COMMONWEALTH OF MASSACHUSETTS
ENERGY FACILITIES SITING BOARD

Petition of Vineyard Wind LLC pursuant to G.L. c. 164, § 69J for Approval to Construct Transmission Facilities in Massachusetts for the Delivery of Energy from an Offshore Wind Energy Facility Located in Federal Waters to an NSTAR Electric Company d/b/a Eversource Energy Switching Station Located in the Town of Barnstable, Massachusetts.	EFSB 17-05
Petition of Vineyard Wind LLC pursuant to G.L. c. 40, § 3 for Exemptions from the Operation of the Zoning Ordinance of the Town of Barnstable and the Zoning Bylaw of the Town of Yarmouth for the Construction and Operation of Transmission Facilities in Massachusetts for the Delivery of Energy from an Offshore Wind Energy Facility Located in Federal Waters to an NSTAR Electric Company d/b/a Eversource Energy Switching Station Located in the Town of Barnstable, Massachusetts.	D.P.U. 18-18
Petition of Vineyard Wind LLC pursuant to G.L. c. 164, § 72 for Approval to Construct and Use Transmission Facilities in Massachusetts For the Delivery of Energy from an Offshore Wind Energy Facility Located in Federal Waters to an NSTAR Electric Company d/b/a Eversource Energy Switching Station Located in the Town of Barnstable, Massachusetts.	D.P.U. 18-19

FINAL DECISION

M. Kathryn Sedor
Presiding Officer
May 10, 2019

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ABBREVIATIONS

AC	alternating current
Act	Act to Promote Energy Diversity, St. 2016, c. 188
AIS	air-insulated switchgear
Alliance	Alliance to Protect Nantucket Sound
Barnstable	Town of Barnstable
Berkshire Power	Berkshire Power Development, Inc., D.P.U. 96-104 (1997)
BOEM	federal Bureau of Ocean Energy Management
Cape Wind 2005 Decision	Cape Wind Associates, LLC and Commonwealth Electric Company d/b/a NSTAR Electric, EFSB 02-2 (2005)
Chapter 91	G.L. c. 91
Company	Vineyard Wind LLC
CECP	Massachusetts Clean Energy and Climate Plan
COP	construction and operations plan
CZM	Massachusetts Office of Coastal Zone Management
dBA	A-weighted decibels
DC	direct current
DEIR	Draft Environmental Impact Report
DEIS	Draft Environmental Impact Statement
Department	Massachusetts Department of Public Utilities
DMF	Massachusetts Division of Marine Fisheries
DOER	Massachusetts Department of Energy Resources

DOMSC	Decisions and Orders of the Massachusetts Energy Facilities Siting Council
East Eagle	NSTAR Electric Company d/b/a Eversource Energy, EFSB 14-04/D.P.U. 14-153/14-154 (2017)
EDCs	Massachusetts electric distribution companies
EFSB	Energy Facilities Siting Board
EJ	environmental justice
ENF	Environmental Notification Form
Eversource Hopkinton	NSTAR Electric Company d/b/a Eversource Energy, D.P.U. 15-02 (2015)
FCP	fisheries communication plan
FEIR	Final Environmental Impact Report
GHG	greenhouse gas
GIS	gas-insulated switchgear
G.L. c.	Massachusetts General Laws chapter
GWSA	Global Warming Solutions Act
Hampden County	New England Power Company d/b/a National Grid, EFSB 10-1/D.P.U. 10-107/10-108 (2012)
HCA	host community agreement
HDD	horizontal direction drill
HDPE	high-density polyethylene
IRP	New England Power Company d/b/a National Grid, EFSB 12-1/D.P.U. 12-46/12-47 (2014)
ISO-NE	ISO-New England
Km	kilometers
km^2	square kilometers

kV	Kilovolts
Lower SEMA	NSTAR Electric Company, EFSB 10-2/D.P.U. 10-131/10-132 (2012)
LSCSF	land subject to coastal storm flowage
MassDEP	Massachusetts Department of Environmental Protection
MassDOT	Massachusetts Department of Transportation
MEPA	Massachusetts Environmental Policy Act
mG	milligauss
mg/L	milligrams per liter
Mm	Millimeters
MVRP	New England Power Company d/b/a National Grid, D.P.U. 15-44/15-45 (2016)
MW	megawatts
NHESP	Natural Heritage and Endangered Species Program
Notice	Notice of Public Comment Hearing/Notice of Adjudication
NRG Canal	NRG Canal 3 Development LLC, EFSB 15-06/D.P.U. 15-180 (2017)
NSTAR Hopkinton	NSTAR Electric Company d/b/a Eversource Energy, D.P.U. 15-02 (2015)
Offshore Cables	two 220 kV offshore transmission cables in state waters, a part of the Project
OMP	Massachusetts Ocean Management Plan
Onshore Cables	two 220 kV and two 115 kV underground transmission cables in Barnstable, a part of the Project
OSHA	U.S. Occupational Safety and Health Administration

Petition to Construct	Petition to construct the Project pursuant to G.L. c. 164, § 69J
Petitions	Petition to Construct, Section 72 Petition, and Zoning Petition, collectively
PPAs	Power Purchase Agreements
Project	The proposed Offshore Cables, Onshore Cables, and Substation, located within Massachusetts and Massachusetts state waters
RFA	Riverfront Area
ROD	BOEM Record of Decision
ROW	right-of-way
Russell Biomass/WMECo	Russell Biomass, LLC, EFSB 07-4/D.P.U. 07-35/07-36 (2009)
Salem Cables	New England Power Company d/b/a National Grid, EFSB 13-2/D.P.U. 13-151/13-152 (2014)
Save the Bay	Save the Bay v. Department of Public Utilities, 366 Mass. 667 (1975)
SDEIR	Supplemental Draft Environmental Impact Report
Secretary	Massachusetts Secretary of Executive Office of Energy and Environmental Affairs
Section 72 Petition	Vineyard Wind petition pursuant to G.L. c. 164, § 72
Section 83C	Section 83C of the Act
Sedimentation Study	Company's hydrodynamic and sediment dispersion modeling study
SF_6	sulfur hexafluoride
Siting Board	Massachusetts Energy Facilities Siting Board
Siting Board Petition	Vineyard Wind petition to construct the Project pursuant to G.L. c. 164 § 69J

SMAST	UMass-Dartmouth School for Marine Sciences and Technology
SPCC plan	spill prevention, control, and countermeasures plan
SSU	special, sensitive, and unique (resources)
Stoughton-Boston	Boston Edison Company d/b/a NSTAR Electric, EFSB 04-1/ D.P.U. 04-5/04-6 (2005)
Substation	proposed onshore 220 kV/115 kV substation, one part of the Project
TMP	Traffic Management Plan
TOY	time-of-year
TSHD	trailing suction hopper dredge
TSS	total suspended solids
TTCP	temporary traffic control plans
Town of Truro	Town of Truro v. Department of Public Utilities, 365 Mass. 407 (1974)
ULSD	ultra-low sulfur diesel
USCG	U.S. Coast Guard
Vineyard Wind	Vineyard Wind LLC
Vineyard Wind Connector	Project
Vineyard Wind Energy Facility	the Project, together with the offshore cables in federal waters and the 800 MW offshore wind development
WHO	World Health Organization
Woburn-Wakefield	NSTAR Electric Company d/b/a Eversource Energy, EFSB 15-04/D.P.U. 15-140/15-141 (2018)
XLPE	cross-linked polyethylene
Yarmouth	Town of Yarmouth

Zoning Petition	Vineyard Wind petition for zoning exemptions pursuant to G.L. c. 40A § 3
2017 Marine Survey	geophysical survey by Vineyard Wind in 2017
2018 Marine Survey	Additional geophysical survey by Vineyard Wind in 2018

Pursuant to G.L. c. 164, § 69J, the Massachusetts Energy Facilities Siting Board ("Siting Board") hereby approves, subject to the conditions set forth below, the Petition of Vineyard Wind LLC ("Vineyard Wind" or the "Company") to construct two new 220 kilovolt ("kV") combined offshore and onshore underground electric transmission lines, a new 220/115 kV substation in the Town of Barnstable, and a new 115 kV underground transmission connection between the Company's proposed onshore substation and NSTAR Electric Company d/b/a Eversource Energy's existing Barnstable Switching Station (together, the "Vineyard Wind Connector" or "Project"). Pursuant to G.L. c. 164, § 72, the Siting Board hereby approves, subject to the conditions set forth below, the Petition of Vineyard Wind for a determination that the proposed onshore transmission lines are necessary, serve the public interest, and are consistent with the public interest. Pursuant to G.L. c. 40A, § 3, the Siting Board hereby both grants and denies, subject to the conditions set forth below, the Petition of Vineyard Wind for certain zoning exemptions. The individual exemptions requested for the proposed substation are granted; the individual exemptions requested for the proposed onshore transmission lines are denied. A comprehensive zoning exemption is granted for the Project.

I. INTRODUCTION

A. Description of the Proposed Project

In July 2016, the Massachusetts General Court passed the Act to Promote Energy Diversity, St. 2016, c. 188 (the "Act"), which was signed into law by Governor Charles D. Baker on August 8, 2016 (Exh. VW-1, at 4). The Act was intended to ensure a diversified electrical energy portfolio for the Commonwealth, strengthen the Massachusetts clean energy economy, and better ensure the achievement of greenhouse gas ("GHG") reduction requirements under the Commonwealth's 2008 Global Warming Solutions Act, St. 2008, c. 298 ("GWSA") (id.).

Section 83C of the Act ("Section 83C") requires electric distribution companies in Massachusetts to solicit proposals for 1,600 megawatts ("MW") of offshore wind generation (Exh. VW-2, at 4-5). The first solicitation was issued on June 29, 2017, and Vineyard Wind was selected by the evaluation team as the sole winning bidder for an 800 MW offshore wind

development (the "Vineyard Wind Energy Facility") (id. at 4; Exh. EFSB-G-1).[1] Executed Power Purchase Agreements ("PPAs") for the output of the Vineyard Wind Energy Facility were submitted to the Department of Public Utilities ("Department") for its review and approval on July 31, 2018 (Exh. EFSB-G-1(S)). Vineyard Wind stated that it expects electricity from the offshore windfarm will begin flowing to Massachusetts in the spring or early summer of 2021 (Tr. 1, at 53).

Many of the Vineyard Wind Energy Facility's components are proposed to be located in federal waters, and as such fall outside the Siting Board's jurisdiction. See G.L. c. 164, §§ 69G, 69J. These elements include the offshore windfarm itself, inter-array cables, offshore electrical service platforms, and portions of the offshore transmission cables (Exh. EV-2, at 1-7 to 1-9). The major elements of the Vineyard Wind Energy Facility, over which the Siting Board has jurisdiction, referred to herein as the Project, include the portions of the two 220 kV offshore underwater transmission cables proposed for installation in state waters (the "Offshore Cables"), the entirety of the two 220 kV and two 115 kV onshore underground transmission cables proposed in Barnstable, Massachusetts (the "Onshore Cables"), and a proposed onshore 220 kV/115 kV electrical substation in Barnstable (the "Substation") (Exhs. VW-2, at 1-1, 1-11 to 1-13; EFSB-G-1; EFSB-N-2).[2,3,4] Figure 1, below, provides a map of the Company's proposed Project and the alternative transmission line routes under consideration.

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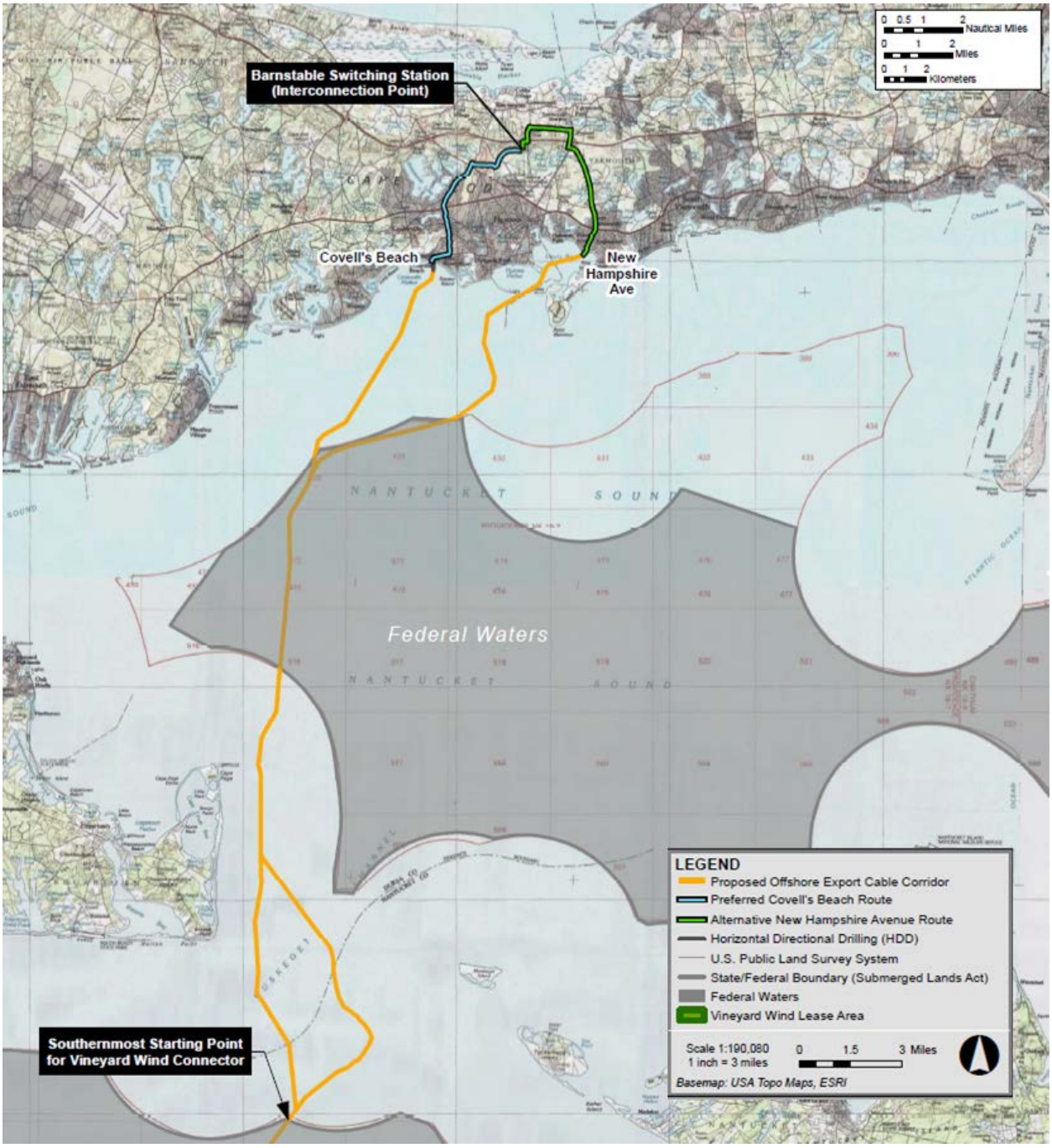
1 The evaluation team was comprised of the Massachusetts electric distribution companies ("EDCs") and the Massachusetts Department of Energy Resources ("DOER"), and was monitored by an independent evaluator (RR-EFSB-1(1) at 2).

2 The 115 kV onshore underground transmission cables, 0.1 miles long, connect the Substation to the existing Barnstable Switching Station (Exh. VW-2, at 1-12).

3 While the Company's preferred route for the Onshore Cables is located entirely in Barnstable, portions of the Company's alternative would cross through Yarmouth as well as Barnstable (Exh. VW-6, at 2-12). See Section VI.B.2, below.

4 The Company proposes to use two three-core (i.e., three conductor), cross-linked polyethylene ("XLPE") insulated, high-voltage alternating-current ("AC") offshore transmission cable systems for its Offshore Cables (Exhs. VW-2, at 1-9; EFSB-G-1). Each of the two three-core Offshore Cables would transition to three separate single-core 220 kV Onshore Cables consisting of a copper or aluminum, XLPE-insulated, conductor

Figure 1. Map of the Proposed Vineyard Wind Connector



Source: Adapted from Exh. VW-14, fig. 1-1.

(Exh. VW-2, at 1-11). The XLPE cable system would not contain any fluids (id. at 1-9, 1-11).

B. Procedural History

Pursuant to G.L. c. 164, § 69J, Vineyard Wind on December 18, 2017 filed with the Siting Board a petition to construct the proposed Project ("Petition to Construct"), docketed as EFSB 17-05. On February 15, 2018, pursuant to G.L. c. 164, § 72, the Company filed a petition with the Department seeking approval of the Onshore Cables ("Section 72 Petition"), docketed as D.P.U. 18-19, and a petition pursuant to G.L. c. 40A, § 3 seeking certain individual zoning exemptions and a comprehensive zoning exemption from the Town of Barnstable Zoning Ordinance and the Town of Yarmouth Zoning Bylaw ("Zoning Petition"), docketed as D.P.U. 18-18 (all three together, the "Petitions"). Also on February 15, 2018, the Company filed a motion to consolidate the Petitions for review and decision by the Siting Board. Pursuant to G.L. c. 164, § 69H(2), on April 4, 2018, the Chairman of the Department issued a Referral and Consolidation Order referring the Section 72 Petition and the Zoning Petition to the Siting Board for review and decision together with the Petition to Construct. The Siting Board accordingly conducted a single adjudicatory proceeding and developed a single evidentiary record with respect to the Petitions, docketed as EFSB 17-05/D.P.U. 18-18/18-19.

1. Public Notice and Public Comment Hearing

The Siting Board conducted a public comment hearing at the Barnstable High School on April 24, 2018 to receive comments from the public on the proposed Project. The Siting Board directed the Company to comply with a number of notice requirements in advance of the public comment hearing. The Siting Board directed the Company to publish the Notice of Public Comment Hearing/Notice of Adjudication ("Notice") for the public comment hearing for a minimum of two consecutive weeks in the Yarmouth Register, the Barnstable Patriot, and the Cape Cod Times. The Company was also required to translate the Notice into Portuguese and serve a copy of the Notice in both Portuguese and English on abutters to the Covell's Beach Route and the New Hampshire Avenue Route, and on abutters to the abutters within 300 feet of the ROWs.[5] The Company was required to mail a copy of the Notice to the Planning Boards of

[5] Siting Board review of the Project was not subject to either the enhanced public participation or enhanced analysis provisions of the Commonwealth's Environmental

the Towns of Barnstable, Yarmouth, Edgartown, Mashpee, and Nantucket. The Company posted the Notice, in both languages, in the libraries and Town Clerk's offices, and placed copies of the Petitions in the libraries of the Towns listed above. The Company also served a copy of the Notice on the Planning Boards of the abutting Towns of Sandwich, Falmouth, Dennis, Oak Bluffs, Tisbury, and West Tisbury. At the public comment hearing, the Company documented its compliance with the Siting Board's notice requirements. See Vineyard Wind Return of Service, Affidavit of Zachary Gerson, Esq. (April 24, 2018).[6]

2. Intervention and Participation

The intervention deadline in the proceeding was May 8, 2018. The Siting Board received five timely petitions to intervene and seven timely petitions for limited participant status.[7] On May 23, 2018, the Presiding Officer issued a ruling granting all five intervention petitions to: the

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Justice ("EJ") Policy. See also Section VII.B., below. However, in accordance with the Commonwealth's Language Access Policy, the Siting Board conducted an analysis of linguistic data for the affected Project locations. Based on the results of the analysis, the Hearing Officer required the Notice to be translated and served in both English and Portuguese.

6 Comments offered at the public comment hearing pertained primarily to two subjects: the environmental benefits of renewable energy projects, such as the proposed Vineyard Wind Energy Facility, and the choice of the landing and on-shore route for the Onshore Cables. Many commenters voiced opposition to the New Hampshire Avenue Route, which travels through Lewis Bay in Yarmouth, asserting that Lewis Bay is environmentally impaired and needs restoration, and that the Project would have adverse impacts on the waterbody itself, as well as on recreational and commercial activities in Lewis Bay, such as fishing, boating, and the cultivation of oysters. Commenters generally voiced support for the Project, if constructed using the Covell's Beach Route in Barnstable. The Siting Board also received approximately 244 sets of written comments regarding the proposed Project during the course of the proceeding. These comments were similar in nature to the comments received during the public comment hearing.

7 The Town of Yarmouth originally petitioned for limited participant status. Yarmouth subsequently filed a petition to intervene, which was granted. See Hearing Officer Ruling on Petitions to Intervene and Motions to Participate as a Limited Participant (May 23, 2018); Hearing Officer Supplemental Ruling on Motions to Intervene and to Participate as a Limited Participant (June 6, 2018).

Town of Barnstable ("Barnstable"); the Town of Yarmouth ("Yarmouth"); the Alliance to Protect Nantucket Sound ("Alliance"); NSTAR Electric Company ("NSTAR"); and Spencer Bode. The ruling also granted limited participant status to Bay State Wind, LLC; Robert Berry and Kathleen Benson; David Bernstein, personally and on behalf of the Englewood Beach Association; Susan Brita; Christine Greeley; John C. Henderson; and Ronna Johnson. On September 6, 2018, Michael H. Dunbar, Dunbar Aquafarm and Edmund J. Janiunas, Sweetheart Creek Oyster Company jointly filed a late-filed petition to intervene. On May 26, 2018, the Presiding Officer issued a ruling denying the petition to intervene, but granting the petitioners limited participant status.[8,9]

3. Pre-Hearing Discovery and Witness Testimony

In advance of hearings, the Company filed the written direct testimony of ten witnesses, and presented each of the witnesses for cross-examination during hearings. The Company's witnesses included: Jack Arruda, Technical Development Manager, Vineyard Wind; Eric Stephens, Chief Development Officer, Vineyard Wind; Theodore A. Barten, P.E., Principal, Epsilon Associates, Inc.; Holly Carlson Johnson, Senior Consultant, Epsilon Associates, Inc.; Robert D. O'Neal, Managing Principal, Epsilon Associates, Inc.; A.J. Jablonowski, Principal, Epsilon Associates, Inc.; Maria B. Hartnett, Associate, Epsilon Associates, Inc.; Mark S. Bartlett, Senior Associate, Stantec Consulting Services, Inc; Peter A. Valberg, Ph.D., Principal, Gradient; and Christopher Long, Sc.D., Principal Scientist, Gradient.

Barnstable filed the written direct testimony of three witnesses. As discussed below, Barnstable subsequently withdrew its prefiled direct testimony. No other parties filed testimony or presented witnesses in the proceeding.

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8 Thus, there are a total of eight limited participants in the proceeding.

9 Intervenors Barnstable and Yarmouth participated in discovery and in evidentiary hearings; Yarmouth also filed an initial and reply brief at the end of the proceeding. Limited participants Berry/Benson, Bernstein, Brita, Greeley, Henderson, Johnson, and Dunbar/Janiunas each submitted multiple sets of written comments during the proceeding.

On May 23, 2018, the Siting Board issued its first set of Information Requests to Vineyard Wind. The Siting Board issued a second set to the Company on July 9, 2018, and a third set on August 21, 2018.[10]

The Alliance issued Information Requests to Vineyard Wind on July 5, 2018; on July 9, 2018, Barnstable and Yarmouth each issued Information Requests to Vineyard Wind. On August 17, 2018, Barnstable issued Information Requests to NSTAR; on September 6, 2018, the Siting Board issued Information Requests to NSTAR.[11]

On September 21, 2018, Vineyard Wind filed the rebuttal testimony of five of the Company's original witnesses. On September 21, 2018, Vineyard Wind issued Information Requests to Barnstable.

On October 3, 2018, one day before evidentiary hearings were to begin, Barnstable notified the Siting Board that it had executed a Host Community Agreement ("HCA") with Vineyard Wind. On that same day, Barnstable withdrew its prefiled direct testimony, and Vineyard Wind withdrew both its Information Requests to Barnstable and its written rebuttal testimony. On October 4, 2018, the first day of the evidentiary hearing, Vineyard Wind notified the Siting Board and the parties that the Company had switched its onshore routing preference for the Onshore Cables. The Company stated that its preferred route was now the Covell's Beach Route, and that the original preferred route, the New Hampshire Avenue Route, was now the Company's alternative route (Exh. EFSB-G-1(S2) at 11-13; Tr. 1, at 14-15; Company Brief at 106). The Covell's Beach Route now makes use of Variant 1 (Attucks Lane and Independence Drive) rather than the originally proposed utility ROW for the final 1.6 miles of this route (Exh. EFSB-G-1(S2) at 9).

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[10] On September 20, 2018, the Siting Board requested additional Project-cost information from Vineyard Wind (Exh. VW-3, Attachment G (Supp.2) Confidential). On July 9, 2018 and August 28, 2018, the Siting Board requested additional information from the Company regarding the potential use of a gas-insulated substation design rather than an air-insulated design (Exhs. EFSB-G-24; EFSB-G-26; EFSB-NO-18; EFSB NO-19; EFSB-NO-21; EFSB-NO-22; EFSB-NO-23; EFSB-V-7; EFSB-V-8).

[11] On August 23, 2018, NSTAR submitted a comment letter regarding the Company's use of the NSTAR ROW.

4. Evidentiary Hearings and Briefing

The Siting Board conducted nine days of evidentiary hearings, beginning on October 4, 2018, and concluding on October 26, 2018. In total, 669 exhibits were entered into evidence, including the Company's Petitions, the Company's written testimony, the Company's responses to Information Requests and Record Requests issued by the Siting Board and by Yarmouth, and NSTAR's responses to Information Requests issued by the Siting Board.

Vineyard Wind and Yarmouth each filed an Initial Brief on November 28, 2018. On December 12, 2018, Vineyard Wind and Yarmouth each filed a Reply Brief.[12]

5. MEPA and BOEM Environmental Review

Because the Vineyard Wind Energy Facility consists of components located within federal waters, as well as components located in Massachusetts and Massachusetts state waters, the Project has required environmental review by both the federal U.S. Department of Interior Bureau of Ocean Energy Management ("BOEM") (under the National Environmental Policy Act) and by the Massachusetts Environmental Policy Act ("MEPA") Office.[13] The two environmental reviews have proceeded concurrently with the Siting Board's review in this proceeding. MEPA review concluded with the issuance of the Secretary of Energy and Environmental Affairs' ("Secretary") Certificate on the Final Environmental Impact Report ("FEIR") for the Project on February 1, 2019. Vineyard Wind submitted its Construction and Operations Plan ("COP") to BOEM in December 2017; BOEM issued a Draft Environmental Impact Statement ("DEIS") in December 2018 (Exhs. VW-13; EFSB-G-17).[14] As of the date of

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[12] The following limited participant who filed letters in lieu of briefs: Michael Dunbar and Edmund Janiunas (November 26, 2018); Susan Britta (November 26, 2018); NSTAR (November 28, 2018); Christine Greeley, John Henderson, David Bernstein, and Ronna Johnson (November 28, 2018); and Robert Berry and Kathleen Benson (December 11, 2018).

[13] Vineyard Wind was awarded its lease area from BOEM as a result of a January 2015 competitive auction (Exh. VW-2, at 1-4, 2-1).

[14] The DEIS was prepared following the requirements of the National Environmental Policy Act (42 USC §§ 4321-4370f) and implementing regulations, and Executive Order 13807

this Decision, BOEM review is continuing, with issuance by BOEM of its Record of Decision ("ROD") expected by summer 2019 (Exh. EFSB-G-17(S)).

On February 15, 2018, Vineyard Wind filed with the Siting Board a copy of the Environmental Notification Form ("ENF") that the Company filed with MEPA for the Project (Exh. VW-4, exh. C). On May 1, 2018, Vineyard Wind filed with the Siting Board a copy of the Draft Environmental Impact Report ("DEIR") the Company submitted to MEPA (Exh. VW-6). On June 27, 2018, the Company filed with the Siting Board both the comment letters on the DEIR received by MEPA (Exh. VW-8) and the Certificate on the DEIR issued by the Secretary (Exh. VW-7). The Certificate required the preparation of a Supplemental DEIR ("SDEIR") (Exh. VW-7, at 1). The Company filed a copy of its SDEIR with the Siting Board on August 31, 2018 (Exh. VW-9). The Company filed a copy of the Secretary's Certificate on the SDEIR on October 15, 2018 (Exh. VW-10). The Company filed a copy of its FEIR with the Siting Board on December 17, 2019 and subsequently received its FEIR Certificate, as noted above.

6. EFSB Decision

After the conclusion of evidentiary hearings and the filing of briefs, Siting Board staff reviewed the record and drafted a Tentative Decision based on the record. On April 26, 2019, staff served a copy of the Tentative Decision on the Siting Board and all parties and the limited participants for review and comment. The parties and limited participants were given until May 6, 2019 to file written comments. The Siting Board received timely written comments from Vineyard Wind, the Town of Yarmouth, Christine Greeley, and Robert Berry and Kathleen Benson. The Siting Board conducted a public meeting to consider the Tentative Decision on May 9, 2019. After deliberation, the Board directed staff to prepare a Final Decision approving the Petitions, subject to conditions, as set forth below.

Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure (Exh. VW-13, at 5). The DEIS assessed the potential environmental, social, economic, historic, and cultural impacts that could result from the construction, operation, maintenance, and future decommissioning of the Vineyard Wind Energy Facility, and informs BOEM's review of the Company's COP (id. at 7).

II. JURISDICTION AND STANDARD OF REVIEW UNDER G.L. C. 164, § 69J

G.L. c. 164, § 69J provides that the Siting Board should approve a petition to construct if the Siting Board determines that the petition meets certain requirements, including that the plans for the construction of the applicant's facilities are consistent with the policies stated in G.L. c. 164, § 69H to provide a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost. Pursuant to G.L. c. 164, § 69J, a project applicant must obtain Siting Board approval for the construction of proposed energy facilities before any construction permits may be issued by another state agency.

G.L. c. 164, § 69G defines a "facility" to include "a new electric transmission line having a design rating of 115 kilovolts or more which is ten miles or more in length on an existing transmission corridor, except [for] reconductoring or rebuilding of transmission lines at the same voltage" or "a new electric transmission line having a design rating of 69 kilovolts or more and which is one mile or more in length on a new transmission corridor." A Section 69G transmission facility also includes "an ancillary structure which is an integral part of the operation of any transmission line which is a facility." The Company's proposed high-voltage onshore and offshore transmission cables would be greater than 69KV, greater than a mile in length, and would run along new transmission corridors. Therefore, the Onshore Cables and Offshore Cables constitute a "facility" that is subject to Siting Board review with respect to Section 69J. Furthermore, the Company's proposed onshore Substation is an ancillary structure which is an integral part of the operation of the transmission line facilities proposed and, therefore, is subject to Siting Board review with respect to Section 69J.

The Siting Board requires that an applicant demonstrate that its proposal meets the following requirements: (1) that additional energy resources are needed (see Section III, below); (2) that, on balance, the proposed project is superior to alternative approaches in terms of reliability, cost, and environmental impact, and in its ability to address the identified need (see Section IV, below); (3) that the applicant has considered a reasonable range of practical facility siting alternatives and that the proposed facilities are sited in locations that minimize costs and environmental impacts (see Section V below); (4) that environmental impacts of the project are minimized and the project achieves an appropriate balance among conflicting

environmental concerns as well as among environmental impacts, cost, and reliability (see Section VI, below); and (5) that plans for construction of the proposed facilities are consistent with the current health, environmental protection and resource use and development policies of the Commonwealth (see Section VII, below).

III. NEED FOR THE PROPOSED PROJECT

A. Standard of Review

In accordance with G.L. c. 164, § 69H, the Siting Board is charged with the responsibility for implementing energy policies to provide a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost. In carrying out this statutory mandate with respect to proposals to construct electrical transmission facilities in the Commonwealth, the Siting Board is required to evaluate whether there is a need for additional transmission resources.

The Siting Board in 2005 established the standard of review governing the proposed construction of in-state transmission facilities that would interconnect to the regional electric grid a new or expanded generating facility. See Cape Wind Associates, LLC, and Commonwealth Electric Company d/b/a NSTAR Electric, EFSB 02-2, at 16-17 (2005) (Cape Wind 2005 Decision").[15] The Siting Board requires an applicant seeking to construct such a transmission facility to show: (1) that the existing transmission system is inadequate to interconnect the new or expanded generator; and (2) that the new or expanded generator is likely to be available to contribute to the regional energy supply. Id. To show that the new or expanded generator is

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[15] The Siting Board expressly stated that "in order to avoid any confusion about the standard to be applied in future cases, the Siting Board takes this opportunity to articulate a single standard of review for need to be applied in all cases where a transmission line is proposed to interconnect new or expanded generation. This new standard must be broad enough to encompass both transmission lines serving generators subject to the Siting Board's jurisdiction, and transmission lines serving generators that are too small to be subject to our jurisdiction, generators that are located in another state, or generators that are located *in federal territory"*(emphasis added). Cape Wind 2005 Decision at 16.

"likely to be available" the Siting Board has developed standards that vary according to the status of the generator:

> If the new or expanded generator exists, or is under construction, the availability showing will be deemed to have been made. If the generator is planned, and is subject to the Siting Board's jurisdiction, that showing may be made by obtaining the Siting Board's approval of the generating facility. If the generator is planned, and not subject to the Siting Board's jurisdiction, the showing may be made on a case-by-case basis based on indicators of project progress (e.g., progress in permitting or in obtaining project financing).
>
> Cape Wind 2005 Decision at 16-17.

B. Description of the Company's Demonstration of Need

The Siting Board's standard of review for assessing the need for transmission resources to interconnect new or expanded generating facilities is a two-pronged test assessing first whether the existing transmission system is inadequate to interconnect the new or expanded generator, and second whether the generator is likely to be available to contribute to the regional energy supply. Vineyard Wind asserts that it satisfies both prongs of the Cape Wind standard (Company Brief at 59).

According to the Company, the existing transmission system is inadequate to interconnect Vineyard Wind's proposed offshore windfarm (Exh. VW-2, at 2-3). Vineyard Wind stated that, at its nearest point, the Company's offshore lease area is approximately 34 miles from the Cape Cod mainland, and approximately 14 miles offshore from Martha's Vineyard and Nantucket (id. at 1-5). Vineyard Wind submitted that, because no existing transmission cables serve this offshore area, new transmission (i.e., the Vineyard Wind Connector) is needed to connect the offshore windfarm to the New England electric grid (id. at 2-3; Exh. VW-3, fig. 1-10).

With respect to the likelihood that its proposed offshore windfarm will reach commercial operation, Vineyard Wind pointed to: (1) support at the federal and state level for the development of offshore wind generation on the outer continental shelf; (2) Massachusetts' commitment in the Act to enter into contracts for the output of offshore wind facilities; (3) the prime location of Vineyard Wind's lease area; and (4) progress achieved in the expedited federal

permitting process (Exh. VW-2, at 2-1 to 2-4; Company Brief at 60-66). Vineyard Wind contends that all these factors support a conclusion that the Vineyard Wind generating facility is likely to be developed and become available to contribute to the regional energy supply (Exh. VW-2, at 2-1 to 2-4; Company Brief at 60-67).[16]

In support of its view, the Company provided information on a number of Project milestones that have been achieved to date, including, among others, selection of the Company's 800 MW offshore wind proposal as the winning bidder in the first Section 83C solicitation; the successful negotiation between the EDCs and the Company of long-term contracts, which at the time of the evidentiary hearings in this proceeding, were under review before the Department; and approval by ISO-New England ("ISO-NE") of the Wind Energy Facility's participation in the February 2019 forward capacity auction (Exh. EFSB-N-3; Tr. 1, at 31).[17]

Vineyard Wind stated that Department approval of the PPAs between the Massachusetts EDCs and the Company would provide a sufficient demonstration that the offshore wind generator is likely to become available to contribute to the regional energy supply (Exh. EFSB-N-3; Tr. 1, at 28-29; RR-EFSB-4; Company Brief at 62, 67-68). Vineyard Wind noted that in order to approve the proposed contracts, the Department is required to make a finding that there has been an adequate demonstration that the generating facility "is viable in a commercially reasonable timeframe" (RR-EFSB-4). Vineyard Wind further stated that Department approval of the PPAs would provide revenue certainty to the Vineyard Wind Energy Facility and commit the Company to bringing the offshore windfarm into commercial operation

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16 The Company stated that the Vineyard Wind Energy Facility is being developed in response to the Commonwealth's efforts to facilitate the development of large-scale offshore wind on the outer continental shelf (Exh. VW-2, at 2-1). According to the Company, beginning in 2009, BOEM spearheaded a focused effort to identify, study, characterize and refine suitable offshore wind energy lease areas in federal waters along the Atlantic seaboard (id.). Vineyard Wind stated that its lease area was determined through a process that involved significant public input – including a joint Massachusetts-BOEM task force – over an approximately six-year period (id.).

17 In an August 1, 2018 letter to the Department, DOER stated that the 800 MW Vineyard Wind Energy Facility and the corresponding contracts with the EDCs would provide a cost-effective source of reliable offshore wind energy for Massachusetts customers, meet the requirements of Section 83C, and would be in the public interest (RR-EFSB-1(1)).

– at which point construction of the Vineyard Wind Energy Facility would be highly likely (RR-EFSB-4; see also, e.g., RR-EFSB-2(1)).[18] On April 12, 2019, the Department issued an Order approving the PPAs between Vineyard Wind and the EDCs. See Long-Term Contracts for Offshore Wind Energy Generation Pursuant to Section 83C, D.P.U. 18-76 through D.P.U. 18-78 (2019) ("Section 83C Order").

While Vineyard Wind argues that Department-approved contracts are a sufficient demonstration of need, the Company submits that obtaining approval from BOEM, in the form of a ROD, would provide the Siting Board with added assurance that its proposed offshore windfarm will be available to contribute to the regional energy supply (RR-EFSB-4; Company Brief at 67-68). According to the Company, BOEM approval is the most significant federal permit required for the Vineyard Wind Energy Facility, and the anticipated timing of the ROD (summer 2019) aligns with financing commitments necessary to construct the windfarm (Exhs. EFSB-G-17(S); EFSB-G-23(S); Tr. 9, at 1478; RR-EFSB-4). Furthermore, the Company indicates that Project construction is expected to begin in late 2019, several months after the anticipated issuance of the ROD (Exh. VW-14, at 1-26; RR-EFSB-3; RR-EFSB-5). The Company argues that a more expansive metric, such as "the attainment of all necessary federal permits and approvals," as required by the Siting Board in Cape Wind, could introduce significant and unnecessary uncertainty into the windfarm's development and should not be made a condition of any Siting Board approval of the Project (Tr. 1, at 77-78; RR-EFSB-4; Company Brief at 67-68). According to the Company, some federal permits and approvals, such as those relating to underwater noise protections, must be (or can only be) obtained shortly before certain construction activities commence, and as such conditioning a final determination

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[18] According to the Company, the proposed contracts commit creditworthy counterparties (the EDCs) to known prices for the output from the Vineyard Wind Energy Facility (RR-EFSB-2). Department approval would back this commitment with the ability of the EDCs to recover costs from their customers (id.). Accordingly, Department-approved contracts would afford a great deal of certainty to the Company that it could recoup the significant investments associated with the development of the Vineyard Wind Energy Facility (id.).

of need on obtaining such permits could significantly impair the necessary sequencing of Project construction (Tr. 1, at 41-56, 78-79; RR-EFSB-4; Company Brief at 67-68).

C. Analysis and Findings on Need

The record shows that, at its closest point, Vineyard Wind's proposed windfarm is approximately 34 miles offshore from the Cape Cod mainland, and approximately 14 miles from both Martha's Vineyard and Nantucket. There is no existing electric infrastructure serving this area. Accordingly, the Siting Board finds that the existing transmission system is inadequate to interconnect the Company's proposed offshore windfarm.

Vineyard Wind has provided evidence of a number of critical milestones relating to the development of its offshore windfarm. The Siting Board views the selection of Vineyard Wind as the winning bidder in the Section 83C solicitation; the successful negotiation of long-term contracts between the EDCs and the Company; the Department's April 12, 2019 approval of the long term contracts; and ISO-NE's approval of the generating facility's participation in the February 2019 forward capacity auction as strong indicators that the Company's proposed 800 MW windfarm will reach commercial operation.

Significantly, in its review of the proposed PPAs between Vineyard Wind and the Massachusetts EDCs, the Department found that, consistent with Section 83C, that the EDCs "have adequately demonstrated Project viability in a commercially reasonable timeframe." Section 83C Order at 36.

The record shows that Department approval of the PPAs provides revenue assurance to the Vineyard Wind Energy Facility, and places substantial performance obligations on the Company. In addition, the Project has completed the MEPA process with issuance of a Certificate from the Secretary. Nonetheless, the Company's offshore windfarm remains subject to significant federal review and approval before construction can begin. The BOEM ROD would provide further assurance that Vineyard Wind's proposed offshore windfarm is likely to become available to contribute the regional energy supply. Further, the record shows that the Company does not expect that a summer 2019 issuance of the ROD, as currently anticipated, would result in any delay to the Company's construction schedule. Accordingly, in order to

clearly establish that the Vineyard Wind Energy Facility is likely to be available to contribute to the regional energy supply, Vineyard Wind shall submit to the Siting Board, prior to commencing construction, a copy of the BOEM ROD approving the Vineyard Wind Energy Facility. Vineyard Wind may not commence construction of the proposed transmission Project until it has complied with this condition. The Siting Board finds that, subject to compliance with the above condition, Vineyard Wind has demonstrated that there is a need for additional transmission resources to interconnect its offshore windfarm to the regional transmission grid.

IV. ALTERNATIVE APPROACHES TO MEETING THE IDENTIFIED NEED

A. Standard of Review

G.L. c. 164, § 69J requires a project proponent to present alternatives to the proposed facility, which may include: (1) other methods of transmitting or storing energy; (2) other sources of electrical power; or (3) a reduction of requirements through load management. In implementing its statutory mandate, the Siting Board requires a petitioner to show that, on balance, its proposed project is superior to such alternative approaches in terms of cost, environmental impact, and ability to meet the identified need. In addition, the Siting Board requires a petitioner to consider reliability of supply as part of its showing that the proposed project is superior to alternative project approaches. NSTAR Electric Company d/b/a Eversource Energy, EFSB 16-02/D.P.U. 16-77, at 13-14 (2018) ("Needham-West Roxbury"); NSTAR Electric Company d/b/a Eversource Energy, EFSB 15-04/D.P.U. 15-140/15-141, at 18-19 (2018) ("Woburn-Wakefield"); NSTAR Electric Company, EFSB 10-2/D.P.U. 10-131/10-132, at 29 (2012) ("Lower-SEMA").

B. Identification of Alternative Approaches for Analysis

In assessing alternative solutions to meet the identified need, Vineyard Wind explored no-build and non-transmission alternatives, as well as alternative transmission arrangements. The Company stated that a no-build or non-transmission alternative would prevent its offshore windfarm from connecting to the regional electric grid, and would not meet the identified need; accordingly, the Company did not consider these alternatives further (Exh. VW-2, at 3-1 to 3-2).

