Decisions and Orders

Massachusetts Energy Facilities Siting Board

VOLUME 15

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COMMONWEALTH OF MASSACHUSETTS
Energy Facilities Siting Board

In the Matter of the Petition of Cape Wind Associates, LLC and Commonwealth Electric Company, d/b/a NSTAR Electric for Approval to Construct Two 115 kV Electric Transmission Lines	)	EFSB 02-2

FINAL DECISION

M. Kathryn Sedor
Presiding Officer
May 11, 2005

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ABBREVIATIONS

1997 BECo Decision	Boston Edison Company, 6 DOMSB 208 (1997)
1997 Restructuring Act	"the 1997 Electric Restructuring Act" (Chapter 164 of the Acts of 1997)
1998 NEPCo Decision	New England Power Company, 7 DOMSB 333 (1998)
AC	alternating current
ACEC	Area of Critical Environmental Concern
ACOE	U.S. Army Corps of Engineers
Act	Massachusetts Ocean Sanctuaries Act
Alliance	The Alliance to Protect Nantucket Sound, Inc.
ANP Bellingham	ANP Bellingham Energy Company, EFSB 97-1 (1998), 7 DOMSB 39
ANP Blackstone	ANP Blackstone Energy Company, EFSB 97-2/98-2 (1999), 8 DOMSB 1
ANSI	American National Standards Institute
Barnstable Interconnect	project approach of interconnecting to the grid at Barnstable Switching Station
Cape Wind	Cape Wind Associates, LLC
CCC	Cape Cod Commission
CELCo Decision	Cambridge Electric Light Company, 12 DOMSB 305 (2001)
CELT	Capacity, Energy, Loads, & Transmission (yearly reports provided by NEPOOL)
CEMP	comprehensive environmental monitoring program
cm	centimeter
CO_2	carbon dioxide
ComElec Decision	Commonwealth Electric Company, 5 DOMSB 273 (1997)
Commonwealth Electric	Commonwealth Electric Company, d/b/a NSTAR Electric
Company	Cape Wind, and/or Commonwealth Electric Company d/b/a NSTAR Electric
CZM	Massachusetts Office of Coastal Zone Management
dB	decibels, unweighted

dBA	A-weighted decibels
DC	direct current
DEM	Massachusetts Department of Environmental Management
Department	Department of Telecommunications and Energy
DOER	Massachusetts Division of Energy Resources
DOMSB	Decisions and Orders of Massachusetts Energy Facilities Siting Board
DOMSC	Decisions and Orders of Massachusetts Energy Facilities Siting Council
DPW	Town of Yarmouth Department of Public Works
DRI	Development of Regional Impact
D.T.E.	Department of Telecommunications and Energy
EEI	Edison Electric Institute
EFSC	Energy Facilities Siting Council
EFH	Essential Fish Habitat
EIR	Environmental Impact Report [not memorialized]
EIS	Environmental Impact Statement
EMF	electromagnetic field
EMI	EMI Cape, LLC
EOEA	Executive Office of Environmental Affairs
ERL	effects range limited
ESP	electrical service platform
ESS	Environmental Science Services, Inc.
FAA	Federal Aviation Administration
GIS	Generation Information System
GPS	Global Positioning System
GWh	gigawatt-hours
HDD	horizontal directional drill
Hz	hertz (cycles per second)
I&M	installation and maintenance

ICAP	Installed Capacity
ISO-NE	Independent System Operator of New England, Inc.
kV	kilovolts
L_{90}	sound level exceeded 90% of time
L_{eq}	time-averaged sound levels
L_{max}	maximum sound levels
La Capra	La Capra Associates, LLC
LOLE	a one-day-in-ten-years loss-of-load expectation
m/s	meter per second
Mashpee Town Landing	Mashpee Neck Road town landing
Mass Audubon	Massachusetts Audubon Society
MBUAR	Massachusetts Board of Underwater Archaeological Resources
MDEP	Massachusetts Department of Environmental Protection
MDMF	Massachusetts Division of Marine Fisheries
MECo	Massachusetts Electric Company
MECo/NEPCo Decision	Massachusetts Electric Company/New England Power Company, 18 DOMSC 383 (1989)
MEPA	Massachusetts Environmental Protection Act
mG	milligauss
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MHC	Massachusetts Historical Commission
MLLW	mean lower low water
mm	millimeters
MMWEC Decision	Massachusetts Municipal Wholesale Electric Company, EFSB 97-4 (2001), 12 DOMSB 18
mph	miles per hour
MVA	mega-volt-amperes
MVAR	mega-volt-amperes-reactive
MW	megawatts

MWh	megawatt-hours
NEPA	National Environmental Policy Act
NEPCo	New England Power Company
NEPOOL	New England Power Pool
NHESP	Natural Heritage and Endangered Species Program
1995 NEPCo Decision	New England Power Company, 4 DOMSB 109 (1995)
1997 Restructuring Act	1997 Electric Restructuring Act
NO_X	nitrogen oxides
NSTAR	Commonwealth Electric Company, d/b/a NSTAR Electric
NPCC	Northeast Power Coordinating Council
Ocean Sanctuaries Act	Massachusetts Ocean Sanctuaries Act
proposed transmission lines	the Company's proposed 115 kV transmission lines
reconnaissance survey	terrestrial reconnaissance archeological survey
ROW	right-of-way
RPS	Renewable Portfolio Standard
Section 72 petition	"A petition pursuant to G.L. c. 164, § 72, seeking a determination that the proposed lines are necessary . . ."
SE Kendall Decision	Southern Energy Kendall, LLC, 11 DOMSB 255 (2000)
Sithe Mystic Decision	Sithe Mystic Development LLC, 9 DOMSB 101 (1999)
Siting Board	Energy Facilities Siting Board
Siting Board petition	joint petition seeking approval to construct the proposed transmission project
SO_2	sulfur dioxide
SPB	Save Popponesset Bay, Inc.
transmission project	the Company's proposed 115 kV transmission lines
Turners Falls Decision	Turners Falls Limited Partnership, 18 DOMSC 141 (1988)
USFWS	U.S. Fish & Wildlife Service
wind farm	offshore wind generating project in Nantucket Sound

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Pursuant to G.L. c. 164, § 69J, the Energy Facilities Siting Board hereby approves, subject to the conditions set forth below, the joint petition of Cape Wind Associates, LLC and Commonwealth Electric Company, d/b/a NSTAR Electric for approval to construct two new 115 kV electric transmission lines, approximately 18 miles in length, for the purpose of interconnecting a proposed offshore wind generating facility in Nantucket Sound with the regional electric grid in New England.

I. INTRODUCTION

A. Summary of the Proposed Project

On September 17, 2002, Cape Wind Associates, LLC ("Cape Wind") and Commonwealth Electric Company, d/b/a NSTAR Electric ("NSTAR") (together, "Company")[1] jointly filed a petition with the Energy Facilities Siting Board ("Siting Board") and a petition with the Department of Telecommunications and Energy ("Department") to construct, operate and maintain two new 115 kilovolt ("kV") electric transmission lines, for the purpose of interconnecting an as yet unconstructed and unpermitted offshore wind generating facility in Nantucket Sound ("wind farm") with the regional electric grid in New England ("proposed transmission lines" or "transmission project").[2] Cape Wind is a Massachusetts limited liability corporation, established for the purpose of developing an offshore wind generating project in Nantucket Sound (Exhs. EFSB-LE-1; CW-1, at 1-3 to 1-4). Commonwealth Electric Company is an electric company pursuant to G.L. c. 164, § 1, and is an operating subsidiary of NSTAR, a Massachusetts business trust (Exhs. EFSB-LE-2; EFSB-LE-3).

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[1] Because Cape Wind and NSTAR are co-applicants, statements of fact generally will not be attributed to an individual company. For ease of reference, "Company" shall mean Cape Wind, NSTAR, or both companies jointly.

[2] The Siting Board lacks jurisdiction to review the proposed wind farm because, as currently proposed, it would lie solely in federal waters. Aspects of the wind farm are discussed in this decision, however, because in determining the need for a transmission line intended to interconnect a non-jurisdictional generating facility to the grid, past Siting Board decisions have required an applicant to consider aspects of the power to be produced by the generating facility. See Appendix A of this Decision.

The record shows that the proposed wind farm would consist of 130 interconnected wind turbines spaced approximately one-third to one-half mile apart, encompassing an approximately 24 square-mile area on Horseshoe Shoal in Nantucket Sound (Exhs. CW-1, at 1-4; EFSB-SS-22-S, Att. at Table 5-6, and App. 5-B at 9; Tr. 12, at 1749-1750).[3] The Company indicated that the wind farm would be located 11.0 miles from Great Point, Nantucket; 5.5 miles from Cape Poge and 9.3 miles from Oak Bluffs on Martha's Vineyard; 6.0 miles from Cotuit; 6.8 miles from Craigville Beach; and 4.7 miles from Point Gammon, which would be the closest point of land to the wind farm (Exh. EFSB-RR-23, Att.).

The Company stated that the wind farm would include an electrical service platform ("ESP"), which would connect to the individual wind turbines and step up the voltage from 33 kV to 115 kV (Exhs. CW-1, at 1-4; APNS-N-64). Transmission from the ESP would consist of two parallel 115 kV circuits, with each circuit consisting of two cables, each with three conductors, for a total of four cables and twelve conductors (Exh. CW-1, at 1-5). Each circuit would be buried approximately 6 feet below the sea bottom in a separate trench, and the two trenches would be placed 20 feet apart (id. at 1-8, and Fig. 1-7). At landfall, the twelve conductors would feed into a single underground duct bank for the upland portion of the route (id. at 1-6, and Fig.1-4).

The Company stated that the primary route[4] would be approximately 18.1 miles in length, 12.2 miles of which would be submarine and 5.9 miles of which would be on land (id. at 1-11, 1-12; Exh. EFSB-RR-84). The primary route would extend from the ESP through Nantucket Sound and then through Lewis Bay, making landfall at New Hampshire Avenue in Yarmouth,

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[3] The wind farm initially included 170 turbines; the Company subsequently reduced that number to 130 (Exhs. CW-2, at 1-2; EFSB-SS-22-S, Att. at Table 5-6).

[4] A Siting Board petition to construct a jurisdictional transmission line must present both the applicant's preferred route (primary route) and at least one alternative to that route (alternative route). Published notice of each route is required, and only a route that has been noticed may be approved by the Siting Board. In this case, the Company has noticed two routes: the primary route, through Lewis Bay, and the alternative route, through Popponesset Bay. Maps showing the marine and land-based portions of the primary and alternative routes are attached as Figs. 1, 2, 3 and 4.

and then traveling underground along town streets and an existing NSTAR right-of-way ("ROW") to an interconnection with the grid at NSTAR's Barnstable Switching Station (Exh. CW-1, at 1-1).[5] The Company stated that the alternative route would be approximately 24.2 miles in length, 10 miles of which would be submarine and 14.2 miles of which would be on land (id. at 1-12, 1-13). The Company stated that the alternative route would extend from the ESP through Nantucket Sound, and then beneath Popponesset Spit into Popponesset Bay, through Popponesset Bay to a landfall at the Mashpee Neck Road Town Landing ("Mashpee Town Landing"), traveling underground to NSTAR's existing Mashpee Substation, and then proceeding aboveground for approximately 12.3 miles to the Barnstable Switching Station (id. at 1-13).[6]

Cape Wind stated that it would own, operate and maintain the proposed wind farm, the ESP, the submarine cables connecting the wind farm to the ESP and all on-land facilities up to the point where the proposed transmission lines would enter the NSTAR ROW (Exhs. EFSB-LE-4; EFSB-LE-5; EFSB-11). The Company stated that NSTAR would own, operate, and maintain the transmission facilities in the ROW at Cape Wind's expense (Exh. EFSB-11).

B. Procedural History

1. Consolidation of Dockets

On September 17, 2002, Cape Wind and NSTAR filed a joint petition with the Siting Board seeking approval, pursuant to G.L. c. 164, § 69J, to construct the proposed transmission project ("Siting Board petition"). The Siting Board petition was docketed as EFSB 02-2. The Company also filed a petition with the Department, pursuant to G.L. c. 164, § 72, seeking a determination that the proposed transmission lines are necessary, would serve the

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5 The Company also noticed an alternative landfall for the primary route, on a parcel of privately owned property at 43 Shore Road in Yarmouth. The Company did not pursue this alternative in the adjudicatory hearing, and we accordingly neither review nor approve the Shore Road landfall as an alternative to the New Hampshire Avenue landfall.

6 Figure 1 shows the location of the proposed wind farm relative to certain onshore locations, and relative to the primary and alternative transmission line routes.

public convenience, and would be consistent with the public interest ("Section 72 petition"). The Section 72 petition was docketed as D.T.E. 02-53.

At the time the Company filed its Siting Board and Section 72 petitions, it requested that the petitions be consolidated for consideration by the Siting Board in a single adjudicatory proceeding. On September 27, 2002, the Chairman of the Department granted the Company's request, issuing a Consolidation Order which directed the Siting Board to render a final decision in both cases ("consolidated proceeding"). The consolidated proceeding was docketed as EFSB 02-2/D.T.E. 02-53. Accordingly, the Siting Board conducted a single adjudicatory proceeding, and a single evidentiary record was developed.

2. Siting Board Adjudicatory Proceeding

The Siting Board formally commenced the consolidated proceeding with a public comment hearing on the Company's petitions in the Town of Barnstable on November 12, 2002.[7] On December 20, 2002, the Presiding Officer issued a ruling granting five petitions to intervene and four petitions for limited participant status in the proceeding. The Town of Yarmouth, the Massachusetts Department of Environmental Management ("DEM") Ocean Sanctuaries Program,[8] the Alliance to Protect Nantucket Sound ("Alliance"), Save Popponesset Bay, Inc. ("Save Popponesset Bay") and the Massachusetts Audubon Society ("Mass Audubon")[9] were granted intervenor status. Nantucket Electric Company, the Cape Cod Commission ("CCC"), Mr. Emil Masotto, and Dr. Charles Levy were granted limited participant status.[10] The Siting

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7 Siting Board staff, including the Presiding Officer, also conducted a site visit on the same day as the public comment hearing. The site visit included views of the on-land portion of the primary and alternative routes, and of the proposed landfalls for both routes.

8 In July 2003, DEM merged with the Metropolitan District Commission to form the Massachusetts Department of Conservation and Recreation.

9 Mass Audubon is the owner of property on Sampson Island and Egg Island, in the vicinity of the primary route (Exh. MA-ALJ at 2). Mass Audubon also owns a portion of Popponesset Spit, on the alternative route (Audubon Brief at 2).

10 See Ruling re Petitions to Intervene and Petitions to Participate, December 20, 2002; (continued...)

Board staff, the Alliance, Mass Audubon, and Save Popponesset Bay each issued two sets of information requests to the Company. The Town of Yarmouth issued one set of information requests to the Company. The Siting Board and the Company each issued Information Requests to the Alliance, Save Popponesset Bay, and Mass Audubon.

a. Prefiled Testimony

i. Company

On February 14, 2003, the Company submitted its direct case, in the form of written prefiled direct testimony. Cape Wind presented the testimony of nine witnesses: Craig Olmsted, Vice President of Projects for EMI Cape, LLC ("EMI"),[11] who testified regarding multiple aspects of the proposed transmission project, including project approach, route selection, and comparison of the proposed facilities along the primary and alternative routes; Leonard J. Fagan, Vice President of Engineering for EMI, who provided testimony regarding project approach and route selection; Charles J. Natale, Jr., Senior Vice President and Principal Scientist at Environmental Science Services, Inc. ("ESS"), and Stephen B. Wood, Vice President and Senior Project Manager at ESS, who provided testimony regarding project approach, route selection, comparison of the proposed facilities along the primary and alternative routes, and consistency with current health, environmental protection and resource use and development policies for the Commonwealth; Douglas C. Smith, Technical Director of La Capra Associates ("La Capra"), who testified regarding project need; Daniel Peaco, President of La Capra Associates, who testified regarding project need; Peter A. Valberg, Ph.D., who provided testimony regarding electric and magnetic fields and public health; Christopher M. Bryan, P.E., owner of CBX Energy Engineering, who provided testimony regarding electrical engineering and transmission

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[10] (...continued)
Supplemental Ruling re: Petitions to Intervene and Petitions to Participate, January 17, 2003; Second Supplemental Ruling on Petitions to Intervene and Participate, February 7, 2003.

[11] Cape Wind's membership interests are owned by EMI, which is a Massachusetts limited liability corporation.

interconnection issues; and David P. Estey, P.E., Principal Electrical Engineer at E/PRO Engineering and Environmental Consulting, who provided testimony regarding the measurement and calculation of electric and magnetic fields.

NSTAR submitted the direct testimony of two witnesses: Charles P. Salamone, Director of System Planning for the electric subsidiaries of NSTAR, who testified regarding design, cost and reliability of the transmission project, and Robert J. Connors, Lead Engineer in the Transmission Engineering Department for the electric subsidiaries of NSTAR, who provided testimony regarding the evaluation of the NSTAR ROW. On September 8, 2003, Cape Wind filed written rebuttal testimony of six witnesses. Four of the Company's witnesses, Craig Olmsted, Charles Natale, Stephen Wood, and Douglas Smith, had previously submitted direct testimony on the Company's behalf. Two additional witnesses testified for the first time: Paul Kerlinger, Ph.D., Principal at Curry & Kerlinger, who provided testimony regarding potential avian impacts of the wind farm, and Peter H. Guldberg, President of Tech Environmental, Inc., who testified regarding potential noise impacts of the wind farm.

ii. Intervenors

On June 20, 2003, the Alliance, Save Popponesset Bay, and Mass Audubon each submitted prefiled direct testimony. The Alliance filed the direct testimony of five witnesses: Jeffrey D. Byron, an independent energy consultant, doing business as Byron Consulting Group, who testified regarding reliability need and economic need for the proposed wind farm; Michael L. Morrison, Ph.D. who testified regarding the potential impacts of wind-generated power on birds and bird habitat; Mark Weissman, Member, the Massachusetts Marine Fisheries Commission, who provided testimony regarding potential impacts on fisheries; Erich Bender, Sc.D., an acoustical engineer who provided testimony regarding acoustical impacts of the proposed wind farm; and Richard S. LeGore, Ph.D., President of Mote Environmental Services, Inc., and Senior Scientist at Mote Marine Laboratory, who provided testimony regarding potential benthic impacts.

Save Popponesset Bay filed the testimony of Peter J. Williams, P.E., Project Manager for Vine Associates, Inc., who provided testimony regarding coastal processes and coastal

engineering.

Mass Audubon filed the testimony of Stanley M. Humphries, Senior Project Manager at Ocean and Coastal Consultants, Inc., who provided testimony regarding coastal zone geology; Andrea L. Jones, Director of Mass Audubon's Coastal Waterbird Program, who provided testimony regarding rare and endangered coastal shorebirds; and Robert N. Buchsbaum, Ph.D., Southeast Regional Conservation Scientist for Mass Audubon, who testified regarding potential impacts of cable installation on subtidal habitats near Mass Audubon properties in Lewis Bay and Popponesset Bay.

b. Adjudicatory Hearing and Evidentiary Record

The Siting Board held twenty-one days of evidentiary hearings, beginning on July 29, 2003, and concluding on October 21, 2003.[12] The parties' witnesses under oath adopted their prefiled written direct testimony, provided certain limited direct testimony, and were subject to cross-examination by the Company, certain intervenors, and Siting Board staff.[13] Approximately 930 exhibits were entered into the evidentiary record. On November 25, 2003, initial briefs were filed by the Company, the Alliance, Mass Audubon ("Audubon Brief") and Save Popponesset Bay ("SPB Brief"), including responses to briefing questions posed by the Siting Board staff. On December 9, 2003, the Company, the Alliance, and Mass Audubon filed reply briefs. The evidentiary record was closed on December 18, 2003.[14]

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12 On May 5, 2003, the Alliance moved to suspend the proceeding, and filed a similar motion at the conclusion of the adjudicatory hearing. The Presiding Officer denied both motions. See Ruling on Motion to Suspend Procedural Schedule, June 6, 2003; see Summary Ruling on Motion to Suspend the Briefing Schedule, October 30, 2003.

13 On June 25, 2003, Cape Wind filed a motion to strike portions of the prefiled direct testimony filed by the Alliance. In a ruling issued on July 22, 2003, the Presiding Officer denied Cape Wind's motion, finding that the disputed testimony was potentially relevant to one of the findings the Siting Board would be required to make in its final decision, relative to a claim raised by Cape Wind itself. See Ruling on Petitioner's Motion to Strike, July 22, 2003.

14 On March 16, 2004, after conclusion of the adjudicatory hearing, the Presiding Officer (continued...)

On July 2, 2004, the Siting Board staff issued a Tentative Decision approving the transmission project. The parties and limited participants were given 60 days, until August 31, 2004, to review and comment on the Tentative Decision. Thereafter, the Siting Board met on November 30, 2004, to consider the Tentative Decision.

On November 8, 2004, the U.S. Army Corps of Engineers issued a Draft Environmental Impact Statement/Draft Environmental Impact Report/Development of Regional Impact for the combined transmission and wind farm projects ("DEIR"). On November 24, 2004, the Alliance filed a motion to reopen hearings to allow the DEIR and any written comments on the DEIR into the evidentiary record. On November 29, 2004, Cape Wind filed its opposition to the Alliance's motion.

At the November 30, 2004, Siting Board meeting, the Siting Board directed the parties to submit written briefs on the issue of reopening and directed the presiding officer to rule on the motion. Cape Wind and the Alliance each filed an initial brief on December 30, 2004, and a reply brief on January 13, 2005.

In a ruling issued on March 21, 2005, the Alliance's motion to reopen was denied. Cape Wind Associates, LLC and Commonwealth Electric Company d/b/a NSTAR Electric, EFSB 02-2 / D.T.E. 02-53, Ruling on Motion to Reopen Adjudicatory Hearing (March 21, 2005).

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[14] (...continued)
issued a Sequencing Ruling recognizing that, pursuant to the Massachusetts Environmental Policy Act ("MEPA") the Siting Board cannot issue a decision in the Section 72 docket until the Massachusetts Executive Office of Environmental Affairs ("EOEA") has completed its review of the proposed transmission project, and that, as of the date of this decision, EOEA has not yet completed that review. The Sequencing Ruling confirms, however, that a final decision in the EFSB docket may be issued at this time, pursuant to the Siting Board's statutory exemption from MEPA, set forth in G.L. c. 164, § I. See Ruling Re Sequencing of Decisions, March 16, 2004, at 2-4. The Siting Board will issue a decision in the Section 72 docket after the Secretary's Certificate on the FEIR has been issued. Pursuant to G.L. c. 30, § 61, that decision must incorporate "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".

C. Jurisdiction and Scope of Review

1. Jurisdiction Pursuant to G.L. c. 164

The Company filed its petition to construct the proposed transmission project in accordance with G.L. c. 164, § 69H, which requires the Siting Board to implement the energy policies in its statute to provide a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost, and pursuant to G.L. c. 164, § 69J, which requires a project applicant to obtain Siting Board approval for the construction of proposed energy facilities before a construction permit may be issued by another state agency.

As a new electric transmission line with a design rating of 69 kV or greater and a length in excess of one mile, the Company's proposed project falls within the definition of "facility" set forth in G.L. c. 164, § 69G, which provides that a "facility" includes:

> a new electric transmission line having a design rating of 69 kV or more and which is one mile or more in length on a new transmission corridor.

In accordance with G.L. c. 164, § 69J, before approving a petition to construct facilities, the Siting Board requires an applicant to justify its proposal in three phases. First, the Siting Board requires the applicant to show that additional energy resources are needed (see Section II.A, below). Next, the Siting Board requires the applicant to establish that, on balance, its proposed project is superior to alternative approaches in terms of cost, environmental impact, reliability, and ability to address the identified need (see Section II.B, below). Finally, the Siting Board requires the applicant to show that it has considered a reasonable range of practical facility siting alternatives and that the proposed site for the facility is superior to a noticed alternative site in terms of cost, environmental impact, and reliability of supply (see Sections III.A and III.C.5, below.)

2. The Ocean Sanctuaries Act

a. Alliance

In its initial brief, the Alliance asserts for the first time that the Ocean Sanctuaries Act, G.L. c. 132A et seq, requires the Siting Board to deny the Company's petition (Alliance Brief at 3). Although this assertion does not technically constitute a challenge to the Siting Board's

subject matter jurisdiction, we address the Alliance's argument here because it does purport to limit the Siting Board's authority to review marine-based projects, and to grant the Company's petition if the record supports such an outcome.

Section 18 of the Massachusetts Ocean Sanctuaries Act ("Ocean Sanctuaries Act" or "Act") provides, in relevant part, that Massachusetts agencies must issue permits "consistently with" the Act. G.L. c. 132A, § 18 ("Section 18"). The Alliance argues that approving the transmission project would violate the Siting Board's obligation under Section 18 to issue permits that are consistent with the Act because, the Alliance asserts, the project would be located within the Cape and Islands Ocean Sanctuary and transmission facilities of the type proposed by the Company are not permitted in that Ocean Sanctuary (Alliance Brief at 3-7, 18).[15,16]

b. Company

The Company agrees with the Alliance that a portion of the proposed transmission project would be located within the Cape and Islands Ocean Sanctuary (Company Reply Brief at 8-10). However, the Company asserts that the Ocean Sanctuaries Act expressly allows the construction of transmission facilities in the Cape and Islands Sanctuary (id.). G.L. c. 132A, §§ 15 and 16. In particular, the Company points to the language of Section 16 of the Act ("Section 16"), one portion of which provides that all "activities, uses and facilities associated with the generation, transmission and distribution of electrical power" may be located within the five designated Massachusetts ocean sanctuaries, except for the Cape Cod Ocean Sanctuary (Company Reply Brief at 9). The Company also points to language in Section 16 which provides that "the laying of cables approved by the [D]epartment of [T]elecommunications and [E]nergy"

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15 The Alliance argues that both the wind farm project and the transmission project are precluded by the Act. However, the Company has not requested Siting Board approval to construct the wind farm. Arguments regarding the application of the Ocean Sanctuaries Act to the wind farm accordingly are not relevant to the Siting Board's review of the transmission project and will not be substantively addressed.

16 In addition to Section 18, the Alliance cites to Sections 15 and 16 of the Ocean Sanctuaries Act.

may take place in any ocean sanctuary except for the Cape Cod Ocean Sanctuary (id.).

c. Analysis

Massachusetts has five ocean sanctuaries, the location and boundaries of which are identified in Section 13 of the Ocean Sanctuaries Act. G.L. c. 132A, § 13. A portion of the Company's proposed transmission project, whether along the primary or alternative route, will lie within the Cape and Islands Ocean Sanctuary.

Certain types of activities, such as offshore drilling and the construction of electric generating facilities, are prohibited in Massachusetts' ocean sanctuaries. G.L. c. 132A, § 15 ("Section 15"). However, this prohibition is not an absolute one; Section 15 expressly provides that the activities enumerated in that section are prohibited "[e]xcept as otherwise provided [in the Act]". Id. Consequently, in determining whether a particular activity is prohibited in an ocean sanctuary, one must review not only the list of prohibited activities set forth in Section 15, but the Act as a whole, to determine whether it contains an exemption or qualification applicable to the activity under consideration.

The Siting Board generally does not engage in interpretations of statutes other than its own enabling legislation, on the ground that such determinations generally are outside the scope of the Siting Board's expertise and lie more properly within the province of the courts. See Massachusetts Municipal Wholesale Electric Company, 12 DOMSB 18 (2001) ("MMWEC Decision"), Hearing Officer Ruling on Motion to Dismiss (March 16, 2000) (scope of applicant's statutory authority under its enabling legislation not appropriately determined in a proceeding before the Siting Board). In this case, however, the language of the statute in question is not ambiguous, and its interpretation is necessary if we are to address the claim by the Alliance that the Siting Board is required by the Ocean Sanctuaries Act to deny the proposed project.

Turning first to the list of prohibited activities set forth in Section 15 of the Act, there is only one category of activity that, if construed broadly, may be read to encompass the installation of transmission cables in the seabed of an ocean sanctuary: that of "the building of [a] structure on the seabed or under the subsoil." G.L. c. 132A, § 15.

We are uncertain whether the Legislature intended to define the term "structure" so broadly as to include buried electric transmission cables, and thus decline to make a finding on this issue. Fortunately, however, we do not need to make such a finding, because even if the proposed cables were deemed to constitute "structures" within the meaning of the Ocean Sanctuaries Act, the laying of such cables is an activity that is expressly permitted in certain ocean sanctuaries, including the Cape and Islands Ocean Sanctuary, under Section 16 of the Act.

The counterpart to Section 15 of the Act and its list of prohibited activities is Section 16, which identifies categories of activities that are allowable in ocean sanctuaries. Section 16 provides, inter alia, that

> Nothing in this act is intended to prohibit the following activities: In all ocean sanctuaries except the Cape Cod Ocean Sanctuary the planning, construction, reconstruction, operation, and maintenance of industrial liquid coolant discharge and intake systems and all other activities, uses and facilities associated with the generation, transmission, and distribution of electrical power . . .; [and] the laying of cables approved by the department of telecommunications and energy . . ..

G.L. c. 132A, § 16 (emphasis added).

The express language of Section 16 is unambiguous. We conclude that the Company's proposed transmission project fits within two of the categories of permissible activity set forth in this section: as facilities associated with the transmission of electrical power, and as cables which, if installed, will necessarily have been approved by the Department under G.L. c. 164, § 72.[17] Thus, even assuming the applicability of Section 15, the proposed transmission project constitutes a clearly permissible activity under Section 16 and may be sited

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[17] G.L. c. 164, § 72 requires Massachusetts electric companies such as NSTAR to obtain Department approval for the construction of new electric transmission lines like the transmission lines proposed by the Companies. The Department will approve such construction if it finds that a proposed line is necessary, will serve the public convenience, and is consistent with the public interest. Without such approval, construction of the lines cannot occur. See, e.g., Boston Edison Company v. Town of Sudbury, 356 Mass. 406 (1969). Thus, even if approved by the Siting Board, construction of the Companies' proposed transmission line cannot occur unless the construction also is approved by the Department under Section 72. The Companies filed a Section 72 petition, which is docketed as D.T.E. 02-53.

within the Cape and Islands Ocean Sanctuary without violation of the Massachusetts Ocean Sanctuaries Act. Siting Board approval of the proposed transmission project accordingly would be consistent with the Act.

II. ANALYSIS OF THE PROPOSED PROJECT

A. Need Analysis

1. Standard of Review

a. Background

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.[18]

Both Cape Wind and the Alliance have argued that the Siting Board should review the need for the proposed project using as guidance the standards applied in Turners Falls Limited Partnership, 18 DOMSC 141, at 154-155 (1988) ("Turners Falls Decision") and in Massachusetts Electric Company/New England Power Company, 18 DOMSC 383, at 394-395 (1989) ("MECo/NEPCo Decision"). In Turners Falls, the Siting Board reviewed a proposal to construct a 1.2-mile, 115 kV transmission line designed to interconnect a 20 megawatt ("MW") coal-fired

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[18] The Siting Board's review of proposed transmission facilities is conducted pursuant to G.L. c. 164, § 69J. This section states, in part, that "[n]o applicant shall commence construction of a facility at a site unless . . . in the case of an electric or gas company which is required to file a long-range forecast pursuant to section sixty-nine I, that facility is consistent with the most recently approved long-range forecast for that company." The Siting Board notes that, pursuant to the Department's Order in D.T.E. 98-84A, Massachusetts electric companies are now exempt from the requirements of G.L. c. 164, § 69I. Because NSTAR is no longer required to file a long-range forecast pursuant to G.L. c. 164, § 69I, and Cape Wind has never been subject to this requirement, the Siting Board need not consider whether the proposed transmission facilities are consistent with a recently-approved long range forecast.

power plant,[19] and required the proponent to show: (1) that there was a need within New England for the power generated by the non-jurisdictional generating facility; and (2) that the facility would provide benefits to Massachusetts. Turners Falls Decision, 18 DOMSC 141, at 144, 153-155. The Siting Board rejected the possibility of determining need for the transmission line based solely on whether a physical connection was needed to connect the power plant to the grid, noting that "[a]ddressing the need issue here so narrowly would be inconsistent with our analysis of other utility and non-utility facilities, as well as with our statutory mandate". Id. at 154, n.10.

In MECo/NEPCo, the Siting Board reviewed a proposal to construct a 3.2-mile, 69 kV transmission line intended to interconnect a 40 MW gas- and oil-fired power plant.[20] MECo/NEPCo, 18 DOMSC at 386. The Siting Board, adapting its analysis in Turners Falls, required the proponent to show: (1) that power from the non-jurisdictional cogeneration plant was needed on either economic efficiency or reliability grounds, and (2) that the existing transmission system was inadequate to support this new power source and that additional energy resources were necessary to accommodate the new power source. Id. at 395. The Siting Board again stated that limiting the need review to an analysis of the need for a physical interconnection "would be inconsistent with our need analysis for other facilities, as well as with our statutory mandate." Id.

The parties' proposal in this proceeding to review the need for the proposed transmission lines under some variant of the standards used in Turners Falls and MECo/NEPCo initially appears reasonable, because these two cases represent the entire body of Siting Board precedent relating to the construction of jurisdictional transmission lines to interconnect non-jurisdictional power plants with the regional electric grid. However, since these two cases were decided, the Siting Board's statute has been amended in ways which undercut the stated rationale for the standards of review used in those cases.

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19 The Siting Board lacked jurisdiction over the power plant because its capacity was less than 100 MW.

20 Again, the Siting Board lacked jurisdiction over the power plant because its capacity was less than 100 MW.

First, the 1997 Electric Restructuring Act ("1997 Restructuring Act") amended the Siting Board's general mandate in G.L. c. 164, § 69H to reflect market-based principles. Prior to the enactment of the 1997 Restructuring Act, the Siting Board was charged with reviewing the need for all major energy facilities to be built in the Commonwealth. Pursuant to Section 69H, as amended in 1997, the Siting Board continues to review the need for proposed transmission and natural gas facilities, but may no longer review the need for proposed generation. Now, the Siting Board is required:

> . . . to provide a reliable energy supply for the commonwealth with a minimum impact on the environment at the lowest possible cost. To accomplish this, the [B]oard shall review the need for, cost of, and environmental impacts of transmission lines, natural gas pipelines, facilities for the manufacture and storage of gas, and oil facilities; provided, however, that the [B]oard shall review only the environmental impacts of generating facilities, *consistent with the commonwealth's policy of allowing market forces to determine the need for and cost of such facilities* (emphasis added).

Second, consistent with the change to G.L. c. 164, § 69H, the Restructuring Act added a new section, G.L. c. 164, § 69J¼, to the Siting Board statute. Section 69J¼ governs the review of proposed generating facilities, and explicitly states that "[n]othing in this chapter shall be construed as requiring the [B]oard to make findings regarding the need for, the cost of, or alternate sites for a generating facility . . ."; in addition, it explicitly prohibits the Siting Board from seeking data regarding the need for or cost of a proposed generating facility, except for certain narrowly-defined cost data. In March 1999, the Siting Board issued a request for comments on the standard of review to be used in future generating facility reviews; and, beginning with its decision in Sithe Mystic Development LLC, 9 DOMSB 101 (1999) ("Sithe Mystic Decision"), the Siting Board has applied a standard of review for generating facilities that excludes any review of project need.

Since the Siting Board no longer reviews the need for power to be generated by power plants, applying a Turners Falls-style analysis in this case would not be consistent with the Siting Board's practice and statutory mandate. Rather, it would be inconsistent both with current practice – the limited review of jurisdictional generating facilities now undertaken pursuant to G.L. c. 164, § 69J¼ – and with the Commonwealth policy, articulated in G.L. c. 164, § 69H, of

allowing market forces to determine the need for new generation.

b. Revised Standard of Review

Given the statutory changes that have taken place since Turners Falls (1988) and MECo/NEPCo (1989), the Siting Board finds that the application of a revised standard of review, one more consistent with the Siting Board's mandate as set forth in the 1997 Restructuring Act, is appropriate in this case. Further, 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.

In a recent review of a transmission line designed to interconnect a generating facility also subject to its jurisdiction, the Siting Board found a need for the line based on: (1) the Siting Board's earlier approval of the power plant to be served by the transmission line,[21] and (2) a showing by the proponent that "some form of electrical interconnection is required to provide the regional transmission system with the additional energy provided by" that power plant. Cambridge Electric Light Company, 12 DOMSB 305, at 318 (2001) ("CELCo Decision"). Taken together, the two findings in CELCo establish that a transmission line, with its attendant costs and potential construction and permanent impacts, is not built unnecessarily. While the Siting Board's approval of a jurisdictional generating facility does not encompass the question of whether the power plant is "needed," it does provide reasonable assurance that the generating project is environmentally sound and buildable at the chosen site. The finding regarding the need for electrical interconnection provides assurance that new transmission facilities will be built

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[21] The Siting Board noted that, pursuant to G.L. c.164, § 69J¼, the Siting Board's approval of a jurisdictional power plant demonstrated that the plant "would contribute to a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost". CELCo Decision, 12 DOMSB 305, at 318.

only when existing transmission facilities are inadequate to the task of supporting the new generation. The Siting Board regards these two factors as critical elements in the analysis of the need for any transmission line intended to interconnect a power plant with the regional electric grid. Therefore, the Siting Board will require an applicant seeking to construct a transmission line to interconnect a new or expanded generating 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. If the new or expanded generator exists, or is under construction, the availability showing will be deemed to have been made.[22] 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).

In the sections below, the Siting Board reviews the need for the proposed transmission lines pursuant to the standard of review set forth above. However, we are mindful that parties before an administrative agency such as the Siting Board have a "right to expect and obtain reasoned consistency" in our decisions, and we recognize the uncertainties inherent in setting forth a new standard of review during the course of an adjudication, even where the new standard is prompted by statutory changes. Boston Gas Company v. Department of Public Utilities, 367 Mass. 92, 104 (1975). Therefore, in Appendix A, the Siting Board provides an analysis of the need for the transmission lines using the Turners Falls/MECo/ NEPCo precedent.

2. Description of the Existing Transmission System

The Company stated that, without the proposed transmission line, there would be no means by which to deliver energy from the proposed wind farm to potential customers in Massachusetts (Exh. CW-1, at 2-30). The Company stated that the 345 kV transmission system

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22 The generators served by the Turners Falls and MECo/NEPCo transmission lines each were under construction at the time those cases were filed. Turners Falls Decision, 18 DOMSC 141, at 144; MECo/NEPCo Decision, 18 DOMSC 383, at 387.

on Cape Cod consists of: (1) two 345 kV lines connecting NSTAR's Canal Station switchyard to off-Cape locations, with capacities of 1261 mega-volt-amperes ("MVA") and 2169 MVA (Exhs. EFSB-3(1), Att.; EFSB-3(2), Att; EFSB-RR-57); and (2) a ring bus at Canal Switchyard, which is connected via transformers both to the Canal Electric power plant in Sandwich and to two 115 kV transmission lines that are part of the Cape Cod 115 kV transmission system (Exhs. EFSB-3(1), Att.; EFSB-3(2), Att.; Tr. 1, at 23-25).

The Company indicated that 115 kV transmission on the south (Nantucket Sound) side of Cape Cod extends from the Falmouth Bulk Substation in the west to the Harwich Bulk Substation in the east (Exhs. EFSB-3(1), Att.; EFSB-3(2), Att.). Existing substations and switching stations on Cape Cod also include the Mashpee Substation, the Barnstable Switching Station, the Hyannis Junction Substation, and the new Oak Street Substation in West Barnstable (Exhs. EFSB-3(1), Att.; EFSB-3(2), Att.; Tr. 1, at 29). Among these stations, Barnstable Switching Station is centrally located on the Cape and has six connections to 115 kV transmission lines (Exh. EFSB-3(2)). Transmission lines connecting at Barnstable Switching Station are listed in Table 1, below:

Table 1. Existing Interconnections to Barnstable Switching Station

Line No.	Termini*		Voltage	Capacity
120	Canal	Barnstable	115 kV	398 MVA
122	Bourne	Barnstable	115 kV	398 MVA
115	Falmouth	Barnstable	115 kV	227 MVA
118	Harwich Tap	Barnstable	115 kV	227 MVA
119	Harwich Tap	Barnstable	115 kV	227 MVA
124	Hyannis	Barnstable	115 kV	227 MVA

Sources: Exhs. EFSB-3(1), Att.; EFSB-3(2), Att; EFSB-RR-57; EFSB-RR-69

* Although some of these lines bifurcate to multiple termini, this table lists only two termini per line.

NSTAR does not expect additional transmission capacity to be needed on the Cape Cod system for at least ten years, following the addition of one transformer in 2003 (Tr. 3, at 386).

The Company indicated that an existing 46 kV transmission cable, operated by National Grid, extends from Lothrop Avenue Station in Harwich under Nantucket Sound to Nantucket

Island, passing approximately four miles east of Horseshoe Shoal (Exhs. EFSB-1, Att.; EFSB-3(1), Att.; Tr. 1, at 25-26). The Nantucket cable has a capacity of 35.8 MVA (Exh. EFSB-RR-57). In addition, four 23 kV transmission cables to Martha's Vineyard are located at the west end of Nantucket Sound; these cables have capacities of 8.5 MVA, 18.2 MVA, 20 MVA, and 22.8 MVA, respectively (Exhs. EFSB-3(1), Att.; EFSB-RR-57). There are no transmission cables traversing the Horseshoe Shoal area in Nantucket Sound (Exhs. EFSB-1, Att.; EFSB-3(1), Att.).

3. Project Permitting and Status

Cape Wind proposes to build its wind farm in Horseshoe Shoal, an area of Nantucket Sound located in federal, rather than Massachusetts, waters (Exh. CW-1, at 1-1 and 1-2). Consequently, the wind farm does not fall under the Siting Board's jurisdiction. Because it is built in navigable waters, it will require a Section 10 permit[23] from the United States Army Corps of Engineers ("ACOE"), which is the lead agency for the environmental review of the entire wind farm project, including the proposed transmission lines, under the National Environmental Policy Act ("NEPA") (Exhs. EFSB-4; EFSB-G-7). Pursuant to NEPA, a draft and final Environmental Impact Statement (respectively, "DEIS" and "FEIS") are required for the project (Exh. APNS-N-2).

In addition, Cape Wind has filed an Expanded Environmental Notification Form ("ENF") initiating review of the entire Cape Wind project, including the wind farm, under the Massachusetts Environmental Policy Act ("MEPA"); a draft and a final Environmental Impact Report ("DEIR" and "FEIR") also will be required for the project (Exhs. CW-2, at 6-2; EFSB-4). The scope of the MEPA review of the wind farm includes alternative generating technologies and locations for the wind farm, avian impacts, fisheries impacts, visual impacts, noise, rare species, marine archeological resources, navigation, and decommissioning and environmental monitoring programs (Exh. CW-2, at 4-1 to 4-9, 7-1 to 7-47).

In an addition to the EIR/EIS requirements, the wind farm will undergo a Federal

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[23] The Section 10 permit is issued by the ACOE pursuant to Section 10 of the Rivers and Harbors Act of 1899, 33 USC §§ 401 et seq.

Consistency Review conducted by the Massachusetts Office of Coastal Zone Management ("CZM") and review by the Cape Cod Commission ("CCC") as a Development of Regional Impact ("DRI") (Exh. EFSB-4). The NEPA, MEPA, and CCC reviews have been coordinated, and a joint EIS/EIR/DRI will be prepared for the wind farm and transmission line (Exhs. EFSB-4; EFSB-9). A draft EIS/EIR/DRI has not yet been issued.

As of March 2003, Cape Wind stated that it had not sought financing for the project (Exh. APNS-N-32).

4. Analysis

Pursuant to the standard of review set forth in Section II.A.1, above, the Siting Board requires an applicant seeking to construct a transmission line to interconnect a new or expanded generating 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.

With respect to the first element of the standard of review, the record indicates that Cape Wind is proposing to build its wind farm in Horseshoe Shoal, several miles distant from the nearest transmission cable. In addition, the record indicates that the total capacity of all existing transmission cables in Nantucket Sound would be insufficient to transmit the output of the proposed wind farm, even if they could be totally dedicated to that purpose. The Siting Board therefore finds that the existing transmission system is inadequate to interconnect the proposed wind farm.

As the wind farm is not yet under construction, and is not subject to the Siting Board's jurisdiction, we consider its availability based on its progress in permitting. The record indicates that, although scoping documents for the joint EIS/EIR/DRI process were issued in early 2002, the ACOE (which is the lead agency for the joint review) has not yet issued a Draft Environmental Impact Statement. Thus, environmental permitting for the wind farm is in its early stages, and the Siting Board cannot yet find that the wind farm will be available to contribute to the regional energy supply. Given the complexity of the federal, state and local permitting process for this project, the Siting Board concludes that acquisition of all permits

required for Cape Wind to begin installation of wind farm equipment in Nantucket Sound is necessary before the Siting Board could make such a finding.[24] Accordingly, the Siting Board finds that, to establish that the wind farm is likely to be available to contribute to the regional energy supply, Cape Wind shall submit to the Siting Board copies of all permits required for Cape Wind to begin installation of wind farm equipment in Nantucket Sound. The Siting Board finds that, at such time as Cape Wind complies with this condition, Cape Wind will have demonstrated that there is a need for additional transmission resources to interconnect the wind farm with the regional transmission grid. Cape Wind and NSTAR may not commence construction of the proposed transmission project until they have complied with this condition.

B. Comparison of the Proposed Project and Alternative Approaches

1. Standard of Review

G.L. c. 164, § 69H requires the Siting Board to evaluate proposed projects in terms of their consistency with providing a reliable energy supply to the Commonwealth with a minimum impact on the environment at the lowest possible cost. In addition, G.L. c. 164, § 69J requires a project proponent to present "alternatives to planned action" which may include: (a) other methods of generating, manufacturing, or storing electricity or natural gas; (b) other sources of electrical power or natural gas; and (c) no additional electric power or natural gas.[25]

In implementing its statutory mandate, the Siting Board requires a petitioner to show that, on balance, its proposed project is superior to alternative approaches in terms of cost, environmental impact, and ability to meet the identified need. CELCo Decision, 12 DOMSB 305, at 321; Boston Edison Company, 6 DOMSB 208, at 252 (1997) ("1997 BECo Decision"); Boston Edison Company, 13 DOMSC 63, at 67-68, 73-74 (1985). In addition, the Siting Board

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[24] Moreover, in light of the expansive scope of the MEPA and ACOE reviews of the wind farm, acquisition of these approvals also would provide reasonable assurance that the wind farm would be constructed and operated with a minimum impact on the environment.

[25] G.L. c. 164, § 69J also requires a petitioner to provide a description of "other site locations." The Siting Board reviews the Company's primary route, as well as other possible routes, in Section III.A, below.

requires a petitioner to consider reliability of supply as part of its showing that the proposed project is superior to alternative project approaches. 1997 BECo Decision, 6 DOMSB 208, at 262-263; Commonwealth Electric Company, 5 DOMSB 273, at 300 (1997) ("ComElec Decision"); Massachusetts Electric Company, 18 DOMSC 383, at 404-405 (1989).

