). The Company stated that prohibited uses in the aquifer protection district are typically those associated with the discharge of contaminated waters and hazardous materials (id.).

(b) Alternative Route

The Company stated that, in addition to wetlands located in or near the Mashpee Town Landing landfall (see Section III.C.2.a.ii(b), above), the alternative route along the NSTAR ROW would pass through 13 inland wetlands, the 100-foot buffer zone of two wetlands, and the Riverfront Area of four perennial streams (Exhs. CW-1, at 5-34; EFSB-W-27). The Company acknowledged that limited temporary and permanent impacts to wetlands, wetland buffer zones, and Riverfront Areas likely would result from the placement of utility poles, construction of access roads, and vegetative clearing associated with construction of the proposed transmission lines along the alternative route (Exh. EFSB-W-29). In particular, the Company stated that some construction would involve work in various wetland buffer zones (Tr. 6, at 805). The Company asserted that it would attempt to avoid placing poles in wetlands by spanning the wetlands along the alternative route; nonetheless, pole installation is expected to result in minimal but permanent filling in of wetlands, wetland buffer zones, and Riverfront Areas (Exhs. EFSB-W-29; EFSB-W-30; Tr. 6, at 806).

The alternative route travels through the Zone I wellhead protection areas of four public

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92 The Company stated that the Zone II area is that area of an aquifer that contributes water to a well under the most severe pumping and recharge conditions that can be realistically anticipated (Exhs. CW-1, at 5-9; EFSB-L-12).

water supply wells but does not enter the Zone II area of any well (Exh. CW-1, at 5-9).

(c) Analysis

The record demonstrates that the primary route would enter wetland buffer zones and a regulated Riverfront Area as it travels in paved roadways and along the existing NSTAR ROW. With regard to groundwater and the associated wellhead protection areas, the Company would adhere to applicable MDEP regulations before constructing in any designated Zone I area. Based on the limited encroachment into wetland buffer areas and Riverfront Area, the use of paved roadways, and the adherence to regulations concerning wellhead protection areas, the Siting Board concludes that construction of the proposed facilities along the land portion of the primary route, in the street and in the NSTAR ROW, would result in no permanent impacts, and only minimal temporary impacts, to water resources. Consequently, the Siting Board finds that the wetlands and water resource impacts of the proposed transmission lines along the primary route would be minimized.

The alternative route traverses 13 inland wetlands, four of which are associated with perennial streams and adjacent Riverfront Areas. While the Company will attempt to avoid impacts to these wetlands, it may be necessary to place a limited number of poles in wetlands, resulting in permanent impacts. In addition, construction of access roads along the 12.2-mile length of the NSTAR ROW may result in temporary or permanent wetland impacts. These temporary and permanent impacts exceed the very limited temporary impacts to wetlands buffer zones associated with construction along the primary route. The record indicates that construction impacts on groundwater and hydrology along the primary and alternative routes would be comparable. Overall, the Siting Board finds that the primary route would be preferable to the alternative route with respect to wetlands and water resource impacts.

ii. Land Resources

(a) Primary Route

The Company asserted that the primary and alternative routes are configured to use existing developed or disturbed landscapes, thereby eliminating or reducing temporary and

permanent impacts to vegetative cover (Exh. CW-1, at 5-11). The Company also asserted that impacts to natural communities resulting from the installation of the proposed transmission lines would be minimal as the line is to be located below grade, within streets and existing ROWs (Exh. YAR-6).

According to the NHESP, the in-street portion of the primary route crosses three Priority/Estimated Habitats containing nine state-listed plant and four state-listed wildlife species (Exhs. CW-1, at 5-12; EFSB-L-21; EFSB-RR-34; Tr. 6, at 791).[93] The Company stated that impacts to these species would be minimal since the transmission lines would be located in previously disturbed areas, and stated that it would work in coordination with the Yarmouth and Barnstable Conservation Commissions, the MDEP and the NHESP to ensure that listed species would not be affected (Exh. CW-1, at 5-14 to 5-15; Tr. 6, at 791). According to the USFWS, there are no federally-listed or proposed threatened or endangered species located in or along the proposed route (Exhs. CW-1, at 5-14 to 5-15; EFSB-L-21).

The Company stated that because the primary route would be located entirely in streets and along an existing NSTAR ROW, minimal tree clearing would be required and the potential for damage to trees during construction would be limited (Exh. EFSB-L-1). The Company stated that clearing along the NSTAR ROW would consist of limited trimming of branches that may have grown into the ROW, and removal of trees located mainly at the point where the route joins the NSTAR ROW (id.; Tr. 6, at 723).

The Company stated that it conducted a terrestrial reconnaissance archeological survey ("reconnaissance survey") of the land portions of the primary and alternative routes; this survey consisted of a review of background information and a walkover survey by archeologists

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93 The nine plant species are: quill-leaf arrowhead (*Sagittaria teres*); redroot (*Lachnanthes caroliana*); inundated beakrush (*Rhyncospora inundata*); long-beaked bald-rush (*Rhyncospora scirpoides*); Wright's panic-grass (*Dichanthelium wrightianum*); Commons' panic-grass (*Dichanthelium commonsonianum*); Mattamuskeet panic-grass (*Dichanthelium mattamuskeetense*); pondshore knotweed (*Polygonum puritanorum*); and Plymouth gentian (*Sabatia kennedyana*) (Exh. CW-1, at 5-12). The four animal species are: comet darner (*Anax longipes*); New England bluet (*Enallagma laterale*); Pine Barrens bluet (*Enallagma recurvatum*); and water-willow stem borer (*Papaipema sulphurata)* (id.).

(Exhs. EFSB-SS-22-S2, at 4; EFSB-L-24).[94] The reconnaissance survey found no previously recorded archeological sites or historic properties within the anticipated area of physical disturbance along the primary route (Exh. EFSB-SS-22-S2, at 10 and App. 5-E at 2). However, three clusters of documented historic buildings are located in the vicinity of the route; two of these clusters are located directly along the route (Exh. EFSB-SS-S2, at 8).[95] The Company indicated that it does not anticipate any impact to these properties as a result of the construction of the proposed transmission lines (Tr. 6, at 816).[96]

The Company indicated that although New Hampshire Avenue extends to the water's edge, the landfall is not a public boat landing, and is accessible only to pedestrians (Exhs. CW-1, at 4-4; EFSB-L-32). A town beach, known as Englewood Beach, is located off of the east side of New Hampshire Avenue (Exh. YAR-19).