Having determined that new transmission facilities were necessary, the Company next considered a variety of transmission alternatives.

Vineyard Wind considered both AC and high-voltage direct current ("DC") technologies for its transmission interconnection (Exh VW-2, at 3-3). According to the Company, AC is the more appropriate technology for use in this instance, as it is more flexible and better suited to the relatively-short length of the Vineyard Wind Connector (Exhs. VW-2, at 3-3; VW-6, at 3-2 to 3-3). A DC cable system would also have a higher cost than an AC system and long equipment lead times that would be incompatible with the Company's construction schedule (Exh. VW-2, at 3-3).[19] The Company asserted that the Vineyard Wind Connector's relatively short length does not justify the cost and complexity of a DC system (Company Brief at 75).

With respect to the voltage of the interconnection, Vineyard Wind stated that 220 kV is the standard and accepted operating voltage for comparable connections of offshore projects in Europe, and that 220 kV offshore cables are readily available in the market from multiple manufacturers (Exh. VW-2, at 3-4). Conversely, Vineyard Wind stated there are no commercially available offshore cables at voltage levels higher than 220 kV, and lower-voltage cables (e.g., 115 kV) would have a higher cost and result in greater environmental impacts due to the need for significantly larger cables or additional cables (id.; Exh. EFSB-PA-2).

Regarding the insulating material of the transmission cables, the Company stated that XLPE is considered state-of-the-art technology for offshore transmission worldwide, and is preferable for both the offshore and onshore cables proposed (Exh. VW-2, at 3-4). According to the Company, XLPE cables have significantly lower dielectric losses than high-pressure fluid-filled or oil-impregnated cables, and have been proven to be more reliable and easier to install (id.).

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[19] Mr. Benson and Ms. Berry argue in favor of DC cable, and comment that while a DC project would require conversion to AC at line termination, DC undersea cables become more cost-effective at greater distances (giving 50 miles as an example of a cross-over point); they argue that the siting Board should order the Company to make public its own comparative analysis of AC versus DC for the Project (Berry and Benson Comment Letter, December 11, 2018, at 2).

With regards to the proposed interconnection point, the Company considered whether to connect at a single onshore location or multiple locations (Exh. VW-2, at 3-4). The Company stated that a single onshore interconnection point would result in the most cost-effective and efficient construction sequence, and would eliminate the need to construct substations in multiple locations with associated cost and impacts (id.; Company Brief at 77).

Finally, Vineyard Wind examined whether to construct a transmission interconnection that would be dedicated solely to its own use, or an expandable facility that could be used by multiple offshore wind developers (Exh. EFSB-PA-1). The Company stated that while it did consider a transmission interconnection arrangement that would accommodate up to the full 1,600 MW of offshore wind generation contemplated under Section 83C, such an arrangement was not selected by the evaluation team during the solicitation process (Exh. EFSB-PA-1; Tr. 1, at 102-103; RR-EFSB-1(1)). Vineyard Wind indicated that a dedicated interconnection would be used efficiently by its 800 MW offshore windfarm, and would avoid speculative expenditures and the potential for unnecessary environmental impacts (e.g., additional, un-used offshore cables, and unnecessary upstream transmission reinforcements) (Exh. EFSB-PA-1; Tr. 1, at 102-108).

C. Analysis and Findings on Alternative Approaches

The record shows that new transmission facilities are needed to connect Vineyard Wind's proposed offshore windfarm to the New England electric grid. As such, no-build and non-transmission alternatives would not address the identified need. Use of the proposed industry-standard offshore transmission technology – a 220 kV XLPE AC transmission interconnection – would facilitate timely and efficient Project construction. The record also shows that a transmission interconnection dedicated to the Company's use would provide a reliable connection to the electric grid while limiting the cost of the Project and the associated environmental impacts, as compared to higher-capacity transmission alternatives premised on speculative future demand, and offshore wind power market development factors that are not under the Company's control. Accordingly, the Siting Board finds that the Project is superior to the other alternatives identified with respect to meeting the identified need and providing a

reliable energy supply for the Commonwealth with minimum impact on the environment at the lowest possible cost.

V. ROUTE SELECTION

A. Standard of Review

G.L. c. 164, § 69J requires a petition to construct to include a description of alternatives to the facility, including "other site locations." Thus, the Siting Board requires an applicant to demonstrate that it has considered a reasonable range of practical siting alternatives and that its proposed facilities are sited in locations that minimize cost and environmental impacts while ensuring a reliable supply. To do so, an applicant must meet a two-pronged test. First, the applicant must establish that it developed and applied a reasonable set of criteria for identifying and evaluating alternative routes in a manner that ensures that it has not overlooked or eliminated any routes that, on balance, are clearly superior to the proposed route. Second, the applicant generally must establish that it identified at least two noticed sites or routes with some measure of geographic diversity. Needham-West Roxbury at 21; Woburn-Wakefield at 34-35; Boston Edison Company, EFSB 04-1/D.T.E. 04-5/D.T.E. 04-7, at 32-33 (2005) ("Stoughton-Boston"). But see Colonial Gas Company, EFSB 16-01, at 28-29 (2016) (Siting Board found reasonable, under the specific facts of the case, the applicant's decision not to notice an alternative route).

B. Company's Approach to Route Selection

Vineyard Wind stated that the overall objective of its route selection analysis was to identify a technically feasible and cost-effective design capable of delivering 800 MW of offshore wind power to a suitable onshore interconnection point (Exh. VW-2, at 4-1; Tr. 1, at 120). The Company submitted that the Offshore Cable route, the landfall site, the Onshore Cable route, the Substation site, and the interconnection point to the New England electric grid were all critical aspects of its route selection process, and that each component must be feasible from a technical, environmental, legal, and permitting perspective (Tr. 1, at 120). The Company also stressed the importance of host community support (Exh. EFSB-G-1(S2); Tr. 1, at 120).

Vineyard Wind argues that: (1) it applied reasonable criteria at each step in its route selection process to ensure that no superior routing options were overlooked; and (2) it has

identified two buildable, geographically distinct routes that would minimize environmental impacts (Company Brief at 79). The Company's route selection process is described below.

1. Initial Routing Options and Interconnection Point Evaluation

Vineyard Wind stated that it began its route selection process by delineating a wide study area that encompassed southeastern Massachusetts and eastern Rhode Island (Exh. VW-2, at 4-2). The Company identified 14 general routing options from its offshore lease area to various onshore interconnection points (id.; Tr. 1, at 120-121). Vineyard Wind considered routes through Narragansett Bay, Buzzards Bay, Nantucket Sound, and Cape Cod Bay, which ranged in length from approximately 35 to 136 miles (Exhs. VW-2, at 4-2 to 4-3; VW-3, fig. 4-2). The Company then applied screening criteria to eliminate route options that were excessively long or lacked the necessary interconnection capacity (Exh. VW-2, at 4-3).[20]

The Company initially identified eight interconnection points, of which three could not accommodate the full 800 MW project, and three it considered prohibitively distant, including Brayton Point (Exh. VW-2, at 4-4 to 4-6).[21] Vineyard Wind stated that, following the completion of its initial screening process, two potential interconnection points in Barnstable

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[20] Vineyard Wind stated that route options with a total length greater than 62 miles (100 kilometers) were removed from consideration due to excessive length (Exh. VW-2, at 4-3). According to the Company, any route longer than 62 miles would likely require the construction of a mid-way volt-ampere reactor station, at considerable cost (id.; Exh. EFSB-RS-35). Furthermore, the Company noted that longer transmission cables would have greater capital costs and environmental impacts than shorter cables (Exhs. VW-2, at 4-3; VW-9, at 2-14; EFSB-RS-35).

[21] Vineyard Wind asserts that the record clearly shows that Brayton Point is not the right interconnection point for the Project as the longer offshore cable and permanent mid-way reactor station necessary for such an interconnection would significantly increase costs and environmental impacts (Company Reply Brief at 15, citing Exhs. VW-9 at 2-13 to 2-15; EFSB-RS-35). Further the Company noted a cable route to Brayton Point and interconnection at that site would also face significant technical challenges associated with narrow, trafficked channels, cable and pipeline crossings, and potential upgrade requirements. (Company Reply Brief at 15, citing Exhs. VW-9 at 2-13 to 2-15; EFSB-RS-35).

remained (the Barnstable Switching Station and the West Barnstable Substation), along with two general offshore cable routes that would travel north from the Company's lease area to a landfall site somewhere in Barnstable or Yarmouth (Exh. VW-2, at 4-2 to 4-10; Tr. 1, at 132). The Company subsequently determined that a connection to the West Barnstable Substation would require significant substation modifications that would increase the cost of interconnection and delay Project construction (Exh. EFSB-RS-9; Tr. 1, at 145-146).[22] Accordingly, the Company selected the Barnstable Switching Station as its preferred interconnection point for the Project (Exh. EFSB-RS-9; Tr. 1, at 145-146).

2. Evaluation of Potential Substation and Landfall Sites

Simultaneously with the above efforts, the Company undertook a review of potential Substation and landfall sites (Exh. VW-2, at 4-7; Tr. 1, at 150-151). Vineyard Wind stated that it initially evaluated seven potential Substation sites within a reasonable proximity of either the Barnstable Switching Station or the West Barnstable Substation (Exh. VW-2, at 4-10 to 4-11; Tr. 1, at 151).[23] The Company evaluated these sites based on the following general criteria: (1) an area of at least five acres; (2) suitable surrounding land uses; (3) site topography and existing conditions; (4) availability of real estate; and (5) site access (Exh. VW-2, at 4-10 to 4-11). Following selection of the Barnstable Switching Station as the preferred interconnection point for the Project, properties near the West Barnstable Substation were removed from consideration (Tr. 1, at 151). The Company stated that, of the four remaining sites, a previously-developed parcel located on Communication Way in Barnstable (a former Cape Cod Times printing and distribution facility property) was the best candidate for the Project's

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22 Unlike at the West Barnstable Substation, the 800 MW Vineyard Wind Energy Facility could connect to the Barnstable Switching Station without any significant modifications to the existing transmission system (Exh. EFSB-RS-9).

23 Vineyard Wind also considered siting its Substation on the existing Barnstable Switching Station property; however, information provided by Barnstable Switching Station owner NSTAR convinced Vineyard Wind that there is insufficient space to accommodate Project equipment at this site and the option was not considered further (Exh. EFSB-RS-12).

Substation (Exh. VW-2, at 4-13 to 4-14). Vineyard Wind stated that, unlike the other properties under consideration, this site has sufficient space to accommodate the Company's 800 MW project, an amenable landowner, suitable site access, and consistency with surrounding land uses (id. at 4-11 to 4-14; Tr. 1, at 151-155).

With respect to landfall site selection, Vineyard Wind stated that it initially considered 48 different landfall sites across the south coast of Cape Cod and the eastern shore of Buzzards Bay; however, following the selection of the Barnstable Switching Station as its preferred interconnection point, the Company focused its efforts on the south coast of Cape Cod from Mashpee to Yarmouth (Exh. VW-2, at 4-7; Tr. 1, at 121). The Company used the following criteria to identify potential landfall sites: (1) clear egress onto a road of sufficient width to accommodate the duct bank; (2) enough space to accommodate the entry pit and drilling equipment associated with horizontal directional drilling ("HDD"); (3) surrounding land uses, if residential, that are characterized as seasonal rather than year-round use; (4) environmental considerations, such as wetland resource areas and mapped eelgrass habitat; (5) onshore route length; (6) a beach-front parking area or similar feature able to accommodate the offshore to onshore transmission and the necessary transition vault(s); and (7) water depths of 10 to 20 feet within approximately 3,000 feet of the landfall to accommodate support barges at the HDD exit location (Exh. VW-2, at 4-6 to 4-7). The Company also performed screening level environmental reviews of potential landfall sites, and held discussions with local officials to incorporate their input (id. at 4-7).

Based on its initial review, the Company identified three potential landfall sites in the towns of Barnstable and Yarmouth: (1) Covell's Beach in Barnstable; (2) New Hampshire Avenue in Yarmouth; and (3) Great Island in Yarmouth (Exh. VW-2, at 4-8 to 4-10). Following additional environmental review, Vineyard Wind eliminated the Great Island landfall site from consideration (Exhs. VW-6, at 3-14; EFSB-RS-8). The Company stated that it eliminated the Great Island landfall site because of: (1) greater impacts to coastal wetlands (including the need for HDD staging within Coastal Dune and Barrier Beach areas); (2) an inability to avoid impacts to mapped eelgrass habitat offshore from the landfall site; (3) Massachusetts Natural Heritage and Endangered Species Program ("NHESP") concern for potential impacts to piping plover

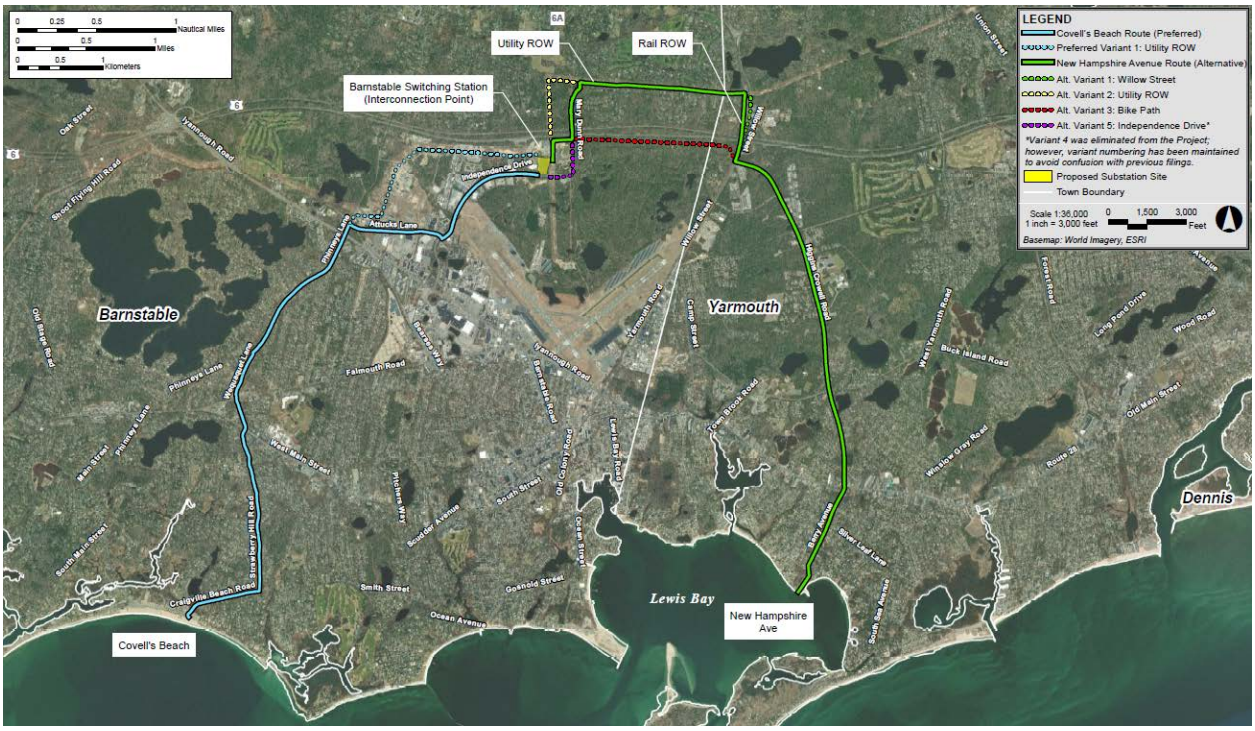
nesting habitat in the area; and (4) complications surrounding the acquisition of necessary onshore property rights (Exh. EFSB-RS-8; Tr. 2, at 211-216).

3. Evaluation of Potential Onshore and Offshore Cable Routes

a. Onshore Cables

Vineyard Wind stated that it used the interconnection point, landfall sites, and Substation location identified above to develop a set of potential routes for the Project's Onshore Cables (Exh. VW-2, at 4-14). The Company used the following screening criteria to identify potential routes: (1) use of public roadway layouts, other public ROWs, and/or existing utility ROWs; (2) sufficient road width to accommodate the cable duct bank; (3) subsurface utility density; (4) major roadway crossings/traffic impacts; (5) avoidance of busy commercial centers; (6) avoidance of dense residential areas; and (7) avoidance of sensitive receptors (id.). Potential onshore routes were then further evaluated for environmental sensitivity and technical feasibility, resulting in a set of two "Candidate Routes" (the Covell's Beach Route and the New Hampshire Avenue Route) and a number of variations thereto that the Company considered viable for the proposed Onshore Cables, all of which are shown below in Figure 2 (id.).

Figure 2. Map of the Company's Onshore Candidate Routes and Variations



Source: Exh. VW-14, fig. 1-2.

According to the Company, the two Candidate Routes and six variations were then evaluated using a weighted-scoring approach (Tr. 1, at 155-156). The Company's scoring process consisted of the following: (1) identifying evaluation criteria to identify impacts of each route; (2) calculating a ratio score for each criterion for each route; (3) assigning individual weights to each criterion to reflect its potential for impact; and (4) determining a total weighted ratio score for each route (Exh. VW-2, at 4-17 to 4-18).[24]

To calculate the ratio score for each route, Vineyard Wind assigned a value of "1" to the criterion on the route with the highest potential for the corresponding impact; other routes received a ratio score between "0" and "1" indicating their relative potential impact for the particular criterion (Exh. VW-2, at 4-22 to 4-23). The Company added scores for each criterion

24 The Company also considered the relative cost and reliability of the Candidate Routes and concluded that the routes were comparable with respect to cost and reliability (Exh. VW-2, at 4-54 to 4-55; Tr. 2, at 257-258).

together to get a total ratio score for each Candidate Route (and variation), with higher scores indicating greater overall impacts (Exh. VW-2 at 4-23; Tr. 1, at 158).

Vineyard Wind stated that its scoring analysis included eleven individual criteria that compared the relative level of impact to both the developed and natural environments along the Candidate Routes and variations (Exh. VW-2, at 4-17). Within the developed environment category, the Company's criteria included a comparison of residential units, sensitive receptors, traffic conditions, historic resources, and archaeological resources (id. at 4-23).[25] Within the natural environment category, the criteria included a comparison of wetland resource areas, state-listed rare species habitat, public water supplies, Article 97-jurisdictional lands, and potential impacts to eelgrass habitat at the landfall site (id. at 4-27).[26] The Company selected weights from 1 to 3 for each scoring criterion (with higher weights signifying greater impact), which it stated were intended to reflect Vineyard Wind's assessment of: (1) the potential temporary and permanent impacts; (2) the magnitude of disruption from these impacts; and (3) the ease of permitting (id. at 4-18).

Table 1 presents the total weighted ratio scores the Company calculated for the Candidate Routes and their variations.

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25 The Company initially included the potential to encounter subsurface contamination as part of its developed environmental criteria; however, Vineyard Wind subsequently determined that no Massachusetts Department of Environmental Protection ("MassDEP") Bureau of Waste Site Cleanup Release sites were located less than 2,400 feet from either Candidate Route and this criterion was therefore removed (Exhs. VW-2, at 4-23; EFSB-RS-21).

26 The Company stated that it did not include consideration of tree clearing in its natural environment criteria because clearing associated with the proposed Substation was common to all Candidate Routes, and it considered vegetation clearing required for Variant 3 along a planned bike path as attributable instead to development of the bike path (Exh. EFSB-RS-20; Tr. 1, at 177). The Company reported that inclusion of a tree clearing criterion and the attribution to Variant 3 of the vegetation clearing impacts along the proposed bike would have resulted in a total weighted ratio score of 10.39 for Variant 3, rather than the 8.39 score presented in Table 1, below (RR-EFSB-12(1)).

Table 1. Comparison of Weighted Scores between Candidate Routes and Variants

Route	*Weighted Score*
Covell's Beach Route (Preferred), using Attucks Lane and Independence Drive	**8.95**
Utility Right-of-Way Variant	9.73
New Hampshire Avenue Route (Noticed Alternative)	**8.18**
Variant 1 (Willow Street)	8.75
Variant 2 (Utility ROW)	10.14
Variant 3 (Bike Path)	8.39
Variant 5 (Independence Drive)	9.00

Source: RR-EFSB-9.

The Company elected to evaluate further all of the potential routes scored above (Exh. VW-2, at 4-30 to 4-32; RR-EFSB-10). Initially, based on the total weighted scores calculated, the Company identified the New Hampshire Avenue Route as the preferred route for the Onshore Cables (Exh. VW-2, at 4-31). Ultimately, based on additional information developed after it filed its initial petition, Vineyard Wind selected the Covell's Beach Route (using Attucks Lane and Independence Drive) as its preferred route for the Onshore Cables, and the New Hampshire Avenue Route as the alternative route (Exh. EFSB-G-1(S2)).[27] Vineyard Wind argued that the difference in scoring between the two routes is small and driven by temporary construction impacts (id.; Exh. VW-2, at 4-30 to 4-31; Company Brief at 104). Furthermore, the Company stated that additional information, in particular the establishment of a HCA between the Company and the Town of Barnstable, changed the relative favorability of the proposed routes (Exh. EFSB-G-1(S2); Company Brief at 104). According to the Company, the HCA represents a shared belief that the Project can benefit Barnstable and that impacts to the town can and will be minimized and/or appropriately mitigated (Exh. EFSB-G-1(S2)).[28]

Additional considerations for changing the preferred route cited by the Company include: refinements to the HDD proposed at the Covell's Beach landfall site (which eliminated some

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[27] As discussed in Section I.B.3, above, this change in in preference occurred after the publication of the Notice in this proceeding, but in advance of hearings.

[28] A detailed comparison of the environmental impacts of the Company's preferred and alternative routes is presented in Section VI, below.

potential environmental impacts associated with this route, while also reducing the length and cost of the HDD); a shorter offshore cable length to the Covell's Beach landfall site compared to the New Hampshire Avenue landfall site; increased confidence that necessary Article 97 approvals could be obtained at Covell's Beach based on commitments included in the HCA; and elimination of an offshore transmission cable crossing that would be required for the New Hampshire Avenue Route (Exh. EFSB-G-1(S2)).

b. Offshore Cables

Vineyard Wind submitted that the distinct nature of offshore routing (where possible variations in route are near-infinite between fixed starting and ending points) necessitated a slightly different approach to route selection compared to routing onshore transmission lines (Exh. EFSB-RS-32; Tr. 1, at 126-132; Company Brief at 108). As such, the Company stated that offshore routes were compared qualitatively and quantitatively, but without using a weighted-score framework (Tr. 1, at 126-132).

As the first step in its Offshore Cable route selection process, the Company undertook a desktop analysis to identify potential corridors between its offshore lease area and the potential landfall sites in Barnstable and Yarmouth (Exh. VW-2, at 4-34). Vineyard Wind stated that critical criteria in this analysis included: (1) avoiding special, sensitive, and unique ("SSU") resources mapped in the Massachusetts Ocean Management Plan ("OMP");[29] (2) avoiding water depths less than 20 feet and avoiding shoals; (3) avoiding slopes where seafloor bathymetry changes dramatically; and (4) crossing navigation corridors in a perpendicular orientation (Exh. VW-2, at 4-34). Other factors considered by the Company included: (1) feasibility of cable installation; (2) permanency of cable burial; (3) avoiding and/or minimizing passage

[29] The 2015 OMP creates a framework for managing uses and activities within the Commonwealth's ocean waters, which the Company stated it considered carefully in identifying potential offshore corridors (Exh. VW-6, at 3-22). The OMP identifies SSU resources that particular types of projects must endeavor to avoid (id.). For offshore cable projects, SSU resources include: (1) core habitat of the North Atlantic right whale, fin, and humpback whales; (2) hard/complex seafloor; (3) eelgrass; and (4) intertidal flats (id.).

through anchorage areas or areas with mapped shipwrecks and boulders; (4) environmental and/or permitting constraints and avoidance of impacts; (5) cable length; (6) cable power delivery capacity; (7) available landfall locations; (8) minimum turn radius requirements for the cables; and (9) ability to cross seabed slopes and existing offshore cables in a perpendicular or nearly perpendicular orientation (id.; Exhs. VW-9 at 2-7 to 2-8; EFSB-RS-26).

In August and September of 2017, building off of its desktop analysis, Vineyard Wind undertook a geophysical survey along more than 125 miles of potential offshore route segments ("2017 Marine Survey") (Exh. VW-2, at 4-35).[30] Vineyard Wind used the results of its 2017 Marine Survey to distill the offshore route segments into two potential offshore cable corridors: the "Western Offshore Corridor," (which included two alternative routes through Muskeget Channel) and the "Eastern Offshore Corridor," as shown below in Figure 3 (id.).[31]

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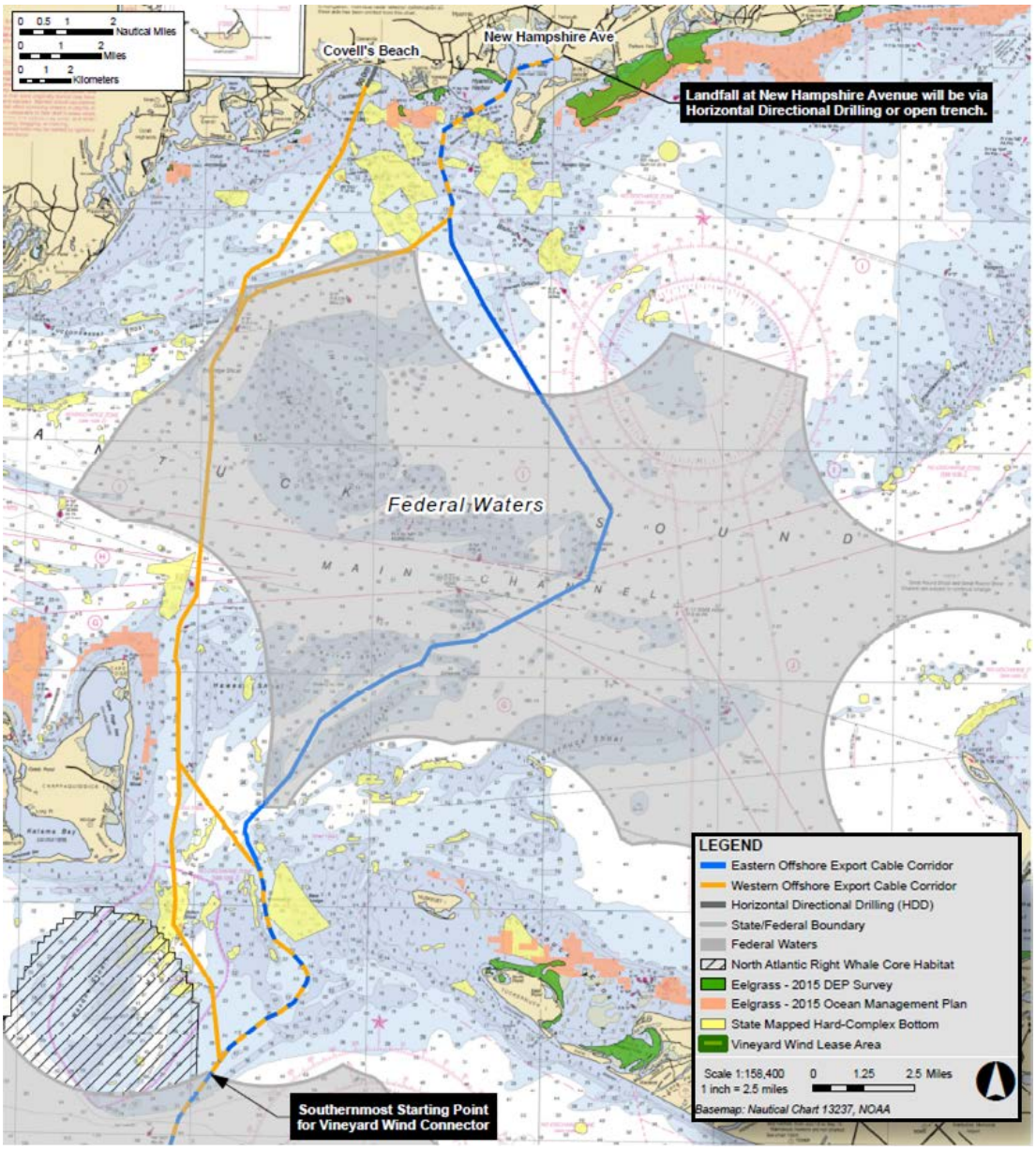
30 Vineyard Wind stated that its 2017 Marine Survey included: (1) a single geophysical trackline along each offshore route alternative, consisting of a 164-foot-wide swath of multi-beam sidescan sonar and sub-bottom profiling; (2) additional geophysical tracklines in areas where route alternatives pass in proximity to mapped SSU areas to map the resources' areal extent and determine a path for avoidance; and (3) additional geophysical tracklines in areas where adverse site conditions were identified (e.g., shallow water depths, difficult surficial geology) (Exh. VW-2, at 4-35).

31 Vineyard Wind also considered a cable corridor crossing Nantucket Island, the Nantucket Offshore Cable Corridor, but eliminated this route based on cost and environmental considerations (Exhs. VW-2, at 4-38; EFSB-RS-30). The Company noted that beyond onshore impacts on Nantucket, among other factors, this route would require longer transmission cables, traverse shallow waters, and cross extensive mapped eelgrass habitat (Exhs. VW-2, at 4-38; EFSB-RS-30).

Figure 3. Map of the Western and Eastern Offshore Corridors



Source: Adapted from Exh. VW-6, fig. 2-2.

The Company then undertook an additional data collection effort for these corridors, which included vibracore sampling,[32] benthic (sea bottom) grab samples, and underwater video

[32] Vibracore sampling involves taking a continuous sample of the upper four meters of the seafloor using a three- to four-inch-diameter core barrel with a plastic liner that is vibrated down into the sediment and then extracted (Exh. VW-6, att. D(1) at 9).

transects (Exh. VW-2, at 4-35). Based primarily on its analysis of: (1) water depths; (2) the presence and height of sand waves; (3) the length of the route passing through mapped hard/complex bottom; and (4) the presence of eelgrass and widgeon grass, the Company concluded that both the Western and Eastern Offshore Corridors are viable alternatives (Exh. VW-2, at 4-39 to 4-52). However, Vineyard Wind considered the Western Offshore Corridor preferable, as it is the most direct route to the Covell's Beach and New Hampshire Avenue landfall sites (Exhs. VW-9, at 2-11 to 2-12; EFSB-RS-28).[33]

In the spring of 2018, the Company undertook extensive additional surveying of the Western and Eastern Offshore Corridors ("2018 Marine Survey"), which Vineyard Wind stated confirmed its preference for the Western Offshore Corridor (Exhs. VW-9, at 1-4, 2-11 to 2-12; EFSB-G-1(S2)). According to the Company, the surveying confirmed that the shorter length of the Western Offshore Corridor would reduce environmental impacts from cable laying, decrease cable installation time, lower electrical line losses, and lower Project costs (Exh. VW-9, at 2-12). The 2018 Marine Survey results also showed that the Eastern Offshore Corridor is characterized by a larger proportion of complex bottom compared to the Western Offshore Corridor (necessitating additional dredging and a more complex installation process), and presents a higher likelihood of encountering paleo-era cultural resources (id.). The Western Offshore Corridor would also avoid potential for construction-related impacts to island ferry traffic (id.). Accordingly, Vineyard Wind eliminated the Eastern Offshore Corridor from further consideration and carried forward the Western Offshore Corridor, with its two variations through Muskeget Channel, for further review (id.; Exh. EFSB-G-1(S2)).

C. Geographic Diversity

Vineyard Wind submitted that it developed and assessed a wide variety of onshore and offshore routes for its proposed Project (Exh. VW-2, at 4-2 to 4-3, 4-14, 4-56). The Company maintains that a fully in-street route from the Covell's Beach landfall site in Barnstable to its

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33 Vineyard Wind stated that, in total, the Western Offshore Corridor is approximately 1.5 to 7.5 miles shorter than the Eastern Offshore Corridor, depending on the eventual route through Muskeget Channel (Tr. 2, at 239).

proposed Barnstable Substation site (the Covell's Beach Route) and a partially in-street, partially off-road route from the New Hampshire Avenue landfall site in Yarmouth to the Substation site (the New Hampshire Avenue Route), represent geographically diverse alternatives (id. at 4-2 to 4-3, 4-14, 4-56, 5-1; Company Brief at 83).

D. Positions of the Parties and Limited Participants

Yarmouth argues that the Company failed to properly consider the marine, commercial, and recreational interests of Lewis Bay in its landfall site selection process, and that shellfish habitat and impacts to commercial and recreational uses of marine resources should have been included in the Company's weighted criteria (Yarmouth Brief at 8-9).

Mr. Berry and Ms. Benson state that they oppose a landfall site on Cape Cod, and argue that the Company failed to provide sufficient evidence that an interconnection at Brayton Point is not preferable to the Barnstable Switching Station (Berry and Benson Comment Letter, December 11, 2018, at 1-2). Mr. Berry and Ms. Benson also argue that Vineyard Wind applied inconsistent standards in its evaluation of alternate Substation sites, asserting that the Company rejected a potential interconnection location at the Oak Street switchyard in Barnstable due to its proximity to residences, but did not similarly eliminate the Communication Way parcel despite its proximity to a school and to residences, some of which Mr. Berry and Ms. Benson characterize as "low-income" (id. at 1).

E. Analysis and Findings on Route Selection

The Siting Board requires that applicants consider a reasonable range of practical siting alternatives and that proposed facilities are sited in locations that minimize cost and environmental impacts. In past decisions, the Siting Board has found various criteria to be appropriate for identifying and evaluating route options for transmission lines and related facilities. These criteria include natural resource impacts, land use impacts, community impacts, cost, and reliability. Needham-West Roxbury at 21; Woburn-Wakefield at 64; Stoughton-Boston at 43-44. The Siting Board has also found the specific design of scoring and weighting methods

for chosen criteria to be an important part of an appropriate route selection process. Needham-West Roxbury at 30; Woburn-Wakefield at 65; Stoughton-Boston at 49-50.

The record shows that Vineyard Wind undertook an extensive effort to identify potential offshore and onshore routes to connect its proposed offshore windfarm to the New England electric grid. The Company's route selection process involved a number of interrelated steps, including the identification and evaluation of: (1) initial routing options between the Company's offshore lease area and onshore interconnection points; (2) potential landfall and substation sites; and (3) onshore and offshore transmission cable routes.

Starting at the Company's offshore lease area, Vineyard Wind identified a study area that encompassed southeastern Massachusetts and eastern Rhode Island. The Company's assessment identified 14 general routes from its offshore lease area to various onshore interconnection points. Application of initial screening criteria eliminated route options that were excessively long or lacked the necessary interconnection capacity. The record shows that the Company reasonably eliminated a routing option that would have connected the Vineyard Wind Energy Facility to the electric grid at Brayton Point based in part on the excessive length of such a route. The record further demonstrates that the Company reasonably selected the Barnstable Switching Station as the interconnection point for its Project based on the capability of the existing Cape Cod transmission system and the Project's implementation schedule.

Next, the Company undertook a review of potential landfall sites. The record shows that Vineyard Wind reviewed a wide variety of potential landfall sites, with a focus on locations along the south coast of Cape Cod from Mashpee to Yarmouth. Through the application of screening criteria, Vineyard Wind narrowed the list of potential landfall sites to three (the Covell's Beach, New Hampshire Avenue, and Great Island landfall sites). Additional environmental review resulted in the elimination of the Great Island landfall site from consideration.

The Siting Board agrees with Yarmouth that potential impacts to marine resources at Project landfall sites are an important consideration. While the Company's landfall site selection process included an assessment of offshore eelgrass beds and water depth, additional criteria, such as the presence of shellfish habitat and mooring fields, could have enhanced the Company's

route selection process. The Siting Board notes that a detailed assessment of potential impacts to marine resources was, in fact, undertaken by the Company in its review of the environmental impacts of the Covell's Beach and New Hampshire Avenue Routes (see Section VI.C, below). There is nothing in the record to suggest that the Company's decision to include these considerations in its detailed environmental review, rather than its route selection process, resulted in the Company overlooking any superior routing options.

To identify a preferred Substation site, the Company evaluated properties in the vicinity of the Barnstable Switching Station based on factors such as land availability, site topography, and surrounding land uses. The screening criteria applied by the Company were generally consistent with the types of criteria the Siting Board has previously found to be acceptable. Contrary to Mr. Berry and Ms. Benson's assertions, the record shows that a Substation site near Oak Street – in West Barnstable – was eliminated based on existing electrical infrastructure capacity, and not primarily due to its proximity to residences.

Vineyard Wind then proceeded to establish a set of potential routes for the Onshore and Offshore Cables. To aid in its selection of onshore preferred and alternative routes, the Company used a weighted-scoring methodology. This approach included consideration of temporary and permanent impacts to the developed and natural environments, as well as the cost and reliability of alternative routes. This is a type of evaluation approach that the Siting Board has previously found to be acceptable for transmission projects. New England Power Company d/b/a National Grid, EFSB 13-2/D.P.U. 13-151/13-152, at 38-39 (2014) (Salem Cables); New England Power Company d/b/a National Grid, EFSB 12-1/D.P.U. 12-46/12-47, at 45 (2012) ("IRP"); Stoughton-Boston at 43-45.[34]

Vineyard Wind submits that the unique nature of offshore transmission line routing is better suited to a quantitative and qualitative comparison, rather than a weighted-scoring approach. The record shows that the Company reasonably screened potential offshore corridors between its lease area and the identified landfall sites based on a desktop analysis of, among

[34] The Siting Board notes that the Company elected to carry forward all of the potential onshore transmission cable routes it scored for further review. While such an approach maintains numerous options for the proponent, it also adds complexity to the subsequent siting review process.

other things, sea floor characteristics (including mapped SSU areas), water depth, and technical requirements of the Offshore Cables. Results from an extensive underwater surveying effort informed the Company's final selection of the Western Offshore Corridor with two options through Muskeget Channel as its preferred route. Based on the record in this proceeding, the Siting Board concludes that Vineyard Wind developed and applied a reasonable set of criteria for identifying and evaluating alternative offshore routes in a manner that ensured it did not overlook or eliminate any clearly superior routes.

Finally, the record shows that Vineyard Wind identified transmission line routes with landfalls in the towns of Barnstable and Yarmouth, respectively, that would take unique routes to the Company's proposed Substation site. The Siting Board concludes that the Covell's Beach Route and the New Hampshire Avenue Route encompass a measure of geographic diversity.

Accordingly, based on the route selection process described above, the Siting Board finds that the Company has: (1) developed and applied a reasonable set of criteria for identifying and evaluating alternative routes in a manner that ensures that it has not overlooked or eliminated any routes that are clearly superior to the proposed project; and (2) identified a range of practical transmission line routes with some measure of geographic diversity. Therefore, the Siting Board finds that the Company has demonstrated that it examined a reasonable range of practical siting alternatives while seeking to minimize cost and environmental impacts.

VI. ANALYSIS OF THE COVELL'S BEACH AND NEW HAMPSHIRE AVENUE ROUTES

In this section, the Siting Board compares the Covell's Beach Route and the New Hampshire Avenue Route, based on environmental impacts, cost, and reliability. Based on the evidence and findings presented below, the Siting Board concludes that the Covell's Beach Route is superior to the New Hampshire Avenue Route with respect to providing a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost.

A. Standard of Review

In implementing its statutory mandate under G.L. c. 164, §§ 69H, 69J, the Siting Board requires a petitioner to show that its proposed facility is sited at a location that minimizes costs and environmental impacts while ensuring a reliable energy supply. To determine whether such a showing is made, the Siting Board requires a petitioner to demonstrate that the proposed route for the facility is superior to the alternative route on the basis of balancing environmental impact, cost, and reliability of supply. Needham-West Roxbury at 32; Woburn-Wakefield at 72; Stoughton-Boston at 32-33.

The Siting Board first determines whether the petitioner has provided sufficient information regarding environmental impacts and potential mitigation measures to enable the Siting Board to make such a determination. The Siting Board then examines the environmental impacts of the proposed facilities and determines: (1) whether environmental impacts would be minimized; and (2) whether an appropriate balance would be achieved among conflicting environmental impacts as well as among environmental impacts, cost, and reliability. Finally, the Siting Board compares the routes to determine which is superior with respect to providing a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost. Needham-West Roxbury at 32; Woburn-Wakefield at 72; Stoughton-Boston at 32-33.

B. Description of Covell's Beach and New Hampshire Avenue Routes

1. Offshore Cable Route and Landfall Locations

Starting in the northwest corner of the Company's offshore lease area, the Western Offshore Corridor travels northward through federal waters for roughly ten miles before entering Massachusetts state waters near Wasque Shoal off Martha's Vineyard (Exhs. VW-2, at 4-37; VW-3, fig. 4-9; EFSB-RS-1). Once in state waters, the Western Offshore Corridor passes between Martha's Vineyard and Nantucket Island via Muskeget Channel along one of two routes; a western route, which travels through the channel itself, and an eastern route, which

would avoid the scoured channel (Exhs. VW-2, at 4-37; VW-3, fig. 4-9).[35] After exiting Muskeget Channel, the Western Offshore Corridor continues northward along the west side of Hawes Shoal before passing through federal waters in Nantucket Sound west of Horseshoe Shoal (Exhs. VW-2, at 4-37; VW-3, fig. 4-9).

As the Western Offshore Corridor approaches the Cape Cod mainland, the corridor splits in two, allowing for a landfall at either Covell's Beach or New Hampshire Avenue (Exhs. VW-2, at 4-37; VW-14, fig. 1-1). For a landfall at Covell's Beach, the offshore route would travel northeast through state waters for roughly seven miles and ending at a transition vault under a large paved parking lot at Covell's Beach in Barnstable (Exhs. VW-2, at 4-8; VW-3, fig. 4-9). For a landfall at New Hampshire Avenue, the offshore route would continue east through federal waters north of Horseshoe Shoal for roughly four miles before entering state waters and traveling northeast through Hyannis Harbor and Lewis Bay to a transition vault under New Hampshire Avenue, which dead-ends at the shore of Lewis Bay in Yarmouth (Exhs. VW-2, at 4-9; VW-3, fig. 4-9).

The total length of the Western Offshore Corridor to the Company's preferred landfall site at Covell's Beach is approximately 37.5 to 39.4 miles, depending on the route through Muskeget Channel (approximately 20.9 to 22.6 miles in state waters) (Exh. VW-9, at 1-43, 1-45). The route to New Hampshire Avenue would be longer, totaling 42.0 to 43.9 miles in length and traversing approximately 21.4 to 23.3 miles of state waters (id.).