2. Identification of Project Approaches for Analysis

The Company considered four approaches for the interconnection of the wind farm (Exh. CW-1, at 3-2 to 3-4). These four approaches include connecting the wind farm: (1) to NSTAR's 115 kV Barnstable Switching Station; (2) to NSTAR's 115 kV Harwich Substation; (3) to NSTAR's 115 kV Pine Street Substation in New Bedford; and (4) to a new 115 kV substation on Martha's Vineyard, then proceeding on to the mainland.[26, 27]

The Company used the following criteria to identify possible approaches to interconnecting the wind farm to the grid: (1) proximity of the electric power system to the wind farm; (2) ability of the electric power system to accept the wind farm's full output; (3) suitability of voltage levels for delivery of the output; and (4) availability of multiple transmission lines at the tie-in point (Exh. CW-1, at 3-1). Cape Wind stated that it considered only approaches that would provide firm capacity for the full output of the wind farm, and excluded approaches that might require curtailing output during a full load (Tr. 1, at 58). The Company stated that Cape Cod is served by a number of 115 kV lines, which generally range in capacity from 200 MVA to

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26 The Company also considered a no-build alternative. The Company determined that this approach would prevent the wind farm from being interconnected to the regional transmission grid, and would preclude operation of the wind farm (Exh. CW-1, at 3-5). Therefore, this approach was not considered further (id.).

27 At the request of the Siting Board, the Company also analyzed an interconnection at the Mashpee Substation (Exh. EFSB-PA-11). The Company stated that existing transmission lines out of the Mashpee substation could not accommodate the 420 MW of power generated by the wind farm (id.). The Company explained that the Mashpee Substation supports two 115 kV transmission lines – one that extends west to the Hatchville Substation and one that extends northeast to the Barnstable Switching Station – each of which has a short-term emergency rating of 291 MVA (id.; Exh. EFSB-1). Because neither line is capable of carrying the full output of the wind farm, the loss of either line would result in the overload of the remaining line (Exh. EFSB-PA-11).

over 400 MVA, but noted that only two of these lines – Lines 120 and 122, which extend west from the Barnstable Switching Station – could accommodate power flows in excess of 400 MVA (id. at 31, 35). The Company stated that approaches which allowed transmission at higher voltages, with lower line losses, were preferred due to their greater ability to deliver large blocks of power more efficiently (Exh. CW-1, at 3-1).

a. The Barnstable Interconnect

The Company's preferred approach ("Barnstable Interconnect") would interconnect the wind farm with the grid at NSTAR's 115 kV Barnstable Switching Station via an approximately 18- to 24-mile transmission line, 9 to 12 miles of which would be submarine cable (Exhs. CW-1, at 3-2; EFSB-RR-84). The Barnstable Switching Station is located south of Route 6 off Mary Dunn Road in Barnstable (Exh. CW-1, at 3-2). Six 115 kV lines emanate from the Barnstable Switching Station, including three that run to the west (Lines 115, 120, and 122), two that run to the east (Lines 118 and 119), and one that runs to the south (Line 124) (Exh. EFSB-3, at Figs. 3-1 and 3-2). The distance from landfall to the Barnstable Switching Station ranges from approximately 5.9 miles (for the New Hampshire Avenue landfall in Yarmouth), to approximately 14.2 miles (for the Mashpee Town Landing landfall) (Exh. CW-1, at 1-4 and 1-13). If the alternative route were used, a new riser station would need to be constructed in the NSTAR ROW in Mashpee, to connect the proposed transmission lines to the existing NSTAR 115 kV line and to the new overhead transmission lines (id. at 1-13 to 1-14). The Company indicated that the capital cost of the Barnstable Interconnect would be $79.5 million (Exh. EFSB-PA-2, Table 3-1).[28]

b. Harwich Alternative

The Harwich Alternative would interconnect the wind farm with the grid at NSTAR's 115 kV Harwich Substation, located south of Route 6 off Great Western Road and Lothrop Avenue in Harwich, via an approximately 21-mile transmission line, 17 miles of which would be

[28] The cost estimate of the Barnstable Interconnect is based on 11 miles of submarine cable (Exh. EFSB-PA-2, Table 3-1).

submarine cable (Exh. CW-1, at 3-3). The Harwich Substation is connected to two 115 kV transmission lines (Lines 118 and 119) that run generally from the Harwich Substation to the Harwich Tap and then to the Barnstable Switching Station (id. at 3-3).[29] The Company noted that the transmission lines from the wind farm would be connected to Lines 118 and 119 at the Harwich Substation (Tr. 1, at 102). The Harwich Alternative would then require the construction of an additional 115 kV line extending 12.3 miles from the Harwich Substation to the Barnstable Switching Station (14 miles from landfall), necessitating an expansion of the Harwich Substation (Exhs. CW-1, at 3-3; EFSB-PA-10). The Company indicated that the capital cost of the Harwich Alternative would be $126.8 million (Exh. EFSB-PA-2).[30]

c. New Bedford Alternative

The New Bedford Alternative would interconnect the wind farm with the grid at NSTAR's Pine Street Substation in New Bedford via an approximately 32-mile submarine cable (Exh. CW-1, at 3-4). The cable would pass through Horseshoe Shoal in Nantucket Sound, Vineyard Sound, Buzzards Bay, and New Bedford Harbor before making landfall at New Bedford and proceeding several hundred feet overland to the Pine Street Substation (id. at 3-3 to 3-4; Tr. 1, at 106). The Company noted that the Pine Street Substation is connected to the grid through three transmission lines – two that are capable of carrying 60 MVA each and one that is capable of carrying 130 MVA– for a total existing transmission capacity of 250 MVA (Tr. 1, at 49). The Company therefore concluded that use of the New Bedford Alternative would require construction of another line to transmit the wind farm's maximum output; it would also

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29 The Lothrop Avenue Low Voltage Substation is located adjacent to the Harwich Substation, and the 23kV Nantucket Cable runs from this low voltage substation to Nantucket (Tr. 1, at 102). The Company explained that although there are plans for a second cable to Nantucket, Nantucket's load is appropriate for low-voltage service and attempting to upgrade the system for use by both the Nantucket Cable Project and the wind farm would add substantial cost and complexity without providing any cost benefits (id. at 72-73,75).

30 The Company estimated that the cost of the Harwich Alternative would be $102.5 million if the on-land cable were installed overhead instead of underground (Exh. EFSB-PA-21).

necessitate an expansion of the Pine Street Substation (Exh. EFSB-PA-27; Tr. 1, at 54, 104).[31] The Company indicated that the capital cost of the New Bedford Alternative would be $129.2 million (Exh. EFSB-PA-2).

The Company initially proposed using a 150 kV direct current ("DC") transmission cable for the New Bedford Alternative, rather than the alternating current ("AC") cable proposed for the other alternatives, due to the length of the submarine cable (Exh. CW-1, at 3-3 to 3-4). However, the Company later concluded that the cost and line loses associated with the use of DC would be greater than for AC, that the DC technology was new and unproven, and that AC was appropriate for cable lengths of less than 50 to 100 miles (Tr. 1, at 46-47). In addition, the Company noted that the use of DC technology would require the installation of converter stations at both the ESP and the Pine Street Substation (Exh. CW-1, at 3-3 to 3-4). The Company indicated that converter stations have large space requirements and high losses, and that the installed cost of the converter stations would be $124 million (Exh. EFSB-PA-1). The cost of the New Bedford Alternative with DC cable would be $292.4 million as opposed to $129.2 million with AC cable (Exh. CW-1, at Table 3-1). The Company therefore indicated that it would use AC technology for the New Bedford Alternative (Exh. EFSB-PA-2).

d. Martha's Vineyard Alternative

The Martha's Vineyard Alternative would connect the wind farm first to Martha's Vineyard to serve load on the Island, and then to a substation on the mainland. A 13.5-mile 115 kV submarine cable would run from the wind farm to a new 115 kV substation on Martha's Vineyard (Exh. CW-1, at 3-4).[32] The Company stated that the most recently recorded summer peak load on Martha's Vineyard was 42.3 MW (August 2002) (Exh. EFSB-PA-8). From

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31 With the wind farm at the maximum output of 420 MW, the Company noted that even adjusting the output to subtract out up to 70 MW of output to the New Bedford area load served from the Pine Street Substation, transmission capacity of at least 350 MW would be required on lines connecting the Pine Street Substation to the rest of the grid to carry the remaining output from the wind farm (Tr. 1, at 51).

32 The highest voltage level currently serving Martha's Vineyard is 23 kV (Exh. EFSB-3, Fig. 3-1).

Martha's Vineyard, a new 115 kV line would extend either to the Mashpee Substation (a distance of 14 miles), or to the Falmouth Substation (a distance of approximately 5 miles) (Exh. CW-1, at 3-4). The Company indicated that the Mashpee tie-in would be preferable (id.).

The Company estimated that the capital cost of the Martha's Vineyard Alternative would exceed that of the Barnstable Interconnect by $109 million, for a total cost of $188.5 million (id.).[33] The Company indicated that it eliminated this alternative from further consideration due to these substantial additional costs (id.).[34]

e. Analysis

The Company has identified four approaches to meeting the identified need, each of which could provide reliable service for the proposed wind farm. The Siting Board agrees with the Company's conclusion that the Martha's Vineyard Alternative does not warrant further consideration due to the magnitude of increased cost over the Barnstable Interconnect without any offsetting benefits.[35] The Martha's Vineyard Alternative would involve increased lengths of

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33 In making this estimate, the Company assumed that the Martha's Vineyard Alternative would make landfall in Mashpee and would follow the Mashpee route for the Barnstable Interconnect to the Mashpee Substation and then on to the Barnstable Switching Station (Exh. CW-1, at 3-4). The additional cost includes the cost of 27.5 miles of submarine cable from the ESP to Martha's Vineyard and then to landfall at Mashpee at $3.7 million per mile, and $7.2 million for the new facilities on Martha's Vineyard (id.).

34 The Company noted that it also considered an interconnection via Nantucket, but rejected it for the same reasons that it rejected the Martha's Vineyard Alternative (Exh. CW-1, at 3-4). A Nantucket alternative would require construction of new 115 kV facilities on the Island and a longer submarine cable than that required for the Martha's Vineyard Alternative (id.).

35 The Siting Board notes the $109 million cost differential is overstated, as the Company failed to subtract out the submarine cable costs of the Barnstable Interconnect when making its calculation. A more accurate incremental cost estimate would be $68 million (based on subtracting the cost of 11 miles of marine lines for the Barnstable Interconnect at $3.7 million per mile). Therefore, the recalculated cost of the Martha's Vineyard Alternative would be approximately $147.5 million, versus the original estimate of $188.5 million. However, this cost is still significantly greater than the $79.5 million cost of the Barnstable Interconnect, the $127 million cost of the Harwich Alternative, and the

(continued...)

the marine route and the associated impacts of such construction, with potentially the same land route as the Barnstable Interconnect.

The Harwich and New Bedford Alternatives are somewhat less costly than the Martha's Vineyard Alternative, although each would cost approximately $50 million more than the Barnstable Interconnect. The Harwich Alternative provides an alternative interconnection point on Cape Cod, while ultimately transmitting most of the wind farm output via the Barnstable Switching Station. The New Bedford Alternative connects to the regional transmission system at a point off Cape Cod, and thus presents a different set of advantages and disadvantages. The Siting Board finds that the Barnstable Interconnect, the Harwich Alternative, and the New Bedford Alternative each would meet the identified need and provide potential tradeoffs between reliability, environmental impacts and cost worthy of further analysis. Therefore, in the following sections, the Siting Board compares the three approaches with respect to reliability, environmental impacts, and cost.

3. Reliability

The Company stated that, while each of the project approaches could provide a reliable interconnection with the regional transmission grid, the best interconnection point would be the Barnstable Switching Station, which is the major bulk substation on Cape Cod, and is connected to the grid by six separate transmission lines (Exhs. CW-1, at 3-5; EFSB-RR-57). The Company explained that interconnecting at a point served by multiple transmission lines would ensure that the loss of one of those lines would not force the curtailment of the wind farm's output (Exh. EFSB-PA-5). The Company also asserted that only the Barnstable Switching Station could accept the wind farm's full output and transport it to the transmission grid without substantial transmission upgrades elsewhere on the system (Tr. 1, at 53). The Company explained that the Barnstable Switching Station already has a ring bus; consequently, the work required for interconnection would involve only the extension of that ring bus to accommodate the cables from the wind farm, which would limit the construction to inside the fence line and would not

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[35] (...continued)
$129.2 million cost of the New Bedford Alternative.

require expansion of the existing substation (id. at 110-111).[36] The Company acknowledged that a system impact study has not yet been conducted, and that it consequently does not have the benefit of system impact study analyses simulating the effect of wind farm operations on the system (id. at 79).

The Company stated that interconnecting at the Harwich Substation would be a less reliable approach, since the new capacity generated by the wind project would be "connected at a greater distance from the core of the Cape Cod transmission system" (Exh. CW-1, at 3-5). Interconnecting at the New Bedford Substation also was deemed less reliable due to the greater length and complexity of the associated submarine cable (id.).

The record shows that the Barnstable Switching Station is the major bulk substation on Cape Cod, with six 115 kV transmission lines available to carry energy to various parts of Cape Cod. Interconnection at this location provides high reliability in that energy from the wind farm can be reliably delivered to the grid even if one of the lines emanating from the Barnstable Switching Station is out of service. Both the Barnstable Interconnect and the Harwich Alternative provide added transmission capacity ultimately reaching the Barnstable Switching Station; however, the Company argues that the Barnstable Interconnect provides a more direct connection to this substation, since the Harwich Alternative first interconnects at the Harwich Substation. The Siting Board agrees that, all other considerations being equal, a direct connection at the Barnstable Switching Station provides greater reliability than an indirect connection through another, smaller substation 12.3 miles distant from the Barnstable Switching Station. However, this reliability advantage would be diminished if for any reason the Company selected the alternative route for the Barnstable Interconnect, which includes an intermediate connection at the Mashpee Substation, and 14.2 miles of upgraded transmission lines, 12.3 miles of which are on new overhead lines, before reaching the Barnstable Switching Station.

The record suggests that the length of the New Bedford marine line – 32 miles, as opposed to 9 to 12 miles for the Barnstable Interconnect and 17 miles for the Harwich

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[36] The Company explained that interconnecting at the Harwich, Mashpee, or Falmouth Substations would require either the construction of a new substation or the expansion of an existing substation's footprint (Tr. 1, at 111).

Alternative – may make the New Bedford Alternative less reliable than interconnection at the Barnstable Switching Station. Further, at the point of interconnection to the grid, the number and capacity of the existing interconnecting lines is significantly lower under the New Bedford Alternative than the Barnstable Interconnect. The record shows that with the Barnstable Interconnect, the wind farm's maximum output is well matched to the transmission capacity at the Barnstable Switching Station. In contrast, with the New Bedford Alternative, the wind farm's output would be six times the existing peak load supplied from the interconnection point, and the excess output could not be fully transferred to other load areas via the available interconnection lines.

Accordingly, the Siting Board finds that the Barnstable Interconnect is slightly preferable to the Harwich Alternative and preferable to the New Bedford Alternative with respect to reliability.

4. Environmental Impacts

The Company asserted that the environmental impacts associated with the Barnstable Interconnect would consist predominantly of temporary impacts associated with the construction of the marine and underground facilities (Exh. CW-1, at 3-6). The Company stated that these temporary impacts could be mitigated through the design of the facilities and through optimization of the route (id.). Asserting that the marine-based construction impacts were essentially equivalent, the Company argued that the only differences would be associated with the lengths of the routes, and concluded that construction of a longer submarine cable might cause greater impacts than construction of a shorter cable (Tr. 1, at 89).[37] The Company concluded that the Barnstable Interconnect would have fewer temporary impacts since it is the shortest project alternative (Exh. CW-1, at 3-7).

The Company also assessed construction impacts on traffic and navigation associated with the three project approaches. With respect to traffic impacts, the Company noted that the

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37 However, the Company also noted that each of the submarine cable routes has its own set of particular environmental constraints or opportunities, and that the New Bedford route is quite different than any of the other project approaches (Tr. 1, at 109).

land portion of the Harwich Alternative is routed through a slightly less dense residential and commercial area, and that the traffic volumes are lighter than along the land portion of the Barnstable Interconnect (id; Tr. 1, at 97). With respect to navigational impacts, the Company noted that the likely route through Vineyard Sound, Buzzards Bay, and New Bedford Harbor is complicated by a number of factors, including the presence of surface bedrock, limited channel work space, and heavy commercial marine traffic (Tr. 1, at 90-92). In addition, the Company noted that construction of the New Bedford Alternative would be complicated by federal navigation channels and a hurricane barrier located in New Bedford Harbor (id. at 91). The Company asserted that, of the three approaches under consideration, the Harwich Alternative would have the fewest impacts on navigation (id. at 90).

The Company noted differences in the permanent land use impacts of the three project approaches. It noted that, depending on the route selected, the Barnstable Interconnect could have some permanent land use impacts resulting from the construction of the Mashpee riser station structures and overhead lines within the existing NSTAR ROWs (id. at 3-6). The Company stated that the impacts of the Harwich Alternative would include permanent impacts associated with the expansion of the Harwich Substation to accommodate the new underground transmission lines (Exhs. CW-1, at 3-7; EFSB-PA-9). The Company explained that the Harwich Substation site is constrained due to the number of existing facilities, including two transformers and distribution equipment (Tr. 1, at 103). The Company indicated that the site is bordered by Lothrop Avenue to the east, by wetlands to the west, open land to the south, and the ROW to the north (Exh. EFSB-PA-9; Tr. 1, at 98, 108, 109). The Company also noted that additional ROW might need to be acquired and cleared to accommodate the Harwich Alternative, since the existing ROW already is cleared to its full width (Exh. EFSB-PA-9; Tr. 1, at 98). The Company noted that Lothrop Avenue is a low-lying road, subject to flooding, that passes through the Parkers River Area of Critical Environmental Concern ("ACEC") (Tr. 1, at 101).

The Company explained that upgrades to the Pine Street Substation with the New Bedford Alternative would consist of additional interconnection work and bus work (Tr. 1, at 104). The Company stated that the Pine Street Substation is located at an industrial waterfront facility, surrounded by urban waterfront, industrial, and commercial uses (id. at 105). Further,

although the Pine Street Substation is fairly compact, there appears to be potential for expansion on the site (id.). The Company estimated that the distance from the New Bedford landfall to the Pine Street Substation is several hundred feet, giving the New Bedford Alternative the shortest and easiest on-land route of the project alternatives (id. at 106).

The Company provided a detailed analysis of magnetic field impacts for the Barnstable Interconnect, but did not measure existing magnetic fields or predict future magnetic fields for the Harwich Alternative and the New Bedford Alternative (Exh. EFSB-PA-12). The Company posited that since the same type of submarine cable would be used for all project approaches, the magnetic fields along the marine portions of the Harwich and New Bedford Alternatives would be similar to those for the Barnstable Interconnect (id.). The Company indicated that on-land electromagnetic field ("EMF") of the Barnstable Interconnect would be limited by the underground design, but they acknowledged that it is not possible, given the existing data, to predict with any accuracy the combined fields associated with the new and existing on-land facilities (id.).

The record indicates that use of the Harwich Alternative or the New Bedford Alternative would require the construction of transmission upgrades at existing substations, and that this construction could result in permanent land use impacts. The Barnstable Interconnect, if constructed along the primary route, would not require substation expansion. If the alternative route for the Barnstable Interconnect were used, some construction would be required at the Mashpee Substation. However, this work would be less extensive and have fewer impacts than the work required for the Harwich Alternative, due to space constraints at the Harwich Substation site, and the presence of wetlands to the west. In addition, the existing ROW in the immediate vicinity of the Harwich Alternative has been cleared to its full width; therefore, additional ROW may need to be acquired and cleared if the Harwich Alternative were used.

The New Bedford Alternative appears to have fewer permanent impacts than the Harwich Alternative; however, it has potential temporary impacts on navigation due to construction of the route through New Bedford Harbor. Construction in New Bedford Harbor may be complicated by bedrock, limited work space, and the hurricane barrier. Further, the marine portion of the New Bedford route is approximately three times the length of the Barnstable Interconnect and

twice that of the Harwich Interconnect.

Accordingly, the Siting Board finds that the Barnstable Interconnect would be preferable to both the Harwich Alternative and the New Bedford Alternative with respect to environmental impacts.

5. Cost

The Company estimated that the total capital cost of the transmission project would be $79.5 million if the Barnstable Interconnect is used, $126.8 million if the Harwich Alternative is used, $102.5 million if an overhead version of the Harwich Alternative is used, and $129.2 million if the AC version of the New Bedford Alternative is used (Exh. EFSB-PA-2).

The record demonstrates that the capital cost of the Barnstable Interconnect would be $47.3 million less than the Harwich Alternative, $23 million less than an overhead version of the Harwich Alternative, and $49.7 million less than the AC version of the New Bedford Alternative. Accordingly, the Siting Board finds that the Barnstable Interconnect would be preferable to the Harwich Alternative and the New Bedford Alternative with respect to cost.

6. Conclusions: Weighing Need, Reliability, Environmental Impacts, and Cost

The Siting Board has found that the Barnstable Interconnect, the Harwich Alternative, and the New Bedford Alternative each would meet the identified need. The Siting Board also has found that the Barnstable Interconnect would be slightly preferable to the Harwich Alternative and preferable to the New Bedford Alternative with respect to reliability, and that the Barnstable Interconnect would be preferable to the Harwich Alternative and the New Bedford Alternative with respect to environmental impacts and cost. Accordingly, the Siting Board finds that the Barnstable Interconnect would be preferable to both the Harwich Alternative and the New Bedford Alternative with respect to providing a reliable energy supply for the Commonwealth, with a minimum impact on the environment at the lowest possible cost.

III. ANALYSIS OF THE PRIMARY AND ALTERNATIVE ROUTES

The Siting Board has a statutory mandate to implement the policies of G.L. c. 164, §§ 69J-69Q to provide a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost. G.L. c. 164, §§ 69H and 69J. Further, G.L. c. 164, § 69J requires the Siting Board to review alternatives to planned projects, including "other site locations." In implementing this statutory mandate, the Siting Board requires a petitioner to demonstrate that it examined a reasonable range of practical siting alternatives, and that its proposed facilities are sited at locations that minimize costs and environmental impacts while ensuring supply reliability. CELCo Decision, 12 DOMSB 305, at 326; MMWEC Decision, 12 DOMSB 18, at 89; New England Power Company, 21 DOMSC 325, at 376 (1991).

A. Site Selection

1. Standard of Review

G.L. c. 164, § 69J provides that a petition to construct a proposed facility must include "a description of alternatives to [the applicant's] planned action" including "other site locations." In past reviews of alternative site locations identified by an applicant, the Siting Board has required the applicant to demonstrate that it examined a reasonable range of practical siting alternatives. CELCo Decision, 12 DOMSB 305, at 326; MMWEC Decision, 12 DOMSB 18, at 119; New England Power Company, 7 DOMSB 333, at 374 (1998) ("1998 NEPCo Decision"). In order to determine whether an applicant has considered a reasonable range of practical alternatives, the Siting Board has required the applicant to 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 sites in a manner which ensures that it has not overlooked or eliminated any sites which, on balance, are clearly superior to the proposed site. Second, the applicant must establish that it identified at least two noticed sites or routes with some measure of geographic diversity. CELCo Decision, 12 DOMSB 305, at 326; MMWEC Decision, 12 DOMSB 18, at 119; 1998 NEPCo Decision, 7 DOMSB 333, at 374.

2. Site Selection Process

a. Description

The Company indicated that its site selection process consisted of two parts – the identification of potential routes connecting the ESP to the Barnstable Switching Station, and the screening and ranking of the identified routes (Exh. CW-1, at 4-2 to 4-3; Tr. 2, at 188). Cape Wind explained that it identified several potential interconnection points through the use of U.S. Geological Survey maps, aerial photography, and consultation with NSTAR; then, potential landfall locations were identified along the southern shore of Cape Cod using the same methods (Exh. EFSB-SS-2). The Company then conducted site visits to screen the potential landfall locations and assessed the viability of the routes (id.).

The Company stated that it used two categories of "siting criteria" – land use criteria and environmental protection criteria – to identify potential routes for the transmission line (Exh. CW-1, at 4-2). With respect to land use, the Company sought to: (1) use landfall locations in close proximity to the Barnstable Switching Station; (2) use interconnection locations with transmission at 115 kV in order to minimize transmission upgrades; (3) maximize use of underground construction for the land portion of the route; (4) use previously developed and disturbed land; (5) use developed waterfront and near shore areas for the transmission cable landfall; (6) use existing ROWs with available workspace; (7) minimize bends or turns in the ROW; and (8) use roadways, sidewalks, and shoulder areas to maintain vehicle and pedestrian travel access (id. at 4-2 to 4-3). With respect to environmental protection, the Company sought to: (1) select a direct route between the ESP and the landfall; (2) avoid or minimize surface or subsurface disturbance of terrestrial, wetland and aquatic resources; (3) maximize use of existing developed land and waterfront areas and avoid encroachment on undeveloped areas; (4) minimize impacts to regional land-based and waterborne commerce and transportation networks; (5) avoid or minimize impacts to aquatic resources, water quality, seabed conditions and benthic habitat; and (6) minimize the number of marine transmission line trenches and the width of the trenches (id. at 4-3).

Based on these criteria, the Company identified six potential routes for the transmission lines, as follows: (1) an approximately 17-mile route making landfall at New Hampshire Avenue

in Yarmouth, continuing along Yarmouth streets and along an NSTAR ROW in Barnstable ("New Hampshire Avenue Route" or "Alternative 1"); (2) an approximately 24-mile route making landfall at the Mashpee Road Town Landing, via Popponesset Bay, continuing along Mashpee streets and along the NSTAR ROW ("Mashpee Town Landing Route" or "Alternative 2"); (3) an approximately 23.25-mile route making landfall at Bryants Cove in Mashpee, via Popponesset Bay, continuing along a cart path and along the NSTAR ROW ("Bryants Cove Route" or "Alternative 3"); (4) an approximately 21-mile route making landfall at Main Street in Cotuit, continuing along Main Street and along the NSTAR ROW ("Cotuit Route" or "Alternative 4"); (5) an approximately 17.5-mile route making landfall at Whale Road/Point Gammon in Yarmouth continuing along Yarmouth streets and along the NSTAR ROW ("Point Gammon Route" or "Alternative 5"); and (6) an approximately 14.5-mile route making landfall at Lewis Bay Road in Hyannis Harbor continuing along Hyannis streets and the Barnstable Airport to the NSTAR ROW and the Barnstable Switching Station ("Hyannis Harbor Route" or "Alternative 6") (Exh. CW-1, at 4-4 to 4-21 and Table 4-1).

The Company stated that it considered, but did not include, routes that would make landfall in an approximately 10-mile long coastal area lying between the Lewis Bay area, where Alternatives 1, 5, and 6 make landfall, and the Popponesset Bay/Cotuit Bay area, where Alternatives 2, 3, and 4 make landfall (Exh. EFSB-SS-23).[38] The Company explained that this in-between area lacked commercially available property for a landfall, and would necessitate use of on-land routing extending toward the Barnstable Switching Station that was likely to present construction difficulties due to congested roadways and utilities (id.).

The Company also considered but rejected routes that would come ashore in the Popponesset Bay/Cotuit Bay area but that, instead of using a lengthy overhead alignment along the NSTAR ROW, would follow an underground alignment along area roadways extending all the way to the terminus at the Barnstable Switching Station, or extending most of that distance before joining and following the NSTAR ROW at a point near the terminus (id.). The Company explained that it sought routes which minimized roadway construction, citing traffic, utility

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38 The coastal area includes Sea View Avenue in Wianno, Craigville Beach, Coville Beach and Keyes Beach (Exh. EFSB-SS-23).

congestion and cost, and added that it deemed the primary route to be clearly superior to other possible routes, beyond the identified alternatives, that would predominantly use roadway alignments (id.; Tr. 2, at 239-240). The Company further stated that it favored overhead construction where possible, based on differences in electrical line losses, environmental impacts and cost (Exh. EFSB-SS-23).

The Company stated that it evaluated the six route alternatives using 26 screening criteria, including cost, reliability, 11 installation and maintenance ("I&M") complexity criteria, and 13 environmental and land use criteria (Exh. CW-1, at 4-21). The Company explained that it started with the same unit price per foot to calculate the cost of each route alternative, but then factored in cost differences due to specific installation and design difficulties, including the number of horizontal directional drills ("HDD"), state highway crossings or railroad crossings, and installation in areas with congested underground utilities (id. at 4-28; Tr. 2, at 247).

The Company stated that the only factor used to assess differences in reliability between the route alternatives was the extent of overhead versus underground construction (wherein an underground line was considered to have a small reliability advantage (Exh. EFSB-SS-18; Tr. 2, at 229). The Company noted that routes which interconnect to the Barnstable Switching Station from the east would use underground lines for their full length, and thus were considered more reliable than those which interconnected from the west (Exh. EFSB-SS-18). The Company stated that the marine route segments all were deemed to be equally reliable because the length of the circuits, installation techniques, burial depths and materials used would be similar (Tr. 2, at 231).

The Company categorized eight of the I&M criteria as land and three as marine (Exh. CW-1, Tables 4-1, 4-2, and 4-3). The I&M criteria for the land portions of the routes included: (1) underground utility congestion; (2) intersection crossings; (3) traffic; (4) street width; (5) transmission line length; (6) number of manholes/splicing vaults; (7) railroad crossings; and (8) road access during construction (id. at 4-21 to 4-24, Table 4-3). The I&M criteria for marine portions of the routes included: (1) marine transmission line distance; (2) marine HDD; and (3) navigational impacts (id.).

Finally, the Company categorized twelve of the environmental criteria as land and one as

marine (id. at Tables 4-1, 4-2, 4-3). The environmental criteria for the land portions of the routes included: (1) wetlands; (2) terrestrial rare and endangered species habitat; (3) tree and vegetation removal; (4) shade tree removal; (5) percentage of new ROW; (6) water supply and groundwater (Zone I); (7) water supply and groundwater (Zone II); (8) disruption to properties during construction;[39] (9) prehistoric and historic archeological sites; (10) historic districts; (11) community facilities; and (12) hazardous waste sites (id. at 4-25 to 4-28, Table 4-3). The Company identified three environmental criteria for the marine transmission cable – eelgrass, fish runs, and shellfish; however, of these, only eelgrass was carried forward to a quantitative analysis (id., at 4-28).[40]

The Company stated that it evaluated and ranked the six alternative routes using the 26 screening criteria described above (id. at 4-30).[41] For each route, the Company assigned scores for each criterion on a scale of 0 to 5, where 5 was the most favorable (id.). Each of the criteria was assigned a weight of 1, 2, or 3, with very important criteria given a weight of 3, moderately important criteria given a weight of 2, and minor criteria given a weight of 1 (id. at 4-31; Tr. 2, at 214).[42] The scores were multiplied by the relevant weights and totaled to develop an overall weighted score for each route (Exh. CW-1, at 4-31). This scoring is shown in Table 2, below.

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39 The Company indicated that the property disruption criteria reflected traffic and property access concerns resulting from construction along streets (Exh. EFSB-SS-19).

40 The Company asserted that fish runs and shellfish were present along all of the routes, and that impacts could be addressed by construction techniques (Exh. CW-1, at 4-28). The Company concluded that impacts to fish runs and shellfish would be essentially equivalent along all routes, and therefore did not carry the fish run and shellfish criteria forward to the quantitative stage of the analysis (id. at 4-28, Tables 4-1, 4-2, 4-3).

41 The Company assessed the land and marine portions of each route separately (Exh. CW-1, at 4-30).

42 The total weights of all of the 26 criteria equaled 52 (based on a 1, 2, or 3 weight assigned to each criterion) (Exh. CW-1, at Table 4-3). Of the total weight of 52, the land installation criteria accounted for 16, the upland environmental/land use criteria accounted for 22, the marine installation criteria accounted for 9, the marine environmental/land use criterion accounted for 2, the cost criterion accounted for 2, and the reliability criterion accounted for 1 (id.).

Table 2. Site Selection Scoring

Criteria Category	Total Weighting	New Hampshire Avenue	Mashpee Town Landing	Bryants Cove	Cotuit	Point Gammon	Hyannis Harbor
UPLAND CRITERIA							
Installation & Maint. Criteria	31%	45	43	53	39	39	35
Environ./ Land Use Criteria	42%	73	73	60	41	74	60
Subtotal	73%	118	118	113	80	113	95
SUBMARINE CRITERIA							
Installation & Maint. Criteria	17%	39	28.5*	24	42	36	30
Environ./ Land Use Criteria	4%	10	10	10	10	2	10
Subtotal	21%	49	38.5	34	52	38	40
COST	4%	2	10	8	6	0	4
RELIABILITY	2%	5	1	1	1	5	5
TOTAL	100%	174	165.5*	156	139	156	144

Sources: Exh. CW-1, at Table 4-3; Tr. 8, at 1059; Company Brief at 136-138.

* As originally presented, the score for submarine I&M was 30: during the course of the proceeding the raw score for marine HDD on the Mashpee Town Landing Route was revised from 3 to 2.5, which lowered the weighted score by 1.5; the submarine I&M score dropped from 30 to 28.5, and the total score decreased from 167 to 165.5 (id.).

In response to questions from staff and intervenors, the Company provided additional information about its approach to assessing marine impacts, noise impacts, visual impacts and cultural resource impacts as part of the site selection process. With respect to marine impacts, the Company explained that for Alternatives 2 and 3, impacts to the landfall barrier beach (Popponesset Spit) were reflected in its site screening analysis, specifically under the criteria of marine HDD, rare and endangered species, and wetlands (Tr. 2, at 296, 297, 332).[43] The

[43] For the two alternatives that pass under Popponesset Spit (Mashpee Town Landing and (continued...)

Company noted that the evaluation of rare and endangered species reflected the presence of plant or wildlife species and habitat on the NSTAR ROW as well as on Popponesset Spit (Exh. EFSB-SS-3A). The Company stated that while wetlands along the marine portion were considered, they were determined to be the same along all six routes within the three mile length of coastal wetlands (Tr. 8, at 1063). Therefore, only the land portions were included in the scoring of routes for wetlands issues (id.).[44]

The Company asserted that, although noise was not used as a siting or screening criterion, and was not explicitly discussed as part of another criterion, it was nonetheless subsumed in the actual rankings and analysis (Tr. 8, at 1060). The Company asserted that the HDD criterion served as a marker for community disturbance and disruption of endangered species caused by HDDs, and the scoring for each route thus incorporated such impacts (id. at 1060).[45]

The Company stated that it did not include visual impacts as a separate screening

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43 (...continued)
Bryants Cove), Tables 4-1 and 4-3 of the Petition provide the following detail for the wetlands criteria: they were described as "no direct impact – buffer zone" (score of 3), and "temporary impact – intermittent stream" (score of 1), respectively (Exh. CW-1, at Tables 4-1, 4-3). The rare and endangered plant and animal species habitat criteria were described as "present – direct impact" (score of 1) for both routes (id.).

44 The record indicated that within the NSTAR ROW, Alternatives 2, 3, and 4 cross 15, 14, and 13 jurisdictional wetlands respectively (Exh. CW-1, at 4-11, 4-13, 4-16, 5-69). However, while Popponesset Spit was not included as a jurisdictional wetland area in the site scoring, the Company indicated that the wetlands associated with Popponesset Spit were considered an upland wetland area (Tr. 8, at 1013, 1064). The record indicates that all of the routes received an unweighted score of three (i.e., no direct impact) for wetlands, with the exception of Alternative 3 which received an unweighted score of one (i.e., temporary impact), due to the crossing of an intermittent stream (Exh. CW-1, at Tables 4-1, 4-3).

45 The Company stated that it did not specifically consider the potential impact of noise from an HDD on nesting and breeding habits of the piping plover (or any other species) in its site selection process, but rather assumed that the impact of noise from HDDs was the same for all route alternatives under all conditions (Tr. 8, at 1038-1040). The Company stated that it did consider whether there were sensitive receptors that could be affected by the noise from HDDs; however, it concluded that the receptors and noise level would be the same for all routes (id. at 1040).

criterion because transmission lines installed underground would have no visual impact, and overhead transmission lines would be limited to the NSTAR ROW where 115 kV structures already exist (Exh. EFSB-SS-20; Tr. 2, at 206-207). The Company argued that visual impacts were reflected in both the tree/vegetation removal criterion and the shade tree removal criterion,[46] since the visual impacts of transmission lines result mainly from the clearing of vegetation for new overhead lines (Tr. 8, at 1064-1065). The Company stated that the north side of the NSTAR ROW was not previously cleared by NSTAR, and therefore currently is wooded for much of the 8-mile distance from the Mashpee Substation to Shootflying Hill Road in Barnstable (Exh. EFSB-L-27; Tr. 2, at 203-204; Tr. 6, at 729). The Company noted that use of this length of ROW would require clearing an additional 55-60 feet width of the ROW and thereby would increase the visibility of transmission lines from some of the nearby residential areas (Exh. EFSB-L-27; Tr. 2, at 203-204; Tr. 6, at 729).

The Company noted that it based its evaluation of the potential impacts on historic resources only on that portion of each route between the landfall and the point at which it joined the NSTAR ROW (Exh. EFSB-SS-19; Tr. 2, at 195). The Company stated that NSTAR's existing ROWs have been disturbed by existing transmission facilities and on-going maintenance, and that the potential for impacts on historic resources therefore was assumed to be generally equivalent for those segments of each route that occurred on the ROW (Exh. EFSB-SS-19).

Based on the results of the route screening analysis, the Company selected the New Hampshire Avenue Route, which had the highest weighted score, as its primary route, and the

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[46] The Company indicated that these criteria each received a weight of 3 (Exh. CW-1, at Table 4-3). Unweighted scores for tree/vegetation removal were: one for Alternative 3, based on clearing in the NSTAR ROW and in an undeveloped area between the route landfall and the NSTAR ROW; three for Alternatives 2 and 4, in each case based on clearing in the NSTAR ROW; and five for Alternatives 1, 5 and 6, which each require little or no ROW clearing (id. at 4-12, Tables 4.1, 4.3). Unweighted scores for shade tree removal focused on in-street construction and ranged from one for Alternative 4, where a route segment along Main Street in Cotuit is very narrow and within a historic district, to five for all the other alternatives where the Company expected no impact (id. at 4-16, Table 4-1).

Mashpee Town Landing Route, which received the second highest weighted score, as its alternative route (Exh. CW-1, at 4-31). The Company asserted that the New Hampshire Avenue Route scored well on both land and marine installation criteria and was superior to all other routes for environmental criteria (id.).[47] It stated that the Mashpee Town Landing Route scored well on land installation criteria, scored second highest on environmental criteria, and had the lowest estimated cost of the six routes; however, it scored on the lower end for marine installation criteria, due to necessary work under and within Popponesset Bay (id.).

b. Positions of the Parties

Two intervenors – Mass Audubon and Save Popponesset Bay – argued that the Company's site selection process understates the environmental impacts associated with construction in and through the Popponesset Bay area, and that the record would not justify the approval of the Company's noticed alternative route, the Mashpee Town Landing Route. The intervenors' arguments and the Company's response are summarized below.

i. Mass Audubon

Mass Audubon stated that it participated in this proceeding to protect the environmental interests affected by the alternative route through Popponesset Beach and Popponesset Bay (Audubon Brief at 1). It argued that the Company's analysis does not justify approval of this route, and notes that because the primary route is clearly superior, there should be no need to use the alternative route (id.). However, Mass Audubon argued that, if the Siting Board were to approve the alternative route, it should impose a condition requiring Cape Wind to "negotiate with the Massachusetts Audubon Society a mutually acceptable easement for construction, placement, and use of the proposed transmission line beneath Popponesset Spit" (id. at 28).

Mass Audubon noted that the Siting Board's standard of review requires an applicant to establish "that it developed and applied a reasonable set of criteria for identifying and evaluating

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[47] However, Table 4-3 of the Petition, and Table 2, above, show that the New Hampshire Avenue and the Mashpee Town Landing Routes were scored equally for environmental criteria (Exh. CW-1, at Table 4-3).

alternative sites . . ." (citing CELCo, 12 DOMSB 305, at 327). Mass Audubon asserted that route selection standards should capture all environmental, cost and reliability features of the various alternatives, based upon a reasonable evaluation of available and relevant information (Audubon Brief at 14).

Mass Audubon further asserted that the Company's consideration of environmental impacts in the site selection process was unreasonable and incomplete (id. at 14). Mass Audubon argued that, out of a total of 26 site selection criteria, only four applied to the installation of the submarine cable, and there was only one environmental criterion for the marine portion of the cable (id.; Tr. 2, at 218-219). Mass Audubon noted that for projects with far fewer marine impacts, companies have in the past used criteria based upon wetland/saltmarsh crossings, shellfish bed/tideland crossings, crossings of ACECs, and use of preferred waterway techniques (Audubon Brief at 15 citing 1998 NEPCo Decision, 7 DOMSB 333, at 374). Mass Audubon asserted that Cape Wind inappropriately limited the number of marine criteria based on its belief that the routes were essentially equivalent at the screening level for these criteria (id.). Mass Audubon noted that the Company used numerous marine criteria to distinguish between the primary and alternative routes when comparing noticed routes; it argued that these criteria cannot therefore rationally be said to be essentially equivalent (id.).

Mass Audubon stated the following factors associated with the marine portion of the route either were not included, or were insufficiently addressed, at the screening stage of the site selection process: (1) impacts on rare and endangered marine species and habitat; (2) impacts on finfish resources and habitat; (3) benthic and shellfish impacts; (4) impacts on wetland resources; (5) presence of underwater archeological resources; (6) differences in sediment characteristics; (7) number of HDD operations, in terms of both cost and the potential marine impacts; and (8) project cost (id. at 17-26).

Specifically, Mass Audubon argued that Cape Wind included rare and endangered plant and animal species and habitats as a criterion for the land portion of the route, but not the marine portion (Audubon Brief at 17). Therefore, Mass Audubon asserted, serious impacts on birds, and the associated impact on the project's construction schedule at Popponesset Bay, were not considered in site selection (id. at 18). Mass Audubon stated that the site selection criteria do not

account for the differences in impacts on anadromous fish runs, with respect to either the number of fish runs or the presence of physical constraints upon the fishes' ability to avoid impacts (id. at 10). Mass Audubon pointed out that Popponesset Bay has two mapped anadromous fish runs that coincide with the noticed Alternative Route (Exhs. CP-1, at 5-19; EFSB-W-3(B); Audubon Brief at 9). Mass Audubon noted that sediment characteristics were not reflected in the site selection criteria, in terms of either sediment metal concentrations or grain size (Audubon Brief at 11, 12). Mass Audubon explained that sediment characteristics can affect suspension times associated with sediment displacement during marine construction, and that longer suspension times result in greater impacts upon shellfish and other benthic organisms (id. at 12 -13; Exh. EFSB-RR-43). Mass Audubon pointed to Cape Wind's data indicating that the Popponesset Bay routes have twice the benthic abundance as one or more of the alternatives and have a recreational shellfish area and two privately licensed shellfish grants, and argued that impacts to shellfishing areas would be more difficult to avoid in Popponesset Bay than along other routes (Audubon Brief at 22).

Further, Mass Audubon stated that Cape Wind did not include Popponesset Spit as a jurisdictional wetland resource (barrier beach), nor did it identify the Popponesset Bay alternatives as involving an additional coastal resource, the barrier beach (id. at 22). Mass Audubon asserted that the Company failed to account for the added marine impacts of multiple HDD operations, for the additional construction time needed for work in Popponesset Bay, or for the cost of potential seasonal restrictions on construction (id. at 25). Finally, Mass Audubon asserted that, because the cost of Alternatives 2, 3, and 4 are within 1.2% of each other, the three routes should have been scored as essentially equivalent in cost (id. at 26).

ii. Save Popponesset Bay

Save Popponesset Bay asserted that Cape Wind did not consider the status of Popponesset Spit as a barrier beach in the site selection process (SPB Brief at 2). Save Popponesset Bay argued that the Company incorrectly estimated the true costs of installing the cable along Alternative Routes 2 and 3 by ignoring the slower rates of installation within Popponesset Bay, the cost of mitigating adverse impacts, and the costs resulting from potential

time of year restrictions (id. at 6). Save Popponesset Bay noted that Popponesset Bay is a designated shellfish growing area, and that the costs of shellfish mitigation work for Alternatives 2 and 3 were not included in the analysis (id.). Save Popponesset Bay pointed out that the Company has not done any subsurface testing on Popponesset Spit to determine whether HDD will work as described (id. at 12). Save Popponesset Bay also stated that Cape Wind did not consider the possible effects of open trenching across Popponesset Spit, which the Company reserved the right to carry out as a last resort (id. at 2, 12).

iii. Company Response

Cape Wind argued that its site selection process meets the Siting Board's standard of review, in that: (1) the Company developed and applied a reasonable set of criteria to identify and evaluate potential routes for the transmission project; (2) the process ensured that Cape Wind did not overlook or eliminate any routes that are clearly superior to the primary route; and (3) Cape Wind noticed two routes that are geographically diverse (Company Reply Brief at 48). The Company suggested that Mass Audubon is arguing that the same level of information should be required for all routes considered in the route selection process; it contends that such a requirement would be impractical, unworkable, and at odds with the practices required by the Siting Board (id. at 49).

The Company argued that the Mass Audubon and Save Popponesset Bay complaints "lie with the reasonable exercise of discretion and judgment by Cape Wind's experts" in the selection of the noticed alternative route (id. at 50-51). The Company defended certain rankings challenged by Mass Audubon or Save Popponesset Bay, arguing, for example, that it was appropriate to consider Lewis Bay and Popponesset Bay as essentially similar with regard to metals in sediments, since the level of metals in both bays were below the ranges in which adverse biological impacts are observed (id.). The Company argued that the appropriate question is not whether other parties agree with its rankings, but whether its experts exercised reasonable judgment in ranking the routes (id. at 52).

The Company also disputed Mass Audubon and Save Popponesset Bay arguments regarding descriptions of its site selection process, suggesting that these parties confused:

(1) the siting criteria, used to identify the six routes; (2) the screening criteria, used to evaluate the six routes and select the primary and alternative routes; and (3) the process of comparing the impacts of the primary and noticed alternative routes (id. at 52). The Company stated that it used 14 siting criteria, of which seven focused on considerations for the submarine cable route and landfall, and 26 screening criteria, of which six involved specific marine considerations (Company Reply Brief at 54). The Company therefore concluded that, overall, it applied 13 marine-based criteria in its route selection process, not just four as stated by Mass Audubon (id.).

c. Analysis

To identify route options for further evaluation, the Company first identified an area that would encompass all viable routing options given the limitations imposed by the location of the ESP and the Barnstable Switching Station. The Company used 14 site identification criteria, which it referred to as siting criteria, to identify six potential routes within this area. It then used 26 screening criteria, including installation, environmental, cost and reliability factors, to evaluate these six routing alternatives. The Company weighted the importance of each criterion as low, medium and high, and for each of the identified alternatives, multiplied the unweighted assigned scores for the 26 criteria by the weights to produce weighted scores. The Company used the weighted scores to balance the environmental impacts, technical issues, costs and reliability of the six routing alternatives.

In past decisions, the Siting Board has found various types of criteria to be appropriate for identifying and evaluating route options for transmission lines and related facilities. These types of criteria include natural resource issues, land use issues, community impact issues, cost and reliability. CELCo Decision, 12 DOMSB 305, at 331; 1998 NEPCo Decision, 7 DOMSB 333, at 381; New England Power Company, 4 DOMSB 109, at 167 (1995) ("1995 NEPCo Decision"). The Siting Board also has found the specific design of scoring and weighting methods for chosen criteria to be an important part of an appropriate site selection process, and in some cases has identified the appropriate allocation of weights among the broad categories of environmental

concerns, cost and reliability.[48] CELCo Decision, 12 DOMSB 305, at 331; 1997 BECo Decision, 6 DOMSB 208, at 285; Boston Edison Company, 19 DOMSC 1, at 38-42 (1989).