The Company stated that the proposed construction in the coastal zone, which includes certain marine and land portions of the primary route, would require a consistency review under the CZM program (Exh. CW-1, at 1-14 to 1-16). As discussed in Section III.C.2.a.ii, above, the Company asserted that the proposed transmission lines would be a "coastally dependent" use of the coastal zone, as defined for CZM program purposes (id.). The Company also indicated the siting of the proposed transmission lines would be consistent with CZM program policies relevant to any land use impacts of the project, including Public Access Policy #1, which relates

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94 A reconnaissance survey is used to determine the scope of an intensive locational archeological survey, which is conducted under permitting from the State Archaeologist (Exh. EFSB-SS-22-S2, at 4, 5). In August, 2003, the Company indicated that it expected the intensive archeological survey to be undertaken within several months (Tr. 6, at 817). As of the close of the record, the Siting Board had not received results of the intensive survey (Exh. EFSB-RR-36).

95 These clusters include: (1) four buildings along Route 28/Main Street at the intersection of Berry Avenue and Higgins Crowell Road; (2) six buildings along Berry Avenue, north of the landfall and south of Route 28; and (3) four buildings along Route 28/Main Street near Camp Street, located west of the route (Exh. EFSB-SS-22-S2, at 8).

96 The Company noted that it has not identified on which side of the street the historic buildings are located (Tr. 6, at 816). The proposed alignment of the transmission line lies on the east side of Berry Avenue and continues along the east side crossing Route 28 onto Higgins Crowell Road (Exh. EFSB-SS-1).

to existing public recreation sites, and Protected Areas Policy #3, which relates to designated or registered historic districts and sites (id. at 5-4, 5-5). The Company stated that, because the proposed transmission lines are sited underground in the public way, they would not adversely affect the Englewood Beach recreation area or identified historic sites adjacent to the primary route along New Hampshire Avenue (id.).

(b) Alternative Route

In addition to Priority/Estimated Habitat on Popponesset Spit (see Section III.C.2.a.ii(b), above), the NHESP has determined that the alternative route along the NSTAR ROW would traverse one vernal pool, located in the area of Old Mill Road and the Quaker River in Mashpee, and one Priority/Estimated Habitat, located in the area around Hathaway Ponds in Barnstable (Exhs. CW-1, at 5-16; EFSB-SS-3B). No federally listed or proposed threatened or endangered species are known to occur on or immediately adjacent to the NSTAR ROW (Exh. EFSB-L-21).

The Company stated that construction of the proposed transmission lines along the alternative route would require clearing an additional 60 feet of the NSTAR ROW between the Mashpee Substation and Shootflying Hill Road, a distance of approximately 8.5 miles (Exh. EFSB-L-27; CW-1, at Figs. 4-3, 4-3a; Tr. 6, at 724). Additional clearing would not be required along the ROW between Shootflying Hill Road and the Barnstable Switching Station, as the proposed transmission lines would be placed between two existing transmission lines located in the ROW (Tr. 6, at 724-725).

The reconnaissance survey found three recorded archeological sites within or in immediate proximity to the alternative route (Exh. EFSB-SS-22-S2, App. E at 3). The Company reported one previously recorded ancient Native American archeological site within or adjacent to the anticipated area of disturbance (Exh. EFSB-L-24). The Company noted that the boundaries of the archeological site have not yet been delineated; consequently, its extent and exact location are not known (id.). The Company stated that, if avoidance of the area is not an option, additional field studies may be undertaken to refine the boundaries of the site and to gather further data on the site (Exh. EFSB-L-35). The archeological reconnaissance report concluded that overall, the alternative route possesses a higher archeological sensitivity than the

primary route, due to the longer length of the route and its proximity to more known prehistoric and historic archeological sites (Exh. EFSB-SS-22-S2, App. E at 4).

(c) Analysis

The record demonstrates that the land resource impacts of the proposed transmission project along the primary route would be temporary and minimal due to the placement of the transmission lines under streets and along the existing NSTAR ROW. The Company has stated that it would work with the Yarmouth and Barnstable Conservation Commissions, the MDEP and the NHESP to ensure that any potential impacts to rare or endangered species are minimized.

With regard to the clusters of historically significant homes, the Siting Board notes that the largest cluster, six homes, is located directly along the primary route. The Company has not identified on which side of Berry Avenue the homes are located, or whether the MHC or the Town of Yarmouth would require special construction techniques or other measures to avoid impacts to the homes. The Siting Board encourages the Company to work in collaboration with the MHC and the Town of Yarmouth on the placement of the transmission lines relative to the homes along Berry Street to avoid construction impacts on the properties from the installation of the ductbank. Accordingly, the Siting Board finds that the land resource impacts of the proposed transmission lines along the primary route would be minimized.

The record indicates that construction of the proposed transmission project along the alternative route would require the clearing of a 60-foot wide, approximately eight-mile long, portion of the NSTAR ROW. In contrast, construction along the primary route would not require any tree clearing, with the exception of minimal trimming of trees and brush at isolated locations. The record indicates that impacts to endangered or protected species along the land portion of the primary and alternative routes would be minimal, because the limited number of mapped priority areas are located in proximity either to paved streets or to the previously disturbed NSTAR ROW. Finally, a previously recorded ancient Native American archeological site has been identified near the alternative route landfall location. Construction of the landfall at that location may require significant mitigation; alternately, the landfall may need to be relocated. In light of the potential impacts to an archeological site, and the significant tree clearing required along the

alternative route, the Siting Board finds that the primary route would be preferable to the alternative route with respect to land resources impacts.