2. Onshore Cable Routes

a. Covell's Beach Route and Proposed Variation

Beginning where the Offshore Cables come ashore at the Covell's Beach parking lot in Barnstable, the Covell's Beach Route proceeds easterly on Craigville Beach Road for approximately 0.6 miles before turning north on Strawberry Hill Road (Exh. VW-2, at 1-18). The route follows Strawberry Hill Road for approximately 1.5 miles, crosses Route 28 (West

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35 Vineyard Wind indicated that the western route through Muskeget Channel would be roughly two miles shorter than the eastern route through the channel (Exh. EFSB-ML-7(S)).

Main Street), then merges with Wequaquet Lane (id.; Exh. VW-3, fig. 1-2). Continuing northeasterly to Phinneys Lane, the route crosses Route 132 and turns easterly onto Attucks Lane (Exhs. VW-2, at 1-18; EFSB-G-1(S2)). Following Attucks Lane to Independence Drive, the route continues on Independence Drive until it turns north into the Substation site (Exhs.VW-9, at 1-5 to 1-6, 1-33, Att. I; VW-3, fig. 1-8; EFSB-G-1(S2)). The Covell's Beach Route proceeds approximately 0.1 miles from the Substation site to the adjacent Barnstable Switching Station (Exhs. VW-2, at 1-19; VW-3, fig. 1-8; EFSB-G-1(S2)). The total length of the onshore portion of the Covell's Beach Route is 5.3 miles, all of which is underground within existing roadway layouts (Exh. VW-9, at 1-34).

The Company also proposed a variation to the Covell's Beach Route that would use a combination of in-street and utility ROW construction (Exhs. VW-2, at 1-18; EFSB-G-1(S2)). Variant 1 to the Covell's Beach Route would continue north on Phinneys Lane, past Attucks Lane, to the intersection of Phinneys Lane and an Eversource-owned overhead transmission line ROW (Exh. VW-2, at 1-18 to 1-19; Tr. 2, at 219). The route then travels east along the ROW for 1.6 miles before reaching the Substation site and continuing to the Barnstable Switching Station (Exh. VW-2, at 1-18). The total onshore length of this route is 5.4 miles – 3.8 miles underground within existing roadway layouts and 1.6 miles within existing utility ROW (id.).[36]

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[36] Vineyard Wind requested that the Siting Board include the Covell's Beach utility ROW variation in the approval of the Covell's Beach Route, and stated this variation would be used only if the Covell's Beach Route, as currently proposed, is subsequently determined not to be feasible (Exh. VW-9, at 1-34; Company Brief at 16). According to Vineyard Wind, possible issues requiring the use of the variation are the inability to obtain permission from Barnstable to use the in-road portion, or if other legal barriers are encountered (Company Reply Brief at 14, citing RR-EFSB-10). The Siting Board notes that there is no compelling reason to include this variation to the Covell's Beach Route in the Board's approval of the Project, as there is no known impediment to using the identified roads in Barnstable, especially in light of the provisions of the HCA between Barnstable and the Company (Exh. EFSB-G-1(S2)(1)). As is the case with all Siting Board approved projects, if an unforeseen event occurs, a proponent can file with the Board for a project change.

b. New Hampshire Avenue Route and Proposed Variations

Beginning at the southern end of New Hampshire Avenue, the New Hampshire Avenue Route proceeds north on New Hampshire and Berry Avenues for approximately 0.8 miles to the intersection with Route 28 (Main Street), where Berry Avenue becomes Higgins Crowell Road (Exhs. VW-2, at 1-15; EFSB-G-1(S2)). After crossing Route 28, the New Hampshire Avenue Route continues north on Higgins Crowell Road for 2.2 miles, followed by a further 0.4 miles on an abandoned section of Higgins Crowell Road (Exh. VW-2, at 1-15). At the end of the abandoned road segment, the route crosses Willow Street, turns north, and follows a railroad ROW under Route 6 to an existing Eversource-owned transmission ROW (id. at 1-15 to 1-16; Exh. VW-3, fig. 1-12, at 4). The route travels westerly along the utility ROW for approximately 1.2 miles, before turning south onto Mary Dunn Road (Exh. VW-2, at 1-16). At a point just south of Route 6, the route turns westerly along an existing unpaved access road and utility ROW before entering the Substation site and connecting to the Barnstable Switching Station (id.; Exh. VW-3, fig. 1-12, at 4). The total onshore length of the New Hampshire Avenue Route is approximately 6.0 miles – 4.2 miles within existing roadway layouts and the balance predominantly within existing off-road ROWs (Exh. VW-2, at 1-16).

Vineyard Wind proposed four variations to the New Hampshire Avenue Route (Exh. VW-2, at 1-16 to 1-18).[37] Variant 1 to the New Hampshire Avenue Route would use a 0.5-mile segment of Willow Street and a short stretch of utility ROW between Willow Street and the railroad ROW rather than the railroad ROW (id. at 1-16; Exh. VW-6, fig. 2-1). Variant 1 would increase the length of the New Hampshire Avenue Route by approximately 0.1 miles (Exh. VW-2, at 1-17).

Variant 2 to the New Hampshire Avenue Route would avoid the use of Mary Dunn Road by staying on the utility ROW for an additional 0.7 miles before entering the Substation site (Exhs. VW-2, at 1-17; VW-6, fig. 2-1). While this variation would have the same total length as

[37] As discussed in Section V.B.2, above, the Company originally proposed five variations to the New Hampshire Avenue Route; however Variant 4, the Great Island landfall site, was subsequently removed from further consideration during the Company's route selection process (Exhs. VW-6, at 3-13; EFSB-RS-8).

the New Hampshire Avenue Route, the portion of the route in-streets would decrease from 4.2 miles to 3.4 miles (Exh. VW-2, at 1-16 to 1-17).

Variant 3 to the New Hampshire Avenue Route would use a Massachusetts Department of Transportation-proposed bike path running south of Route 6, rather than the existing utility ROW north of Route 6 (Exh. VW-2, at 1-17).[38] Variant 3 diverges from the New Hampshire Avenue Route at the western end of the abandoned road segment, crossing Willow Street and continuing westward through a currently wooded area before rejoining the New Hampshire Avenue Route at the existing unpaved access road and utility ROW near the Barnstable Switching Station (id.; Exh. VW-3, fig. 1-12, at 4). The total length of Variant 3 is approximately 5.1 miles – approximately 0.9 miles shorter than the New Hampshire Avenue Route (Exh. VW-2, at 1-17).

Variant 5 to the New Hampshire Avenue Route provides an alternative access to the Substation site (Exh. VW-2, at 1-18). This variation avoids use of the unpaved access road near the Barnstable Switching Station and instead continues south on Mary Dunn Road to Independence Drive before traveling west on Independence Drive to enter the Substation site (id.). The total length of Variant 5 is approximately 6.0 miles – 4.8 miles within existing roadway layouts and 1.2 miles within existing off-road ROWs (id.).

C. Offshore and Landfall Impacts

1. Construction Methods and Sequencing

Vineyard Wind stated that the Project would be installed using construction techniques designed to maximize efficiency while minimizing environmental impacts (Exh. VW-2, at 5-34). Project construction would begin with the onshore Substation civil works, followed by installation of substation equipment, HDD or open trench work at the landfall site, and installation of the Onshore Cables (id.). Installation of the Offshore Cables would follow (id.). The construction methods proposed by the Company for the Offshore Cables and the Covell's

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[38] According to the Company, the bike path proposed for use in Variant 3 has not yet entered permitting, but has received Article 97 approval (Exh. VW-2, at 1-16).

Beach and New Hampshire Avenue landfall sites are described below. The construction methods proposed for the Onshore Cables and Substation are described in Section VI.D, below.

a. Offshore Cable Installation

Installation of the Offshore Cables would begin with a pre-lay "grapnel run" to locate and remove any obstructions, such as abandoned fishing gear and other marine debris, from the seafloor where the cables would be laid (Exhs. VW-2, at 5-36; EFSB-MC-8; Tr. 4, at 638). Once the route has been cleared, the Company would complete any necessary dredging and begin offshore cable laying (Tr. 3, at 498).[39] Vineyard Wind would install each cable in segments, with some segments being installed concurrently (id. at 461-462, 498; Exh. VW-16, at 8-9; RR-EFSB-27(1), at 3-5).

Vineyard Wind stated that the target burial depth of the Offshore Cables is approximately five to eight feet below stable seabed and that, given conditions along the Western Offshore Corridor, this burial depth could be achieved for the majority of the route using a simultaneous lay and bury approach via jet-plow (Exh. VW-2, 5-35; Tr. 3, at 469).[40] In areas where jet-plow installation would be insufficient to achieve the target burial depth (e.g., areas with large sand waves or stiff sediments), the Company would employ alternative techniques, such as dredging or mechanical trenching (Exh. VW-9, at 1-37 to 1-39, 1-49 to 1-50; Tr. 3, at 473).[41]

The Company explained that jet-plowing involves a vessel pulling a seabed tractor or sled (the jet-plow), which rides along the seafloor on two tracks or skids with the transmission cable suspended between (Exh. VW-9, at 1-37; Tr. 3, at 478-479). The jet-plow directs

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39 The Company stated that it intends to begin cable installation within 30 days of completing any necessary dredging (Tr. 3, at 495).

40 Vineyard Wind asserted that a burial depth of five to eight feet below stable seabed is more than twice as deep as is necessary to protect the Offshore Cables from potential anchor strikes or fishing activities (Exh. EFSB-MC-10).

41 Other possible installation techniques the Company stated may be employed based on specific seafloor characteristics include mechanical plowing; shallow water cable installation tractor; pre-trenching; boulder relocation; precision installation; and jetting (Exh. VW-9, at 1-37 to 1-39).

pressurized seawater into the seabed, fluidizing the sediment and allowing the cable to sink under its own weight to a selected depth (Exh. VW-9, at 1-37). Vineyard Wind stated that as the jet-plow advances along the route, fluidized sediment naturally settles out of suspension to refill the trench, allowing for simultaneous lay and burial of the cable (id.).

The Company stated that, while the exact installation approach to be used for the Offshore Cables was subject to further engineering and discussion with the installation contractor, the most likely approach to cable installation would be to jet-plow the entire route, suspending the jetting action in areas with more difficult sediment conditions, and restarting the jet-plow after the obstruction has been passed (Tr. 3, at 474). In areas where the jetting is suspended, some length of cable would be left uncovered on the seafloor until jet-plowing of the entire route was complete, at which point the Company would return with a different piece of equipment, such as a mechanical trencher, to complete cable burial (id. at 473-474).[42] Vineyard Wind estimated that cable laying via jet-plow would advance at a rate of approximately 656 feet per hour and that installation activities associated with the Offshore Cables would occur 24 hours per day (Exhs. EFSB-MC-1; EFSB-MC-6; Company Brief at 29).

For portions of the route where large sand waves are present the Company would remove the tops of the sand waves prior to jet-plow installation of the cable (Tr. 3, at 494-495, 497). Vineyard Wind stated that it would likely use a trailing suction hopper dredge ("TSHD") to complete this work (id. at 499). Vineyard Wind explained that TSHD involves a drag arm extending from the operating vessel to the seabed, which contains a hose through which pumps located on the vessel suction water and sediment into a storage area (i.e., a "hopper") aboard the vessel (Exh. VW-9, att. F at 50). Once the hopper is full, the vessel would sail approximately 825 feet away from the cable route and release the dredged material about 20 feet below the surface into the water column (Exh. VW-9, at 10-36, att. F at 51).[43]

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[42] Vineyard Wind reported that, in areas where the Company is unable to achieve the target burial depth, cable protection measures, such as rock placement over the cables, may be required (Exh. VW-6, at 4-17).

[43] Vineyard Wind stated that because dredging is only proposed for sand waves, side-cast material would remain in areas characterized by sand waves and would be available for

Vineyard Wind stated that it was seeking to maximize the length of the Offshore Cables that can be installed by vessels equipped with dynamic positioning systems; however, due to strong currents (particularly in the Muskeget Channel) and shallow water depths (particularly in Lewis Bay) some anchoring would likely be required (Exhs. VW-2, at 5-36; VW-9, at 1-40). Vessels equipped with a dynamic positioning system use a variety of onboard sensors and the ship's thrusters to maintain the correct course (Exh. EFSB-A-3; Tr. 3, at 538). When anchoring is necessary, an auxiliary vessel (such as an anchor-handling tugboat) would be used to place the anchors and winches on the main vessel to position the ship appropriately (Tr. 3, at 538-539).[44] A temporary safety zone approximately 0.19 square miles in size would be maintained around installation vessels, regardless of whether a dynamic position system or anchoring is used (Exh. VW-9, at 1-86).

b. Landfall Site Construction

The Company proposed two distinct approaches to landfall site construction: HDD, which could be used at either the Covell's Beach or New Hampshire Avenue landfall sites; and open-cut trenching, which could only be used at the New Hampshire Avenue landfall site (Exh. VW-2, at 5-37 to 5-38).[45,46]

Vineyard Wind stated that the first step of HDD installation at either landfall site would be to erect safety fences and erosion controls, and to assemble the HDD drilling equipment at the

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reworking by ocean currents (Exh. VW-9, at 10-36). See Section VI.C.2.a, below, for discussion of the land use impacts associated with marine construction.

44 Vineyard Wind stated that depending on the final installation tool selected there is the potential that anchoring may be required along the length of the offshore route to achieve sufficient pulling force (Exh. VW-14, at 4).

45 The Covell's Beach HDD, shortened by 2,000 feet from the Company's original estimate of 3,000 feet, would be approximately 1,000 feet long from the parking lot to the water (Exh. VW-2, at 5-39; Tr. 3, at 372).

46 Vineyard Wind indicated that it would prefer to use open-cut trenching at the New Hampshire Avenue landfall site, but that HDD installation was still under consideration (Exh. VW-2, at 5-38; Tr. 2, at 286-287).

onshore end of the landfall site (Tr. 2, at 326; RR-EFSB-23(1); RR-EFSB-23(2)). The Company would then excavate an approximately ten foot by ten foot approach pit to serve as the on-shore entry point for the drill itself, and install a steel conductor sleeve to support the initial portion of the excavation (Exh. EFSB-NO-5; Tr. 2, at 326, 330-332). A small pilot hole would be drilled from the approach pit out to the seafloor exit of the HDD (Exh. VW-6, at 9-10; Tr. 2, at 326). Vineyard Wind stated that an inert, bentonite clay drilling fluid would be used to cool and lubricate the drill bit and other HDD equipment as the pilot hole is excavated (Exh. VW-6, at 9-11).[47] Vineyard Wind will require that contractors reduce the potential for an inadvertent release of drilling mud as the borehole reaches the seafloor by replacing drilling fluid with water as the pilot hole approaches the seafloor, or by taking other steps that are similarly protective (id.; Tr. 3, at 454).[48]

Following completion of the pilot hole, Vineyard Wind would replace the cutting head on the drill shaft with a reaming device and the borehole would be widened to the appropriate diameter as the drill is pulled back towards shore (Exh. VW-6, at 9-11; Tr. 2, at 327). Cuttings would be pumped from the borehole into onshore settling and reclaim tanks as part of the reaming process and non-reusable material would be trucked to an appropriate disposal site (Exh. VW-6, at 9-11). The Company would then pull a continuous piece of high density polyethylene ("HDPE") conduit through the borehole, completing the HDD process for the first Offshore Cable (id.). The process would be repeated for the second Offshore Cable (Exh. EFSB-LF-4; Tr. 3, 372-374). According to the Company, scuba divers would be used to insert the Offshore Cables into the exposed end of the HDPE conduit and the cables would be pulled through to the onshore connection (Exh. VW-6, at 9-11). Divers would then bury cable at

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47 The bentonite drilling fluid also serves to seal the sides of the borehole once excavation has proceeded beyond the depth of the conductor sleeve (Exh. VW-6, at 9-11; Tr. 2, at 330-331).

48 The Company stated that bentonite clay is a benign, natural material that poses little threat to water quality or ecological resources (Exh. EFSB-MW-9). Nevertheless, should the drilling crew detect drilling fluid losses indicative of a release, the crew would shut down the drilling fluid pumps and take technical corrective action(s) (id.).

the seaward end of the HDD, likely by hand-jetting a small area of seafloor to allow the cable to the desired depth (id.).

In the case of open-cut trenching at the New Hampshire Avenue landfall site, Vineyard Wind stated that landfall site construction would begin with the installation of a three-sided cofferdam made of sheet piles at the end of New Hampshire Avenue (Exh. VW-6, at 9-8). The cofferdam would be installed using a barge-mounted crane and would measure approximately 30 feet wide by up to 215 feet long, with the open end located at the landward side (id.).[49,50] Once the sheet piles are in place, the Company would cut the tops off at a height of approximately five feet above mean high water and seal the vertical seams to hold back seawater (id.).

Next, Vineyard Wind would dewater the area contained by the cofferdam and excavate two trenches for the Offshore Cables from a point approximately 200 feet offshore to an offshore/onshore transition vault located in New Hampshire Avenue (Exh. VW-6, at 9-8 to 9-9). The Company explained that, depending on the effectiveness of the sheet piles and the dewatering system, an excavator could potentially enter the cofferdam area to excavate the trenches (Exh. EFSB-LF-4). Alternatively, trench excavation could be accomplished using barge-mounted equipment (id.). HDPE conduits would then be installed and the trenches backfilled (Exh. VW-6, at 9-9). Finally, the Offshore Cables would be brought to the ends of the conduits and pulled through to the offshore/onshore transition vault on New Hampshire Avenue (id.).

c. Offshore Cable Splicing

Vineyard Wind stated that, due to the length of the Offshore Cables and shallower water depths near the landfall site, at least one splice joint would likely be required for the Offshore

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49 A cofferdam is a watertight enclosure placed or constructed under water and pumped dry so that construction or repairs can proceed under normal (dry) conditions.

50 According to the Company, some riprap would need to be removed from the existing seawall at the New Hampshire Avenue landfall site to accommodate cofferdam installation near shore (Exh. VW-6, at 9-8). Vineyard Wind would restore the riprap and seawall after cofferdam removal (id.).

Cables (Exh. VW-2, at 5-37). Upon reaching the splice joint location, one end of installed cable would be retrieved from the seabed and brought inside the cable laying vessel (id.). Aboard the vessel, one end of a newly delivered length of cable would be spliced to the free end of the installed cable over approximately six days (id.; Exh. EFSB-MC-5).

Vineyard Wind reported that good weather is required to complete Offshore Cable splicing since during the joining process the seaward end of the Offshore Cable is suspended over the stern of the vessel (Exhs. VW-9, at 1-40; EFSB-MC-5). Vineyard Wind indicated that if adverse weather conditions were encountered during Offshore Cable installation, the Company would cut the cable and suspend installation activities, and that the vessel would seek refuge in a safe location (Exh. VW-9, at 5-8 to 5-10; Tr. 3, at 520). The Company would return after the storm has abated to recover the cable end and splice it to the remaining section of cable held on the vessel (Exh. VW-9, at 5-10).

2. Offshore and Landfall Environmental Impacts

a. Land Use and Water Resources

i. Company Description

Vineyard Wind proposes to install the Offshore Cables within an approximately 2,600-foot-wide installation corridor that runs between the Company's offshore lease area and the Cape Cod mainland (the Western Offshore Corridor) (Exhs. VW-6, fig. 2-2; EFSB-ML-3).[51] Vineyard Wind submits that impacts from Offshore Cable installation along a route making landfall at either Covell's Beach or New Hampshire Avenue would be "generally similar and minimized," but notes differences in the total length of the Offshore Cables between the two routes and differences in the potential for near-shore impacts (Company Brief at 121, 127-131).

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[51] Vineyard Wind stated that its proposed installation corridor would allow for flexibility during construction, provides adequate lateral spacing between cables, and avoids SSU areas and other obstacles identified in the Company's 2018 Marine Surveys (Exhs. VW-2, at 4-34; VW-6, at 3-21, 3-23; EFSB-ML-3; Company Brief at 12). The Company stated the corridor also includes areas up to 3,300 feet wide where necessary for maneuverability during construction (Exh. VW-9 at 1-20; Company Brief at 12). The two Offshore Cables would typically be separated by approximately 330 feet within the installation corridor (Exh. EFSB-ML-3).

Vineyard Wind stated that, generally, a shorter route would result in fewer impacts from cable installation (Tr. 5, at 780, 801-803).[52]

According to the Company, the majority of the Western Offshore Corridor consists of low-complexity bottom habitats, primarily classified as flat/sand mud, sand waves, or biogenic structures (Exh. VW-14, at 2-4). The Company identified areas of shell aggregate in the northern portion of Nantucket Sound, and coarse deposits/hard bottom habitat and sand waves in a number of locations within Muskeget Channel (Exh. VW-6, at 4-7).[53] Vineyard Wind estimated that jet-plowing and other typical installation methods would result in a trench width of up to approximately 6.6 feet (Exh. EFSB-ML-11(S)). Where sand wave dredging is necessary, the Company anticipated a trench width of approximately 65 feet (id.; Exh. VW-14, at 2-29.

Table 2, below, provides a summary of the impacts to land under the ocean associated with Offshore Cable installation between the Company's windfarm lease area and a landfall site at either Covell's Beach or New Hampshire Avenue (Exh. VW-14, at 2-27 to 2-28). The Company proposed two potential routes through Muskeget Channel (id. at 2-27).[54] The western route travels through the channel itself where water depths are greater and the currents are

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52 Avoidance, minimization, and mitigation for offshore historical and archeological resources within the Project area will be determined in consultation with the Massachusetts Board of Underwater Archeological Resources through the Section 106 process (Exh. VW-9, at 9-6 to 9-7). The Company indicated that marine survey activities have not located any shipwrecks along the Offshore Cable corridors (id.).

53 Vineyard Wind stated that hard/complex bottom areas (SSU habitat) in portions of Nantucket Sound include high concentrations of coarse material (i.e., greater than 50 percent gravel, cobbles, boulders in a sand matrix), which form a relatively hard substrate suitable for the attachment of sessile benthic organisms (Exh. VW-6, at 2-37). Areas with rugged bottom topography and highly variable bathymetry and slopes were also included in this category (id.). Sessile (immobile) benthic organisms may attach to relatively hard substrate (Exh. VW-9, at 1-23). In addition, hard/complex bottom may require special techniques for offshore cable installation (Exh. VW-2, at 5-34).

54 According to the Company, offshore cable installation in the Muskeget Channel area is particularly challenging and, therefore, the Company has maintained two routing options for traversing the channel (Exh. EFSB-ML-10; Tr. 5, at 771).

stronger (Exh. EFSB-ML-10). The eastern route would instead pass through an area of shallower water with weaker currents (id.). Vineyard Wind stated that the results of its 2017 and 2018 Marine Surveys suggest that the two routes are comparable in terms of the presence of hard bottom habitat, sand waves, and steep slopes (Exh. EFSB-ML-10; Tr. 5, at 773). Vineyard Wind argues that because its assessment shows challenging, but feasible, conditions for both options, with similar overall environmental impact, approval of both routing options through Muskeget Channel is warranted (Tr. 5, at 770-776; Company Brief at 114). The Company stated that, if both route variations were approved, it would ultimately select one of the variations to install both cables based on the results of a detailed engineering and constructability analysis currently underway (Tr. 5, at 770-774; RR-EFSB-33). This analysis includes a comparison of seafloor impacts such as the length of unavoidable hard bottom habitat to be crossed and the length and volume of unavoidable dredging required along each route (RR-EFSB-33).

Table 2. Offshore Cable Corridor Characteristics and Impacts from Installation of Two Offshore Cables (Total State and Federal Waters)

	To Covell's Beach		*To New Hampshire Avenue*	
	West through Muskeget	East through Muskeget	West through Muskeget	East through Muskeget
Offshore Export Cable Corridor Characteristics (total state and federal waters)				
Total Length from Wind Development Area (miles)	37.5 (60.4 km)	39.4 (63.3 km)	42.0 (67.6 km)	43.9 (70.6 km)
Volume of sand wave dredging (nearest 1,000 m^3)	83,000-100,000	96,000-115,000	89,000-107,000	103,000-124,000
Volume of sediment fluidized in trench (nearest 1,000 m^3)	222,000	233,000	249,000	259,000
Impact Calculations (total state and federal waters)				
Trench impact zone (acres)	30	31	34	35
Disturbance zone from tool skids/tracks (acres)	60	63	67	70
Anchoring (acres)	3.7	3.9	4.2	4.4
Cable Protection (acres)	9	9	10	10
Sediment deposition greater than 1mm from dredging (fish egg sensitivity threshold) (acres)	304 (1.23 km^2)	262 (1.06 km^2)	329 (1.33 km^2)	296 (1.20 km^2)
Sediment deposition greater than 20mm from dredging (shellfish sensitivity threshold) (acres)	32 (0.13 km^2)	25 (0.10 km^2)	36 (0.14 km^2)	27 (0.11 km^2)

Source: Exh. VW-14, at 2-27.

As shown in Table 2, an offshore route making landfall at Covell's Beach would be approximately 4.5 miles shorter than a route making landfall at New Hampshire Avenue, assuming the same route through Muskeget Channel (Exh. VW-14, at 2-27). Vineyard Wind indicated that this shorter route length would reduce the amount of anchoring needed during cable installation and would also reduce the amount of cable protection likely to be required (id.;

Tr. 5, at 780).[55] The Company also estimated that a smaller amount of seafloor would be directly impacted by cable trenching, sand wave dredging, and sediment deposition for an offshore route to Covell's Beach than to New Hampshire Avenue (Exh. VW-14, at 2-27). Vineyard Wind indicated that it would minimize seafloor impacts from anchoring and cable protection along either route by using mid-line anchor buoys where feasible and safe, and by seeking sufficient cable burial depth wherever possible (Exhs. VW-6, at 4-16 to 4-17; EFSB-ML-11; EFSB-ML-17).

With respect to hard/complex bottom areas along the Western Offshore Corridor, the Company stated that it conducted a significant survey effort in 2017 and 2018 to assess benthic conditions and to revise OMP-mapped resource areas (Exhs. VW-2, at 4-34 to 4-36; VW-14, at 2-11). In some locations, only a small portion of the installation corridor was characterized as hard/complex bottom, and the Company would site the cables outside of the SSU area (Exh. VW-14, at 2-1, 2-11 to 2-12). For both options through Muskeget Channel, hard bottom covers the full width of installation corridor and thus micrositing cannot be used to avoid impacts to hard bottom in this area (id.). Additionally, Vineyard Wind stated that in most areas where sand waves are present, the sand waves typically cover the full lateral extent of the installation corridor and cannot be avoided (id. at 2-12). The Company stated that its preliminary cable alignments minimize passage through areas of complex bottom while considering technical and logistical factors (id.). Table 3, below, provides a summary of the Company's estimates for impacts to hard and complex bottom from installation of the two Offshore Cables (id. at 2-5).

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[55] Construction of the Covell's Beach Route would also avoid the need to cross an existing electric transmission line to Nantucket and associated cable protection measures at this crossing (Company Brief at 128, citing Exh. EFSB-MC-9; Tr. 2, at 218; Tr. 3, at 532-536; Tr. 4, at 644-645).

Table 3. Offshore Cable Corridor Characteristics and Impacts from Installation of Two Offshore Cables (total, State and Federal Waters)

	Hard Bottom	*Complex Bottom*
To Covell's Beach		
East through Muskeget option		
Eastern cable preliminary alignment	2.1	8.9
Western cable preliminary alignment	2.6	7.6
Total (both cables)	***4.7 (7.6 km)***	***16.5 (26.5 km)***
West through Muskeget option		
Eastern cable preliminary alignment	1.8	9.0
Western cable preliminary alignment	1.6	8.2
Total (both cables)	***3.4 (5.5 km)***	***17.2 (27.7 km)***
To New Hampshire Avenue		
East through Muskeget option		
Eastern cable preliminary alignment	2.1	10.4
Western cable preliminary alignment	2.6	8.9
Total (both cables)	***4.7***	***19.3***
West through Muskeget option		
Eastern cable preliminary alignment	1.8	10.5
Western cable preliminary alignment	1.7	9.5
Total (both cables)	***3.5 (5.6 km)***	***20 (32.1 km)***

Source: Exh. VW-14, at 2-5.

Vineyard Wind also completed an assessment of submerged aquatic vegetation along the Western Offshore Corridor as part of its 2017 and 2018 Marine Surveys (Exh. VW-14, at 2-6 to 2-7). The Company's survey results showed a single patch of eelgrass along the Western Offshore Corridor co-located with an area of hard bottom around Spindle Rock near the Covell's Beach landfall site (Exh. VW-9, at 1-26 to 1-27, 1-84). The Company stated that the HDD installation alignment proposed for the Covell's Beach landfall would entirely avoid impacts to this eelgrass bed (id. at 1-27; Exh. EFSB-G-1(S2)).

With respect to water quality impacts associated with offshore construction, the Company stated that sand wave dredging and cable installation may result in temporary increases in suspended sediment; however, such impacts would occur over a limited period of time (Exh. VW-14, at 4-6). Vineyard Wind stated that it would minimize sediment disturbance by selecting the appropriate cable installation methodology, minimizing the amount of sand wave dredging to the extent possible, and using vessels equipped with dynamic positioning devices to the extent possible to avoid anchoring (Company Brief at 152, citing Exhs. VW-2, at 4-51; VW-6, at 9-41; Tr. 6, at 676). The Company indicated that Offshore Cable installation would not significantly affect either water circulation or surficial sediment grain size distribution (Exh. VW-2, at 4-49).

In order to gain a thorough understanding of the sediment dispersion resulting from construction of the Project, the Company completed a hydrodynamic and sediment dispersion modeling study ("Sedimentation Study") (Exh. VW-9, at 1-51). The Sedimentation Study modeled increases in total suspended sediment ("TSS") and patterns of sediment deposition along the Western Offshore Corridor attributable to Project installation (id.). According to the Company, the Sedimentation Study showed that impacts from Offshore Cable construction would be short term, with elevated suspended sediments typically settling out within four to six hours (id.). Modeling of sand wave removal via TSHD showed TSS concentrations greater than ten milligrams per liter ("mg/L") would extend up to ten miles from the cable trench center line and persist for no more than twelve hours (id. at 1-55). High TSS concentrations (i.e., concentrations greater than 1,000 mg/L) were predicted to occur at distances of up to approximately three miles from the TSHD hopper dumping site for periods of less than two hours (id. at 1-55 to 1-56).[56] Vineyard Wind indicated that harmful effects from high TSS concentrations can be apparent if high concentrations are sustained for 12 to 48 hours, and not the short durations anticipated to result from Project construction (Tr. 4, at 608-609). The Company committed to implementing a benthic monitoring plan designed to assess and document the disturbance to, and the recovery of, the benthic community along the cable installation route (Exh. VW-9, at 1-76, att. D).[57]

Vineyard Wind stated that the offshore portion of the Project would be located entirely within flowed tidelands, and as such would be subject to MassDEP jurisdiction under G.L. c. 91 ("Chapter 91") (Exh. VW-9, at 1-93). Vineyard Wind stated that the Project is a

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56 Vineyard Wind noted that suspended sediment concentrations between 45 and 71 mg/L can occur in Nantucket Sound under natural tidal conditions, and stated that increases in suspended sediment concentrations due to cable installation via jet-plow are within the range of variability already caused by tidal currents, storms, trawling, and vessel propulsion (Exh. VW-14, at 2-36).

57 In comments on the FEIR submitted by the Company, the Massachusetts Division of Marine Fisheries ("DMF") indicated concerns with the Company's proposed benthic monitoring plan (Exh. VW-15, at 8). In connection with its concerns, DMF provided guidance for revising aspects of the plan, including sample sizes and collection methods (id. at 8-10).

water-dependent use as defined by 310 CMR 9.12(2)(e) (id. at 1-94). In the Certificate on the FEIR, the Secretary confirmed this position stating that "the project is water-dependent because the facility requires location in tidal waters and cannot reasonably be located or operated away from tidal waters" (Exh. VW-16, at 14).

The NHESP has mapped piping plover nesting habitat at Covell's Beach and foraging habitat at Egg Island at the entrance to Lewis Bay (Exh. VW-9, at 1-60). Additionally, Vineyard Wind stated that the Project's offshore transmission cables would be located within NHESP-mapped Priority Habitat for state-listed migratory birds including least tern, common tern, piping plover, and roseate tern (which is also a federal-listed species) (Exh. VW-6, at 8-4).

Vineyard Wind identified Muskeget Channel as an area of high-density avian observations for scoters and terns (Exhs. VW-9, at 5-6; VW-14, at 4-4). According to the Company, some marine birds may be disturbed by Project-related vessels and suspended sediments associated with cable installation, leading to temporary displacement during Project construction (Exh. VW-9, at 5-6 to 5-7). The Company stated that cable installation activities would be temporary and short-term in duration in any particular location, and that most birds in the Muskeget Channel area are likely already habituated to vessel traffic (id.). The Company also identified the potential for collisions between birds and lighted vessels during construction in low-light and poor weather conditions (id. at 5-7). The Company stated that it would reduce the number of lights on board Project vessels to only those necessary for safety or required by regulation and that it would ensure down shielding of lights, where possible (id.). Vineyard Wind asserted that with these measures, any impacts to marine birds would be reduced to insignificant levels (id.).

With respect to potential impacts to piping plover nesting areas, the Company stated that the Covell's Beach landfall site itself is not within mapped habitat because the HDD would be staged from the paved parking lot and would extend underneath the beach, avoiding impacts to priority habitat (Exh. VW-9, at 1-60, 5-6). Thus, the Company indicated that there would be no physical disturbance to the piping plovers; however, there is the potential for noise disruptions to nesting areas (id. at 5-6; Tr. 3, at 374-375). Therefore, in consultation with NHESP, the Company committed to beginning HDD work at the landfall site in advance of April 1, or

waiting until after Labor Day, to avoid and minimize noise impacts to piping plover during the breeding season (Exh. VW-9, at 5-6).[58,59]

Vineyard Wind noted that a route making landfall at New Hampshire Avenue would cross a portion of the Town of Yarmouth's mooring field (Exh. VW-9, at 3-11; Tr. 2, at 300). The Company stated that certain types of mooring anchors (e.g., helical pile moorings) have the potential to penetrate to the planned burial depth of the Offshore Cables, and as such could not be sited directly over, or in close proximity to, the cables (Exh. VW-9, at 3-11; Tr. 2, at 300). The Company stated that it would work with Yarmouth to establish an approximately 400-foot-wide exclusion zone for these types of anchor systems along the cable corridor if the New Hampshire Avenue Route were selected (Exh. VW-9, at 3-11; Tr. 3, at 428-429). No anchoring restrictions were anticipated in association with a route making landfall at Covell's Beach (Tr. 3, at 443, 445).

Regarding landfall site construction, Vineyard Wind stated that installation of the Offshore Cables would involve crossing Land Subject to Coastal Storm Flowage ("LSCSF") at the Covell's Beach landfall site, and crossing Coastal Beach, LSCSF, and Riverfront Area ("RFA") for the New Hampshire Avenue landfall site (Exh. VW-6, at 4-2). The Covell's Beach landfall site would also involve crossing land subject to Article 97 jurisdiction, and approval for easements for the Offshore Cables beneath Covell's Beach and the associated parking area would be required (Exh. VW-14, at 1-23). On October 18, 2018 the Barnstable Town Council granted an easement across Covell's Beach, and it also sponsored a petition to the Legislature in favor of Article 97 legislation for the Company's use of Covell's Beach (Exh. VW-12).

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58 Vineyard Wind reported that NHESP supports the Company's plans to perform HDD work at the Covell's Beach landfall site provided that HDD work begins in advance of April 1 and continues without any large breaks in activity, or is delayed until after August 31 (Exh. VW-14, at 221; Tr. 3, at 374-376). Vineyard Wind indicated that this approach would ensure any piping plovers in the area were familiarized with construction noise prior to nesting and would minimize impacts to this species during the breeding season (Exh. VW-14, at 221; Tr. 3, at 374-376).

59 Vineyard Wind will also develop a piping plover protection and contingency plan to ensure protection in the event that either delays or HDD issues arise during the cable installation process (Exh. VW-16, at 22).

ii. Positions of the Parties

The Town of Yarmouth argues that: (1) environmental impact from a landfall at New Hampshire Avenue would be greater than from a landfall at Covell's Beach; (2) Vineyard Wind has failed to provide sufficient information regarding Lewis Bay to allow the Siting Board to properly compare the environmental impacts of the two landfall sites under consideration; and (3) a route making landfall at New Hampshire Avenue presents additional technical challenges for the Company compared to a route making landfall at Covell's Beach (Yarmouth Brief at 2, 12, 20).[60]

Yarmouth maintains that Lewis Bay is an environmentally sensitive shallow estuary with a nitrogen-impaired ecosystem (Yarmouth Brief at 2, 11, citing Exh. VW-6, at 11-70 to 11-71). Yarmouth submits that construction and operation of the Project could release additional nitrogen and increase TSS in the bay, leading to decreased light levels and adverse impacts (id. at 11, citing Exh. VW-8, at 93-94).[61] Yarmouth also voices concern that the placement of the Offshore Cables in Lewis Bay could restrict future efforts by the Town to address nitrogen-loading levels (id. at 11, citing RR-EFSB-20(1) at 62).

Yarmouth questions the accuracy of the Company's sedimentation modeling for Lewis Bay and notes that the Sedimentation Study did not compare the potential for impacts between HDD and open-cut installation (Yarmouth Brief at 15, citing Tr. 3, at 370).[62] Yarmouth

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60 Other limited participants and public commenters, primarily from Yarmouth, indicate opposition to an offshore route making landfall at New Hampshire Avenue for reasons also addressed by the Town of Yarmouth, including, for example, concerns with the need to cross the existing electric cable to Nantucket and challenges associated with cable installation in a shallow estuary (see, e.g., Brita Comments at 2; Greely/Bernstein/ Henderson/Johnson Comments at 1-2).

61 Yarmouth also indicated that Vineyard Wind's operation and maintenance activities, including the possible need to rebury the Offshore Cables in the future, could result in additional adverse impacts to Lewis Bay (Yarmouth Brief at 19, citing Tr. 4, at 573, 575-576).

62 According to Yarmouth, the Company's draft Benthic Monitoring Plan also lacks required pre- and post-construction monitoring specific to Lewis Bay (Yarmouth Brief at 17, citing Exh. VW-9, att. D).

maintains that a detailed, pre-construction, environmental, water quality, and habitat study for the entirety of Lewis Bay is necessary to assist in providing proper mitigation for the Project if a landfall at New Hampshire Avenue is selected (id. at 13).

Yarmouth submits that landfall site construction at New Hampshire Avenue is more constrained than at Covell's Beach, with a greater number of residents located near the work area (Yarmouth Brief at 19, citing Tr. 2, at 289; RR-EFSB-23). Additionally, the Town states that its residents have expressed significant concerns regarding the Project, while no such opposition has been presented by residents of Barnstable (id. at 19, citing Tr. 2, at 280).

Yarmouth reports that it maintains about 60 boat moorings offshore from New Hampshire Avenue and that the Town's sailing center is located near the proposed New Hampshire Avenue landfall site (Yarmouth Brief at 12, citing Exh. VW-6, at 4-6). Yarmouth opposes trench installation and submits that safeguards associated with the placement of the cables in a trench (rather than in a subsurface conduit via HDD) would negatively impact the town's tourism, recreation, and aquaculture industries (id.). For example, Yarmouth states that helical pile moorings would be restricted in a portion of the Town's mooring field and opines that this restriction could be expanded to apply to all mooring types along the Offshore Cable corridor (id. at 19, citing Tr. 3, at 431, 443-444). The Town notes that no such restrictions would be present at the Covell's Beach landfall site (id. at 19, citing Tr. 3, at 443, 445).

In addition, Yarmouth argues that Offshore Cable installation in Lewis Bay presents additional challenges that would be avoided by the Covell's Beach Route (Yarmouth Brief at 20). Challenges identified by the Town include the need to cross the existing offshore cable to Nantucket, the need for shallow-water installation techniques, and additional time-of-year ("TOY") restrictions (Yarmouth Brief at 20-21, citing Exhs. VW-6, fig. 2-4; VW-9, at 44; Tr. 2, at 220; Tr. 4, at 563, 707; RR-EFSB-20(1) at 12, 16).

Overall, Yarmouth submits that an offshore route making landfall at New Hampshire Avenue would be four to five miles longer than a route making landfall at Covell's Beach, Yarmouth submits that, all things being equal, a shorter route is preferable and has fewer environmental impacts (Yarmouth Brief at 21, citing Tr. 1, at 198, Tr. 2, at 217).

The Company agrees that the Covell's Beach Route is superior to the New Hampshire Avenue Route, but it asserts that parties overstate the difference between the generally comparable routes (Company Reply Brief at 4-5). Further, Vineyard Wind asserts that it comprehensively evaluated and minimized impacts associated with the New Hampshire Avenue Route (id. at 5-13). Vineyard Wind maintains that the New Hampshire Route (and its variations) remains a viable alternative with generally comparable impacts to the Covell's Beach Route, and that the New Hampshire Avenue Route (and variations) is acceptable and consistent with all applicable standards (id. at 3).

iii. Analysis and Findings on Land Use and Water Resources

Vineyard Wind proposes to install the two Offshore Cables along an approximately 2,600-foot-wide Western Offshore Corridor, which includes a landfall site at either Covell's Beach or New Hampshire Avenue, and two potential routes through Muskeget Channel. The Company's preferred offshore route would make landfall at Covell's Beach. Intervenors and limited participants have expressed support for the Company's position that the Covell's Beach Route would be preferable to a route making landfall at New Hampshire Avenue from an offshore land use and water resource impacts perspective. Vineyard Wind has requested Siting Board approval of both a western or eastern route through Muskeget Channel, arguing that flexibility is necessary to accommodate the challenging installation conditions in this area and that similar seafloor conditions are present along both routes.[63] No parties have expressed a position on this offshore routing approach.

The record shows that a route making landfall at Covell's Beach would be approximately 4.5 miles shorter than a route making landfall at New Hampshire Avenue and that this shorter length would result in fewer environmental impacts. Specifically, the Company's estimates show that a lower volume of sand wave dredging would be required for the Covell's Beach Route (approximately 6,000 to 9,000 cubic meters less), and that fewer acres of trench excavation impacts (eleven acres less), anchoring impacts (half an acre less), and cable

[63] Ultimately, only one route through Muskeget Channel would be constructed for the Offshore Cable.

protection (one acre less) would result. Restrictions to the placement of boat moorings and a crossing of the existing underwater electric cable to Nantucket would also be avoided by an offshore route making landfall at Covell's Beach. Vineyard Wind committed to minimizing seafloor impacts from anchoring and cable protection by requiring the use of mid-line anchor buoys where feasible and safe, and by seeking to achieve a sufficient cable burial depth, wherever possible, along the Offshore Cable route. In addition, as noted earlier, Vineyard Wind plans to use vessels equipped with dynamic positioning devices to the extent possible.