Here, the Company developed 14 siting criteria, which it used to identify potential routes, and 26 screening criteria, which it used to evaluate the routing options. These criteria generally encompass the types of criteria that the Siting Board previously has found to be acceptable. The Company also developed a quantitative system for ranking routes based on compilation of weighted scores across all criteria; this is a type of evaluation approach the Siting Board previously has found to be acceptable.

However, questions have been raised about whether certain categories of environmental criteria, including marine impacts from underwater cable installation and visual impacts of overhead construction, were under-represented in the Company's site selection process. As a related matter, the Company also has been asked about the merits of other possible routes, which might have been preferred if marine and visual impacts had been given greater weight. The Siting Board addresses these questions below.

As an initial matter, the Siting Board notes that it requires applicants to analyze the primary route in greater detail than the alternative route, and to analyze both the primary and alternative routes in far greater detail than the routes which are discarded as a result of the site selection process. Thus, a disparity in the level of detail available in the record on the different routes does not indicate a flaw in the site selection process. However, the site selection analysis must be detailed enough to capture any significant differences between the route options, and the criteria used to evaluate the various route options must be carefully selected and weighted to ensure that an unintended bias does not lead the applicant to overlook or eliminate superior routes.

Mass Audubon and Save Popponesset Bay argue that the 26 screening criteria did not sufficiently address the environmental impacts associated with the marine portion of the routes;

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[48] For example, the CELCo Decision, 12 DOMSB 305, at 331, the Company used weighted scores to balance the community/environmental impacts, technical issues and costs, and the Siting Board stated that the allocation of approximately half of the overall weight to community/ environmental and half to technical/cost was reasonable.

they therefore conclude that the development of the screening criteria was unreasonable and incomplete. They assert that the following specific areas should have been included or addressed in more depth: rare and endangered marine species and habitat; finfish resources and habitat; benthic and shellfish habitat; wetland resources; archeological resources; sediment characteristics; costs and impacts of multiple HDD operations; and costs. The Company counters that the routes were deemed to be essentially equivalent for certain of these criteria, and that other criteria were appropriately analyzed. In addition, it notes that a total of 13 marine-related criteria were used in the Company's analysis, when both the siting and screening criteria are taken into account.

Regarding the Company's argument that a total of 13 marine-related criteria were applied, the Siting Board notes that it is not appropriate to point to a combination of the siting and screening criteria, as they each address one iteration of the siting process, and therefore should be assessed separately. Mass Audubon and Save Popponesset Bay have not challenged the Company's choice of siting criteria; instead, their critique focuses on the screening criteria used to evaluate, score and rank the six routes. In its quantitative screening analysis, the Company used four marine-based criteria – marine transmission line length, number of marine HDDs, navigational impacts, and eelgrass – which together accounted for 21% of the total weight for screening criteria.[49] The Company asserted that it qualitatively considered two other marine-based criteria – fish runs and shellfish – but did not incorporate them into the quantitative analysis, as it considered the impacts to be equivalent along all routes. The Siting Board notes that the inclusion of these two criteria in the quantitative analysis would have increased the weight given to marine criteria, but not altered the Company-generated ranking of the six routes, given the Company's qualitative opinion of the two criteria. The Siting Board urges future applicants to include all important criteria in any quantitative ranking of potential routes, in order to eliminate confusion about the decision-making process.

The record indicates that the Company considered, in greater or lesser detail, six marine-

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[49] The total weight of all the screening criteria is 52, of which the discrete marine transmission criteria account for 21%, compared to 73% for land-based criteria, 4% for cost, and 2% for reliability.

related criteria in ranking the six routes, although only four were formally quantified. Of these four, only one (eelgrass) was classified as "environmental," although two others – HDD and navigational impacts – represent environmental criteria for which project impacts appeared significant and necessary mitigation potentially costly. However, even assuming that the Company were correct in treating the impacts of fish runs and shellfish as equivalent along all routes, the Company's analysis appears to be missing certain criteria that would help distinguish the level of environmental impacts and construction difficulties associated with the different landfalls. Specifically, the review of endangered species appears to have been limited to species along the land portion of the route, leading the Company to overlook impacts to the piping plover; and there was no recognition of the status of Popponesset Spit as a barrier beach. In short, the Company's screening criteria addressed the costs and impacts of on-land construction in greater detail than the costs and impacts of construction under water or at the landfall; this disparity may have led the Company to overlook screening-level differences between routes using the Lewis Bay and Popponesset Bay landfalls.

With respect to visual impacts, the record shows that three routes, including the Mashpee Town Landing Alternative, would require extensive tree clearing along an approximately eight-mile segment of the NSTAR ROW through a largely built-up area, significantly increasing the visibility of existing and any new transmission lines that occupy the ROW. The Company maintained that the overhead segment of each route would be located where there are existing overhead transmission facilities, and that the tree/vegetation removal criterion was a suitable proxy for visual impacts along the NSTAR ROW. Given that the visual impacts of overhead construction would be a long-term issue affecting half or more of the on-land portion of the three routes, it is unclear that the issue was adequately represented by one criterion[50] encompassing a range of issues of which visual impacts was one, and which accounted for only 1 of 13 environmental and 26 total criteria, in the screening analysis. Further, by relying on tree removal as the sole indicator of visual impacts along the NSTAR ROW, the Company failed to take into account other factors relating to visual impact sensitivity, such as the residential density of

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50 As indicated in n.45, above, the shade tree criterion was applied to the in-street portion of the route, not the NSTAR ROW.

affected areas, potential visibility from different directions, and potential visibility of the new substation facilities. In recent Siting Board cases concerning transmission lines with overhead construction options, two companies included visual impacts specifically, and several companies included residential density and other visual sensitivity indicators, as discrete environmental/land use criteria for selecting routes. ANP Blackstone Energy Company, 8 DOMSB 1, at 216-217 (1999) ("ANP Blackstone"); 1997 BECo Decision, 6 DOMSB at 208, 278; New England Power Company, 5 DOMSB 1, at 44-47 (1996); 1995 NEPCo Decision, 4 DOMSB 109, at 163-166.

Overall, the record indicates that the Company's choice of screening criteria may not have captured fully (1) the screening-level differences between the costs and impacts of the Lewis Bay and Popponesset Bay landfalls, and (2) the potential visual impacts associated with overhead lines. The Siting Board notes that the Company's primary route uses the lower-impact Lewis Bay landfall, and has no overhead component. The parties do not claim, and the record does not indicate, that the Company erred in selecting the primary route as the first choice among its identified routes. Similarly, the Company's consideration of additional possible routes identified by staff provided no indication that the Company may have overlooked a route that would be superior to the primary route. Accordingly, the Siting Board finds that the Company has developed and applied a reasonable set of criteria for identifying and evaluating alternative routes in a manner which ensures that it has not overlooked or eliminated any routes which are clearly superior to the proposed project.

However, the Siting Board notes that the issues raised about the Company's site selection process were significant to the Company's ranking of the Mashpee Town Landing Route, which resulted in its selection as the noticed alternative route. The identified shortcomings in the site selection process call into question the merit of the alternative route as a fallback to the primary route. The Siting Board notes that, if the Company were to abandon its primary route and seek approval of the alternative route, it might have difficulty demonstrating that it had not overlooked a clearly superior route without significant further analysis.

3. Geographic Diversity

The Company stated that its site selection process resulted in a spectrum of alternative routes that reflects an appropriate degree of geographical diversity (Exh. CW-1, at 4-32). The Company stated that the primary and alternative routes are geographically diverse, noting that the primary route makes landfall in Yarmouth and traverses Barnstable, while the alternative route makes landfall nearly 10 miles away in Mashpee (Company Reply Brief at 48).

The Company considered six geographically diverse transmission line routes to connect the wind farm with the Barnstable Switching Station. Consequently, the Siting Board finds that the Company has identified a range of practical route alternatives with some measure of geographic diversity.

4. Conclusions on the Site Selection Process

The Siting Board has found that the Company has developed and applied a reasonable set of criteria for identifying and evaluating alternative routes in a manner which ensures that it has not overlooked or eliminated any routes which are clearly superior to the proposed project. In addition, the Siting Board has found 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.

B. Description of the Primary and Alternative Routes

The proposed project along the primary route would be an approximately 18.1-mile transmission line connecting at one end to the ESP of the wind farm and at the other end to the Barnstable Switching Station, located off Mary Dunn Road (Exhs. CW-1, at 1-1; EFSB-RR-84). The primary route would begin in Nantucket Sound, in the area of Horseshoe Shoal, pass to the west of underwater ledges known as Bishop and Clerks, proceed northerly across WSW Ledge, turn northeast at a point west of Great Island, follow near the east edge of the Hyannis ship channel past the Egg Island sandbar, then turn east-northeast across Lewis Bay to a landfall at New Hampshire Avenue in Yarmouth (Exhs. CW-1, at 1-11; EFSB-5(b)).

At the landfall, the primary route would connect with a 115 kV transmission line at an underground transition vault located on New Hampshire Avenue approximately 10 feet south of Shore Road; from there it would proceed in a single underground in-street ductbank for approximately 4 miles to the existing NSTAR ROW at Willow Street in Yarmouth (Exhs. CW-1, at 1-4; CO-3; EFSB-RR-14; Tr. 6, at 755).[51] The in-street route would follow New Hampshire Avenue northward, merging with Berry Avenue, continuing across Route 28 and north on Higgins Crowell Road (Exh. CW-1, at 1-12). The route then would continue north on Willow Street, passing under Route 6, to an intersection with the existing NSTAR 115 kV line north of Summer Street (id.). The route would then proceed underground along NSTAR's ROW, at a depth of 32 inches for approximately 1.9 miles to the Barnstable Switching Station, crossing again under Route 6 (id. at 1-10 and 1-12).[52]

The alternative route would run approximately 24.2 miles from the ESP to the Barnstable Switching Station, with an intermediate connection point at NSTAR's Mashpee Substation (Exh. CW-1, at 1-12 to 1-13). The alternative route would begin in Horseshoe Shoal, traveling in Nantucket Sound to Popponesset Spit at the entrance of Popponesset Bay (id. at 1-12, 4-8). The alternative route would cross under Popponesset Spit via an approximately 1000-foot HDD to avoid impacts to the barrier beach (id. at 4-8; Exh. MA-32). The alternative route would then continue through Popponesset Bay to a landfall at the Mashpee Town Landing (Exh. CW-1, at 1-13).

The Company stated that the alternative route would make landfall via a second HDD, connect with a 115 kV transmission line in an underground transition vault, and then proceed in a single underground in-street ductbank for approximately 1.9 miles to the existing NSTAR ROW off Orchard Road (id. at 1-4). From the transition vault, the alternative route would follow Mashpee Neck Road north to Orchard Road, then turn onto a proposed street located off Orchard Road and follow it to NSTAR's Mashpee Substation, a 115 kV substation located on an

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51 The ductbank would be approximately 5 feet, 8 inches wide by 2 feet deep and would be buried approximately 64 inches in-street (Exh. CW-1, at 1-10).

52 The 1.9-mile portion of the NSTAR ROW begins in Yarmouth and enters Barnstable approximately 1,000 feet in from Willow Road (Exh. EFSB-2, Att. 2-e).

NSTAR-owned 10.6-acre parcel at the intersection of Orchard Road and Route 28 (id. at 4-10). At the Mashpee Substation, a new riser station would be built in an approximately 50 by 100 foot area within the site (id.).[53] The alternative route would then travel easterly for 12.3 miles overhead along the NSTAR ROW from the Mashpee Substation to the Barnstable Switching Station, crossing numerous roads including Main Street, Route 28, Route 149, Osterville-West Barnstable Road, Old Stage Road, Shootflying Hill Road, Route 132 and Phinney's Lane, and would terminate at the Barnstable Switching Station off Mary Dunn Road (id.; Exh. EFSB-L-28).

C. Environmental Impacts, Cost and Reliability of the Proposed and Alternative Facilities

1. Standard of Review

In implementing its statutory mandate to ensure a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost, 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 site for the facility is superior to the noticed alternatives on the basis of balancing cost, environmental impact, and reliability of supply. CELCo Decision, 12 DOMSB 305, at 334; MMWEC Decision, 12 DOMSB 1, at 127; 1997 BECo Decision, 6 DOMSB 208, at 287.

An assessment of all impacts of a proposed facility is necessary to determine whether an appropriate balance is achieved both among conflicting environmental concerns as well as among environmental impacts, cost, and reliability. A facility which achieves that appropriate balance thereby meets the Siting Board's statutory requirement to minimize environmental impacts at the lowest possible cost. CELCo Decision, 12 DOMSB 305, at 335; MMWEC Decision, 12 DOMSB 1, at 128; 1997 BECo Decision, 6 DOMSB 208, at 287.

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[53] The riser station would include a new ring bus, consisting of five new circuit breakers, providing connections to NSTAR's existing Line 115 (Exh. CW-1, at 1-13 and 1-14).

The Siting Board recognizes that an evaluation of the environmental, cost and reliability trade-offs associated with a particular proposal must be clearly described and consistently applied from one case to the next. Therefore, in order to determine if a petitioner has achieved the proper balance among various environmental impacts and among environmental impacts, cost and reliability, the Siting Board must first determine if 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 can determine whether environmental impacts would be minimized. Similarly, the Siting Board must find that the petitioner has provided sufficient cost and reliability information in order to determine if the appropriate balance among environmental impacts, cost, and reliability would be achieved. CELCo Decision, 12 DOMSB 305, at 336; MMWEC Decision, 12 DOMSB 1, at 128; Commonwealth Electric Company, 5 DOMSB 273, at 337 (1997) ("ComElec Decision").

Accordingly, in the sections below, the Siting Board examines the environmental impacts, reliability, and cost of the proposed facilities along Cape Wind's and NSTAR's primary and alternative routes to determine: (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. In this examination, the Siting Board compares the primary and alternative 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.

2. Environmental Impacts

a. Marine Construction Impacts

In this section, the Siting Board reviews the environmental impacts associated with installing the proposed underwater transmission lines seaward of the seawall at New Hampshire Avenue, for the primary route, and seaward of the landfall in Mashpee, for the alternative route.

i. Construction Techniques

The Company stated that it would use jet-plowing as the primary means of installation for the submarine transmission cables (Exh. EFSB-C-3). The Company described jet-plowing as the installation and burial of submarine cables using a jet plow blade mounted on two skids that can serve as pontoons by adjustment of their buoyancy (id.; Tr. 7, at 940). The jet plow has no propulsion of its own, but is towed along the seabed by a cable-laying barge, generally within 50 feet of the designated centerline (Exh. EFSB-C-3; Tr. 7, at 913-914). In deeper water, the cable-laying barge progresses forward by winching itself toward anchors placed ahead of it by anchor-handling tugs (Exh. MA-10; Tr. 7, at 943-944). The Company stated that the blade of the jet plow is fitted with nozzles that release a total of 2500 to 9000 gallons of seawater per minute at velocities of 143 to 235 feet per second (Exh. EFSB-RR-41). As the jet plow is towed along the seabed, the blade cuts a continuous trench by fluidizing the sediments in the trench to a predetermined depth (Exh. EFSB-C-3; Tr. 7, at 936-937). The Company stated that there are no indications of shallow bedrock beneath the seafloor sediments, and that the entire route is suitable for jet-plowing (Exhs. EFSB-W-11; CW-CJN/SBW-2-R at 13; Tr. 8, at 1066-76).[54] The Company indicated that, as the trench is formed by the jet plow, cable is fed from a turntable on the barge and settles into the trench under its own weight (Exh. EFSB-C-3). Depth of burial is controlled by the depth of the jetting blade (Exh. MA-6). The Company stated that the sediment temporarily suspended by the pressurized seawater then resettles, burying the cable to depth (id.; Exh. EFSB-RR-44).

The Company indicated that near the shore, it would use anchors and spuds to station the cable-laying barge and would use either a smaller jet plow or the same jet plow tended by a smaller barge to carry the hydraulic pumps (Exh. MA-10; Tr. 7, at 943-944, 952). The Company stated that the construction equipment would be diesel powered and that it expected no refueling of vessels within the job site (Exhs. MA-40; MA-42; Tr. 2, at 318). The Company stated that the tugboats that would be used are standard for the region (Exh. MA-42).

The Company explained that the jet-plowing process would be conducted twice, to create

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[54] The Company stated that the existing cable from Harwich to Nantucket was installed by jet plow to the same depth as the proposed transmission line (Exh. EFSB-W-11).

two trenches, one for each cable circuit (Exh. MA-6). The Company stated that the cables would be buried at a depth of 6 to 8 feet below the seabed, and that the two trenches would be spaced approximately 20 feet apart (Exhs. CW-1, at 1-8, Fig. 7; MA-4).

The Company stated that it would use hand jet-plowing and direct trenching to install cable in inshore areas of the primary route (Tr. 7, at 882-884). Direct trenching would be used for the first 40 feet from the seawall, and hand-jetting would be used the next 50 feet (Exhs. EFSB-RR-38; EFSB-RR-39). Hand jets fluidize sediments to allow the cable to descend to a depth within the seabottom, like ordinary jet-plowing, but the jets are hand carried (Tr. 7, at 951). Also on the primary route, the Company stated that installation of the cables at the landfall would require the excavation of an area at the foot of the existing seawall, construction of a temporary cofferdam, and replacement of the seawall (Exh. CW-CO-3; Tr. 17, at 2218-19).

On the alternative route, the Company specified the use of HDDs at two locations – at the landfall, and underneath Popponesset Spit. The Company indicated that at each HDD location there would be four separate holes drilled from the entrance point, each involving boring a pilot hole, reaming out the pilot hole, pulling 12-inch diameter plastic conduit back through the borehole, and then pulling transmission cable through the conduit (Exh. CW-1, at 1-8; Tr. 2, at 775; Tr. 7, at 866-869). Before the conduit is installed, the hole would be maintained by keeping it pressurized with bentonite (Tr. 7, at 869). The Company explained it would excavate a pit at the exit point, prior to boring the HDDs, in order to receive the borehole beneath the seabottom, and to transition to jet-plowing (Exh. CW-1, at 1-8).

The Company stated that the HDD under Popponesset Spit would consist of four 1000-foot long boreholes extending approximately 60 feet below the mean low water elevation (Exh. EFSB-C-2(B), Att.; Tr. 20, at 2742). The Company stated that the Popponesset Spit boreholes would be staged from barges positioned in sub-tidal areas off the spit, with the entrance point approximately 300 feet into Nantucket Sound and the exit point approximately 300 feet into Popponesset Bay (Exhs. EFSB-C-1; EFSB-W-16; SPB-3; MA-28; Tr. 2, at 261; Tr. 7, at 860; Tr. 8, at 1026). A 45-foot by 63-foot area around the entrance point would be isolated by a cofferdam (Exh. EFSB-RR-37). The Company stated that if the Popponesset Spit HDDs were to prove unsuccessful, another site on the spit would be tried (Exh. EFSB-C-5). The

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

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

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

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

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

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

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

ii. Direct Impacts (Sand and Sediment Disturbance)

(a) Primary Route

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

63 The preliminary CEMP is dated April 25, 2003.

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

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

(b) Alternative Route

(i) Company

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

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

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

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

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

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

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

(ii) Intervenors

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

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

at 1700).

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

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

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

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

(c) Analysis

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

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

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

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

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

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

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

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

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

iii. Eelgrass and Other Submerged Aquatic Vegetation

(a) Company

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

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

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

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

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

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

(b) Intervenors

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

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

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

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

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

(c) Analysis

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

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

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

iv. Shellfish

(a) Primary Route

(i) Company

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

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

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

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

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

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

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

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

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

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

(ii) Intervenors

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

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

(b) Alternative Route

(i) Company

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

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

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

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

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

(ii) Intervenors

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

(c) Analysis

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

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

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

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

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

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

v. Fish

(a) Primary Route

(i) Company

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

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72 16 USC §§ 1801 et seq.

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

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

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

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

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

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

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

(ii) Intervenors

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

(b) Alternative Route

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

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

(c) Analysis

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

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

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

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

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

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

vi. Protected Marine Species

(a) Description

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

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

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

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

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

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

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

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

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

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

(b) Analysis

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

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

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

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

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

vii. Protected Coastal Shorebirds

(a) Primary Route

(i) Company

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

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

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

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

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

of the route (id.).[82]

(ii) Intervenors

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

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

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

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

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

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

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

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

(b) Alternative Route

(i) Company

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

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

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

(ii) Intervenors

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

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

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

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

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

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

(c) Analysis

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

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

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

(continued...)

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

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

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

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

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

viii. Marine Archeology

(a) Description

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

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

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

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

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

(b) Analysis

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

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

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

ix. Navigation

(a) Primary Route

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

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

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

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

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

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

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

(b) Alternative Route

(i) Company

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

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

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

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

(ii) Intervenors

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

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

(c) Analysis

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

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

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

minimized.

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

x. Conclusions on Marine Construction Impacts

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

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

b. Land Construction Impacts

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

i. Wetlands and Water Resources

(a) Primary Route

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

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

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

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

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

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

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

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

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

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

(b) Alternative Route

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

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

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

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

(c) Analysis

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

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

ii. Land Resources

(a) Primary Route

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

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

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

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

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

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

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

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

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

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

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

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

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

(b) Alternative Route

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

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

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

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

(c) Analysis

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

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

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

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

iii. Traffic

(a) Primary Route

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

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

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

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

(b) Alternative Route

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

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

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

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

(c) Analysis

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

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

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

iv. Noise

(a) Primary Route

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

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

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

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

(b) Alternative Route

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

(c) Analysis

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

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

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

v. Conclusion on Land Construction Impacts

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

c. Permanent Impacts

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

i. Land Use and Visual Impacts

(a) Primary Route

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

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

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

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

(b) Alternative Route

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

RR-26).

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

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

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

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

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

(c) Analysis

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

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

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

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

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

ii. Electric and Magnetic Fields

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

(a) Primary Route

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(b) Alternative Route

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(c) Analysis

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

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

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

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

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

iii. Conclusions on Permanent Impacts

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

with respect to permanent construction impacts.

d. Alternative Construction Methods – HDD

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

i. Land Use Impacts

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

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

ii. Construction Traffic

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

iii. Construction Noise

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

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

and pull back the transmission line would be located in a transition vault on New Hampshire Avenue, adjacent to the Englewood Beach recreation area (Exhs. CW-1, at 1-8; EFSB-L-31).

The Company estimated that the L_{max} for the HDD would be 78 dBA at 50 feet,[109] and that the average sound levels ("L_{eq}") would be approximately 73 dBA at 50 feet, and 61 to 67 dBA at 200 feet (Exh. EFSB-L-31). The Company estimated that, absent mitigation, L_{max} noise levels at the closest residence to the northwest would be 79 dBA, and L_{max} noise levels at the closest residence to the southwest would be 77 dBA (Exh. EFSB-RR-29).[110]

The Company stated that, if it were to use HDD at the New Hampshire Avenue landfall, it would use good engineering practices, such as sound barriers, to mitigate noise impacts in a reasonable manner (Exh. EFSB-RR-31). The Company stated that a typical sound barrier, such as those used in highway sound attenuation, is solid wood and 10 feet high (id.).[111] It estimated that the use of sound barriers could reduce L_{max} noise levels from 79 dBA to 74 dBA at the nearest residence to the northwest, and from 77 dBA to 69 dBA at the nearest residence to the southwest (Exh. EFSB-RR-29).

iv. Analysis

In its initial filings in this proceeding, Cape Wind indicated that it intended to use horizontal directional drilling at the New Hampshire Avenue landfall in order to minimize impacts to coastal wetlands in the near-shore area. Since that time, the Company has concluded that any reduction in impacts to coastal wetlands would be outweighed by significant traffic and noise impacts on New Hampshire Avenue residents. The Siting Board agrees with this conclusion. Most of the wetland impacts that would result from jet plowing at the New

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109 The Company noted that the sound levels for the HDD rig are comparable to those for the excavators and backhoes (80 to 84 dBA at 50 feet) (Exhs. EFSB-L-31; EFSB-SS-22-S, Att. at 5-124).

110 The Company noted that noise impacts at the residences were modeled for a second floor window (Exh. EFSB-RR-29).

111 The Company stated that the average cost of materials and installation for a sound barrier is $140 per linear foot for a 10-foot high wall; $185 per linear foot for a 12-foot high wall; and $235 per linear foot for a 14-foot high wall (Exh. EFSB-RR-54).

Hampshire Avenue landfall site, described in Section III.C.2.a, above, would be temporary; moreover, the coastal bank that would be left undisturbed if HDD techniques were used is a man-made concrete wall with limited ecological value. The noise and traffic impacts on New Hampshire Avenue residents, on the other hand, would be significant.

The record indicates that use of HDD at the New Hampshire Avenue landfall would result in the four-to-six week closure of a portion of New Hampshire Avenue that is more heavily traveled than the smaller, southern portion that would be closed for construction of the transition vault using the jet plow method. Further, a recreation area and two residences front onto the transition vault location; direct access to these properties would be blocked or limited during construction.

In addition, for four to six weeks, residents would be affected by continuous nighttime construction noise, based on an expected 20-to-24 hour construction day, at a noise level comparable to that generated by a backhoe or excavator. The Company has estimated that the use of a 10-foot high noise barrier would reduce expected noise levels by 5 dBA to 8 dBA, depending on the distance from the transition vault. However, even with the use of the sound barriers, the resultant L_{max} noise levels would range from 69 dBA to 74 dBA at the nearest residences for nighttime construction.

Given the significant disruption that would be associated with use of HDD at the New Hampshire Avenue landfall, the Siting Board cannot find, on this record, that construction traffic and noise impacts would be minimized along the primary route if HDD were used to make landfall. Should the Company choose, either for technological reasons or because of restrictions imposed by another agency, to pursue use of HDD at the New Hampshire Avenue landfall, additional proceedings before the Siting Board would be required to determine whether and how that approach could be undertaken consistent with minimizing noise and traffic impacts. Specifically, to allow use of HDD to achieve landfall at New Hampshire Avenue, the Siting Board would require the Company to make a project change filing, providing: (1) an analysis of both existing and predicted construction period L_{eq}, L_{90} and L_{max} noise levels at affected residences, and proposed and possible mitigation to minimize residential noise impacts; and (2) an analysis of proposed and possible mitigation to minimize traffic impacts on residents,

particularly for those homes in close proximity to the transition vault. Necessary mitigation might include: (1) for noise, the use of noise barriers of different heights and widths or temporary enclosures surrounding the HDD operations, and limitations on hours of nighttime construction; and (2) for traffic, development of an ingress and egress plan, including detailed notification procedures that would be applied in advance of the construction period, and specific measures addressing the residences located on New Hampshire Avenue between Shore Road and Berry Avenue.

e. Conclusions on Environmental Impacts

In Sections III.C.2.a, III.C.2.b, and III.C.2.c, above, the Siting Board has reviewed the record evidence regarding the marine construction impacts, the land-based construction impacts, and the permanent impacts of the proposed transmission lines, and has imposed mitigation where necessary to minimize the environmental impacts of the proposed transmission lines. Based on its review of the record, the Siting Board finds that Cape Wind has provided sufficient information regarding environmental impacts and potential mitigation measures to allow us to determine that it has achieved the proper balance among environmental impacts.

In Section III.C.2.a, above, the Siting Board found that, with implementation of the stated conditions, the marine construction impacts of the proposed transmission lines along the primary route would be minimized, and that the primary route would be preferable to the alternative route with respect to marine construction impacts. In Section III.C.2.b, above, the Siting Board found that, with implementation of the stated condition, the land construction impacts of the proposed transmission lines along the primary route would be minimized, and that the primary route would be preferable to the alternative route with respect to land construction impacts. In Section III.C.2.c, above, the Siting Board found that the permanent impacts of the proposed transmission lines along the primary route would be minimized, and that the primary route would be preferable to the alternative route with respect to permanent impacts. Consequently, the Siting Board finds that the environmental impacts of the proposed transmission lines along the primary route would be minimized, and that the primary route would be preferable to the alternative route with respect to environmental impacts.

3. Cost

a. Description

The Company initially estimated the cost of the proposed transmission lines along the primary route to be $79,510,000, and the cost of the proposed transmission lines along the alternative route to be $68,610,000 (Exh. CW-1, at 5-67 and Table 4-4). The Company stated that these cost estimates would be subject to refinement as plans for the proposed project are developed (Exh. CW-1, at 5-67). The Company attributed the higher cost of the primary route primarily to the longer length of in-street cable required for that route (id.). However, the Company stated that it considered the costs of the proposed project along the primary and alternative routes to be comparable (id.).

During the proceeding, the primary route evolved in a number of ways that could affect the cost of construction. First, the initial cost estimates assumed an 11-mile submarine cable and the use of HDD at the New Hampshire Avenue Landfall (id. at Table 3-1). As discussed above, the anticipated length of the submarine cable is now approximately 12.2 miles, and the Company intends to use jet-plowing, rather than HDD, at the landfall. The Company asserted that the increased length of the submarine cable would increase costs slightly, but did not provide a revised cost estimate (Exh. EFSB-RR-84).[112] The Company stated that the use of jet plowing rather than HDD at the landfall would reduce costs by approximately $460,000 (Exhs. EFSB-RR-55; EFSB-RR-56).[113]

Second, the initial cost estimates for both the primary and alternative routes assumed the use of two switched shunt reactors, at a cost of $600,000 each (Exh. CW-1, at Table 4-4; Tr. 11, at 1497-1500). However, NSTAR indicated that the proposed transmission line, if built along the primary route, may need additional reactive power compensation in the form of more switched shunt reactors; additional switched shunt reactors would not be required for the

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[112] The Company has assumed a cost of $3.7 million per mile for the submarine cable (Exh. CW-1, at 3-4, Tables 3-1, 4-4).

[113] In addition, as discussed in Section III.C.2.b, above, the cost of installing a sound barrier at the New Hampshire Avenue landfall in conjunction with the use of HDD could range from $14,000 to $23,500, assuming a 100-foot long wall (Exh. EFSB-RR-54).

alternative route (Tr. 11, at 1495-1500).

The Company stated that it likely would use a jack-up barge, rather than the cable-laying vessel, for cable installation inside Popponesset Bay on the alternative route, due to the shallow and narrow characteristics of Popponesset Bay (Exh. CW-1, at 5-51). The Company stated that the cost estimates for the routes included a built-in cost for specific installation and design difficulties that would affect the cost of installing the transmission lines (id. at 4-28).[114]

Save Popponesset Bay asserted that cable installation through Popponesset Spit and Popponesset Bay would be difficult and expensive (SPB Brief at 3). Specifically, Save Popponesset Bay argued that the shallow waters of Popponesset Bay would make installation difficult and costly, noting that the Company had recognized that installation would be challenging due to the size of the cable-laying vessel and the size and depth of Popponesset Bay (SPB Brief at 4, citing Exh. CW-1, at 4-11, 4-13, 5-51). Save Popponesset Bay asserted that the Company's cost estimates ignored the higher construction costs that would result from the slower rate of installation, mitigation of adverse impacts, and time-of-year restrictions (SPB Brief at 6). Specifically, Save Popponesset Bay pointed to the use of a standard unit price per foot for installation on both routes, which it argued led to an underestimate of the costs associated with installation in Popponesset Bay (id.). Save Popponesset Bay stated that it is not unreasonable to assume that, due to the difficulty of installation in Popponesset Bay, the length of cable installed per day would be half that estimated for the overall route, potentially doubling the cost of cable installation in Popponesset Bay (Exh. SPB-PJW at 4).[115]

In response, the Company stated that it has factored in the appropriate cost estimates for the alternative route (Tr. 10, at 1454-1457). However, the Company acknowledged that unanticipated time-of-year restrictions would add cost to the proposed project (id. at 1454).

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[114] Table 4-4 of the Petition lists the following for marine installation costs for the primary and alternative routes: (1) quantity of cable at $3.7 million per mile (landfall HDD included); (2) one 1000-foot HDD for the alternative route at $1.5 million (Exh. CW-1, at Table 4-4).

[115] Based on the estimates of the marine portion of the transmission lines along the alternative route, the increase in cost would be on the order of $5 to $6 million dollars (Exh. CW-1, at Table 4-4; Tr. 10, at 1473).

b. Analysis

The Company's initial cost estimates indicate that the cost of constructing the proposed transmission project along the primary route is approximately $11 million higher than the cost of construction along the alternative route. However, the initial estimates of project costs along the primary route appear low in light of later testimony. Specifically, the expected length of the marine portion of the primary route has increased by approximately 1.2 miles from original estimates, likely resulting in additional costs of approximately $4.4 million. Further, the possible need for a third switched shunt reactor could increase the cost of the proposed project along the primary route by an additional $600,000. Partially offsetting these increases, the decision to use jet plowing rather than HDD at the New Hampshire Avenue Landfall should reduce construction costs along the primary route by $460,000. Overall, the cost of the proposed project along the primary route is likely to be approximately $4.5 million higher than the original estimate, or approximately $15.5 million more than the estimated cost of the proposed project along the alternative route.

The Siting Board notes that it is quite likely that the construction cost estimates provided by the Company for the alternative route, through Popponesset Bay and underneath Popponesset Spit, have been underestimated. In particular, the record suggests that the potential difficulties associated with construction through Popponesset Bay and under Popponesset Spit are significantly greater than those likely to be encountered along the marine portion of the primary route. For example, the burial of cables in shallow water between the two HDDs adds complexity to the construction process, and may extend the construction period for that portion of the project beyond what was originally anticipated. Moreover, as discussed in Section III.C.a., above, there is the possibility of seasonal restrictions to protect the piping plover, terns, fish and shellfish during vulnerable time periods. Aside from the cost of the additional HDD, the Company's cost estimates do not reflect such challenges.

Although the increased costs associated with the construction of the proposed project along the alternative route are not known at this juncture, and may be significant, it is not likely that they would approach the approximately $15.5 million difference between the current cost

estimates for the two routes. Accordingly, the Siting Board finds that the alternative route is slightly preferable to the primary route with respect to cost.

4. Reliability

a. Description

The Company noted that the primary and alternative routes both provide an interconnection with the Barnstable Switching Station, the main bulk power substation on Cape Cod (Exh. CW-1, at 5-68). However, the Company asserted that the primary route has a reliability advantage over the alternative route, both because it would be entirely underground and because its initial point of interconnection is closer to the Barnstable Switching Station (id.). Specifically, the Company noted that the primary route interconnects directly with the Barnstable Switching Station, while the alternative route interconnects on the Mashpee ROW and then continues for a considerable distance before ultimately delivering power to the Barnstable Switching Station (Tr. 11, at 1515-1517).

The Company asserted that the risk of outages is significantly less on an underground transmission line than on an overhead line, because underground lines are less exposed to the elements (Tr. 11, at 1490). However, the Company noted that when a failure does occur on an underground line, it is more difficult to locate the source of the failure and it therefore may take longer to correct the problem (id. at 1491). Overall, the Company suggested that the primary route, which is entirely underground, is less susceptible to interruptions and thus more reliable than the alternative route (id. at 1506).

The Company noted that the primary route has more miles of underground cable than the alternative route, and thus would supply a higher level of reactive power and require a greater number of switched shunt reactors to compensate for the additional reactive power (id. at 1495). However, the Company stated that, after voltage compensation, the reliability of the system would be the same regardless of whether the primary or alternative route is selected (id. at 1502).

The Company asserted that the reliability of the marine portions of the primary and alternative routes would be essentially the same (Tr. 11, at 1507). Specifically the Company noted that the design, trenching, and installation methodologies for the cable would be the same

for either route, and that the same standard repair method would be used along either route (id. at 1507-1508).

As discussed in Section III.C.2.a.ii(b), above, Save Popponesset Bay asserted that Popponesset Spit is susceptible to breaching during severe storms and that a breach at the location of the submarine cable crossing could damage the cable (Exh. SPB-PJW at 7).

b. Analysis

The record shows that underground transmission lines typically experience fewer outages than overhead lines, as they are less exposed to weather and other hazards. However, once an outage has occurred, underground lines may take longer to repair, as it is more difficult to isolate the source of the problem. Thus, the reliability of the underground primary route and the overhead alternative route may not be substantially different. In addition, the record indicates that additional switched shunt reactors may be needed along the primary route to compensate for the higher levels of reactive power produced by the longer underground cables; however, with such mitigation in place, the reliability of the two routes would be similar. Accordingly, the Siting Board finds that the primary route and the alternative route are comparable with respect to reliability.

5. Conclusions on Transmission Line Routing

In Section III.C.2, above, the Siting Board found that the primary route would be preferable to the alternative route with respect to environmental impacts. In Section III.C.3, above, the Siting Board found that the alternative route would be preferable to the primary route with respect to cost. In Section III.C.4, above, the Siting Board found that primary and alternative routes would be comparable with respect to reliability. Based on its review of the record, the Siting Board finds that Cape Wind has provided sufficient information regarding costs, reliability, and environmental impacts to allow the Siting Board to determine whether it has achieved the proper balance between environmental impacts, cost and reliability.

To make this determination, the Siting Board must weigh the environmental advantages of the primary route against the cost advantages of the alternative route. In its analyses in Section

III.C.2, above, the Siting Board identified several key advantages of the primary route over the alternative route. In particular, the Siting Board determined that the transmission lines along the primary route would have no permanent visual impacts, while the twelve-mile overhead segment of the transmission line along the alternative route potentially would be visible from backyards, side yards, and street crossings, and the eight miles of clearing required could increase views of existing transmission lines on the NSTAR right-of-way; that construction in Popponesset Bay would take longer than in Lewis Bay, would potentially affect sensitive barrier beach and estuary areas, and would have a greater potential for impacts on fish, coastal shorebirds, and navigation; and that construction noise and wetlands impacts potentially were greater along the alternative route than along the primary route. In Section III.C.3, the Siting Board was unable to identify the extent to which the costs of constructing the transmission lines along the primary route would exceed those of constructing along the alternative route; however, the differential would not exceed $15.5 million, and likely would be considerably less. Overall, the Siting Board concludes that the elimination of the potential for permanent visual impacts, coupled with lower overall construction impacts both on land and under water, outweighs the less clearly defined cost benefits of the alternative route. Accordingly, the Siting Board finds that the primary route is preferable to the alternative route with respect to providing a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost.

IV. 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. G.L. c. 164, § 69H. In addition, the statute requires that the Siting Board determine whether plans for the construction of energy facilities are consistent with current health, environmental protection, and resource use and development policies as adopted by the Commonwealth. G.L.c. 164, § 69J.

In Section II.A.4, above, the Siting Board found that, to establish that there is a need for additional transmission resources to interconnect the wind farm with the regional transmission

grid, Cape Wind shall submit to the Siting Board copies of all permits required for Cape Wind to begin installation of wind farm equipment in Nantucket Sound.

In Section II.B, the Siting Board found that the Barnstable Interconnect is preferable to both the Harwich Alternative and the New Bedford Alternative 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 III.A, above, the Siting Board found that Cape Wind and NSTAR developed and applied a reasonable set of criteria for identifying and evaluating alternatives to the proposed project in a manner which ensures that it has not overlooked or eliminated any siting options which, on balance, are clearly superior to the proposed project. The Siting Board also found that Cape Wind and NSTAR identified a range of practical transmission line route alternatives with some measure of geographic diversity. Consequently, the Siting Board found that Cape Wind and NSTAR have considered a reasonable range of practical siting alternatives.

In Section III.C, above, the Siting Board found that the primary route would be preferable to the alternative route with respect to providing a reliable energy supply to the Commonwealth with a minimum impact on the environment at the lowest possible cost. The Siting Board also found that with the implementation of the proposed mitigation and conditions, the environmental impacts of the proposed facilities along the primary route would be minimized with respect to marine construction impacts, land construction impacts and permanent impacts.

In Section III.C.2.d, above, the Siting Board reviewed trade-offs of use of HDD in lieu of jet plowing to install the transmission lines at the New Hampshire Avenue landfall along the proposed route. The Siting Board held that, should the Company choose, either for technological reasons or because of restrictions imposed by another agency, to pursue use of HDD at the New Hampshire Avenue landfall, additional proceedings before the Siting Board would be required to determine whether and how that approach could be undertaken consistent with minimizing noise and traffic impacts. Specifically, to allow use of HDD to achieve landfall at New Hampshire Avenue, the Siting Board would require the Company to make a project change filing, providing: (1) an analysis of both existing and predicted construction period L_{eq}, L_{90} and L_{max} noise levels at affected residences, and proposed and possible mitigation to minimize residential noise impacts;

and (2) an analysis of proposed and possible mitigation to minimize traffic impacts on residents, particularly for those homes in close proximity to the transition vault.

In Sections I.C.2 and III.C, above, the Siting Board reviewed the environmental impacts of the proposed transmission lines in light of related regulatory or other programs of the Commonwealth, including programs related to wetlands and riverfront protection, water supply wellhead protection, rare and endangered species, tidelands and waterways, water quality certification, marine fisheries, coastal zone management, ocean sanctuaries, historic preservation, and underwater archeology. As evidenced by the above discussions and analyses, the proposed transmission lines along the primary route would be generally consistent with the identified requirements of all such programs.

Accordingly, the Siting Board APPROVES the proposal of Cape Wind and NSTAR to construct two approximately 18-mile, 115-kilovolt underground electric transmission lines along the primary route identified by Cape Wind and NSTAR. This approval is subject to compliance by Cape Wind and NSTAR with the following conditions:

(A) No wind turbines will be built in state waters.

(B) There shall be no construction in Yarmouth between Memorial Day and Labor Day, unless permission is given in writing in advance by the Town of Yarmouth.

(C) Construction in Yarmouth shall not occur prior to 7 a.m. or after 5 p.m., unless permission is given in writing in advance by the Town of Yarmouth.

Prior to the commencement of construction:

(D) To establish that there is a need for additional transmission resources to interconnect the wind farm with the regional transmission grid, Cape Wind shall submit to the Siting Board copies of all permits required for Cape Wind to begin installation of wind farm equipment in Nantucket Sound.

(E) To minimize marine construction impacts on eelgrass beds, the Siting Board directs Cape Wind to aerially photograph the entrance to Lewis Bay in the month of July, immediately prior to jet-plowing, under conditions conducive to documenting the extent of eelgrass beds, to use the photographs in finalizing the exact location of jet-plowing, and to provide such photographs to the Siting Board. The Siting Board also directs Cape Wind to provide this documentation to the Yarmouth Shellfish Warden. Also, Cape Wind shall file a Notice of Intent with the Yarmouth Conservation Commission and fully consult with the Yarmouth Division of Natural Resources prior to commencing with construction.

(F) To minimize marine construction impacts on protected coastal shorebirds, the Siting Board directs Cape Wind to work with the ACOE, NHESP, and MDMF, and with Mass Audubon, if Mass Audubon wishes to participate: (1) to determine whether seasonal restrictions, or some other protective measures, are appropriate to minimize potential impacts on protected coastal shorebirds and their habit along the primary route and, if so, to develop appropriate seasonal restrictions and/or other protective measures; and (2) to determine whether protected coastal shorebirds should be included in the Company's comprehensive environmental monitoring plan and, if so, to develop an appropriate monitoring protocol. Cape Wind shall file with the Siting Board, prior to the commencement of marine construction, documentation of the seasonal restrictions, any additional protective measures, and any monitoring protocol.

(G) To help ensure that potential navigational impacts on all individuals or groups, including commercial fishermen and recreational boaters, would be avoided or minimized, the Siting Board directs Cape Wind to consult with the Harbormasters of the Towns of Barnstable and Yarmouth, in order to coordinate the scheduling of marine construction activities, or to arrange other mitigation measures.

(H) To minimize construction traffic impacts, the Siting Board directs Cape Wind, and NSTAR as appropriate, to submit a draft Traffic Management Plan to Yarmouth officials and school administrators at least six months prior to the commencement of construction.

(I) To minimize impact to potential historic sites on Berry Avenue, the Siting Board directs Cape Wind to consult with the Yarmouth Historical Commission prior to commencing construction.

(J) Prior to applying for a street opening permit, Cape Wind shall provide detailed noise and traffic management information to the Town of Yarmouth.

Because the issues addressed in this Decision relative to this facility are subject to change over time, construction of the proposed facility must commence 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 Cape Wind and NSTAR 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. Cape Wind and NSTAR 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.

M. Kathryn Sedor

M. Kathryn Sedor
Presiding Officer

Dated this 11th day of May, 2005

APPENDIX A

ALTERNATIVE NEED ANALYSIS

In Section II.A.1, above, the Siting Board adopted a new standard of review for transmission lines that interconnect power plants with the electric transmission system, and analyzed the need for the proposed lines under that standard. As discussed in Section II.A.1, above, the Siting Board adopted this new standard in response to statutory changes that have been enacted since the Turners Falls/MECo/NEPCo precedent was last used. However, parties developed a record and briefed the case assuming the use of a standard similar to that used in two earlier Siting Board cases, Turners Falls and MECo /NEPCo.[116] Therefore, in this section, the Siting Board reviews need for the proposed transmission lines using Turners Falls and MECo/NEPCo as guidance.[117]

A-I. Scope of Review

In this section, the Siting Board considers whether the proposed transmission line is needed using its Turners Falls/MECo/NEPCo precedent as guidance. Because the standards of review are stated differently in the two relevant Siting Board decisions, and because Cape Wind and the Alliance have offered additional interpretations of the standards, the Siting Board finds it appropriate, as a preliminary matter, to clarify the scope of the analysis under this precedent.

As discussed in Section II.A.1, above, the Siting Board in Turners Falls reviewed a proposal to construct a 1.2-mile, 115 kV transmission line which would interconnect a non-jurisdictional 20 MW coal-fired cogeneration plant with the transmission grid. Turners Falls Decision, 18 DOMSC 141. In that decision, the Siting Board required the proponent to show: (1) that there was a need within New England for the power generated by the non-jurisdictional

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116 At the close of evidentiary hearings, the Siting Board issued briefing questions regarding the appropriateness of using Turners Falls and MECo/NEPCo as precedent.

117 The Siting Board notes that the need analysis in Section II.A, above, is independent of the analyses in other sections of the decision. Thus, if need were analyzed using Turners Falls and MECo/NEPCo as guidance, the findings in Sections I, II.B, III, and IV, above, would not change.

generating facility; and (2) that the transmission facility would provide benefits to Massachusetts. Id. at 153-155. The Siting Board found a need for the power from the plant based on a power sales contract between Turners Falls Limited Partnership (the developer of the power plant) and UNITIL (a bulk power purchaser for two New Hampshire electric utilities). Id. at 155-156. The Siting Board found benefits to Massachusetts based on: (1) economic benefits to Strathmore Paper Company, a local employer that would purchase steam from the power plant; and (2) conveyance of an easement along the proposed transmission right-of-way to the DEM for use as a bike path. Id. at 160-164.

In MECo/NEPCo, the Siting Board reviewed a proposal to construct a 3.2-mile, 69 kV transmission line which would interconnect a non-jurisdictional 40 MW gas- and oil-fired cogeneration plant with the transmission grid. In this case, the proponent was required to show that: (1) power from the non-jurisdictional plant was needed on either economic efficiency or reliability grounds; and (2) the existing transmission system was inadequate to support the new power source and additional energy resources were necessary to accommodate it. Id. at 395. The Siting Board found need for the power plant based on a power sales contract between Pepperell Power Associates (the developer of the power plant) and Cambridge Electric Light Company (a Massachusetts electric utility). Id. at 396-397. The Siting Board also found that the existing transmission system was inadequate to support this new power source, and that additional energy resources (the proposed transmission line) were necessary to accommodate the new power source. Id. at 397-403.