iii. Traffic

(a) Primary Route

Cape Wind stated that construction of the proposed transmission lines along the primary route would result in temporary traffic impacts (Exh. CW-1, at 5-44). The Company stated that the transmission lines would be located within and along New Hampshire Avenue, Berry Avenue, Higgins Crowell Road and Willow Street, which are owned and maintained by the Town of Yarmouth; in addition, the transmission lines would cross Route 28 and Route 6, which are owned and maintained by the Massachusetts Highway Department (id. at 5-46). The Company indicated that, during the construction period, the width of roadway available to traffic would be limited to approximately 18 to 22 feet, and that construction of the ductbank would progress approximately 150 feet a day over the five-month period (id. at 5-44 to 5-45).[97] Cape Wind indicated that it would use an HDD under Route 6 to prevent traffic disruption (Tr. 6, at 798). Cape Wind noted that traffic could be routed around construction activity on most of New Hampshire Avenue via streets that connect to Berry Avenue and New Hampshire Avenue with access to Route 28 (Exh. EFSB-RR-28). The Company also indicated that it would need to close the portion of New Hampshire Avenue between the landfall and Shore Road while landfall construction takes place; however, it asserted that this portion of New Hampshire Avenue is not heavily traveled (Tr. 6, at 755). In addition, the Company noted that construction on New Hampshire Avenue would not affect most traffic destined for Englewood Beach, a nearby town beach with parking access from New Hampshire Avenue, since on-land construction would not take place during the summer traffic season (Exh. YAR-19).

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[97] The land portion of the proposed transmission lines would be installed in two phases. Phase I, which would last for five months, would involve excavation to install the ductbank; Phase II, which also would last for five months, would involve the installation of the cables through the ductbank, and would require minimal excavation (Exh. EFSB-T-6).

Cape Wind and the Town of Yarmouth have entered into a Host Community Agreement which addresses a number of traffic-related issues (Exh. CW-CO-2). Cape Wind has agreed to avoid construction along the Yarmouth streets and the portion of the NSTAR ROW in Yarmouth between Memorial Day and Labor Day, with limited exceptions – Yarmouth may allow construction through June 15 subject to the consent of the Yarmouth DPW, and may allow work on Higgins Crowell Road in the summer months if the Town also is performing work on Higgins Crowell Road at that time (id.; Tr. 6, at 714).[98] Cape Wind also has agreed to provide street improvements for Higgins Crowell Road, Berry Avenue and New Hampshire Avenue, including widening Higgins Crowell Road (Exh. CW-CO-2).

Cape Wind stated that it would develop a Traffic Management Plan in consultation with Yarmouth once the route for the transmission line is finalized (Exh. EFSB-T-10). The Traffic Management Plan would address signage, police details, maintenance of ingress and egress from off-street facilities, temporary markings, barriers, and other traffic control measures, notification of construction schedules and locations, coordination with other public works projects, and pedestrian safety (id.; Exh. EFSB-T-11). The Company noted that as part of the Traffic Management Plan, it would work with Town officials and school administrators to identify school bus stops and pedestrian routes that might be affected by construction, and to ensure that they would be kept open and safe during the construction period (Exh. EFSB-T-11).

(b) Alternative Route

Cape Wind stated that the in-street segments of the alternative route would be located within and along Mashpee Neck Road, Quinaquisset Avenue, and Orchard Road, all of which are owned and maintained by the Town of Mashpee (Exh. CW-1, at 5-48). The Company noted that Mashpee Neck Road is a residential road and is not a route to Popponesset Beach; consequently, the Company expects traffic impacts to be the same throughout the year (Tr. 6, at 720). However, Cape Wind noted that the Cape Cod Commission has requested that there be no

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[98] Approximately 90% of the NSTAR ROW is located in Barnstable, and there are no seasonal construction restrictions for that portion of the ROW (Exh. EFSB-2(e), Att.; Tr. 6, at 714).

construction in roadways during the summer months; it therefore expects that in-street construction along the alternative route would be subject to restrictions similar to those for construction along the primary route (id. at 719).

The Company asserted that construction techniques and mitigation methods would be identical for the primary and alternative routes (Exh. CW-1, at 5-49). However, it indicated that since the in-street portion of the primary route, at 4 miles, is longer than that of the alternative route, at 1.9 miles, it would require more intersection crossings and additional construction time (id.).

(c) Analysis

The record demonstrates that construction of the proposed transmission lines along the primary route has the potential to create temporary traffic impacts on Higgins Crowell Road, Berry Avenue and New Hampshire Avenue. These impacts would be mitigated in part by scheduling construction outside the summer peak travel period. The Company has provided a list of issues that would be addressed in a Traffic Management Plan, including mitigation measures to address the safety of pedestrian, bus, and vehicular traffic to the two elementary schools located on Higgins Crowell Road. The Company has agreed to work with Town of Yarmouth officials and school administrators to identify specific measures to further mitigate traffic impacts, but has not yet provided a draft of the Traffic Management Plan for the proposed project. The Siting Board notes that it is crucial that the Company and the Town of Yarmouth develop a workable Traffic Management Plan in a time frame that allows for notification to residents and businesses. Consequently, to ensure that all outstanding issues can be resolved in a timely fashion, the Siting Board directs the Company to submit a draft Traffic Management Plan to Yarmouth officials and school administrators at least six months prior to the commencement of construction. The Siting Board finds that, with the implementation of this condition, the construction traffic impacts of the proposed transmission lines along the primary route would be minimized.

The record indicates that traffic impacts during construction along either the primary or the alternative route would be temporary, and that proposed mitigation would be similar and

addressed through Traffic Management Plans developed in consultation with the respective host towns. However, the in-street portion of the primary route, at four miles long, is twice the length of the in-street portion of the alternative route; the primary route therefore would require a longer period of in-street construction. In addition, the in-street portion of the alternative route is somewhat less traveled than the primary route. Accordingly, the Siting Board finds that the alternative route would be preferable to the primary route with respect to construction traffic impacts.

iv. Noise

(a) Primary Route

The Company indicated that the only noise associated with the transmission project would be noise from construction (Exh. CW-1, at 5-66). The Company stated that land-based construction activities would include excavation, construction, and the movement of construction vehicles, and that these activities would be audible near the cable route (id.; Exh. EFSB-L-31).