With respect to hard/complex bottom areas along the Western Offshore Corridor, the record shows that a similar amount of hard bottom habitat is located along both routes and that there is an increased presence of complex bottom (approximately 2.8 miles more) along a route making landfall at New Hampshire Avenue. A single patch of eelgrass was identified near the Covell's Beach landfall site. The Company's commitment to install the Offshore Cables using HDD at the Covell's Beach landfall site would avoid any impacts to eelgrass resources, and careful positioning of the cables within the Western Offshore Corridor (i.e., micrositing) would further minimize impacts to SSU areas along the offshore route.

Results from the Company's 2017 and 2018 Marine Surveys show similar SSU characteristics along both the western and eastern routing variations through Muskeget Channel. Vineyard Wind is awaiting the results of a detailed engineering and constructability analysis in order to make a final determination as to its preferred route in this location. The engineering and constructability analysis will include, among other things, a detailed assessment of impacts to hard bottom habitat along the two routes, as well as quantification of the length and volume of sand wave dredging. The Siting Board recognizes the challenging installation conditions in the vicinity of Muskeget Channel and concurs with the Company that routing flexibility in this location is warranted. The Siting Board therefore finds that using either the western or eastern route through the Muskeget Channel is acceptable and approves the Company's use of either route. The Siting Board directs Vineyard Wind to notify the Siting Board of the Company's final selection of either the western or eastern route through the Muskeget Channel, including documentation and analysis describing the results of the engineering and constructability analysis for Muskeget Channel.

With respect to water quality impacts associated with offshore construction, the record shows that sand wave dredging and cable installation would result in temporary increases in suspended sediment concentrations, but that these impacts would be of limited extent and duration. Modelling of sand wave removal via TSHD showed TSS concentrations greater than 10 mg/L would extend up to ten miles from the cable trench center line and persist for no more than twelve hours. High TSS concentrations (those greater than 1,000 mg/L) resulting from TSHD hopper dumping would persist for periods of less than two hours.[64,65]

The Company committed to minimizing sediment disturbance through the selection of the appropriate cable installation tools, limiting the amount of sand wave dredging to the extent possible, and using vessels equipped with dynamic positioning devices to avoid the need to use anchors. Vineyard Wind also committed to implementing a benthic monitoring plan to assess and document the disturbance to, and the recovery of, the benthic community along the cable installation route. The Siting Board directs the Company to cooperate with DMF in planning and implementing its benthic habitat monitoring for the Project and to comply with applicable permit, license, and approval requirements that pertain to benthic habitat monitoring.

Offshore routes making landfall at Covell's Beach or New Hampshire Avenue would also pass through areas of Priority Habitat for a number of state-listed migratory birds. Regular exposure to vessel traffic, the limited duration of the Company's proposed construction activities in any particular location along the Western Offshore Corridor, and the Company's commitment to limit vessel lighting all serve to minimize the potential for impacts to avian foraging behavior and for collisions between birds and Project vessels. Potential impacts to piping plover nesting habitat at the Covell's Beach landfall site would also be minimized through the use of HDD (which avoids any direct impacts to the beach) and the Company's commitment to begin HDD operations before April 1 or to wait until after August 31.

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64 TSS concentrations associated with jet-plow or other typical installation methods would be significantly less than those associated with sand wave dredging.

65 See Section VI.C.2.b. below, for an assessment of potential impacts to marine species associated with sediment suspension and deposition.

Finally, with respect to onshore construction at the landfall sites, fewer wetland resources would be crossed at the Covell's Beach landfall site than at the New Hampshire Avenue landfall site. Article 97 approval would be required for the Covell's Beach Route; however, the record shows that the Town of Barnstable supports the issuance of an easement over Covell's Beach. Barnstable has also sponsored a petition to the Legislature in favor of Article 97 legislation for the landfall site.

Based on the above, the Siting Board finds that the Covell's Beach Route is preferable to the New Hampshire Avenue Route with respect to offshore and landfall site land use and water resource impacts. The Siting Board further finds that: with (1) the mitigation measures proposed by the Company; (2) compliance with the above reporting condition relating to the final route selected in Muskeget Channel; and, (3) compliance with the condition that the Company coordinate with DMF in planning and implementing its benthic habitat monitoring for the Project, impacts to offshore and landfall site land use and water resources along the Covell's Beach Route would be minimized.

b. Impacts to Shellfish, Fish, and Protected Marine Species

i. Company's Position

(A) Covell's Beach Route

In assessing the impact of the Project on marine life, Vineyard Wind particularly focused on commercial shellfish, commercial fish, marine mammals, and turtles. Vineyard Wind stated that, according to the DMF, the Covell's Beach landfall site appeared to have fewer marine resources, and to involve a lower risk of impact for those resources, than the New Hampshire Avenue landfall site (Exh. EFSB-F-7; Tr. 4, at 627-628, 630, 655).[66] The Company indicated the presence of horseshoe crab habitat at the intertidal area of Covell's Beach and of surf clam habitat in offshore waters at Covell's Beach (Exh. EFSB-F-7; Tr. 4, at 627-628, 630). The

[66] Agencies assessing the impact of the Project on marine resources, in addition to the DMF, include CZM and NHESP (Exh. VW-9, at 5-1). All three agencies submitted detailed comments into the BOEM NEPA EIS scoping process in 2018 (id.). Federal agencies also reviewing the Project include the USFWS and NMFS, as well as by environmental non-governmental organizations (id.).

Company stated that its planned use of HDD would avoid impacts to horseshoe crabs and their habitat at that location (Tr. 4, at 627-628, 630; Company Brief at 150).

Mapped shellfish areas along the route of the Offshore Cables include surf clam and bay scallop within Nantucket Sound and surf clam and blue mussel within the north end of the Muskeget Channel (see below for a discussion of shellfish in Lewis Bay) (Exhs. VW-14, at 3-6; VW-6, at fig. 4-4).

The Company conducted sediment dispersion modeling to assess potential impacts from dredging and cable installation on marine resources (i.e., shellfisheries, fish, and other marine species such as mammals and sea turtles) and provided modeled results (Exhs. EFSB-F-1; VW-6, at 4-22 to 4-23). The Company's model indicated that deposition of sediment thicker than 0.2 millimeters ("mm") would extend less than 200 meters to the side of cable placement and did not reach 5.0 mm for any of the modeled cable installation scenarios (Exh. EFSB-F-1(S)). According to Vineyard Wind, the modeled suspended sediment concentrations and durations of exposure for dredging and cable installation were below the levels that might cause sub-lethal or lethal effects to benthic organisms, including quahogs, oyster eggs, mollusk juveniles and eggs, and all life stages of crustaceans (id.).

The Company indicated that modeled temporary increases in suspended sediments due to dredging and cable installation operations indicated little to no effect on motile pelagic organisms (fish and invertebrate larvae, juveniles, and adults, such as shrimp) or burrowing invertebrates (Exh. EFSB-F-1). The Company explained that this was because the mobility of pelagic species allows them to escape harm and move away from the construction path in areas with increased suspended sediment; for non-motile organisms, the modeled suspended concentrations and durations are below known sub-lethal thresholds (id.). Vineyard Wind likewise explained that it did not anticipate that sediment dispersion due to dredging and cable installation operations would affect protected marine species (e.g., marine mammals and sea turtles) because these mobile species would be able to move away from the construction path in areas with increased suspended sediment (id.).

Vineyard Wind stated that the Project-related effects on fisheries in the cable corridor would be very short-term and localized and unlikely to result in significant fishery-related

economic impacts (Exhs. VW-9, at 1-84; VW-14, at 3-8). The Company also discussed impacts of the Project specifically on whelk, a commercially important marine species, and on fixed gear fishery, managed by the DMF (Exh. VW-9, at 3-10).[67] Vineyard Wind acknowledged the potential for impacts to whelk and squid mops (egg masses) in the direct area of disturbance during cable installation, but explained that this potential for impacts was limited given the wide distribution of whelk and squid habitat in the region (Tr. 4, at 599, 601-602, 606). The Company stated it has been communicating with fishermen and their representatives, as well as with other related fisheries groups such as the Massachusetts Lobstermen and the Martha's Vineyard Fishermen Preservation Trust regarding Project impacts and mitigation (Exh. VW-9, at 3-10).

The Company stated its willingness to implement TOY restrictions for various fisheries-related purposes, including protection of squid mops (Tr. 3, at 510-514). Specifically, Vineyard Wind acknowledged DMF's preference for cable laying within Nantucket Sound outside of April, May, and June since spring is the period of commercial squid activity (Exhs. VW-14, at 3-12 to 3-13; VW-16, at 17; EFSB-MC-2(S2); RR-EFSB-27(1); RR-EFSB-27(2)). Vineyard Wind continues to evaluate options to avoid work within this TOY restriction, including Project sequencing and whether the Company could accept more weather-related risk in the other months (Exh. VW-16, at 17; RR-EFSB-27(1)).

Vineyard Wind reported that it has established a Fisheries Communication Plan ("FCP") to facilitate discussions between fishermen and the Company (Exh. VW-9, at 4-5). The Company also presented a framework for a pre- through post-construction fisheries monitoring program to measure the Project's effect on fisheries resources (id.).[68] The Company explained that this was a cooperative effort involving the Company, the University of Massachusetts

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67 DMF has suggested that whelk might be harvested and/or translocated by local fishermen from offshore cable corridor areas prior to the cable installation; Vineyard Wind indicated it is open to this approach (Exh. VW-9, at 3-10).

68 The time and duration of monitoring is still to be determined but the Company anticipates that it will include the pre-construction period and at least one-year of post construction monitoring (Exh. VW-16, at 11-12).

Dartmouth School for Marine Science and Technology ("SMAST"), fishermen, the fisheries science community, and other stakeholders (Exh. VW-9, at 4-5).[69]

The Company indicated that recreational anglers' access concerns involve the wind turbine arrays in federal waters rather than the Project's use of state waters, which is the focus in this proceeding (Exhs. EFSB-F-5; VW-9, at 10-104 to 10-105). Vineyard Wind stated, however, that it did not anticipate impacts to species of interest to recreational anglers as a result of Project pre-construction, construction, or operation (Exh. EFSB-F-5). The Company reported, furthermore, that it was communicating with recreational anglers about their concerns and would continue to do so (id.).

The Company has developed a Navigational Risk Assessment for the Project (Exh. EFSB-F-15).[70] The Company also indicated it would employ a Marine Coordinator to manage all construction vessel logistics and act as a liaison with various authorities, marine patrol, and port operators (id.). The Company anticipated that an important function of the Marine Coordinator would be to ensure that Project activities do not interfere with recreational and commercial fishing vessels and their equipment (Exhs. EFSB-F-15; VW-14, at 5-14). Further, Vineyard Wind stated it would implement the use of consistent transit lanes for its construction-related vessels to avoid conflicts with other vessels and minimize or eliminate loss of gear (Exh. VW-14, at 5-14).

Vineyard Wind stated that, to limit the impacts of noise on sensitive species, including marine mammals and sea turtles, it would minimize underwater sound generated by offshore

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69 In comments on the FEIR submitted by the Company, DMF indicated its concern that a draft fisheries monitoring plan was not yet available for review (Exh. VW-15, at 8). The agency emphasized the importance of such a review in light of time constraints for pre-construction monitoring (id.).

70 The Navigational Risk Assessment is a guidance document that conforms to U.S. Coast Guard ("USCG") guidelines for offshore renewable energy installations (Exh. EFSB-F-15). It incorporates information obtained through consultation with the USCG, marine trades, and maritime transportation stakeholders (id.).

construction (Exhs. VW-9, at 5-4; VW-6, at 9-39).[71] The Company indicated it would minimize underwater sound and resultant impacts on marine mammals and sea turtles by limiting the speed of the vessel involved in cable-laying below recommended speeds and ensuring that other Project vessels meet applicable speed restrictions (Exhs. VW-9, at 5-2). In addition, Vineyard Wind committed to maintaining minimum setbacks of Project vessels from marine mammals (generally 100 yards, and a larger distance for right whales), and stated that it was in discussions with federal regulators about the potential use of protected species observers as well (id. at 5-2 to 5-3; Tr. 4, at 686, 688). The Company stated that its offshore export cable corridors would also avoid mapped North Atlantic Right Whale core habitat (Exh. VW-6, at 2-40).[72,73]

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71 Vineyard Wind stated that it believes adequate protection of marine mammals is best addressed through the Marine Mammal Protection Act and with marine mammal experts at the National Marine Fisheries Service and BOEM (Exh. VW-14 at 4-2).

72 Vineyard Wind also stated that it would implement a $3,000,000 fund to advance marine mammal protection given the growing offshore wind industry (Exhs. VW-6, at 4-23; VW-14, at 1-17; RR-EFSB-32). Examples of initial ideas for the fund are quieter pile driving technologies, technologies to better protect whales or other mammals in exclusion zones, and efforts to implement fishing practices that provide stronger protections to whales and marine mammals (Exh. VW-14, at 1-18).

73 On January 22, 2019, Vineyard Wind also entered into an agreement with the National Wildlife Federation, the Natural Resources Defense Council, and the Conservation Law Foundation ("NGO Agreement") in which Vineyard Wind voluntarily committed to implement certain measures protective of North Atlantic Right Whales (RR-EFSB-50(S); RR-EFSB-50(S)(1)). These measures include the use of real-time passive acoustic monitoring ("PAM") and of Protected Species Observers as well as seasonal restrictions on the use of pile driving (which would not occur in state waters) (RR-EFSB-50(S); RR-EFSB-50(S)(1). The NGO Agreement also includes vessel speed restrictions, reporting commitments, other steps Vineyard Wind will take to minimize impacts to North Atlantic Right Whales, and commitments with respect to Vineyard Wind's marine science and conservation efforts (RR-EFSB-50(S); RR-EFSB-50(S)(1)). The Company stated that the parties to the NGO Agreement intend for it to serve as a model for similar agreements pertaining to offshore wind projects along the East Coast and, specifically, for application of protective measures for marine mammals during marine construction (RR-EFSB-50(S); RR-EFSB-50(S)(1).

(B) New Hampshire Avenue Route

The DMF has indicated that Lewis Bay supports a variety of marine resources including winter flounder, horseshoe crabs, and shellfish including quahogs, oysters, soft shell clams and bay scallop (Exhs. EFSB-F-7; VW-9, at 3-8). DMF has voiced concerns that the proposed cable installations in Lewis Bay could conflict with a seasonal commercial bay scallop fishery and a recreational quahog area at the New Hampshire Avenue landfall site (Exh. EFSB-F-7).

The Company addressed potential impacts to quahogs and other shellfish in the area of Lewis Bay (Exh. VW-9, at 3-8; EFSB-F-11). Vineyard Wind characterized quahogs as largely a recreational resource and indicated that the Town of Yarmouth has a stocking program near the New Hampshire Avenue Landfall (Exhs. VW-9, at 3-8; EFSB-F-11).[74] The Company stated that avoidance and minimization of impacts to quahogs within the recreational shellfishing area off New Hampshire Avenue could be accomplished by coordinating with the shellfish constable to ensure that seeding of contaminated quahogs within the cable installation corridor is suspended temporarily until completion of cable installation (Exh. VW-9, at 3-8). Vineyard Wind indicated that cable laying in Lewis Bay would take no more than ten days (id. at 3-9).

The Company stated that avoidance and minimization of impact to bay scallops in Lewis Bay could be accomplished through translocation, whereby scallops within the cable corridor would either be harvested or temporarily relocated by local fishermen under the direction of the local shellfish constable immediately prior to cable installation (Exh. VW-9, at 3-8).[75] The Company intends to conduct cable installation outside the Lewis Bay scallop season, which is October through March (Exh. EFSB-F-6(S)). Vineyard Wind stated that its offshore construction schedule, developed in consultation with CZM and DMF, would attempt to avoid

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74 The Company explained that the program harvests quahogs from contaminated waters in Mount Hope Bay and relocates them to nearshore area of Lewis Bay, where they are typically harvested again following a one-year depuration (purification) period (Exh. VW-9, at 3-8).

75 The Company stated that local resource managers have found bay scallop seeding effective in increasing shellfish stocks and sustaining and enhancing the native bay scallop population (Exh. VW-9, at 3-9).

and minimize impacts to sensitive marine species such as bay scallop and winter flounder (id.). The Company would also implement cable-laying restrictions from January 15 to June 30 to minimize interference with winter flounder, and from January 15 to September 30 to avoid shellfish spawning in Lewis Bay (Tr. 3, at 509-514). Vineyard Wind committed to other potential mitigation to Lewis Bay shell fishermen, such as direct compensation to affected commercial shellfishermen for any lost shellfishing days (Exh. VW-9, at 3-9).[76]

With respect to the Project's potential impact on aquaculture, the Company stated that it has been in contact with the four aquaculture grant holders in Lewis Bay (Exh. EFSB-F-22). According to the Company, one topic of discussion was construction scheduling that might avoid and minimize impacts to aquaculture grant holders (id.).[77] The Company reported that a second topic of ongoing discussion was the parking area at the end of New Hampshire Avenue and maintaining its availability during construction given its importance to oyster lease operations (id.).[78]

ii. Positions of the Parties

(A) Town of Yarmouth

The Town of Yarmouth emphasizes the importance of Lewis Bay in connection with a variety of marine resources, including winter flounder, horseshoe crab, juvenile horseshoe crab,

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76 The Company anticipated establishing a compensation fund for lost fishing days, to be coordinated with the Yarmouth shellfish constable and possibly managed by a third-party administrator agreed upon by shellfishermen, local resource managers, and the Company (Exh. VW-9, at 3-9 to 3-10).

77 Along these lines, two grant holders suggested completion of installations when water temperatures fall below 49 degrees Fahrenheit (Exh. EFSB-F-22). At this temperature, the oysters stop filtering and therefore would be unlikely to process any re-suspended silt (Exh. EFSB-F-22).

78 The Company explained that oystermen parked their trucks and trailers at this location when working their lease; therefore, it was important for Vineyard Wind to propose that the cable make landfall using an open trench rather than HDD (Exh. EFSB-F-22). The open-trench method would have a smaller onshore footprint and occupancy period, thus minimizing impacts to oyster farm operations in Lewis Bay (id.).

and shellfish, as cited by the DMF (Exh. VW-8, at 75). Yarmouth also reports mapping by DMF of soft shell clam and American oyster habitat in Lewis Bay, the presence of bay scallop habitat throughout Lewis Bay, and oyster aquaculture grants along Lewis Bay's eastern shoreline, as well as a seasonal bay scallop fishery in Lewis Bay from October to April (id.).

Yarmouth represents that the scallop fishery is an "intricate part of the commercial and recreational fishery activity that the Town has worked diligently to improve" along with aquaculture shell fishing (Exh. VW-8, at 94). Yarmouth points to a description of Lewis Bay by Vineyard Wind in its SDEIR that, Yarmouth asserts, "concedes the vibrant nature of this [fishing] activity" (Yarmouth Brief at 9-10, citing Exh. VW-9, at 177). Yarmouth remarks on important Lewis Bay quahog habitat and fishery activities including the use of Lewis Bay as a quahog relay area for contaminated shellfish transplanted from Mount Hope Bay (Exh. VW-8, at 75; Yarmouth Brief at 10). Yarmouth expresses concern about the possibility of harm to wild and propagated shellfish health as a result of Project cable installation in Lewis Bay using open-cut trenching methodology and jet plowing (Yarmouth Brief at 11-12, citing RR-EFSB-20(1) at 62).[79]

Yarmouth also highlights concerns about potential impacts to two oyster farmers and several others with Yarmouth-issued aquaculture leases in the eastern end of Lewis Bay, as well as to two shellfish propagation sites operated by the Town in the same area (Yarmouth Brief at 11, citing RR-EFSB-14(1)). Yarmouth questions, in particular, whether sedimentation associated with cable-laying operations and the potential for silt smothering and choking of oysters might result from the Project if constructed through Lewis Bay (id. at 11-12, citing RR-EFSB-20(1) at 315-320). Yarmouth argues that Vineyard Wind has not gathered sufficient information about Lewis Bay shellfish habitat and resources to ensure that it avoids high-density shellfish areas during offshore cable installation, to prevent sedimentation harm to shellfish, or to employ TOY restrictions properly to minimize impacts to Lewis Bay fisheries resources (id. at

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[79] Yarmouth echoes the concerns of the DMF that disturbance to benthic habitat and marine resources, as well as to existing quahog relay area and additional mapped shellfish habitat, might occur with open trenching at the New Hampshire Avenue landfall (Exh. VW-8, at 76).

12-16, citing e.g., Tr. 4, at 591, 593; RR-EFSB-20(1) at 2, 12, 61; RR-EFSB-36(1)). In addition, Yarmouth voices concern that the Company has yet to finalize a mitigation plan for impacts to shellfish and aquaculture interests in Lewis Bay (Yarmouth Brief at 16, citing Tr. 4, at 617-618, 657).[80]

(B) Other Parties/Limited Participants

Mr. Dunbar and Mr. Janiunas, both operating commercial oyster farms in Lewis Bay, raise issue with anticipated impacts on their aquaculture operations due to the proposed burial of transmission cables in Lewis Bay and general disruption to the Lewis Bay seabed by the proposed Project (RR-EFSB-20(1) at 315-320). Their specific concerns are that: (1) plowing, trenching, and burial of industrial cables will cause sand, silt, and sediment to rise – with each successive storm for an extended period of months – throughout the eastern end of Lewis Bay, smothering and choking their oysters; (2) cable operation emanations (including electromagnetism, heat, sound, and vibration) and possible other impacts (vibrio) will affect the Lewis Bay estuary, with detrimental effect on the growth pattern of their oysters; (3) any leak of electricity into Lewis Bay will result in electrolysis, causing damage to aquafarm equipment; and (4) any need for future Offshore Cable repairs will again present all of the above issues (id.).[81] Mr. Dunbar and Mr. Janiunas assert, in addition, that suggestions for remediation by Vineyard Wind are inadequate (id.).

Other limited participants and public commenters, primarily from the Yarmouth community, oppose the landfall of the Project in Lewis Bay given their concerns about fishing, shellfishing, and aquaculture in Lewis Bay, similar to those expressed by the Town of Yarmouth (Exh. VW-8; Tr. 2, at 280; RR-EFSB-20(1)).

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80 According to Yarmouth, landfall at Covell's Beach, by contrast, would not require shellfish or aquaculture mitigation (Yarmouth Brief at 17, n.8, citing Tr. 4, at 655).

81 Vibrio are warm (coastal) water bacteria.

iii. Analysis and Findings on Shellfish, Fish, and Protected Marine Species

Vineyard Wind provided information with respect to impacts to marine life, including shellfish, fish, and protected marine species for its Project given a route to a landfall at Covell's Beach and to a landfall at New Hampshire Avenue via Lewis Bay. Impacts to marine life include impacts from construction, sediment, and noise.

With respect to a landfall at New Hampshire Avenue via Lewis Bay, the record shows that Lewis Bay supports marine resources including winter flounder, horseshoe crabs, quahogs, oysters, soft shell clams, and bay scallop. The marine resources associated with the Covell's Beach landfall are substantially more limited, consisting at the intertidal area of horseshoe crab habitat, to be avoided with the use of HDD, and surf clam habitat in offshore waters, to be avoided as a result of their distance from landfall and Offshore Cable construction.

For Lewis Bay, the Company would rely in large part on TOY construction restrictions to avoid habitat, as well as relocation and seeding programs for shellfish. The Company anticipates developing a plan with the oyster farmers in Lewis Bay that would minimize impacts to oyster farm operations. Nonetheless, the oyster farmers dispute the compatibility of Offshore Cable construction and operation with their activities, and contest the adequacy of the Company's suggestions for mitigation. The Town of Yarmouth also strongly contests the adequacy of the Company's research and conclusions regarding potential effects of Project activities on Lewis Bay fishing, shellfishing, and aquaculture. Other comments, from limited participants and the public, strongly oppose the use of Lewis Bay and the New Hampshire Avenue landfall because of concerns about potential fishing, shellfishing, and aquaculture impacts; such concerns were largely absent in the record with respect to the Covell's Beach Route.

The record shows that the extensive uses of Lewis Bay for fishing, shellfishing, and aquaculture present challenges requiring impact avoidance and mitigation for the New Hampshire Avenue Route. In contrast, the Covell's Beach Route presents few such potential impacts, and has elicited few concerns from the community. The Siting Board concludes that the Covell's Beach Route is preferable to the New Hampshire Avenue Route with respect to impacts to marine life, including shellfish, fish, and protected marine species.

For the proposed Project, the Company would minimize impacts to whelk and squid by scheduling cable installation to avoid disturbing their egg masses. Modeled suspended sediment concentrations are sufficiently low and short-term even near the route centerline to fall generally below sub-lethal or lethal effect levels. The mobility of pelagic species will enable them to move away from sites of increased suspended sediment.

The Company commits to implementing TOY restrictions for various fisheries-related purposes including, for example, the avoidance of commercial squid harvesting and protection of squid mops. Vineyard Wind also acknowledges DMF's preference for cable-laying within Nantucket Sound outside the months of April, May, and June. The Company also continues in its efforts to evaluate options to sequence work with TOY restrictions in mind and to accept more weather-related risk in other months. The Company is relying on the FCP it has established to facilitate discussions between the Company and fishermen and has pursued a monitoring program with SMAST, fishermen, the fisheries science community, and other stakeholders to measure the Project's effect on fisheries resources. The Siting Board directs the Company to cooperate with DMF and SMAST in planning and implementing fisheries monitoring for the Project and to comply with applicable permit, license, and approval requirements that pertain to fisheries monitoring.

With respect to minimizing impacts on protected marine species, including marine mammals and sea turtles, Vineyard Wind proposes a number of methods to protect these species from the noise impacts of underwater sound. First, the Project's offshore export cable corridors would avoid mapped North Atlantic right whale core habitat. Second, the Company would maintain minimum setbacks of vessels from marine mammals, use protected species observers to identify and prevent impacts, and limit the speed of cable-laying and other vessels. Vineyard Wind also proposes a fund to advance marine mammal protection over time and has made commitments to implement certain measures protective of North Atlantic Right Whales along with additional commitments with respect to Vineyard Wind's marine science and conservation efforts. The Company has developed a Navigational Risk Assessment for the Project and proposes use of a Marine Coordinator to manage all construction vessel logistics. The Siting

Board determines that the Company's proposed measures are adequate to minimize impacts of the Project on protected marine species.

Accordingly, given the Company's implementation of proposed mitigation measures and conditions described above, including the condition that the Company coordinate with DMF in planning and implementing fisheries monitoring for the Project, the Siting Board finds that impacts to marine life, including shellfish, fish, and protected marine species from of the construction and operation of the Project along the Covell's Beach Route would be minimized.

c. Noise

i. Description

According to the Company, vessel engines would be the primary source of noise associated with installation of the Offshore Cables and this noise would be temporary and of short duration at any given location (Exhs. VW-9, at 5-3; EFSB-NO-13; EFSB-NO-14). Vineyard Wind submitted that marine species in the Project area are regularly exposed to commercial shipping and other vessel traffic and may have become habituated to vessel engine noise (Exh. EFSB-NO-15(S)). Vineyard Wind indicated that because noise from Project-related vessels is likely to be similar to background noise levels along the installation corridor, risk to marine species associated with additional engine noise is low (Exh. EFSB-NO-15(S)). Additionally, the Company indicated that monitoring for marine mammals and turtles, and associated setbacks and speed-regulation procedures, would reduce vessel noise levels in the vicinity of these species, further mitigating exposure risk (Exh. EFSB-NO-16(S)). In addition, Vineyard Wind stated that noise impacts to sensitive marine species would be minimized in coordination with federal regulators and with reference to National Oceanic and Atmospheric Administration guidance (Exhs. VW-9, at 5-3, 5-5; EFSB-NO-15(S); EFSB-F-16(S); RR-EFSB-50(S); RR-EFSB-50(S)(1)).

With respect to landfall site construction, the Company stated that there would be short-term construction related noise impacts associated with either HDD or open-cut trench installation (Company Brief at 140). For HDD installation at either the Covell's Beach or New Hampshire Avenue landfall sites, Vineyard Wind proposed a construction schedule of Monday

through Saturday from 7:00 a.m. to 7:00 p.m. during the off season (Tr. 2, at 322-323).[82] The Company estimated that HDD installation would be completed in approximately 15 weeks for the Covell's Beach landfall site and nine weeks for the New Hampshire Avenue landfall site (Exh. EFSB-LF-4; Tr. 3, at 373).

According to the Company, the loudest part of HDD installation is conductor sleeve drilling, which would take place over roughly four twelve-hour shifts (Exh. EFSB-NO-5; RR-EFSB-22). The Company reported that for the Covell's Beach landfall site HDD, work would be staged from the eastern side of the beach parking lot, approximately 135 feet away from the closest residential receptor (RR-EFSB-22). At a distance of 135 feet, noise levels associated with conductor sleeve drilling would be approximately 93 A-weighted decibels ("dBA") (id.). In comparison, the closest residential receptor to the New Hampshire Avenue landfall site would be approximately 20 feet away and would experience noise levels of approximately 110 dBA during conductor sleeve drilling (id.). The Company identified a total of two residences within 250 feet of the HDD drill rig at the Covell's Beach landfall site (one of which is a seasonally occupied rental property), and 18 residences within 250 feet of the HDD drill rig at the New Hampshire Avenue landfall site (two of which are known to be seasonally occupied) (RR-EFSB-23).[83]

Vineyard Wind stated that to reduce noise impacts from HDD operations at either landfall site a temporary sound barrier could be constructed (RR-EFSB-22). For the Covell's Beach landfall site, the Company proposed an acoustical blanket – either free-standing or attached to planned security fencing – along the eastern and northern sides of the HDD work area (id.). Vineyard Wind stated that this barrier would need to be at least 16 feet tall and that it would reduce noise from conductor sleeve drilling, and all subsequent HDD installation activities, by 5 to 10 dBA (id.). The Company stated that limited work space at the New

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82 The Company defined the local "off season" as the period outside of Memorial Day to Labor Day (Exh. EFSB-LF-5).

83 Of the 18 residences within 250 feet of the New Hampshire Avenue HDD, three are located within 50 feet (two are seasonally occupied); five are located between 50 feet and 100 feet; and ten are located between 100 feet and 250 feet (RR-EFSB-23).

Hampshire Avenue landfall site could make similar mitigation measures problematic (id.; Tr. 3, at 385-386). Vineyard Wind indicated that at this location, to the extent possible, a construction fence would closely wrap construction activities and an acoustical blanket could potentially be installed along this fence (Tr. 2, at 336-337; RR-EFSB-22). In either case, the Company committed to limiting conductor sleeve drilling to daytime hours (unless otherwise instructed by the municipality) and to contacting housing unit owners proximate to the HDD work area to determine whether other temporary housing could reasonably be provided (RR-EFSB-22).[84]

For open-cut trenching at the New Hampshire Avenue landfall site, the Company stated that work would generally be conducted in eight- to ten-hour shifts Monday through Friday between the hours of 7:00 a.m. and 6:00 p.m., depending on U.S. Coast Guard and/or Town of Yarmouth permit conditions (Exh. EFSB-LF-4; Tr. 2, at 320-322). As with HDD installation, work would be performed during the off season (Exh. VW-6, at 1-9). Vineyard Wind estimated that it would take approximately nine weeks to complete open-cut installation at the New Hampshire Avenue landfall site (Exh. EFSB-LF-4; Tr. 2, at 317).

According to the Company, noise impacts associated with open-cut trenching at the New Hampshire Avenue landfall site would generally be less than for HDD installation (RR-EFSB-22). However, Vineyard Wind indicated that the loudest activity associated with open-cut installation is pavement saw cutting and that this would result in a sound pressure level of approximately 98 dBA at a nearby residence (id.; RR-EFSB-23). The Company anticipated that pavement saw cutting near the landfall site could be completed over the course of a single work shift (RR-EFSB-22). Vineyard Wind identified a total of nine residences within 250 feet of the cofferdam proposed for open-cut trench installation at the New Hampshire Avenue landfall site and stated that two of these residences were known to be seasonally occupied (RR-EFSB-23).

Overall, the Company argues that the Covell's Beach Route is preferable to the New Hampshire Avenue Route with respect to noise impacts from landfall site construction because

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84 The Company stated that it would contact the owners of the two residences closest to the HDD set up at the Covell's Beach landfall site and all owners within 135 feet of the New Hampshire Avenue landfall site (RR-EFSB-22).

construction at New Hampshire Avenue would take place in a more constrained area with a larger number of nearby residences (Company Brief at 129, citing Exh. EFSB-LF-10; Tr. 3, at 384-385, 387; RR-EFSB-22; RR-EFSB-23).

ii. Analysis and Findings on Noise

The record shows that the primary source of noise associated with installation of the Offshore Cables would be vessel engine operations. Regardless of the route selected, Project-related engine noise would be temporary and of short duration at any given location and would be similar to existing background noise levels experienced along the Western Offshore Corridor. The Siting Board finds that noise impacts from installation of the Offshore Cables along routes making landfall at either Covell's Beach or New Hampshire Avenue are comparable and would be minimized.

With respect to noise impacts from landfall site construction, the record shows that conductor sleeve drilling and pavement saw cutting would be the loudest activities associated with HDD and open-cut installation, respectively. Maximum sound pressure levels at the closest residential abutter to the Covell's Beach landfall site, where only HDD installation is proposed, would be 93 dBA. In contrast, maximum sound pressure levels at the New Hampshire Avenue landfall site would range between 110 dBA and 98 dBA, depending on whether HDD or open-cut installation were used. The record demonstrates that fewer residential abutters are located within 250 feet of construction activities at the Covell's Beach landfall site than at the New Hampshire Avenue landfall site. The closest residential receptor is only 20 feet from construction at the New Hampshire Avenue landfall site, whereas there is a separation of 135 feet between the Covell's Beach landfall site and the closest residence. Further, noise mitigation measures, such as acoustical blankets, have a greater likelihood of success at Covell's Beach landfall site due to better workspace availability. Accordingly, the Siting Board finds that the Covell's Beach Route is preferable to the New Hampshire Avenue Route with respect to noise impacts from landfall site construction.

To minimize noise impacts to abutters from HDD installation at the Covell's Beach landfall site, the Company committed to limiting conductor sleeve drilling to daytime hours,

unless requested otherwise by the Town of Barnstable, and to working with the owners of the two closest residences to discuss reasonable temporary accommodations for relocation that could be provided while conductor sleeve drilling is being performed. Additionally, all HDD work would be performed during the off season. The Company also identified the potential for a 5 to 10 dBA reduction in sound pressure levels from all HDD installation activities through the use of acoustical blankets or other similar noise barriers at the landfall site. Given sound levels associated with HDD construction and the duration of the work, the Siting Board directs the Company to use noise barriers at the Covell's Beach landfall site when performing HDD installation activities.

In light of the above mitigation measures, the Siting Board approves the Company's proposed HDD construction schedule of Monday through Saturday between the hours of 7:00 a.m. and 7:00 p.m. Should the Company need to extend construction work beyond those hours and days (i.e., on Sunday), with the exception of emergency circumstances on a given day that necessitate extended hours, the Siting Board directs the Company to seek prior written permission from the Town of Barnstable before commencing work and to provide the Siting Board with a copy of such permission. If the Company and municipal officials are not able to agree on whether such extended construction hours or days should occur, the Company may request prior authorization from the Siting Board and shall provide the relevant municipality with a copy of any such request and authorization.

The Company shall inform the Siting Board and the Town of Barnstable in writing within 72 hours of any work that continues beyond the days and hours allowed by the Siting Board. The Company shall also send a copy to the Siting Board, within 72 hours of receipt, of any municipal authorization for an extension of work hours. Furthermore, the Company shall keep records of the dates, times, locations, and durations of all instances in which work continues beyond the days and hours allowed by the Siting Board, or, if granted extended work hours in writing by a municipality, work that continues past such allowed hours, and must submit such records to the Siting Board within 90 days of Project completion.

With the implementation of the above noise conditions, the Siting Board finds that noise impacts from Offshore Cable and landfall site construction associated with the Covell's Beach Route would be minimized.

d. Magnetic Fields

i. Company Description

Vineyard Wind reported that the maximum modeled full-load (i.e., 400 MW for each cable) magnetic field levels directly above each of the two proposed Offshore Cables would be 162.9 milliGauss ("mG"), assuming a one-meter burial depth; magnetic fields would fall to 44.5 mG with a two-meter burial depth (Exh. VW-6, at 2-28, 4-25). Table 4, below, provides modeled magnetic fields at the sea floor with Project offshore transmission lines buried at one and two meters (id. at 4-25; Exh. VW-9, att. J at 4).[85]

Table 4. Modeled Magnetic Fields at the Sea Floor for Project Offshore Transmission Lines

Cable Load and Depth	Maximum Magnetic Field[86] (mG), Directly Above Centerline	Magnetic Field (mG), +/-20 feet from Centerline
400-MW Submarine Cable/ 1-Meter Burial Depth	162.9	5.4
400-MW Submarine Cable/ 2-Meter Burial Depth	44.5	5.0

Source: Exh. VW-9, att. J at 4.

Vineyard Wind stated that its modeling is conservative because the target burial depth for the Offshore Cables is deeper (1.5 to 2.5 meters, or five to eight feet) than the modeled depths of

85 The Company stated that, given the 50 meter spacing between the two Offshore Cables and the rapid reduction in magnetic field levels with increasing distance away from the cables, there is only minimal interaction of magnetic fields from the two adjacent cables (Exh. VW-9, att. J at 4, 17, 19).

86 Vineyard Wind stated that the shorter cable lengths for the offshore portion of the Covell's Beach Route versus the New Hampshire Avenue Route would reduce the Covell's Beach Route estimated current flow and resulting magnetic fields by two percent (yielding 43.6 mG at a two meter burial depth and 159.6 mG for a one meter burial depth, both above the centerline at a load of 400 MW) (RR-EFSB-41).

one and two meters (Exh. VW-6, at 4-25). The Company added that its Offshore Cable modeling is also conservative because it did not account for the shielding effect of the steel armoring wire forming the outer portion of the Offshore Cables (id. at 2-28 to 2-29; Exh. VW-9, att. J, at 18). The Company estimated that the armoring would reduce magnetic field levels by approximately 50 percent (Exh. VW-6, at 2-29, n.9; Tr. 6, at 899-901).

In its magnetic field modeling, the Company assumed transmission line loadings at 100 percent of the maximum capacity for the proposed 220 kV cable, reflecting maximum wind turbine output and the impacts of charging currents (Exh. VW-9, att. J at 8) (see VI.D.2.f). Because the wind turbine array is expected to operate at an annual capacity factor of approximately 45 percent, the Company stated that, under expected operating conditions, the annual average magnetic fields would be similarly lower than modeled (id. at 19; Company Brief at 196) (see VI.D.2.f).

The Company stated that magnetic field impacts on marine organisms are the subject of ongoing scientific research (Exh. VW-6, at 4-26). Earlier work had shown electrosensitivity in some fish (id.). However, the Company reported on a recent study showing that magnetic fields from direct current electrical cables did not block the movement of either cartilaginous fish (sharks, skates, and rays) or American lobster (id. at 4-26 to 4-27). The Company stated that for AC magnetic fields (such as those associated with the Vineyard Wind Connector), sensitivity had not been reported and might not exist (Exh. VW-9, att. J, at 17 to 18). Furthermore, the Company stated that there is no evidence linking magnetic fields from wind turbine cables to negative responses in fish; however, according to the Company, such research has been limited (Exh. VW-6, at 4-26 to 4-27).[87] Based on this information, the Company argues that marine magnetic field impacts have been properly minimized (Company Brief at 201). In comments on the FEIR, DMF noted that cable shielding and burial are the primary means of minimizing magnetic fields (Exh. VW-15, at 7). DMF expressed concerns with the monitoring proposed by

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[87] Vineyard Wind asserted that it is not aware of any formal studies of potential magnetic field effects from operating power cables in Nantucket Sound, nor is the Company aware of any anecdotal or observed evidence indicating that the existing cables are having a deleterious effect on marine life (Exhs. VW-9, at 10-55; VW-14, at 6-33).

the Company to verify cable burial and suggested continuous monitoring mechanisms, or more frequent geophysical surveys (id.).

The Company also modeled magnetic field levels at the Covell's Beach landfall, where the two cables come ashore separated by a horizontal distance of approximately 65 feet (RR-FSB-19; RR-EFSB-41).[88] The Company modeled the magnetic fields at two locations for each cable: the middle of Covell's Beach, i.e., halfway between the most seaward and most landward edges of the beach (with a depth of 22 feet from the top of the Offshore Cable conduits to the beach surface) and at the landward edge of the beach abutting the parking lot (with a depth of 8.5 feet) (RR-EFSB-19; RR-EFSB-41). The Company reported maximum modeled magnetic fields of 3.6 and 21.1 mG, respectively, directly at the ground surface above the Offshore Cable conduit for the middle and landward edge beach locations (RR-EFSB-41). Modeled magnetic fields drop off with lateral distance from the cables, falling to 2.5 and 4.7 mG, respectively, for the middle and landward Covell's Beach locations, at 20 feet from the centerlines (id.).[89]

ii. Analysis and Findings on Magnetic Fields

The record shows that the target burial depth for its Offshore Cable is 1.5 to 2.5 meters and average output of the wind turbines at 45 percent. The Company provides modeled magnetic fields with burial closer to the surface (one or two meters), higher output (100 percent), and no steel armoring, thereby introducing an element of conservatism in its modeling. Assuming burial at one to two meters, full load, and no shielding effect from the steel armoring

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88 The magnetic fields attributable to the Project are the same along either route, including the respective landfalls (Tr. 6, at 856-857).

89 Similar to the Offshore Cable modeling, the landfall modeling is based on 100 percent capacity/maximum wind turbine output (RR-EFSB-19). The Company stated that the steel armoring is expected to reduce the magnetic fields at the beach surface significantly (id.). Vineyard Wind stated that modeling magnetic fields at Covell's Beach is conservative because it assumes: (1) no shielding of magnetic fields by the steel armoring of the Offshore Cables; (2) receptors at zero elevation above the ground (as opposed to customary modeling at 1 meter above the ground); and (3) slightly higher current per phase conductor of 1,145 ampere for the Offshore Cables at Covell's Beach than the loading of 1,100 ampere used for the Onshore Cable modeling; in addition, it (4) does not take into consideration the cancellation effect of the cables (id.; RR-EFSB-19).

that surrounds the Offshore Cables, the Company's magnetic field modeling shows a range of 159.6 mG to 162.9 mG (one meter burial) and 43.6 mG to 44.5 mG (two meter burial) directly over the centerline of the Offshore Cable making landfall at Covell's Beach and New Hampshire Avenue, respectively. At a distance of 20 feet from the centerline, the magnetic field levels drop significantly. Modeled maximum magnetic fields at the Covell's Beach Landfall itself decrease at the ground surface above the cable conduit for the middle and landward edge beach locations; they drop to 2.5 and 4.8 mG at 20 feet to either side of the cables.