Cape Wind argues that the Siting Board should use the principles set forth in MECo/NEPCo, slightly modified, to review the need for the Company's proposed transmission lines. Cape Wind proposes that the Siting Board adopt the following analysis:

> Whether the proponent is a utility or a non-utility developer, the proponent must first establish that the power from the non-jurisdictional cogeneration plant is needed on either reliability, economic efficiency [or environmental] grounds. If it can be established that the cogeneration plant is needed, the proponent must then show that the existing transmission system is inadequate to support this new power source and that additional energy resources are necessary to accommodate this new power source

(Cape Wind Brief at 21). [118]

The Alliance argues for more extensive modifications to the MECo/NEPCo standard (Alliance Brief at 36-38). The Alliance accepts that the proponent of an interconnecting transmission line may show need for the power from a non-jurisdictional power plant on reliability, economic efficiency, or environmental grounds (id. at 36-37). However, it argues that the Siting Board should consider the positive and negative attributes of the power plant as potentially offsetting each other, and require a petitioner to show:

> (1) a need for the transmission line by demonstrating that there is a need for the specific power to be produced by the power plant on reliability, economic efficiency, or environmental grounds; and (2) there is a net positive contribution in at least one of these areas which is not offset by negative effects in the others

(id. at 37-38). In response, Cape Wind argues that this "netting of individual need bases" is contrary to statute and applicable precedent, and could lead to the rejection of facilities shown to be needed on reliability or economic grounds in accordance with the Siting Board's mandate (Cape Wind Reply Brief at 24-25).

The Siting Board agrees with Cape Wind and the Alliance that a modified version of the standard articulated in MECo/NEPCo is appropriate for the purposes of this review, and that the standard should allow for a showing of need for the power from the Cape Wind generator on reliability, economic, or environmental grounds. In addition, the Siting Board will consider other bases for establishing need for the power from the wind farm, examining on its merits any argument that does not fit easily into the three established bases for a finding of need.

However, the Siting Board will not adopt the Alliance's proposal for a more extensive reworking of Turners Falls and MECo/NEPCo. Historically, the Siting Board has never required project proponents to show need for a facility on more than one basis, for the very good reason that many facilities have been needed primarily, or entirely, for a single purpose -- typically, for reliability. The fact that such projects had costs and environmental impacts was a given, and did

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[118] Cape Wind notes that, since MECo/NEPCo, the Siting Board's review of need has evolved to include environmental objectives as a possible basis for a need determination (Cape Wind Brief at 21, n.8).

not alter the need analysis. Similarly, a facility could be required for a single purpose unrelated to reliability – for example a project required to comply with the environmental regulations of another agency. It is therefore sufficient to show need for a project on *one* basis, so long as that basis is adequately supported.[119]

The Alliance recognizes that its proposal goes beyond existing Siting Board precedent,[120] and argues that the Siting Board should "strengthen" its precedent specifically for offshore power plants to fill a perceived regulatory gap (Alliance Brief at 35-36). The Siting Board does not believe that the Turners Falls/MECo/NEPCo precedent, and our jurisdiction over the proposed transmission line, can be interpreted to serve the purpose suggested by the Alliance. In addition, in Section II.A.1, above, the Siting Board has explained why the Turners Falls/MECo/NEPCo analysis is no longer consistent with the Siting Board's mandate and practice, and has established a new standard of review that will be used in the future for transmission lines that interconnect power plants, including offshore power plants. Thus, there is no need to strengthen Turners Falls and MECo/NEPCo in anticipation of future cases.

Therefore, in the following sections, the Siting Board will review the need for the proposed transmission line using the following standard adapted from MECo/NEPCo, which is adopted *for the purpose of this section only*:

In order to demonstrate the need for a jurisdictional transmission line which would

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119 In cases where the benefits provided by a proposed project are modest, the Siting Board may separately consider whether the costs or impacts of the project outweigh its benefits. For example, in the MMWEC Decision, 12 DOMSB 18, at 71, the Siting Board found environmental and economic need for a natural gas pipeline, but noted that, because the identified benefits might be modest, it was possible that the benefits of the proposed pipeline could be outweighed by its other environmental impacts. After reviewing the environmental impacts of the proposed pipeline, the Siting Board concluded that these impacts did not outweigh the economic and environmental benefits of the project. Id. at 149.

120 The Siting Board notes that, in Turners Falls, it found need for the energy from a coal plant without tabulating the plant's environmental impacts, and that, in MECo/NEPCo, it found need for the energy from a gas- and oil-fired plant based solely on a signed and approved contract for the plant's output. Turners Falls, 18 DOMSC at 151-165; MECo/NEPCo, 18 DOMSC at 11-12.

> interconnect a non-jurisdictional power plant, the proponent must establish: (1) that the power from the non-jurisdictional power plant is needed on reliability, economic, environmental or other grounds; and (2) that the existing transmission system is inadequate to interconnect this new power plant and, thus, that additional transmission resources are necessary to accommodate this new power plant.

Cape Wind has advanced reliability, economic, and environmental need arguments for the power that would originate at the wind farm and that would be transported by the proposed transmission lines. These are general classes of need arguments that fit Siting Board precedent. In addition, the Company has argued that the power is needed to meet the Commonwealth's Renewable Portfolio Standard ("RPS"). Each of these arguments is outlined and evaluated below.

A-II. Need for Energy: Reliability

A. Wind Farm Capacity

1. Company

The Company stated that the wind farm's maximum potential delivery of energy at Barnstable Switching Station would not exceed 454 MW (Tr. 3, at 418-419). The Company projected that the wind farm would produce 420 MW or more approximately 15% of the year; between 100 MW and 420 MW approximately 42% of the year; and less than 100 MW approximately 43% of the year, including periods of no power amounting to approximately 10% of the year (Exhs. EFSB-RR-9; EFSB-RR-10). The Company expected that power production generally would be highest in the months of December through March and lowest during early morning hours in the summer months (Exh. EFSB-RR-17). On average, the Company expects the wind farm's MW output to be 36% of its total capacity (Exh. APNS-N-11; Tr. 3, at 422-423; Tr. 4, at 539).

The Company stated that the wind farm's capability rating would be less than its maximum output, but asserted that it would make a significant capacity contribution to regional supply adequacy (Exh. CW-DCS-2-R at 10). The Company initially stated that the wind farm would provide approximately 100 MW of summer-rated capacity, based on the Independent System Operator of New England's ("ISO-NE") then-existing policy of assigning wind farms a

capacity rating of 25% as an initial value counted towards total Installed Capacity ("ICAP") (Exh. CW-1, at 2-7; Tr. 3, at 413-415). The Company later indicated that ISO-NE had altered its policy, and would now accept engineering projections for the first year and actual seasonal operating history data for time periods when ISO-NE needs capacity thereafter (Tr. 3, at 413-415). The Company did not update its anticipated capacity rating in light of the new ISO-NE procedures (Exh. CW-DCS-2-R at 10).

2. Alliance

Jeffrey Byron, a witness for the Alliance, testified that wind-generated power does not contribute to system reliability because the system operator cannot rely on wind plants to be available when needed (Exh. APNS-JB-1, at 11, 15). Mr. Byron contended that adding generating capacity or new transmission lines does not necessarily improve the reliability of the grid (id. at 4).

Mr. Byron accepted the hypothesis that there could be a peak in demand in the future, for which the contribution of the wind farm could prevent loss of load; however, he argued that the energy could not be counted on in such a situation (id. at 11; Tr. 14, at 1874-1877). Mr. Byron also asserted that the turbines to be used in the wind farm are substantially untested and that previous wind generator designs have not met manufacturers' expectations for life span (Exh. APNS-JB-1, at 22). Finally, the Alliance argued that the Siting Board has never found that power from a generating plant that cannot be dispatched is needed for reliability purposes (Alliance Reply Brief at 7).

3. Company Rebuttal

In rebuttal, Cape Wind asserted that any facility with a capability rating greater than zero can be expected to make a contribution to resource adequacy (Exh. CW-DCS-2-R at 10). In response to the assertion that the turbines themselves would be unreliable, the Company stated that the 3.6 MW turbines it has selected have markedly improved operating reliability, relative to previous generations of wind turbines (Exh. CW-CO-2, at 2). The Company asserted that the availability factor of General Electric's previous generation of 1.5 MW turbines is over 97%

(id. at 3).

4. Analysis

In prior cases where it has reviewed the need for generating facilities to meet regional capacity needs, the Siting Board has required proponents to determine the year in which there would be a need for the nameplate capacity of the facility, on the assumption that this capacity typically would be available to meet capacity needs. See, e.g., ANP Bellingham Energy Company, 7 DOMSB 39, at 76-78 (1998) ("ANP Bellingham"); ANP Blackstone, 8 DOMSB 1, at 33-35. In this instance, however, the record indicates that the wind farm is projected to deliver on average approximately 36%, or 163 MW, of its maximum output of 454 MW. The record also indicates that generation would tend to be lower than average in the summer, when New England electric demand is at its peak; thus, the summer capacity rating of the wind farm is likely to be less than 163 MW, and substantially less than its nameplate capacity.

The Alliance has argued that the Siting Board may not find a reliability need for the wind farm, as its output is intermittent, and cannot be assured at any particular point in time. The Siting Board notes that, because all generating facilities are subject to unplanned outages, no generating facility can be relied on absolutely to be available at times of peak demand. The Siting Board notes the expertise of ISO-NE in the matter of developing capacity factors for intermittent facilities such as hydro-electric projects and wind generators, and concludes that it is appropriate to find reliability need for intermittent facilities based on their likely summer capacity rating, rather than the higher nameplate capacity. Here, the record demonstrates that ISO-NE intends to assign capacity ratings to wind farms based initially on engineering projections, and later on actual seasonal operating history data. The Company's original projection of a capacity rating of 100 MW was based on ISO-NE's capacity rating policies at the time of filing; the Siting Board accepts it for purposes of this review.

B. Regional Need

1. Company

The Company argued that additional generating capacity will be needed in New England to meet anticipated growth in the demand for electricity, to replace retirements of existing generation, and to maintain capacity reserve margins (Exh. CW-1, at 2-7). The Company predicted that 110 MW of capacity would be needed for reliability purposes beginning in summer 2007, with higher levels of capacity needed in later years (Exh. EFSB-N-9-S; Tr. 3, at 472-479). The Company also predicted that, under a high growth scenario or a hot weather scenario, there could be a capacity shortfall before 2007 (Tr. 3, at 483).

In support, the Company provided an analysis prepared by La Capra Associates, LLC ("La Capra") of the need for additional generating capacity in New England (Exhs. CW-1, at 2-4; EFSB-N-9-S). The Company stated that it used methods consistent with ISO-NE's Resource Adequacy Assessment to prepare this analysis, reviewed ISO-NE documents, and considered more recent developments that may affect supply and demand for power (Exh. CW-1, at 2-9, 2-13; Tr. 3, at 467-468).

As a basis for its analysis, the Company developed five forecasts of summer peak load, each based on the April 2003 NEPOOL Forecast of Capacity, Energy, Loads, and Transmission ("CELT Report") (Exhs. CW-1, at 2-10; EFSB-N-9-S). Three of these forecasts – a base case, a high load growth case, and a low load growth case – incorporate differing assumptions as to load growth while assuming normal summer weather (Exhs. APNS-N-7; APNS-N-7(b), Att.; EFSB-N-9-S). For its base case, the Company assumed an annual growth rate in peak demand of 1.74%, consistent with assumptions in the 2003 CELT Report (Exh. EFSB-N-9-S). For its high growth rate case, the Company assumed that peak demand would grow 2.65% annually (id.). For its low growth case, the Company used a "low economic growth" scenario from NEPOOL that reflected an average annual growth rate of approximately 0.41% (id.). In addition, the Company provided two forecasts to reflect extreme weather conditions: a hot weather case having a 10% chance of being exceeded, and a mild weather case having a 90% chance of being exceeded according to the 2003 CELT Report (id.).

The Company assessed the need for additional capacity under each of the five forecast scenarios by adjusting for the effects of demand-side management programs and net purchases and sales from other regions, adding in a 15% installed capacity reserve requirement,[121] and comparing the resulting demand with the capacity projected to be available from existing and developing generation (Exh. CW-1, at 2-9, 2-10, 2-11; Tr. 3, at 472-479). The Company took its estimates of the effects of demand-side management and net purchases and sales from ISO-NE (Exh. CW-1, at 2-11).

To develop estimates of available generating capacity, the Company obtained an initial inventory of regional supplies from the 2002 CELT Report; it then identified unit-specific supply assumptions that warranted adjustments through May 2003, and adjusted further for expected attrition (id. at 2-8 to 2-16; Exh. EFSB-N-9-S; Tr. 3, at 473, 477). In its modeling, the Company assumed the announced retirement of New Boston Unit 1, and assumed that 25% of plants with an operating life over 40 years would be retired, and that 50% of plants with an operating life over 50 years would be retired (Exhs. CW-1, at 2-15; APNS-N-7(d), Att.). In comments made subsequent to its modeling, the Company noted the decision by Exelon to retire Mystic Units 4, 5, and 6, and noted pressure on Salem Harbor Units 1, 2, and 3 as perhaps representative of increased pressure to retire plants; the Company asserted that additional generation may be needed sooner than anticipated by the La Capra model (Exh. EFSB-N-9-S). The Company's demand, supply, and need projections for 2004 through 2010 are shown in Table A-1, below.

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[121] The Company asserted that the 15% reserve requirement has historically been linked to a one-day-in-ten-years loss-of-load expectation adopted by the Northeast Power Coordinating Council ("NPCC") (Exhs. EFSB-N-1, Att. at 45; EFSB-N-8, Att. at 12; Tr. 3, at 476-478).

Table A-1
Need for Capacity in New England, 2004-2010, Summer Capacity (MW)

BASE CASE	2004	2005	2006	2007	2008	2009	2010
Peak Demand	25,690	26,000	26,290	26,620	26,990	27,390	27,820
Required Capacity	29,544	29,900	30,234	30,613	31,039	31,499	31,993
Available Supply	31,284	31,153	30,562	30,503	30,845	30,502	30,495
Surplus / (Need)	1740	1253	328	**(110)**	**(194)**	**(997)**	**(1498)**
HIGH LOAD GROWTH CASE	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Peak Demand	26,130	26,730	27,330	27,990	28,710	29,460	30,280
Required Capacity	30,050	30,740	31,430	32,189	33,017	33,879	34,822
Available Supply	31,284	31,153	30,562	30,503	30,845	30,502	30,495
Surplus / (Need)	1234	413	**(868)**	**(1686)**	**(2172)**	**(3377)**	**(4327)**
LOW LOAD GROWTH CASE	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Peak Demand	25,230	25,250	25,220	25,230	25,270	25,330	25,420
Required Capacity	29,015	29,038	29,003	29,015	29,061	29,130	29,233
Available Supply	31,284	31,153	30,562	30,503	30,845	30,502	30,495
Surplus / (Need)	2269	2115	1559	1488	1784	1372	1262
HOT WEATHER CASE	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Peak Demand	27,710	28,050	28,370	28,730	29,130	29,560	30,020
Required Capacity	31,867	32,258	32,626	33,010	33,500	33,994	34,523
Available Supply	31,284	31,153	30,562	30,503	30,845	30,502	30,495
Surplus / (Need)	**(583)**	**(1105)**	**(2064)**	**(2537)**	**(2655)**	**(3492)**	**(4028)**
MILD WEATHER CASE	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Peak Demand	24,620	24,910	25,190	25,510	25,860	26,250	26,660
Required Capacity	28,313	28,647	28,969	29,337	29,739	30,188	30,659
Available Supply	31,284	31,153	30,562	30,503	30,845	30,502	30,495
Surplus / (Need)	2971	2506	1593	1166	1106	314	**(164)**

"Peak Demand" estimated by La Capra; "Required Capacity" assumes an additional 15% reserve margin; "Available Supply" estimated by La Capra as "Base Supply." Selected years shown here. Source: Exh. EFSB-N-9-S.

2. Alliance

The Alliance argued that the proposed wind farm would produce power at a time of an unprecedented surplus of supply in New England (Alliance Reply Brief at 10). The Alliance argued that there is no need for the power that would be produced by the wind farm (id. at 10).

3. Analysis

The Company has provided an analysis, similar to those accepted by the Siting Board in generating facility cases prior to the 1997 restructuring of the electric industry, of the need for additional generating capacity in New England for the years 2003-2011. The Company provided three demand scenarios based on load growth: a base case scenario, representing a demand case with a 50% chance of being exceeded, a high load growth scenario, and a low load growth scenario representing essentially static electric demand. The Company also provided cases that reflect extreme and mild weather scenarios. The Siting Board finds that the three demand scenarios presented represent a reasonable range of load growth scenarios for purposes of this review, and that the extreme and mild weather cases provide indicators of the sensitivity of supply adequacy to weather contingencies. The Siting Board further finds the Company's reliance on NEPOOL projections of demand-side management and net purchases and sales, and its use of a 15% reserve margin, to be appropriate for purposes of this review.

The Company has projected available supplies by adjusting resource levels listed in the 2002 CELT Report to account for retirement and project cancellation decisions made through May 2003, and for anticipated future retirements. The Siting Board has previously accepted the assumption of 25% retirement, by capacity, of fossil fuel plants in operation over 25 years. ANP Bellingham, 7 DOMSB 39, at 75. The Siting Board concludes that the Company's assumption that 25% of plants with an operating life over 40 years would be retired, and that 50% of plants with an operating life over 50 years would be retired, is consistent with current trends, and thus reasonable. Therefore, the Siting Board finds that the Company's estimate of available supplies is appropriate for purposes of this review.

As shown in Table A-1, additional capacity would be needed in New England by 2007 for

reliability purposes under the base load growth case, and by 2006 in the high load growth case.[122] Under the base case, 110 MW of power would be needed by the New England system in 2007, 197 MW would be needed in 2008, 997 MW would be needed in 2009, and 1498 MW would be needed in 2010. Based on the record, the Siting Board finds that there is a need in New England for at least 110 MW of energy resources beginning in 2007 and beyond.[123] The Siting Board therefore finds that there is a need for the capacity provided by the wind farm beginning in 2007 for reliability purposes.

C. Other Reliability Benefits

1. Company

The Company asserted that the wind farm would improve local reliability by providing an additional source of energy at the Barnstable Switching Station (Exh. CW-1, at 2-5). At present, the Canal Electric power plant is the only source of generation located on Cape Cod (Tr. 1, at 139). NSTAR maintained that under certain contingencies, the availability of the proposed wind farm could forestall localized outages that otherwise would occur (Tr. 3, at 377-387). For example, NSTAR stated that if the Canal Switching Station were lost to service, the Cape Cod

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122 Under the extreme weather case, there would be inadequate capacity to meet load and maintain the 15% reserve margin requirement beginning in 2004.

123 Historically, the Siting Board has analyzed the need for new generating capacity both within New England and within Massachusetts. ANP Blackstone, 8 DOMSB 1, at 26-35; ANP Bellingham, 7 DOMSB 39, at 60-83; Altresco Lynn, Inc., 2 DOMSB 1, at 19-92 (1993). The Siting Board notes that, following the enactment of the 1997 Electric Restructuring Act, Massachusetts electric distribution companies are no longer allowed to own generation, and generally do not enter into long-term supply contracts to serve the load within their service territories. Thus, the Siting Board can no longer identify generating units that are dedicated over the long term to serving Massachusetts load, and therefore cannot project the need for additional capacity to meet the requirements of Massachusetts electric customers. However, we note that Massachusetts is part of a tightly interconnected regional power grid, and constitutes approximately 40% of New England load. A regional shortage of power thus is very likely to affect Massachusetts electric customers. The Siting Board therefore concludes that, if additional energy resources are needed in New England for reliability purposes, these additional energy resources also are needed to reliably serve Massachusetts load.

region would be interconnected to the grid only through the Bourne Switching Station, which does not have sufficient capacity to supply all of Cape Cod (id. at 378-380). NSTAR stated that under this scenario, an outage could be avoided if the wind farm were generating at least half its capacity; if the wind were lighter and output lower, power from the wind farm would help limit the extent of outages (id. at 379-385). Similarly, NSTAR noted that energy from the wind farm would improve reliability in the Cape Cod area under the contingency of the loss of a double-circuit tower between Canal Electric and the Bourne Switching Station (id. at 504). NSTAR noted that both contingencies have a low probability of occurrence (id. at 383-384, 503-504).

NSTAR indicated that demand growth on Cape Cod would create a need for voltage support within the next few years (id. at 386-387). Cape Wind stated that the proposed transmission lines would provide approximately 120 megaVAR ("MVAR") of reactive power on a continuous basis (Exhs. CW-DCS-2-R at 20; EFSB-RR-12; EFSB-RR-65).[124] NSTAR noted that this new source of reactive power would allow it to postpone planned voltage support projects such as the installation of 20 to 60 MVAR of capacitor banks (Tr. 3, at 387-389). Cape Wind acknowledged that the reactive power from the transmission lines may not always be needed, and that Cape Wind may need to provide a switched shunt reactor for the NSTAR system to compensate for unneeded reactive power (Tr. 1, at 147; Tr. 3, at 512-513).

In addition, Cape Wind stated that the turbines themselves would be able to produce or absorb reactive power, as needed, thus providing bidirectional reactive power under electronic control (Tr. 1, at 124, 143, 145). The Company stated that the wind turbine generators would produce from 0 MVAR to 226 MVAR, depending on wind power output and on power factor setting (Exh. EFSB-RR-65).

Cape Wind further asserted that the wind farm would improve electric system reliability by supplying renewable energy during peak winter periods (Exh. CW-DCS-2-R at 44-45). In support, Cape Wind asserted that New England is highly dependent on natural gas for power generation, citing a 2003 ISO-NE study which concluded that 42% of New England generating capacity will be fueled by natural gas by 2005 (id. at 43). Cape Wind noted that the ISO-NE

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[124] Transmission lines buried underground or undersea provide reactive power, unlike overhead lines (Tr. 1, at 119, 147-148).

report indicated that natural gas production levels in North America have leveled off; the Company therefore suggested that significant additional pipeline capacity is unlikely, and asserted that gas supply constraints may adversely affect the reliability of gas-fired generation during the coldest part of the heating season (id. at 44-45).

2. Alliance

Mr. Byron, a witness for the Alliance, asserted that wind-generated resources cannot provide reactive power (Exh. EFSB-APNS-6). The Alliance argued that any reliability benefit of fuel diversity, per se, should be reflected in the reliability characteristics of the plant itself (Alliance Reply Brief at 30).

3. Analysis

The record shows that, under certain scenarios, the availability of energy from the wind farm could limit or forestall an electric outage on Cape Cod. However, NSTAR has stated that such contingencies are very low probability events; in addition, NSTAR has not provided an analysis demonstrating that additional energy resources are needed, or will be needed, to meet ISO-NE reliability standards. The Siting Board concludes that, while the wind farm may provide local reliability benefits under certain contingencies, these benefits, in and of themselves, would not be sufficient to establish need for the energy from the wind farm.

In addition, the record shows that the proposed transmission cables would generate a steady supply of reactive power, obviating or delaying the need for NSTAR to install capacitors. The record shows that the wind farm turbines can supply or absorb reactive power as required and indicates that at times there is some need for additional reactive power to provide voltage support. Thus, the proposed transmission lines will consistently provide needed reactive power to the grid on Cape Cod and the wind turbines will be able to provide reactive power when they are operating. Although the net effect of providing voltage support is positive, NSTAR's alternative of installing capacitors has not been shown to have substantial costs. The Siting Board concludes that these modest voltage support benefits, in and of themselves, would not be sufficient to establish need for the energy from the wind farm.

The record shows that the wind farm would act as a hedge against risks associated with the availability of natural gas and other fossil fuels. The record suggests that gas supply constraints may adversely affect the reliability of gas-fired generation during the coldest part of the heating season. Therefore, there is a possibility that the wind farm could improve system reliability during peak winter electricity use in the future, although the likely extent of any such improvement was not established. Thus, while agreeing that the wind farm may be beneficial by reducing reliance on gas-fired generation, the Siting Board concludes that these benefits, in and of themselves, would not be sufficient to establish need for the energy from the wind farm.[125]

D. Effect of Variable Output on Grid Reliability

1. Alliance

The Alliance argued that interconnection of the wind farm would degrade, rather than improve, the reliability of the New England electric grid. Specifically, the Alliance asserted that generation levels from the wind farm would regularly change or cease unexpectedly, placing additional challenges on the system operator, which is required to balance electric supply and demand (Exh. APNS-JB-1, at 10). The Alliance asserted that wind-generated electricity is intermittent, constantly changing, and relatively unpredictable (id.); however, it did not quantify the level of intermittence or unpredictability. The Alliance stated that ISO-NE would have to procure an increased amount of regulation services from other generators to compensate for the lack of operator control over the wind farm's output (id. at 13).

2. Company

The Company asserted that its project would not cause risks to reliable operation of the electric system (Exh. EFSB-RR-2). The Company acknowledged that volatility can present challenges to the system operator (Exh. CW-1, at 2-8). As an indicator of the likely volatility of output from the wind farm, the Company provided information from its meteorological test tower

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125 The Siting Board notes that the diversity benefits of renewable energy facilities generally are reflected in the legislature's enactment of the RPS statute. The need for energy from the wind farm to meet RPS is addressed in Section A-III, below.

for April, May, and June 2003 showing that the average wind speed is 19 miles per hour (mph), and that hour-to-hour variations in wind speed average about 1 meter per second (m/s), or 2.2 mph (Exhs. EFSB-RR-49; EFSB-RR-50). The Company concluded that the median error in its day-ahead forecast would be approximately 10% of the wind farm's capacity, or less than 0.002% of peak load in New England, and that the median error in its hour-ahead estimate of power generation would be less than 5% of the wind farm's capacity (Exhs. CW-DCS-2-R at 14; EFSB-RR-7).

The Company noted that electric grids must routinely contend with varying and uncertain demand, and with unexpected outages (Exh. CW-DCS-2-R at 13). The Company stated that ISO-NE must plan for an unexpected loss of Units 8 and 9 at Mystic Station in Everett, totaling 1400 MW; the Company therefore argued that ISO-NE would be prepared to respond to the unexpected loss of the 452 MW wind farm (id. at 19). The Company also argued that ISO-NE is experienced in dealing with variability caused by unpredictable levels of system demand, noting that the peak hourly load record of 25,715 MW in New England on August 14, 2002, exceeded the normal weather condition peak load summer outlook by more than 6% (Exh. CW-1, at 2-8). The Company noted that the wind farm's annual output represents approximately 1% of the region's power supply (Tr. 3, at 445).

The Company stated that ISO-NE and various New England transmission owners are conducting a System Impact Study to assess system performance impacts of the proposed interconnection of the wind farm, to ensure no degradation of reliability (Tr. 1, at 143-155; Tr. 3, at 464).

3. Analysis

The record demonstrates that the electric power generated by the wind farm would be variable and not wholly predictable, and suggests that the ISO-NE may need to procure an increased amount of regulation services from other generators to compensate for this variability. However, the record also demonstrates that the margin of variability in wind farm output would be smaller than certain other generation contingencies. In addition, the record indicates that any reliability issues will be identified in the forthcoming System Impact Study, and that the wind

farm will not be permitted to interconnect to the New England transmission grid until it is shown that interconnection will not adversely affect the reliability of the transmission grid. Therefore, the Siting Board finds that the variability or unpredictability of the energy generated by the wind farm is unlikely to adversely affect the reliability of the electric system. The cost implications of the need for increased regulation services are discussed in Section A-IV, below.

E. Conclusions on Reliability Need

In the sections above, the Siting Board has found that: (1) there is a need in New England for at least 110 MW of energy resources beginning in 2007 and beyond; (2) there is a need for the capacity provided by the wind farm beginning in 2007 for reliability purposes; and (3) the variability or unpredictability of the energy generated by the wind farm is unlikely to adversely affect the reliability of the electric system. Consequently, the Siting Board finds that there is a need for the power provided by the wind farm beginning in 2007 for reliability purposes.

A-III. Need for Energy: Qualified RPS

A. Company

The Company argued that the renewable energy from the wind farm is needed for compliance with Massachusetts and Connecticut renewable portfolio standards (Company Brief at 32-39). The Company noted that Massachusetts and Connecticut have recently enacted statutes requiring retail electric suppliers to acquire increasing percentages of energy from specified renewable energy sources over time (Exh. CW-1, at 2-18; Tr. 4, at 610). In both Massachusetts and Connecticut, wind power is among the technologies that may be counted towards RPS targets (Exh. CW-1, at 2-18). The Company reported that Massachusetts enacted its RPS statute based on an understanding that renewable power provides fuel diversity and technology diversity, consumes no fossil fuel, and has air emission benefits (Tr. 4, at 610-611).

The Massachusetts RPS requires each retail electricity supplier to obtain RPS "new renewable" attributes[126] corresponding to a minimum of 1.0% of electricity consumed in 2003;

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[126] In the RPS context, "new renewables" are energy projects that meet specific criteria with (continued...)

the requirement increases by one-half percentage point each year until the requirement is 4.0% in 2009, then increases to 5.0% in 2010 (Exh. CW-1, at 2-19, Table 2-4).[127] Combining these percentages with forecasted electric consumption, the Company projected that compliance with the Massachusetts RPS will require approximately 733 gigawatt-hours ("GWh") per year of new renewable power in 2004, increasing to 1256 GWh per year in 2006 and 2658 GWh per year by 2010 (Exh. EFSB-RR-18, Att.). The Company indicated the Connecticut RPS would require additional renewable energy, rising from an estimated 237 GWh in 2004 to 2408 GWh in 2010 (id.).

The Company also anticipated market-driven demand for green attributes in Massachusetts, Connecticut, Rhode Island, and Maine by 2005 (Exh. CW-1, at 2-20). The Company projected that this market demand for "green power" would rise from zero in 2003 and 76 GWh in 2004 to 757 GWh in 2010 (Exh. EFSB-RR-18, Att.). Combining the Massachusetts and Connecticut RPS requirements with anticipated demand for green energy attributes, the Company predicted that total demand for new renewable energy in New England would increase from 636 GWh in 2003 to 2468 GWh in 2006, and 5822 GWh in 2010 (id.).

The Company projected that new renewable power sources currently approved by the Massachusetts Division of Energy Resources ("DOER") will provide approximately 447 GWh annually from 2004 through 2010 (id.).[128] The Company projected that known sources that have

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126 (...continued)
respect to source of energy and date of commercial operation (Exh. CW-1, at 2-18). Generators of electricity sell the attributes of their power separately from the electrical output itself (Exh. PO-1).

127 Eligibility under Massachusetts rules as a new renewable energy source is an attribute tracked through certificates in the NEPOOL Generation Information System ("GIS") (Exh. CW-1, at 2-18; Tr. 4, at 609-613). In Massachusetts, a load-serving entity that fails at the end of the year, and after the various trading periods in the NEPOOL GIS, to procure sufficient renewables is assessed an "alternative compliance mechanism," which is $50 per megawatt-hour ("MWh") of shortfall measured against its RPS requirement (Tr. 4, at 623-624).

128 The largest contributors listed by the Company are Indeck West Enfield, a biomass plant, producing 167 GWh annually, and four landfill gas plants, each producing 42 to 46 GWh (continued...)

not yet applied to DOER for certification could provide an additional 33 GWh annually (id.; Exh. EFSB-N-9-S).

Based on these estimates, the Company concluded that New England would need an additional 1989 GWh of renewable resources to meet statutory and market demand in 2006, increasing to 5343 GWh in 2010 (Exh. EFSB-RR-18, Att.). The Company estimated the total energy production of the wind farm to be 1437 GWh (Exhs. CW-1, at 2-17; EFSB-RR-49).

B. Alliance

The Alliance challenged the level of need for renewable energy in Massachusetts, noting that applications for interconnection of nearly 300 MW of onshore wind projects have been filed with NEPOOL since May 2003 (Exh. APNS-JB-1, at 38). In addition, the Alliance argued that the Siting Board may not consider an argument based on the need for renewable energy to meet the requirements of the Massachusetts RPS (Alliance Reply Brief at 7). In support, the Alliance argued that the Siting Board has never found that power from a generating plant is needed for reliability based on the plant's impact on a market other than the electricity market (id.). The Alliance also argued that the Siting Board's G.L. c. 164, § 69H mandate with respect to an "energy supply for the commonwealth" concerns energy and not green credits, which the Alliance considers to be a separate product (id. at 11).

C. Analysis

General Law c. 25A, § 11F, the Renewable Energy Portfolio Standard for Retail Electricity Suppliers, requires that every retail supplier of electricity provide a minimum percentage of kilowatt-hour sales to end-use customers from renewable energy generating sources. 225 CMR § 14.07 requires retail electricity suppliers serving Massachusetts customers to hold increasing levels of renewable energy in their energy supply portfolios, beginning at 1.0%

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128 (...continued)
annually (Exh. EFSB-N-9-S). The Company excluded from its calculation the Indeck Jonesboro plant, which was mothballed in January 2003; the facility had eligible generation which the Company had estimated at 192 GWh (id.; Exhs. CW-1, at Table 2-6; EFSB-N-6 and -6(a), Att.; EFSB-RR-18, Att).

in 2003 and increasing to 5.0% in 2010. This requirement, by design, creates a need for renewable energy attributes that is separable from the need for capacity or energy to serve New England load. Because the RPS is an energy policy of the Commonwealth, established by statute, with clear relevance to the Siting Board's mandate to provide for "a reliable energy supply for the commonwealth with a minimum impact on the environment at the lowest possible cost," the Siting Board concludes that it is appropriate to examine the need for renewable energy to meet the requirements of the Massachusetts RPS.

Table A-2, below, summarizes forecasts of demand for new renewable energy to meet RPS and green demand, and lists supplies available from DOER-approved sources and other potential sources of renewable energy. As shown in Table A-2, the record demonstrates that Massachusetts electric suppliers will be required to obtain 991 GWh of new renewable energy attributes in 2005, rising to 2658 GWh in 2010 in order to comply with G.L. c. 25A, § 11F. The record also shows that 671 GWh annually are available from DOER-qualified projects, if the mothballed Indeck Jonesboro biomass plant is included. That leaves a shortfall of 320 GWh in 2005, and 1987 GWh in 2010. Including the additional 300 GWh of possible new renewable energy identified by the Alliance, the shortfall would be reduced to 20 GWh in 2005 and 1687 GWh in 2010. By this more conservative analysis, the full 1437 GWh of the proposed wind farm would be needed beginning in 2010. The Siting Board therefore finds that there will be a need for additional renewable resources to meet the requirements of the Massachusetts RPS beginning in 2005, and that there will be a need for the full renewable output of the wind farm to meet the requirements of the Massachusetts RPS beginning in 2010.

Because Massachusetts is not the only New England state with a renewable portfolio standard, the Siting Board also considers the regional need for new renewable resources. The record indicates that the level of new renewable resources needed to comply with both the Massachusetts and Connecticut RPS will rise from 1473 GWh in 2005 and 2150 GWh in 2006, to 5066 GWh in 2010. Under this analysis, the full 1437 GWh of the wind farm would be needed beginning in 2005 to meet regional demand; if the additional 300 GWh of new renewable energy identified by the Alliance materializes, the 1437 GWh from the proposed wind farm would be needed beginning in 2006. Consequently, the Siting Board finds that there will be a

need for the renewable resources provided by the wind farm to meet regional RPS requirements beginning in 2006.

Table A-2
Need for Renewable Energy in New England, 2004-2010 (GWh per year)

DEMAND	2004	2005	2006	2007	2008	2009	2010
MA Percentage Required [1]	1.5%	2.0%	2.5%	3.0%	3.5%	4.0%	5.0%
MA RPS Demand [2]	733	991	1256	1528	1808	2095	2658
CT RPS Demand [2]	237	481	894	1401	1839	2204	2408
Regional RPS Demand (CT + MA) [2]	970	1473	2150	2930	3647	4299	5066
Green Demand [2]	76	186	319	474	654	737	757
RENEWABLE SUPPLY	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Available "New" Renewables [2, 4]	671	671	671	671	671	671	671
Recent Wind Projects Applied to NEPOOL [3]	300	300	300	300	300	300	300
SURPLUS / (NEED)	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
MA RPS Demand vs. Available Renewables	62	(320)	(585)	(857)	(1137)	(1424)	(1987)
MA RPS Demand vs. Available Renewables + Applications	362	(20)	(285)	(557)	(837)	(1124)	(1687)
Regional RPS Demand vs. Available Renewables	(299)	(802)	(1479)	(2259)	(2976)	(3628)	(4395)
Regional RPS Demand vs. Available Renewables + Applications	1	(502)	(1179)	(1959)	(2676)	(3328)	(4095)

(1) Exh. CW-1, at Table 2-4. (2) Exh. EFSB-RR-18, Att. (3) Exh. CW-JB-1, at 38.
(4) Includes DOER-approved renewables (including the mothballed 192 MW Indeck Jonesboro plant), and other renewables identified by Cape Wind (Exhs. EFSB-N-6; EFSB-N-9-S; EFSB-N-15).

A-IV. Economic Need

The Company asserted that the power from the wind farm would be needed for economic purposes, arguing that the power would displace more expensive generation, lowering the clearing price in the New England spot market. The Company also argued that the dispatch of the wind farm would help reduce the price of natural gas during periods of peak gas demand, and that availability of renewable attributes from the wind farm would reduce the overall price of renewable portfolio certificates. The Alliance asserted that operation of the proposed wind farm would cause the system operator to pay more to manage variability in the supply and demand for electricity. The Siting Board examines these arguments below.

A. Displacement Savings

1. Company

The Company asserted that dispatch of the wind farm would provide economic benefits for the Commonwealth and the New England region by increasing competition in the wholesale electrical power market (Exh. CW-1, at 2-4, 2-5, 2-17). The Company asserted that, when operating, the wind farm would displace generating units at the top of the dispatch queue and cause cheaper units to set the New England spot market clearing price (id. at 2-5, 2-23). Cape Wind asserted that the wind farm would be self-scheduled and a price taker in the region's energy market; consequently, its dispatch would lower market clearing prices (Exh. DCS-2, at 36).

The Company engaged La Capra to model the effect on wholesale electricity prices of adding the wind farm's power to the New England electric supply (Exh. CW-1, at 2-24). The La Capra model is based on the idea of bid stack displacement, in which energy provided by the wind turbines would displace energy from the highest successful bidder in the bid stack at any specific time (Exh. APNS-N-15, Att.; Tr. 4, at 563). The Company stated that the wind farm would have an operating advantage over fossil-fuel-fired generating plants, because its short-run variable operating costs are near zero (Exh. APNS-N-15, Att.). The Company stated that whenever the wind turbines generate power, the wind farm will be called on-line before fossil units with higher operating costs (id.). The Company stated that, when its operation displaces a

generating unit at the top of the bid stack, a unit offering a lower bid will set the clearing price (id.).

The Company used PROSYM, a utility dispatch simulation program, to simulate the hourly dispatch of generators and the operation of the electric system in New England, New York, the Pennsylvania/New Jersey/Maryland Interconnection, and adjacent Canadian provinces including Quebec and Ontario (id.).[129] PROSYM's dispatch algorithm selects the lowest cost combination of bids from generators and available imports (id.). Wheeling charges and congestion charges are included in the model (id.). The model generates hourly clearing prices, total generation by technology, total emissions, and total fuel consumption (id.). The Company asserted that the model approximates the actual spot markets in the northeast (id.).

The Company used the PROSYM model to simulate the effect of the wind farm on the annual average energy clearing price in each of four load zones in New England,[130] for the years 2005 through 2009 (Exhs. APNS-RR-1; APNS-RR-1, Att.). The Company then multiplied the price effect by the anticipated total load for each zone for each year (Exhs. APNS-RR-1; APNS-RR-1, Att.).[131] The Company's model projected regional savings of approximately $4 million in 2005, $28 million in 2006, $28 million in 2007, $17 million in 2008, and $22 million in 2009, or an average of $19.8 million per year for the first five years of operation (Exhs. APNS-RR-1; APNS-RR-1, Att.). The Company adjusted its initial projection of

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129 The modeling was performed in Spring 2001 (Exh. EFSB-N-13; Tr. 4, at 573).

130 The Company defined the four load zones as Maine, NEMA-Boston, Connecticut, and the rest of New England (Exh. APNS-RR-1, Att.).

131 The Company asserted that, while the most immediate effect of the Cape Wind project would be on clearing prices in the spot market, the lower clearing prices would reduce prices in the forward market and thereby lead to price reductions for all customers (Exh. APNS-N-15, Att.; Tr. 4, at 563; Tr. 18, at 2364-2365). In support, the Company argued that forward prices are, to a large extent, expectations for spot prices, and that market participants will take the Cape Wind project into account when developing prices for forward power (Tr. 18, at 2465). In addition, the Company noted that power for most Massachusetts load is procured through short-term forward purchases, rather than through long-term contracts which would be slow to reflect the Cape Wind project due to less frequent contract renewals (id. at 2367).

$19.8 million per year up to an estimated $25 million per year, arguing that because prices and the price suppression effect both increase disproportionately when the market is tight, average savings under variable conditions would be higher than savings calculated for average conditions (Exh. APNS-RR-1). The Company also argued that higher prices should be weighted more heavily to account for the typically higher prices that accompany higher load (id.). In addition, the Company noted that fuel prices in October 2003 were 25% to 50% higher than prices widespread in early 2001, when the modeling was performed, and suggested that an analysis assuming the fuel prices prevailing in late 2003 would have yielded economic benefits 25% to 50% higher than the estimate of $25 million (i.e., $31 to $38 million) (id.; Tr. 18, at 2366-2367).

The Company stated that customers in southeastern Massachusetts would have savings slightly greater than customers elsewhere, due to transmission constraints on the export of wind farm output from the area (Tr. 4, at 553-554). Since over 40% of NEPOOL's total energy output is consumed in Massachusetts, the Company estimated that savings to Massachusetts consumers would likely be at least 40% of $25 million, or $10 million annually (Exhs. EFSB-RR-14; CW-DCS-2-R at 29; Tr. 4, at 555).[132]

2. Alliance

Mr. Byron, a witness for the Alliance, asserted that the wind farm could distort the electricity market in Massachusetts and New England, and reduce overall economic efficiency (Exh. APNS-JB-1, at 3). Mr. Byron stated that long-run marginal cost is the best measure of the economic efficiency of a generating plant (id. at 27). He estimated costs of various types of generators and concluded that, on a cost per MWh basis, the proposed offshore wind project would have higher long-run marginal costs than a combined-cycle natural gas-fired plant (id. at 23-37). Mr. Byron expressed doubt as to whether the wind farm would be constructed without the federal production tax credit and credits from the Massachusetts RPS, and indicated the two

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132 In addition, the Company asserted on a conceptual basis that by displacing fossil fuel generating plants, the wind farm would put downward pressure on regional natural gas prices, providing savings to natural gas customers, and lowering costs of fossil fuels generally (Exhs. APNS-N-10; CW-DCS-2-R at 38). The Company did not attempt to quantify such an effect (Exhs. APNS-N-10; CW-DCS-2-R at 38).

sets of credits would provide revenue of about 1.8 cents per kWh and about 2.5 cents per kWh, respectively, to the project (id. at 30). Mr. Byron then asserted that a zero-bid plant distorts the market if it is not more economically efficient than a plant it displaces (id. at 28).

Mr. Byron also expressed concern that electricity producers with lower overall costs may be forced out of the market by the wind farm, which would sell electricity by bidding its short-term marginal operating cost, which is close to zero (id. at 37). Mr. Byron stated that the proposed wind farm must eventually cover its capital and operating costs or go out of business, and questioned whether the wind farm would in fact cover its costs (id. at 37-38).

On brief, the Alliance questioned whether a reduction in wholesale energy prices would have any effect on "wholesale sellers who provide power to the retail supplier who actually serve[s] retail customers" (Alliance Reply Brief at 24). The Alliance also argued that the Siting Board is not permitted to find that a self-scheduling plant brings economic efficiency benefits based solely on its potential impact on the wholesale clearing price in certain hours (id. at 22).

3. Company Rebuttal

In response, Cape Wind stated that its economic need argument focused primarily on the cost to consumers, noting that recovery of the fixed costs of the wind farm would be a risk taken on by project developers (Tr. 18, at 2316). Cape Wind noted that, historically, the Siting Board's analysis of economic need has focused on whether consumer benefits would be achieved in NEPOOL's energy market (Exh. CW-DCS-2-R at 28; Tr. 18, at 2317-2318). The Company asserted that in ANP Bellingham, the Siting Board accepted the results of an analysis of cumulative energy price savings as evidence of "economic efficiency" (Exh. CW-DCS-2-R at 28). The Company asserted that its analysis of the economic benefits created by displacement within the wholesale energy market is similar to that accepted by the Siting Board in prior proceedings (id.).

4. Analysis

The Company has argued that need for the energy from the wind farm can be demonstrated based on economic benefits, and has provided, in support, a dispatch analysis

showing the extent to which the wind farm, operating as a price taker, would reduce clearing prices in the New England energy market during its first five years of operation. In the past, the Siting Board has determined that, in some instances, utilities need to add energy resources primarily for economic efficiency purposes. Specifically, in Massachusetts Electric Company, 13 DOMSC 119, at 178-179, 183, 187, 246-247 (1985), and in Boston Gas Company, 11 DOMSC 159, at 166-168 (1985), the Siting Board recognized the benefit of adding economic supplies to a specific utility system. The Siting Board also noted in Eastern Energy Corporation Remand, 1 DOMSB 213 (1993) ("Eastern Energy Remand"), that because G.L. c. 164 requires a necessary energy supply to be provided with a minimum impact on the environment at the lowest possible cost, it is reasonable to conclude that a proposed facility may be necessary even if there is no additional need for supply capacity or transmission reasons. We stated that, in such a case, an applicant would be required to establish a record that supported a finding that the Commonwealth's energy supply would have lower costs or reduced environmental impacts with the addition of the proposed facility than it would have without the addition of the proposed facility. Eastern Energy Remand, 1 DOMSB 213, at 411-412.

More recently, in ANP Blackstone, the Siting Board found need for a generating facility based on cost savings as calculated using a dispatch model. ANP Blackstone, 8 DOMSB at 1, at 49-57. In MMWEC, the Siting Board found need for a natural gas pipeline based on likely economic benefits in the form of lower electric rates for MMWEC customers. MMWEC Decision, 12 DOMSB at 29, n.3, and at 60.

Here, the Company has provided a dispatch analysis similar to those accepted in ANP Blackstone and in MMWEC, projecting average annual savings of $19.8 million for New England customers over the first five years of operation of the wind farm. For purposes of estimating economic benefits, the Siting Board accepts the assumption that the wind farm will be a price taker in the energy markets, and thus will fall at or near the bottom of the regional dispatch queue whenever it is operating. The Siting Board also finds credible the Company's assumption that energy price reductions and anticipated price reductions in the spot market will be reflected in longer-term contracts for energy after standard offer service ceases in March 2005.

Cape Wind argued that its modeling protocol was conservative, and asserts that average

annual savings actually would be at least $25 million, with $10 million per year of this savings accruing to Massachusetts customers. The Siting Board agrees that savings may well be higher than those modeled based on average market conditions, and notes further that because the savings are sensitive to fossil fuel prices, savings would be higher than modeled if future fuel prices are higher than those prevailing in Spring 2001.

The Alliance has not challenged the Company's modeling techniques or assumptions. Rather, it has argued that economic efficiency should be analyzed based on a generator's long-run marginal cost as compared to those of other generators, rather than by its effect on energy prices. However, in past decisions, the Siting Board has evaluated economic need based on the actual costs that electric utilities or customers in Massachusetts and New England pay for the electricity they consume, not the long-run marginal cost of a project. The wind farm may be a project with relatively high capital costs and may receive government support;[133] however, its cost structure is relevant to the Siting Board's need analysis only insofar as it has cost implications for electric customers.