The Company indicated that along the primary route in Barnstable and Yarmouth, 260 residences are located within 50 feet of the center of the proposed ductbank, in streets, or within 50 feet of the edge of the NSTAR ROW (Exh. EFSB-L-7). The Company further stated that the residences abutting the public ways generally are located approximately 30 feet from the street (id.). The primary route also passes two schools on Higgins Crowell Road: the Mattacheese Middle School and the Marguerite E. Small School (Exh. CW-1, at 4-6).[99]

The Company stated that construction noise mitigation would consist of scheduling all work during the daytime hours, ensuring that all construction equipment and trucks have properly functioning noise mufflers, minimizing equipment idling, and either shielding equipment or locating the equipment away from sensitive receptors (Exhs. CW-1, at 5-67; EFSB-L-31).

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[99] The Company stated that the centerline of the primary route would be approximately 870 feet from the nearest building at the Mattacheese School, 400 feet from the nearest public area, and 100 feet from the nearest playground or field (Exh. EFSB-L-7; Tr. 6, at 745). At the Marguerite E. Small School, the centerline would be approximately 275 feet from the nearest building, 150 feet from the nearest public area, and 100 feet from the nearest playground or field (Exh. EFSB-L-7; Tr. 6, at 745).

(b) Alternative Route

The Company stated that land construction activities along the alternative route would include HDD, excavation, construction, and the movement of construction vehicles (Exhs. EFSB-L-31; CW-1, at 5-66). The Company indicated that HDD operations at the Mashpee Town Landing landfall would operate for 20 to 24 hours a day, producing noise on a continuous basis (Tr. 10, at 1329). As discussed further in Section III.C.2.d, below, the Company stated that noise levels associated with the HDD rig (a maximum sound level ("L_{max}") of 78 dBA at 50 feet) are comparable to those for the excavators and backhoes (80 to 84 dBA at 50 feet) (Exhs. EFSB-L-31; EFSB-SS-S at 5-124). The transition vault, situated within the HDD staging area, would be located approximately 100 feet from the nearest two residences, one southwest and one northeast of the transition vault (Exhs. EFSB-SS-1B; EFSB-RR-27).

(c) Analysis

The record demonstrates that the noise impacts of the proposed project along the primary route would be limited to temporary noise impacts associated with construction activities. Construction noise impacts would be minimized by confining work to daytime hours. Further mitigation for construction noise includes employing proper muffling and idling limitations on construction equipment, as well as shielding and placement of construction equipment. The Siting Board notes that the noise mitigation measures proposed by the Company, consisting of limiting construction to daytime hours, installing muffling, adhering to idling restrictions, and using shielding and optimal placement of the construction equipment, would be consistent with approaches to mitigation that the Siting Board has accepted in past cases. The Siting Board finds that the construction noise impacts of the proposed transmission lines along the primary route would be minimized.

The noise impacts of the proposed project along the alternative route also would be limited to temporary noise impacts associated with construction activities, and the same mitigation measures would be employed. However, the Company expects it would use HDD, rather than jet-plowing, at the Mashpee Town Landing landfall. The record indicates that construction noise associated with HDD can be significant, and that HDD operations would

continue for 20 to 24 hours per day. Accordingly, the Siting Board finds that the primary route would be preferable to the alternative route with respect to noise impacts.

v. Conclusion on Land Construction Impacts

In Sections III.C.2.b.i to iv, above, the Siting Board has found that: (1) the wetlands and water resource impacts of the proposed transmission lines along the primary route would be minimized, and that the primary route would be preferable to the alternative route with respect to wetlands and water resource impacts; (2) the land resource impacts of the proposed transmission lines along the primary route would be minimized, and that the primary route would be preferable to the alternative route with respect to land resources impacts; (3) with the implementation of the proposed condition, the construction traffic impacts of the proposed transmission lines along the primary route would be minimized, and that the alternative route would be preferable to the primary route with respect to construction traffic impacts; and (4) the construction noise impacts of the proposed transmission lines along the primary route would be minimized, and that the primary route would be preferable to the alternative route with respect to noise impacts. Accordingly, the Siting Board finds that with the implementation of the stated condition, the land construction impacts of the proposed transmission lines along the primary route would be minimized, and that the primary route would be preferable to the alternative route with respect to land construction impacts.

c. Permanent Impacts

In this section, the Siting Board reviews the permanent environmental impacts associated with the construction and operation of the proposed transmission lines. These impacts include land use and visual impacts, and electromagnetic frequency impacts.

i. Land Use and Visual Impacts

(a) Primary Route

The transmission lines along the primary route would make landfall at New Hampshire Avenue, and would travel underground for four miles in existing public ways through residential

and commercial areas in Yarmouth, until they intersect with the NSTAR ROW; the lines then would travel underground for 1.9 miles along the NSTAR ROW until they reach the Barnstable Switching Station (Exh. CW-1, at 1-4, 5-7). The Company asserted that views of the existing transmission lines on the NSTAR ROW would not change, as there would be minimal tree clearing along the route (Tr. 6, at 723).

The Company indicated that along the primary route in Barnstable and Yarmouth, the zoning is predominantly residential, with the exception of the intersection of Route 28 and Berry Avenue, which is developed with small businesses and zoned B2 (Exh. CW-1, at 5-7). The Company stated that 260 residences are located within 50 feet of the center of the proposed ductbank, in streets, or within 50 feet of the edge of the NSTAR ROW (Exh. EFSB-L-7). The primary route also passes two schools on Higgins Crowell Road: the Mattacheese Middle School and the Marguerite E. Small School (Exh. CW-1, at 4-6).

The Company indicated that with use of the primary route, permanent impacts to inland wetland resources would be avoided by installing the transmission lines in paved streets, and along an alignment in the NSTAR ROW that would include no wetland crossings (Exhs. EFSB-W-19; YAR-16). The alignment also would avoid any impact on Englewood Beach, a Town recreation area located off of the east side of New Hampshire Avenue (Exh. YAR-19).

(b) Alternative Route

The transmission lines along the alternative route would make landfall at the Mashpee Town Landing on Mashpee Neck Road, and would travel for 1.9 miles in existing public ways through residential areas in Mashpee, until they intersect with the NSTAR ROW, where one of the lines would terminate; the remaining line then would travel overhead along the NSTAR ROW through residentially-zoned areas for 12.3 miles (Exh. CW-1, at 1-13, 5-7). The Company indicated that much of the NSTAR ROW runs through residential back yards and side yards (Tr. 6, at 729-731). Overall, 94 residences (all in Mashpee) would be located within 50 feet of the center of the proposed ductbank, in a street, while 401 residences (36 in Mashpee and 365 in Barnstable) would be located within 50 feet of the edge of the NSTAR ROW (Exh. EFSB-

RR-26).