Based on the record, the anticipated burial depths and use of steel armoring will reduce magnetic fields from the Project cables. The record shows that the shorter offshore portion of the Project along the Covell's Beach Route would lead effectively to the same magnetic field strengths relative to the New Hampshire Avenue Route. The Company's modeling scenarios show a rapid drop-off to either side of the cable centerline in all considered examples of burial depth and landfall. The record contains no evidence that links magnetic fields from offshore cables and negative responses in fish. Nevertheless, the Siting Board directs the Company to consult with DMF regarding appropriate measures to verify cable burial depth periodically to ensure that magnetic fields are minimized over the life of the Project.

The Siting Board concludes that the magnetic field strengths of the Offshore Cables ending at the Covell's Beach landfall site would be comparable to magnetic field strengths along the New Hampshire Avenue Route. Based on the above, the Siting Board finds that magnetic field impacts for the Offshore Cables using the Covell's Beach Route would be appropriately minimized.

e. Air, Traffic, and Safety[90]

i. Air

Vineyard Wind stated that, regardless of the route selected, air impacts related to offshore construction would consist of temporary and minor impacts to ambient air quality from commercial vessel emissions (Exh. VW-2, at 5-52). According to the Company, emissions from

[90] These items for the landfall are addressed in the Onshore Cables Section XI.B.2., below.

marine vessels would be minimized through the use of modern equipment that complies with domestic and international regulations (id. at 5-54). Marine engines used during Project construction would be certified by the manufacturer to comply with applicable marine engine standards, including, among others, those related to maximum allowable sulfur content levels for fuel and exhaust emission testing procedures (Exhs. VW-2, at 5-52; EFSB-A-1).

Vineyard Wind indicated that highly specialized vessels are required for installation of the Offshore Cables and that vessel availability would depend on other offshore projects across the country and worldwide (Exh. EFSB-A-1; Tr. 8, 1163-1164). The Company submitted that flexibility around the specific vessels to be used during construction is critical to the timely implementation of the Project and stated that variable availability and limitations associated with the Jones Act may result in vessels being changed just prior to, or even during, construction (Exh. EFSB-A-1; Tr. 8, at 1164).[91] Vineyard Wind asserted that because of these limitations, air impacts from the Project cannot be further minimized by locating vessels that improve on marine exhaust emissions standards (Exh. EFSB-A-1; Tr. 8, at 1163-1164). The Company noted that it would offset construction phase emission of nitrogen oxides and volatile organic compounds through purchases of Emissions Reduction Credits in compliance with national air quality standards (Exh. EFSB-A-1; Tr. 8, at 1166-1168).

ii. Traffic

Vineyard Wind stated that marine traffic impacts from the Project would be limited to temporary construction-related increases in vessel traffic (Exh. VW-6, at 9-25 to 9-26).[92]

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91 Vineyard Wind explained that generally, the Jones Act requires seagoing vessels transporting "merchandise" or "passengers" between "points" in the United States to be built in U.S. shipyards and be "wholly owned by citizens of the United States," among other requirements (Exh. EFSB-A-6). The Company stated that therefore the Jones Act may restrict the availability of vessels to perform certain tasks in connection with the Project (id.).

92 Vineyard Wind stated that once installed, the Offshore Cables would be located beneath the seafloor and would pose no hazard to navigation (Exh. VW-6, at 2-45). Further, on average, fewer than three vessels per day are expected during the operations and maintenance phase of the Project (Exh. VW-9, at 4-4).

Vessels working on the Vineyard Wind Energy Facility would transit Massachusetts waters between the Company's offshore lease area, the Western Offshore Corridor, and the New Bedford Marine Commerce Terminal and other port facilities, as necessary (id. at 9-27).[93] According to the Company, an average of approximately 25 vessels would operate within both state and federal waters during a typical construction day (id. at 4-2). Many of these vessels would remain within the windfarm lease area for days or weeks at a time and the Company estimated that a maximum of approximately 18 vessel trips per day would be required during the most active period of construction (id. at 4-2 to 4-3). Specific to the Offshore Cables, the Company estimated that an average of six vessels would be used for cable laying activities in any given month (id. at 4-3).

Vineyard Wind submitted that this level of marine traffic would not represent a significant increase over existing traffic volumes in Massachusetts waters (Exh. VW-9, at 4-3). The Company stated that between 150 and 200 vessels transit the New Bedford hurricane protection barrier each day and, therefore, in the unlikely event that all of the Project's vessels use the New Bedford port, the Project would result in a less than ten percent increase in daily vessel traffic counts (id. at 4-3).

The Company stated that there are no shipping lanes within a mile of the Western Offshore Corridor and that an offshore route making landfall at New Hampshire Avenue would not cross the existing Federal Navigation Channel located in Lewis Bay (Exh. EFSB-ML-22). With respect to commercial ferry traffic, the Company stated that no significant impacts to ferry operations are anticipated so long as adequate notice of construction activities is provided to the ferry operators (Exhs. VW-6, at 9-30; EFSB-ML-22).[94] Nonetheless, the Company indicated that there would be a significantly greater volume of ferry traffic along an offshore route making landfall at New Hampshire Avenue compared to a route making landfall at Covell's Beach and

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93 The Company noted that it had signed a letter of intent to use the New Bedford Marine Commerce Terminal to support Project construction (Exh. EFSB-T-20).

94 Vineyard Wind stated that the precise timing of construction notifications was still under development, but that the Company anticipated giving initial notice to ferry operators, fishermen, and recreational boaters one or two months in advance of construction and then providing updates on a consistent basis thereafter (Tr. 5, at 799-800).

that this difference was one of the factors supporting the Company's preference for the Covell's Beach Route (Exh. EFSB-ML-22(1); Tr. 5, at 800-801; Company Brief at 127, 129).

Regardless of the route selected, Vineyard Wind committed to employing a Marine Coordinator to manage all construction-related vessel logistics and to act as a liaison with the U.S. Coast Guard, port authorities, state and local law enforcement, marine patrol, and port operators (Exh. VW-9, at 4-3). Vineyard Wind stated that it has also engaged with the Northeast Marine Pilots Association to coordinate vessel approaches to the region, as required by state and federal law, and to minimize impacts to commercial vessel traffic and navigation (Exh. VW-6, at 9-26). Finally, Vineyard Wind stated it would implement the use of consistent transit lanes for its construction-related vessels to avoid conflicts with other vessels (Exh. VW-14, at 5-14).

iii. Safety

Vineyard Wind identified a number of measures that the Company would implement to protect the health and safety of the public and its workers during construction and operation of the Offshore Cables (see e.g., Tr. 2, at 323, 326; Tr. 3, at 391-395, 399, 537). As described in Section VI.C.1.a, above, during installation of the Offshore Cables, a temporary safety zone would be established around all construction vessels (Exh. VW-9, at 1-86). Vineyard Wind committed to working with the U.S. Coast Guard to create a safety plan, which would describe the boundaries of these exclusion zones, and to having security or "guard-type" vessels maintain the zones (Tr. 3, at 537).[95] Additionally, offshore construction would only proceed under suitable weather conditions (Exh. VW-9, at 1-40, 5-8 to 5-10; Tr. 3, at 518-520).

With respect to ongoing operations, as discussed in Section VI.C.1.a, above, the Company indicated that if the New Hampshire Avenue Route were selected, restrictions to certain types of anchor systems within the Town of Yarmouth's mooring field would be required to protect public safety (Exh. VW-9, at 3-11; Tr. 3, at 430-432). Vineyard Wind committed to

[95] The Company also indicated that its Marine Coordinator would play a key role in keeping stakeholders informed of where construction activities would be taking place on a given day (Tr. 3, at 537).

working with the Town of Yarmouth to restrict the use of helical moorings directly over the Offshore Cables in the event that this route is constructed (Exh. VW-9, at 3-11).

iv. Analysis and Findings on Air, Traffic, and Safety

The record shows that, regardless of the route selected, air impacts from the Offshore Cables would consist of temporary construction impacts to ambient air quality from commercial vessel emissions. Vineyard Wind would minimize these impacts through the use of modern equipment, compliance with domestic and international regulations, and purchases of Emissions Reduction Credits. Based on the above, the Siting Board finds that air impacts of Offshore Cable construction along the Covell's Beach Route and the New Hampshire Avenue Route are comparable and would be minimized.

With respect to marine traffic impacts, the record shows that construction and operation of the Project would not cause an undue increase in vessel traffic volumes. Vineyard Wind committed to employing a Marine Coordinator to manage all construction-related vessel logistics and to act as a liaison with the U.S. Coast Guard, port authorities, state and local law enforcement, marine patrol, and port operators. The Company noted that there is a significantly higher volume of commercial ferry traffic located along an offshore route making landfall at New Hampshire Avenue compared to a route making landfall at Covell's Beach. While advanced notice to ferry operators would serve to minimize the potential for conflicts between ferry operations and Project-related construction vessels, avoidance of ferry routes, where possible, is preferable. As such, the Siting Board finds that the Covell's Beach Route is preferable to the New Hampshire Avenue Route with respect to the potential for marine traffic impacts and that marine traffic impacts from the Covell's Beach Route would be minimized.

Finally, the record shows that the Company would implement measures to protect the safety of its workers and the public during construction and operation of the Project. These measures include creating a safety plan, establishing a temporary safety zone around all construction vehicles, and constructing only under suitable weather conditions. Based on the Company's proposed safety measures, the Siting Board finds that potential safety impacts from

offshore construction along the Covell's Beach Route and the New Hampshire Avenue Route are comparable and would be minimized.

D. Onshore Cable and Substation Impacts

1. Onshore Construction Methods and Sequencing

Vineyard Wind stated that its cable installation method is intended to maximize efficiency while minimizing potential impacts (Exhs. VW-2 at 5-34; VW-6 at 9-1). Vineyard Wind expects that installation would begin with the Substation civil works, followed by Substation equipment and the HDD or open trench work proposed at the landfall site and installation of the underground Onshore Cable (Exhs. VW-2 at 5-34; VW-6 at 9-1). Installation of the Offshore Cable would then follow (Exhs. VW-2 at 5-34; VW-6 at 9-1). Vineyard Wind stated that its construction contractor would select laydown/staging areas for Onshore Cable installation (Exh. VW-6, at 9-20).

The Company described the typical duct bank construction sequence as follows:

- pipe arrival via flatbed truck for stockpiling in a local staging area or along the road, depending on space;
- trench excavation, with daily removal of excavated material by truck;
- installation of pipe, and backfill of the duct bank array by concrete trucks;
- placement of steel plates over trench areas not backfilled by the end of workdays;
- installation of cables, spicing and testing of cables;
- installation of temporary pavement;
- final road restoration with half- or full-street-width paving.

(id. at 9-14 to 9-15).[96]

[96] The Company notes that the record (and the Tentative Decision) uses the following terms interchangeably: "within existing roadway layouts," "within roadway layouts," "within roadways," "within existing roadways," "within roadway corridors," "in-street," or "in-road" (Company Comments on Tentative Decision, at 2). The Company asserts that for each of these terms, the Siting Board should clarify that location of the underground

The onshore duct bank system would carry the two 220 kV onshore circuits (Exhs. VW-6, at 9-12; VW-9, at 1-4). Each onshore circuit would have three separate cables, each in its own sleeve or conduit within the proposed underground duct bank (Exh. VW-9, at 1-4). The duct bank would consist of an array of eight 10-inch-diameter PVC conduits, approximately 12 inches apart, encased in concrete – six for the two circuits and two to serve as spares – with additional smaller conduits for fiber optic communications cables (id. at 1-4, 1-67). The Company stated that the target depth of cover for the duct bank would be at least three feet, although if necessary in some instances (e.g., at certain utility crossings), the minimum cover could be 2.5 feet (id. at 1-68). According to the Company, construction of the duct bank typically progresses at the rate of 100 to 200 feet per day (Exh. VW-6, at 2-12).

Vineyard Wind stated that underground manhole vaults would be located at intervals of approximately 1,500 to 3,000 feet (Exh. VW-6, at 2-12). The typical vault installation sequence would include excavation of vault locations, followed by placement of vaults by crane, vault assembly, and backfill and compaction of the vault area, with temporary paving added thereafter (id. at 9-15). The excavated area for vaults would be approximately 30 feet wide by 50 feet long, to accommodate a pre-cast concrete two-splice vault, which typically measures nine feet wide by 35 feet long and up to nine feet deep (id. at 9-13).

Vineyard Wind stated that it would backfill its Onshore Cable trench with a combination of flowable thermal backfill, native material (typically sand and gravel), and a road base material (Exh. VW-6, at 9-14). The Company stated that pavement restoration would be implemented in compliance with Section 9.0 of the Department of Public Utilities Street Restoration Standards

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transmission cable may also include "shoulders and sidewalks within the roadway layout" (id.). Given that the Company did not define the roadway terms above as including sidewalks or shoulder locations for placement of the underground transmission cable until the Company's submission of the FEIR on December 17, 2018 – after Reply Briefs had been filed – the Siting Board declines to adopt the Company's suggested language (see Exh. VW-14, at 1-1). Nevertheless, should construction within shoulders or sidewalks prove to be necessary or advantageous, the Company may work with the Town of Barnstable on designing and permitting such underground transmission cable locations, and shall advise the Siting Board in advance of its intention to seek local approval of such plans, for further review by the Siting Board.

(id. at 9-16; see D.T.E. 98-22). In off-road or landscaped areas, the top backfill layer (above the flowable thermal backfill) would typically be a sandy, seedable loam (id. at 9-14, 9-17).

The Company would install conductors and up to three fiber optic cables in the conduits between adjacent manhole vaults (Exh. VW-6, at 9-17). A cable reel would be placed at the "pull-in" manhole and a cable puller at the "pull-out" manhole for installation of each cable section (id.). The Company explained that it would splice adjacent cable sections, once installed, inside the manhole vaults (id.). The Company would operate a splicing van with an air conditioning unit and generator at the manhole locations (id. at 9-18). The Company would field test the fully installed cable system from the Project Substation and energize the line upon completion of successful testing (id.).

Construction of the Substation for the Project would begin with installation of security fencing and erosion controls, proceed with site civil work, pouring of foundations and containment sumps, delivery and placement of transformers and reactors, installation of underground connections, placement of crushed stone, delivery of a prefabricated control house, construction of overhead buswork and connections, and concludes with final landscaping (Exh. VW-6, at 9-18 to 9-19).

2. Onshore Environmental Impacts

a. Land Resources

i. Description

As discussed above, the Company's assessment of the relative advantages of its two Onshore Cable route options changed over the course of Project development (Exh. EFSB-G-1(S2); Tr. 2, at 216; Company Brief at 119). The Company initially identified the New Hampshire Avenue Route as its preferred route and the Covell's Beach Route as its noticed alternative route, primarily due to the greater number of residential units adjacent to the Covell's Beach Route (Tr. 2, at 246; Company Brief at 119).[97] The New Hampshire Avenue Route is adjacent to 293 residential units (Exh. VW-2, at 4-30). The Covell's Beach Route is currently

[97] Given Vineyard Wind's preference for the Covell's Beach Route, the Siting Board analyzes the New Hampshire Avenue Route without the variations.

adjacent to 350 residential units, with another 340 residential units under construction at one development, known as Independence Park, set off from Independence Drive in Barnstable (id.; Exh. VW-6, at fig. 7-3).

The Company subsequently reversed its route preference based on further evaluation of the number of adjacent residential units as contributing less significantly to overall Project impacts than other factors (Tr. 2, at 246). The Company indicated that among the important reasons for the selection of the Covell's Beach Route is its shorter length versus the New Hampshire Avenue Route (0.7 miles shorter for onshore and approximately 4.5 miles shorter offshore) (id. at 217). Another factor was the Company's decision to substitute the use of Attucks Lane and Independence Drive (Variant 1) instead of the Eversource ROW segment as part of the Covell's Beach Route (Exh. VW-2, at 4-32; Tr. 2, at 219). Vineyard Wind stated that altering the Covell's Beach Route in this way produced a route entirely within existing roadways that would avoid impacts to vegetation and archaeological resources, in addition to avoiding the need to obtain rights to use the Eversource ROW (Exhs. EFSB-G-1(S2); EFSB-RS-20; Tr. 2, at 219).

The Company stated that by following existing paved roadways, the Project's onshore duct bank would largely avoid crossing public open spaces (Exh. VW-2, at 5-28). The Covell's Beach Route does however pass underneath a parcel subject to Article 97 at the Covell's Beach landfall site (Exhs. VW-2, at 5-28 to 5-29; VW-12).[98] The Company stated that municipal support, as evidenced by the HCA, was important to Project scheduling as it increased Vineyard Wind's confidence in obtaining land use approval at Covell's Beach, including Article 97 approval (Exh. EFSB-G-1(S2)(1); Tr. 2, at 218).[99] Vineyard Wind presented documentation from the Barnstable Town Council vote that granted a necessary easement over Covell's Beach

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98 If installed along the Covell's Beach Route Variation, the Onshore Cable would cross an approximately 400-foot-wide open space parcel owned by the Town of Barnstable, managed by the Barnstable Conservation Commission, and subject to Article 97 jurisdiction that is also part of an existing utility ROW (Exh. VW-2, at 5-29).

99 As special mitigation in its use of Covell's Beach for the Project landfall, the Company agreed to provide Barnstable with $80,000 to construct a bathhouse at Covell's Beach (Exh. EFSB-G-1(S2)(1) at 15).

and sponsored a petition to the legislature in favor of Article 97 legislation for Covell's Beach (Exh. VW-12). The Company indicated that the New Hampshire Avenue Route would avoid crossings of public open space entirely (Exh. VW-2, at 5-28).

The Company represented that Project impacts to non-residential sensitive land uses would be limited to the active construction period (Exh. VW-2, at 5-30). The Company indicated that the Covell's Beach Route would pass the Barnstable Police Department and Saint George Greek Orthodox Church (id.). The Company stated that the New Hampshire Avenue Route would pass the Trinity Christian Academy, Mattacheese Middle School, Marguerite E. Small Elementary School, Yarmouth Police Department, and the New Testament Baptist Church (id.).

The Company stated that the Covell's Beach Route and the New Hampshire Avenue Route would avoid Priority Habitat of state-listed rare species with one possible exception: nesting habitat at Covell's Beach of piping plover, as identified by the NHESP (Exh. VW-6, at 8-5) (See VI.C.2.a, above for TOY restrictions). Further, Vineyard Wind stated that, to avoid conflict with public recreational usage, the Company has committed to restricting HDD operations at Covell's Beach to the late fall or winter months (Exh. EFSB-LU-13).

The Covell's Beach Route would pass by or through two areas of high archaeological sensitivity, whereas the New Hampshire Avenue Route would pass by or through three areas of high archaeological sensitivity (Exh. VW-2, at 5-27). Based on an assessment performed by Vineyard Wind's archaeology consultant, the Company stated that onshore construction of the Project along either the Covell's Beach or New Hampshire Avenue Route would occur in previously disturbed areas (i.e., within public roadways or other ROWs) with low likelihood of impact to uncompromised soils or significant archaeological deposits (Exh. VW-2, at 5-25). The Company committed to addressing potential effects, if any, to onshore archaeological resources through the Massachusetts Historical Commission and Section 106 of the National Historic Preservation Act and the Massachusetts State Register of Historic Places review process (Exhs. VW-2, at 5-25, 5-27 to 5-28; EFSB-LU-10(S)).

ii. Positions of the Parties

The New Hampshire Avenue Route would, in part, follow existing NSTAR ROW #346 to connect to a proposed Project substation in Barnstable. NSTAR states that it operates three 115 kV overhead transmission lines on ROW #346 (Exh. EFSB-NSTAR-3). NSTAR indicates that upon receiving Vineyard Wind's request to co-locate the Project in the subject ROW, NSTAR conducted a preliminary review of its current and anticipated needs for the ROW (Exh. EFSB-NSTAR-4(1); NSTAR August 23, 2018 Comment Letter at 1-2). Based on its Preliminary Review, NSTAR concludes that the co-location request should be denied because it might be incompatible with NSTAR's current and planned future use for ROW #346 (Exh. EFSB-NSTAR-4(1) at 3). Specifically, NSTAR's preliminary review indicates that the property underlying ROW #346 is not owned by NSTAR, and that NSTAR may not have the right to grant access to Vineyard Wind (id. at 2). NSTAR contends that a detailed review of the easements would be required to determine whether its ownership status and rights are sufficient for granting Vineyard Wind access to the ROW property (Exhs. EFSB-NSTAR-4(1) at 2; EFSB-NSTAR-3).

The Town of Yarmouth objects to use of the New Hampshire Avenue Route for installation of the Project Onshore Cable (Yarmouth Brief at 2-3; see also Sections VI.C.2.a.ii, VI.C.2.b.ii, above). Yarmouth bases its objections largely on impacts at the New Hampshire Avenue landfall site and along the Offshore Cable route through Lewis Bay (id. at 6, 8-11, 18-21; see also Sections VI.C.2.a.ii, VI.C.2.b.ii, above). In addition, Yarmouth contends that the longer offshore and onshore lengths of the New Hampshire Avenue Route compared to the Covell's Beach Route argue against Project construction using the New Hampshire Avenue Route (id. at 21, citing Tr.1 at 198; Tr. 2, at 217).

iii. Analysis and Findings on Land Resources

Land use impacts of the Project along either route would occur primarily in-road or in previously disturbed areas, and would be temporary for the most part. Modification of the Covell's Beach Route over the course of the proceeding has produced a preference for an entirely in-road route option. This in-road design and the shorter length of the Covell's Beach

Route, relative to the New Hampshire Avenue Route, both favor using the Covell's Beach Route. However, the number of residential units currently affected by the Project along the New Hampshire Avenue Route (293) would be fewer than along the Covell's Beach Route (350) – and even more so, with consideration of the proposed 340 new units on Independence Drive.

Impacts to vegetation, protected species, and historical or archaeological resources are not anticipated to be a concern along either route option. As indicated above, the HDD would not affect Covell's Beach use as a recreational resource because construction at Covell's Beach would occur outside of summer months. Further, given TOY restrictions on HDD work at Covell's Beach, impacts to piping plover nesting habitat would be avoided. Finally, the Siting Board also notes, the Company's ability to secure permission to construct along the NSTAR ROW for the New Hampshire Avenue Route appears to be unlikely.

Given the above, the Siting Board finds that the land use impacts for the Covell's Beach Route and the New Hampshire Avenue Route would be comparable. HDD use at Covell's Beach along with TOY restrictions will mitigate interference with recreational beach use and resource impacts at Covell's Beach. However, in addition to HDD construction, other construction activities could potentially impact recreational use at Covell's Beach. Therefore, in addition to the NHESP TOY prohibition on HDD construction at Covell's Beach, in accordance with protection of the piping plover, the Siting Board directs the Company to prohibit construction of all Project components and delivery of all Project equipment and materials within the period of Memorial Day to Labor Day at Covell's Beach. Further, the Siting Board directs the Company to discuss with the Town of Barnstable whether to place signage on Covell's Beach informing the public that the Onshore Cables are located under the beach, and to submit the results of such discussions to the Siting Board.

The record shows that the HCA between Vineyard Wind and Barnstable will likely facilitate the Project's progress as scheduled, without obstacles related to land use approvals, including Article 97 approval, at Covell's Beach. In addition, installing the Project entirely in-road along the Covell's Beach Route as planned will dispense with the need to obtain additional use rights to, for example, the NSTAR ROW.

Given the implementation of the mitigation measures proposed by the Company and the above conditions, the Siting Board finds that land use resource impacts from the construction and operation of the Project along the Covell's Beach Route would be minimized.

b. Wetlands and Water

i. Description

The Company stated that the Project was designed to avoid water quality impacts (Exh. VW-6 at 9-39). The Company asserted that, because it would install duct banks within paved road or previously disturbed utility or transmission ROWs, onshore cable construction for the Project would have no direct impacts on wetland area resources, even within 100-foot buffer zones (id. at 4-11; Tr. 7, at 1090).[100] According to the Company, any indirect wetland impacts would be construction-related and temporary (Exh. VW-6, at 4-11).

The Company stated that the Covell's Beach Route would not pass within the 100-foot buffer zone of any inland wetland resource other than approximately 600 (linear) feet of LSCSF near the Covell's Beach landfall site (Exh. VW-6, at 4-2 and fig. 4-2). The New Hampshire Avenue Route would cross 1,500 feet of LSCSF and 400 feet of Riverfront Area, all within roadway layouts (Exh. VW-6, at 4-2 and fig. 4-1). It would also cross through the 100-foot buffer zone of several inland wetland resource areas in Yarmouth, but would avoid the wetlands themselves (Exh. VW-6, at 4-2 and fig. 4-1).

With respect to Zone I and Zone II public water protection areas, Vineyard Wind indicated that the Covell's Beach Route would not pass through any Zone I area, but would pass through 4.18 linear miles of Zone II protection area (Exh. VW-6, at 8-2).[101] The New Hampshire Avenue Route would pass through both Zone I and Zone II public water protection areas for 3.15 linear miles (id.).

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[100] The XLPE cable system will not contain any fluids (Exh. VW-2, at 1-9, 1-11).

[101] As defined in 310 CMR 22.02, Zone I is the protective radius required around a public water supply well or wellfield. Zone II is an area of an aquifer that contributes water to a well under the most severe pumping and recharge conditions that can be realistically anticipated (180 days of pumping at approved yield, with no recharge from precipitation).

The Company maintained that it would not refuel construction vehicles, except as necessary for a few large, difficult-to-move pieces of equipment, on any Project construction site (Exh. VW-6, at 9-39). In addition, refueling would not occur along either the Covell's Beach or New Hampshire Avenue Route within 100 feet of wetlands or waterways, or within 100 feet of known private or community potable wells (id.). The Company also committed that refueling would not take place within Barnstable and/or Yarmouth water supply Zone I area were construction to occur along the New Hampshire Avenue Route (id.).

The Company committed to keeping proper spill containment gear and absorption materials on its construction site, and to training all operators in the use of these materials (Exh. VW-6, at 9-39 to 9-41). The Company would also provide containment bins or absorbent blankets to contain accidental fuel spills or leaks from generators, pavement saws, and other small pieces of power equipment (id. at 9-39 to 9-40). The Company stated that it would not allow the temporary presence or storage of any fuel or oils in a splice vault or within 100 feet of any vault (id. at 9-39 to 9-41).

The Company anticipated that it might need to dewater the duct bank trench in areas of high groundwater, saturated soils, and storm water impacts (Exh. VW-6, at 9-41). High groundwater conditions at the landfall site along the New Hampshire Avenue Route increase the probability that trench and vault excavations along this route would require dewatering (id. at 9-20, 9-41). The Company did not specifically identify the need for dewatering along the Covell's Beach Route (Exhs. VW-6, at 9-20; VW-9, at 9-5 to 9-10). The Company indicated that, to minimize impacts to groundwater, areas where groundwater might be encountered would be identified as part of the preconstruction investigation of soils (Exh. VW-6, at 9-20).

The Company also provided detailed information regarding the use of temporary erosion control barriers, silt fence installation and maintenance, and hay/straw bale installation and maintenance (Exh. VW-6, at 9-42 to 9-43). The Company explained that it would hold its contractor responsible for implementing and maintaining erosion and sediment control measures during construction and would expect its Environmental Inspector or designee (such as a construction supervisor) to provide oversight of the contractor's activities (id. at 9-42).

ii. Analysis and Findings on Wetlands and Water

The placement of the Onshore Cables within roadways for either route would avoid any direct impacts to wetlands and water resources. Short stretches of the onshore portion of the New Hampshire Avenue Route abut wetlands and are within water supply protection areas. Similarly, any impacts to wetlands and water supply protection areas along the Covell's Beach Road would be limited to in-road areas. Installation of the Onshore Cable within roadway corridors along the Covell's Beach Route would not encroach upon inland wetland and water resources, or water supply Zone I areas, but would impinge on approximately 600 feet of LSCSF and 4.18 linear miles of Zone II protection area. The New Hampshire Avenue Route would encroach upon 400 feet of Riverfront Area, impact twice the LSCSF affected by the Covell's Beach Route, and cross through the 100-foot buffer of several wetland areas in Yarmouth. The New Hampshire Avenue Route would pass through both Zone I and Zone II protection areas, for a total distance of 3.15 linear miles (i.e., 1.03 linear miles less than the linear distance of the Covell's Beach Route through Zone II protection area).

The Company anticipates the need for dewatering with use of the New Hampshire Avenue Route, particularly at the New Hampshire Avenue Route Landfall. Although the need for dewatering at the Covell's Beach Route is not explicitly anticipated, it may be required depending on whether the Company encounters saturated soils and/or storm water.

Based on the evidence, refueling for installation of the Onshore Cable would take place outside the 100-foot buffer zone of wetlands and waterways. Vineyard Wind has committed to inspections to minimize the likelihood of spills and leaks and to a protocol for proper spill containment. With respect to erosion and sediment control, the record shows that the Company has pledged to implement practices that will minimize erosion and sedimentation impacts of Project construction, and to restore any disturbed areas.

The record indicates that erosion and sediment control and associated impacts along the Covell's Beach and New Hampshire Avenue Routes would be comparable, but that impacts to wetlands and groundwater would be somewhat greater with Project construction along the New Hampshire Avenue Route. Nonetheless, in-road construction avoids direct impacts to wetlands. The Siting Board finds, consequently, that the Covell's Beach Route would be comparable

overall to the New Hampshire Avenue Route with respect to wetlands and water resource impacts.

Given the details noted above, the Siting Board concludes that construction of the proposed facilities along the in-street Covell's Beach Route would result in no permanent impacts, and only minimal temporary impacts, if any, to wetlands and water resources. Therefore, with the implementation of the mitigation measures proposed by the Company, the Siting Board finds that the wetland and water resource impacts from the construction and operation of the Project along the Covell's Beach Route would be minimized.

c. Traffic

i. Description

The Company stated that its principal means of minimizing traffic impacts during construction along either the Covell's Beach Route or the New Hampshire Avenue Route, and at the Substation would be through implementation of traffic management plans ("TMP") developed with affected municipalities (Exhs. VW-2, at 5-21 to 5-25; VW-9, at 6-1 to 6-14; Tr. 6, at 1012 to 1013). The Company indicated that, in addition to the municipalities, it would also work with Massachusetts Department of Transportation ("MassDOT") District 5 traffic engineers to develop a series of temporary traffic control plans ("TTCPs") (Exh. VW-9, at 6-1).

The Company detailed specific traffic mitigation measures for both the Covell's Beach and New Hampshire Avenue Routes (Exh. VW-9, at 6-3 to 6-13). Vineyard Wind explained that it did not expect significant impacts on businesses because the Company would maintain access to businesses throughout Project construction, and duct bank installation would proceed at 100 to 200 feet per day; furthermore, TOY construction restrictions would ensure that in-road construction occurs outside the busy summer season (Exh. EFSB-T-13).[102] During construction, pedestrians and bicyclists would follow the same restrictions as vehicular traffic (Exh. EFSB-T-9).

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[102] In-road construction would be prohibited from Memorial Day to Labor Day, or from June 15th to Labor Day, as allowed by the municipalities (Exh. VW-9, at 1-105).

The Company committed to an active public outreach program to inform residents, business owners, and town officials of construction schedules, vehicular access, lane closures, detours and other traffic management measures, local parking availability, emergency vehicle access, construction crew movement and parking, laydown areas and staging, equipment delivery, nighttime or weekend construction, and road repaving (Company Brief at 166, citing Exh. EFSB-T-2). The Company anticipated that construction workers would park at satellite locations provided at commercial locations such as strip malls and/or contractors' yards; employees would then be shuttled to their work site in company-supplied passenger vans (Exh. EFSB-T-1). The Company indicated that suitable satellite shuttle parking locations exist for both the Covell's Beach and the New Hampshire Avenue Routes (id.). The Company stated it would coordinate any required parking with the local police and municipal departments as necessary (Exh. EFSB-T-1). The Company asserts that, based on its proposed mitigation, it has avoided or minimized construction-related traffic impacts of the Project along either the Covell's Beach or New Hampshire Avenue Route (Company Brief at 166).

ii. Analysis and Findings on Traffic

The record shows that construction along either the Covell's Beach or the New Hampshire Avenue Route would potentially create temporary traffic impacts along the roads designated for onshore transmission line installation. Traffic impacts would be mitigated by the limited duration of construction at any one location, and by the implementation of TMPs on local streets and of TTCPs to govern roadways under MassDOT jurisdiction; pedestrian and bicycle safety and movement would also be addressed to minimize impacts of construction. TOY restrictions would further mitigate impacts by ensuring that in-street construction does not take place during the busy summer tourist season. Vineyard Wind would minimize impacts of parking and movement of its personnel and work crews by siting these activities at satellite locations and using shuttle buses. Thus, traffic impacts would be similarly mitigated and comparably minimized whether the Onshore Cable were constructed along the Covell's Beach Route or the New Hampshire Avenue Route. Accordingly, the Siting Board finds that the

Covell's Beach and New Hampshire Avenue Routes are comparable with respect to traffic impacts of onshore construction.

The record shows that the Company is committed to instituting an active public outreach program that would keep town officials and the public apprised of detours, lane closures, work crew and equipment movement, repaving, emergency vehicle access, and other traffic management measures. However, to ensure that the outreach plan is implemented and followed, the Siting Board directs the Company, in consultation with the Town of Barnstable, to develop a comprehensive public outreach plan for Town residents and businesses. The outreach plan should describe the procedures the Company will use to notify the public about: (1) the scheduled start, duration, and hours of construction in particular areas; (2) the methods of construction that will be used in particular areas (including any use of nighttime construction); and (3) anticipated street closures and detours. The outreach plan should also include information on complaint and response procedures; Project contact information; the availability of web-based Project information; and protocols for notifying schools and local and regional public transit operators of upcoming construction.

Further, the Siting Board directs the Company to develop a TMP for the Project, as the Company has proposed. The Siting Board also directs the Company to submit a copy of the final TMP to the Siting Board and all other parties when available, but no less than two weeks prior to the commencement of construction, and to publish the TMP on the Company's Project website. With the implementation of the mitigation measures and conditions discussed above, the Siting Board finds that traffic impacts of construction of the Onshore Cables along the Covell's Beach Route would be minimized.

d. Construction Noise

i. Description

Vineyard Wind listed five principal noise-producing phases of construction related to the onshore portion of the Project: trench excavation; duct bank installation; manhole installation; backfill and compaction; and final pavement restoration (Exhs. VW-2, at 5-55; VW-6, at

9-36).[103] The Company explained that it would conduct each phase in sequence at each location, and that several phases of construction might occur simultaneously along various sections of the Onshore Cable route (Exhs. VW-2, at 5-55; VW-6, at 9-36).

Vineyard Wind anticipated that the proximity of construction equipment to noise-sensitive land uses would vary along the onshore route, and noise levels at receptors would also vary accordingly (Exh. VW-6, at 9-37). The Company reported that other factors, including, but not limited to, construction activity, equipment type, and separation distances between source and receiver, would also cause noise levels to fluctuate, further limiting the impact of construction-period noise (id.). The Company indicated that the loudest sound levels from construction equipment at 50 feet from the Project would be primarily in the range of 80 to 90 dBA; at 25 feet from each noise source, maximum sound levels would range from 86 to 96 dBA (id., Table 9-2; EFSB-NO-3). Vineyard Wind stated that the loudest phases of construction are typically trench excavation and manhole installation, but that construction crews would likely progress at approximately 100 to 200 feet per day, resulting in a typical construction duration of seven days at one location (Exh. VW-6, at 9-37). Manhole construction would take place over four or five extended work days at each location (id. at 9-37 to 9-38).

The Company reported that the potential for noise impacts from Project construction would be a function of specific receptors along the construction route, the equipment used, and proposed hours of operation (Exh. VW-6, at 9-36). The Company would typically undertake construction from 7:00 a.m. to 6:00 p.m., Monday through Friday, with adjustments in specific instances at some locations (id.; EFSB-NO-1).[104] Vineyard Wind might also request municipal approval for night work in the event of, for example, construction at a busy road crossing (Exh. VW-6, at 9-36). The Company represented that nighttime work would be minimized, performed on an as-needed basis only, and coordinated with each municipality (Exh. VW-2, at 5-55). The

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[103] See also Section VI.D.2.g.iii, below, for a discussion of noise impacts associated with the operation of the Project substation. See Section VI.C.2.c, for a discussion of the noise impacts of offshore and landfall construction.

[104] See Section VI.C.2.c, for construction hours related to HDD at the Covell's Beach landfall site.

Company indicated that the Towns of Barnstable and Yarmouth have no bylaws applicable to construction-related noise (Exh. VW-6, at 9-38).

Table 5. Receptor Distances Within 100 Feet of the Onshore Construction Route

	Covell's Beach Route			**New Hampshire Avenue Route**		
Distances in feet	0≤ 25	> 25 to ≤ 50	> 50 to ≤ 100	0≤ 25	> 25 to ≤ 50	> 50 to ≤ 100
Residences (Structures)	14	55	124	4	43	68
Residence Unit Count	14	55	141	5	47	137
Businesses	1	2	11	1	7	12

Sources: Exh. EFSB-LU-3, at 2, 8.

The Company explained that adjacent cable sections, once installed, would be spliced together over four or five work days at each manhole location (Exh. VW-6, at 9-37 to 9-38). [105] A portable generator, placed to avoid restricting traffic, would provide electrical power for the splicing van, located at one manhole access cover, and the air conditioning unit would be located near a second manhole cover (id., at 9-38). The Company stated that although the portable generator and air conditioner would produce some noise, it would implement noise mitigation measures, such as muffling the generator, to limit noise disturbance (Exh. VW-6, at 9-37 to 9-38). These measures would include use of a low-noise/muffled generator, portable sound walls (i.e., temporary sound barriers) as needed to reduce sound from the generators, and coordinating such work with municipalities (id. at 9-38). According to the Company, the

[105] The Company stated that splicing activities would not be continuous, but would take place over four or five extended work days, in twelve hour shifts from 7:00 a.m. to 7:00 p.m., at each manhole location (Exh. VW-6, at 9-37 to 9-38; Tr. 8, at 1285).

Covell's Beach Route would require twelve manholes, five fewer than the 17 manholes required to construct the New Hampshire Avenue Route (Tr. 8, at 1286-1288).[106]

The Company committed to making every reasonable effort to minimize noise impacts from construction. Measures the Company proposed to use for this purpose include: (1) minimizing the amount of work conducted outside of typical construction hours; (2) ensuring installation and maintenance of appropriate mufflers on construction equipment; (3) ensuring appropriate maintenance and lubrication of construction equipment to provide the quietest performance; (4) requiring muffling enclosures on continuously-operating equipment such as air compressors and welding generators; (5) turning off construction equipment when not in use and minimizing idling times; and (6) mitigating the impact of noise-producing equipment on sensitive locations by using shielding or buffering distance to the extent practical (Exhs. VW-6, at 9-38 to 9-39, att. C at 49).

ii. Analysis and Findings on Construction Noise

The record demonstrates that noise impacts of the Project along either the Covell's Beach or New Hampshire Avenue Route would be temporary, and would principally result from the construction activities of trench excavation, duct bank installation, manhole installation, backfill and compaction, and final pavement restoration. The same mitigation measures would be employed along either route.

In comparing noise impacts of Onshore Cable construction for the Project, the Siting Board notes the greater number of residential units and other structures within zero to 100 feet of the Covell's Beach Route compared to the New Hampshire Avenue Route. However, the record also shows a greater number of manholes are required to construct the New Hampshire Avenue Route, and that there are more residences within 100 feet of manholes along the New Hampshire Route. The Siting Board observes that manhole installation, an intrusive noise source that can

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[106] There are 19 residential structures or businesses within 100 feet of manholes along the Covell's Beach Route and 24 residential structures or businesses within 100 feet of manholes along the New Hampshire Avenue Route (Exhs. EFSB-NO-4(2); EFSB-NO-4(3)).

occur over four or five extended workdays, is typically one of the loudest phases of construction. The Siting Board observes, in addition, that the generator use necessary for cable pulling and splicing would be another source of noise associated with manholes and, consequently, of greater impact along the New Hampshire Avenue Route than the Covell's Beach Route. The Siting Board therefore concludes that noise impacts of Onshore Cable construction are comparable along both routes. Accordingly, the Siting Board finds that the Covell's Beach Route and the New Hampshire Avenue Route are comparable with respect to noise impacts.

Barnstable and Yarmouth do not have bylaws governing construction-related noise; however, the Company commits to conducting work to the extent possible during daytime hours from 7:00 a.m. to 6:00 p.m., Monday through Friday, to minimize noise impacts. The Company agreed to an "as-needed only" basis for night work, coupled with coordination with each affected municipality. The Company also committed to proper muffling and maintenance of construction equipment, muffling enclosures on continuously-operating equipment, turning off construction equipment if not in use, minimizing idling times of construction equipment, taking specified measures to minimize noise from splicing cable inside manholes, and using shielding or buffering distance to the extent practical to mitigate the impact of noise equipment on sensitive locations. The Siting Board observes that the Company's proposed noise mitigations, noted above, would be consistent with approaches to mitigation that the Siting Board has accepted in past cases. In keeping with minimizing noise impacts, the Siting Board directs Vineyard Wind to use the quietest generators and portable HVAC units reasonably available to the Company. In addition, to reduce noise impacts on residences, when operating noisy equipment, such as whole tree chippers or compressors, the Company shall locate such equipment as far away as possible from nearby residences, where the flexibility exists to do so.

With respect to the Onshore Cables, the Siting Board accepts the standard construction hours of Monday to Friday from 7:00 a.m. to 6:00 p.m. Work requiring longer continuous duration than normal construction hours allow, such as cable splicing, is exempted from this requirement. Should the Company anticipate the need to extend construction work beyond the above-noted hours or days, with the exception of emergency circumstances on a given day necessitating extended hours, the Siting Board directs the Company to seek prior written

permission from the Town of Barnstable before the commencing such work, and to provide the Siting Board with a copy of such permission. If the Company and municipal officials are not able to agree on whether such extended construction hours or days should occur, the Company may request prior authorization from the Siting Board and shall provide the Town with a copy of any such request and authorization.

The Company shall inform the Siting Board and Barnstable within 72 hours of any work that continues beyond the days and hours allowed by the Siting Board. The Company shall also send a copy to the Siting Board, within 72 hours of receipt, of any municipal authorization for an extension of work hours. Furthermore, the Company shall keep records of the dates, times, locations, and duration of all instances in which work continues beyond the days and hours allowed by the Siting Board; if Barnstable grants the Company extended work hours in writing, the Company shall keep records of work that continues past allowed hours, and must submit such record to the Siting Board within 90 days of Project completion.