The record shows that the wind farm will tend to reduce market clearing prices for electricity because it typically will be bid into that market at its marginal operating costs, which are close to zero, and displace power plants with higher marginal costs. The savings resulting from this displacement would accrue to electric customers, and are estimated to be $25 million per year for New England customers, including $10 million annually for Massachusetts customers over the first five years of operation. Consequently, the Siting Board finds that operation of the wind farm would provide average annual savings of $25 million for New England customers, including $10 million annually for Massachusetts customers, during the first five years of operation.

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133 The Alliance characterizes this support as a market distortion; however, it also can be viewed as government intervention to remediate market failures. The Siting Board shares the Commonwealth's commitment to the development of new renewable energy resources, and views the implementation of renewable portfolio standards as an important part of that commitment. To the extent that the marketplace is influenced by these requirements, the Siting Board accepts such influence as presumptively warranted.

B. Other Economic Benefits

1. Company

The Company offered two additional arguments regarding regional economic benefits provided by the wind farm.[134] First, the Company asserted that the additional diversity provided by the wind farm would provide a hedge against financial risks associated with the availability of natural gas and other fossil fuels (Exh. CW-1, at 2-6). Although Cape Wind asserted that generating unit resource diversity has economic value and that increasing the use of renewable sources of energy is wise from a power supply portfolio perspective, it did not provide a quantitative estimate of that value (Exh. CW-DCS-2-R at 41, 46). However, the Company suggested that the Siting Board consider such a benefit qualitatively (id. at 46).

To illustrate indirect price benefits from renewable energy, La Capra noted that when hydroelectric production in the Pacific Northwest is poor, natural gas units run more frequently, gas storage is depleted, and upward pressure is placed on natural gas prices (Tr. 3, at 511). The Company predicted that the addition of non-fossil-fuel-fired resources in New England would leave more natural gas available for electric generation, domestic heating, and industry (id.). Lower consumption would tend to reduce fuel prices for electric generation, thus lowering electric prices and the price of fuels for other purposes as well (Tr. 4, at 565-567). The Company asserted that the extent of renewable generation is one of the key factors influencing the availability and price of natural gas in the next few years (Tr. 3, at 512). The Company also predicted that displacement of fossil-fuel plants by the wind farm would tend to reduce the volatility of fuel prices and argued that the wind facility's projected high winter output would help offset tight winter gas supplies (Tr. 4, at 567-568).[135] The Company asserted that, because

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134 The Company initially asserted that operation of the wind farm would provide economic benefits for Cape Cod by lowering the locational prices paid by Cape Cod consumers under the ISO-NE congestion management pricing system (Exh. CW-1, at 2-4, 2-5, 2-17, 2-25). However, after further analysis, the Company concluded that it was unlikely that the wind farm would reduce locational prices specifically for Cape Cod customers (Exh. EFSB-RR-14).

135 Cape Wind stated that the facility's output would be greatest from December through

(continued...)

natural gas prices are sensitive to supply-and-demand conditions, a relatively small reduction in consumption in New England could result in a large price reduction (Tr. 18, at 2391).

Second, the Company asserted that development of the wind farm would increase the supply of new renewable power assigned RPS certificates, thus tending to reduce the price paid by consumers for compliance with the Massachusetts RPS (Exh. CW-1, at 2-5; Tr. 4, at 625-637). The Company stated that the upper bound on plausible bilateral prices for Massachusetts qualified RPS certificates would be $50 per MWh (Tr. 4, at 624). The Company estimated that increasing the supply of RPS certificates would lower the price of Massachusetts qualified RPS certificates by at least $5 per MWh (id. at 625-637). Using this estimate of $5 per MWh, the Company projected savings for Massachusetts customers of just over $40 million, for the period 2007 through 2010 (Exh. EFSB-RR-19; Tr. 4, at 644).

2. Alliance

The Alliance argued that the wind farm is too small to exert any significant downward pressure on fuel prices (Tr. 14, at 1907-1908). Further, the Alliance argued that there is no evidence that construction and operation of the Cape Wind generator would reduce the number of hours that the price-setting plant would be fossil-fueled, and argued that electricity prices will continue to be closely tied to fossil fuel prices in New England (Alliance Reply Brief at 31, n.24). In addition, the Alliance argued that fuel diversity does not offer benefits with regard to cost, but rather comes at a high price through subsidies (id. at 32).

3. Analysis

The Siting Board agrees with the Alliance that operation of the wind farm is unlikely to change the extent to which fossil-fueled plants set the market clearing price for electricity. However, the record indicates that the addition of non-fossil-fueled resources such as the wind farm to the regional energy supply could reduce demand for fossil fuels during periods of high electricity demand, and thus marginally reduce fuel prices during periods when gas and oil prices

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135 (...continued)
March (Exh. EFSB-RR-17).

are elevated due to high demand. The Company has not analyzed regional energy prices in sufficient detail to allow the Siting Board to determine the probability and likely magnitude of any ratepayer savings resulting from such an effect. The Siting Board therefore makes no finding regarding the economic benefits of the resource diversity provided by the wind farm.

With respect to the Company's second argument, the Siting Board notes that the RPS program imposes costs on load-serving entities in order to promote the use of renewable sources of energy. However, the supply and demand figures provided by the Company suggest that for several years there will be an insufficient number of RPS certificates whether or not the wind farm is built, so the estimated $40 million savings to Massachusetts customers is fairly speculative. The Siting Board therefore makes no finding regarding the level of consumer savings that would derive from the increased supply of RPS certificates provided by the wind farm.

C. Offsetting Costs

1. Alliance

The Alliance stated that ISO-NE would need to procure an increased amount of automatic generation control or other regulation services from existing generators, if the proposed wind farm were in operation, in order to compensate for the variability in output from the wind farm (Exh. APNS-JB-1, at 13, 19). The Alliance stated that electric customers would bear the cost of these regulation services (id. at 19).

2. Company

The Company stated that ISO-NE obtains regulation services to handle intra-hour variations in the load and resource balance on the electric system (Tr. 3, at 445). The Company explained that these intra-hour variations reflect both load and generation variations (id.). ISO-NE needs to be able to dispatch certain generators that can cover variations in demand and supply within an hourly period (id.).

The Company stated that the median error in its hour-ahead estimate of power generation would be about 10% of its capacity, or about 0.002% of New England peak load

(Exhs. CW-DCS-2-R at 14; EFSB-RR-7). The Company asserted that the wind farm would increase New England's regulation services requirements by 2% at most; it estimated that this additional cost would be a few million dollars per year, and thus much less than the estimated $25 million savings in wholesale electric costs (Exhs. CW-DCS-2-R at 26; EFSB-RR-11; Tr. 18, at 2289).

3. Analysis

The record indicates that ISO-NE may need to procure an increased level of automatic generation control or other regulation services if the wind farm is added to the grid, but that these additional costs would not exceed a few million dollars per year. The Siting Board finds that the cost of any additional regulation services made necessary by the wind farm would be significantly less than the expected displacement savings.

D. Conclusion on Economic Need

In the sections above, the Siting Board has found: (1) that operation of the wind farm would provide average annual savings of $25 million for New England customers, including $10 million annually for Massachusetts customers, during the first five years of operation; and (2) that the cost of any additional regulation services made necessary by the wind farm would be significantly less than the expected displacement savings. The Siting Board therefore finds that there is a need for the power generated by the wind farm for economic purposes during the first five years of operation.

A-V. Need for Energy: Environmental

A. Scope of Environmental Need

Cape Wind asserted that operation of the wind farm would provide the New England region with substantial benefits in the form of reduced system-wide emissions of pollutants, due to the displacement of fossil-fuel generators (Company Brief at 72). In support, the Company provided a dispatch analysis comparing regional emissions of sulfur dioxide ("SO_2"), nitrogen oxides ("NO_X"), and carbon dioxide ("CO_2"), with and without the wind farm (Exhs. CW-1, at

2-26 to 2-28; EFSB-RR-21).

The Alliance has argued that such an analysis is incomplete, in that it does not recognize other environmental impacts of constructing and operating the wind farm (Alliance Brief at 39). In support, the Alliance presented testimony on the noise impacts, fisheries impacts, and avian impacts of the proposed wind farm. Cape Wind also presented testimony on these impacts, as well as limited testimony on visual impacts, while arguing that Siting Board precedent limits the scope of the environmental need analysis to an analysis of comparative air emissions (Company Brief App. A at 8-10). Therefore, as an initial matter, the Siting Board must determine the scope of its review of environmental need for the wind farm.

Cape Wind accurately represents the Siting Board's precedent in this area. The Siting Board found need for a proposed facility for environmental purposes in four prior decisions – three involving generating facilities, and one involving a natural gas pipeline intended to provide an increased supply of natural gas to an existing generating facility. MMWEC Decision, 12 DOMSB 18, at 61-70; ANP Blackstone, 8 DOMSB 1, at 57-63; ANP Bellingham, 7 DOMSB 39, at 91-97; U.S. Generating Company, 6 DOMSB 1, at 43-45 (1997). In each of these cases, the need finding was based entirely on an analysis of the net reduction in air emissions that would result from the operation of a new generating facility, or from the increased use of natural gas at an existing generating facility, as documented by dispatch analyses showing expected emissions with and without the new power plant or fuel source.[136] Thus, in the past, the Siting Board has found environmental need based on an analysis of comparative air quality, without further analysis of other environmental impacts.

The Alliance has proposed expanding the environmental need analysis to include other impacts of the wind farm. An expanded environmental need analysis has not been warranted in past cases. However, the Siting Board notes that an expanded environmental need analysis may be useful in this case, because the wind farm's impacts likely would differ significantly both in

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136 As mentioned earlier, after noting in the MMWEC Decision, 12 DOMSB 18, at 149, that identified economic and environmental benefits appeared modest, the Siting Board considered whether these benefits were outweighed by the environmental impacts of MMWEC's proposed pipeline project, and concluded they were not. See n.118, above.

type and extent from those of the generators that it would displace. However, the Siting Board notes that the environmental need analysis is a comparative analysis – it looks, not just at the impacts of the new facility, but at changes in regional impacts with and without the new facility. Therefore, an analysis of the impacts created by the operation of a new generator must be considered in the context of any changes in impacts caused by the displacement of other generators. For example, any analysis of the noise that would be produced by the operation of a new generator should be considered in the context of the possible reduction in noise at other locations caused by the less frequent dispatch of other generation facilities. In addition, a full comparative environmental analysis should take into consideration all important classes of environmental impacts, although impacts that either are minor, or are likely to be similar for the new and displaced generators, may be excluded.

In the following sections, the Siting Board considers the evidence provided by Cape Wind and the Alliance, placing it, where appropriate, into this comparative framework, and evaluating it on its merits and completeness.

B. Air Quality Impacts

1. Company

The Company stated that energy from the wind farm would be produced without perceptible air emissions, and would displace production of energy by fossil-fuel fired facilities in the region, thereby reducing regional emissions of criteria pollutants and CO_2 (Exh. CW-1, at 2-26, 2-27). To estimate the expected level of emissions displacement, the Company first estimated the annual energy output of the wind farm as 1437 GWh per year (id. at 2-17; Tr. 4, at 614). The Company then obtained marginal emission rates developed by ISO-NE in its NEPOOL Marginal Emission Rate Analysis for the year 2000 (Exh. CW-1, at 2-27; Tr. 5, at 657). The Company used these marginal emission rate data for SO_2, NO_X, and CO_2 to estimate the project's impact on state and regional emissions (Exhs. CW-1, at 2-27; EFSB-RR-21). The Company calculated that, had the wind farm been operating in 2000, regional air emissions in that year would have been reduced by approximately 4480 tons of SO_2, 1323 tons of NO_X, and 1,062,554 tons of CO_2 (Exhs. CW-1, at 2-28; EFSB-RR-21). The Company estimated that

approximately 40% of these emissions reductions, including 1792 tons of SO_2, 529 tons of NO_X, and 425,022 tons of CO_2, would have been released by facilities within Massachusetts (Exh. EFSB-RR-20).

The Company estimated that future regional reductions would be substantial but would gradually decline as the mix of generation changes (Tr. 5, at 665-668, 694). The Company also claimed that operation of the wind farm would result in reductions in regional mercury and particulate emissions, but did not quantify these reductions (Exh. CW-1, at 2-28; Tr. 5, at 694-695).

2. Analysis

Cape Wind has estimated reductions in emissions based on the average emissions of power producers at the margin for dispatch in 2000, and the total amount of power expected to be delivered from the wind farm. The Company did not attempt to predict marginal emissions rates for future years, but argued that in the short term, emissions reductions generally would be comparable to those in 2000. In prior cases involving proposed generating facilities, the Siting Board has accepted analyses based on expected displacement of other generators and on ISO-NE data on marginal emissions rates, similar to those presented here by Cape Wind, as evidence of the facility's potential to reduce regional air emissions of certain pollutants. Sithe Edgar Development LLC, 10 DOMSB 1, at 21, 26 (2000); see also Brockton Power, 10 DOMSB 157, at 187-188, and Sithe Mystic, 9 DOMSB 101, at 132. However, we note that the marginal emissions rates will change over time with the retirement of older, less efficient generation, and the development of newer, primarily gas-fired units. Consequently, the Siting Board finds that, in the near term, operation of the wind farm would reduce regional air emissions by approximately 4480 tons of SO_2, 1323 tons of NO_X, and 1,062,554 tons of CO_2 annually, and would reduce Massachusetts air emissions in Massachusetts by approximately 1792 tons of SO_2, 529 tons of NO_X, and 425,022 tons of CO_2 annually. The Siting Board also finds that, given its zero-emissions profile, operation of the wind farm will result in long-term reductions in regional and Massachusetts air emissions of unknown size.

C. Noise

1. Company

The Company's noise witness, Peter Guldberg, asserted that operational noise from the proposed wind farm would not be audible from onshore locations or to boaters (Exh. CW-PHG-1, at 5). Mr. Guldberg also asserted that underwater noise would "disappear into the ambient background sound levels of the sea" at distances over 110 meters (360 feet) and that it is unlikely that project operation would be audible to seals or porpoises (id. at 6, 7).

In support, Cape Wind presented a preliminary draft of its analysis of baseline and project noise levels. The Company indicated that it had collected baseline sound data at two offshore locations and at three coastal locations (Exh. EFSB-SS-22-S, Att. at 5-114). The two offshore locations were at Buoy G5 in the North Shipping Channel, about one mile north of the edge of the proposed wind farm, and at Buoy R20 at the edge of the Main Channel, about 1/3 mile south of the proposed wind farm (id. at 5-116). The three coastal locations were: 100 feet inland from the high water mark of a south-facing beach at Point Gammon in Yarmouth, 4.7 miles from the closest turbine; 80 feet inland from the high water mark at Oregon Beach in Cotuit, specified in the draft as 5.5 miles from the closest turbine; and 40 feet inland from an east-facing beach at Cape Poge in Edgartown, specified as 5.4 miles from the closest turbine (id. at 5-116, 5-120, 5-121).

The Company stated that it collected baseline sound levels from the two offshore buoy locations under conditions of clear skies, light winds, and light seas for periods of 20 minutes each between 10 a.m. and 12 noon on October 22, 2002 (id. at 5-118, 5-119). The time-averaged sound levels ("L_{eq}") at Buoys G5 and R20 were 46 and 51 dBA, respectively (id. at 5-119). Sound levels exceeded 90% of the time ("L_{90}") at Buoys G5 and R20 were 35 dBA and 37 dBA, respectively (id. at 5-119; Tr. 19, at 2586). Identified sources of the sound measured at the offshore buoys included aircraft, vessels, and waves slapping on the hull of the boat used for monitoring (Exh. EFSB-SS-22-S, Att. at 5-119; Tr. 19, at 2624).

The Company stated that it selected Point Gammon, Oregon Beach, and Cape Poge for background monitoring because they are coastal locations remote from high traffic areas (Exh. EFSB-SS-22-S, Att. at 5-119, 5-120). Measurements were collected over periods of four

to seven days in November and early December 2002 under a variety of wind conditions (id. at 5-120, 5-121).[137] At the lowest wind speed at which the turbines would generate power ("cut-in wind speed"), one-hour average L_{eq} sound levels ranged from 41 to 63 dBA (id. at Table 5-19). L_{eq} sound levels with an on-shore wind at the design wind speed were higher, ranging from 54 to 71 dBA (id. at Table 5-19). L_{90} sound levels ranged from 27 to 70 dBA, including a range of 34 to 66 dBA at the cut-in wind speed, and a range of 50 to 67 dBA with an on-shore wind at the design wind speed (id. at Table 5-19). Identified sources of sound at various locations included wave noise, wind, birds, aircraft, motor vehicles, and vessels (id. at 5-120, 5-121, 5-125).

The Company presented data provided by the prospective turbine manufacturer, General Electric, indicating that the total sound energy emitted by a single turbine ("sound power") would be 95 dBA at the cut-in wind condition, and 107 dBA at the design wind condition (id. at 5-115; Exh. CW-PHG-1-R, Att. A). For comparison, the Company indicated that an outboard motorboat or a typical diesel fishing boat could have a sound power level as high as 122 dBA (Exh. EFSB-RR-77; Tr. 15, at 2591). The Company indicated that the sound power of 130 turbines would be similar in magnitude to the sound power of a single powerboat, but that the distribution of sound frequencies could be very different (Tr. 19, at 2592-2594).

The Company modeled sound attenuation between 130 operating turbines located on Horseshoe Shoal and several locations (including the five baseline noise monitoring locations) under various wind conditions (Exh. CW-PHG-1-R, Att. A). The predictions were based on hemispherical sound wave divergence and atmospheric absorption of sound (Exh. EFSB-SS-22-S, Att. at 5-115; Tr. 19, at 2617).[138] The Company claimed that, excepting very low frequency

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137 The Company measured sound levels in a series of frequency bands and also provided A-weighted sound levels for various wind conditions, including baseline sound levels at a cut-in wind speed (8 mph at the turbine height, or about 5 mph at 10 feet above the ground at Hyannis Airport) (Exh. EFSB-SS-22-S at 5-121; Tr. 19, at 2572). Among conditions when the turbines operate, ambient noise would be lowest at the cut-in wind speed (Tr. 19, at 2574).

138 The Company included cylindrical spreading in its model, starting 2 kilometers

(continued...)

sound, any relative enhancement of sound resulting from a temperature inversion and/or downwind receptor location is necessarily less than the excess diminution of sound caused by other factors (Exh. CW-PHG-1, at 4; Tr. 18, at 2406-2416).[139] The Company therefore did not make any separate prediction for enhanced propagation attributable to temperature or wind gradients (Tr. 18, at 2414).

The Company noted that turbine noise would be greater at the design wind speed than at the cut-in wind speed, but that background noise would generally increase by as much or more (Exh. EFSB-SS-22-S, Att. at Table 5-27). The Company predicted that the sound level from the wind turbines would be 30 dBA and 34 dBA at Buoys G5 and R20, respectively, at the cut-in wind speed, and 40 dBA and 45 dBA at design wind speed (id. at 5-125, 5-126). The Company predicted that the sound level from the wind turbines, as measured at Point Gammon, the closest point of land, would be 18 dBA at the cut-in wind speed, and 26 dBA at the design wind speed, with onshore winds (id. at figs. 5-40, 5-50). The data show that the modeled sound most closely approaches background levels in the frequency band around 80 cycles per second (Hz) (id.). In the 80 Hz band, the sound level at Point Gammon would be 34 dB at the cut-in wind speed

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138 (...continued)
downwind from turbines, only for low frequencies outside the range of human hearing (below 20 Hz), and only for times when winds exceed 20 mph (Exh. EFSB-SS-22-S, Att. at 5-115).

139 The Company provided ANSI and EEI descriptions of how sound waves can be bent toward a low-elevation receptor when the wind speed near the surface is lower than wind speeds aloft and the wind is toward a receptor, and/or when air temperatures near the surface are lower than air temperatures aloft (Exhs. CW-PHG-1-R, Att. E; EFSB-RR-78, Att.). However, the Company asserted that any tendency for sound to carry long distances due to temperature gradients and/or wind gradients is always overwhelmed by additional attenuation attributable to factors such as absorption by surfaces and turbulence (Exh. CW-PHG-1, at 4; Tr. 18, at 2406-2416). The Company's witness identified these other factors as: (1) imperfections in the reflectivity of the sea surface when it is not glassy smooth; (2) upward bending of sound waves due to cooler temperatures aloft in high wind conditions; (3) excess attenuation due to turbulence; and for inland receptors, (4) sound absorption by grass, trees, structures, and other barriers (Tr. 18, at 2415-2416).

(id. at Fig. 5-40).[140] At the location with the quietest (average) background level, Cape Poge on Martha's Vineyard, the Company predicted 17 dBA, with 33 dB in the 80 Hz band, as the maximum continuous level from project operation at the cut-in wind speed (id. at Fig. 5-48).

Table A-3, below, compares the Company's modeling and monitoring results for the cut-in wind speed, at which wind turbine noise is more likely to be noticeable, for representative locations.

Table A-3
Comparison of Modeled Sound Levels to Baseline Sound at Cut-In Wind Speed

MODELED SOUND RECEPTOR LOCATION	Distance from Wind Farm (miles)	Baseline Sound at Cut-In Wind Speed: Lower Range of L_{90}		Modeled Turbine Noise at Cut-In Wind Speed		Wind Farm Sound Level as Compared to Baseline	
		Full Spectrum (dBA)	80 Hz band (dB)	Full Spectrum (dBA)	80 Hz band (dB)	Full Spectrum (dBA)	80 Hz band (dB)
Buoy G5	1	35	NA	30	43	-5	NA
Buoy R20	0.37	37	NA	34	46	-3	NA
Point Gammon	4.7	39.6	39	17.8	34	-22	-5
Oregon Beach*	NA	34	20	17	34	-17	14
Cape Poge	5.4	40	29	17	33	-22	4

* Baseline monitoring data from Oregon Beach in Cotuit are compared to sound levels modeled for Wianno Beach.
Data sources: Exhs. CW-PHG-1, at 6; EFSB-SS-22-S; EFSB-RR-76, Att. (Rounding and subtraction by EFSB staff).

The Company asserted that a sound would be inaudible if its full spectrum L_{eq} sound level were less than the baseline sound level, unless a pure tone situation were to result (Exh. EFSB-SS-22-S, Att. at 5-122; Tr. 19, at 2629-2630).[141] The Company concluded that the turbines would be inaudible on the basis that the Company's modeled A-weighted sound levels

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140 The Company indicated that the project sound spectrum has an energy peak at 80 Hz (Exh. EFSB-RR-76).

141 Within the context of audibility, the Company defines a pure tone as a 1/3-octave band that is 5 to 15 decibels higher than the mean of the two adjacent 1/3-octave bands (Exh. EFSB-SS-22-S, Att. at 5-122).

from the wind farm are lower than its measured average baseline sound levels (Exh. EFSB-SS-22-S, Att. at 5-122).

The Company stated that there are four planned perimeter foghorns which would operate during foggy conditions only (Tr. 19, at 2596). Sound power levels of the foghorns were not provided but the Company asserted that the foghorn sound has a range of one-half mile and would not be audible from shore (Exh. EFSB-SS-22-S, Att. at 5-127; Tr. 18, at 2386-2387).

2. Alliance

Erich Bender, Sc.D., the noise witness for the Alliance, contended that operational noise from the proposed wind farm would be audible both by boaters and from onshore locations, under some meteorological conditions (Exh. CW-APNS-EB-1, Att. at 3). Dr. Bender stated that the spherical spreading model used by Cape Wind would apply only in the absence of temperature inversion and wind gradients (Tr. 12, at 1593). Dr. Bender contended that the Company was incorrect in its assertion that wind and temperature gradients could not effectively focus sound and that any such effect would be overwhelmed by other types of attenuation (Exh. APNS-EKB at 3, 4; Tr. 12, at 1592-1598, 1677). Specifically, Dr. Bender suggested that cylindrical spreading would be more appropriate than spherical spreading as a model for the geometric dispersion of sound power at distances beyond about 300 or 600 feet from a source, for downwind receptors under certain meteorological conditions (Tr. 12, at 1618-1619, 1672). Dr. Bender stated that spherical spreading causes a reduction in sound pressure of 6 decibels with each doubling of distance, whereas cylindrical spreading reduces sound pressure by 3 decibels with each doubling of distance from a sound source (id. at 1597-1598). For instance, the difference between cylindrical spreading and spherical spreading between 1 km (3300 feet) and 8 km (5 miles) would be 9 decibels since there are three doublings of distance (id. at 1615). Using noise data collected in the late 1980s for a variety of turbines, and assuming cylindrical spreading beyond 300 meters, Dr. Bender estimated that turbine sound levels in shoreline residential areas would be 45 dBA to 55 dBA (Exhs. APNS-EKB at 4; EFSB-APNS-21; CW-APNS-EB-1, at 5; CW-APNS-EB-1-C at 3; EFSB-RR-59; Tr. 12, at 1603, 1618, 1634, 1642, 1649).

3. Analysis

The Company has provided modeling that predicts that the noise contribution of the wind turbines would be less than background sound levels at representative onshore and offshore locations. The Company's analysis predicts that wind farm noise would be 17 to 22 dBA less than background at onshore locations, and 3 dBA less than background at offshore receptors. The Company's modeling also predicts that noise from the wind turbines may surpass background sound levels in a low frequency band around 80 Hz at some coastal locations.

The Company's calculations reflect an assumption that sound in frequencies within the range of human hearing would spread hemispherically. The Alliance has challenged Cape Wind's assumption, arguing that a cylindrical dispersion model is more appropriate for certain meteorological conditions.[142] The Company asserts that, even when meteorological conditions enhance downwind sound propagation, other effects (e.g., air turbulence) would provide enough sound attenuation to keep noise from the wind farm at or below modeled levels.

The Siting Board notes that, since there is little to block or absorb sound traveling over open water, it is likely that sound will travel better than predicted by the Company at times when enhanced by wind or pressure gradients. Thus, actual sound levels at onshore receptors may occasionally exceed the sound levels listed in Table A-3, above. The extent to which these levels may be exceeded has not been established in this record. However, the Alliance's testimony suggests that, at times when sound spreads cylindrically beginning at 1 kilometer from the wind farm, actual sound levels at onshore receptors could temporarily exceed the levels listed in Table A-3 by up to 9 dBA; this would result in onshore noise levels that are 8 dBA to 13 dBA below background levels. These figures do not account for absorption of sound by the water surface, turbulence of the air, or other factors that would affect sound levels at receptor locations.[143]

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142 The record shows that sound propagation may be enhanced by: (1) temperature inversion, where air near the ground is cooler than air aloft; (2) wind blowing towards receptor locations; and (3) relatively calm water.

143 The Siting Board notes that there are several unquantified effects, including the (continued...)

The Company asserts that sound sources are inaudible if their A-weighted sound level is less than background, except in cases where a pure tone results. The Siting Board has never assessed thresholds of audibility; however, in prior cases where the Siting Board has reviewed projected ambient increases in the L_{90} sound level, witnesses have testified that increases in ambient sound of less than 3 dBA would not be perceptible as an increase in noise. See ANP Blackstone, 8 DOMSB 1, at 159; Nickel Hill Energy LLC, 11 DOMSB 83, at 181 (2000). Even the enhanced sound levels discussed above would not result in a 3 dBA increase in sound levels at onshore receptors. The Siting Board therefore concludes that total sound levels at the onshore monitoring locations selected by the Company would not be appreciably increased. However, because sound levels in the 80 Hz (low frequency) band are modeled as exceeding background levels at certain coastal locations, and because modeled levels may be exceeded, we conclude that low-pitched sound from the turbines might be distinguishable from background noise under certain meteorological conditions. It also appears likely that turbine noise would be heard by some boaters.

Based on the record, the Siting Board finds that, while the wind farm may be audible onshore when meteorological conditions permit, the noise levels produced by the wind farm would be lower than background noise levels onshore, and would not result in a perceptible increase in the overall noise levels at shore locations. The record does not contain information on the potential changes in noise levels at other locations that would result from the less frequent operation of generators displaced by the wind farm. However, the Siting Board notes that many fossil-fueled generators are located in close proximity to residential areas and result in significant increases in overall noise levels when operating. Therefore, the Siting Board finds that the noise impacts of the wind farm are likely to be less than those of many of the generators it would displace.

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143 (...continued)
potential range of actual sound wave spreading geometries, any variations in turbine sound output over time, absorption due to air turbulence, and absorption by the water surface, that would cause sound levels to differ from any predictions made here.

D. Fisheries

1. Company

The Company asserted that benthic habitat conditions are very similar throughout much of Nantucket Sound (Exh. CW-CJN/SBW-2-R at 10). The Company asserted that adult and juvenile finfish are considerably mobile in the water column and would be capable of moving away from construction activities (id. at 11-12). The Company therefore asserted that finfish would be able to go elsewhere while marine construction activities are occurring (id. at 10-11).

The Company characterized the seabed as having lower invertebrate diversity than other areas off southern New England, but having high biomass and density (id. at 18).

The Company commissioned and provided a scour analysis which found that scour around the turbine pilings could reasonably be expected to a depth of 4.1 feet, with scour extending laterally as much as 33.1 feet from a pile (Exh. EFSB-SS-22, App. 5-B, at 7). The scour analysis concludes that it is not realistic to conclude that the pilings will have long-term, far-field effects on the composition of Horseshoe Shoal (id. at 7). To mitigate near-field effects, the Company proposes to install scour control mats (id. at Fig. 4).

Cape Wind asserted that criticism by Dr. LeGore and Mr. Weissman of the extent of its fisheries studies was based on information provided in the ENF for the project, rather than on the full case record (Exh. CW-CJN/SBW-2-R at 2, 4, 10, 15-16). Cape Wind contested some of Mr. Weissman's assertions about studies being inadequate. The Company qualitatively characterized investigations it had undertaken as numerous, extensive, and comprehensive (id. at 8, 17).

2. Alliance

Richard S. LeGore, Ph.D., provided testimony on potential benthic (sea-bottom) impacts of the wind farm. Dr. LeGore estimated that over 2 million cubic yards of sediment would be fluidized during project construction, and asserted that the habitat alteration associated with rearranging sediments by jet plow had not been properly characterized (Exh. APNS-RSL at 13-15; Tr. 17, at 2157). Dr. LeGore asserted that analysis is needed of the marine effects of construction noise, anchor line sweep during the construction of pilings, and scouring around the

base of pilings (Exh. APNS-RSL at 15, 17-18).

Dr. LeGore estimated that over 245,000 square feet of new hard surfaces would be created for colonization on piling surfaces, plus an unknown amount of hard surfaces in riprap (Exh. APNS-RSL at 16). This would affect local biological communities, which Dr. LeGore asserted should be characterized, whether positive or negative (id. at 16-17). Specifically, Dr. LeGore asserted that the level of environmental impact analysis for the project has been inadequate (id. at 4-19).[144] Dr. LeGore indicated that the characterization of existing benthic life was inadequate and criticized the characterization of bottom sediments (id. at 4-11; Tr. 17, at 2178).

Mark Weissman, also an Alliance witness, provided testimony on the value of fisheries habitat in Nantucket Sound. Mr. Weissman pointed out that the area supports a high level of fishing and boating (Exh. APNS-MW at 4). Mr. Weissman stated that Nantucket Sound has been designated EFH for sea clam (*Spisula solidissima*), long-finned squid (*Loligo pealei*), short-finned squid (*Illex illecebrosus*), blue shark (*Prionace glauca*), Atlantic mackerel (*Scomber scombrus*), king mackerel (*Scomberomorus cavalla*), Spanish mackerel (*S. maculatus*), bluefin tuna (*Thunnus thynnus*), Atlantic cod (*Gadus morhua*), winter flounder (*Pleuronectes americanus*), yellowtail flounder (*P. ferruginea*), windowpane (*Scopthalmus aquosus*), fluke (*Paralichthys dentatus*), Atlantic butterfish (*Peprilus triacanthus*), scup (*Stenotomus chrysops*), and black sea bass (*Centropristus striata*) (id. at 5-6; Tr. 12, at 1683-1684).[145] Mr. Weissman stated that long-finned squid are believed to spawn on Horseshoe Shoal, and that individuals tend

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144 Dr. LeGore's criticisms include inadequate description of sampling, possibly too coarse sampling, lack of replicates, lack of description of heterogeneity and spatial variations, lack of seasonal stratification in sampling, inadequate particle size analysis, inadequate statistical analysis of diversity, taxonomic imprecision, and lack of analysis of larger mobile species such as whelks, crabs, and lobster, and incomplete statistical evaluation of the data (Exh. APNS-RSL at 4-11; Tr. 17, at 2159-2162, 2194-2199). Dr. LeGore asserted further that the evidence presented by the Company does not include the linear feet of jet-plowing that would be required to join turbines to the ESP (Exh. APNS-RSL at 13).

145 The Company also listed shortfin mako shark (*Isurus oxyrhinchus*) and cobia (*Rachycentron canadum*) as species with EFH in the project area (Exh. CW-2, at 7-16).

to return to their hatch location as spawning adults (Exh. APNS-MW at 17). Mr. Weismann asserted that bluefish (*Pomatomus saltatrix*), striped bass (*Morone saxatilis*), tautog (*Tautoga onitis*), bonito (*Sarda sarda*), herring, and alewives (*Brevoortia tyrannus*) are present in large numbers, as well (id. at 9).

Mr. Weissman stated that, compared to Georges Bank, Nantucket Sound has lower biomass levels but a more intensive recreational fishery (id. at 7). On the commercial side, Mr. Weissman stated that a majority of the state's 40 permitted spring squid draggers, 58 permitted fluke draggers, and 32 black sea bass potters work Nantucket Sound, and also that 11 of the State's weirs are in Nantucket Sound (id. at 11). Mr. Weissman asserted that the fish surveys conducted by Cape Wind were inadequate to characterize the fishery (id. at 7-10). Aside from effects on fish habitat, Mr. Weissman expressed concern about the ability of draggers and trollers to maneuver among the turbines while towing their nets and lines (id. at 19).

Mr. Weissman characterized Horseshoe Shoal as a large, well-established fish aggregating structure with considerable physical stability (id. at 14; Tr. 12, at 1696-1697). Mr. Weissman stated that the catch in Nantucket Sound annually returns some tens of millions of dollars to local fishermen and is important to the economy of Cape Cod and to Massachusetts (Exh. APNS-MW at 13). Mr. Weissman asserted that construction activities would cause mortality of benthic fauna, eggs, and juvenile fish, and would also cause dispersal of juvenile and adult fish and invertebrates (id. at 17).

Mr. Weissman asserted that the proposed turbine pilings would likely create continuous turbulence, erosion, and gullying due to strong tidal currents moving across Horseshoe Shoal (Exh. APNS-MW at 16; Tr. 12, at 1689-1690). He asserted that the existing shoal structure would likely be disrupted and replaced by large gullies and ridges (Exh. APNS-MW at 16, 18). Also, Mr. Weissman asserted that some fish species are attracted to vertical structures but that others avoid them (Tr. 12, at 1691). Mr. Weissman asserted that the import of such changes cannot be determined at this time but could be detrimental or beneficial (Exh. APNS-MW at 16, 18).

3. Analysis

As highlighted by Dr. LeGore, field studies of sea bottom life at Horseshoe Shoal have been limited, at least as reflected in the record of this case. The Company's argument that benthic habitat conditions are homogeneous is difficult to confirm without an extensive analysis of many sampling locations. However, it is not the role of the Siting Board to determine the scale and design of studies of the risk to fisheries posed by the proposed turbines, which are located outside of state waters. Benthic and fisheries studies will be evaluated by the ACOE as part of its review of the wind farm.

It is difficult to predict the scope of benthic and fishery implications of installing the turbines and connecting cables. The installation may alter the species composition in the area immediately surrounding the monopiles; however, the record does not demonstrate that the benthic and fishery impacts of the wind farm would extend beyond the area of the turbines. Mr. Weissman points out that Horseshoe Shoal in its present configuration is a beneficial feature from the point of view of fish and fisheries; consequently, any alteration carries with it some risk of disturbance to the existing marine community. However, the record provides no clear indication whether and to what extent any changes caused by the project would be, on balance, beneficial or harmful to the marine benthic community, shellfish, finfish, or fisheries.[146] The Siting Board therefore makes no finding with respect to the wind farm's impact on fisheries.

E. Birds

1. Company

The Company's witness, Paul Kerlinger, Ph.D., stated that he participated in a number of field and literature studies related to avian risk associated with the proposed wind farm (Exh. CW-PK-1-R, Att. A at 3). Dr. Kerlinger contended that avian risks would be low because: (1) bird use of Horseshoe Shoal is relatively low; and (2) the bird species that are present are not

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146 The Siting Board notes that a small number of fossil-fueled generators, primarily those that use once-through cooling, have significant negative fisheries impacts. However, since these plants are only a fraction of the New England generating fleet, we do not include off-setting fisheries impacts from displaced generation in our analysis of the environmental need for the wind farm.

likely to collide with the turbine rotors (id. at 4). Dr. Kerlinger also contended that generating electricity with wind power would have advantages for birds, compared to combustion of coal, oil, and natural gas (id. at 4 to 8).

Dr. Kerlinger contended that among a dozen or more wind power facilities in the United States, excluding Altamont Pass, California, estimated avian fatalities have averaged about two birds per turbine per year (id. at 10). Dr. Kerlinger stated that bird mortality was low at wind power sites in Minnesota and Montana that he characterized as having relatively high use by waterfowl and raptors (id. at 11). Dr. Kerlinger indicated that wind turbines in California and in Spain had high raptor mortality (id.; Tr. 20, at 2704). He stated that these areas had dense resident and/or migratory populations of raptors that used the areas of the turbines (Exh. CW-PK-1-R, Att. A at 12; Tr. 20, at 2704). Dr. Kerlinger speculated that the high bird mortality at the Altamont Pass wind power site may be due to the close spacing of turbines, the irregular topography of the site, and unusually high level of site use by raptors (Exh. CW-PK-1-R, Att. A at 13, 15). Dr. Kerlinger stated that migrating songbirds have had large-scale fatality events from communication towers (Tr. 20, at 2693-2694). He stated that the vast majority of avian fatalities from communication towers have occurred at towers taller than 500 feet with guy wires and Federal Aviation Administration ("FAA") lighting that does not blink; some fatalities also occur at other types of towers which have associated spotlights or sodium vapor lamps (Exh. CW-PK-1-R, Att. A at 21). Dr. Kerlinger indicated that the FAA requires flashing lights on wind turbines, rather than steady lighting (id. at 22)

The Company described the Cape Wind turbines as having blades extending from 75 feet above the water surface to 416 feet high, and as being spaced at least 1400 feet apart (id. at 15). The Company calculated the collision probability for birds flying through the plane of the rotor of a single turbine, for representative species. The Company calculated that the chance of a blackpoll warbler being hit by a blade is less than one percent, while a much larger black-backed gull flying through the same area would have a 5.6 % chance of being hit by a blade; these calculations assume no evasive action by the birds (Exh. EFSB-RR-71).

Dr. Kerlinger discussed the likelihood of collision risk among various orders of birds, in the context of the Horseshoe Shoal site. Birds that might be present include various groups of

waterbirds including seabirds, waterfowl, and shorebirds; raptors; and migrating landbirds. He stated that loons, grebes, and alcids are not common in the area, and furthermore tend to fly low over water, suggesting that these birds would not be struck by a blade (Exh. CW-PK-1-R, Att. A at 15, 20). Among pelagic seabirds, Dr. Kerlinger indicated that gannets tend to fly as high as the rotor-swept area, but these birds are not generally abundant in Nantucket Sound (id. at 22; Tr. 20, at 2691).

Dr. Kerlinger stated that a quarter million long-tailed ducks roost in Nantucket Sound in the winter but conceded that the nocturnal location of long-tailed ducks within Nantucket Sound is not well established (Tr. 20, at 2708-2713). He stated that long-tailed ducks and other sea ducks such as scoters and eiders fly low over water, generally below 50 feet, and that some of these species have been observed in Europe to fly around wind turbines (Exh. CW-PK-1-R, Att. A at 15, 20; Tr. 20, at 2688-2689). On the other hand, he stated that brant tend to migrate at a very high elevation (Tr. 20, at 2691).

Dr. Kerlinger indicated that shorebirds coming off the east coast of North America generally reach altitudes above 1000 feet within a few miles of the shoreline (id. at 2697). He asserted that piping plover and least terns, which are protected species, do not forage in the area and rarely fly over Horseshoe Shoal, based on species habitat preferences (Exh. CW-PK-1-R, Att. A at 18). He also asserted that these species have not been shown to be collision prone (id.). Dr. Kerlinger indicated that there is some overlap between the height at which foraging terns fly and the lower end of turning blades (Tr. 20, at 2714-2715). He indicated that roseate terns departing staging areas at Monomoy Island at the end of the summer would tend to fly out over the Atlantic, and would therefore tend to miss Horseshoe Shoal (id. at 2686). However, Dr. Kerlinger did not offer information on the arrival time or direction of arrival of terns in the spring (id. at 2686-2687). Gulls, which are common in the area, and cormorants tend to fly higher over water than most other waterbirds; consequently, they would be at the height of blades more often than other birds; however, Dr. Kerlinger indicated that these birds typically do not collide with turbines or towers in other locations (Exh. CW-PK-1-R, Att. A at 34-35; Tr. 20, at 2691).

Dr. Kerlinger stated that raptors rarely migrate across Horseshoe Shoal, preferring to take routes over land as much as possible (Exh. CW-PK-1-R at 15; Tr. 20, at 2681-2683). Dr. Kerlinger stated that migrating songbirds tend to fly higher over water than over land (Tr. 20, at 2697). Dr. Kerlinger predicted that because the wind turbines and the ESP would lack steady and intense lighting, would lack guy wires, and would be less than 500 feet tall, the turbines would not attract significant numbers of night flying migratory birds (Exh. CW-PK-1-R, Att. A at 21; Tr. 20, at 2719-2720).

Dr. Kerlinger stated that data from the National Wind Coordinating Committee indicate that an average of about 2 birds are killed per turbine per year (Exh. EFSB-RR-80). He stated that turbines at the Waddensee, a coastal lake in the Netherlands with a high level of bird activity, kill an average of 0.04 to 0.14 birds per turbine per day, which is 8 to 25 times higher than the North American average (Tr. 20, at 2706). He indicated that in his opinion, the wind farm would have mortality rates lower than those at the Waddensee (id. at 2705-06). Allowing for uncertainties, Dr. Kerlinger expressed confidence that bird mortality from the wind farm would not exceed 4 birds killed per turbine per year (id. at 2708).

Asked for comparisons, Dr. Kerlinger provided estimates based on research conducted by others (Exh. EFSB-RR-80). He cited information that free ranging cats kill many birds, with an estimate from Wisconsin of between 3.9 and 143 birds killed per cat per year (id.). He cited studies of bird mortality from collisions with windows, yielding estimates ranging from 0.65 to 33 birds killed per house per year (id.). As an average among a thousand television broadcast towers over 800 feet in height, Dr. Kerlinger provided an estimate of 1250 birds killed per tower per year (id.).

Dr. Kerlinger indicated an understanding that fossil fuel use was detrimental to bird populations (Exh. CW-PK-1-R, Att. A at 6-8; Tr. 20, at 2719).

2. Alliance

The Alliance's witness, Michael Morrison, Ph.D., also provided testimony on potential impacts to birds. Dr. Morrison indicated that wind turbines at Altamont Pass, California, have a high incidence of bird kills (Exh. APNS-MLM at 2). He asserted that there are virtually no data

on the impact of offshore wind developments on birds, and no data on wind farms of the size proposed (id. at 2). Dr. Morrison also asserted that standard guidelines recommend multiple years of intensive, rigorous avian data collection prior to wind farm construction (id. at 3). Dr. Morrison contends that insufficient data have been collected in the project area on bird abundance, bird movement, and bird behavior, and that the data that have been collected are flawed (id. at 3, 4).

Dr. Morrison asserted that Dr. Kerlinger's statements about a lack of mortality from towers less than 500 feet tall are untested due to an absence of long-term studies of such towers (id. at 27). Dr. Morrison also indicated that existing data on bird collisions at wind farms in North America come primarily from the west, which, he suggested, would not represent conditions in the east (id. at 27, 28).

Dr. Morrison stated that studies from Altamont Pass indicate that turbines with a larger rotor-swept area tend to kill more birds than do smaller turbines (Tr. 19, at 2470). He also stated that most of the bird fatalities occur at a small number of turbines in particular locations, usually near the end of a ridge (id. at 2474). Dr. Morrison said studying bird mortality at offshore wind parks in Europe was difficult because stricken birds sink or get eaten immediately (id. at 2476).

Dr. Morrison indicated that he was unable to estimate the potential hazard to birds from the Cape Wind turbines due to inadequate data (id. at 2555-2556). In response to additional questioning, Dr. Morrison stated that avoidance of air pollution would be beneficial to birds, and that extraction of fossil fuels has potential negative impacts on bird habitat (id. at 2527-2529).

3. Analysis

Cape Wind has provided evidence leading to a conclusion that bird mortality associated with operation of the wind farm would be no more than four birds per turbine per year, which is relatively low compared to some other hazards to birds. The Alliance has challenged this estimate, arguing primarily that the available bird studies were not sufficiently thorough to make accurate projections.

As of the close of the record, actual field studies of bird usage of Horseshoe Shoal were limited. Nevertheless, the record does contain an evaluation of potential risks of avian mortality

based on a combination of field visits, historical knowledge of regional bird activity, characteristic behavior of birds using the area, and observed mortality due to structures including wind turbines at other locations. The record shows that there is high raptor mortality at the Altamont Pass wind turbines associated with high raptor use of the area. The record shows that circumstances at Horseshoe Shoal would differ from those at Altamont Pass, so that high raptor mortality would not be expected. The witness for Cape Wind provided information sufficient to support an estimate of mortality of no more than four birds per turbine per year; this translates to no more than 520 birds per year in aggregate. The record shows that this mortality rate is relatively low compared to some other hazards faced by bird life.

However, there are some factors that have not been adequately determined to date. Specific uncertainties identified during the hearings include the circumstances of tern arrival in the spring; the vulnerability of foraging roseate and common terns to rotor collisions; and the spatial distribution within Nantucket Sound of the large winter population of roosting long-tailed ducks. Behavior of brant around turbines may need to be investigated as well. Also, there is uncertainty as to the possibility of high mortality events in atypical weather conditions. Some of these issues may well be resolved in ongoing proceedings before other federal and state regulatory agencies.

Based on the record, the Siting Board finds that the wind farm would cause avian mortality, but that the mortality would be modest relative to some other causes of avian mortality. Uncertainty remains as to the wind farm's likely effects on several avian species. The Siting Board notes that the record contains only qualitative information on the potential benefits to birds of reduced operation of existing fossil-fueled generating facilities, based on air emissions and oil spills. Moreover, in past reviews of generating facilities, the Siting Board has not investigated adverse impacts on birds either from emissions or fuel handling; therefore, it cannot draw on its findings in those cases. The Siting Board therefore makes no finding as to the extent of any benefits to bird populations resulting from the displacement of other power plants by the wind farm.