As discussed in Section III.C.2.b, above, the Company expects to clear approximately 60 feet of currently-vegetated ROW along the eight miles of ROW between the Mashpee Substation and Shootflying Hill Road, leaving approximately 40 feet of ROW nearest the northern edge uncleared (Exh. EFSB-L-27; Tr. 6, at 733-734).[100] This portion of the ROW is 210 feet wide and is occupied by two transmission lines – the 23 kV 88 Line, located approximately 35 feet from the southern edge of the ROW, and the 115 kV Line 115, located approximately 75 feet from the southern edge of the ROW (Exh. EFSB-L-2; Tr. 6, at 726). The new transmission line would be located approximately 130 feet from the southern edge of the ROW (Exh. EFSB-L-2). The Company acknowledged that views of the existing transmission lines from some of the residences along the northern edge of the NSTAR ROW are presently screened by woods, and stated that, after the ROW is cleared, some residences may have open views of the transmission lines in the ROW, while views from other residences may continue to be screened (Tr. 6, at 729). The Company indicated that the new transmission line would be mounted on single wooden pole structures, while the existing Line 115 is mounted on wooden double pole H-frame structures (Exh. EFSB-L-2).

The Company stated that use of the alternative route would require the construction of a new riser station on a 50-by-100 foot cleared area at the Mashpee Substation at the intersection of Orchard Road and Route 28 (Exh. CW-1, at 1-13; Tr. 6, at 736, 744;). The Company asserted that the visual impact of the riser station would be minimal, since it would be located within the 10-acre substation property (Tr. 6, at 737). However, the Company acknowledged that some areas to the south of the ROW may have views of the riser station, since there is not much vegetation along the southern boundary of the parcel (id. at 738).

The Company stated the alternative route along the NSTAR ROW would pass through 13 inland wetlands and the Riverfront Area of four perennial streams (Exhs. CW-1, at 5-34; EFSB-W-27). The Company acknowledged that limited permanent impacts to wetlands and

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[100] The Company stated that the vegetation along the northern edge of this portion of the ROW varies in height and density, from low-growing wetland species to dense woods (Tr. 6, at 727-728).

Riverfront Areas along the alternative route likely would result from construction of the proposed transmission lines, including installation of utility poles and access roads (Exh. EFSB-W-29). The Company asserted that it would attempt to avoid placing poles in wetlands by spanning the wetlands along the alternative route; nonetheless, pole installation is expected to result in minimal but permanent filling in wetlands and Riverfront Areas (id.; Exh. EFSB-W-30; Tr. 6, at 806).

(c) Analysis

The record demonstrates that construction of the transmission lines along the primary route would not result in any permanent visual impacts, because the transmission lines would be installed underground, within streets and the NSTAR ROW.[101] Removal of vegetation along the NSTAR ROW would be limited to minimal trimming of branches and brush. In addition, with use of the primary route, the proposed transmission line project would include no siting through inland wetlands or through Riverfront Area except within paved roadway. Accordingly, the Siting Board finds that the land use and visual impacts of the proposed transmission lines along the primary route would be minimized.

With use of the alternative route, the new transmission line would run overhead along the NSTAR ROW, which accounts for much of the route. Additionally, construction along the NSTAR ROW would require substantial clearing of existing trees and vegetation. The record demonstrates that the NSTAR ROW passes through the back and side yards of numerous homes, many of which may be directly affected by the removal of vegetation which screens views of the transmission lines located in the ROW. The Company has acknowledged the increase in open views of the existing and proposed transmission lines.

Overhead transmission line construction along the alternative route's NSTAR ROW also would traverse numerous wetlands and Riverfront Areas. While many of these resources likely

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[101] As part of the consistency review under the CZM Program, any land use impacts of the transmission lines will be reviewed for consistency with applicable CZM policies, including Public Access Policy #1 and Protected Areas Policy #3 (see Section III.C.2.b.ii, above).

could be spanned, some displacement of resource areas for placement of transmission line poles is expected. Accordingly, the Siting Board finds that the primary route would be preferable to the alternative route with respect to land use and visual impacts.

ii. Electric and Magnetic Fields

In this section, the Siting Board reviews the potential impacts of electric and magnetic fields ("EMF") associated with the proposed transmission lines.

(a) Primary Route

The Company conducted an assessment of existing measured and predicted future magnetic fields[102] associated with the proposed 115 kV transmission lines, for both an average wind farm output of 168 MW and a maximum wind farm output of 420 MW (Exh. EFSB-E-3, Att. at 12). In addition, the Company provided revised predictions of magnetic field levels assuming a higher peak wind farm output of 454 MW and a modified circuit configuration (Exh. EFSB-E-3-S; Tr. 10, at 1361-1363, 1370).[103] The Company asserted that, although the higher output would increase magnetic field levels, the new circuit configuration would have a cancelling effect, resulting in magnetic field levels that are either the same as those calculated for a 420 MW output, or lower by 0.5 to 1.0 milligauss ("mG") (Tr. 10, at 1363-1364, 1371).

The Company's modeling indicated that the new transmission lines laid in streets would generate maximum above-ground magnetic fields of approximately 6 mG for a wind farm output

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[102] The Company stated that, because the proposed transmission lines would be effectively contained within a grounded metallic shielding, electric fields associated with the cable would be negligible (Exh. CW-1, at 5-54). Further, the operating voltage of NSTAR's existing overhead transmission and distribution lines would not be changed by the addition of the proposed facilities; therefore, the existing electric field would not change (id.). Consequently, the Company performed no measurements or modeling of the electric fields which would be produced by the proposed transmission lines (id.).

[103] The circuits were reconfigured from 14 circuits to 16 circuits to allow for an additional fiber optic circuit (Exh. EFSB-E-3-S). The arrangement changed from a seven-over-seven configuration to an eight-over-eight configuration, with a more centralized array as the cables are now on the interior six conduits of the duct bank (id.; Tr. 10, at 1362).

of 168 MW and 16 mG for an output of 454 MW (Exh. EFSB-E-3-S). Maximum magnetic fields under the new transmission lines in the NSTAR ROW were modeled as 15 mG for a 168 MW output, and 42 mG for a 454 MW output (id.).