With the implementation of the mitigation measures and conditions discussed above, the Siting Board finds that noise impacts of construction of the Onshore Cables along the Covell's Beach Route would be minimized.

e. Visual, Air, Safety, and Hazardous Waste[107]

i. Visual

With the exception of proposed Substation construction, Vineyard Wind stated that underground installation would avoid permanent visual impacts associated with the onshore Project cable whether constructed along the Covell's Beach or the New Hampshire Avenue Route (Exh. VW-2, at 5-31).

ii. Air

Vineyard Wind stated that impacts on ambient air quality from onshore Project construction, including the Substation, would be due solely to operation of construction vehicles and would be limited to areas adjacent to active construction (Exh. VW-6, at 9-33). The

[107] The landfall sites are included in this section.

Company indicated that it would minimize these air quality impacts by complying with MassDEP Air Pollution Control Regulations, 310 CMR 7.02. The Company pledged that no pavement crushing would occur on site and stated that it would institute measures to minimize fugitive dust emissions during active construction (id. at 9-34).

The Company indicated that it would implement the following steps to reduce dust: (1) mechanical street sweeping of construction areas and surrounding streets and sidewalks as necessary; (2) for on-ROW construction, use of appropriately designed track out pads to prevent off-site migration of soils; (3) removal of construction waste in covered or enclosed trailers; (4) use of water to suppress dust from exposed soils and stockpiles; (5) minimizing stockpiles of materials and storage of construction waste on site; and (6) minimizing the length of time that soils are left exposed (Exh. VW-6, at 9-34).

Vineyard Wind committed to requiring its contractors to use ultra-low sulfur diesel ("ULSD") in off-road diesel vehicles, and to minimize idling consistent with the Massachusetts anti-idling law, G.L. c. 90, § 16A; G. L. c. 111, §§ 142A-142M; 310 CMR 7.11 (Exh. VW-2, at 5-53).[108] The Company also committed to comply with requirements of the MassDEP Diesel Retrofit Program and consistent with the Program, all non-road engines used on its Project would comply with the non-road diesel fuel sulfur limit of 15 ppm under 40 CFR Part 80 (Exh. VW-6, at 9-34). In addition, Vineyard Wind stated that all non-road construction equipment with engine horsepower ratings of 50 or above to be used for 30 or more days over the course of Project construction would either be EPA TIER 4-compliant or would have EPA-verified (or equivalent) emissions control devices such as oxidation catalysts or other comparable technologies – to the extent that they are commercially available – installed on the exhaust system side of the diesel combustion engine (id. at 9-35).

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[108] The Company stated that it would require its contractors to turn off construction equipment when not in use; minimize idling times to five minutes (except when engine power was needed for the delivery of materials or to operate accessories to the vehicle, such as power lifts); and obligate all contractors to comply with the idling provisions in 310 CMR 7.11 (Exh. VW-6, at 9-34 to 9-35).

iii. Safety and Hazardous Waste

The Company indicated that during landfall construction, exclusion fencing would be erected to prevent any unauthorized access to the work area (Tr. 3, at 392-393). The Company would also work with local emergency responders to ensure traffic management plans are in place that allow for safe access into and egress from landfall site construction areas (Tr. 3, at 392).

Vineyard Wind developed, and submitted to the Siting Board, an environmental construction management plan ("CMP") (Exh. VW-6, att. C). The Company's CMP includes guidelines to ensure the safety of workers and passersby and to minimize impacts of hazardous waste during Project construction (id. at 17, 38-39). With respect to safety, the Company stated that, as excavation proceeded, Vineyard Wind would sheet and shore the onshore duct trench as required by soil conditions, Occupational Safety and Health Administration ("OSHA") safety rules, and local and state regulations (id. at 17).[109] The Company explained that shoring provides a safe work environment for construction and also a limited trench width (id.). The Company explained, in addition, that shoring allows passage of traffic adjacent to the trench and also facilitates covering the trench with a steel plate to allow traffic over the trench during non-working hours (id.).

The Company reported that disposal of all hazardous wastes would take place according to local or state regulations or the manufacturer's recommendations (Exh. VW-6, att. C at 38). The Company stated that site personnel would be instructed as to these regulations and recommendations and the Owner's Site Representative would be responsible for their implementation (id.). In addition to specifying actions to implement in the event of hazardous waste spills, Vineyard Wind provided a Spill Prevention, Control, and Countermeasures Plan

[109] Sheeting and shoring are construction techniques used for temporary support of soil and existing structures.

("SPCC Plan") in its CMP to minimize the impacts of spills by preventing their occurrence (id. at 41-43).[110]

iv. Analysis and Findings on Visual, Air, and Safety and Hazardous Waste

The record shows that, due to underground installation, no permanent visual impacts are anticipated with construction of the Onshore Cables along either the Covell's Beach Route or the New Hampshire Avenue Route. Accordingly, the Siting Board finds that visual impacts along the Covell's Beach Route and the New Hampshire Avenue Route would be comparable and minimized.

With regards to air quality impacts of Onshore Cable and landfall construction, the record demonstrates that the Company would minimize air quality impacts by complying with MassDEP Air Pollution Control Regulations, by adhering to the MassDEP Diesel Retrofit Program, by using ULSD in off-road diesel vehicles, and by minimizing idling consistent with the Massachusetts anti-idling law. The Company would also institute measures to prevent airborne dispersal of dust and other fine particles associated with construction. Based on the record, the Siting Board finds air impacts of the Onshore Cables along the Covell's Beach Route and the New Hampshire Avenue Route would be comparable. With the proposed measures to minimize dust and air emissions from construction equipment, the Siting Board finds that potential air impacts of the Onshore Cables along the Covell's Beach Route would be minimized.

The record demonstrates that the Company would follow all OSHA rules as well as local and state regulations in constructing the Project duct trench along either the Covell's Beach Route or the New Hampshire Avenue Route and at the respective landfalls. The work completed by the Company according to OSHA, local, and state rules and regulations would include sheet

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110 Vineyard Wind reported that there are no hazardous waste sites adjacent to either route or at the Substation site (Exh. VW-6, at 11-29, fig. 12-1). The closest regulated hazardous waste site is 2,400 feet from the Covell's Beach Route (id.).

and shoring of the duct trench. The Siting Board notes the safety benefits of shoring during and after work hours as construction along the onshore duct trench progresses. The record also shows that the Company would handle and dispose of hazardous wastes and spills in keeping with all applicable regulations, and would mitigate and minimize any potential associated impacts, regardless of whether constructing its Onshore Cable along the Covell's Beach or the New Hampshire Avenue Route.

Given the Company's proposed safety and hazardous waste mitigation measures, the Siting Board finds that the Covell's Beach Route and the New Hampshire Avenue Route would be comparable with respect to safety and hazardous waste impacts. Accordingly, the Siting Board finds that potential safety impacts of landfall site construction and Onshore Cable installation along the Covell's Beach Route would be minimized.

f. Magnetic Fields

A magnetic field is present when current flows in a conductor (Exh. WV-9, att. J at 5; RR-EFSB-39(1) at 1). Magnetic field values decrease rapidly with lateral distance from the cables (Exh. WV-9, att. J at 5-6). Some epidemiology studies have identified statistical associations between exposure to power-frequency magnetic fields and diseases such as childhood leukemia (RR-EFSB-39(1) at 33-34). In 2007, the World Health Organization ("WHO") concluded that the evidence of a causal relationship was limited and that magnetic field exposure limits based upon epidemiological evidence were not recommended, but some precautionary measures were warranted (id. at 36 to 37). When reviewing magnetic fields in past proceedings, the Siting Board, in recognition of public concern about magnetic fields and in keeping with WHO guidance, has encouraged use of low-cost measures that would minimize magnetic fields along transmission ROWs. Needham at 63; Woburn-Wakefield at 121; Salem Cables at 88.

i. Description

The Company provided an electric and magnetic field assessment with its initial petition, updating its assessment with submission of its SDEIR (Exhs. VW-2, att. F; VW-9, att. J;

RR-EFSB-41).[111] The Company stated that it conducted magnetic field modeling for transmission line cross sections selected to represent possible onshore line segments with differing conductor configurations (Exh. VW-9, att. J at 9). Two possible duct bank configurations were examined, a two-by-four ("2x4") configuration and a flatter profile four-by-two configuration ("4x2") (id.).[112] The Company developed modeling results representative for both the Covell's Beach Route and the New Hampshire Avenue Route in-road routes (id. at 11; Tr. 6, at 856-857).

Vineyard Wind explained that, for each representative onshore cross section, aboveground magnetic field strengths were modeled as a function of horizontal distance, perpendicular to the direction of current flow, one meter above the ground surface (Exh. VW-9, att. J at 11). The Company assumed a cover depth of three feet to the top of the duct bank for both 2x4 and 4x2 conduit arrays, resulting in depths below grade of 5.22 feet and 3.97 feet for the uppermost conductors for the 2x4 and 4x2 conduit arrays, respectively (id.).

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111 These transmission line loadings represent modeled currents for the proposed 220 kV cable that assume maximum (100 percent capacity) wind turbine output and include the impacts of charging currents (Exh. VW-9, att. J at 8, 19). As discussed above, the Company indicated, however, that the wind turbine array was expected to operate at an annual capacity factor on the order of 45 percent, and that, much of the time, the actual output and magnetic fields attributable to Project cables would therefore be correspondingly lower (id. at 19); see also Section VI.C.2.d. Vineyard Wind therefore concluded that the modeled measurements are conservative (Tr. 6, at 856-857).

112 The Company stated that it anticipated using both configurations along the route, noting that the narrower configuration would likely work for the majority of the in-road work (Tr. 6, at 848-849). Vineyard Wind explained that the final decision on the actual configurations will be dependent on further discussions with the town DPW and engineers based on where existing utilities are located and any restrictions on placement of the duct bank (id.). Currently, the Company estimates that approximately 70 percent of the route would use the 2x4 configuration and 30 percent would use the 4x2 configuration (id. at 859).

Table 6. **Modeled Magnetic Fields for Onshore Underground Transmission Line**

Cable Array	Magnetic Field (mG), –20 feet from Centerline	Maximum Magnetic Field (mG), Directly Above Centerline	Magnetic Field (mG), +20 feet from Centerline
2x4 Duct Bank Array	2.3	32.5	2.3
4x2 Duct Bank Array	2.7	52.1	2.4

Source: Exh. VW-9, att. J at 3.

As shown in Table 6, above, modeled magnetic fields for typical roadway/bike path cross sections indicated a lower peak magnetic field directly above the conductors for the 2x4 array due to the deeper burial depth of the conductors resulting from this duct bank orientation (Exh. VW-9, att. J at 3, 12-13). For both cross sections, modeled magnetic fields drop off rapidly with increasing lateral distance from the Project conductors, with similar magnetic field levels for both duct bank arrays at 20 feet to either side of the centerline, with the levels at 2.3 mG and 2.7 mG based on the two arrays (id.).[113] The Company reported only one residence (along the Covell's Beach Route) that is within 20 feet of the centerline along either route and the associated variations (RR-EFSB-38). Therefore, with respect to the one form of mitigation identified by the Company – the possibility of burying the poured concrete duct bank deeper in order to achieve some incremental reduction in magnetic fields, Vineyard Wind opined that the additional cost and disruption associated with deeper (and wider) trenches for the purpose of further reducing magnetic field levels is not warranted (Exh. EFSB-MF-12).

The Company also developed cross sections for ROW #346, specific to the utility ROW portion of the New Hampshire Beach Route (Exh. VW-9, att. J at 9-11). The modeling indicated that magnetic fields for ROW #346 cross sections would change little with or without the Project (id.).

The Company also provided anticipated typical magnetic field levels at splice vaults (RR-EFSB-37). For this purpose, the Company modeled a "typical construction" scenario where splice vaults would be installed in side-by-side pairs and the phasing for the conductors would be

[113] The Company stated that given the distances of the residences to the east of the proposed Substation and the location of the ROW with existing transmission lines, there would be an undetectable change in magnetic fields at those locations (Tr. 6, at 864-865).

the same as in the 2x4 in-road duct bank, optimized for magnetic field cancellation (id.).[114] The Company reported that the maximum modeled magnetic field is 168 mG at one meter above ground surface above the splice vaults; modeled magnetic fields drop off rapidly with lateral distance from the cables, falling to 7.2 mG for lateral distances of 25 feet on either side of the vault and 1.0 mG for lateral distances of 50 feet (RR-EFSB-37). The Company estimated magnetic fields assuming operation of the wind turbine array at full capacity, but given probable operation of the array at an annual capacity factor of approximately 45 percent, Vineyard Wind asserted that the actual magnetic fields at the splice vaults attributable to the Project would be correspondingly lower (id.).

ii. Analysis and Findings on Magnetic Fields

The record shows that magnetic field strengths along the Covell's Beach Route and the New Hampshire Avenue Route would be similar. Consistent with WHO recommendations, the Siting Board continues to look for low-cost measures that would minimize exposures to magnetic fields from transmission lines. In prior Siting Board decisions, the Siting Board has recognized public concern about magnetic fields and has encouraged the use of practical and low-cost design to minimize magnetic fields along transmission ROWs. See e.g., Salem Cables at 88.

Given the underground installation of the Project Onshore Cables, the Company's modeled magnetic field values show maximums located over the Project centerline, with lateral distance from the centerline resulting in rapid magnetic field reduction. Magnetic fields at 20 feet from the onshore Project centerline, assuming no previous transmission line at the location in question, would be between 2 mG and 3 mG along both the Covell's Beach Route and New Hampshire Avenue Route, with only one residence within 20 feet of the transmission line. Magnetic fields along the New Hampshire Avenue Route at the ROW #346 Cross Section

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114 Project conductors within a 2x4 in-road duct bank would be split into two 1x4 arrays, such that each array entered one of the paired vaults (RR-EFSB-37). Within each vault, the conductors would be placed on the wall closest to the other vault, with a Project depth at a minimum of 1¾ feet between grade and the top of the vault and two feet vertical separation between the conductors within each vault (RR-EFSB-37).

would remain at existing levels with the addition of the Onshore Cables. Therefore, no residences along either route are in a location where exposure to high magnetic fields is anticipated. The Siting Board finds, therefore, that magnetic field impacts for the Covell's Beach Route and the New Hampshire Avenue Route would be similar, and that, given the planned installation described above, magnetic field impacts from construction and operation of the Project using the Covell's Beach Route would be minimized.

g. Substation

i. Introduction

The Project would require an onshore Substation to step down its 220 kV export cables to 115 kV in preparation for interconnecting to the existing Barnstable Switching Station (Exhs. VW-2, at 1-13; VW-6, at 2-23).

Vineyard Wind proposed locating the Substation in the eastern portion of an approximately 13.1-acre previously developed site in Barnstable, the former distribution center for the Cape Cod Times (Exh. VW-9, at 1-34). The proposed Substation parcel is 6.35 acres, primarily wooded, with some existing parking areas and a small building on the western portion of the 13.1-acre parcel (id.).[115] The Company described the portion of the parcel that it will lease for the Substation site as bordered to the north by the Barnstable Switching Station, to the west by the former Cape Cod Times distribution building, to the south by Independence Drive, and to the east by an existing approximately 150- to 200-foot-wide electric transmission corridor with a number of 115 kV overhead lines on H-frame and single pole support structures (id. at 1-34 to 1-35). Beyond the transmission corridor to the east are a four building, 60-unit apartment complex, a 29-unit apartment building under construction, a school and a church (Exh. VW-6, at 2-25, 7-12). The Company specified that this transmission corridor, Eversource ROW #344, runs between the Barnstable Switching Station and the Hyannis Junction Station, approximately a half-mile to the south (Exh. VW-9, at 1-35).

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115 The proposed Substation could also include synchronous condensers within the eastern portion of the existing building (formerly the Cape Cod Times building) on the western portion of the site (Exhs. VW-6, at 2-24, fig. 2-12; VW-9, at 1-6, 1-70; EFSB-NO-9; VW-10, at 14-15; Tr. 8, at 1198-1200, 1225-27).

ii. Wetlands and Water

The Company represented that there were no wetlands or mapped rare species habitat at the proposed Substation site (Exh. VW-9, at 1-35). The Company reported that a site inspection and desktop review of site conditions including hydrology, geology, and soil conditions at the Substation site indicate no wetlands within 100 feet of the proposed Substation, and no perennial streams within 200 feet (id.). Based on the Company's information, the Substation area is entirely upland (id.). The Company stated that the site is within a Zone II water supply protection area and the Barnstable Groundwater Protection Overlay District (Exh. VW-6, at 8-3).

Vineyard Wind committed to equipping the Substation with full containment for all components containing dielectric fluid, including all transformers, reactors, and capacitor banks (Exh. VW-6, at 8-3; Tr. 7, at 1044-45).[116] The Company indicated that, while full containment for large transformers and oil-filled reactors is standard industry practice, full containment is not normally used for lower-volume fluid-filled equipment given the low probability of any leakage (Company Brief at 191, citing Exhs. VW-2 at 1-14; VW-6, at 1-10, 2-25). The Company stated the Substation design would include at least full volume (110 percent) impervious containment sumps and, in response to a request from the Town of Barnstable, the Company is committing to adding additional containment volume in consideration of an extreme rain event (Exh. VW-9, at 1-71). Specifically, Vineyard Wind stated it would adjust the 110 percent containment volume upwards to account for a simultaneous 100-year, 24-hour rainfall event, estimated to yield nine inches of rain on Cape Cod, which would add approximately 7,500 gallons to the design containment volume (id.; Tr. 7, at 1041-45, 1087-88).[117] The Company explained that the

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116 The Company indicated it would equip the Substation with sumps to encompass full volume containment for liquids in the two main 450 MVA 220/115 kV stepdown transformers, tap changed iron core reactors, capacitor banks for the harmonic filter, and any equipment containing oil associated with the synchronous condensers (Exhs. VW-9, at 1-70).

117 Vineyard Wind committed to exploring options for using a biodegradable alternative to dielectric fluid in components (Exh. VW-6, at 8-3; RR-EFSB-44). However, the Company indicated that there is insufficient industry experience using biodegradable

Substation design includes a common drain system that would direct runoff from each individual containment area, after passage through an oil-absorbing inhibition device, to an oil-water separator before draining to the infiltration basin (Exh. VW-9, at 1-71).[118]

iii. Substation Design: Air- vs Gas-Insulated

The Company originally proposed a substation design with air-insulated switchgear ("AIS") (Exh. VW-2, at 1-13). At the request of the Siting Board, the Company provided a design with gas-insulated switchgear ("GIS"); the Company also subsequently provided an AIS redesign (Company Brief at 21-22). Vineyard Wind defended its choice of an AIS substation over a GIS substation, and maintained that it should not be required to use a GIS design based on information it provided supporting use of the AIS design (id.).

The Company described its proposed Substation as a conventional AIS design, with two 220/115 kV stepdown transformers, other necessary equipment, switchgear, and bus work (Exh. VW-6, at 2-24). Vineyard Wind explained that equipment spacing in an AIS substation allows for ambient air to provide electrical insulation (id.). The Company stated that it considered using a GIS design, which is more compact but more expensive than the AIS design and is insulated with sulfur hexafluoride ("SF_6") gas (id.). The Company represented that, in this case, the need for SF_6 and the additional expense of the GIS system is not necessary as the size of the Substation site is sufficient to accommodate the proposed AIS design and maintain appropriate vegetative buffering at the perimeter of the Substation (id.; Tr. 8, at 1312 to 1315).

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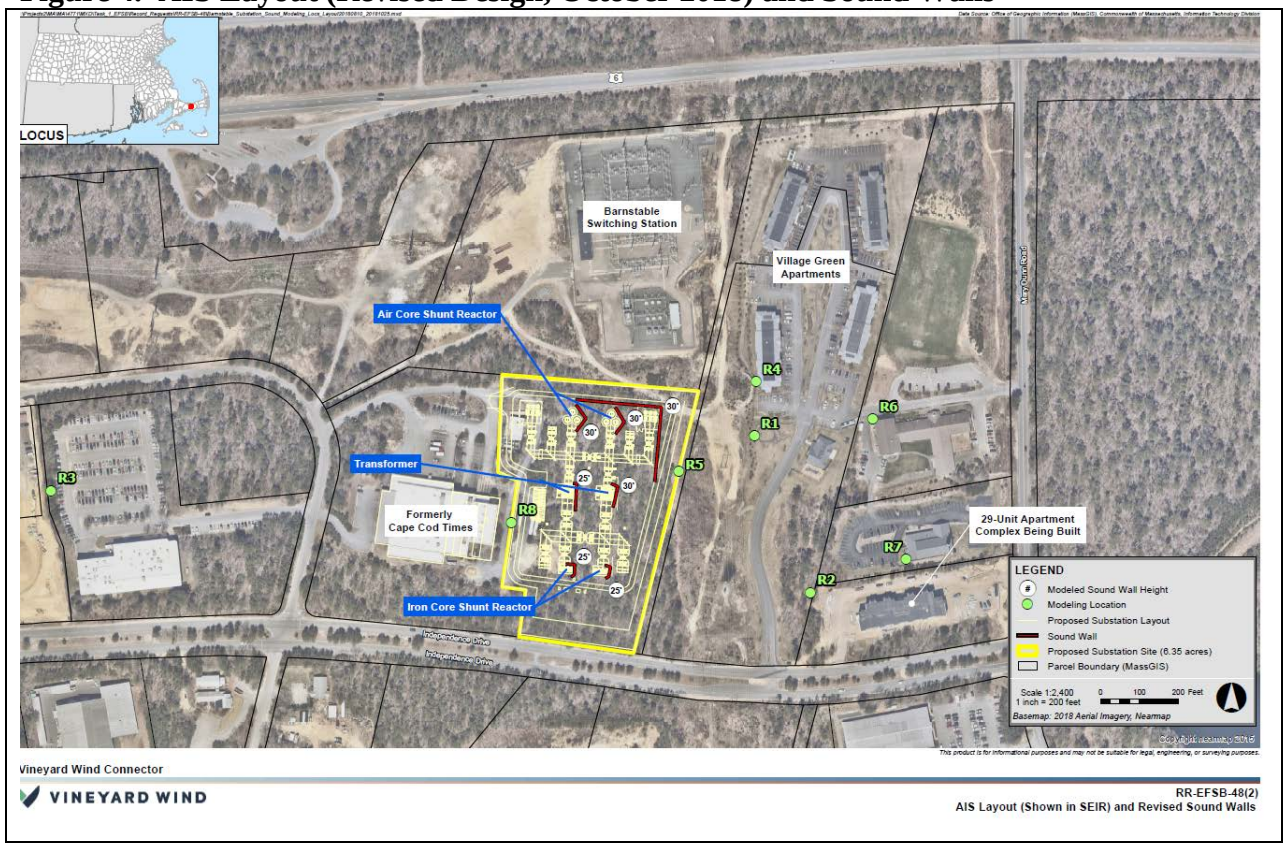
dialectic fluid and few commercial vendors, which could impair the Company's ability to obtain sufficient supplies at reasonable prices (RR-EFSB-44). Further, the Company indicated that the larger quantities of biodegradable insulating oils involved would most likely necessitate use of larger equipment, reducing space for other equipment within the Substation site (id.; Exh. VW-6, at 8-3). The Company maintained it is confident that the containment and other safeguards planned for the proposed Substation will protect groundwater and municipal water supplies in particular, regardless of whether or not the dielectric fluid used is characterized as biodegradable (RR-EFSB-44).

[118] Mitigation methods pertaining to containment are detailed in the HCA executed between Vineyard Wind and the Town of Barnstable (Exh. G-1(S2)(1).

The Company estimated that the incremental cost difference between the proposed AIS design and a GIS design would be $25 million (Exh. VW-3, Att. G (Revised Public)(S1)).

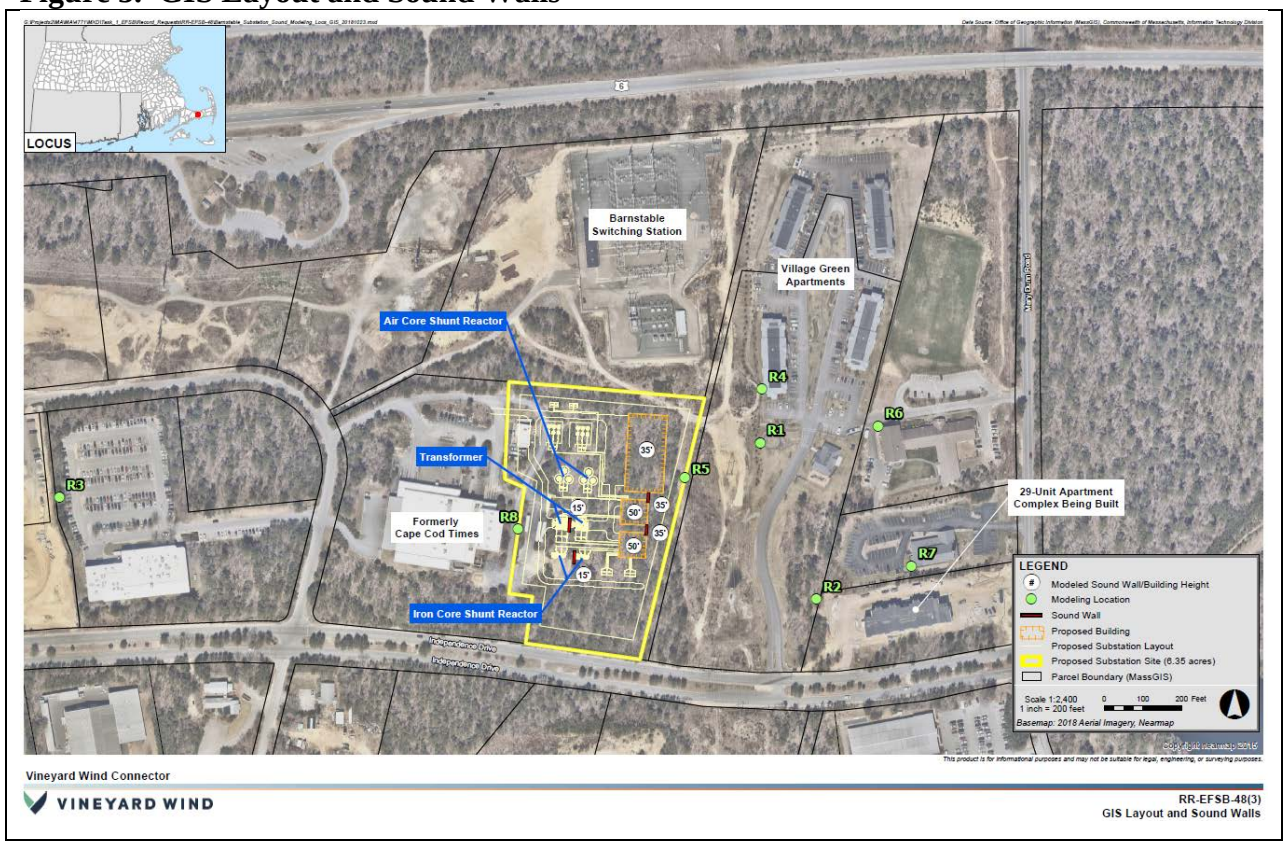
The Company provided a sound level impact comparison of the Substation with Vineyard Wind's AIS re-design (submitted as part of the Project DEIR) and a GIS design (RR-EFSB-48). The sound level evaluation compared, at sensitive receptors near the proposed Substation, the predicted increase over ambient sound levels (in dBA) with both the AIS re-design and the GIS design (id.). The Company subsequently further revised its AIS design to apply insights gained in consideration of a GIS design to its AIS design (Exhs. EFSB-G-26; EFSB-G-26(1); EFSB-G-26(2); EFSB-G-26(3); RR-EFSB-48).

Figure 4. AIS Layout (Revised Design, October 2018) and Sound Walls



Source: RR-EFSB-48(2)

Figure 5. GIS Layout and Sound Walls



Source: RR-EFSB-48(3)

(A) Noise

Vineyard Wind conducted a sound level impact assessment study for its proposed new Substation adjacent to the existing Barnstable Switching Station (Exh. VW-6, at 7-1). The assessment included a baseline sound monitoring program to measure existing ambient sound levels in the vicinity of the proposed Substation, computer modeling to predict future sound levels when the Substation is operational, and a comparison of predicted sound levels with applicable noise criteria, including the MassDEP noise policy (id. at 7-1, 7-5).[119, 120]

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119 The Company stated that MassDEP prohibits emission of noise that: (1) results in an increase in the broadband sound pressure level of more than ten A-weighted dBA above the ambient sound level; or (2) results in a "pure-tone" condition (Exh. VW-6, at 7-5). "Ambient" is defined as the background A-weighted sound level that is exceeded 90 percent of the time, measured during equipment operating hours (L_{90}) (id.). A "pure

The Company conducted an ambient sound level survey of the area surrounding the proposed Substation site to characterize the existing acoustic environment (Exh. VW-6, at 7-6). The Company described the Substation site as in a largely commercial/industrial part of Barnstable, approximately 750 feet south of Route 6 (a four-lane divided limited-access highway), and less than a half-mile to the north/northeast of the Hyannis Airport (id.). The Barnstable Switching Station, transmission ROWs, the former Cape Cod Times distribution complex, and several commercial uses border the Substation site, as do several apartment developments (id.). The four-building Village Green apartment complex is immediately east of the existing Barnstable Switching Station (id.). A 29-unit apartment complex is under construction to the east of the proposed Substation site, as is a larger apartment development on the west side of a commercial building beyond Communication Way (id. at 7-6, 11-11).

The Company selected three sound level measurement locations to represent sound levels at the nearest noise sensitive receptors to the Project.

- Location LT-1 —Village Green Apartments: This location is representative of the Village Green Apartments to the north and east of the Project.

- Location LT-2 — Eastern Apartment Building (under construction): This location is representative of noise receptors east of the Project including a future apartment building currently under construction at the corner of Independence Way and Mary Dunn Road.

- Location LT-3 —Western Apartment Complex (under construction): This location is closest to the future apartment buildings that are currently under

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tone" condition occurs when any octave band sound pressure level exceeds both of the two adjacent octave band sound pressure levels by 3 dB or more (id.). The Company explained that MassDEP's noise limits are MassDEP policy and are applicable both at the facility property line and at the nearest residences (id.).

120 To model noise impacts from the Substation electrical equipment, the Company used Cadna/A noise calculation software, which accounts in its computations for local topography, ground attenuation, drop-off with distance, barrier shielding, diffraction around building edges, reflection off building facades, and atmospheric absorption of sound from multiple noise sources (Exh. VW-6, at 7-10 to 7-11).

> construction west of the proposed Substation, and is representative of the existing commercial and industrial buildings to the west.

The Company presented a broadband sound level evaluation (Exhs. VW-6, at 7-11 to 7-12; EFSB-NO-7; RR-EFSB-48). The nighttime ambient sound levels for the evaluation of modeling receptors R1 through R3 were provided as the established ambient levels at measurement locations LT-1, LT-2, and LT-3 (Exh. EFSB-NO-7). Location R5 is at the residential Project property line shared with the Village Green Apartment complex and location R4 is the nearest apartment building on the complex (Exh. EFSB-NO-7). Location R6 is a school, Trinity Christian Academy, to the east of the Village Green Apartments; R7 is a church (Brazilian Assembly of God) directly south of Trinity Christian Academy (Exhs. EFSB-NO-7; EFSB-NO-7(1)). R8 is at the western property line of the proposed Substation (Exhs. EFSB-NO-7; EFSB-NO-7(1)). [121]

Subsequent to the submission of the Project DEIR, the Company indicated that it performed updated acoustic modeling for the AIS design in an effort to improve sound barrier design and find associated additional noise reductions (RR-EFSB-48). Table 7, below, summarizes the increase over the nighttime background noise for the original and revised AIS design cases, together with the Company's GIS design (RR-EFSB-48).

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[121] The Company estimated ambient sound levels for modeling locations R4 through R8 based on sound levels measured at LT-1, LT-2, and LT-3 since sound levels were not measured at these specific points (EFSB-NO-7).

Table 7. Predicted Increase Over Ambient (dBA)

Receptor ID	Description	Land Use	Predicted Increase Over Ambient (dBA)		
			Original AIS Design	Revised AIS Design	GIS Design
R1	Village Green Apartments (LT-1)	Residential	9	3	2
R2	Eastern Apartment Building Property Line (LT-2)	Residential	9	6	5
R3	Western Apartment Complex Property Line (LT-3)	Residential	1	1	1
R4	Village Green Apartment Building	Residential	7	3	3
R5	Western side of utility ROW, across from Village Green Apartments	Residential	18	7	2
R6	Trinity Christian Academy	Institutional	5	2	1
R7	Brazilian Assembly of God	Institutional	7	5	4
R8	Western Substation Property Line	Institutional	16	12	20

Source: RR-EFSB-48, at 8.

Vineyard Wind indicated that, in conjunction with its updated modeling, the Company made changes both to its interior sound barriers and to its northeast corner perimeter sound barrier, which it made longer and taller (RR-EFSB-48, at 2). The Company stated that its revised AIS design calls for an increase of approximately 10,800 square feet of sound barrier over the original design (id.).[122] The Company stated that the complement of sound walls

[122] The Company indicated that the additional sound barrier would add approximately $1,000,000 to the cost of the Project over its previous cost estimates (RR-EFSB-48, at 2).

proposed to mitigate sound from the Substation at nearby receptors was developed based on professional judgment coupled with use of Cadna/A noise calculation software (Exh. EFSB-NO-23(S)). Vineyard Wind indicated that the sound walls reflect a workable, but not necessarily fully optimized, noise control solution (id.). Vineyard Wind represented that, given noise controls added with its revised acoustical modeling, the Company's updated noise analysis for the AIS design would achieve off-site sound levels comparable to those using a GIS design (Exh. EFSB-NO-20; RR-EFSB-48).

The Company argues that the Siting Board should not require a GIS design (Company Brief at 22, 188-189). For the AIS design, the Company argues in favor of including a design margin or contingency (RR-EFSB-48, at 3). In this regard, the Company maintained that the Siting Board should allow noise levels of 3 dBA above the modeled levels for the AIS design as revised October 2018 (RR-EFSB-48, at 3 to 4).

More specifically, the Company proposes a performance-based noise minimization standard of 6 dBA (Company Brief at 189). The Company contends that compliance should be measured by an increase of 6 dBA over ambient at R4, rather than the modeled 3 dBA increase reported at this receptor, the nearest residential building to the Substation (id.).[123] The Company recognizes that the increase in noise at this location (i.e., R4) was 3 dBA based on post-DEIR changes to the sound wall design, but opined that additional tolerance or allowance is warranted (id. at 189-190).

Vineyard Wind provided the following reasons to support limiting sound increases to 6 dBA instead of the modeled 3 dBA.

- Projections of sound propagation, such as described in relevant guidance published by the International Organization for Standardization have a model uncertainty of plus or minus 3 dBA; the Company's own modeling does not account for this modeling uncertainty (Tr. 9, at 1348-1352; RR-EFSB-53).

- Noise increases up to 3 dBA are not generally noticeable by the public; a noise increase of 6 dBA would not perceptibly differ from a noise increase of 3 dBA since the difference between the two does not exceed 3 dBA (Company Brief at 190, citing Tr. 9, at 1340, 1352).

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[123] See also Table 7 and Figure 6, above.

- Conditions under which the Project would add the most to ambient sound levels occur only at hours of the night when people tend not to be outside (Tr. 9, at 1349).

- Plans for the placement and sizing of noise barriers may change with selection of specific Substation equipment and refinement of the civil and electrical layout of the Substation (Company Brief at 190, citing RR-EFSB-48, at 2). Design flexibility enabled by using a performance standard, rather than specific noise mitigation devices or layouts, would allow the Company to refine and optimize its design and to solicit solutions from vendors that would achieve noise requirements at competitive costs (Company Brief at 190-191, citing Tr. 8, at 1239-1242; Tr. 9, at 1357-1363).

- The requested limit of 6 dBA over ambient is consistent with other Siting Board decisions, which have authorized sound increases in the range of 5 dBA to 8 dBA (Company Brief at 191, citing e.g., Lower SEMA at 84; NRG Canal, at 117; Sithe Edgar Development, LLC, EFSB 98-7, at 83 (2000).

(B) Visual

The Company anticipated that most of the major equipment and bus work for its proposed AIS design Substation would not exceed 30 feet in height (Exh. VW-6, at 2-25). As described by the Company, the proposed Substation would have no overhead transmission lines but would be otherwise similar in scale and appearance to the existing Barnstable Switching Station immediately to the north (id.). In contrast to the switching station, the Substation would be situated at a lower grade and at least partially obscured by deciduous vegetative screening (id.). The Substation would be bordered immediately to the west by the building formerly housing the distribution headquarters for the Cape Cod Times (Exh. VW-9, at 1-34; see also Section VI.D.2.g.i, above). [124]

Vineyard Wind indicated that it would retain both a band of existing vegetation along the eastern side of the Substation and a band of existing vegetation at the south side of the parcel

[124] The Company planned to finish the Substation yard with crushed stone, to install perimeter security fencing, and to provide access to the Substation area via an existing paved driveway off Communication Way in Barnstable (Exh. VW-6, at 2-25). The Substation design would include an internal access road (id.).

along Independence Drive (Exh. VW-6, at 2-25). Vineyard Wind anticipated that a 50-foot-wide vegetative screen to the south and a 30-foot-wide vegetative screen to the east would be the maximum amount of vegetative screening reasonably possible on the Substation site, regardless of AIS or GIS design (RR-EFSB-52; see also Figure 6 and Figure 7, below). According to the Company, additional vegetative screening on the eastern portion of the Substation site generally would not be possible without intruding on the utility ROW, though some vegetation would be possible east of the noise barrier located on the northeast corner of the Substation site (RR-EFSB-52).

Vineyard Wind described the existing vegetation on the eastern side of the site as providing visual screening for the Village Green Apartments, a four-building, 60-unit apartment complex dating to 2014 and built east of the existing Barnstable Switching Station and the adjoining ROW (Exh. VW-6, at 2-25).[125] The Company contended that vegetation on the east side of the Project Substation site, together with existing vegetation on the adjoining utility ROW, would provide screening for a new 29-unit apartment building under construction at the intersection of Independence Drive and Mary Dunn Road (id.). Vineyard Wind indicated that because the site elevation of the Substation would be approximately 20 feet lower than the site elevation of the existing Barnstable Switching Station, topography would further reduce potential visual impacts to the referenced 29-unit building from the proposed Substation (id.).

The Company provided revised and updated photosimulations for both the AIS and GIS Substation designs (RR-EFSB-51; RR-EFSB-51(1) through RR-EFSB-51(13)). The revised photosimulations for the updated AIS Substation design reflect changes to the AIS Substation sound wall design as of October 2018 (RR-EFSB-51).

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125 The referenced ROW #344 includes two 115 kV lines (#124 and #128) on wooden H-frames and two 25 kV lines (Exh. VW-6, at 2-25 n.8).

Figure 6. AIS Layout with Sound Walls

Source: RR-EFSB-51(1)

Figure 7. GIS Layout with Sound Walls

Source: RR-EFSB-51(8)

iv. Town of Yarmouth

Yarmouth states that, given the Substation would be in a Zone II Wellhead Protection Area and in the Barnstable Groundwater Overlay Protection District, it has reservations about the location of the Substation with respect to its potential impacts to groundwater (Yarmouth Brief at 23, citing Exh. VW-6, at 8-2, 8-3). Yarmouth therefore favors incorporating, in any approval of the Project, all conditions necessary to ensure protection of groundwater and public water supplies, including, but not limited to, robust containment mechanisms and state and federal mandated spill prevention and protection measures during construction and operation of the Substation (id.).

v. Analysis and Findings

(A) Introduction

Vineyard Wind proposes the same location and design for its Substation along either the Covell's Beach Route or the New Hampshire Avenue Route. The Company indicates that it would construct the Substation on 6.35 leased acres within an approximately 13.1-acre partially developed site in Barnstable. The Substation site is largely wooded or otherwise surrounded by primarily utility and commercial uses, but several apartment complexes, located to the east and southeast, existing or under construction, are also in the area.

(B) Wetlands and Water

Assessments completed by the Company show no wetlands within 100 feet of the proposed Substation and no perennial streams within 200 feet. The Substation, however, is within both a Zone II water supply protection area for the Town of Barnstable and the Barnstable Groundwater Protection Overlay District. As Yarmouth's Brief indicates, the location of the Substation with respect to these two water protection zones is also a concern to the Town of Yarmouth.

The Company plans measures to avoid contamination of water supply and groundwater by construction, operation, or maintenance of the Project Substation. These measures include sending flows from the Substation through an oil-water separator before draining them to the Substation infiltration basin. The Company's plans also call for equipping the Substation with at

least full volume (110 percent) impervious containment sumps for all equipment using dielectric fluid, e.g. transformers, reactors, and capacitor banks, and any other components, as well as additional mitigation to contain a simultaneous 100-year, 24-hour rainfall event (approximately nine inches of rain). The record shows that containment and other safeguards for the proposed Substation will protect groundwater and municipal water supplies regardless of whether or not the dielectric fluid used is characterized as biodegradable. The Company commits to considering the use of biodegradable dielectric fluids in equipment where it is commercially available and proven, regardless of whether the Siting Board adopts any such condition.

Given implementation of these containment measures the Siting Board finds the wetlands and water impacts of the Substation would be minimized.

(C) Substation Design: Air- vs Gas-Insulated

Vineyard Wind's preference is for an AIS design substation over a GIS design substation. The Company emphasizes the additional expense inherent with use of a GIS system and its desire to avoid the use of SF_6, a potent greenhouse gas. The Company argues that reasons typically justifying use of a GIS design, e.g., constrained space and sometimes associated concerns about noise and/or visual impacts, do not apply to the Project given its redesigned substation with AIS design. The record shows that the proposed location of the Substation is large enough to encompass a Substation of AIS design and to allow for noise and visual buffering of the facility with sound walls and vegetation, respectively. The Company provided adequate information to determine the extent of noise and visual impacts of both an AIS and a GIS design tailored to the proposed Substation site.

(1) Noise

The record includes updated acoustic modeling and Substation design changes provided by the Company. The information submitted by Vineyard Wind indicates that given the improved design and placement of sound walls, predicted off-site sound levels of the Company's revised AIS design are comparable to predicted off-site sound levels using a GIS design. The Company changed its AIS design to achieve the referenced lower off-site sound levels by

(1) adding interior sound walls, and (2) by making the northeast corner perimeter sound wall longer and higher. Vineyard Wind's proposed additional sound walls are estimated to cost $1 million. The Siting Board concludes that with the Company's proposed changes, sound level impacts would be comparable for the AIS- and GIS-design substations.