F. Visual Impacts

1. Company

The Company indicated that the proposed wind farm would consist of 130 wind turbines, each approximately 420 feet in height from the water to the top of the blade, arrayed over an approximately 24 square mile area of Horseshoe Shoal in Nantucket Sound (Exhs. CW-1, at 1-3; CW-2, at 2-2 to 2-3; EFSB-SS-22-S, Att. at Table 5-6; EFSB-RR-22; EFSB-RR-23). The closest land locations in different directions from the wind farm include Point Gammon in Yarmouth, 4.7 miles to the north, Cape Poge on Martha's Vineyard, 5.5 miles to the southwest, and points in Nantucket approximately 11 miles to the south and southeast (Exhs. EFSB-RR-22, Att.; EFSB-RR-23, Att.).

The Company stated that the theoretical maximum distance of visibility of a 420-foot structure located at sea, from a point 10 feet above sea level, is approximately 27.1 nautical miles, or 31.2 statute miles, based on standard visibility charts (Exh. EFSB-RR-22). Charts provided by the Company show that all of Nantucket Sound is within 27.1 nautical miles of Horseshoe Shoal (Exh. EFSB-1).

The Company asserted that a number of factors would affect the visibility of the wind farm, including sky cover, curvature of the earth, color of the turbines, and presence of line-of-sight obstructions (Exh. EFSB-RR-22). The Company provided visual simulations from twelve representative locations on Cape Cod, Martha's Vineyard and Nantucket, at distances from the wind farm ranging from 5.4 miles to 14.1 miles (Exh. EFSB-RR-22, Att.). Wind turbines are generally visible in the simulations, although their appearance varies based on the context of respective views (id.).[147, 148] The Company stated that the simulations are

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147 The vertical and horizontal scale of the wind farm, as it appears in the view simulations, varies based on the distance from the vantage point to the wind turbines (Exh. EFSB-RR-22, Att.). For example, in the views from the closest vantage points, the wind turbines along the horizon generally extend to all or nearly all of the view field, while in the most distant views they generally extend to a portion of the view field (id.). The varying width of the wind farm, as seen from different vantage points measured perpendicular to the line of sight, also affects how much of the view field in each simulation is encompassed by the array of wind turbines (id.). The total view field of

(continued...)

conservative, in that the sky cover conditions are assumed to be clear in all of the views (Exh. EFSB-RR-22).

2. Analysis

The Company has provided visual simulations indicating that the wind farm's turbines would be visible from points on the surface of Nantucket Sound, excepting some shoreline embayments, and from points on Cape Cod, Martha's Vineyard, and Nantucket with water views toward Horseshoe Shoal. The Company's simulations suggest that the appearance of the wind farm would vary based on distance and other factors. As seen from the nearest vantage points in the Company's analysis – generally coastal points located five to seven miles away in Barnstable and Yarmouth on Cape Cod and on the northeast side of Martha's Vineyard – the wind farm would appear as extending over a substantial portion of the seaward horizon in each simulation, creating significant visual impacts.

The Company argued that visual impacts have been analyzed assuming clear conditions – a worst-case assumption. While it is true that clear conditions are present only part of the time, no evidence has been provided as to the percent of time visibility might be less than shown, or the extent to which visual impacts might be reduced under conditions of impaired visibility. Consequently, the Siting Board finds that the wind farm turbines would be visible from onshore and offshore locations, and that their appearance would vary based on distance and other factors, including weather.[149]

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147 (...continued)
each of the simulations in the Company's analysis is identified, and ranges from 38.7 degrees to 44 degrees (id.).

148 The Company stated that the wind turbines would be blue-gray (Exh. EFSB-RR-22, Att.; Tr. 20, at 2756). However, the Company noted that the wind turbines appear black in several of the views with the position of the sun behind the facilities, and white in several of the views with the position of the sun behind the vantage point (Exh. EFSB-RR-22, Att.; Tr. 20, at 2756-2757).

149 The Siting Board notes that operation of the wind farm could reduce the frequency with which steam plumes from existing power plants are seen, and could preclude or delay the (continued...)

G. Conclusions on Environmental Need

In the sections above, the Siting Board has considered certain direct and indirect environmental impacts of the construction and operation of the wind farm, with a view towards determining whether the energy from the wind farm is needed for environmental purposes.[150] The record clearly documents significant and lasting air quality benefits resulting from the wind farm's displacement of other, primarily fossil-fueled, generators.

However, to conclude that the wind farm project will provide environmental benefits, these air quality benefits must be balanced with identified noise, visual, avian, and fisheries impacts, and with the potential for other impacts and benefits. As discussed above, the onshore noise impacts of the wind farm would be minimal, as it would not result in a perceptible increase in overall noise levels at onshore locations. Simulations contained in the record suggest that the wind farm would result in significant visual impacts in nearby waters and some onshore areas under clear conditions; the extent, if any, to which visual impacts might be less than simulated (e.g., in reduced-visibility weather) was not demonstrated. Operation of the wind farm would result in relatively modest avian mortality. The direct impacts of the wind farm on fisheries are unknown, and could be positive or negative.

The wind farm may have other indirect benefits, although these are not well-defined in the record. As discussed above, operation of the wind farm may result in the less frequent operation of existing generators with significant noise impacts, and may indirectly benefit bird populations by reducing impacts on birds from fossil-fueled generation (e.g., impacts from spills related to fuel delivery). However, the extent of these benefits cannot be assessed based on the

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149 (...continued)
development of a new power plant with associated visual impacts in another location. However, based on the current record, no assessment was made of the extent to which visual impacts from generation in other locations might be reduced.

150 The Siting Board notes that the environmental benefits of renewable energy facilities generally are reflected in the legislature's enactment of the RPS statute. The need for energy from the wind farm to meet RPS is addressed in Section A-III, above.

existing record.[151]

Overall, the Siting Board concludes that the air quality benefits of the wind farm are significant, and important for Massachusetts and New England. Available evidence indicates the air quality benefits of the wind farm likely would outweigh its noise and avian impacts. Several other indirect benefits are likely to favor the wind farm, although they cannot be given any significant weight in light of the limitations of the record. Beyond these, the potential for significant visual impacts from the wind farm remains, and there is uncertainty regarding the nature and extent of direct impacts on fisheries. The Siting Board notes that, with further analysis clarifying uncertainties as to fisheries impacts and fully addressing visual impacts,[152] a finding that environmental benefits outweigh other environmental impacts might well be supportable. However, on this record, the Siting Board can reach no conclusion as to whether, overall, the environmental benefits of the wind farm outweigh its environmental impacts. The Siting Board therefore makes no finding with respect to the need for the energy from the wind farm for environmental purposes.

A-VI. Conclusion on Alternative Need Analysis

The Siting Board has found that there is a need for the power provided by the wind farm beginning in 2007 for reliability purposes. The Siting Board also has found that: (1) there is a need for additional renewable resources to meet the requirements of the Massachusetts RPS beginning in 2006; (2) there is a need for the full renewable output of the wind farm to meet the requirements of the Massachusetts RPS beginning in 2010; and (3) there is a need for the renewable resources provided by the wind farm to meet regional RPS beginning in 2006. The Siting Board further has found that there is a need for the power generated by the wind farm

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151 In addition, certain impacts that would seem important to a broad-based environmental need analysis (e.g., indirect water use or water quality benefits) were not developed in this record. The absence of record evidence on these impacts and benefits hinders the analysis in this case.

152 Such further analysis may be developed by other permitting agencies in their environmental analysis of the wind farm.

for economic purposes during the first five years of operation. Finally, the Siting Board has made no finding with respect to the need for the energy from the wind farm for environmental purposes. Based on the findings above, the Siting Board finds that the power from the wind farm is needed on reliability and economic grounds, and to meet the requirements of Massachusetts and regional renewable portfolio standards.

In Section II.A.4, above, the Siting Board has found that the existing transmission system is inadequate to interconnect the wind farm. Accordingly, the Siting Board finds that additional energy resources are necessary to accommodate this new power plant.

The Company has established that: (1) the power from the non-jurisdictional wind farm is needed on reliability, economic, and other grounds; and (2) the existing transmission system is inadequate to interconnect the wind farm and, thus, that additional energy resources are necessary to accommodate this new power plant. Consequently, the Siting Board finds that the Company has established need for the proposed transmission line, consistent with our Turners Falls/MECo/ NEPCo precedent.

APPROVED by a majority of the Energy Facilities Siting Board at its meeting of May 10, 2005, by the members and designees present and voting. Voting for approval of the Tentative Decision, as amended: Paul G. Afonso (Chairman, DTE/EFSB), W. Robert Keating (Commissioner, DTE); David L. O'Connor, (Commissioner, Division of Energy Resources); James Stergios (for Ellen Roy Herzfelder, Secretary of Environmental Affairs) and Louis A. Mandarini, Jr., Public Member. Voting against the approval of the Tentative Decision, as amended: Judith F. Judson (Commissioner, DTE) and Deborah Shufrin (for Ranch Kimball, Secretary, of Economic Development).

Paul G. Afonso, Chairman
Energy Facilities Siting Board

Dated this 10th day of May, 2005

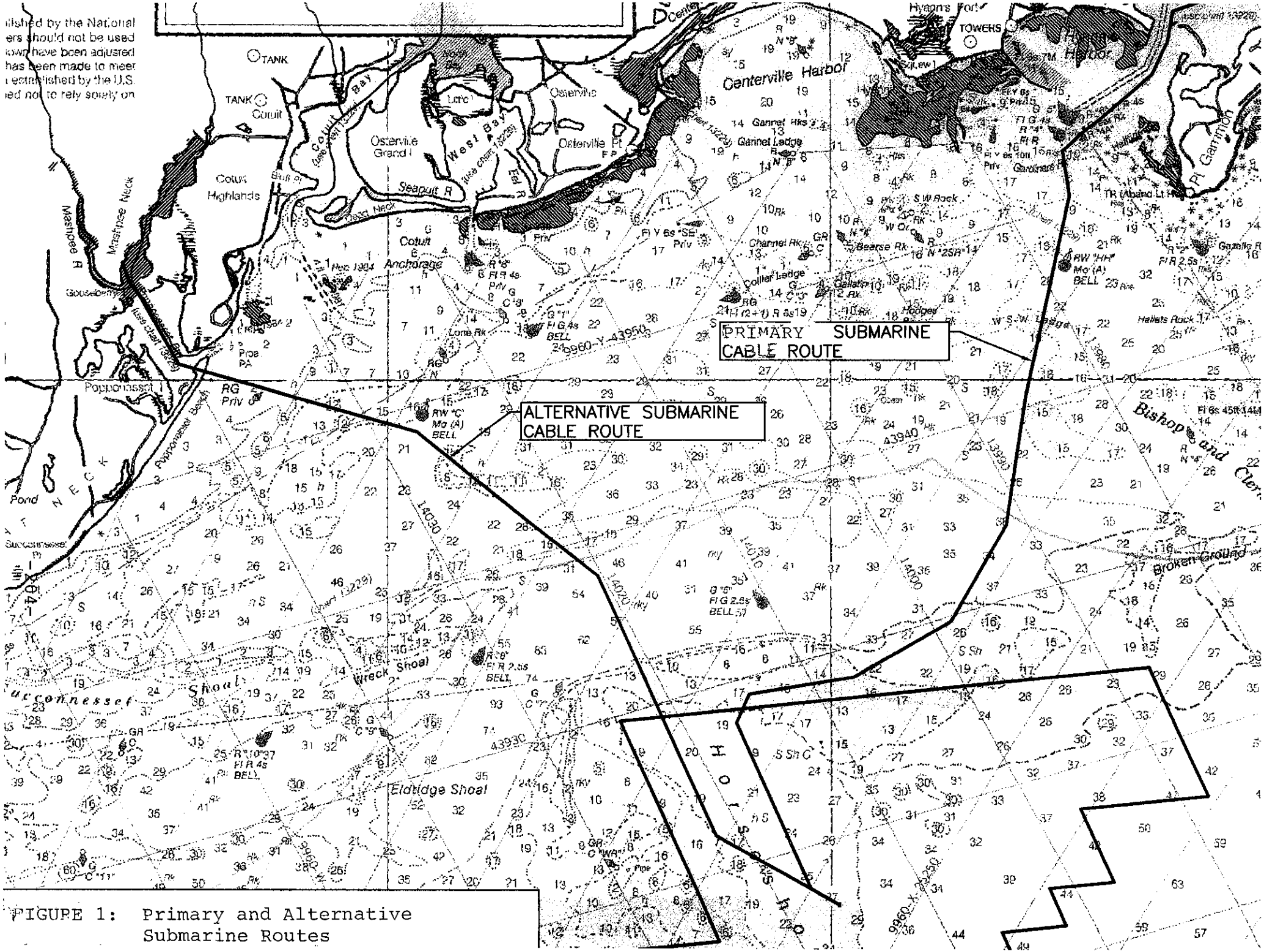
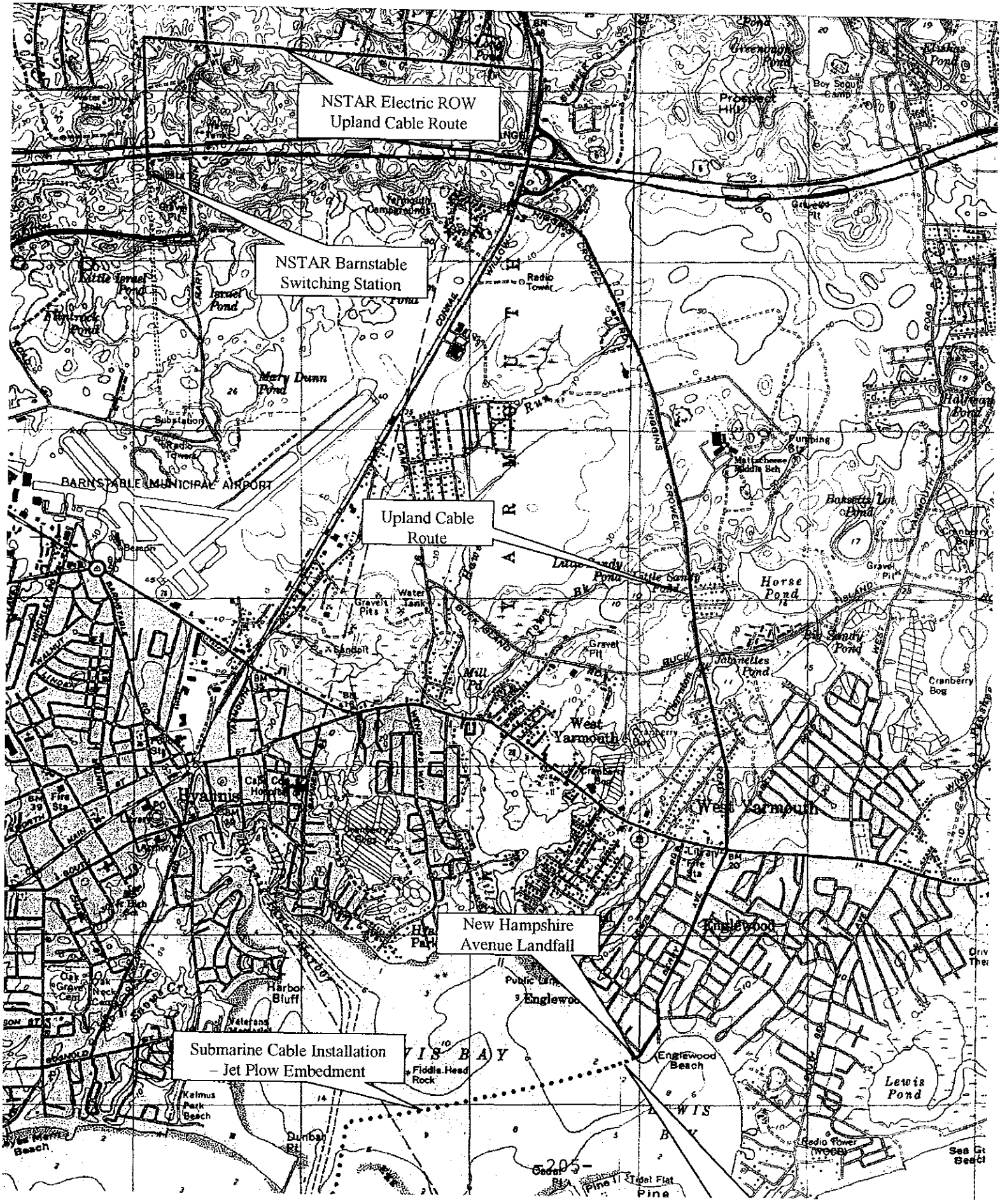


FIGURE 1: Primary and Alternative Submarine Routes

FIGURE 2: Primary Land Route



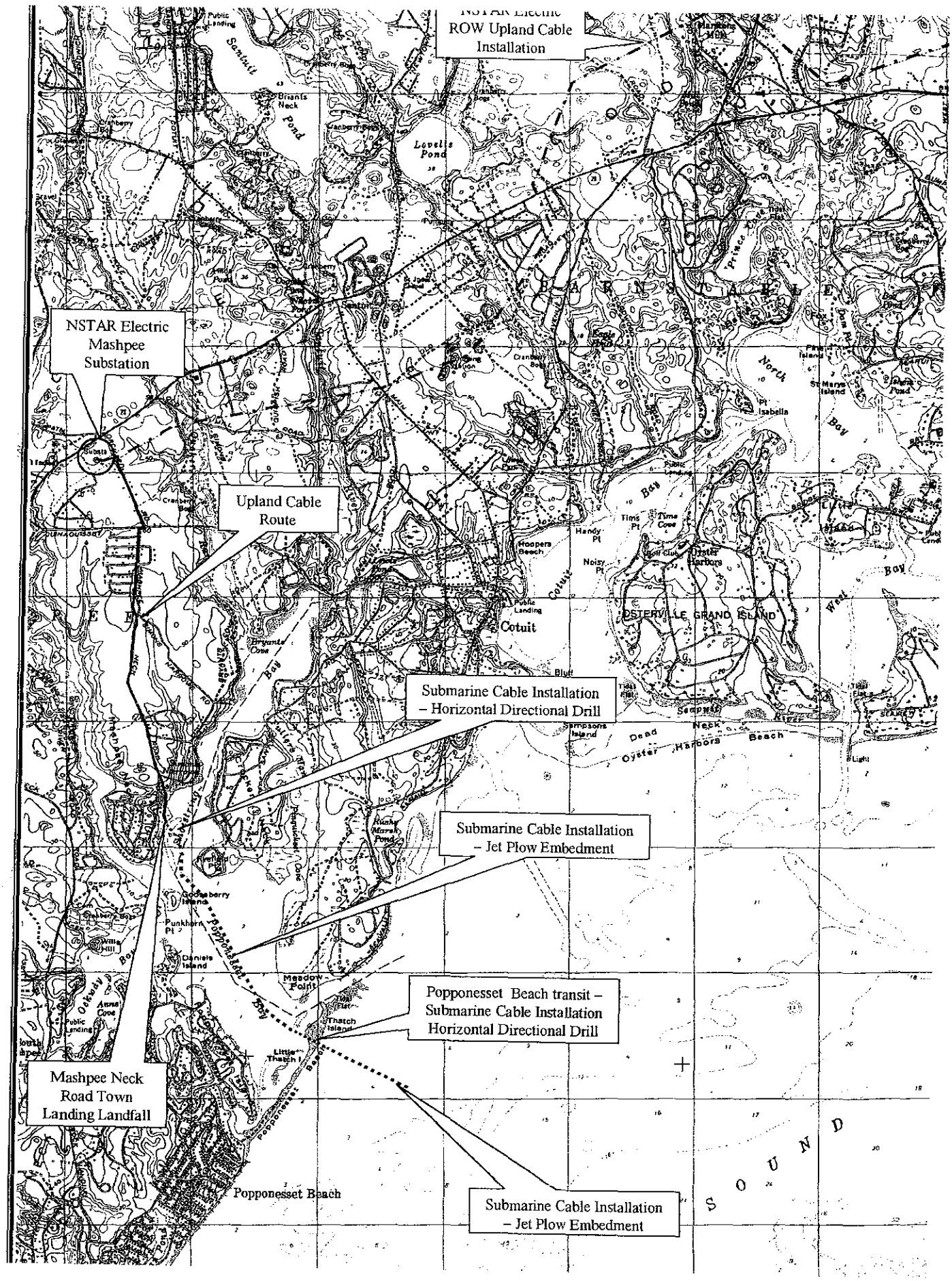


FIGURE 3: Alternative Land Route - Western Portion

FIGURE 4: Alternative Land Route - Eastern Portion

COMMONWEALTH OF MASSACHUSETTS
Energy Facilities Siting Board

In the Matter of the Petition of The Berkshire Gas Company for Approval to Construct Natural Gas Distribution Lines in Northampton and Hatfield, Massachusetts	EFSB 05-1

FINAL DECISION

Selma Urman
Presiding Officer
January 13, 2006

On the Decision:
Barbara Shapiro
John Young

APPEARANCES: James M. Avery, Esq.
Jennifer M. Kiely, Esq.
Brown Rudnick Berlack Israels LLP
One Financial Center
Boston, Massachusetts 02111
FOR: The Berkshire Gas Company
Petitioner

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FIGURE 1: Map of Primary and Alternative Routes

LIST OF ABBREVIATIONS

Berkshire	The Berkshire Gas Company
1999 Berkshire Gas Decision	Berkshire Gas Company, 9 DOMSB 1 (1999)
1998 Cabot Power Decision	Cabot Power Corporation, 7 DOMSB 233 (1998)
CELCo Decision	Cambridge Electric Light Company, 12 DOMSB 305 (2001)
ComElec Decision	Commonwealth Electric Company, 5 DOMSB 273 (1997)
Company	The Berkshire Gas Company
dBA	decibels, A-weighted
degree days	heating degree-days
Department	Massachusetts Department of Telecommunications and Energy
DPW	Department(s) of Public Works
Dth	dekatherms
2002 F&SP	Berkshire's March 15, 2002 Forecast and Supply Plan, approved by the Department in February 2003
2005 F&SP	Berkshire's January 31, 2005 Forecast and Supply Plan
EFSB	Massachusetts Energy Facilities Siting Board
G.L.	General Laws (of Massachusetts)
HDD	Horizontal directional drilling
I-91	Interstate Route 91
2003 KeySpan Decision	Colonial Gas Company d/b/a KeySpan Energy Delivery New England, 14 DOMSB 49 (2003)
Laurel Compressor	Laurel compressor station in Northampton
LNG	liquified natural gas

MAOP	Maximum Allowable Operating Pressure
Mcfh	thousand cubic feet per hour
MDQ	maximum daily quantity
MECo/NEPCo Decision	Massachusetts Electric Company and New England Power Company, 18 DOMSC 383 (1989)
MHC	Massachusetts Historical Commission
MHD	Massachusetts Highway Department
MMWEC Decision	Massachusetts Municipal Wholesale Electric Company, 12 DOMSB 18 (2001)
1998 NEPCo Decision	New England Power Company, 7 DOMSB 339, at 357 (1998)
NHESP	Massachusetts Natural Heritage and Endangered Species Program
NPV	net present value
2005 NSTAR Electric Decision	Boston Edison Company, d/b/a NSTAR Electric, 14 DOMSB 233 (2005)
2001 NSTAR Gas Decision	NSTAR Gas Company, 13 DOMSB 143 (2001)
propane air	a mixture of propane and air
psig	pounds per square inch, gauge
ROW	right-of-way
pipeline-with-load-management alternative	serve UMass with pipeline gas to 51 degree days
Siting Board	Massachusetts Energy Facilities Siting Board
Tennessee	Tennessee Gas Pipeline Company
total pipeline alternative	serve UMass with pipeline gas to 76 degree days
UMass	University of Massachusetts at Amherst

The Energy Facilities Siting Board hereby APPROVES, with conditions, the petition of The Berkshire Gas Company to construct new natural gas pipeline facilities approximately 3.6 miles in length in the City of Northampton and the Town of Hatfield, Massachusetts.

I. INTRODUCTION

A. Summary of the Proposed Project

The Berkshire Gas Company ("Berkshire" or the "Company") is a local gas distribution company that provides natural gas service to customers in twenty communities in western Massachusetts (Exh. BGC-1 at 2-1 and Att. 2A; EFSB-N-1, Att. at 5). These communities are served by three separate divisions of Berkshire's distribution system, the Greenfield, Pittsfield and North Adams Divisions (Exh. BGC-1 at 2-1 and Att. 2A). The Company proposes to build 3.6 miles of 12-inch diameter pipeline ("proposed project" or "proposed pipeline") in Northampton and Hatfield to accommodate a substantial anticipated incremental demand in connection with a planned new heating plant at the University of Massachusetts at Amherst ("UMass") while maintaining adequate distribution system pressures (id. at 1-1, 1-2, 3-1; Exh. EFSB-G-4).[1]

For most of its route, the proposed pipeline would follow existing 6-inch distribution lines (Exh. BGC-1 at Att. 1-A). The proposed pipeline would begin at the Company's existing pipeline at the intersection of the Northampton Bike Path and Hatfield Street in Northampton and proceed northeasterly along Hatfield Street to the intersection with North King Street, and then proceed north along North King Street to the intersection with Hatfield Road (Exh. EFSB-G-1). The new pipeline would then proceed northeasterly under Interstate Route I-91 ("I-91") and the Springfield Terminal Railway and into Hatfield (id.). In Hatfield, the pipeline would proceed northeasterly along Elm Court to the intersection with Elm Street and then east on Elm Street to the intersection with Prospect Street where the new pipeline would connect with an existing Company pipeline (id.). The proposed pipeline would have a Maximum Allowable Operating Pressure ("MAOP") of 200 pounds per square inch, gauge ("psig") (Exh. EFSB-G-3).

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[1] Berkshire stated that it would also install a 2600-foot service line within the UMass campus to serve the new load at UMass (Exh. EFSB-G-3).

B. Procedural History

On April 11, 2005, Berkshire filed with the Energy Facilities Siting Board ("Siting Board") its petition to construct the proposed project. The Siting Board docketed the matter as EFSB 05-1.

On April 27, 2005, the Presiding Officer directed the Company to supplement its initial petition with an analysis of the environmental impacts of the proposed project and a description of any proposed mitigation to address these impacts (April 27 Siting Board Letter to Company at 1-2). On May 4, 2005, the Company submitted the requested information.

In accordance with the direction of the Presiding Officer, Berkshire provided Notice of Public Comment Hearing and Adjudication. On June 7, 2005, the Siting Board conducted a public comment hearing in Northampton regarding the proposed project. The Siting Board received no petitions to intervene or participate in the proceeding.

The Siting Board conducted two days of evidentiary hearings in this proceeding on September 20 and 21, 2005. Berkshire presented the testimony of three witnesses: Richard E. Nasman, Director of Operations for Berkshire; David M. Grande, Manager of Operations for Berkshire; and André L. Gonthier, Manager of Civil Engineering and Permits/Project Manager for Northstar Industries, Inc.

The Presiding Officer entered approximately 130 exhibits into the record consisting primarily of information request responses and record request responses. On October 17, 2005, the Company submitted a brief.

C. Jurisdiction and Scope of Review

Berkshire filed its petition to construct a natural gas pipeline in accordance with G.L. c. 164, § 69H, which requires the Siting Board to implement the energy policies in its statute to provide a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost, and pursuant to G.L. c. 164, § 69J, which requires a project applicant to obtain Siting Board approval for the construction of proposed energy facilities before a construction permit may be issued by another state agency.

As a new pipeline over one mile in length intended for the transmission of natural gas, Berkshire's proposed project falls within the definition of "facility" set forth in G.L. c. 164, § 69G, which provides that a "facility" includes:

> a new pipeline for the transmission of gas having a normal operating pressure in excess of 100 pounds per square inch gauge which is greater than one mile in length except restructuring, rebuilding, or relaying of existing transmission lines of the same capacity.

G.L. c. 164, § 69G.

Before approving a petition to construct facilities, the Siting Board requires an applicant to justify its proposal in three phases. G.L. c 164, § 69J. First, the Siting Board requires the applicant to show that additional energy resources are needed (see Section II.A, below). Next, the Siting Board requires the applicant to establish that, on balance, its proposed project is superior to alternative approaches in terms of cost, environmental impact, reliability, and ability to address the identified need (see Section II.B, below). Finally, the Siting Board requires the applicant to show that it has considered a reasonable range of practical facility siting alternatives and that the proposed site for the facility is superior to a noticed alternative site in terms of cost, environmental impact, and reliability of supply (see Section III, below).

II. ANALYSIS OF THE PROPOSED PROJECT

A. Need Analysis

1. Standard of Review

In accordance with G.L. c. 164, § 69H, the Siting Board is charged with the responsibility for implementing energy policies in its statute to provide a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost. G.L. c. 164, § 69H. In carrying out this statutory mandate with respect to proposals to construct natural gas pipelines, the Siting Board evaluates whether there is a need for additional natural gas pipelines in the Commonwealth to meet reliability, economic efficiency, or environmental objectives. See Colonial Gas Company, d/b/a KeySpan Energy Delivery New England, 14 DOMSB 49, at 58 (2003) ("2003 KeySpan Decision"); NSTAR Gas Company, 13 DOMSB

143, at 153 (2001) ("2001 NSTAR Gas Decision"); Massachusetts Electric Company and New England Power Company, 18 DOMSC 383, at 393 (1989) ("MECo/NEPCo Decision").

In evaluating the need for new energy facilities to meet reliability objectives, the Siting Board may evaluate the ability of its existing system to accommodate changes in aggregate demand or supply,[2] to serve major new loads, or to maintain reliable service in certain contingencies. The Siting Board previously has approved proposals to construct gas pipelines to accommodate load growth within a utility's service territory (Boston Gas Company, 17 DOMSC 155 (1988)) and to transport natural gas to generating facilities. See 2001 NSTAR Gas Decision, 13 DOMSB at 149; Berkshire Gas Company (Phase II), 20 DOMSC 109 (1990); Bay State Gas Company, 21 DOMSC 1 (1990)). In such cases, the proponent must demonstrate that additional energy resources are necessary to meet reliability objectives by establishing that its existing system is inadequate to serve the anticipated load with acceptable reliability.

2. Description of the Existing System

Berkshire indicated that its Greenfield Division provides natural gas to 8500 customers located in Greenfield, Montague, Deerfield, Sunderland, Whately, Hatfield, Hadley, and Amherst (Exh. BGC-1, at 2-1, Att. 2-A). Berkshire receives natural gas at the Northampton Gate Station in Northampton, supplied from the Northampton Lateral in the Tennessee Gas Pipeline Company ("Tennessee") system (id.). The Northampton Lateral also provides service to Bay State Gas Company, Westfield Gas & Electric Light Department, and Holyoke Gas & Electric Department (id. at 2-1). The Greenfield Division is also supplied with liquified natural gas ("LNG") that is injected at Berkshire's Whately LNG Facility (Exh. BGC-1, at 2-2). The Greenfield Division distribution system operates at pressures up to its MAOP of 200 psig (id.; Tr. 1, at 14).

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[2] With respect to changes in demand or supply, the Siting Board has found that new capacity is needed where projected future capacity available to the system is found to be inadequate to satisfy projected load and reserve requirements. ANP Blackstone Energy Company, 8 DOMSC 1, at 27 (1999); Cabot Power Corporation, 7 DOMSB 233, at 249 (1998) ("1998 Cabot Power Decision"); New England Electric System, 2 DOMSC 1, at 9 (1977).

The Greenfield Division is served by the Greenfield Feedline, which originates at the Northampton Gate Station and proceeds north approximately 22 miles to Greenfield, and by the Amherst Feedline, which branches off the Greenfield Feedline to serve the Amherst area (Exh. BGC-1, at 2-1, 2-2). The Greenfield Feedline consists of 6-inch diameter pipe for its full length, together with 8-inch or 12-inch loop pipeline paralleling three miles northward from the Northampton Gate Station and also one mile northward from the Laurel Compressor (id. at 2-1, Att. 3-A). The Laurel Compressor (a.k.a. the Northampton compressor station) is located five miles north of the Northampton Gate Station (id. at 2-2).

Berkshire stated that Tennessee is obligated to provide gas to Berkshire at a minimum pressure of 100 psig at the Northampton Gate Station, and in amounts up to Berkshire's contractual delivery limitation or maximum daily quantity ("MDQ") of 12,380 dekatherms ("Dth") (Exh. BGC-1, at 2-1; Exh. EFSB-G-10). The Company stated that Tennessee's Northampton Lateral is currently operating at full capacity (Exh. BGC-1, at 2-1).[3] The pressure at the outlet of the Northampton Gate Station is normally maintained at 200 psig, which is the MAOP of the Greenfield Feedline (Exh. EFSB-RR-1; Tr. 1, at 14). The Company stated that the pressure of the gas at the point it is received from Tennessee depends on the amount of gas drawn from the Northampton Lateral by Berkshire, the Bay State Gas Company, the Westfield Gas & Electric Light Department, and the Holyoke Gas and Electric Department; weather-dependent demand elsewhere in Tennessee's Zone 6; injections of LNG into pipelines; and operation of compressors on the Tennessee system (Tr. 1, at 18-20).

Occasionally (for example, four times in 2003/2004 and eight times in 2004/2005), the pressure at the Northampton Gate Station drops below 200 psig; pressures as low as 180 psig have been experienced on the upstream side of the Northampton Gate Station (Exhs. EFSB-G-10; EFSB-RR-1; Tr. 1, at 14). Berkshire can, if necessary, help maintain 200 psig at the Northampton Gate Station by supplying additional gas to its system from its Whately LNG facility (Tr. 1, at 21-23). The Company also maintains and operates the Laurel Compressor which, when in operation, pushes approximately 425 to 500 thousand cubic feet of

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[3] The Company noted that additional gas capacity on Tennessee facilities would be needed to support an increase in Berkshire's MDQ (Exh. BGC-1, at 2-1, Att. 2-D).

gas per hour ("Mcfh") northward to maintain system pressures at the ends of the system (id. at 2-2; Exh. EFSB-N-2). At the Whately LNG facility, located seven miles north of the Laurel Compressor, the Company can inject gas at up to 650 Mcfh, but stated that injection can be less economical than operating the Laurel Compressor (id.; Exh. BGC-1, at 2-2). The Whately LNG facility has two 70,000-gallon storage tanks, with space for the anticipated installation of three additional tanks (Exh. BGC-1, at 1-3).[4]

Just downstream of the Laurel Compressor, five miles north of the Northampton Gate Station, the 6-inch diameter Amherst Feedline branches off the Greenfield Feedline and proceeds easterly approximately seven miles into the Amherst area (Exhs. BGC-1, at 2-1, Att. 3-A; EFSB-G-12(a), Att.). The Company stated that in order to supply its customers via lower pressure distribution pipelines served by the Greenfield Feedline and the Amherst Feedline, the Company needs to maintain pressures of at least 100 psig at the intakes to its regulator stations located at the extremities of its 200 psig system (Exh. BGC-1, at 2-3).

The Company explained that when gas flowing from the Northampton Gate Station is insufficient alone to maintain sufficient pressures on the system, Berkshire first starts operating the Laurel Compressor because it is the next least cost resource (Exh. EFSB-N-2). The Whately LNG Facility is operated when operation of the Laurel Compressor is insufficient to maintain pressures, when the Laurel Compressor is not available, or when there is a low inlet pressure at the Northampton Gate Station (id.). In addition, the Company stated that it has existing load management rights by which it can reduce supplies to UMass for up to 15 days a year, which provides Berkshire with a measure of load management flexibility which it can use to manage system operation (id.; Exh. BGC-1, at 4-4).

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[4] Pursuant to EFSB 99-2, construction of any of the three additional tanks would require Siting Board approval. Since more than three years have elapsed since issuance of that Decision, the Company would have to file with the Siting Board updated plans for minimizing the environmental impacts, given any changes in applicable environmental laws and regulations, any changes in the site or in surrounding land uses, and any changes in the expected timing and frequency of use of the facilities. 1999 Berkshire Gas Decision, 9 DOMSB 1 at 83.

3. Need for Additional Pipeline Capacity

a. Description

Berkshire modeled the capability of its Greenfield Division and determined that, without an additional energy resource, it would be unable to maintain adequate system pressures with the planned addition of load for the new heating plant at UMass (Exhs. BGC-1, at 3-9; EFSB-PA-8, Table PA-2). The Company stated that the UMass heating plant is scheduled to come on-line in February 2008, but UMass has contracted with Berkshire for a tripling of its gas service by September 2006 (Exhs. EFSB-G-9; EFSB-N-3). To document the requirements of its Greenfield Division customers, Berkshire provided a copy of its most recently approved forecast, prepared March 15, 2002, and approved by the Department of Telecommunications and Energy ("Department") in February 2003, entitled "Forecast and Supply Plan" ("2002 F&SP"), and a copy of its forecast submitted to the Department on January 31, 2005 ("2005 F&SP") (Exhs. EFSB-N-1; EFSB-N-1, Att.(a); EFSB-N-1, Att.(b)).[5] The proposed project is anticipated in both the 2002 F&SP and the 2005 F&SP (Exhs. EFSB-N-1(a), Att. at 9 and Table G21; EFSB-N-1(b), Att. at 8 and Table G21).

In 2002, Berkshire projected that the total annual Company firm throughput, for twenty communities in its overall service territory, would increase at a rate of approximately 1.5% per year between 2002 and 2006 (Exh. EFSB-N-1(a), Att. at 5, 13). In 2005, Berkshire projected that the total annual Company firm throughput would increase by a total of 6.7% between 2004 and 2009, an average of 1.3% per year (Exh. EFSB-N-1(b), Att. at 12). Berkshire asserted that its resource plans provide for reliable service for its expected design day of 75 heating degree-days ("degree days"),[6] as well as seasonal, cold snap, and annual loads (id. at 3; Exh. EFSB-N-1(a), Att. at 4, 57; Tr. 1, at 56). Load estimates in the resource plans are not broken out for the

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5 A review of the Company's 2005 F&SP, which has been docketed as D.T.E. 05-7, is pending before the Department.

6 In its 2005 F&SP modeling, the Company began using effective degree days, an indicator that incorporates a measurement of wind velocity (EFSB-RR-3, Att. at 3; EFSB-RR-5; Tr. 1, at 64). However, the Company evaluated the need for the project using the older heating degree-day metric (Tr. 1, at 72).

Greenfield Division (Tr. 1, at 54).

The planned UMass heating plant will be able to switch from gas to alternative fuel (Exh. BGC-1, at 3-2 n.1).[7] However, for firm transportation, the planned UMass heating plant would require up to 215 Mcfh of gas at a pressure of 115 psig at the upstream side of the planned meter to the plant (Exhs. BGC-1, at 3-7, 4-8; EFSB-G-11). The Company stated that, under system peak load conditions, the existing gas supply system in the Greenfield Division would not be able to supply UMass with firm gas transportation while maintaining full service for its existing customers (Exh. BGC-1, at 3-6 to 3-8). Specifically, Berkshire explained that it could not deliver 215 Mcfh of gas to UMass with its existing facilities, and still maintain a minimum of 100 psig at all points of intake to the distribution system from the Greenfield Feedline (id.). This conclusion was based on modeling gas flow in the Greenfield Division under conditions of peak day 2005/2006 sendout for 76 degree days,[8] receipt of gas at 185 psig at Northampton Gate Station, and demand for 215 Mcfh of gas at UMass (id. at 3-7, 3-8, Att. 3-B). The Company modeled future system performance based on an assumption that future peak load in the Greenfield Division would grow by 1.75% annually (id. at Atts. 4-B-1 to 4-B-4).

The Company did not indicate the range of climate conditions below its peak level of 76 degree days for which it would be unable to meet 2005/06 sendout based on its modeling with the increased UMass load. However, the Company indicated that its modeling showed that by 2016, the existing system would be inadequate for the sendout requirements under weather conditions ranging from 51 to 76 degree days (Exh. EFSB-PA-8).

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7 As described in Section III.B, below, during contract negotiations Berkshire and UMass evaluated curtailment of service to UMass during peak periods, specifically those periods when conditions are more severe than 51 degree days.

8 The Company modeled future system performance under 76 degree day conditions (i.e., more conservatively than under the 75 degree days conditions used in the 2002 F&SP) because of observed 76 degree day conditions in a recent year (Exh. EFSB-RR-5).

b. Analysis

In order to meet its statutory mandate, the Siting Board first evaluates whether there is a need for additional energy resources to meet reliability, economic efficiency, or environmental objectives. The Siting Board must find that additional energy resources are needed as a prerequisite to approving a proposed energy facility. 2003 KeySpan Decision, 14 DOMSB 49, at 65; 2001 NSTAR Gas Decision, 13 DOMSB 143, at 158; MECo/NEPCo, 18 DOMSC at 396-403.

Here, Berkshire has proposed to increase system capacity by installing a pipeline parallel to existing facilities in order to transport additional gas to a new heating plant at UMass, while providing reliable service to its other customers. The record shows that Berkshire uses the Greenfield and Amherst Feedlines, the Laurel Compressor, and the Whately LNG facility in combination to deliver gas to customers in eight towns north and east of Northampton, including UMass.

To demonstrate need, the Company modeled peak hour gas flow and delivery pressures through its system, assuming that no additional capacity is added. The Company's modeling demonstrates that, without changes to the existing supply system, the system would be unable to deliver 215 Mcfh of gas at UMass under conditions of peak day 2005/2006 demand. The record thus indicates that the system is not currently capable of supplying UMass with the requested volumes of gas while maintaining adequate pressure for existing customers in the Greenfield Division. The record further indicates that by 2016, the existing system would be unable to deliver 215 Mcfh of gas at UMass for a significant range of peak and near-peak conditions, from 51 degree days to 76 degree days.

Based on model results for the Greenfield Division, the Company has established that its existing system is inadequate to serve its anticipated load at UMass with acceptable reliability. Consequently, the Siting Board finds that there is a need for additional energy resources in the Company's Greenfield Division.

4. Consistency with Long-Range Forecast

G.L. c. 164, § 69J requires that a facility proposed by a gas company required to file a long-range forecast pursuant to G.L. c. 164, § 69I be consistent with that company's most recently approved long-range forecast. G.L. c. 164, § 69J. Berkshire is a gas company required to file a long-range forecast pursuant to G.L. c. 164, § 69I. See G.L. c. 164, §§ 75B, 75H. Consequently, to satisfy the statutory requirement, the Siting Board reviews the consistency of the proposed gas pipeline with the Company's most recently approved long-range forecast.

As noted above, Berkshire's 2002 F&SP was approved by the Department in February 2003 (Exh. EFSB-N-1). See The Berkshire Gas Company, D.T.E 02-17 (2002) (Exh. EFSB-N-1(a)). The Company provided a copy of its 2002 F&SP, including load projections for the period 2001/2002 to 2005/2006, and a copy of its 2005 F&SP, including load projections for the period 2004/2005 to 2008/2009 (Exhs. EFSB-N-1(a); EFSB-N-1(b)). In the 2002 F&SP, Berkshire projected that growth in normalized system-wide firm throughput would average 1.5% per year between 2002 and 2006 (Exh. EFSB-N-1(a) at 13; Tr. 1, at 76). In the 2002 F&SP, the Company explained that it used an econometric model, as well as eight years of historical data, to forecast total annual system-wide firm throughput (Exh. EFSB-N-1(a) at 13). In evaluating throughput specifically on the Greenfield Division, which accounts for approximately 25% of total throughput for the Company, the Company described growth of throughput in its Pittsfield and North Adams Divisions as insignificant (Tr. 1, at 76-77). Conversely, the Company indicated that its Greenfield Division experiences more growth than the Company-wide average, and concluded that an annual growth rate of 1.75% would be more representative of future growth in the Greenfield Division than a rate of 1.5%, which was a system-wide projection (id. at 76-80).

In prior cases where the need for a facility has been premised on an electric or gas company's need to serve load in a localized area, the Siting Board has found the facility to be consistent with a previously approved forecast either if the need for the facility was established in that forecast, or if the localized forecast upon which a showing of need was based was methodologically consistent with that forecast. See 2001 NSTAR Gas Decision, 13 DOMSB

143, at 161; Cambridge Electric Light Company, 12 DOMSB 305, at 320 (2001) ("CELCo Decision"); Norwood Municipal Light Department, 5 DOMSB 109, at 127 (1997).

Another class of projects, not clearly anticipated by statute, are those projects designed to serve a specific customer or set of customers, rather than to serve load in a specific section of a company's service territory. While the need for such projects generally is unrelated to the issues typically addressed in a long-range forecast, the choice of project approach may affect, either positively or negatively, a company's ability to reliably meet load requirements in the remainder of its service territory. See 2001 NSTAR Gas Decision, 13 DOMSB 143, at 161.

The Siting Board acknowledges that electric and gas companies may receive requests to serve major new loads, including new generation, at any time during the forecast cycle, and that companies should respond to such requests in a timely fashion, using the best information available at the time of the request. Therefore, when considering a proposed facility designed to serve new generation, the Siting Board will consider the facility to be consistent with a long-range forecast if any issues related to the project's effect on the company's ability to serve load in its service territory are addressed using a forecast that is methodologically consistent with its most recently approved forecast. See 2001 NSTAR Gas Decision, 13 DOMSB 143, at 161; CELCo Decision, 12 DOMSB 305, at 320.

Here, Berkshire has performed a system analysis in order to assess the need for additional energy resources to meet UMass' request for an enhanced gas supply to its new heating plant, using load projections from a Company forecast. The Company also used the system analysis to evaluate various approaches to providing this enhanced gas supply, in light of their effect on the Company's ability to reliably serve its customers in the Greenfield Division (see Section II.B, below).

With respect to forecast consistency, Berkshire has provided information about the following: the methods and results of its most recently approved long-range forecast and its most recently submitted long-range forecast; and an explanation of how its system forecasts are used to derive Greenfield Division throughput. The record indicates that growth is near zero on three-quarters of the Berkshire system. It would therefore be expected that growth on the Greenfield Division would be well above 1.5%, if the observed trend of near zero growth in the

remainder of the Berkshire system is correct. Berkshire's estimate of 1.75% per year increase in the Greenfield Division appears to conservatively reflect higher growth in that portion of its territory. Therefore, the Company has established that it reasonably adjusted its approved forecast for its entire service territory to more accurately represent expected throughput in the Greenfield Division. The Company's modeling of throughput in the Greenfield Division is methodologically consistent with the most recently approved forecast. Accordingly, the Siting Board finds that the proposed project is consistent with the Company's most recently approved long-range forecast.

B. Comparison of Proposed Project and Alternative Approaches

1. Standard of Review

G.L. c. 164, § 69H requires the Siting Board to evaluate proposed projects in terms of their consistency with providing a reliable energy supply to the Commonwealth with a minimum impact on the environment at the lowest possible cost. G.L. c. 164, § 69H. In addition, G.L. c. 164, § 69J requires a project proponent to present "alternatives to planned action" which may include: (a) other methods of generating, manufacturing, or storing electricity or natural gas; (b) other sources of electrical power or natural gas; and (c) no additional electric power or natural gas.[9] G.L. c. 164, § 69J.

In implementing its statutory mandate, the Siting Board requires an applicant to show that, on balance, its proposed project is superior to alternative approaches in terms of cost, environmental impact, and ability to meet the identified need. Boston Edison Company d/b/a NSTAR Electric, 14 DOMSB 233, at 266 (2005) ("2005 NSTAR Electric Decision"); 2003 KeySpan Decision, 14 DOMSB 49, at 69; Boston Edison Company, 13 DOMSC 63, at 67-68, 73-74 (1985). 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.

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[9] G.L. c. 164, § 69J, also requires an applicant to provide a description of "other site locations." G.L. c. 164, § 69J. The Siting Board reviews the applicant's preferred route, as well as other possible routes, in Section III.B, below.

2005 NSTAR Electric Decision, 14 DOMSB 233, at 266; 2003 KeySpan Decision, 14 DOMSB 49, at 69; MECo/NEPCo Decision, 18 DOMSC at 404-405.