In order to assess the effect of these magnetic fields, the Company measured existing ambient magnetic field levels at various points along the route and calculated the combined magnetic fields from existing sources and the new transmission lines. The Company measured maximum existing field levels ranging from 4 mG to 34 mG at peak loads along public ways (Exh. EFSB-E-3, at 9). These field levels would increase to between 8 and 32 mG with the wind farm output at 168 MW, and to between 17 and 32 mG with the wind farm output at 420 MW (Exh. EFSB-E-3, Bulk Att. at 13).

The Company measured existing field levels along the NSTAR ROW ranging from a maximum of 127 mG directly under the lines, to 56 mG at the north edge of the ROW and 12 mG at the south edge of the ROW (Exh. EFSB-E-3, Bulk Att. at 15). The combined magnetic fields for the existing overhead lines and the new underground lines would remain at 127 mG directly under the lines, 56 mG at the north edge of the ROW, and 12 mG at the south edge of the ROW, under either wind farm output level (id.). The Company noted that the magnetic field impact of the proposed transmission lines would be negligible because the fields from the existing overhead lines would overshadow the fields created by the new underground transmission lines (id.). Finally, the Company noted that the existing measured field strength directly under the lines in front of the Marguerite E. Small School (5 mG, or 9 mG at peak load), would not be affected by construction of the proposed transmission lines (Exh. CW-1, at 5-55).

The Company asserted that magnetic field impacts of the proposed transmission lines both along the street and at the edge of the NSTAR ROW would be minimized through optimal phase arrangement (Company Brief at 201). The Company stated that it would normally operate the wind farm with both 115 kV cable circuits energized, and that the power would flow equally between the two circuits (Exh. EFSB-E-1). The cables of each circuit would be arranged in a delta configuration with reverse phasing of the conductors (Exh. EFSB-E-4).

The Company noted that the existing magnetic field levels at the edge of the NSTAR ROW are less than the 85 mG level previously accepted by the Siting Board, and that the

addition of the proposed transmission lines would not increase the edge of the ROW field strengths along the primary route (Exh. CW-1, at 5-62). The Company asserted that there have been no scientific studies demonstrating that human exposure to magnetic fields results in adverse impacts to human health (Tr. 10, at 1399-1400; Company Brief at 199). Dr. Valberg, the Company's witness on EMF, noted that epidemiological studies concerning long-term effects of people living close to power lines are ongoing in Great Britain, with the results showing no adverse effects (Tr. 10, at 1417-1418). While acknowledging that previous studies showed statistical associations between childhood leukemia and magnetic fields, Dr. Valberg argued that less weight is being placed on the possibility that such associations reflect causal factors since laboratory studies have failed to determine how such an effect could take place (id. at 1419).

For locations ranging from zero to 30 feet above the sea floor, the Company modeled magnetic field levels associated with the underwater cables at wind farm outputs of 168 MW, 420 MW (alternative route), and 454 MW (primary route) (Exhs. CW-1, at 5-62 to 5-63; EFSB-E-3-S). Based on its modeling, the Company stated that magnetic fields above the sea floor would range from 1 mG to 22 mG with wind farm output at 168 MW, and from 3 mG to 60 mG with wind farm output at 454 MW (Exhs. CW-1, at 5-62 to 5-63; EFSB-E-3-S). The Company noted that any existing magnetic fields are the natural magnetic fields of the earth (Exh. CW-1, at 5-62). The Company noted that its calculations of marine magnetic fields did not assume optimal phasing and did not account for attenuation of magnetic fields by the wire metal jacket surrounding the cable (Tr. 10, at 1391-1392).[104]

The Company asserted that magnetic fields from the transmission lines would not have an adverse impact on the marine environment (Exh. CW-1, at 5-63). The Company explained that marine organisms are sensitive to direct current, rather than 60-cycle hertz alternating current (id. at 5-64). The Company further asserted that the highly localized nature of the potential magnetic fields means both that exposures are not likely to occur, and that if they do occur, they will be of a short duration as birds or marine-based or land-based wildlife pass by the cables (Exh. MA-69). The Company asserted that the use of three conductor cables, which minimizes the spacing

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[104] The Company estimated that magnetic fields would be reduced by a minimum of 15% to 20%, depending on the exact nature of the steel armor casing (Tr. 10, at 1393-1394).

between phases, serves to reduce magnetic field strength, as does the 6-foot burial depth (id.; Exh. EFSB-E-3).

Dr. Valberg asserted that there are no affirmative studies that have identified problems resulting from magnetic fields created by existing submarine cables, or evidence that alternating current would affect the sensory perception of animals (Tr. 10, at 1389). However, Dr. Valberg noted that he extrapolated from information on general animal systems, as he was not aware of any studies specifically on marine organisms and EMF (id. at 1389, 1416).

Dr. LeGore, witness for the Alliance, stated that several types of fish are highly sensitive to electromagnetic fields, which may affect the movement and behavior of the fish (Exh. APNS-RSL at 17). However, he stated that he was satisfied with information provided for the Company on this matter by Dr. Valberg (Tr. 17, at 2174-2175).

(b) Alternative Route

In order to assess the effect of the proposed facilities on EMF along the alternative route, the Company measured existing ambient magnetic field levels at various points along the route. The Company's measurements show that maximum existing magnetic field levels under peak load along public ways range from 2 mG to 3 mG (Exh. EFSB-E-3, Bulk Att. at 14). The Company calculated that, with the new transmission lines in operation, these levels would rise to 7 mG (assuming a wind farm output of 168 MW) and 17 mG (assuming a wind farm output of 420 MW) (id. at 13).

The Company's measurements show that existing magnetic field levels along the NSTAR ROW west of the Mashpee Substation[105] range from a maximum of 14 mG directly under the lines to 0.5 mG at the north edge of the ROW and 2 mG at the south edge of the ROW (id. at 17).