While the Company's updated modeling and AIS Substation design changes result in lower sound levels than originally modeled, these predicted sound levels over ambient are still preliminary. The Company continues to refine its substation design, affecting sound levels and associated off-site noise impacts. Depending on availability and cost of materials, the final design of the Substation may incorporate a number of modifications to the size and placement of sound walls in particular. The Company specifically acknowledges, for example, that at the closest residential property to the Substation, the Village Green Apartments (R4), operation of the Substation combined with changes to its AIS design might result in more than a 3 dBA increase in sound levels over ambient predicted by Vineyard Wind's modeling. Similar consequences, i.e., an increase in sound level impacts above 3 dBA, might occur at other residential and institutional receptors in the nearby vicinity. The Company maintains that an increase of less than 3 dBA over modeled sound levels would likely be imperceptible and variability up to 3 dBA would be within expected measurement and model tolerance.

Vineyard Wind opines that it will need flexibility in its continued substation design efforts and that changes to one aspect of substation design (e.g., placement and size of sound walls) are likely to trigger other adjustments. The Company advises that any noise conditions imposed by the Siting Board regarding Substation operation should reflect the ongoing refinement of the Substation design. Specifically, Vineyard Wind requests that the Siting Board regard any noise increase of 6 dBA or less at receptor location R4 as indicative of overall noise compliance for the Substation.

The Siting Board recognizes that Vineyard Wind's selection of specific Substation equipment will have consequences for Substation operation and associated noise impacts that cannot be determined exactly until final design and construction of the Project. The Siting Board also recognizes that there is some variability within the Company's acoustic modeling and its prediction of increases over ambient noise at sensitive receptors in the vicinity of the Substation.

However, such variation is common to all noise modeling that the Siting Board has analyzed in prior cases and is not a compelling reason to provide a more permissive condition in this proceeding. The Siting Board is not persuaded that the Substation cannot be built as currently modeled, within the limit of 3 dBA over predicted ambient noise at the R4 receptor location. In general, the Siting Board's past practice has been to rely on an applicant to present an accurate projection of operational noise levels, and meet the modeled noise increases presented in its analysis. In the event that an approved facility's noise levels exceed those represented during a proceeding, the Siting Board reviews such deviations, and where significant, may require additional post-construction noise mitigation measures. In determining whether post-construction noise in excess of previously modeled results is significant, and would potentially require additional noise mitigation measures, the Siting Board takes into account, among other things, the magnitude of such deviations from earlier modeling; whether the Company built the project with noise mitigation equivalent to what it proposed in the proceeding; the availability, effectiveness, and cost of additional mitigation; and whether project-related operational noise concerns have been reported.

Accordingly, to evaluate and verify operational noise impacts of the Substation, the Siting Board directs the Company to prepare and submit a report comparing actual noise impacts at the R4 and other receptor locations to the noise levels predicted in this proceeding. This report shall be submitted to the Siting Board within four months of the end of the Vineyard Wind Energy Facility's first year of operation.

Given the implementation of the mitigation measures proposed by the Company, and the noise monitoring condition, above, the Siting Board finds that the noise impacts of the Substation as proposed with the AIS design would be minimized.

(2) Visual

The record shows that the Substation would be compatible with much of the area around the proposed substation location. The Substation site is bounded in part by vegetation and existing utility uses (the Barnstable Switching Station) to the north and an existing ROW #344 to the east. The Substation site itself is part of a larger parcel recently used for commercial

purposes. The record also shows a number of apartment complexes and community uses (school and religious buildings) nearby and indicates that at least one additional apartment building is being constructed in the area. These residential and community structures currently have views of existing ROW #344 and the Barnstable Switching Station that are consistent with views they are expected to have assuming completion of the proposed Substation.

According to the record, the maximum height of most major equipment and bus work for the Company's AIS-design substation is not to exceed 30 feet in height. Much of the eastern and southern side of the proposed substation is currently vegetated; a swath of this vegetation, 50 feet wide to the south and 30 feet wide to the east, would continue to provide screening for properties to the east, which are separated from the Substation by an existing ROW, and to existing and future structures along Independence Drive to the south.

The record includes photosimulations for an updated AIS-design and a GIS-design substation at the Project Substation site, reflecting changes made as a result of the Company's modifications to substation design in response to its latest sound level impact evaluation summary (see Table 7). Based on the record, the current AIS-design substation calls for 30-foot-high sound walls to the northeast and east; the substation if designed with a GIS presents a 35-foot-high structural face in the same directions (northeast and east). The appearance of the Substation and likely views from proximate residences and community buildings with either AIS- or GIS-design results in comparable visual impacts. The height of sound walls and equipment enclosures and vegetative screening serves to otherwise mitigate views of the proposed Substation. However, the Siting Board anticipates some visual impacts to residential units that abut the Eversource ROW and face towards the Substation. Therefore, the Siting Board directs Vineyard Wind, prior to finalizing the design of the exterior sound wall, to inform the Siting Board as to what architectural treatments could be incorporated to maximize the aesthetics of the exterior sound wall. Prior to taking any steps to finalize the wall design, the Company shall submit the proposed wall design to the Siting Board for review. Further, the Siting Board directs the Company to provide a final landscaping plan along with a description of the community process that took place with the surrounding abutters prior to completion of the final plan.

Based on the record, the Siting Board concludes that visual impacts for its Project with the Company's construction of either an AIS- or GIS-design Substation would be comparable. The Siting Board therefore finds that, with implementation of the above mitigation measures and conditions, the visual impacts of the Substation with AIS-design would be minimized.

E. Summary of Environmental Impacts

The Siting Board finds that the information the Company provided regarding the Project's environmental impacts is substantially accurate and complete. In comparing the environmental impacts along the two routes, the Siting Board finds that with regard to offshore impacts, the Covell's Beach Route would have lower land use and water impacts, and lower impacts to shellfish, fish and protected species, predominantly due to utilizing the landfall location at Covell's Beach versus New Hampshire Avenue via Lewis Bay. Further, marine traffic impacts are lower using the Covell's Beach Route. With regard to onshore impacts, the two routes are comparable for all environmental impact categories. Therefore, on balance, the Siting Board finds that the Covell's Beach Route is preferable to the New Hampshire Avenue Route with respect to environmental impacts.

F. Cost

Vineyard Wind stated that the Covell's Beach and New Hampshire Avenue Routes, including their variations, are comparable from a cost perspective (Exh. VW-3, att. G (Revised Public)(S1); Tr. 1, at 101). The Company submitted estimates showing the onshore construction costs associated with the Covell's Beach Route would be approximately $4.3 million more than those associated with the New Hampshire Avenue Route, but that the offshore construction costs associated with the Covell's Beach Route would be approximately $10.4 million less (Exh. VW-3, att. G (Revised Public) (S1)).[126,127] Vineyard Wind states that, because the cost

[126] The cost differentials presented assume the eastern option through Muskeget Channel and the primary Covell's Beach and New Hampshire Avenue Routes (rather than the variations) for the Onshore Cables (Exh. VW-3, att. G (Revised Public)(S1)).

estimates are concept-level and involve significant variables, it views the difference in overall cost between the routes as "very similar" (Company Brief at 54). The Siting Board concurs with the Company's assessment and finds that the Covell's Beach Route and the New Hampshire Avenue Route are comparable in terms of cost.

G. Reliability

According to the Company, the Covell's Beach and New Hampshire Avenue Routes would provide a similar level of reliability once constructed; however, the Covell's Beach Route is preferable with respect to reliability because it is more likely to be permitted and constructed in a timely manner (Exhs. VW-2 at 4-55; EFSB-G-1(S2); Company Brief at 132).

With respect to the Offshore Cables, the Company stated that there is no significant difference between the cable type, number of cables, or burial depth proposed for a route making landfall at Covell's Beach or New Hampshire Avenue (Exh. VW-2 at 4-55).[128] Similarly, for the Onshore Cables the Company stated that both the Covell's Beach and New Hampshire Avenue Routes would use a fully underground transmission design, and any differences in length between the routes would not result in a meaningful impact to reliability (id.).

Vineyard asserted that the reliability of a transmission project is also tied to a proponent's ability to successfully permit and construct the facility on a predictable and efficient timeline (Exh. VW-2 at 4-55). According to the Company, the HCA with Barnstable reduces the risk of permitting and construction delays for the Covell's Beach Route, thus increasing the likelihood that the Project will be able to reliably deliver power from the offshore windfarm on schedule (Exh. EFSB-G-1(S2) at 11-13). In contrast, the Company stated that discussions with Yarmouth

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127 The Company reported that its costs are estimated to an accuracy level of plus or minus 25 percent for the Onshore Cables and an accuracy level of plus or minus 50 percent for the Offshore Cables (Exhs. EFSB-C-1; EFSB-C-2).

128 While HDD installation is proposed at the Covell's Beach landfall site (rather than the open cut trenching methodology proposed for the New Hampshire Avenue landfall site), Vineyard Wind indicated that its current design for the HDD at Covell's Beach would limit burial depths and avoid any restrictions to the thermal ratings of the Offshore Cables (Tr. 1, at 91-96).

have not yet advanced to a similar stage, and certain residents have expressed concerns with a route making landfall at New Hampshire Avenue (id. at 12).[129]

The Siting Board recognizes the benefits of local support, including the successful negotiation of host community agreement(s), to the implementation of transmission projects and strongly encourages meaningful municipal and public consultation and engagement by proponents. On the specific bases of the comparable physical and operational characteristics of the two routes, the Siting Board finds that the Covell's Beach Route and the New Hampshire Avenue Route are comparable in terms of reliability.

H. Conclusion on the Covell's Beach and New Hampshire Avenue Routes

The Siting Board finds that the Covell's Beach Route, including the two routing alternatives through Muskeget Channel, is superior to the New Hampshire Avenue Route with respect to environmental impacts, and that the routes are comparable with respect to cost and reliability. The Siting Board therefore finds that the Covell's Beach Route is superior to the New Hampshire Avenue Route with respect to providing a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost.

Based on review of the record, the Siting Board finds that the Company provided sufficient information to allow the Board to determine whether the Project has achieved a proper balance among cost, reliability, and environmental impacts. The Siting Board finds that with the implementation of the specified conditions and mitigation presented above, and compliance with all local, state, and federal requirements, the environmental impacts of the Project along the Covell's Beach Route would be minimized. The Siting Board finds that the Project along the Covell's Beach Route would achieve an appropriate balance among conflicting environmental concerns as well as among environmental impacts, reliability, and cost.

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[129] The Town of Yarmouth submits that there has been significant opposition from its residents regarding the potential for a route making landfall at New Hampshire Avenue and that the Town remains concerned about potential environmental impacts associated with a route crossing Lewis Bay (Yarmouth Brief at 22, citing, e.g., RR-EFSB-20(1) at 61-65, 140-317).

VII. CONSISTENCY WITH POLICIES OF THE COMMONWEALTH

A. Standard of Review

G.L. c. 164, § 69J requires the Siting Board to determine whether plans for construction of the applicant's new facilities are consistent with current health, environmental protection, and resource use and development policies as adopted by the Commonwealth.

B. Analysis and Conclusions

1. Health Policies

In Section 1 of the Electric Utility Restructuring Act of 1997, the Legislature declared that "electricity service is essential to the health and well-being of all residents of the Commonwealth…" and that "reliable electric service is of utmost importance to the safety, health, and welfare of the Commonwealth's citizens…" See St. 1997, c. 11, §1(a),(h). In Section III.C, the Siting Board finds that with compliance with the condition requiring BOEM approval, Vineyard Wind would demonstrate that its proposed 800 MW offshore windfarm is likely to become available to contribute to the regional energy supply. Construction of the Project would enable the delivery of zero-emission renewable energy from this offshore facility to the ISO-NE electric grid and would enhance the reliability and diversity of the energy mix on Cape Cod and in the Commonwealth, consistent with the Electric Utility Restructuring Act (Exh. VW-2, at 1-22 to 1-23; Company Brief at 202-203).

In Section VI.C.2.e, the Company committed to complying with marine exhaust emissions standards. The Company will also offset offshore construction emissions of nitrogen oxides and volatile organic compounds through purchases of Emissions Reduction Credits in compliance with national air quality standards. In addition, the Company committed to use only retrofitted non-Tier 4 off-road construction equipment to limit emissions of particulate matter during onshore Project construction, consistent with MassDEP's Diesel Retrofit Program, which is designed to address health concerns related to diesel emissions.

In Sections VI.C.2 and VI.D.2, the Siting Board found that the Project's offshore and onshore noise, magnetic field, air, traffic, and safety impacts have been minimized. Accordingly, subject to the Company's specified mitigation and the Board's conditions set forth

in Section XII, below, the Siting Board finds that the Company's plans for construction of the Project are consistent with current health policies of the Commonwealth.

2. Environmental Protection Policies

Developed pursuant to the Oceans Act, the Massachusetts OMP creates a framework for managing uses and activities within the state's ocean waters. See St. 2008, c. 114. The OMP identifies and maps ecological resources that are important components of the Commonwealth's estuarine and marine ecosystems (i.e., SSU areas), as well as key areas of water-dependent uses (Exh. VW-16, at 10). The OMP also contains siting and management standards designed to protect these mapped resources (id.). In the Certificate on the FEIR, the Secretary found that that the Project is consistent with the siting standards of the OMP (id. at 2).[130] In Section VI.C.2, the Siting Board reviewed the Project's impacts to water-dependent uses such as commercial and recreational fishing, and navigation and concluded that, subject to the specified mitigation and conditions set forth below, the Project's impacts have been minimized.

The Oceans Act also establishes an Ocean Development Mitigation Fee to be assessed to offshore development projects, with the intent of compensating the Commonwealth for impacts to ocean resources and the broad public interests and rights in the lands, waters, and resources of OMP areas (Exh. VW-16, at 12). In the Certificate on the FEIR, the Secretary established a minimum fee of $240,000 for the Vineyard Wind Connector based on the Project's footprint and impacts (id.). If impacts exceed the identified estimates – based on actual installation and post-construction surveys – the fee will increase and is not capped (id.).

The GWSA, enacted in August 2008, is a comprehensive statutory framework to address climate change in Massachusetts. St. 2008, c. 298. The GWSA mandates that the Commonwealth reduce its GHG emissions by 10 to 25 percent below 1990 levels by 2020, and by at least 80 percent below 1990 levels by 2050. G. L. c. 21N, §3(b). The GWSA authorizes

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130 The OMP is incorporated into the Massachusetts Coastal Zone Management ("CZM") Plan, and thus the CZM Office will assess the Project in light of the OMP during its federal level consistency review (Exh. VW-6, at 2-36). In the Certificate on the FEIR, the Secretary noted that in its comments to MEPA, CZM agreed that Vineyard Wind has adequately met the siting standards in the OMP (Exh. VW-16, at 10).

the establishment of legally binding limits on GHG emissions in the Commonwealth, and designates the Secretary and MassDEP as the entities primarily responsible for implementing the GWSA. G.L. c. 21N, §§ 2-5.

Pursuant to the GWSA, the Secretary issued the Massachusetts Clean Energy and Climate Plan for 2020 on December 29, 2010 (the "2020 CECP") and an update dated December 31, 2015 (the "2020 CECP Update"). In a determination accompanying the 2020 CECP, the Secretary set the 2020 state-wide GHG emissions limit at 25 percent below 1990 levels. On September 16, 2016, Governor Charles D. Baker issued Executive Order 569, titled "Establishing an Integrated Climate Change Strategy for the Commonwealth." Executive Order 569 included the directive that MassDEP issue regulations pursuant to Section 3(d), setting declining annual aggregate GHG emissions limits for sources or categories of sources that emit GHGs, in order to achieve the 2020 limit. See Executive Order 569, at 3; see also G.L. c. 21N, § 3(d). On August 11, 2017, MassDEP issued final regulations in accordance with the GWSA.

The GWSA obligates administrative agencies, such as the Siting Board, to consider reasonably foreseeable climate change impacts and related effects when reviewing permit requests. The Company has shown that the Project would have no adverse climate change impacts or negative effects relating to sea level rise. Rather, the Company reported that construction and operation of the Vineyard Wind Energy Facility would advance the GWSA's goals of reducing carbon dioxide emissions across the New England electric grid by more than 1,600,000 tons per year (Exh. VW-2, at 6-6).

The Commonwealth's EJ Policy includes an enhanced public participation provision and an enhanced analysis provision.[131] Because the Project does not exceed any MEPA environmental notification form review thresholds that trigger the enhanced public participation or enhanced review provisions, the Board's review of the Project in this proceeding is not subject to the EJ Policy. Based on a linguistic analysis of the populations in the Project area communities, however, the Presiding Officer directed Vineyard Wind to implement a number of

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[131] The Commonwealth first issued its EJ Policy on October 9, 2002. On January 31, 2017, EEA issued an updated version of the EJ Policy. The Siting Board's review of the Project was not subject to either version of the EJ Policy.

public outreach measures consistent with the enhanced public participation component of the EJ Policy, including publication of the Notice in Portuguese as well as English, and the provision of a Portuguese-speaking interpreter at the public comment hearing. The Siting Board's review of the Project is not subject to, but is consistent with the Commonwealth's EJ Policy.

In Sections VI.C.2 and VI.D.2, above, the Siting Board reviewed how the Project would meet other state environmental protection requirements. The Company will obtain all applicable environmental approvals, licenses, and permits (Exh. VW-2, at 6-3). The Siting Board also (1) considered the Project's environmental impacts, including those related to land use, wetlands and waterways, marine resources, traffic, noise, air emissions, visual impacts, and magnetic fields; and (2) concluded that, subject to the specified mitigation and conditions set forth below, the Project's environmental impacts have been minimized.

Subject to the specified mitigation and conditions set forth in this Decision, the Siting Board finds that the Company's plans for construction of the Project are consistent with the current environmental protection policies of the Commonwealth.

3. Resource Use and Development Policies

As discussed in Section I.A, above, the Vineyard Wind Energy Facility was proposed in response to the clean energy mandate of Chapter 188 of the Acts of 2016 (An Act to Promote Energy Diversity) and an associated competitive solicitation. St. 2016, c. 188 (includes Section 83C). Vineyard Wind was the successful bidder in this procurement process, the Department has approved the long term contracts between the Company and the Massachusetts EDCs, and the Project directly advances the purposes of Section 83C by facilitating the delivery of up to 800 MW of offshore wind generation to the Commonwealth.

The Project is also consistent with the Commonwealth's 2007 Smart Growth/Smart Energy Policy, wherein the Massachusetts Executive Office of Energy and Environmental Affairs established Sustainable Development Principles. Among the principles are: (1) the promotion of clean energy; and (2) encouraging reuse of existing sites, structures and infrastructure. In Section III, above, the Siting Board reviewed the need for the Vineyard Wind Connector and concluded that the existing transmission system is inadequate to interconnect the

Company's proposed offshore windfarm. Construction of the Project would promote the development of clean energy by permitting the delivery of up to 800 MW of offshore wind generation to the Commonwealth. Additionally, the Onshore Cables would be located primarily underground in existing roadways, thus utilizing previously disturbed lands.

The Commonwealth seeks to preserve and protect the rights of the public, and to guarantee that private uses of tidelands and waterways serve a proper public purpose, through the Massachusetts Public Waterfront Act (Chapter 91). As discussed in Section V.C.5, above, MassDEP has determined the Project is a Water-Dependent Use Project and therefore is consistent with this policy.

Subject to the specific mitigation and the conditions set forth in this Decision, the Siting Board finds that the Company's plans for construction of the Project are consistent with the current resource use and development policies of the Commonwealth.

VIII. ANALYSIS UNDER G.L. C. 40A, § 3 - ZONING EXEMPTIONS

Pursuant to G.L. c. 40A, § 3, Vineyard Wind requests certain individual zoning exemptions and a comprehensive zoning exemption from the Town of Barnstable Zoning Ordinance, to allow construction and operation of the Substation and the Onshore Cables (Exh. WV-4).[132]

A. Standard of Review

G. L. c. 40A, § 3, provides, in relevant part, that:

> Land or structures used, or to be used by a public service corporation may be exempted in particular respects from the operation of a zoning ordinance or by-law if, upon petition of the corporation, the [Department] shall, after notice given pursuant to section eleven and public hearing in the town or city, determine

[132] Vineyard Wind originally sought exemptions from both the Barnstable Zoning Ordinance and the Yarmouth Zoning Bylaw. Since the proposed Substation and the Company's preferred route, the Covell's Beach Route, are both located entirely within the Town of Barnstable, and because we find, in Section VI.H, above, that the Covell's Beach Route is superior to the New Hampshire Avenue Route, we do not address the requested exemptions from the Yarmouth Bylaw.

> the exemptions required and find that the present or proposed use of the land or structure is reasonably necessary for the convenience or welfare of the public.

Thus, a petitioner seeking exemption from a local zoning by-law under G.L. c. 40A, § 3, must meet three criteria. First, the petitioner must qualify as a public service corporation. Save the Bay, Inc. v. Department of Public Utilities, 366 Mass. 667 (1975) ("Save the Bay"). Second, the petitioner must demonstrate that its present or proposed use of the land or structure is reasonably necessary for the convenience or welfare of the public. Woburn-Wakefield at 140; NRG Canal 3 Development LLC, EFSB 15-06/D.P.U. 15-180, at 140-141 (2017) ("NRG Canal"). Finally, the petitioner must establish that it requires exemption from the zoning ordinance or by-law. Woburn-Wakefield at 140; NRG Canal at 141; Tennessee Gas Pipeline Company, D.T.E. 01-57, at 3-4 (2002).

Additionally, the Siting Board favors the resolution of local issues on a local level whenever possible, to reduce concern regarding any intrusion on home rule. The Siting Board believes that the most effective approach for doing so is for a petitioner to consult with local officials regarding its project before seeking zoning exemptions pursuant to G.L. c. 40A, § 3. Woburn-Wakefield at 140; NRG Canal at 141; Russell Biomass LLC and Western Massachusetts Electric Company, EFSB 07-4/D.P.U. 07-35/07-36 (2009) ("Russell Biomass/WMECo"). Thus, the Siting Board encourages petitioners to consult with local officials, and in some circumstances, to apply for local zoning permits, prior to seeking zoning exemptions from the Department under G.L. c. 40A, § 3. Woburn-Wakefield at 140; NRG Canal at 141; Russell Biomass/WMECo at 68.[133]

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[133] G.L. c. 40A, §3 authorizes the Department, not the Siting Board, to grant zoning exemptions. On April 4, 2018, the Chair of the Department referred the Company's zoning exemption petition to the Siting Board for review and decision. G.L. c. 25, § 4. In accordance with G.L. c. 164, § 69H, the Siting Board applies Department and Siting Board standards "in a consistent manner." G.L. c. 164, § 69H(3). Thus, the Department and the Siting Board implement G.L. c. 40A, §3 using consistent standards of review. Consequently, the standard of review, and this Decision, cites to both Siting Board Decisions and Department Orders interpreting G.L. c. 40A, §3.

A. Public Service Corporation

1. Standard of Review

In determining whether a petitioner qualifies as a "public service corporation" ("PSC") for the purposes of G.L. c. 40A, § 3, the Massachusetts Supreme Judicial Court has stated:

> among the pertinent considerations are whether the corporation is organized pursuant to an appropriate franchise from the State to provide for a necessity or convenience to the general public which could not be furnished through the ordinary channels of private business; whether the corporation is subject to the requisite degree of governmental control and regulation; and the nature of the public benefit to be derived from the service provided.

Save the Bay, 366 Mass. at 680; Woburn-Wakefield at 141; NSTAR Electric Company d/b/a Eversource Energy, EFSB 14-04/D.P.U. 14-153/14-154, at 141 (2017) ("East Eagle"); see also Berkshire Power Development, Inc., D.P.U. 96-104, at 26-36 (1997) ("Berkshire Power").[134]

2. Company's Position

The Company states that it qualifies as a PSC "without consideration of its corporate structure" (Exh. EFSB-Z-16, at 11). The Company notes, however, that its corporate structure "may. . . be relevant to the Siting Board" in determining whether Vineyard Wind qualifies for PSC status (Exh. EFSB-Z-16, at 11). Vineyard Wind states that it is a Delaware limited liability

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134 The Department interprets this list not as a test, but rather, as guidance to ensure that the intent of G.L. c. 40A, § 3, will be realized, i.e., that a present or proposed use of land or structure that is determined by the Department to be "reasonably necessary for the convenience or welfare of the public" not be foreclosed due to local opposition. Berkshire Power at 30; Save the Bay, 366 Mass. at 685-686; Town of Truro at 410 (1974); New England Power Company d/b/a National Grid, D.P.U 15-44/15-45. at 5-6 (2016) (" MVRP"); NSTAR Energy Company d/b/a Eversource Energy, D.P.U. 15-02, at 4-5 (2015) ("Eversource Hopkinton"). The Department has interpreted the "pertinent considerations" as a "flexible set of criteria which allow the Department to respond to changes in the environment in which the industries it regulates operate and still provide for the public welfare." Berkshire Power at 30; MVRP at 6; see also Dispatch Communications of New England d/b/a Nextel Communications, Inc., D.P.U./D.T.E. 95-59B/95-80/95-112/96-113, at 6 (1998). The Department has determined that it is not necessary for a petitioner to demonstrate the existence of "an appropriate franchise" in order to establish PSC status. Berkshire Power at 31; MVRP at 6; Eversource Hopkinton at 4-5.

company registered in Massachusetts (id. at 7). The Company states that 50 percent of Vineyard Wind LLC is indirectly owned by two investment funds, each of which owns 25 percent of the Company (id. at 7-8). The Company states that the remaining 50 percent of Vineyard Wind LLC is owned by Avangrid Renewables LLC ("Avangrid"), "a leader in the renewable energy industry in the United States" that is "engaged in the business of acquiring, owning, and operating electric generation facilities" (id. at 8). Vineyard Wind states that Avangrid has "$10 billion of operating assets in the United States including 6,000 MW of wind and solar in 22 states" (id.).

The Company asserts that it "will own and operate the Vineyard Wind Connector as a generator lead line to bring the output of the Wind Energy Facility to Massachusetts electric distribution facilities for the benefit of Massachusetts citizens" (Exh. EFSB-Z-16, at 2). Vineyard Wind states that, accordingly, it "will be a wholesale generator, and thus qualifies for PSC status under Siting Board and Department precedent" (id. at 2, 5-6; Company Brief at 212). In support, the Company cites in particular to decisions of the Siting Board and Department in which, Vineyard Wind asserts, the Siting Board has determined that non-utility generators "that own generating assets and make those assets available to serve New England energy markets qualify for PSC status" (Exh. EFSB-Z-16, at 2). In addition, Vineyard states that it satisfies the standard for PSC status articulated by the Massachusetts Supreme Judicial Court in Save the Bay; and that the Company's status as a generator that will provide offshore wind energy to the regional electric grid pursuant to Section 83C "provides additional support for its PSC status" (id.).

3. Analysis and Findings

As noted above, the standard for determining whether an entity qualifies as a PSC under G.L. c. 40A, § 3 has evolved considerably since the Massachusetts Supreme Judicial Court issued its Save the Bay decision in 1975. The three-factor analysis for establishing PSC status articulated by the Court in Save the Bay was developed at a time when vertically integrated, highly regulated utilities owned and operated electric power generation and transmission facilities in Massachusetts. Since restructuring of the electric industry in 1997, however, the

Department and the Siting Board have recognized that non-utility independent power producers qualify for PSC status in the same way that regulated utilities once did. Specifically, the Department and Siting Board have held that a generator who "owns generating assets in Massachusetts, and makes those assets available to serve the New England market, is a public service corporation." NRG Canal at 142-143; Exelon West Medway, LLC and Exelon West Medway II, LLC, EFSB 15-01/D.P.U. 15-25, at 136 (2017) ("Exelon West Medway"); Russell Biomass LLC, D.T.E./D.P.U. 06-60, at 15 (2008) ("Russell Biomass 2008"); USGen New England, Inc., D.T.E. 03-83, at 15 n.9 (2004).

Based on the record in this proceeding, we find, first, that the Vineyard Wind Connector is not, and should not be viewed as, a stand-alone transmission project. Rather, it is one component of the overall Vineyard Wind Energy Facility, which consists of generation and transmission elements, the overall purpose of which is to provide power to the New England grid. We therefore find that it is appropriate to consider Vineyard Wind as a generator for purposes of determining whether the Company qualifies as a PSC.[135]

Vineyard Wind would not appear to satisfy one element of the standard for public service corporation status, which the Company did not discuss in its articulation of the standard. The standard provides that PSC status is to be conferred on generators who "own generation assets *in Massachusetts* and make those assets available to serve the New England market" (emphasis added). Vineyard Wind has stated that it will own and operate the Vineyard Wind Energy Facility, and that the power generated by the Facility will be available to the New England market, including electric customers in Massachusetts. The generation component of the Vineyard Wind Energy Facility, however, will be located offshore of Massachusetts in federal waters, not within Massachusetts or Massachusetts state waters.

We find that Vineyard Wind constitutes a PSC, even though the generation component of the Project will not be located within Massachusetts. The record shows that Vineyard Wind has demonstrated an appropriate nexus with Massachusetts to be considered a PSC in Massachusetts. While the Company is incorporated in Delaware, it is registered and doing business in

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135 Thus, we need not, and do not, decide here whether a non-utility transmission company would qualify as a PSC.

Massachusetts, and thus is subject to a degree of business regulation under Massachusetts law. See G.L. c. 156C, § 48; 950 CMR 101.00-112.00. Additionally, while the generation component of the Wind Energy Facility will be located outside of Massachusetts, other major components of the Facility will have a physical presence within Massachusetts, including approximately 20 miles of the Offshore Cables; the landfall site for the transition between the Offshore and Onshore Cables; all 5.3 miles of the Onshore Cables from the landfall to the new Substation; and the new Substation.

We find that Vineyard Wind meets the most salient aspects of the current Siting Board and Department standard for PSC status in Massachusetts: the Company's Project will deliver the power generated by the Wind Energy Facility to the New England electric market, including Massachusetts, and will have a legal and physical presence in Massachusetts. We accordingly find that Vineyard Wind qualifies as a Massachusetts public service corporation for the purposes of G.L. c. 40A, §3.

B. Public Convenience and Welfare

1. Standard of Review

In determining whether the present or proposed use is reasonably necessary for the public convenience or welfare, the Department must balance the interests of the general public against the local interest. Save the Bay at 680; Town of Truro v. Department of Public Utilities, 365 Mass. 407, 409 (1974) ("Town of Truro"). Specifically, the Department is empowered and required to undertake "a broad and balanced consideration of all aspects of the general public interest and welfare and not merely [make an] examination of the local and individual interests which might be affected." New York Central Railroad v. Department of Public Utilities, 347 Mass. 586, 592 (1964) ("NY Central Railroad"). When reviewing a petition for a zoning exemption under G.L. c. 40A, § 3, the Department is empowered and required to consider the public effects of the requested exemption in Massachusetts as a whole and upon the territory served by the applicant. Save the Bay at 685; NY Central Railroad at 592.

Therefore, when making a determination as to whether a petitioner's present or proposed use is reasonably necessary for the public convenience or welfare, the Department examines:

(1) the need for, or public benefits of, the present or proposed use; (2) the present or proposed use and any alternatives or alternative sites identified;[136] and (3) the environmental impacts or any other impacts of the present or proposed use. The Department then balances the interests of the general public against the local interest and determines whether the present or proposed use of the land or structures is reasonably necessary for the convenience or welfare of the public. Woburn-Wakefield at 142; NRG Canal at 143-144; Tennessee Gas Company, D.T.E. 98-33, at 4-5 (1998).

2. Company's Position

The Company argues that the Project is necessary to interconnect the Vineyard Wind Energy Facility to the New England electric grid and thereby achieve the Commonwealth's policy of developing large-scale wind energy projects offshore from Massachusetts (Exhs. VW-4, at 26; VW-2, at § 2.0). Vineyard Wind asserts that the Wind Energy Facility will serve the public interest by increasing the reliability and diversity of the regional and state-wide energy supply with a clean, renewable resource (Exh. VW-4, at 23). The Company asserts further that the Project "will provide significant environmental benefits as a zero-carbon generation resource" avoiding 50,100,000 tons of carbon dioxide emissions, 27,800 tons of nitrogen oxide emissions, and 26,400 tons of sulfur dioxide emissions over the life of the Project (id. at 23, 27). The Company asserts that the expeditious development of offshore wind energy is in the public interest, as reflected in the enactment by the Massachusetts Legislature of Section 83C (id.).

In summary, the Company asserts that the Vineyard Wind Energy Facility (and the associated transmission interconnection) will advance the public interest goals of Section 83C; contribute to meeting the Commonwealth's and the region's growing demand for clean energy;

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[136] With respect to the particular site chosen by a petitioner, G.L. c. 40A, § 3 does not require the petitioner to demonstrate that its primary site is the best possible alternative, nor does the statute require the Department to consider and reject every possible alternative site presented. Rather, the availability of alternative sites, the efforts necessary to secure them, and the relative advantages and disadvantages of those sites are matters of fact bearing solely upon the main issue of whether the primary site is reasonably necessary for the convenience or welfare of the public. Martarano v. Department of Public Utilities, 401 Mass. 257, 265 (1987); NY Central Railroad at 591.

and support other Massachusetts policy goals such as GHG reduction requirements of the Massachusetts Global Warming Solutions Act (id. at 23-24).[137]

3. Analysis and Findings

With respect to the need for, or public benefits of, the Project, the Siting Board found in Section III, above, there is a need for additional transmission resources to interconnect Vineyard Wind's offshore windfarm to the regional transmission grid. In Section IV, the Siting Board analyzed a number of different project approaches that the Company might use to meet the need and concluded that the proposed approach is superior to other approaches. The Siting Board also reviewed the Company's route selection process in Section V, and found that the Company has demonstrated that it examined a reasonable range of practical siting alternatives and that the proposed facilities are sited in locations that minimize cost and environmental impacts.

The Siting Board then compared the impacts of the Covell's Beach Route and the New Hampshire Avenue Route, and concluded that the Covell's Beach Route is superior to the New Hampshire Avenue Route in providing a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost. Finally, regarding Project environmental impacts, in Section IV the Siting Board reviewed the environmental impacts of the Project and while some potential local environmental impacts were identified, the Siting Board found that the environmental impacts of the Project would be minimized with the implementation of certain mitigation measures and conditions.

Beyond the findings above, which are routinely noted for projects deemed eligible for zoning exemptions, the Siting Board notes the importance of the Project in providing an abundant and wide-range of energy and environmental benefits, critical to meeting the Commonwealth's statutory and regulatory policy objectives. Such benefits include substantial avoidance of GHG and other air pollutant emissions, progress towards the Commonwealth's

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[137] The Department found in the Section 83C Order that "the Companies have shown that the aggregate cost for energy and RECs under the PPAs are less than the forecasted market prices and RECs by $1.289 billion (nominal) over the life of the contracts." Section 83C Order at 48.

climate mitigation and renewable energy objectives, increasing the reliability and diversity of the state-wide energy supply, and providing energy-consumer benefits in the form of a new, clean energy supply that offers ratepayer savings.

Based on the foregoing, the Siting Board finds that the general public interest in constructing the Project far outweighs any identifiable adverse local impacts. Accordingly, the Siting Board finds that the Project is reasonably necessary for the convenience or welfare of the public.

C. Individual Exemptions Required

1. Standard of Review

In determining whether an exemption from a particular provision of a zoning bylaw is "required" for purposes of G.L. c. 40A, § 3, the Department determines whether the exemption is necessary to allow construction or operation of the petitioner's project. Woburn-Wakefield at 143-144; NRG Canal at 143-144; Tennessee Gas Company, D.P.U. 92-261, at 20-21 (1993). It is a petitioner's burden to identify the individual zoning provisions applicable to the Project and then to establish on the record that exemption from each of those provisions is required:

> The Company is both in a better position to identify its needs, and has the responsibility to fully plead its own case . . . The Department fully expects that, henceforth, all public service corporations seeking exemptions under [G.L.] c. 40A, § 3 will identify fully and in a timely manner all exemptions that are necessary for the corporation to proceed with its proposed activities, so that the Department is provided ample opportunity to investigate the need for the required exemptions.

New York Cellular Geographic Service Area, Inc., D.P.U. 94-44, at 18 (1995); Woburn-Wakefield at 144; NRG Canal at 145.

2. Requested Exemptions and Siting Board Findings

Vineyard Wind seeks multiple individual zoning exemptions from the Barnstable Zoning Ordinance. Exemptions requested relating to the Company's proposed Substation are addressed first, followed by exemptions requested relating to the Onshore Cables.

a. Proposed Substation

The Substation would be located in an Industrial District, a Well-Protection Overlay District, and a Groundwater Protection Overlay District (RR-EFSB-57, at 2-3). An electrical substation is not a permitted use in any of these districts. The Company's requested exemptions for the construction and operation of the Substation are summarized in Table 8, below, and described in detail in the following subsections.

Table 8. Substation - Requested Individual Exemptions from the Town of Barnstable Zoning Ordinance: Summary of Company's Position

Section of the Zoning Ordinance	Available Relief	Why Exemption is Required: Company's Position
Use Restrictions Sections 240-33; 240-7.A; 240-35.F (2); 240-35.G (2);	Use Variance	Public utility uses not expressly authorized in underlying districts; unclear whether will need a variance. Variances are a legally disfavored from of relief, difficult to obtain, and even if granted are subject to appeal. If required, can result in delay, burden, and undue expense.
Prohibited Uses Section 240-10.A;	Use Variance	Prohibits "injurious, noxious, or offensive" emissions; Company does not believe Substation emissions will be offensive. Standard is unspecified, discretionary. Town has the authority under other statutes to enforce against such emissions. Variances are a disfavored from of relief, difficult to obtain, and even if granted are subject to appeal. If required, can result in delay, burden, and undue expense.
Height Restrictions Section 240-33.E	Dimensional Variance	Unclear whether 30-foot height restriction would apply to Substation components that will exceed 30 feet in height. Variances are a disfavored from of relief, difficult to obtain, and even if granted are subject to appeal. If required, can result in delay, burden, and undue expense.
Sign Restrictions Sections 240-61.D; 240-65; 240-66	Variance	Section prohibits danger and warning signs. Variances are a disfavored from of relief, difficult to obtain, and even if granted are subject to appeal. If required, can result in delay, burden, and undue expense.

Section of the Zoning Ordinance	Available Relief	Why Exemption is Required: Company's Position
Site Plan Review Sections 240- 98 through 240-105	Site Plan Approval	Site Plan approval requires compliance with all provisions of the Ordinance; Project cannot or may not be able meet all zoning requirements. Company must be able to design Substation in accordance with industry standards. Site Plan approval is discretionary and, even if granted, may be appealed. If required, can result in delay, burden, and undue expense.
Performance Bond Section 240-124.A	Variance	Potential for delay is great, as bond amounts are within discretion of Building Commissioner. Bonds are unnecessary, as HCA requires Company to restore all roadways to "as new" condition at Company's cost. Variances are a disfavored from of relief, difficult to obtain, and even if granted are subject to appeal. If required, can result in delay, burden, and undue expense.
Occupancy Permit Section 240-124.B	Variance	Issuance of an Occupancy Permit requires compliance with all provisions of the Ordinance; Project cannot or may not be able meet all zoning requirements. Variances are a disfavored from of relief, difficult to obtain, and even if granted are subject to appeal. If required, can result in delay, burden, and undue expense.
Off-Street Parking Sections 240-48 through 240-58	Special Permit or Variance	Number of parking spaces is within the discretion of the Building Commissioner, and may be inconsistent with the Substation design. Variances are a disfavored from of relief, difficult to obtain, and even if granted are subject to appeal. If required, can result in delay, burden, and undue expense

Sources: Exh. VW-4; Company Brief at 233-247.

i. Use Restrictions

For the Substation, the Company seeks exemption from Ordinance Section 240-33 (uses in Industrial Districts); Section 240-7.A (requiring conformity with all use restrictions); and Sections 240-35.F(2) and G(2) of the Ordinance (uses in Groundwater Protection and Well-Protection Districts), on the ground that the Substation is not a use expressly allowed in an Industrial District and, consequently, also is not a use allowed in a Well-Protection or Groundwater-Protection Overlay Districts (Exh. VW-4, at 34).

The Company states that, without exemptions, it may be or would be required to seek a variance from each of the Use Restriction sections identified above to allow construction of the Substation (Exh. VW-4, at 41). With respect to obtaining variances, the Company states that variances "are a legally disfavored form of relief and even if granted, can be susceptible to appeal" (id.). The Company seeks relief from the need to obtain a variance "[b]ecause of the legal uncertainty in obtaining variances, and the potential for adverse interpretations, delay, burden and undue expense" (id.). The Siting Board finds that Vineyard Wind requires exemption from Sections 240-33; 240-7.A; and Sections 240-35.F(2) and G(2) to construct and operate the Project within the meaning of G.L. c. 40A, § 3.

The Company also seeks an exemption from Section 240-10.A of the Ordinance, which prohibits from all zoning districts "[a]ny use which is injurious, noxious or offensive by reason of the emission of odor, fumes, dust smoke, vibration, noise, lighting or other cause" (Exh. VW-4, at 36; RR-EFSB-57, at 3). In support, the Company notes that Section 240-10.A "contains no objective standards, nor does it contain any limitations on the discretion of the Building Commissioner in determining what constitutes an 'offensive' level of any of the indicated emissions," with the potential consequence of denying the Company the ability to locate the Substation within the Town of Barnstable, absent a variance (Company Brief at 237-238, citing Exh. EFSB-Z-20(a)). The Company notes that "[i]t is conceivable that Substation may emit noise, light or vibration that, in the subjective discretionary opinion of the Building Commissioner, may be deemed 'injurious, noxious or offensive'" (id. at 238, citing Exh. VW-4 at 36-37). However, the Company argues that it "[d]oes *not* believe that as an

objective factual matter, the Substation, when operating, [would] have emissions that are injurious, noxious or offensive" (Exh. EFSB-Z-20, at 3).

With respect to the concern that granting the requested exemption would exempt the Company from an environmentally protective operational condition, the Company contends that Section 240-10.A is neither an operational nor enforcement provision governing the conduct of otherwise-permitted uses (Company Brief at 239). Instead, the Company argues that Section 240-10.A is, by its own terms, a zoning and siting provision, addressing categories of uses and prohibiting uses that are "injurious, noxious, or offensive…" (id. at 239, citing Exh. EFSB-Z-20(a)). The Company notes that an electrical substation is not a *per se* "injurious, noxious or offensive" use as those terms are defined by Section 240-10.A (id.). Nevertheless, the Company seeks exemption from this ordinance, citing the risk of a potentially adverse interpretation by the Building Commissioner (id.).

The Company contends that granting the Company an exemption from Section 240-10.A for the Substation would not preclude the Town of Barnstable, through its Board of Health, from the exercise of its enforcement and nuisance abatement authority (Company Brief at 239). The Company cites such authority as including G.L. c. 21A, § 13, and 310 CMR 11.00 et seq. (granting local Boards of Health express authority to enforce the State Environmental Code to "protect the health, environment and well-being of the people of the Commonwealth"), G.L. c. 111, § 122 (granting local Boards of Health express authority to abate nuisances), G.L. c. 111, § 31 (granting local Boards of Health express authority to make and enforce "reasonable health regulations"), and G.L. c. 149, § 136 (granting local Boards of Health express authority to abate any nuisance in any industrial establishment) or Town ordinances pertaining to the same (id. at 239-240, citing Exh. EFSB-Z-20(a)).