2. Identification of Project Approaches for Analysis

Berkshire evaluated six project approaches for analysis: (1) additional conservation programs; (2) additional load management programs; (3) expansion or construction of additional LNG facilities; (4) construction of new propane air facilities and related distribution facilities; (5) construction of additional distribution pipeline, combined with the acquisition of additional upstream capacity and expansion of the capacity of the Northampton Gate Station; and (6) construction of additional distribution pipeline without acquisition of additional upstream capacity (Exh. BGC-1, at 4-1).[10, 11] The Company explained that it used an iterative process involving substantial consultation with UMass to identify specific alternatives and select a project approach (id. at 4-2).

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10 Besides the six project approaches listed here, the Company also considered providing service from Palmer, where Bay State Gas Company has service, or from Ludlow, where Massachusetts Municipal Wholesale Electric Company has service (Exh. EFSB-PA-6). The Company indicated that these locations are at least 16 miles from UMass and that the construction costs and environmental disturbance would be concomitantly increased with the longer construction distance (id.). The Company stated that these options had no complementary benefits and that neither was an economical or environmentally superior alternative (id.).

11 With respect to installation of additional distribution pipeline, the Company evaluated constructing new pipeline only on the Amherst Feedline (Exh. EFSB-PA-8). This was evaluated at the request of Siting Board staff because the record shows that the bottleneck in moving gas to UMass is downstream of the Laurel Compressor. Specifically, under existing peak day conditions, the Company's modeling showed a pressure drop of only 5 psig between the Northampton Gate Station and the downstream side of the Laurel Compressor (185 psig to 180 psig), but 40 psig from that location to the Amherst area (180 psig to 140 psig) (Exh. BGC-1 at Att. 3-A). The Company therefore evaluated constructing loop pipeline starting at the beginning of the Amherst Feedline near the Laurel Compressor and extending eastward (Exhs. EFSB-PA-8, EFSB-PA-8(b), runs 3 & 8; EFSB-PA-8(e)). The Company stated that such an approach likely would provide sufficient gas to UMass (Exh. EFSB-PA-8). However, the Company indicated that this approach would cause the planned UMass heating plant to rely more heavily on LNG from Whately, and would therefore be relatively expensive over the long term (id.).

a. Additional Conservation Programs

As previously noted, Berkshire would have to supply 215 Mcfh to meet the anticipated load of UMass. This amount would be in addition to a 2005/2006 peak day Greenfield Division throughput estimate of 727 Mcfh (Exh. BGC-1 at Att. 3-A). Berkshire asserted that its historical aggressive performance in promoting conservation programs results in an ability to conserve only a negligible amount of gas, compared to the anticipated UMass load, such that any conservation efforts would be ineffective (Tr. 1, at 89). Therefore, according to the Company, there would not be sufficient conservation potential within the Greenfield Division to meet the identified need (id. at 89-91; Exh. BGC-1, at 4-3).

b. Additional Load Management Programs

The Company stated that there is not sufficient load management potential within the Greenfield Division to meet the identified need, on a stand-alone basis (Exh. BGC-1, at 4-4; Tr. 1, at 89-90). The Company indicated that it had approximately zero percent ability to use load management to obtain resources, since it has no dual-fuel customers in the Greenfield Division (aside from UMass) (Tr. 1, at 89-90). The Company noted that load management might be combined with other alternatives to meet the identified need (Exh. BGC-1, at 4-4) (see, e.g., Section II.B.2.f, below).

c. Installation of Additional LNG Facilities

The Company evaluated the efficacy of adding three additional LNG tanks to its system in 2006. This approach would allow the Company to maintain three days of gas storage while trucking in LNG to supply additional gas to UMass (Exh. BGC-1, at 4-6). The Company indicated that, under this alternative, it has three possible options. Under the first option, the three tanks would be installed in Whately, thereby immediately completing the long-term planned layout at the Whately LNG facility; the Company would also need to construct 29,500 feet of 12-inch gas pipeline to deliver gas to the planned UMass heating plant (id.). This approach would increase costs for UMass by increasing the amount of LNG in the mix used by the planned UMass heating plant, creating a net present value ("NPV") cost of approximately

$30.2 million over 20 years for a project sized to provide gas 365 days per year to the planned UMass heating plant (id. at 4-7, 4-13). A second, less ambitious option would provide gas to the planned UMass heating plant 360 days per year; it would involve installation of the three LNG tanks and construction of 26,500 feet of 12-inch gas pipeline; it would cost $27.4 million over 20 years (id. at 4-7 n.3, 4-13). The third option would involve adding new LNG storage and vaporization in Hadley, instead of adding storage in Whately. According to the Company, this third option would be more costly, with an NPV cost of approximately $36.8 million, and would have more permanent environmental impacts (id. at 4-7; Exh. EFSB-PA-8).

d. Construction of Propane Air Facilities

The Company evaluated the feasibility of installing a facility that would inject a mixture of propane and air ("propane air") into the distribution system (Exh. BGC-1, at 4-4). The Company indicated that propane air injection rates are limited by the need to mix the propane air with natural gas in the pipeline (id. at 4-5). Berkshire indicated that adding propane air facilities would be possible and that it would be feasible to truck in the necessary fuel (id.). However, solving various engineering difficulties would be relatively expensive (id.). The Company indicated that, to achieve an acceptable mixture of fuels, the propane air facilities would have to be placed upstream of the Northampton Gate Station (id.). Also, mechanical systems at the planned UMass heating plant would need to be redesigned and UMass' construction costs would be substantially increased (id.). Because the propane air would need to be injected near the upstream end of the Greenfield Feedline, the Company stated that the propane air alternative would not meet the identified requirements of the planned UMass heating plant (id. at 4-6).

e. Pipeline Construction with Upstream Capacity Increases

The Company evaluated an approach to supplying additional gas to UMass by adding 5160 Dth to its contracted MDQ from Tennessee and installing approximately 26,500 feet of looping pipeline along the Greenfield and Amherst Feedlines from Northampton into Hadley ("total pipeline alternative") (Exh. BGC-1, at 4-9 and Att. 4-B-3). This alternative would also involve upgrading the Northampton Gate Station to transfer additional gas (id. at Att. 4-B-3).

In addition, the Company stated that it likely would have to eventually add a total of three LNG tanks at Whately, one in each of the years 2012, 2018, and 2023 (id.). Berkshire stated that this alternative could meet the identified need using only pipeline gas (id. at 4-9). The NPV cost of this alternative, over 20 years, is approximately $26.1 million (id. at Att. 4-B-3).

f. Pipeline Construction with Load Management

The Company indicated that, subsequent to analyzing the total pipeline alternative, and in consultation with UMass, it evaluated the possibility of installing a portion of the additional pipeline in the total pipeline alternative together with implementing load management under an agreement with UMass ("pipeline-with-load-management alternative") (Exh. BGC-1, at 4-9). The pipeline-with-load-management alternative includes construction of the proposed pipeline, which is approximately 20,000 feet of looping 12-inch pipeline in Northampton and Hatfield (id. at 4-10). This alternative also includes reliance on a load management agreement allowing Berkshire to request that UMass stop taking gas on days colder than 51 degree days (id.). This alternative does not include increasing the MDQ from Tennessee (id.). The NPV cost of this alternative over 20 years is approximately $19.6 million, assuming that UMass uses LNG deliveries from Berkshire as its alternative fuel source (id. at 4-15).

g. Analysis

Berkshire has identified six general approaches to providing additional gas to the planned UMass heating plant. Two of these approaches focus on reducing system load; two turn first to trucking in additional fuel to add to the pipeline stream; and two deliver more gas by expanding the capacity to deliver pipeline gas.

The record indicates that the majority of customers in the Greenfield Division do not have ready access to alternate fuels to substitute for gas as an energy source. The record shows that the additional UMass load would be a proportionately large increase in Greenfield Division throughput. The record indicates that focusing on pursuing additional conservation programs or additional load management on a stand-alone basis would therefore not provide sufficient system

resources to deliver the required additional gas to the planned UMass heating plant. Therefore, the Siting Board concludes that approaches focused on reducing system load would not meet the identified need.

The record indicates that relying on an increase in use of LNG via additional LNG facilities to meet UMass requirements would be costly relative to alternatives relying on pipeline gas, based on estimated NPV costs ranging from $27.4 to $36.8 million for LNG-based alternatives compared to a range of $19.6 to $26.1 million for pipeline-based alternatives. The record indicates that mixing propane into the gas supply for the Greenfield Division would pose significant engineering difficulties and would also be relatively costly. Due to the higher costs of the propane air facilities and additional LNG facilities alternatives, the Siting Board concludes that project alternatives relying first on transporting of fuels by truck are expensive relative to project alternatives relying first on expanding the capacity to deliver pipeline gas.

The project approaches described above, which focus on reducing load and on trucking in fuel, are excluded due to infeasibility and high cost, respectively. The Siting Board therefore focuses its review on (1) the total pipeline alternative (pipeline construction with increased upstream capacity) and (2) the pipeline-with-load-management alternative (the proposed pipeline construction project combined with load management). In the following sections, the Siting Board compares the total pipeline alternative and the pipeline-with-load-management alternative with respect to performance, environmental impacts, and cost.

3. Reliability of Pipeline Alternatives

Berkshire indicated that the total pipeline alternative, which includes pipeline construction and increased upstream capacity, would meet the identified need (Exh. BGC-1, at 4-9). Assuming 200 psig delivery at the Northampton Gate Station during peak 76 degree day conditions in 2005/2006, the Company's model showed that the system would be able to deliver 215 Mcfh of gas to the planned UMass heating plant at 120 psig, while maintaining pressures above 100 psig elsewhere on the system (id. at 4-9, Att. 4-A-3). The Company indicated that later additions of LNG capacity included in the total pipeline alternative would be sufficient to meet need at least through 2015/2016 (id. at 4-9, Att. 4-B-3).

Berkshire indicated that, by reducing the physical requirement for gas at system peak load, the pipeline-with-load-management alternative would also provide adequate delivery capability through 2015/2016 (id. at 4-10, 4-11, Att. 4-A-5, Att. 4-A-6). Assuming 200 psig delivery at the Northampton Gate Station in 51 degree day conditions in 2015/2016, the Company's model showed that the system would be able to deliver 215 Mcfh of gas to the planned UMass heating plant at 115 psig, while maintaining pressures above 100 psig elsewhere on the system (id.). Gas flow to the planned UMass heating plant would be curtailed for several hours on days when weather conditions are more severe than 51 degree days (id. at 4-9, 4-10).

The Company pointed out that its existing Laurel Compressor Station is over 20 years old and potentially subject to breakdown; the facility has had mechanical problems and over the past few winters has occasionally been out of service awaiting repairs (Exhs. EFSB-PA-4; EFSB-PA-7). Therefore, the Company ran the modeling described above without assuming operation of the Laurel Compressor (Exh. BGC-1, at Atts. 4-A-1 to 4-A-6). While the Company could continue to run the compressor when relative prices of pipeline gas and LNG gas make it advantageous to do so, the modeling shows that the full pipeline alternative and the pipeline-with-load-management alternative would each maintain adequate system pressures even without use of the Laurel Compressor (id. at Atts. 4-A-3, 4-A-5, 4-A-6).

The record shows that Berkshire can reliably deliver gas to the planned UMass heating plant at a pressure of at least 115 psig, and to Berkshire's other customers at a pressure of at least 100 psig, under the arrangements for firm or interruptible transportation laid out for either pipeline-based alternative. The record also shows that under either alternative, Berkshire could continue to deliver gas at the indicated pressures even in the event of loss of the Laurel Compressor. Considering each within its own framework, the Siting Board finds that the total pipeline alternative and the pipeline-with-load-management alternative would be comparable with respect to reliability.

4. Environmental Impacts of Pipeline Alternatives

Berkshire indicated that pipeline construction would be the activity with the most significant environmental impacts under the two pipeline-based alternatives (Exh. BGC-1,

at 4-18).[12] Having considered residential and commercial abutters, trees, culverts, and adjacent wetlands, the Company asserted that the pipeline construction impacts would be consistent with impacts of its routine gas main construction practices (id.). The Company indicated that the pipeline-with-load-management alternative would involve a shorter length of pipeline construction, compared to the total pipeline alternative and that, unlike the total pipeline alternative, the pipeline-with-load-management alternative would not include any construction extending across or east of the Connecticut River into Hadley (id. at 4-9, 4-10, Att. 4-A-3, Att. 4-A-5; Exh. EFSB-G-12). On the basis of its shorter length, approximately 25% less than the total pipeline alternative, as well as avoidance of possible construction across the Connecticut River, the Siting Board finds that the pipeline-with-load-management alternative would be superior to the total pipeline alternative with respect to environmental impacts.

5. Cost of Pipeline Alternatives

Berkshire estimated that the NPV cost of the total pipeline alternative would be approximately $26.1 million over 20 years, including a cost of $5.9 million in 2006 for distribution pipeline construction, approximately $1.4 million added annual capacity charges for pipeline gas, and approximately $0.5 million annually for LNG charges (Exh. BGC-1, at Att. 4-B-3). The Company estimated that the NPV cost of the pipeline-with-load-management alternative would be approximately $19.6 million over 20 years if UMass chose to take delivery of LNG from Berkshire during peak periods not covered by its load management contract (id. at 4-15, Att. 4-B-4). This NPV cost incorporates a cost in 2006 of $4.5 million for distribution pipeline construction and annual costs of approximately $1.2 million for LNG charges (id. at Att. 4-B-4).

Berkshire stated, however, that UMass has indicated that when it is colder than the 51 degree day level, UMass would likely switch to its alternate fuel, rather than paying for LNG-based supply (Exh. BGC-1, at 4-15). Assuming no delivery of gas to UMass through the

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[12] The Siting Board notes that the two alternatives differ with respect to the amount of gas UMass would use in lieu of other fuels. However, environmental implications of varying fuel use by UMass have not been addressed as part of the analysis of the proposed project.

Whately LNG station, the Company stated that the NPV cost of the pipeline-with-load-management alternative would be approximately $6.2 million (id. at 4-15; Exh. EFSB-PA-11(b)). The Siting Board notes that there would be added cost to UMass for alternative fuel with implementation of the pipeline-with-load-management alternative, if it did not take LNG from Whately, and thus the $6.2 million gas supply cost is not strictly comparable to the costs of other alternatives.

The pipeline-with-load-management alternative is less ambitious than the total pipeline alternative, and does not attempt to provide gas to UMass when gas is scarce on the system due to extreme weather conditions. This scaled-back approach allows UMass to take pipeline gas when it can be delivered, but requires that it use other sources, such as oil or LNG, when pipeline gas is in short supply due to temperatures colder than 51 degree days, in accordance with its contract with Berkshire. By taking this approach, UMass receives pipeline gas at considerably lower cost. At the same time, the system as a whole would move gas at a higher load factor. The record does not identify the relative cost of UMass' alternative fuel supply, so the total cost of the pipeline-with-load-management alternative is not established. However, even were UMass to use LNG from Berkshire rather than oil during peak periods, the pipeline-with-load-management alternative would be less costly than the identified alternatives. Therefore, the Siting Board finds that the pipeline-with-load-management alternative would be superior to the total pipeline alternative with respect to cost.

6. Conclusions

In the sections above, the Siting Board dismissed alternatives focusing on obtaining capacity by conservation programs, load management, addition of LNG facilities, and addition of propane air facilities. The Siting Board then compared an approach of combining pipeline construction with obtaining increased upstream capacity from Tennessee with an approach of combining pipeline construction with load management. The Siting Board found that both the total pipeline alternative and the pipeline-with-load-management alternative would meet the identified need in the Greenfield Division of the Berkshire system.

In Sections II.B.3, II.B.4, and II.B.5, above, the Siting Board found that the total pipeline alternative and the pipeline-with-load-management alternative would be comparable with respect to reliability; that the pipeline-with-load-management alternative would be superior to the total pipeline alternative with respect to environmental impacts; and that the pipeline-with-load-management alternative would be superior with respect to cost. The record shows that, given the cost differences, UMass as principal customer preferred to contract for the pipeline-with-load-management alternative, despite the limitation in supply to 51 degree days. The Siting Board observes that following negotiations with Berkshire, UMass entered into a contract which includes the load management component of the pipeline-with-load-management alternative. Direct environmental impacts, as reflected in the record, would be less for the pipeline-with-load-management alternative. Therefore, weighing need, reliability, environmental impacts and cost, the Siting Board finds that the proposed project, combined with a load management agreement with the primary customer, UMass, would be superior to alternative approaches to providing the planned UMass heating plant with additional gas delivery capacity.

III. ANALYSIS OF THE PRIMARY AND ALTERNATIVE ROUTES

The Siting Board has a statutory mandate to implement the policies of G.L. c. 164, §§ 69J-69Q to provide a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost. G.L. c. 164, §§ 69H and 69J. Further, G.L. c. 164, § 69J requires the Siting Board to review alternatives to planned projects, including "other site locations." In implementing this statutory mandate, the Siting Board requires a petitioner to demonstrate that it has examined a reasonable range of practical siting alternatives, and that its proposed facilities are sited at locations that minimize costs and environmental impacts while ensuring supply reliability. 2005 NSTAR Electric Decision, 14 DOMSB 233, at 277; 2003 KeySpan Decision, 14 DOMSB 49, at 79; New England Power Company, 21 DOMSC 325, at 376 (1991).

A. Site Selection

1. Standard of Review

G.L. c. 164, § 69J provides that a petition to construct a proposed facility must include "a description of alternatives to [the applicant's] planned action" including "other site locations." G.L. c. 164, § 69J. In past reviews of alternative site locations identified by an applicant, the Siting Board has required the applicant to demonstrate that it examined a reasonable range of practical siting alternatives. See 2005 NSTAR Electric Decision, 14 DOMSB at 233, at 277; 2003 KeySpan Decision, 14 DOMSB 49, at 79; 1998 NEPCo Decision, 7 DOMSB 333, at 374. In order to determine whether an applicant has considered a reasonable range of practical alternatives, the Siting Board has required the applicant to 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 sites or routes in a manner which ensures that it has not overlooked or eliminated any sites or routes which, on balance, are clearly superior to the proposed site or route. 2005 NSTAR Electric Decision, 14 DOMSB at 233, at 277; 2003 KeySpan Decision, 14 DOMSB 49, at 79-80; 1998 NEPCo Decision, 7 DOMSB 333, at 374. Second, the applicant must establish that it identified at least two noticed sites or routes with some measure of geographic diversity. 2005 NSTAR Electric Decision, 14 DOMSB at 233, at 277-278; 2003 KeySpan Decision, 14 DOMSB 49, at 80; 1998 NEPCo Decision, 7 DOMSB 333, at 374.

2. Site Selection Process

a. Description

Berkshire indicated that its site selection process considered engineering requirements, the nature of the study area, relevant environmental policy, industry design and operation requirements, and relevant regulatory precedent (Exh. BGC-1(R) at 5-1). Having determined that the preferred project approach was to enhance the capacity of its primary distribution system, the Company stated it began its site selection process by considering the location of its existing infrastructure, together with the location of the planned UMass heating plant (Exh. EFSB-SS-9).

Specifically, Berkshire stated that to enhance its existing system to meet identified needs, it determined that it would install additional pipeline to loop portions of the Greenfield and

Amherst Feedlines (Exh. BGC-1(R) at 5-1 to 5-2). The Company determined that to loop the Greenfield Feedline portion, it would route new pipeline in Northampton, in a corridor between the Connecticut River to the east and an undeveloped area of wetlands and woodlands to the west (id. at 5-2). To loop the Amherst Feedline portion, the Company determined it would route new pipeline in Hatfield, in an area located north and west of the Connecticut River or in Hadley (id.). Given these parameters, the Company developed an approximately 16 square mile study area located in Northampton, Hatfield, and Hadley (Exh. EFSB-SS-9).

The Company stated that a siting team conducted initial field investigations of the study area, as well as a review of the area using United States Geographical Survey maps and tax assessors maps (Exh. BGC-1(R) at 5-4). Berkshire stated that it also consulted with state and local officials and members of the public in the early stages of its planning and selection process (Exh. EFSB-SS-13). The Company stated that to assess whether to include a possible route, it applied several criteria (Exh. BGC-1(R) at 5-8). First, Berkshire concentrated on alignments within existing rights-of-way ("ROW") or parallel to existing utility facilities, to minimize environmental impacts and cost (id.). In addition, Berkshire stated that it looked to identify routes that would avoid locations that resulted in substantial engineering or regulatory requirements that would limit or complicate construction (id. at 5-2). Finally, the Company noted it focused on shorter, more direct routes, thereby using route length as a siting criterion (Brief at 35). The Company indicated that it considered developing a longer alternative through the Town of Hadley, which would cross the Connecticut River (Exh. BGC-1(R) at 5-12). Berkshire stated that a route through Hadley would involve a substantially longer alignment, resulting in greater environmental impacts and a 50% increase in construction costs (id.).[13]

To analyze the remaining routing options, Berkshire determined that a segment analysis would be a beneficial approach that would allow consideration of a large number of overall route alternatives derived from aggregating segments in different combinations (Exh. EFSB-SS-6).

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[13] In addition, during the initial stage of the site selection process, several other routes were rejected, including installing pipeline along I-91; using the Guilford Railroad ROW; constructing new overland ROWs; traversing the area in the vicinity of the Hatfield Mill River dam; and constructing along the Northampton Bike Path(Exh. BGC-1(R) at 5-13).

Based on the general siting criteria, public meetings, and the study area review, the Company identified 28 segments (Exh. BGC-1(R) at 5-14). Of the 28 segments, 11 were located completely in Northampton, 2 were located partially in Northampton and Hatfield, and 15 were completely located in Hatfield (id.). In addition, the Company developed four "legs" that covered the distance between several nodes, comprised of various numbers of contiguous segments (id. at Att. 5-S).

To compare the environmental attributes of the route segments, the Company developed 11 environmental criteria: (1) social receptor density; (2) archeological and historical resources; (3) traffic; (4) residential and commercial/industrial density; (5) community acceptance; (6) soil quality; (7) groundwater presence; (8) location parallel to the Connecticut or Mill Rivers; (9) location within wetlands; (10) location within buffer areas; and (11) location within priority habitat areas (Exh. BGC-1(R) Att. 5-D).

The Company stated that it evaluated and ranked the 28 segments using the 11 criteria described above (Exh. BGC-1(R) at 5-18 to 5-19). For each segment, the Company assigned scores of zero to three, where zero represented the lowest potential impact, and three represented the highest potential impact (id. at 5-20). The Company then length-weighted the score for each segment by multiplying the total segment score by the segment's total distance in miles (id.). In addition, the Company applied adders when it determined that an individual segment had a more substantial impact in a specific category than other segments (Exh. EFSB-SS-16; Tr. 2, at 147). Adders for four criteria were applied to specific segments for traffic, residential and commercial/industrial density, location parallel to the Connecticut or Mill Rivers, and location within wetlands (Exh. EFSB-SS-16; Tr. 2, at 147).[14] Berkshire asserted that the use of an adder

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[14] For the traffic criterion, an increase in the score by a factor of two was applied to segments where a road closing would be necessary; for the residential and commercial/industrial density criterion, a decrease in the score by a factor of two was applied to segments with commercial/industrial areas to reflect that construction in those areas is preferable to construction in residential areas; for the location parallel to the Connecticut or Mill Rivers criterion, an increase in the score by a factor of two was applied to one segment where it directly crossed the Mill River; and for the location within wetlands criterion, an increase in the score by a factor of two was applied to one segment where it was the only stream crossing (Exh. EFSB-SS-16).

for the commercial/industrial and residential density criterion was sufficient to account for the differences between commercial/industrial and residential characteristics (Tr. 2, at 148).

The record showed that based on the results of the environmental scoring, the primary route, consisting of 10 segments, had the lowest or best score, while Alternative 1, consisting of 13 segments and Alternative 2, consisting of 8 segments, had substantially higher scores than the primary route (Exh. EFSB-SS-2).[15] The Company also developed detailed cost estimates for each segment and then analyzed the results to determine which combination of segments resulted in the least cost route alternative (Exh. BGC-1(R) at 5-18). Finally, the Company presented a cost analysis showing that the primary route would have the lowest construction cost (id.).

b. Analysis

Berkshire has developed a set of route selection guidelines and a set of environmental criteria that address environmental impacts, land use concerns, and community issues – types of criteria that the Siting Board has found to be appropriate for the siting of energy facilities. See 2005 NSTAR Electric Decision, 14 DOMSB 233, at 288; 2003 KeySpan Decision, 14 DOMSB 49, at 86; New England Power Company, 4 DOMSB 109, at 167 (1995).

To develop route options for further evaluation, the Company identified an area that would encompass the starting and ending points for the pipeline and developed three possible alternative routes based on 28 different segments. The Company ranked each of the segments based on its environmental criteria, using a length-weighted scoring system. The Company calculated a total environmental score for each route based on a combination of identified segments and developed an estimated cost for each route. Berkshire selected the route that had both the best environmental score and the lowest cost as its primary route.

This case involves a relatively short pipeline project in which roadway ROW would be used for all or the majority of the route under the identified options. The Company used a disaggregated segment analysis involving close to 30 segments to identify its primary route and

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[15] For the environmental scores, where low scores indicate the advantage, the primary route had a length-weighted score of 38.44, while Alternatives 1 and 2 had scores of 81.30 and 87.91, respectively (Exh. EFSB-SS-2).

presented routing comparisons based largely on segment-by-segment scores grouped for various zones or "legs" of the distance covered. Given the similar characteristics of the routes and the limited choice for a direct route, it is unclear whether a site selection process encompassing all possible street combinations and the disaggregation into four legs was warranted. The route selection process would have been easier to follow if total route alternatives were the focus.

In addition, Berkshire used length-weighting, an approach the Siting Board has previously found to be problematic. In a recent case, in response to the use of length-weighting for a lengthy route (over 15 miles), the Siting Board recommended that future applicants avoid the length-weighting approach and seek a different method. 2005 NSTAR Electric Decision, 14 DOMSB at 290. The Siting Board pointed to the fact that many environmental criteria are best evaluated based on a single number indicating the extent of occurrence, such as total acres of disturbed wetlands, total number of streams crossed, total square footage of tree clearing or disturbance, which is independent of the length of the route. Id. If applied to such criteria, length-weighting raw scores for the criteria could bias the assessment in favor of a shorter route.

Berkshire also used "adder" adjustments to its scores for certain criteria to account for particular conditions along a route segment. However, this adjustment was confined to four criteria; the remaining seven criteria were scored using only length-weighting.

In this case Berkshire did not apply comprehensive numerical weighting of criteria based on their relative importance – an approach the Siting Board has found to be useful in past cases involving power plants, as well as some linear projects. NSTAR Gas Company, 13 DOMSB at 178; CELCo Decision, 12 DOMSB at 331; ANP Blackstone Energy Company, 8 DOMSB 1, at 106 (1999); Altresco Lynn, Inc, 2 DOMSB 1, at 170 (1993). Specifically, applicants have used numerical weighting to reflect the relative importance of criteria, where each criteria is assigned a specific weight based on the importance of its environmental impact (e.g., 1 for low importance, 2 for moderate importance, and 3 for high importance).

The Siting Board notes that in one recent case involving a linear project located underground in roadways, the Siting Board accepted a site selection process that lacked numerical weighting to reflect relative importance of criteria. 2003 KeySpan Decision, 14 DOMSB 49, at 87. Here, Berkshire's identified routing predominantly extends underground

along roadways, and primarily traverses areas of similar land use and encounters similar transitions, such as first traversing the Route 5/ Route I-91 area and then deviating away from that area eastward through Hatfield. As its best alternative, Berkshire selected the in-road route that was clearly the most direct. Therefore, the record in this case establishes that the Company did not overlook any better alternative routes.

Overall, the Siting Board reaffirms its conclusion in the 2005 NSTAR Electric Decision that length-weighting is not well-suited for general use in a site selection process. In addition, as noted above, comprehensive numerical weighing of criteria, based on their relative importance, has been favorably reviewed by the Siting Board as an element of site selection in many previous cases.

The Siting Board also notes that, as presented in the Company's petition, Berkshire's overall analysis of its final route ended with the segment analysis discussed above. In past cases, the Siting Board has separately reviewed, first, a company's site selection process to identify and screen a range of possible sites or routes and, second, a company's comprehensive, comparative analysis of the environmental impacts, cost, and reliability of its final site or route and at least one practical alternative (see Section III.C, below). The separate reviews address analyses that typically entail very distinct methods. As part of the site selection analysis, the Siting Board reviews the process, such as application of quantitative scoring methods, that a company uses to simply but systematically evaluate a broad range of potential sites or routes. As part of the comprehensive, comparative analysis of a company's final site or route and at least one practical alternative, the Siting Board reviews more detailed information on the environmental impacts, cost, and reliability of the primary and alternative routes, including the selection of a final site or route. To support this second review, applicants have generally presented an analysis of the primary and alternative sites or routes that describes in more detail the environmental impacts for the respective alternatives, describes possible and proposed mitigation of those impacts, and compares alternatives assuming proposed mitigation. Thus, the Siting Board is able to review information more detailed than is presented for the more simple screening performed for the site selection analysis.

Berkshire's filing in this case interwove the above two phases. In so doing, the applicant provided, in the petition, an incomplete version of the more detailed evaluation of routes required for the second phase of the Siting Board's evaluation, and instead relied on the initial site selection analysis as the full comparison of the noticed routes. However, to complete the record, during discovery and hearings, the Company elaborated on the results of its segment analysis and more fully described expected impacts and mitigation for noticed routes. The Siting Board recognizes that there is often some overlap between screening-level evaluations of many routes and detailed evaluation of few routes. However, in order to obtain a complete and systematic initial presentation of information relating to site selection and route evaluation, the Siting Board requests that future applicants present, separately, a description of the site selection process used to identify and screen sites or routes, and a full evaluation of the sites or routes selected for detailed analysis.

Accordingly, the Siting Board finds that the Company has developed and applied a reasonable set of criteria for identifying and evaluating alternative routes in a manner the ensures that it has not overlooked or eliminated any routes that are clearly superior to the proposed route.

3. Geographic Diversity

The Company stated that it considered combinations of 28 different route segments for the proposed pipeline through the City of Northampton and the Town of Hatfield (Exh. BGC-1(R) at 5-14). Berkshire indicated that the two alternative routes differ from the primary route for most of their length (Company Brief at 41). Further, while all three routes share segments along North King Street in Northampton, each route then crosses I-91 at a different location (Exhs. EFSB-NO-6; BGC-1(R) at Att. A). Berkshire indicated that the Company provided several points of interconnection and alternative routing from the primary route to alternative routes (Exh. BGC-1(R) at 1-C and 5-S).

Consequently, the Siting Board finds that the Company has identified a range of practical route alternatives with some measure of geographic diversity.

4. Conclusions on the Site Selection Process

The Siting Board has found that the Company has developed and applied a reasonable set of criteria for identifying and evaluating alternative routes in a manner which ensures that it has not overlooked or eliminated any routes which are clearly superior to the proposed project. In addition, the Siting Board has found that the Company has identified a range of practical pipeline 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.

B. Description of the Primary and Alternative Routes

1. Primary Route

The Company indicated that the primary route begins at the end of the Company's existing 12-inch looped pipeline, located at the intersection of Hatfield Street and the Northampton Bike Path in Northampton (Exhs. EFSB-G-1; EFSB-SS-12(s)(a)). The primary route extends approximately 3.6 miles, running through Northampton and Hatfield (Exhs. EFSB-G-1; EFSB-G-4). The Company stated that the proposed pipeline generally would run parallel to Berkshire's existing 6-inch pipeline facilities (Exh. BGC-1(R) at Att. 1-A; Brief at 2).[16]

Specifically, the primary route travels northeasterly along Hatfield Street and North King Street, then crosses under I-91 and the Guilford Railroad ROW near the municipal boundary of Northampton and Hatfield (id.). In Hatfield, the primary route continues northeasterly along Elm Court to the intersection of Elm Street, where it follows Elm Street to the intersection of Prospect Street (id.). The proposed pipeline would be connected with the Company's existing pipeline at the intersection of the Elm Street and Prospect Street (id.).

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16 The proposed pipeline route follows that of the existing 6-inch pipeline except for an interval between a location along North King Street, approximately 2050 feet south of the Laurel Compressor and the intersection of Elm Street and Elm Court (Exhs. BGC-1(R) at Att. 1-A; EFSB-G-12; Company Brief at 2).

2. Alternative Routes

The Company selected two noticed alternative routes. Both alternatives run through Northampton and Hatfield, and also begin at the end of the Company's existing 12-inch looped pipeline, located at the intersection of Hatfield Street and the Northampton Bike Path (Exhs. EFSB-G-2; EFSB-SS-12(s)(a)). Alternative 1 is approximately 5.4 miles long and travels a short distance northeasterly along Hatfield Street to North Elm Street, continues northwest on North Elm Street, then east on Bridge Road, and northeast on Cooke Avenue to the intersection with Hatfield Street (Exh. EFSB-G-2). The route continues north along North King Street to a tie-in at the Laurel Compressor, and then continues from a separate tie-in north of the intersection of North King Street and Allen Road (id.). The route then crosses under I-91 and the railroad ROW, entering Hatfield and travels to an area near the intersection of Elm Street and Elm Court (id.). The route continues southeasterly along Elm Court to Little Neponsett Road, and then continues east along Little Neponsett Road and an unnamed roadway, to Brook Hollow Road, then north on Brook Hollow to Elm Street (id.). Alternative 1 joins and then follows the same route as the primary route along Elm Street to the tie-in with the existing pipeline at the intersection of Elm Street and Prospect Street (id.).

Alternative 2 is approximately 5.6 miles long and travels a short distance northeasterly along Hatfield Street to North Elm Street, continues southeast on North Elm Street, then north on Prospect Avenue to the intersection with Bridge Road (Exh. EFSB-G-2). The route travels east on Bridge Road, then easterly and northerly on Pine Brook Curve to North King Street (id.). The route continues north along North King Street to a tie-in at the Laurel Compressor, and then continues from a separate tie-in to the north, located at the intersection of West Street and Hatfield Street in Hatfield (id.). The route crosses under I-91 and the railroad ROW, and continues east along Bridge Street to School Street, then east on School Street to Main Street (id.). Alternative 2 then follows Main Street south to the intersection of Bridge Lane, where the pipeline would be connected with the Company's existing pipeline (id.).

C. Environmental Impacts, Cost and Reliability of the Primary and Alternative Routes

1. Standard of Review

In implementing its statutory mandate to ensure a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost, 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 site for the facility is superior to the noticed alternatives on the basis of balancing cost, environmental impact, and reliability of supply. 2005 NSTAR Electric Decision, 14 DOMSB 233, at 296; 2003 KeySpan Decision, 14 DOMSB 49, at 89; 1997 BECo Decision, 6 DOMSB 208, at 287.

An assessment of all impacts of a proposed facility is necessary to determine whether an appropriate balance is achieved both among conflicting environmental concerns as well as among environmental impacts, cost, and reliability. A facility which achieves that appropriate balance thereby meets the Siting Board's statutory requirement to minimize environmental impacts at the lowest possible cost. 2005 NSTAR Electric Decision, 14 DOMSB 233, at 297; 2003 KeySpan Decision, 14 DOMSB 49, at 89; 1997 BECo Decision, 6 DOMSB 208, at 287.

The Siting Board recognizes that an evaluation of the environmental, cost and reliability trade-offs associated with a particular proposal must be clearly described and consistently applied from one case to the next. Therefore, in order to determine if a petitioner has achieved the proper balance among various environmental impacts and among environmental impacts, cost and reliability, the Siting Board must first determine if 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 can determine whether environmental impacts would be minimized. Similarly, the Siting Board must find that the petitioner has provided sufficient cost and reliability information in order to determine if the appropriate balance among environmental impacts, cost, and reliability would be achieved. 2005 NSTAR Electric Decision, 14 DOMSB 233, at 297; 2003 KeySpan Decision, 14 DOMSB 49, at

89-90; Commonwealth Electric Company, 5 DOMSB 273, at 337 (1997) ("ComElec Decision").

Accordingly, in the sections below, the Siting Board examines the environmental impacts, reliability, and cost of the proposed facilities along Berkshire's primary and alternative routes to determine: (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. In this examination, the Siting Board compares the primary and alternative 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.

2. Environmental Impacts

In this section, the Siting Board compares the environmental impacts of the proposed facilities along the primary and alternative routes, the proposed mitigation for such impacts, and any options for additional mitigation. The Siting Board then determines whether the environmental impacts along the primary route have been minimized. The subsections below consider impacts to adjacent land resources, wetlands and water resources, noise, and traffic.

a. Land Resources

i. Primary Route

Berkshire asserted that the primary route travels within the paved roadways for most of its length, and therefore impact would be minimal upon either the natural or human environment (Exh. EFSB-L-2; Brief at 26). The Company explained that while a portion of the route near the end tie-in point is within a small section of an Natural Heritage Endangered Species Program ("NHESP") habitat area along the Mill River, the proposed construction in that area is beneath an existing paved roadway and therefore there would be no additional or meaningful impact on habitat (Exh. EFSB-L-2). The Company further stated that construction in this area would be at the top of a steep slope extending down to the Mill River, which would isolate the construction from the priority habitat (Exh. EFSB-L-8). Berkshire indicated that any work in this area would require consultation with NHESP staff (Exh. BGC-1(R) App. F).

The Company indicated that any areas adjacent to the route that are identified as having the potential for wood turtle habitat would be monitored, and sensitive areas would be isolated from construction areas with hay bales and/or silt fence barriers (Exh. EFSB-L-9). In addition, any wood turtles discovered in construction areas would be relocated to adjacent, undisturbed areas (id.). Finally, the Company's consultant noted that seasonal restrictions, such as avoiding construction between October and April, would virtually eliminate all direct contact with the wood turtle (Exh. BGC-1(R) App. F at 2).

The Company stated that it does not expect to remove any large trees along the primary route (Exh. BGC-1(R)), at Att. 5-AA at 6). Berkshire noted that it may conduct limited tree trimming along Hatfield Street, in the segment between Cooke Avenue and North King Street (Exh. EFSB-L-10). Further, the Company explained that, when traversing areas with trees, it would align the pipeline at or near the center line to the extent possible, in order to minimize potential root damage (id.). Berkshire asserted that it would be working with the Northampton and Hatfield Departments of Public Works ("DPW") and tree wardens to address any concerns (id.; Tr. 2, at 183).

Berkshire asserted that the environmental impacts of the proposed pipeline on geology and soils would be minor and limited to temporary construction impacts (Exh. BGC-1(R) at Att. 5-AA at 2). The Company noted that it has not identified any soil limitations relating to trenching or unusual conditions that would warrant special installation techniques along any of the three routes (id.). Berkshire asserted that it would employ erosion and runoff control, such as hay bale filters, silt fences, diversion trenches, and terracing, as well as any necessary special procedures, to reduce construction impacts (id. at 3). Further, where necessary, specialized revegetation procedures would be implemented to ensure the rapid revegetation and restoration of pre-existing vegetative cover (id.).

The Company provided information gathered from an archeological reconnaissance survey which noted that, in general, both Northampton and Hatfield have a high potential for containing Native American and historic archeological sites (Exh. BCG-1(R) at App. D). However, Berkshire stated that generally there would be no impacts to archeological and historical resources as construction would take place in previously disturbed roadways (id.).

Specifically, for the Northampton portions of the proposed route, the Company noted that it is unlikely to encounter any archeological resources within the established roadways and developed areas, and therefore the Company concluded that additional surveys are not warranted (id.). In addition, although Hatfield has a moderate to high potential to contain Native American sites, the Company does not recommend subsurface testing, as long as construction is limited to paved areas (id.).

The Company provided maps indicating that all of the route alternatives pass through historic districts in the Town of Hatfield, as substantial portions of the town have been designated as historic districts (Exh. EFSB-L-4). The primary route passes through the Elm Street Historic District for the majority of the Hatfield portion of the route (Exh. EFSB-L-4(a)).[17]

ii. Alternative Routes

Alternative 1 passes through an NHESP habitat area for a portion of Little Neponsett Road, and is in close proximity to NHESP habitat areas in the vicinity of Little Neponsett and Brook Hollow Roads (Exhs. BGC-1(R) at App. F; EFSB-L-18). The Company stated that construction in this area could affect wood turtle habitat (Exh. EFSB-L-7). Berkshire stated that the risk of impact to the wood turtle would be greater in the vicinity of the Connecticut River, which is proximate to Alternative 2, along School and Bridge Street in Hatfield (id.; Exh. EFSB-L-9). However, other information provided by the Company stated that the Mill River and other tributaries may support the wood turtle, while it is unlikely that the Connecticut River would support the species (Exh. BGC-1(R) App. F, 11/21/04 Memo). Berkshire indicated that any work in mapped habitat areas would require consultation with NHESP staff (Exh. BGC-1(R) App. F).

The Company stated that trees would need to be cleared for an area of new ROW along Alternative 1 in Hatfield (Exh. EFSB-L-10). The tree clearing would be located in a 1600-foot segment along Little Neponsett Road, consisting of approximately 0.5 acres (id.). The Company

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[17] Along the primary route, the Elm Street Historic District includes portions of Hatfield Road, Elm Court, and Elm Street along the primary route (Exh. EFSB-L-4(a)).

indicated that for Alternative 2, tree clearing would only be necessary at the crossing of the Mill River at Bridge Street, and it would be minimal (id.).

Berkshire stated that based on its analyses, construction along the Little Neponsett Road area of Alternative 1 would present a moderate to high likelihood of encountering archeological or historical resources (Exh. BGC-1(R) at App. D at 9-10). The Company's consultant therefore indicated more extensive testing in this area would be warranted, based on expected construction in unpaved areas and roadways (id.).

The Company noted that the Main Street portion of Alternative 2 in Hatfield traverses areas with National Register resources (Exh. EFSB-L-4). However, Berkshire asserted that the location of the pipeline and associated construction activities in the paved roadway, away from historical structures, would minimize impacts (id.). Alternative 1 also passes through the Elm Street Historic District in Hatfield for a small portion of the route along Little Neponsett Road (Exh. EFSB-L-4(a)). Alternative 2 for its entire Hatfield portion traverses two historic districts, the Hatfield Center Historic District and the Mill Street-Prospect Street Historic District (id.).[18]

Finally, the Company stated that the Little Neponsett Road area along Alternative 1 consists of working farm areas that are regularly worked for agricultural use (Exh. BCG-1(R), at Att. 5-AA at 6). Berkshire therefore categorized the land resources impacts from construction of the proposed pipeline in this area as temporary economic disturbances, rather than as temporary or permanent environmental impacts (id.). The Company noted that it would likely provide financial compensation to affected farmers along Alternative 1 (id.).

iii. Analysis

The record demonstrates that the land resource impacts of the proposed pipeline along the primary route would be temporary and minimal due to the placement of the proposed pipeline under streets. The Company stated that it would work with the Northampton and Hatfield

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18 The Hatfield Historic District encompasses portions of School Street and Main Street along Alternative 2; and the Mill Street-Prospect Street Historic District encompasses all of Bridge Street, and portions of Prospect Street, School Street and Church Street (Exh. EFSB-L-4(a)).

Conservation Commissions, and the NHESP to ensure that any potential impacts to rare or endangered species are minimized. However, there is nothing in the record to indicate that the Company has submitted specific project plans to NHESP; therefore, there may be additional mitigation required in conjunction with construction of the proposed pipeline, since the tie-in of the primary route at Elm Street and Prospect Street is in close proximity to a potential wood turtle habitat. The Siting Board directs the Company to provide a copy to the Siting Board of final NHESP correspondence addressing any requirements for further monitoring and mitigation, as applicable, with regard to habitat areas along the primary route.

Along the primary route, the proposed pipeline would pass through historic districts in Hatfield, but construction would be located in the roadway, away from historic properties. However, the record does not include any correspondence with the Massachusetts Historical Commission ("MHC") detailing whether there would be any potential effect on identified properties and districts with regard to construction in Northampton and Hatfield. Further, there is no record evidence indicating whether the MHC or the Town of Hatfield would require special construction techniques or other measures to avoid any potential impacts on the Hatfield historic districts, such as impacts on historic structures or landscapes. The Siting Board directs the Company, prior to construction, to consult with the MHC and provide a copy to the Siting Board of MHC correspondence addressing any requirements for further analysis and mitigation that MHC may require relative to construction of the proposed pipeline through Northampton and Hatfield. In addition, the Siting Board directs the Company to collaborate with the MHC and the Town of Hatfield on the placement of the pipeline in the Hatfield historic districts to avoid, to the extent possible, construction impacts from the installation of the pipeline. Accordingly, the Siting Board finds that with the implementation of the above conditions, the land resource impacts of the proposed pipeline along the primary route would be minimized.

The record indicates that construction of the proposed pipeline project along the alternative routes would not have a significant impact on habitat resource areas, or on historic or archeological resources due to construction in the paved roadway. The record further indicates that as with the primary route, impacts to endangered or protected species along Alternative 2 would be minimal, given its routing within paved streets proximate to a limited number of

mapped priority areas. However, because Alternative 1 includes a segment along an unpaved roadway in Hatfield, it would have the potential for greater impacts. The Siting Board finds that the primary route would be comparable to Alternative 2, and preferable to Alternative 1 with respect to land resources impacts.

b. Wetlands and Water Resources

i. Primary Route

Berkshire stated that any impacts to wetland resource areas and buffer zones would be temporary and minor (Exh. EFSB-L-12). The Company asserted that the primary route is not located within any wetlands (id.). The Company explained that along the primary route, it anticipates that it would install the proposed pipeline only in buffer zones and not in any wetland resource areas (Exh. BGC-1(R) at Att. 5-AA at 5). Berkshire asserted that it would install temporary erosion and control measures to minimize the impacts of construction due to siltation and/or sedimentation near streams and wetland areas (id. at 4). Specifically, as the tie-in point on Elm Street is located proximate to the Mill River, the Company explained that it would employ a number of measures to mitigate impacts to the Mill River, including the following: capping the trench at the end of each work day; installing silt fences and hay bales; and suspending construction during periods of heavy precipitation (Exh. EFSB-L-17).

Berkshire asserted that the Northampton DPW has indicated that the Company's proposed construction plans for this area appear to be acceptable and that it is not necessary to impose additional mitigation (Exh. EFSB-RR-11). Berkshire explained that the DPW cited Connecticut River flood control projects and the addition of culverts to affected area roads, as measures that have controlled flooding damage over the past 50 years (id.). Further, the Company indicated that it would comply with requirements of the Northampton and Hatfield conservation commissions with regard to construction techniques near surface water and water resources (Exh. BGC-1(R) Att. 5-AA at 4).

The Company noted the possibility of encountering ground water during excavation due to the presence of seasonally high water tables during the months of November to April (Exh. BGC-1(R) at Att. 5-AA at 4). The Company explained that if trench dewatering is required, it

would pump water to an appropriate vegetated area to avoid erosion, and/or it would use haybales, which would be effective mitigation measures (id. at Att.5-AA at 4; EFSB-L-13).

ii. Alternative Routes

The Company indicated that Alternative 1 crosses approximately 1000 feet of wetland and habitat area near the intersection of Little Neponsett Road and Elm Court (Exh. EFSB-L-12). Alternative 1 travels in close proximity to the Mill River along the eastern portion of Little Neponsett Road, near Brook Hollow Road (Exh. BGC-1(R) at Att.1-B and App. F). Alternative 2 also travels in close proximity to the Mill River along Bridge Street and School Street (id. at Att. 5-M and Att. 1B; Exh. EFSB-L-2). In addition, Alternative 2 crosses the Mill River, which is the only major stream crossing proposed for any of the three routes, and the Company expects wetland impacts at the ends of the crossing (Exhs. BGC-1(R) at Att. 5-N and Att. 1B; EFSB-L-12). Berkshire asserted that additional permitting and mitigation plans would be necessary in order to construct on the portions of Alternatives 1 and 2 in the areas parallel and proximate to the Mill River and the Connecticut River (Exh. BGC-1(R) at 5-27; Brief at 56).

iii. Analysis

The record demonstrates that the primary route would not enter any wetlands, and construction would be confined to wetland buffer zones as it proceeds in paved roadways. Based on the limited encroachment into wetland buffer areas and the use of paved roadways, the Siting Board concludes that construction of the proposed pipeline along the primary route would result in no permanent impacts, and only minimal temporary impacts to water resources. Consequently, the Siting Board finds that the wetlands and water resource impacts of the proposed pipeline along the primary route would be minimized.