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105 Line 115 and Line 77 run west from the Mashpee Substation along the NSTAR transmission ROW (Exh. EFSB-E-3, Att. at 16). The proposed transmission line would run east from the Mashpee substation, and thus would not be located in this part of the ROW; however, the interconnection of the proposed transmission project at the Mashpee substation would alter power flows on the lines extending west (as well as east) from the Mashpee Substation, resulting in changes in magnetic field levels.

The measurements along the NSTAR ROW located east of the Mashpee Substation,[106] between the Mashpee Substation and Shootflying Hill Road, range from a maximum of 47 mG directly under the lines to 1 mG at the north edge of the ROW and 7 mG at the south edge of the ROW (id.). The measurements show that existing field levels along the NSTAR ROW between Shootflying Hill Road and the Barnstable Switching Station range from a maximum of 210 mG directly under the lines to 95 mG at the north edge of the ROW and 21 mG at the south edge of the ROW (Exh. EFSB-RR-52).

Table 3, below, presents the Company's predictions of magnetic fields that would be present during facility operation, at peak load.[107] The Company explained that the maximum in-ROW EMF levels would occur immediately below the existing Line 115, and noted that load and output conditions producing these maximum impacts would occur only a small portion of the time that the wind farm was operating (Exh. EFSB-E-10). The Company noted that the changes in line-by-line power flow along the NSTAR ROW with the addition of the wind farm output and the proposed transmission lines causes significant decreases in magnetic field strength at the north edge of the ROW (Exh. EFSB-RR-52).

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106 Line 115 and Line 88 runs east from the Mashpee Substation along the NSTAR transmission ROW (Exh. EFSB-E-3, Att. at 16).

107 The Company also modeled power flows on the Shootflying Hill Road-to-Barnstable segment of the ROW under light load conditions (Exh. EFSB-RR-52). Existing field levels under light load conditions range from a maximum of 83 mG directly under the lines, 36 mG at the north edge of the ROW, and 8 mG at the south edge of the ROW; projected field levels under light load would be 40 mG directly under the lines, 58 mG at the north edge of the ROW, and 9 mG at the south edge of the ROW, assuming a wind farm output of 168 MW, and 173 mG directly under the lines, 31 mG at the north edge of the ROW, and 10 mG at the south edge of the ROW under a wind farm output of 420 MW (id.).

Table 3. Combined Magnetic Fields at Peak Load - Alternative Route

Scenario and Location	210-ft. ROW West from Mashpee Substation	210-ft. ROW East from Mashpee Substation	270-ft. ROW Shootflying Hill Road to Barnstable Substation
AVERAGE OUTPUT			
Under Lines	90 mG	68 mG	138 mG
North-edge ROW	3 mG	4.5 mG	58 mG
South-edge ROW	5 mG	8 mG	19 mG
HIGH OUTPUT			
Under Lines	197 mG	173 mG	181 mG
North-edge ROW	6 mG	12 mG	36 mG
South-edge ROW	11.5 mG	13 mG	24 mG

Source: Exhs. EFSB-E-3, Bulk Att. at 17; EFSB-RR-52

The Company explained that EMF increases on the NSTAR ROW portion of the alternative route are greater than for the NSTAR ROW portion of the primary route because of: (1) the increased load on the new line and Line 115 along the alternative route; and (2) the higher production of magnetic fields from overhead conductors as compared to in-ground conductors (Tr. 10, at 1425-1426). The Company indicated that the proposed transmission lines along the NSTAR ROW portion of the alternative route would have a single pole design with the phased conductors arranged in a delta configuration (Exh. EFSB-E-6). The Company asserted that this conductor arrangement would provide for the lowest possible edge-of-ROW magnetic fields (id.).

The Company acknowledged that, because the NSTAR ROW runs through the back and side yards of existing residences, it is possible that people residing along the ROW could be engaging in activities closer than the edge of the ROW (Tr. 6, at 1397). The Company estimated that half-way in from the northern edge of the ROW the magnetic fields could be between 40 and 50 mG (id. at 1399). The Company asserted that this level of exposure would not result in adverse health effects, given the limited periods of time that people likely would be within the ROW during peak load conditions (Tr. 6, at 1400).

Finally, the Company calculated magnetic field levels at Popponesset Spit to determine

impact to bathers; it determined that magnetic fields would be approximately 2 mG with the wind farm output at 168 MW, and 4 mG with output at 420 MW (Exh. CW-1, at 5-63).

(c) Analysis

In a previous review of proposed transmission line facilities, the Siting Board accepted edge-of-ROW levels of 85 mG for magnetic fields. 1985 MECo/NEPCo Decision, 13 DOMSC 119, at 228-242. The Siting Board has used this edge-of-ROW level in subsequent facility reviews to determine whether anticipated magnetic field levels are unusually high. See CELCo Decision, 12 DOMSB 305, at 348, 349; Norwood Municipal Light Department, 5 DOMSB 109, at 145 (1997); MASSPOWER, Inc., 20 DOMSC 301, at 401-403 (1990). Here, assuming the maximum export of electricity from the wind farm to the Barnstable Switching Station, the maximum magnetic field levels along the primary route would be 32 mG directly above the proposed transmission lines in the street, and 56 mG at the edge of the ROW, representing either no or minimal increase above existing EMF levels. The in-street and edge-of-ROW levels would remain well below levels found acceptable in the 1985 MECo/NEPCo Decision.

More recently, the Siting Board has inquired into the current scientific literature regarding the possible impact of exposure to magnetic fields on human health. CELCo Decision, 12 DOMSB 305, at 345-346; Southern Energy Kendall, LLC, 11 DOMSB 255, at 383-386 (2000) ("SE Kendall Decision"); Sithe Mystic Decision, 9 DOMSB 101, at 196-199. The Siting Board has consistently found that, although some epidemiological studies suggest a correlation between exposure to magnetic fields and childhood leukemia, there is no evidence of a cause-and-effect association between magnetic field exposure and human health. CELCo Decision, 12 DOMSB 305, at 348-349; SE Kendall Decision, 11 DOMSB 255, at 385-386; Sithe Mystic Decision, 9 DOMSB at 198-199. The record in this proceeding is consistent with the record developed in previous proceedings, and leads to the same conclusion. Thus, the record in this case does not support a conclusion that the EMF levels anticipated as a result of the proposed transmission project would pose a public health concern. Finally, with regard to magnetic field effects associated with the marine portion of the transmission lines, studies to date have not identified problems in the vicinity of existing submarine cables, and epidemiological research has

not found that alternating current would affect the sensory perception of animals. Further, the Company has implemented mitigation such as minimizing the spacing between phasing, sufficient burial depth, and a steel armor covering of the cables to minimize the magnetic field levels. Accordingly, the Siting Board finds that the magnetic field impacts of the proposed transmission lines along the primary route would be minimized.