With regard to the Company's request for exemption from Section 240-10.A, the record shows that this provision contains no objective standards, nor does it limit the discretion of the Building Commissioner, leaving open the possibility – however remote – of the Company being unable to construct and operate the Substation in Barnstable absent a zoning variance. With regard to the preservation of local environmental enforcement, the record indicates that the Town of Barnstable Board of Health would retain full regulatory authority, independent of the Zoning

Ordinance, to ensure that the Substation does not produce injurious, noxious, or offensive emissions during construction and operation. In addition, as found in Section VI, above, the Siting Board has determined that the environmental impacts of construction and operation of the Substation would be minimized, consistent with applicable regulatory and statutory requirements, and the conditions imposed by this decision. Accordingly, the Siting Board finds that exemption from compliance from Section 240-10.A of the Barnstable Zoning Ordinance is required to construct and operate the Substation within the meaning of G.L. c. 40A, § 3.[138]

ii. Dimensional Restrictions

The Company seeks exemption from the thirty-foot height limitation in Industrial Districts, contained in Section 240-33.E of the Ordinance (Exh. VW-4, at 37). The Company states that certain Substation structures will, and others may, exceed the thirty-foot height limitation, in which case a height variance would be necessary (Exh. VW-4, at 37 and exh. A at 100-101; EFSB-RR-57, at 4). The Siting Board finds that exemption from Section 240-33.E of the Zoning Ordinance is required to construct and operate the Substation within the meaning of G.L. c. 40A, § 3.

iii. Other Restrictions and Requirements

The Company seeks exemption from Sections 240-61.D, 240-65, and 240-66, which prohibit danger and warning signs in all zoning districts (RR-EFSB-57, at 4). The Company states that it will post warning signs along the perimeter of the Substation fenceline, as well as additional safety information at Substation access points (Exh. VW-4, at 38). The Company states that, without an exemption from these provisions of the Ordinance, it could be required to obtain a variance to post these signs (id.). To ensure public safety, the Company must be able to post all required or appropriate danger and warning signs for the Substation. Siting Board finds

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138 We note expressly that granting the Company's request for exemption from Section 240-10.A of the Ordinance does not affect in any way any other environmental, health or safety-related authority the Town may have under other statutory or regulatory provisions of local, state or federal law.

that exemption from Sections 240-61.D, 240-65, and 240-66 of the Zoning Ordinance is required to construct and operate the Substation within the meaning of G.L. c. 40A, § 3.

The Company seeks an exemption from Section 240-124.A of the Ordinance, which provides for the posting of a performance bonds, in an amount to be determined by the Building Commissioner, "against possible costs due to erosion or damage within passable street rights-of-way" and a certification by a registered land surveyor "that the structure has been located in compliance with all yard requirements" (Exh. VW-4, at 40-41 and exh. A at 191; Company Brief at 241). The Company argues that providing a performance bond for the Town is no longer necessary because of the HCA the Company and Vineyard Wind have entered into (Company Brief at 242). Specifically, the Company notes that, in the HCA, Vineyard Wind has already committed to restore, at its own cost, any Project-related damage to Town roadways, to "like new condition" or a mutually acceptable alternative (id. at 242; Exh. EFSB-G-1(S2)(1) at 16). Accordingly, the Company asserts, the HCA "renders a performance bond condition duplicative and unnecessary" (Company Brief at 242, citing RR-EFSB-55).

The Siting Board notes that Substation construction may result in a significantly lower risk to Town roadways than installation of the Onshore Cables, as cable installation will occur directly within public roadways, while Substation construction will not. Nevertheless, roadway damage also could occur, for example, in the transport of construction equipment and constructions workers to and from the Substation site.

The Siting Board acknowledges that the posting of performance bonds for potential damage to municipal streets during construction of a project outside of municipal streets may at times be appropriate. In this case, however, based on the roadway restoration provisions contained in the HCA, we do not find that provision of a performance bond by Vineyard Wind, in addition to its commitment in the HCA to bear the cost of all roadway restoration attributable to the Project, is necessary to ensure that such restoration will occur.

We find that, due to the road-restoration to which the Company has committed in the HCA, exemption of the Company from Section 240-124.A is appropriate. Accordingly, we find that the Company requires exemption from Section 240-124.A to construct and operate the Substation without unnecessary duplicative financial-assurance obligations for roadway

restoration, within the meaning of G.L. c. 40A, § 3. Accordingly, we grant Vineyard Wind's request for exemption from Section 240-124.A.

The Company seeks exemption from Section 240-124.B of the Ordinance which provides that no building or structure may be occupied without an occupancy permit issued by the Building Commissioner, and that such a permit may not be issued until the building or structure complies "in all respects" with the Zoning Ordinance (Exh. VW-4, at 41 and exh. A at 191). The Substation will not comply with all aspects of the Ordinance; as discussed above, the Company will require, for example, exemptions from several use restrictions in the Ordinance. Accordingly, the Siting Board finds that exemption from Section 240-124.B is required to construct and operate the Substation within the meaning of G.L. c. 40A, § 3.

iv. Site Plan Approval

The Company seeks exemption on a number of grounds from Sections 240-98 through 240-105 of the Ordinance, all of which pertain to Site Plan Review. The Company notes that Section 240-105.E requires that, for site plan approval, a project "shall be reviewed for consistency with zoning and other applicable regulations and standards," and the Substation cannot meet or "is subject to significant uncertainty" with respect to meeting a number of zoning requirements in the Ordinance (Exh. VW-4, at 39, 47 and exh. A at 182). The Company states additionally that site plan approval is discretionary, and could result in costly and burdensome Project conditions; that the site plan review process "is potentially iterative and time consuming," threatening significant delays for the Project; and that, even if granted, site plan approval is subject to appeal and the accompanying delay and burden of the appeal process (id. at 39). The Company states that a Substation must be designed in accordance with industry standards, and that site plan review requirements could conflict with industry standards (id.).

The Siting Board finds that exemption from Sections 240-98 through 240-105 of the Zoning Ordinance is required to construct and operate the within the meaning of G.L. c. 40A, § 3.

v. Off-Street Parking Requirements

The Company seeks exemption from Sections 240-48 through 240-58 of the Ordinance, which establish off-street parking requirements, including the minimum number of parking spaces required for a new or expanded use (Exh. VW-4, at 42 and exh. A at 143-148). The Company states that the Substation "will generally not be manned" (Exh. VW-4, at 42). The Company asserts that the number of parking spaces required for the Substation appears to be within the discretion of the Building Commissioner (id.) Vineyard Wind stated that it will incorporate loading space on the site to conform "to proper construction techniques for electric transmission facilities" (id.). Vineyard Wind also stated, however, that it does not object to the Siting Board requiring the Company to provide "a reasonable minimum number of parking spaces"; the Company "suggests that no more than three spaces are necessary and that fewer would very likely to be sufficient" (Company Brief at 244).

Since the Substation generally will not have personnel working on-site, the Siting Board finds that compliance by the Company with the parking requirements in Sections 240-48 through 240-58 of the Ordinance may not be appropriate or achievable for the Substation site. The Company has stated that it will comply with industry standards, and we find that it is appropriate to allow the Company to design the Substation layout in accordance with these standards. For the same reason, the Siting Board will not require as a condition to this Decision that a certain number of parking spaces be included on the Substation site. We find that exemption from Sections 240-48 through 240-58 of the Ordinance is appropriate and, accordingly, required for construction and operation of the Substation within the meaning of G.L. c. 40A, §3.

vi. Conclusion on Zoning Exemptions for the Substation

The Siting Board finds that the Company has demonstrated that exemption from certain sections of the Town of Barnstable Zoning Ordinance is required for construction and operation of the Substation within the meaning of G.L. c. 40A, §3. Specifically, the Siting Board grants the Company's requests for exemption from the use restrictions in Sections 240-33; 240-7.A; 240-35.F(2);240-35.G(2); the dimensional restrictions in Section 240-33.E; the signage prohibitions in Sections 240-61.D, 240-65, and 240-66; the performance bond requirements in Section 240-124.A; the occupancy permit requirements in Section 240-124.B; the site plan

review requirements in Sections 240-98 through 240-105; the off-street parking requirements in Sections 240-48 through 240-58; and the anti-nuisance provisions of Section 240-10.A.

b. Onshore Cables on the Covell's Beach Route

The Covell's Beach Route using Attucks Lane and Independence Drive is located entirely within existing Town of Barnstable roadway layouts (public ways) (Exh. VW-9, at 1-34; Company Brief at 15). The Company stated that it does not believe that in-street construction within public ways is subject to local zoning requirements; the Company stated that it seeks zoning exemptions for in-street construction of the Onshore Cables "out of an abundance of caution" (Exh. VW-4, at 34 n.10). Vineyard Wind asserted that it needs zoning exemptions to construct the Onshore Cables because it does not have a legally binding determination from the Town of Barnstable that the Ordinance does not apply to in-street construction (Exh. VW-Z-10, at 2). The Company acknowledged that the common practice is to request a grant of location from a municipality for construction of a transmission line in a public way under G.L. c. 166, § 22, rather than to apply local zoning rules (id. at 1-2). Specifically, the Company requests exemptions from certain use restrictions (Ordinance Sections 240-131; 240-13; 240-14; 240-11; 240-33; 240-21; 240-25; 240-35.F(2); 240-35.G(2); 240-35.E(2); 240-36; 240-38; 240-44.2; 240-29; 240-30; 240-7.A), site plan review (Article IX, Sections 240-98 through 240-105), and performance bond requirements (Section 240-124.A).

Table 9. Onshore Cables - Requested Individual Exemptions from the Town of Barnstable Zoning Ordinance: Summary of Company's Position

Section of the Zoning Ordinance	Available Relief	Why Exemption is Required: Company's Position
Use Restrictions Sections 240-13; 240-33; 240-7.A; 240-35.F (2); 240-35.G (2) ; 240-131; 240-13; 240-33; 240-21;240-11; 240-14; 240-25; 240-7.A; 240-35.f (2); 240-35.G (2); 240-36; 240-38; 240-30; 240-29; 240-44.2;	Use Variance	The Onshore Cables will be located in public ways in the Town of Barnstable. It is unclear whether local zoning requirements apply to public ways. The cables will travel underground through the following zoning districts, in which public utility uses are not expressly allowed: RF-1; IND; Well Protection and Groundwater Protection Overlay; CBD; CBNOD; RG; B; RD-1; RB; RC-1; HB; Aquifer Protection; Resource Protection Overlay; Medical Services Overlay; Medical Marijuana Overlay; Senior Continuing care Retirement Community; and Ground Mounted Solar Voltaic Overlay. Variances are a disfavored from of relief, difficult to obtain, and even if granted are subject to appeal. If required, can result in delay, burden, and undue expense.
Site Plan Approval Article IX, Sections 240-98 through 240-105	Special Permit	Site Plan approval requires compliance with all provisions of the Ordinance; Project cannot or may not be able meet all zoning requirements. Company must be able to design Substation in accordance with industry standards. Site Plan approval is discretionary and, even if granted, may be appealed. If required, can result in delay, burden, and undue expense.
Performance Bond Section 240-124.A	Variance	Potential for delay is great, as bond amounts are within discretion of Building Commissioner. Bonds are unnecessary, as HCA requires Company to restore all roadways to "as new" condition at Company's own cost. Variances are a disfavored from of relief, difficult to obtain, and even if granted are subject to appeal. If required, can result in delay, burden, and undue expense.

Sources: Exh. VW-4; Company Brief at 233-247.

Onshore Cable installation will occur entirely within public ways in the Town of Barnstable. Vineyard Wind does not provide legal analysis regarding the applicability of local

zoning requirements to work in public ways. Rather, the Company asserts that because it does not know whether local zoning applies, and that, if it does apply, multiple variances for construction of the Onshore Cables would be necessary.

The Siting Board has not received in any prior zoning exemption proceedings a request for exemption from local zoning requirements for the in-street construction of a transmission line. The Massachusetts Supreme Judicial Court, however, has addressed the question of whether public ways are or are not exempt from local zoning, and has opined that they are exempt. Specifically, the Court has stated that "we know of no authority for the proposition that a public way . . . may be used only for purposes which are permitted in the zoning district in which the public way lies." The Court stated further that an opposite result "would be surprising and disruptive throughout the Commonwealth." Harrison v.Textron, 367 Mass. 540, 549 (1975) ("Harrison"); in accord, Bruni v. Planning Board of Ipswich, 73 Mass. App. Ct. 663, 672 (2009) (use of a public way not restricted by local zoning provisions, citing Harrison).

Vineyard Wind has provided no legal authority or other basis in support of the Company's view that the Barnstable Zoning Ordinance would apply to construction or operation of the Onshore Cables under public roadways in Barnstable. We find that the Company has not met its burden of demonstrated that the exemptions it has requested from the Barnstable Zoning Ordinance for construction of the Onshore Cables are necessary. Accordingly, we find that the requested exemptions for the Onshore Cables are not required within the meaning of G.L. c. 40A, § 3. Consequently, we deny each of the Company's requests for individual zoning exemptions for the Onshore Cables.

iv. Conclusion on Zoning Exemptions for the Onshore Cables

The Siting Board finds that the Company has not sufficiently demonstrated that construction and operation of the Onshore Cables within a public roadway requires exemption from local zoning requirements. Rather, we conclude that exemptions from local zoning are not necessary for construction and operation of the Onshore Cables within the meaning of G.L. c. 40A, § 3.

Accordingly, with respect to the Onshore Cables, the Siting Board denies all of the Company's requests for exemptions from the Barnstable Zoning Ordinance. Specifically, the Siting Board denies the Company's requests for exemption from: Sections 240-131; 240-13; 240-14; 240-11; 240-33; 240-21; 240-25; 240-35.F(2); 240-35.G(2); 240-35.E(2); 240-36; 240-38; 240-44.2; 240-29; 240-30; 240-7.A; 240-98 through 240-105; 240-124.A.

3. Consultation with the Municipality

The Company stated in its Siting Petition that it conducted "extensive community outreach" regarding the Project through November 2017 (Exhs. VW-4, at 16; VW-2, at Section 1.10, Table 1-3). The Company recounted that, in 2016 and 2017, it met on approximately 90 occasions with various state, federal, regional, and local permitting agencies; municipalities; and Indian Tribes (Exh. VW-4, at 16-17).[139,140] The Company has executed a HCA with Barnstable, the only community through which the Onshore Cables will travel and in which the Substation will be located (Exh. EFSB-G-1 (S2)(1)). The HCA, executed on October 3, 2018, contains several provisions regarding how the Town will support the Project, including support in obtaining local project approvals (see HCA Section 8; Exh. EFSB-G-1 (S2)(1), at 9-11). HCA Section 8 states, for example, that the Town "agrees to publicly support" the issuance by the Siting Board of the individual and comprehensive zoning exemptions that Vineyard Wind is requesting in this proceeding (id. at 9). The HCA further states that Barnstable "will similarly support Vineyard Wind's requests for relief before" all other Town boards or departments whose approval is required for the Project (id.). Barnstable specifically agrees to support the Company's effort to obtain Article 97 approval for the Project from the Massachusetts Legislature, and to approve requested grants-of-location and easements needed for the Project,

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139 Company meetings with Town of Barnstable officials in 2016-2017 included a meeting with the Assistant Town Attorney in March 2017; a meeting with the Barnstable Town Manager and several other Town officials in June 2017 and October 2017 (Exh. VW-2, Section 1.10, Table 1-3).

140 The Company has stated that it intends to continue to make a good faith effort "to abide by reasonable recommendations from the affected municipalities" (Company Brief at 227-228).

including easements over Town roads and Town property, including Covell's Beach (id. at 4, 10).

The record shows that Vineyard Wind has consulted and worked cooperatively with the Town of Barnstable with respect to zoning and other municipal and state permitting for the Project. In addition to numerous meetings with Barnstable officials, the Company has executed a HCA with Barnstable. The HCA memorializes a high level of cooperation between the Company and the Town; a high degree of municipal support for the Project, particularly with respect to municipal and state permitting; and specific support for the Company's requested individual and comprehensive zoning exemptions.

Based on the foregoing, the Siting Board finds that the Company made a good faith effort to consult with the Town of Barnstable, the Project's host community, regarding the Company's request for zoning relief under G.L. c. 40A, § 3, and that the Company's communications have been consistent with the spirit and intent of Russell Biomass/WMECo.

D. Conclusion on Request for Individual Zoning Exemptions

The Siting Board found above that: (1) the Company is a public service corporation; (2) the proposed use is reasonably necessary for the public convenience or welfare; and (3) certain specifically named zoning exemptions, set forth above, are required for construction and operation of the proposed Substation, within the meaning of G.L. c. 40A, § 3. Additionally, the Siting Board found that the Company engaged in good faith consultation with the Town of Barnstable, the host community for the Project.

With respect to the Substation, the Siting Board grants all of the Company's requested exemptions. Specifically, the Siting Board grants the Company's requests for exemption from the following Sections of the Barnstable Zoning Ordinance: Sections 240-33, 240-7.A; 240-35.F(2) and 240-35. (G) (use restrictions)); 240-33.E (height); 240-61.D; 240-65; 240-66 (signs); 40-124.A (performance bond); 240-124.B (occupancy permit); 240-98 through 240-105 (site plan review; 240-48 through 240-58 (off-street parking); and 240-10.A (anti-nuisance provisions).

With respect to the Onshore Cables, using the Covell's Beach Route, the Siting Board denies each of the Company's requested individual exemptions from the Barnstable Zoning

Ordinance, based on our determination that Vineyard Wind has not met its burden of demonstrating that these exemptions are required to allow in-street installation or operation of the Onshore Cables within the meaning of G.L. c. 40A § 3. The Siting Board accordingly denies the Company's requests for exemption from Ordinance Sections 240-131; 240-13; 240-14; 240-11; 240-33; 240-21; 240-25; 240-35.F(2); 240-35.G (2); 240-35.E(2); 240-36; 240-38; 240-44.2; 240-29; 240-30; 240-7.A; 240-98 through 240-105; and 240-124.A.

IX. COMPREHENSIVE ZONING EXEMPTION

A. Standard of Review

The Siting Board will grant a comprehensive exemption from a local zoning ordinance or bylaw "on a case-by-case basis where the applicant demonstrates that issuance of a comprehensive exemption could avoid substantial public harm by serving to prevent a delay in the construction and operation of the proposed use." Woburn-Wakefield at 150-151; East Eagle at 161-163;New England Power Company d/b/a National Grid and Western Massachusetts Electric Company, EFSB 10-1/D.P.U. 10-107/10-108 (2012) ("Hampden County").

The Department and the Siting Board have articulated several factors to be considered in determining whether an applicant has demonstrated that the grant of a comprehensive exemption could avoid substantial public harm. These factors include but are not limited to, whether: (1) the proposed project contributes to a reliable energy supply for the Commonwealth; (2) the project is time-sensitive; (3) the project involves multiple municipalities that could have conflicting zoning provisions that might hinder the uniform development of a large project spanning these communities; (4) the proponent of the project has actively engaged the communities and responsible officials to discuss the applicability of local zoning provisions to the project and any local concerns; and (5) the affected communities do not oppose the issuance of the comprehensive exemption. Woburn Wakefield at 150; East Eagle at 161; Hampden County at 89-90.

B. Company Position

Vineyard Wind seeks a comprehensive exemption from all provisions of the Barnstable Zoning Ordinance (Exh. VW-4, at 59-65). The Company asserts that the Project meets each of the factors identified by the Department in its consideration of comprehensive exemptions, and its overall determination of whether the exemption will avoid substantial public harm, or avoid delaying public benefits (Company Brief at 252).

With respect to whether the Project contributes to a reliable energy supply for the Commonwealth, the Company asserts that the Project will serve the public interest by increasing the reliability and diversity of the regional and statewide energy supply (Company Brief at 223). In particular, the Company maintains that the Project will improve the reliability of the electric grid in Southeastern Massachusetts by connecting to the bulk power system on Cape Cod, and increasing the supply of power to the Cape and southeastern Massachusetts (Exh. VW-6, at 1-11). The Company points out that this area has experienced significant recent (and planned) generation unit retirements (Company Brief at 49, citing Exhs. VW-6, at 1-11 to 1-13; VW-2 at 1-22 to 1-23).

The Company asserts that the Project is time sensitive and that any delays in development will prevent the Project from delivering on the energy, economic, and environmental benefits to the Commonwealth (Company Brief at 252). In particular, the Company notes that pursuant to Section 83C, the Company has executed PPAs with the EDCs that set deadlines for achieving commercial operation (id., citing RR-EFSB-2, RR-EFSB-2(10-(6)).[141] The Company contends it must also carefully time Project construction activities for specific installation windows aligning with onshore and offshore TOY restrictions, such that even small delays in initiating a particular

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141 The Company notes that the EDC deadlines are consistent with the timeline expectations set forth in Section 83C, which expresses a legislative determination that offshore wind energy generation be brought to Massachusetts expeditiously (Company Brief at 252, n.129). Section 83C required that competitive solicitations be issued by June 30, 2017 and that subsequent solicitations for no less than 400 MW of aggregate nameplate capacity occur within 24 months of each previous solicitation until the EDCs have procured 1,600 MW of aggregate nameplate capacity (RR-EFSB-2; RR-EFSB-2(1) to (6)).

construction activity can result in major overall delays to the Project (Company Brief at 252, citing Tr. 1, at 45-49).[142] The Company also asserts that the granting of a comprehensive zoning exemption would avoid two possible sources of Project delay in the future (id. at 254-256). The Company asserts that a comprehensive exemption: (1) would render the Project exempt from any changes to the Ordinance that occur after the final decision in this proceeding, but before the Project has commenced;[143] and (2) would prevent the situation in which a zoning provision currently deemed inapplicable to the Project is later determined to apply (id. at 255-256).

With approval of the Covell's Beach Route, the Company acknowledges it no longer faces the additional challenges of local permitting in multiple municipalities, as would have been the case for the New Hampshire Avenue Route (Company Brief at 253). Nevertheless, the Company asserts that Project permitting and development remain quite complex, and that the lack of a multiple-municipality permitting context should not dissuade the Board from approving a comprehensive exemption (id.).

And finally, the Company asserts that it has "engaged with officials from . . . Barnstable to discuss the applicability of local zoning provisions to the Project, and "has not been made aware of any local zoning-related concerns on the part of Barnstable" (id.). The Company notes, as discussed in Section VIII.C.3, above, that the HCA executed by the Company and Barnstable contains a number of provisions evidencing the Town's support for the Project, including, specifically, its support of the Company's intent to seek from the Siting Board individual zoning exemptions and a comprehensive exemption for the Project from the Barnstable Zoning Ordinance (id. at 254).

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142 The Company notes that in order to be eligible for federal tax credits related to the Project, it must commence construction by the end of 2019 (Exhs. EFSB-G-25; EFSB-Z-18). The Company may demonstrate compliance with this provision by either: (1) commencing physical work of a significant nature; or (2) paying or incurring five percent or more of the total cost of the Vineyard Wind Energy Facility (Exh. EFSB-G-25).

143 The Company does not clarify whether "before the Project has commenced" refers to the period before construction begins or before commercial operation of the Project begins.

C. Analysis and Findings

As noted above, the Vineyard Wind Energy Facility, which the Project would connect to the New England energy grid, will provide environmental and energy benefits to the New England region, at a significant scale. These benefits include a major contribution towards reducing the Commonwealth's GHG emissions (and furthering compliance with the GWSA); $1.4 billion in estimated cost savings over the life of the power supply contracts to Massachusetts EDC ratepayers; and increased diversity and reliability of energy supplies, benefitting the Massachusetts and New England markets.[144]

With respect to required consultation with and support from the affected municipality, we find that Vineyard Wind has consulted openly and frequently with Barnstable officials, and has demonstrated that the Project has garnered a comprehensive level of support from Barnstable for the Project. The Company and the Town have executed an HCA, which provides, among other things, a statement of the Town's support for issuance of the individual and comprehensive zoning exemptions the Company is seeking from the Siting Board in this proceeding.

The Company has described the permitting challenges, complexities, and risks it faces, and the construction timing requirements that could cause delays in Project construction that would be costly and potentially detrimental to attainment of the Commonwealth's energy and environmental objectives. Consequently, the potential for zoning impediments that may result in Project construction delays could result in substantial public harm. Accordingly, based on the record in this proceeding, the Siting Board finds that a grant of a comprehensive zoning exemption for the Project is necessary and appropriate.

X. ANALYSIS UNDER G.L. C. 164, § 72

A. Standard of Review

General Laws, c. 164, § 72 requires, in relevant part, that an applicant seeking approval to construct a transmission line must file with the Department a petition for:

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144 In its Section 83C Order, the Department found that the Wind Energy Facility would have regional economic and employment benefits. Section 83C Order at 41-42; see also, Exh. VW-9, at 1-9 to 1-17).

> authority to construct and use … a line for the transmission of electricity for distribution in some definite area or for supplying electricity to itself or to another electric Company or to a municipal lighting plant for distribution and sale … and shall represent that such line will or does serve the public convenience and is consistent with the public interest .... The [D]epartment, after notice and a public hearing in one or more of the towns affected, may determine that said line is necessary for the purpose alleged, and will serve the public convenience and is consistent with the public interest.[145]

The Department, in making a determination under G.L. c. 164, § 72, considers all aspects of the public interest. Boston Edison Company v. Town of Sudbury, 356 Mass. 406, 419 (1969). Among other things, Section 72 permits the Department to prescribe reasonable conditions for the protection of the public safety. Id. at 419-420.

In evaluating petitions filed under G.L. c. 164, § 72, the Department examines: (1) the need for, or public benefits of, the present or proposed use; (2) the environmental impacts or any other impacts of the present or proposed use; and (3) the present or proposed use and any alternatives identified. Woburn-Wakefield at 151-152; East Eagle at 164; Boston Edison Company, D.T.E. 99-57, at 3-4 (1999). The Department then balances the interests of the general public against the local interests and determines whether the line is necessary for the purpose alleged and will serve the public convenience and is consistent with the public interest. Woburn-Wakefield at 152; East Eagle at 164; Walpole-Holbrook at 101.

B. Analysis and Findings

As described above in Sections III through VI, the Siting Board examined: (1) the need for, or public benefits of, the proposed Project; (2) the environmental impacts of the proposed Project; and (3) any identified alternatives. With implementation of the specified mitigation measures to which the Company has committed, and the conditions set forth by the Siting Board in Section XII, below, the Siting Board finds pursuant to G.L. c. 164, § 72, that the proposed

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145 Pursuant to G.L. c. 164, § 72, the electric company must file with its petition a general description of the transmission line, a map or plan showing its general location, an estimate showing in reasonable detail the cost of the line, and such additional maps and information as the Department requires.

Project is necessary for the purpose alleged, would serve the public convenience, and is consistent with the public interest. Thus, the Siting Board approves the Section 72 Petition.

XI. SECTION 61 FINDINGS

MEPA provides that "[a]ny determination made by an agency of the commonwealth shall include a finding describing the environmental impact, if any, of the Project and a finding that all feasible measures have been taken to avoid or minimize said impact" ("Section 61 Findings"). G.L. c. 30, § 61. Pursuant to 301 CMR 11.01(3), Section 61 Findings are necessary when an EIR is submitted to the Secretary of EEA and Section 61 Findings should be based on such EIR. Where an EIR is not required, Section 61 Findings are not necessary. 301 CMR 11.01(4). The record shows that Vineyard Wind filed an ENF for the Project with MEPA on December 17, 2017 (Exh. VW-4, exh. C) and that the Secretary issued a Certificate on the ENF on February 9, 2018, requiring the Company to file a DEIR and an FEIR (Exh. VW-4, exh. G). Therefore, a finding under G.L. c. 30, § 61 is necessary in this proceeding.[146]

The Company submitted its DEIR to MEPA on April 30, 2018 (Exh. VW-6) and the Secretary issued a Certificate on the DEIR on June 15, 2018, requiring the preparation of an SDEIR (Exh. VW-7). The Company submitted its SDEIR on August 31, 2018 (Exh. VW-9). The Secretary issued a Certificate on the SDEIR on October 12, 2018 (Exh. VW-10). Vineyard Wind submitted its FEIR to MEPA on December 17, 2018 (Exh. VW-14). The Secretary issued a Certificate on the FEIR on February 1, 2019, determining that the FEIR adequately and properly complied with MEPA and its implementing regulations (Exh. VW-16 at 1).

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146 The Siting Board generally is not required to make a G.L. c. 30, § 61 finding in a G.L. c. 164, § 69J proceeding, as the Siting Board is exempt by statute from MEPA. G.L. c. 164, § 69I. However, the Board must comply with MEPA with respect to review of the Company's Section 72 Petition and Zoning Petition. Section 72 Petitions are filed pursuant to G.L. c. 164, § 72, and Zoning Petitions are filed pursuant to G.L. c. 40A, § 3, both of which are statutory provisions implemented by the Department, and the Department is not exempt from MEPA. Accordingly, in reviewing the Company's Section 72 Petition and Zoning Petition in this case, the Siting Board has conducted the review and made the findings required by MEPA.

The record contains, and the Siting Board has reviewed, the MEPA documents submitted by the Company, including the ENF, DEIR, SDEIR and FEIR for the Project, as well as the Secretary's Certificates and comments filed by the public and by other reviewing agencies regarding these documents. Additionally, as set forth in Section VI, above, the Siting Board has conducted a comprehensive analysis of the potential environmental impacts of the Project, including GHG impacts.[147]

As specifically required by MEPA, the Siting Board has: reviewed the FEIR for the Project; evaluated, and determined the impact of the Project on the natural environment; and specified in detail in this Decision measures to be taken by Vineyard Wind to avoid damage to the environment or, to the extent damage to the environment cannot be avoided, to minimize and mitigate damage to the environment to the maximum extent practicable. The Secretary has determined that the FEIR for the Project adequately and properly complies with MEPA (Exh. VW-16, at 1). Accordingly, as provided by MEPA, the Siting Board finds that all feasible measures have been taken to avoid or minimize the environmental impacts of the proposed Project. G.L. c. 30, § 61; 301 CMR 11.2(5).

XII. DECISION

The Siting Board's enabling statute directs the Siting Board to implement the energy policies contained in G.L. c. 164, §§ 69H to 69Q, to provide a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost.

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147 With respect to GHG impacts, the Siting Board recognizes that the Commonwealth's policies relating to GHG emissions, including G.L. c. 30, § 61 and the MEPA Greenhouse Gas Emission Policy and Protocol ("GHG Policy") apply to the Project. The Siting Board notes that in his Certificate on the ENF, the Secretary stated that the Vineyard Wind Energy Facility is subject to the 2010 MEPA GHG Policy; directed the Company to identify features of the transmission line and Substation "that will minimize line losses, such as the use of premium efficient transformers" and directed the Company to identify in the DEIR "mitigation commitments to reduce construction period CO_2 emissions and construction practices and/or design features that will minimize the leakage of SF_6 gas." The Secretary noted that the Vineyard Wind Energy Facility has the potential to offset CO_2 emissions by approximately 1,680,000 tpy (Exh. VW-4, exh. G at 14).

G.L. c. 164, § 69H. Thus, an applicant must obtain Siting Board approval under G.L. c. 164, § 69J, prior to construction of a proposed energy facility.

In Section III, above, the Siting Board finds that Vineyard Wind has demonstrated that there is a need for additional transmission resources to interconnect its Vineyard Wind Energy Facility to the regional transmission grid.

In Section IV, above, the Siting Board finds that the Project is superior to the other alternatives identified with respect to providing a reliable energy supply for the Commonwealth with minimum impact on the environment at the lowest possible cost.

In Section V, above, the Siting Board finds that the Company has developed and applied a reasonable set of criteria for identifying and evaluating alternatives to the Project in a manner that ensures that the Company has not overlooked or eliminated any routes that, on balance, are clearly superior to the Project. The Siting Board also finds that the Company has identified a range of practical transmission line routes with some measure of geographic diversity. Consequently, the Siting Board finds that the Company has demonstrated that it examined a reasonable range of practical siting alternatives.

In Section VI, above, the Siting Board finds that the proposed facilities along the Covell's Beach Route, including use of the Western Corridor and either route through Muskeget Channel, would be superior to the proposed facilities along the New Hampshire Avenue Route with respect to providing a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost.

In Section VI, above, the Siting Board reviewed environmental impacts of the Project and finds that with the implementation of the specified mitigation and conditions, and compliance with all applicable local, state and federal requirements, the environmental impacts of the Project along the Covell's Beach Route, onshore and offshore, would be minimized.

In Section VII, above, the Siting Board finds that with the implementation of specified mitigation and conditions, the Project is consistent with the health, environmental, and resource use and development policies of the Commonwealth.

In addition, the Siting Board finds, pursuant to G.L. c. 164, § 72, that the Project is necessary for the purpose alleged, and will serve the public convenience and is consistent with the public interest, subject to the following Conditions A through R.

In addition, the Siting Board finds, pursuant to G.L. c. 40A, § 3, that construction and operation of the Company's proposed Project is reasonably necessary for the public convenience or welfare. Accordingly, the Siting Board GRANTS the Company's Zoning Petition to the extent that it seeks individual exemptions from the Barnstable Zoning Ordinance for the proposed Substation; the Siting Board DENIES the Zoning Petition to the extent that it seeks individual zoning exemptions for the Onshore Cables. The Siting Board finds further that issuance of a comprehensive exemption could avoid substantial public harm. Accordingly, the Siting Board GRANTS a comprehensive zoning exemption for the Project

Accordingly, the Siting Board APPROVES pursuant to G.L. c. 164, § 69J, the Company's Petition to construct the Project using the Covell's Beach Route, as described herein, subject to the following Conditions A through S.

A. In order to clearly establish that the Vineyard Wind Energy Facility is likely to be available to contribute to the regional energy supply, Vineyard Wind shall submit to the Siting Board, prior to commencing construction, a copy of the BOEM ROD approving the Vineyard Wind Energy Facility.

B. The Siting Board directs Vineyard Wind to notify the Siting Board of the Company's final selection of either the western or eastern route through the Muskeget Channel, including documentation and analysis describing the results of the engineering and constructability analysis for Muskeget Channel.

C. The Siting Board directs the Company to cooperate with DMF in planning and implementing its benthic habitat monitoring for the Project and to comply with applicable permit, license, and approval requirements that pertain to benthic habitat monitoring.

D. The Siting Board directs the Company to cooperate with DMF and SMAST in planning and implementing fisheries monitoring for the Project and to comply with applicable permit, license, and approval requirements that pertain to fisheries monitoring.

E. The Siting Board directs the Company to use noise barriers at the Covell's Beach landfall site when performing HDD installation activities.

F. With respect to the Covell's Beach landfall site, the Siting Board approves the Company's proposed HDD construction schedule of Monday through Saturday between the hours of 7:00 a.m. and 7:00 p.m. Should the Company need to extend construction work beyond those hours and or days (i.e., on Sunday), with the exception of emergency circumstances on a given day that necessitate extended hours, the Siting Board directs the Company to seek prior written permission from the Town of Barnstable before commencing work and to provide the Siting Board with a copy of such permission. If the Company and municipal officials are not able to agree on whether such extended construction hours or days should occur, the Company may request prior authorization from the Siting Board and shall provide the Town of Barnstable with a copy of any such request and authorization.

The Company shall inform the Siting Board and the Town of Barnstable in writing within 72 hours of any work that continues beyond the days and hours allowed by the Siting Board. The Company shall also send a copy to the Siting Board, within 72 hours of receipt, of any municipal authorization for an extension of work hours. Furthermore, the Company shall keep records of the dates, times, locations, and durations of all instances in which work continues beyond the days and hours allowed by the Siting Board, or, if granted extended work hours in writing by a municipality, work that continues past such allowed hours, and must submit such records to the Siting Board within 90 days of Project completion.

G. The Siting Board directs the Company to consult with DMF regarding appropriate measures to verify cable burial depth periodically to ensure that magnetic fields are minimized over the life of the Project.

H. The Siting Board directs the Company to prohibit construction of all Project components and delivery of all Project equipment and materials within the period of Memorial Day to Labor Day at Covell's Beach.

I. The Siting Board directs the Company to discuss with the Town of Barnstable whether to place signage on Covell's Beach informing the public that the Onshore Cables are located under the beach, and to submit the results of such discussions to the Siting Board.

J. The Siting Board directs the Company, in consultation with the Town of Barnstable, to develop a comprehensive public outreach plan for Town residents and businesses. The outreach plan should describe the procedures the Company will use to notify the public about: (1) the scheduled start, duration, and hours of construction in particular areas; (2) the methods of construction that will be used in particular areas (including any use of nighttime construction); and (3)

anticipated street closures and detours. The outreach plan should also include information on complaint and response procedures; Project contact information; the availability of web-based Project information; and protocols for notifying schools and local and regional public transit operators of upcoming construction.

K. The Siting Board directs the Company to develop a TMP for the Project, as the Company has proposed. The Siting Board also directs the Company to submit a copy of the final TMP to the Siting Board and all other parties when available, but no less than two weeks prior to the commencement of construction, and to publish the TMP on the Company's Project website.

L. The Siting Board directs Vineyard Wind to use the quietest generators and portable HVAC units reasonably available to the Company. In addition, to reduce noise impacts on residences, when operating noisy equipment, such as whole tree chippers or compressors, the Company shall locate such equipment as far away as possible from nearby residences, where the flexibility exists to do so.

M. With respect to the Onshore Cables, the Siting Board accepts the standard construction hours of Monday to Friday from 7:00 a.m. to 6:00 p.m. Work requiring longer continuous duration than normal construction hours allow, such as cable splicing, is exempted from this requirement. Should the Company anticipate the need to extend construction work beyond the above-noted hours or days, with the exception of emergency circumstances on a given day necessitating extended hours, the Siting Board directs the Company to seek prior written permission from the Town of Barnstable before the commencing such work, and to provide the Siting Board with a copy of such permission. If the Company and municipal officials are not able to agree on whether such extended construction hours or days should occur, the Company may request prior authorization from the Siting Board and shall provide the Town with a copy of any such request and authorization.

The Company shall inform the Siting Board and Barnstable within 72 hours of any work that continues beyond the days and hours allowed by the Siting Board. The Company shall also send a copy to the Siting Board, within 72 hours of receipt, of any municipal authorization for an extension of work hours. Furthermore, the Company shall keep records of the dates, times, locations, and duration of all instances in which work continues beyond the days and hours allowed by the Siting Board; if Barnstable grants the Company extended work hours in writing, the Company shall keep records of work that continues past allowed hours, and must submit such record to the Siting Board within 90 days of Project completion.

N. The Siting Board directs the Company to prepare and submit a report comparing actual noise impacts at the R4 and other receptor locations to the noise levels predicted in this proceeding. This report shall be submitted to the Siting Board

within four months of the end of the Vineyard Wind Energy Facility's first year of operation.

O. The Siting Board directs Vineyard Wind, prior to finalizing the design of the exterior sound wall, to inform the Siting Board as to what architectural treatments could be incorporated to maximize the aesthetics of the exterior sound wall. Prior to taking any steps to finalize the wall design, the Company shall submit the proposed wall design to the Siting Board for review.

P. The Siting Board directs the Company to provide a final landscaping plan along with a description of the community process that took place with the surrounding abutters prior to completion of the final plan.

Q. The Siting Board directs the Company to comply with all applicable federal, state, and local laws, regulations, and ordinances from which the Company has not received an exemption. The Company shall be responsible for ensuring such compliance by its contractors, subcontractors, or other agents.

R. The Siting Board directs the Company, within 90 days of Project completion, to submit a report to the Siting Board documenting compliance with all conditions contained in this Decision, noting any outstanding conditions yet to be satisfied and the expected date and status of compliance.

S. The Siting Board directs the Company that, should construction within shoulders or sidewalks prove to be necessary or advantageous, the Company may work with the Town of Barnstable on designing and permitting such underground transmission cable locations, and shall advise the Siting Board in advance of its intention to seek local approval of such plans, for further review by the Siting Board

Because issues addressed in this Decision relative to this facility are subject to change over time, construction of the proposed Project must be commenced within three years of the date of the Decision.

In addition, the Siting Board notes that the findings in this Decision are based upon the record in this case. A project proponent has an absolute obligation to construct and operate its facility in conformance with all aspects of its proposal as presented to the Siting Board. Therefore, the Siting Board requires Company, and their successors in interest, to notify the Siting Board of any changes other than minor variations to the proposal so that the Siting Board may decide whether to inquire further into a particular issue. The Company or its successors in

interest are obligated to provide the Siting Board with sufficient information on changes to the proposed Project to enable the Siting Board to make these determinations.

The Secretary of the Department shall transmit a copy of this Decision and the Section 61 findings herein to the Executive Office of Energy and Environmental Affairs and the Company shall serve a copy of this Decision on the Town of Barnstable Board of Selectmen, the Town of Barnstable Planning Board, and the Town of Barnstable Zoning Board of Appeals, within five days of its issuance. The Company shall certify to the Secretary of the Department within ten business days of issuance that such service has been made.

M. Kathryn Sedor

M. Kathryn Sedor
Presiding Officer

Dated this 10th day of May, 2019

APPROVED by a vote of the Energy Facilities Siting Board at its meeting on May 9, 2019, by the members present and voting. Voting for the Tentative Decision as amended: Gary Moran, Deputy Commissioner and designee for the Commissioner of MassDEP and Siting Board Acting Chair; Matthew H. Nelson, Chairman of the Department of Public Utilities; Cecile M. Fraser, Commissioner of the Department of Public Utilities; Judith Judson, Commissioner of the Department of Energy Resources; Jonathan Cosco, Senior Deputy General Counsel and designee for the Secretary of the Executive Office of Housing and Economic Development; Glenn Harkness, Public Member; and Joseph Bonfiglio, Public Member.

Gary Moran, Acting Chair
Energy Facilities Siting Board

Dated this 10th day of May, 2019

Appeal as to matters of law from any final decision, order or ruling of the Siting Board may be taken to the Supreme Judicial Court by an aggrieved party in interest by the filing of a written petition praying that the order of the Siting Board be modified or set aside in whole or in part. Such petition for appeal shall be filed with the Siting Board within twenty days after the date of service of the decision, order or ruling of the Siting Board, or within such further time as the Siting Board may allow upon request filed prior to the expiration of the twenty days after the date of service of said decision, order or ruling. Within ten days after such petition has been filed, the appealing party shall enter the appeal in the Supreme Judicial Court sitting in Suffolk County by filing a copy thereof with the clerk of said court. Massachusetts General Laws, Chapter 25, Sec. 5; Chapter 164, Sec. 69P.