The record demonstrates that, assuming the maximum export of electricity from the wind farm using the alternative route, the maximum magnetic field levels in the street would be 17 mG directly above the proposed transmission lines, a minimal increase from the existing level of 3 mG. Magnetic field levels along the NSTAR ROW would vary considerably. Where the ROW is 210 feet wide, the edge-of-ROW measurements would be well below 85 mG; however magnetic field levels directly under the transmission lines increase from 14 mG to 197 mG, when the wind farm is running at full capacity. While edge-of-ROW levels are significantly lower than within the ROW, the Company acknowledged that some back and side yards extend into the existing NSTAR ROW, where magnetic field levels would be higher.

In summary, while edge-of-ROW measurements for the alternative route are below levels found acceptable in 1985 MECo/NEPCo Decision, operation of the proposed transmission lines along the primary route results in little or no increase in magnetic fields. Accordingly, the Siting Board finds that the primary route would be preferable to the alternative route with respect to magnetic field impacts.

iii. Conclusions on Permanent Impacts

In Sections III.C.2.c.i and ii, above, the Siting Board has found that: (1) the land use and visual impacts of the proposed transmission lines along the primary route would be minimized, and that the primary route would be preferable to the alternative route with respect to land use and visual impacts; and (2) the magnetic field impacts of the proposed transmission lines along the primary route would be minimized, and that the primary route would be preferable to the alternative route with respect to magnetic field impacts. Accordingly, the Siting Board finds that the permanent impacts of the proposed transmission lines along the primary route would be minimized, and that the primary route would be preferable to the alternative route

with respect to permanent construction impacts.

d. Alternative Construction Methods – HDD

In the sections above, the Siting Board has examined the potential impacts of the construction and operation of the proposed transmission lines, assuming currently proposed construction techniques. However, at an earlier point in the proceeding, the Company proposed to achieve landfall at New Hampshire Avenue using horizontal directional drilling, rather than jet plowing. Because a change in construction techniques at this location would markedly alter the construction impacts along the primary route, the Siting Board addresses these tradeoffs here.

i. Land Use Impacts

The Company stated that, if HDD were used to install the submarine cables in the nearshore area, four approximately 800-foot long boreholes would be drilled six to twenty feet below the seabed or ground, beginning at a site upland of the New Hampshire Avenue seawall and traveling seaward to a temporary offshore pit and cofferdam, where jet plow installation of the remaining submarine cable would begin (Exhs. CW-1, at 1-8 to 1-9; EFSB-C-2A; EFSB-W-18; EFSB-RR-39). The Company stated that approximately 840 cubic yards of sediment would be excavated if HDD were used, including 180 cubic yards for the boreholes and 660 cubic yards for the offshore pit (Exhs. EFSB-W-25; EFSB-RR-39). The Company indicated that completion of the HDD would require approximately four to six weeks, and that work would occur for 20 to 24 hours a day (Exh. EFSB-RR-30). The Company initially stated that it selected HDD for use in the area of the New Hampshire Avenue landfall to minimize potential impacts in the intertidal zone and the nearshore area (Exh. EFSB-W-18). The Company stated that use of HDD in the area of the landfall would avoid some temporary and permanent impacts to coastal wetlands, including areas of coastal bank, coastal beach, and seabed (Exhs. EFSB-W-19; EFSB-W-15, sheet 2). The Company subsequently supported its preference for use of jet plowing at the New Hampshire Avenue landfall by stating that: (1) HDD and jet plowing would have similar environmental impacts; (2) HDD is a more complicated process than jet plowing; (3) the coastal bank at the New Hampshire Avenue site is man-made and is not an ecologically

valuable coastal wetland resource; and (4) jet plowing would significantly reduce traffic-related construction impacts, as it would require less construction and less time to complete than an HDD (Tr. 1, at 10-11; Tr. 6, at 754, 764-765, 775-779, 787-789).

ii. Construction Traffic

Cape Wind indicated that use of HDD, rather than jet plowing, at the landfall location would alter the expected traffic impacts along New Hampshire Avenue (Exh. EFSB-RR-14). If HDD were used, a transition vault would be built on New Hampshire Avenue adjacent to the Englewood Beach Recreation area, approximately 300 feet north of the landfall and 200 feet north of Shore Road (Exhs. CW-CO-3; EFSB-RR-27, Bulk Att.; Tr. 6, at 750-751). The Company explained that, to construct the transition vault in this location, it would need to occupy the full width of New Hampshire Avenue for the period of the HDD operation, obstructing frontages of two residences and the Englewood Beach recreation area, and blocking travel from Berry Road to points on New Hampshire Avenue south of the work area, including access to Shore Road (Exhs. EFSB-RR-27, Bulk Att.; EFSB-RR-30; Tr. 6, at 752, 754). The Company noted that, if jet plowing were used, the transition vault could be located south of the intersection with Shore Road, and only the portion of New Hampshire Avenue between the landfall and Shore Road, which is not heavily traveled, would be closed (Exh. EFSB-RR-27; Tr. 6, at 755). Cape Wind noted that it perceived that the jet plow proposal has been favorably received by Town of Yarmouth representatives (Exh. EFSB-RR-28).[108]

iii. Construction Noise

Cape Wind stated that HDD operations at the New Hampshire Avenue landfall would operate 20 to 24 hours a day, seven days a week, for four to six weeks (Exh. EFSB-RR-30; Company Brief at 206). The Company explained that the equipment used to drill the bore holes

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[108] The Host Community agreement does not directly address construction methods to be used by the Company. However, a major focus of the agreement is the scheduling and coordination of project construction to minimize impacts on the local community, including traffic impacts (Exhs. CO-2; EFSB-RR-28; Tr. 1, at 10).