Alternative 1 traverses wetlands in the Little Neponsett Road area and is proximate to the Mill and Connecticut Rivers. Alternative 2 crosses the Mill River and most likely would enter wetlands located at each terminus of the crossing. These impacts exceed the very limited temporary impacts to wetlands buffer zones associated with construction along the primary route. The record indicates that construction impacts on groundwater and hydrology along the primary

and alternative routes would be comparable. Overall, the Siting Board finds that the primary route would be preferable to both Alternative 1 and Alternative 2 with respect to wetlands and water resource impacts.

c. Traffic

i. Primary Route

The Company stated that the proposed pipeline would be located within Hatfield Street, North King Street, Hatfield Road, Elm Court, and Elm Street (Exh. EFSB-G-1).

The Company indicated that the standard construction work zone would be approximately 25 feet wide, and that construction would progress at approximately 400 feet per day over an approximately six month period (Exh. EFSB-C-14; Tr. 2, at 164).[19] The Company stated that, under the primary and both alternative routes, two-way traffic would not be maintained as it presently exists along any route segment within streets during construction (Exh. EFSB-T-7; Tr. 2, at 218). For the primary route, one travel lane would be maintained along all of the streets except for Hatfield Street in Northampton, which may be completely closed during construction (Exh. EFSB-T-7). Berkshire indicated that it may be possible to maintain two lanes of traffic on wider roads, such as portions of North King Street and Elm Street, if traffic were slowed down substantially by traffic control officers at each end of the roadway (Tr. 2, at 219).

Based on traffic counts, the Company stated that all of the streets with high traffic levels are located in Northampton, while those in Hatfield have moderate and low traffic levels (Exh. BGC-1(R) at Att. 5-I; Tr. 2, at 207-208).[20] The Company noted that Bridge Road in Northampton is heavily traveled, and that at the intersection of Bridge Road and Hatfield Street,

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19 The Company indicated that in areas where it would be necessary to close an entire street due to the inability to support construction and traffic, the work zone may be increased for ease of construction which could decrease the construction period (Exh. EFSB-C-14).

20 The Company used the Pioneer Valley Planning Commission Traffic Map (July 2001), to derive average daily traffic volumes for Northampton (Exh. BGC-1(R) at 5-23). The Company determined the estimate of Hatfield traffic volumes using field-based assessments of traffic and a comparative assessment of the Northampton volumes from the Pioneer Valley Traffic Map (id.).

significant traffic delays could occur during construction (Tr. 2, at 210). Berkshire explained its understanding that the City of Northampton would maintain some configuration of traffic flow on Bridge Street since it is a highly traveled road (id. at 213).

Berkshire noted that the proposed I-91 crossings under the primary route as well as the alternative routes require approval of the Massachusetts Highway Department ("MHD") (Exh. EFSB-C-6). The Company explained that the MHD would require horizontal directional drilling ("HDD") for crossing I-91 in order to avoid disruption to traffic and to minimize the need to access MHD property (id.). The Company provided a permit approved by MHD dated August 9, 2005 for an I-91 crossing based on the primary route configuration (Exh. EFSB-C-12).

Berkshire stated that the majority of construction activity would occur during the day, Monday through Friday from 7:00 a.m. to 5:00 p.m. (Exh. EFSB-C-8). The Company explained that construction outside of these time periods would be undertaken in conjunction with the use of HDD equipment and could occur elsewhere in the event of a construction deadline (see Section III.C.2.d.) (id.). The Company indicated that trenching in roadways would generally occur during the summer months, due to weather conditions and asphalt supply availability (Exh. EFSB-C-2).

The Company asserted that any impacts to school bus routes and schedules would be minimal since construction is planned for late spring and summer (Exh. EFSB-T-4). Further, to the extent that construction might coincide with the school year, the Company indicated that it would work with the school department(s) to prevent any disruptions to schools that could occur due to construction of the pipeline (id.).

The Company asserted that it would begin addressing detailed traffic issues and mitigation measures with the local DPWs and state and local police departments when the project contractor is selected (Exh. EFSB-T-8; Tr. 2, at 220). Berkshire indicated that its proposed mitigation measures would insure that: (1) signs and traffic control personnel are available; (2) bus routes and schedules are followed as closely to existing conditions as possible; (3) alternative routing is identified; (4) access to residential and commercial properties is maintained; and (5) emergency vehicle routes are provided (Exh. EFSB-T-3; Tr. 2, at 208). Berkshire noted that in some instances, the City of Northampton would prefer that a road be

closed with detours and rerouting, rather than trying to maintain one lane of traffic (Tr. 2, at 206). Further, the Company stated the mitigation options at the Bridge Road/Hatfield Street intersection could include off-hour construction or boring across Bridge Street, but noted that the short length of the installation at the Bridge Street crossing may not lend itself to boring (id. at 214).

With regard to community outreach and notification of project construction, the Company indicated that it would continue to advise local officials as to the status of the project and related construction activities (Exh. EFSB-T-2). In order to notify businesses and residences of the project schedule and location of construction, the Company stated it would employ a combination of mailed notices, notices posted at the affected residences and businesses, and individual visits (id.).

ii. Alternative Routes

Berkshire asserted that all of the routes and associated segments are comparable with regard to traffic impacts, with the exception of the Little Neponsett Road area in Hatfield, located along Alternative 1 (Segments 16, 22 and 24) (Tr. 2, at 203, 204). Berkshire explained that the area along Little Neponsett Road is in an agricultural area with negligible traffic (id.). The roadways in this area are largely unpaved and account for approximately 2.0 miles of the total 5.4 mile length of Alternative 1 (Exh. BGC- 1(R) at Att. 5-D and App. F). The Company stated that the pipeline along Alternative 1 would be located within Hatfield Street, North Elm Street, Bridge Road, Cooke Avenue, North King Street, Elm Court, Elm Street, Little Neponsett Road, and Brook Hollow Road (Exh. EFSB-G-2). The Company stated that the pipeline along Alternative 2 would be located within Hatfield Street, North Elm Street, Prospect Avenue, Bridge Road, Pine Brook Curve, North King Street, Church Street, Bridge Street (Hatfield) School Street, and Main Street (id.).

The Company stated that the following streets along Alternative 1 could potentially be completely closed during construction: North Elm Street, Cooke Avenue, and Hatfield Street, all located in Northampton (Exh. EFSB-T-7). In addition, the Company stated that the following streets along Alternative 2 could potentially be completely closed during construction: North

Elm Street, Prospect Avenue and Pine Brook Curve, located in Northampton; and Church Street in Hatfield (id.).

iii. Analysis

The record demonstrates that construction of the proposed pipeline along the primary route has the potential to create temporary traffic impacts. The Company provided a list of issues that would be addressed in a Traffic Management Plan, including mitigation measures to address the safety of pedestrian, vehicular and bus traffic. The Company has agreed to work with City of Northampton and Town of Hatfield officials to identify specific measures to further mitigate traffic impacts, but has not yet provided drafts of the Traffic Management Plans for the proposed project. Berkshire has indicated that it would formalize traffic mitigation arrangements with the affected communities when it has selected its contractor. The Siting Board notes that it is crucial that Berkshire and the City of Northampton and the Town of Hatfield develop workable Traffic Management Plans in a time frame that allows for notification to residents and businesses. Consequently, to ensure that all outstanding issues can be resolved in a timely fashion, the Siting Board directs the Company to submit draft Traffic Management Plans to Northampton and Hatfield officials at least two months prior to the commencement of construction. The Siting Board finds that, with the implementation of this condition, the construction traffic impacts of the proposed pipeline along the primary route would be minimized.

The record indicates that traffic impacts during construction along the primary or either alternative route would be temporary, and that proposed mitigation would be similar and could be addressed through Traffic Management Plans developed in consultation with the host communities. The total lengths of each of the three routes are 3.6 miles, 5.4 miles, and 5.6 miles; however, the in-street, paved portions of the primary route and Alternative 1 are similar in length, at 3.6 miles and 3.4 miles respectively, while the in-street paved portion of Alternative 2 is approximately two miles longer. Alternative 2 therefore would require a longer period of in-street construction. Accordingly, the Siting Board finds that the primary route would be comparable to Alternative 1, and preferable to Alternative 2 with respect to construction traffic impacts.

d. Noise

i. Primary Route

Berkshire asserted that the majority of construction would occur during the daytime, and estimated average construction noise is to be between 80-85 decibels, A-weighted ("dBA") at the noise source, and 68-73 dBA at 50 feet away (Exh. EFSB-NO-3). However, noise associated with a backhoe/excavator, which the Company stated is the most commonly used noisier piece of equipment, could be between 85-105 dBA at the noise source, and 73-93 dBA at 50 feet away (Exhs. EFSB-NO-5; EFSB-RR-10(a)).[21] The closest residences to construction activities are 22 feet away from the work zone, located at Hatfield Street in Northampton and Elm Street in Northampton, where the estimated noise levels from a backhoe/excavator would be 79-99 dBA (Exhs. EFSB-NO-5; EFSB-RR-10(a)). Berkshire asserted that the use of the backhoe/excavator would only occur for a portion of a full-day construction period, therefore the associated decibel level would not be continuous over an 8-hour period (Tr. 2, at 226). The Company indicated that based on its construction schedule, it would expect to be in front of a house for one day for pipe laying activities, with additional time for earlier excavation and later restoration activities (id.).

The Company stated that occasional night work may take place and would include the operation of a generator for lighting and the use of a sump pump to dry areas where groundwater is present (Exh. EFSB-NO-2). Berkshire also noted that it may conduct limited daytime weekend work to meet construction deadlines (Exh. BGC-19(R) Att. 5-AA at 11).

The use of HDD at any of the I-91 crossings would be a continuous 24-hours a day operation (Exh. EFSB-C-8; Tr. 2, at 230).[22] The Company explained that most of the HDD work is performed at the entry pit, where the noise levels would be the highest (Exh. EFSB-NO-6).

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21 The Company stated that other noisier pieces of construction equipment, and the estimated noise levels at 50 feet from the source are: jackhammer, 81-99 dBA; trucks, 83-95 dBA; pavers, 86-89 dBA; welding machines, 71-83 dBA; and slurry pumps, 69-76 dBA (Exhs. EFSB-NO-6; EFSB-RR-10(a)).

22 As part of the HDD process, a hole is drilled from a drilling pit along the length of the HDD alignment, here extending beneath I-91 (Exh. BCG-1, App. E at 3). The pipeline is then typically pulled through the drill hole by jacks that are pushed against the base and wall of the drilling pit (id.).

The Company asserted that the construction activities at the HDD receiving pit would produce lower noise levels and added that noisy activities at the receiving pit, such as excavation, could be undertaken during the normal, daytime construction hours of operation (id; Tr. 2, at 229).

The entry pit for the primary route is located on an abandoned section of North Hatfield Street, 200 feet from the State Police Barracks on North King Street in Northampton (Exh. EFSB-NO-4). The closest residence to this entry pit is located 300 feet away across North King Street, where the estimated noise level would be 67 dBA during HDD operation (Exh. EFSB-NO-6). The receiving pit for the primary route is located on Elm Court in Hatfield (Exh. EFSB-NO-4). The closest residence to this receiving pit is located 85 feet away on Elm Court, where the estimated noise level would be 63-77 dBA from the weld and slurry pumps, and 67-87 dBA when a backhoe/excavator is used (Exh. EFSB-NO-6; Tr. 2, at 228). The Company stated that the likely duration of HDD operation for the primary route would be eight days at the entry pit and eight days at the receiving pit (Exh. EFSB-C-13).

Berkshire explained that any mitigation relating to HDD work would most likely consist of acoustic material or acoustic blankets around the equipment; however, the Company could not quantify the noise reduction that could be achieved by such measures (Tr. 2, at 227-228).

ii. Alternative Routes

The Company indicated that of the three I-91 crossings, Alternative 1 is located the furthest distance from receptors, and is the overall longest crossing (Tr. 2, at 230).
The entry pit for Alternative 1 is located in the cloverleaf for the I-91 south on ramp in Northampton (Exhs. EFSB-NO-4; EFSB-NO-6). The Company stated that the closest residence to this entry pit is located over 400 feet away across North King Street, and that noise from operation of the HDD would not increase the existing ambient noise levels (Exh. EFSB-NO-6). The receiving pit for Alternative 1 is located in a wooded area approximately 185 feet away from I-91 in Hatfield (id.). The Company stated that the closest residence to this receiving pit is located approximately 650 feet away on Elm Court, and that noise from operation of the HDD would not increase the existing ambient noise levels (Exh. EFSB-NO-6). The likely duration of HDD operation for Alternative 1 would be ten days at the entry pit and twelve days at the

receiving pit (Exh. EFSB-C-13).

The entry pit for Alternative 2 is located at the end of Church Street in Hatfield (Exhs. EFSB-NO-4; EFSB-NO-6). The Company stated that entry pit HDD operation noise would be 85 dBA at a distance of 50 feet and that the closest residence to this entry pit is located approximately 55 feet away (Exhs. EFSB-NO-3; EFSB-NO-6). The receiving pit for Alternative 2 is located at the end of Bridge Street (Exh. EFSB-NO-4). The Company stated that the closest residence to this receiving pit is located approximately 100 feet away, where the estimated noise level would be 63-77 dBA from weld and slurry pumps, and 67-87 dBA when a backhoe/excavator is used (Exh. EFSB-NO-6). The likely duration of HDD operation for Alternative 2 would be seven days at the entry pit and eight days at the receiving pit (Exh. EFSB-C-13).

iii. Analysis

The record demonstrates that the noise impacts of the proposed pipeline along the primary route would be limited to temporary noise associated with construction activities. Construction noise impacts would be minimized by confining work to daytime hours, with the exception of HDD work at the entry pit locations. The Siting Board notes that the Company has not proposed specific noise mitigation measures, with the exception of limiting construction to daytime hours. There are additional measures that focus on the use and placement of construction equipment, such as employing proper muffling, adhering to idling limitations on the equipment, as well as shielding and placement of construction equipment. These mitigation methods would be consistent with approaches to mitigation that the Siting Board has accepted and encouraged in past cases. The Siting Board directs the Company to: (1) employ and maintain sound mufflers on construction equipment; (2) comply with applicable idling limitations when operating construction equipment; and (3) to the extent possible, use shielding and the optimal placement of equipment to minimize construction noise impacts.

Further, with regard to HDD operation and nighttime noise, it appears that while there may be mitigation measures that can be applied to operation of the equipment at the entry pit, they would have limited effect in reducing noise levels. The Company has provided estimates of

noisy work at the receiving pit ranging from 63 dBA to 87 dBA, consisting of welding, slurry pump operation, and excavation. The record shows that noisy HDD work at the receiving pit does not have to be conducted at night, as it is not a 24-hour activity. For the primary route, the receiving pit is located closer to residences than the entry pit, and if HDD activities at the receiving pit were conducted at night, the noise levels could be significant. Therefore, the Siting Board directs the Company to confine noisy HDD operations at the receiving pit, including but not limited to welding, slurry pump operation, and excavation, to the same daytime construction schedule as is proposed for the linear construction activities along the proposed route.

The Siting Board finds that with the implementation of the above conditions, the construction noise impacts of the proposed pipeline along the primary route would be minimized.

The noise impacts of the proposed project along the alternative routes also would be limited to temporary noise impacts associated with construction activities, and the same mitigation measures would be employed. The record shows that with the exception of the HDD crossings, the primary and alternative routes would be comparable with respect to the types and volume of noise generated during construction. The record indicates that construction noise associated with HDD could be significant, and that HDD operations would continue for 24 hours per day at the entry pit. However, with regard to the noise associated with the use of HDD, the location of the entry and receiving pits in relation to residences varies. Specifically, the noise levels at the closest residence to the entry pit during construction would be 67 dBA along the primary route, the noise levels would remain close to the ambient along Alternative 1, and would be close to 85 dBA along Alternative 2. Although the operation of the HDD at the receiving pit can be curtailed in the nighttime, the daytime noise levels at the receiving pit for the primary route and Alternative 2 could be high due to the proximity of the closest residences, while Alternative 1 is located 650 feet away from the closest residence. Further, there is little indication that on-site mitigation could meaningfully reduce the noise levels at the affected residences. Accordingly, the Siting Board finds that Alternative 1 would be preferable to the primary route, which in turn would be preferable to Alternative 2 with respect to noise impacts.

e. Conclusions on Environmental Impacts

In Sections III.C.2.a, III.C.2.b, III.C.2.c, and III.C.2.d above, the Siting Board has reviewed the record evidence regarding the construction impacts and the permanent impacts of the proposed pipeline, and has imposed mitigation where necessary to minimize the environmental impacts of the proposed pipeline. Based on its review of the record, the Siting Board finds that Berkshire has provided sufficient information regarding environmental impacts and potential mitigation measures to allow the Siting Board to determine that the Company has achieved the proper balance among environmental impacts.

In Sections III.C.2.a, III.C.2.c, and III.C.2.d, above, the Siting Board found that, with implementation of the stated conditions, the environmental impacts of the proposed pipeline along the primary route would be minimized. The Siting Board found that the primary route would be comparable to Alternative 2, and preferable to Alternative 1 with respect to land resources impacts; the primary route would be preferable to both Alternative 1 and Alternative 2 with respect to wetlands and water resource impacts; that the primary route would be comparable to Alternative 1, and preferable to Alternative 2 with respect to construction traffic impacts; and Alternative 1 would be preferable to the primary route, which in turn would be preferable to Alternative 2 route with respect to noise impacts.

Thus, in comparing the primary route to Alternative 1 as to overall environmental impacts, the advantages of the primary route with respect to land resource impacts and wetland and water resource impacts must be balanced with the advantage of Alternative 1 with respect to noise impacts. The primary route would avoid construction in agricultural areas and habitat resource areas that are located along Alternative 1. Further, approximately 0.5 acres of trees would need to be cleared along Alternative 1, which would have a permanent impact on the landscape. The advantages of Alternative 1 over the primary route with respect to noise are confined to the use of HDD, which is a small percentage of the overall construction schedule, where overall construction noise is comparable along the two routes. Therefore, on balance, the primary route would be preferable to both Alternative 1 and Alternative 2 with respect to environmental impacts.

Consequently, the Siting Board finds that the environmental impacts of the proposed pipeline along the primary route would be minimized, and that the primary route would be preferable to Alternative 1 and Alternative 2 with respect to environmental impacts.

3. Cost and Reliability

a. Description

Berkshire asserted that the primary route would be the least cost alternative (Exh. BGC-1(R) at 5-18). The Company estimated that the cost of the proposed pipeline along the primary route would be $4,483,773, and the cost of the proposed pipeline would be $7,571,539 along Alternative 1 and $6,526,042 along Alternative 2 (Exhs. BGC-1(R) at App. C; EFSB-G-4; EFSB-G-5). The Company explained that these cost estimates include route-specific costs, as well as the cost of work at the Northampton Gate Station and at the UMass service line and meter, which would be the same for all three routes (Exh. EFSB-G-4). Berkshire stated that total pipeline installation costs were estimated to be $225 per linear foot based upon the Company's past experience with pipeline construction and information received from vendors (Exh. BGC-19(R) at Att. 4-B-3; Brief at 30).

Berkshire stated that it developed specific, distance-based estimates for the pipeline construction and related mitigation (Exh. BGC-1(R) at 5-16). The Company then factored in cost adjustments for area-specific complicated construction, such as the I-91 crossing on each route (id. at 5-17).

With regard to reliability, Berkshire asserted that the primary and both alternative routes would be comparable in terms of reliability and operation flexibility (Exh. EFSB-G-6). The Company recognized that with use of any route, the project would provide some operational benefits since a greater rate of gas throughput could be supplied from the Northampton Gate Station and additional portions of the Greenfield and Amherst Feedlines would be looped (Exh. BGC-1(R) at 5-36). The Company explained that the reliability is similar since each route results in comparable looping of Berkshire's existing distribution system (Exh. EFSB-G-6).

b. Analysis

The Company's estimate of the cost of constructing the proposed pipeline along the primary route is approximately $3 million lower than the estimate for Alternative 1, and approximately $2 million lower than its estimate of Alternative 2. Accordingly, the Siting Board finds that the primary route is preferable to Alternative 1 and Alternative 2 with respect to cost.

With regard to reliability, the record shows that the construction environment and techniques, use of looping, and operational characteristics are similar with each of the three routes. Accordingly, the Siting Board finds that the primary route and Alternative 1 and Alternative 2 are comparable with respect to reliability.

4. Conclusions on Facility Routing

The Siting Board has found, above, that the primary route would be preferable to the alternative routes with respect to environmental impacts and cost. The Siting Board also has found that primary and alternative routes would be comparable with respect to reliability.

Based on its review of the record, the Siting Board finds that Berkshire has provided sufficient information regarding costs, reliability, and environmental impacts to allow the Siting Board to determine whether it has achieved the proper balance between environmental impacts, cost and reliability. Accordingly, the Siting Board finds that the primary route is preferable to Alternative 1 and Alternative 2 with respect to providing a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost.

IV. 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. G.L. c. 164, § 69H. In addition, the statute requires that the Siting Board determine whether plans for the construction of energy facilities are consistent with current health, environmental protection, and resource use and development policies as adopted by the Commonwealth. G. L. c. 164, § 69J.

In Section II.A, above, the Siting Board found that there is a need for additional energy resources to maintain reliable gas service to customers to serve the Company's anticipated load at UMass. Further, in Section II.A, above, the Siting Board found that the proposed project is consistent with the Company's most recently approved long-range forecast.

In Section II.B, above, the Siting Board found that the proposed project, combined with a load management agreement with the primary customer, UMass, would be superior to alternative approaches 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 III.A, above, the Siting Board found that the Company has examined a reasonable range of practical siting alternatives.

In Section III.C, above, the Siting Board found that with the implementation of listed conditions regarding land resources, traffic, and construction noise, the proposed project would be preferable to the alternative routes with respect to providing a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost. The Siting Board also found that, with the implementation of the conditions regarding land resource, traffic, and construction noise, the environmental impacts of the proposed project along the primary route would achieve an appropriate balance among conflicting environmental concerns as well as among environmental impacts, reliability and cost.

In Section III, above, the Siting Board reviewed the environmental impacts of the proposed project in light of related regulatory or other programs of the Commonwealth, including programs related to wetlands protection, groundwater protection, rare and endangered species' habitat, and historic preservation. As evidenced by the above discussions and analyses, the Siting Board finds that the proposed project along the primary route would be generally consistent with the identified requirements of all such programs. Consequently, the Siting Board finds that the construction of the proposed project is consistent with current health, environmental protection, and land resource and development policies as adopted by the Commonwealth.

Accordingly, the Siting Board finds that, upon compliance with the conditions set forth in Section III.C, above, and listed below, the construction and operation of the proposed project will

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

Accordingly, the Siting Board APPROVES the proposal of The Berkshire Gas Company to construct an approximately 3.6 mile, 12-inch diameter gas pipeline in the City of Northampton and the Town of Hatfield along the primary route, subject to the following conditions:

Prior to commencement of construction of the proposed project:

(A) In order to minimize land resource impacts, the Siting Board directs the Company to provide a copy to the Siting Board of final NHESP correspondence addressing any requirements for further monitoring and mitigation, as applicable, with regard to habitat areas along the primary route.

(B) In order to minimize land resource impacts, the Siting Board directs the Company to consult with the MHC and provide a copy to the Siting Board of MHC correspondence addressing any requirements for further analysis and mitigation to allow construction of the proposed pipeline through Northampton and Hatfield.

(C) In order to minimize land resource impacts, the Siting Board directs the Company to collaborate with the MHC and the Town of Hatfield on the placement of the pipeline in the Hatfield historic districts to avoid, to the extent possible, construction impacts from the installation of the pipeline.

(D) In order to minimize traffic impacts, the Siting Board directs the Company to submit draft Traffic Management Plans to Northampton and Hatfield officials at least two months prior to the commencement of construction.

During construction of the proposed project:

(E) In order to minimize noise impacts, the Siting Board directs the Company to: (1) employ and maintain sound mufflers on construction equipment; (2) comply with applicable idling limitations when operating construction equipment; and (3) to the extent possible, use shielding and the optimal placement of equipment to minimize construction noise impacts.

(F) In order to minimize noise impacts, the Siting Board directs the Company to confine noisy HDD operations at the receiving pit, including but not limited to welding, slurry pump operation, and excavation, to the same daytime construction schedule as is proposed for the linear construction activities along the proposed route.

Because the issues addressed in this decision are subject to change over time, construction of the proposed pipeline must commence 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 Berkshire 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. Berkshire is obligated to provide the Siting Board with sufficient information on changes to the proposed project to enable the Siting Board to make these determinations.

Selma Urman
Presiding Officer

January 13, 2006

APPROVED by a majority of the Energy Facilities Siting Board, at its meeting of January 12, 2006, by the members and designees present and voting. Voting for approval of the Tentative Decision, as amended: Judith F. Judson (Chairman, DTE/EFSB), W. Robert Keating (Commissioner, DTE); David L. O'Connor, (Commissioner, Division of Energy Resources); James Connolly, (Commissioner, DTE); Stephen Pritchard, (Secretary of Environmental Affairs); and Deborah Shufrin (for Ranch C. Kimball, Secretary, of Economic Development).

Judith F. Judson

Judith F. Judson, Chairman
Energy Facilities Siting Board

Dated this 12th day of January, 2006

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).

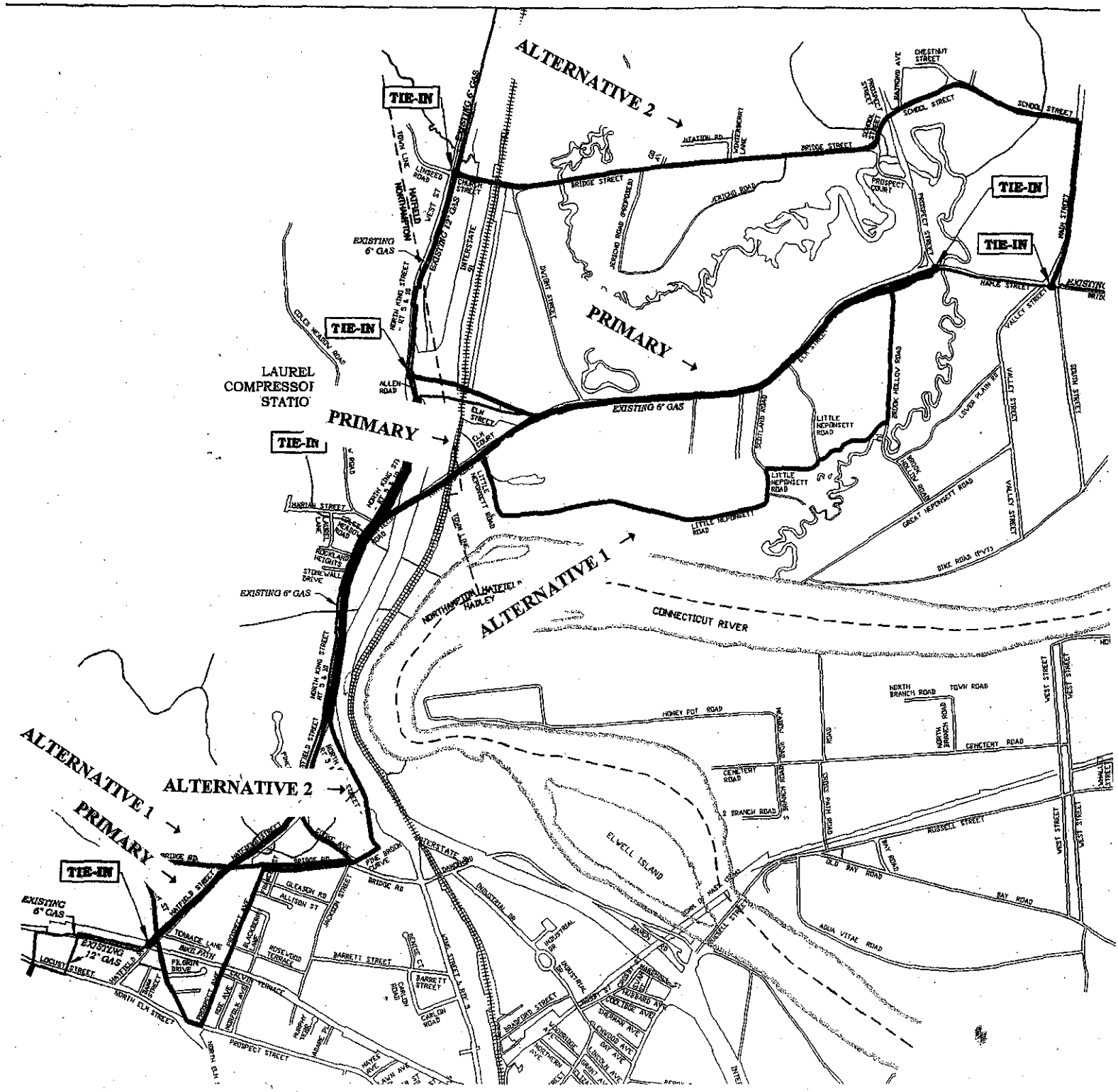

Figure 1

MAP OF PRIMARY AND ALTERNATIVE ROUTES

COMMONWEALTH OF MASSACHUSETTS
Energy Facilities Siting Board

In the Matter of the Petition of Colonial Gas Company d/b/a KeySpan Energy Delivery New England for Approval to Construct 13.1 Miles of Natural Gas Pipeline in Sandwich, Barnstable, Yarmouth, Dennis, and Harwich, Massachusetts	)	EFSB 05-2

FINAL DECISION

M. Kathryn Sedor
Presiding Officer
May 17, 2006

On the Decision:
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Enid Kumin
John Young

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LIST OF ABBREVIATIONS

Algonquin	Algonquin Gas Transmission Company
Company	Colonial Gas Company d/b/a KeySpan Energy Delivery New England
d/b/a	doing business as
dBA	decibels, A-weighted
Department	Massachusetts Department of Telecommunications and Energy
DCR	Massachusetts Department of Conservation and Recreation
DSM	demand side management
D.T.E. Road Restoration Standards	Public Utility Road Restoration Standards, D.T.E. 98-22, att., §§ 1.0-12.0 (August 26, 1999)
G.L.	Massachusetts General Laws
hp	horsepower
KeySpan	Colonial Gas Company d/b/a KeySpan Energy Delivery New England
L_{10}	sound levels exceeded for 10% of a time period
LNG	liquified natural gas
2002 LRRP	Long-Range Resource and Requirements Plan for the years 2001/2002 to 2005/2006 (2002)
2005 LRRP	Long-Range Resource and Requirements Plan for the years 2005/2006 to 2009/2010 (2005)
MADEP	Massachusetts Department of Environmental Protection
MassGIS	Massachusetts Geographic Information System
MCP	Massachusetts Contingency Plan [310 CMR 40.0000]
MHD	Massachusetts Highway Department
MMBtu	million British thermal units
MMBtu/day	million British thermal units per day
MMBtu/hr	million British thermal units per hour
MMBtu/yr	million British thermal units per year
municipalities	Towns of Sandwich, Barnstable, Yarmouth, Dennis, and Harwich
NHESP	Massachusetts Natural Heritage and Endangered Species Program

PAL	Public Archaeology Lab, Inc.
psig	pounds per square inch, gauge
PV	present value [costs]
Rail Trail	Cape Cod Rail Trail
railroad bridge	no-longer-used railroad bridge crossing the Bass River
Siting Board	Massachusetts Energy Facilities Siting Board
SPCC	Spill Prevention Control and Countermeasures [plan]
SWPPP	Stormwater Pollution Prevention Plan
SynerGEE model	Advantica/SynerGEE gas flow model
Towns	Town of Yarmouth and Town of Dennis, jointly
URAM	Utility-related Abatement Measure [for MCP]
USGS	U.S. Geological Survey

ANP Blackstone Decision	ANP Blackstone Energy Company, 8 DOMSB 1 (1999)
CELCo Decision	Cambridge Electric Light Company, 12 DOMSB 305 (2001)
MECo/NEPCo Decision	Massachusetts Electric Company and New England Power Company, 18 DOMSC 383 (1989)
MMWEC Decision	Massachusetts Municipal Wholesale Electric Company, 12 DOMSB 18 (2001)
NSTAR Gas Decision	NSTAR Gas Company, 13 DOMSB 143 (2001)
1997 BECo Decision	Boston Edison Company- Hopkinton and Milford, 6 DOMSB 208 (1997)
1998 NEPCo Decision	New England Power Company, 7 DOMSB 333 (1998)
2006 Berkshire Gas Decision	The Berkshire Gas Company, EFSB 05-1 (2006)
2005 NSTAR Electric Decision	Boston Edison Company, d/b/a NSTAR Electric, 14 DOMSB 233 (2005)

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Pursuant to G.L. c. 164, § 69J, the Energy Facilities Siting Board hereby APPROVES, subject to the conditions set forth below, the petition of Colonial Gas Company, d/b/a KeySpan Energy Delivery New England, to construct approximately 13.1 miles of underground natural gas pipeline on Cape Cod.

I. INTRODUCTION

A. Summary of the Proposed Project

On June 3, 2005, Colonial Gas Company, d/b/a KeySpan Energy Delivery New England ("KeySpan" or "Company") filed a petition with the Energy Facilities Siting Board ("Siting Board") for approval to construct three new non-contiguous segments of natural gas distribution pipeline, approximately 13.1 miles in combined length in the Towns of Sandwich, Barnstable, Yarmouth, Dennis, and Harwich, Massachusetts ("municipalities"). The new pipeline segments would augment the Company's existing Sagamore Line, a 42-mile distribution line on Cape Cod ("pipeline project" or "proposed project") (Exhs. KED-1, at 1-1; KED-2).

Algonquin Gas Transmission Company ("Algonquin") currently supplies natural gas to the Company at two take stations located north and west of the Cape Cod Canal, in Bourne (Exh. KED-1, at 1-1). KeySpan indicated that Algonquin intends to extend its pipeline facilities to a new delivery point on Cape Cod, connecting to KeySpan's Sagamore Line at the intersection of Route 130 and Service Road in Sandwich. According to KeySpan, the Algonquin G Lateral will provide additional gas supplies at the new delivery point at 270 pounds per square inch, gauge ("psig"). KeySpan stated that the purpose of the pipeline project is to address existing low-pressure issues on the Sagamore Line and to provide deliverability for the additional gas that the Company would receive from Algonquin (id.).

The three segments of the proposed project are identified by KeySpan as the Western Segment, which would be located in the Towns of Sandwich and Barnstable; the Middle Segment, which would be located in the Towns of Yarmouth, Dennis, and Harwich; and the Eastern Segment, which would be located in the Town of Harwich (id.). KeySpan views

construction of the three individual segments as one project, and stated that it intends to construct the project in stages over a time-frame of approximately ten years (id. at 1-3).[1]

1. The Western Segment

The Western Segment along the primary route would consist of 6.6 miles of 270-psig, 20-inch diameter pipeline in Sandwich and Barnstable (Exhs. KED-1, at 1-4; EFSB-E-1(1)). The primary route begins at the intersection of Route 130 and Service Road in Sandwich, runs east along Service Road, and ends where an existing NSTAR right-of-way crosses Service Road, just short of Route 149 in Barnstable (Exhs. KED-1, at 1-4; EFSB-E-1(1)). KeySpan indicated that it would build the Western Segment in stages – the first stage installed in time to provide additional capacity for the 2009/2010 heating season and additional stages completed by approximately 2014, depending on the actual rate of growth of customer demand (Exh. KED-1, at 2-25; Tr. 1, at 147-150).

2. The Middle Segment

The Middle Segment along the primary route would consist of approximately 4.9 miles of 200-psig, 12-inch diameter pipeline in Yarmouth, Dennis, and Harwich (Exhs. KED-1, at 1-4; EFSB-E-1(2)). The primary route begins at KeySpan's existing liquified natural gas ("LNG") facility in South Yarmouth, runs easterly through Yarmouth on White's Path, North Main Street, Great Western Road, and Highbank Road, crossing the Highbank Road bridge over the Bass River into Dennis (Exhs. KED-1, at 1-4; EFSB-E-1(2)). In Dennis, the primary route passes through the South Dennis Historical District on Highbank Road, and continues eastward on Upper County Road, Great Western Way, Great Western Road, and Depot Street; the primary

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[1] KeySpan presented information regarding the likely sequence and timing of construction for each of the three segments, based on its current base-case load forecast. However, the Company stated that it will re-evaluate its load forecast on an annual basis (Tr. 1, at 147-150). The Company further stated that the actual sequencing and timing of pipeline construction would be conducted on an as-needed basis, consistent with any future modifications to KeySpan's load forecast and subject to any adjustments the Company might make to coordinate with activities of the municipalities that would be affected by construction (id.).

route extends into Harwich, where it ends at the intersection of Depot Street and Main Street (Exhs. KED-1, at 1-14, fig. 4-6).

KeySpan stated that the first 12,000 feet of the Middle Segment is needed by the start of the 2006/2007 heating season (Exh. KED-1, at 1-5, 2-24). KeySpan indicated that, assuming completion of Algonquin's pipeline extension by the start of the 2007/2008 heating season, the Company would construct the remainder of the Middle Segment (a total of approximately 13,000 feet) in 2008 and 2009, in time to provide additional capacity for the 2009/2010 heating season (id. at 2-24 to 2-25; Tr. 1, at 147-150). The Company stated that, without the Algonquin pipeline extension, and subject to the actual rate of growth of demand, it would complete construction of the entire Middle Segment by the start of the 2007/2008 heating season (Exh. KED-1, at 2-24 to 2-25).

3. The Eastern Segment

The Eastern Segment along the primary route would consist of 1.6 miles of 200-psig, 12-inch diameter pipeline in Harwich (Exhs. KED-1, at 1-4; EFSB-E-1(3)). The primary route runs along Route 39 in Harwich, from the intersection with Depot Road to the intersection with Church Street, ending at the KeySpan Church Street regulator station (Exh. KED-1, at fig. 4-4).

KeySpan stated that it would construct the Eastern Segment in time to increase capacity beginning with the 2010/2011 heating season, subject to the actual rate of growth of demand (Exh. KED-1, at 2-25; Tr. 1, at 147-150). The Company stated that it would either construct the Eastern Segment in three stages, beginning in 2010 and ending in 2013, or in a single year, depending largely on the expressed preference of the Town of Harwich (Exhs. KED-1, at 3-4; EFSB-S-4; EFSB-E-24; Tr. 2, at 270-272).

B. Procedural History

On June 3, 2005, KeySpan filed a petition with the Siting Board seeking approval, pursuant to G.L. c. 164, § 69J, to construct the proposed pipeline project. The Siting Board petition was docketed as EFSB 05-2. The Siting Board conducted public comment hearings on the Company's petition in the Barnstable on July 27, 2005 and in Harwich on July 28, 2005.

On August 30, 2005, the Presiding Officer issued a ruling granting two petitions to intervene and three petitions for limited participant status in the proceeding. The Town of Yarmouth and the Town of Dennis (jointly, "Towns") and Andrew Collentro were granted intervenor status. Russell DeTore and Suzanne DeTore, jointly, Diane Pinto, and NSTAR were granted limited participant status.

The Siting Board staff issued one preliminary and two additional sets of information requests to the Company; the Towns issued two sets of information requests to the Company. The Company issued one set of information requests to the Towns.

On September 15, 2005, the Company submitted its direct case, in the form of written prefiled direct testimony. Thereafter KeySpan presented the testimony of three witnesses: Walter F. Fromm, Manager of Project Engineering for KeySpan and Project Manager for the proposed project; Theodore E. Poe, Jr., Manager of Energy Planning for KeySpan; and Theodore A. Barten, Managing Principal of Epsilon Associates, the Company's engineering and environmental consultant.

On October 13, 2005, the Towns submitted their prefiled direct testimony. Thereafter the Towns presented the testimony of three witnesses: Joseph A. Rodricks, Town Engineer for the Town of Dennis; Edmond R. Nickerson, Chairman of the South Dennis Historical District; and George Allaire, Town of Yarmouth Public Works Director.

Adjudicatory hearings were held on November 17 and 29, 2005, and December 1, 6, and 9, 2005. Approximately 370 exhibits were entered into evidence. On January 6, 2006, the Company and the Towns filed initial briefs and on January 13, the Company filed a reply brief. The evidentiary record was closed on January 4, 2006.

C. Jurisdiction and Scope of Review

The Company filed its petition to construct the proposed pipeline project in accordance with G.L. c. 164, § 69H, which requires the Siting Board to implement the energy policies in its statute to provide a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost, and pursuant to G.L. c. 164, § 69J, which requires a

project applicant to obtain Siting Board approval for the construction of proposed energy facilities before a construction permit may be issued by another state agency.

As a new gas pipeline with a normal operating pressure in excess of 100 psig and a length in excess of one mile, the Company's proposed project falls within the definition of facility set forth in G.L. c. 164, § 69G, which provides that a "facility" includes:

> a new pipeline for the transmission of gas having a normal operating pressure in excess of 100 pounds per square inch gauge which is greater than one mile in length except restructuring, rebuilding, or relaying of existing transmission lines of the same capacity.

In accordance with G.L. c. 164, § 69J, before approving a petition to construct facilities, the Siting Board requires an applicant to justify its proposal in three phases. First, the Siting Board requires the applicant to show that additional energy resources are needed (see Section II.A, below). Next, the Siting Board requires the applicant to establish that, on balance, its proposed project is superior to alternative approaches in terms of cost, environmental impact, reliability, and ability to address the identified need (see Section II.B, below). Finally, the Siting Board requires the applicant to show that it has considered a reasonable range of practical facility siting alternatives and that the proposed site for the facility is superior to a noticed alternative site in terms of cost, environmental impact, and reliability of supply (see Sections III.A and III.C, below).

II. ANALYSIS OF THE PROPOSED PROJECT

A. Need Analysis

1. Standard of Review

In accordance with G.L. c. 164, § 69H, the Siting Board is charged with the responsibility for implementing energy policies in its statute to provide a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost. G.L. c. 164, § 69H. In carrying out this statutory mandate with respect to proposals to construct natural gas pipelines, the Siting Board evaluates whether there is a need for additional natural gas facilities in the Commonwealth to meet reliability, economic efficiency, or environmental

objectives. See The Berkshire Gas Company, EFSB 05-1, at 3-4 (2006) ("2006 Berkshire Gas Decision"); Boston Edison Company, d/b/a NSTAR Electric, 14 DOMSB 233 (2005) ("2005 NSTAR Electric Decision"); Massachusetts Electric Company and New England Power Company, 18 DOMSC 383, at 393 (1989) ("MECo/NEPCo Decision").

In evaluating the need for new energy facilities to meet reliability objectives, the Siting Board may evaluate the ability of its existing system to accommodate changes in aggregate demand or supply,[2] to serve major new loads, or to maintain reliable service in certain contingencies. The Siting Board previously has approved proposals to construct gas pipelines to accommodate load growth within a utility's service territory (Boston Gas Company, 17 DOMSC 155 (1988)) and to transport natural gas to generating facilities. See NSTAR Gas Company, 13 DOMSB 143 (2001) ("2001 NSTAR Gas Decision"); Massachusetts Municipal Wholesale Electric Company, 12 DOMSB 18 (2001) ("MMWEC Decision"); Berkshire Gas Company, 20 DOMSC 109 (Phase II) (1990). In such cases, the proponent must demonstrate that additional energy resources are necessary to meet reliability objectives by establishing that its existing system is inadequate to serve the anticipated load with acceptable reliability.

2. Description of the Existing System

The Company stated that KeySpan's existing Sagamore Line is an approximately 42-mile, high-pressure natural gas distribution line serving about 89,000 residential and 8300 commercial customers in the Company's Cape Cod service territory (Exh. KED-1, at 2-1, 2-4 to 2-5). The Company indicated an average and peak daily gas throughput on its Cape Cod system of approximately 31,500 million Btu ("MMBtu") and 114,000 MMBtu, respectively (id.). The Company explained that natural gas supplies currently reach the Cape by the G Lateral, which is a feeder line off the Algonquin pipeline system, and by truck to the Company's LNG facilities (id.). The Company stated that the G Lateral is at present the sole interstate pipeline

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[2] With respect to changes in demand or supply, the Siting Board has found that new capacity is needed where projected future capacity available to the system is found to be inadequate to satisfy projected load. ANP Blackstone Energy Company, 8 DOMSB 1, at 27 (1999) ("ANP Blackstone Decision"); Cabot Power Corporation, 7 DOMSB 233, at 249 (1998); New England Electric System, 2 DOMSC 1, at 9 (1977).

facility supplying southern Massachusetts (id. at 2-5). Gas from Algonquin enters the KeySpan system at the Bourne and Sagamore take stations (id.).

The Company stated that the principal supply lines of its Cape Cod distribution system are the Sagamore and Bourne Lines (id. at 2-5). The Company indicated that the Sagamore Line, the principal feeder line for customers on the northern side of the Cape, starts at the Sagamore take station and runs through Bourne, Sandwich, Barnstable, and Yarmouth to an interconnection with the South Yarmouth LNG facility (id.). From South Yarmouth, the Sagamore Line continues through Dennis, Harwich, and Brewster (id.). The Company stated that the Bourne Line starts at the Bourne take station, continues to the southwestern portion of the Cape to serve customers in Bourne, Sandwich, Falmouth, and Mashpee, and connects with the Sagamore Line in Barnstable, where it terminates at a regulator station on Oak Street (id. at 2-5 to 2-6).

The Company indicated that the Sagamore Line generally operates at 270 psig in winter and 200 psig in summer (id.). The Company noted that smaller 60 psig distribution lines feed gas into the easternmost part of its Cape Cod system in Chatham, Orleans, and Eastham as well as into the areas of the Cape adjoining the length of the Sagamore and Bourne Lines (id.). The Company stated that gas pipeline supplies to the Cape and pipeline pressure to serve the eastern extremities of KeySpan's Cape distribution system originate at the western Cape and the interstate pipeline system (id.).

The Company explained that, in addition to the Sagamore and Bourne Lines, another key component of its Cape Cod system is the South Yarmouth LNG facility (Exh. KED-1, at 2-6). The Company stated that it operates the South Yarmouth LNG facility to provide a source of gas supply during peak demand periods and to help maintain system pressures for gas flows to the easternmost portion of the Cape (id.). The Company stated that its South Yarmouth LNG facility has an operational sendout capability of approximately 27,600 MMBtu/day, and a storage capacity of 165,073 MMBtu (id.). The Company reported that the South Yarmouth LNG facility includes a single LNG storage tank, an LNG tanker truck unloading station and four heated vaporizers (id.).

The Company indicated that since 1999, it has supplemented the Cape Cod distribution system with two portable LNG vaporizer units at the eastern extremity of the system (id.).

One of these units is in Chatham and has a maximum output of 250 MMBtu/hr; the other, in Eastham, has a maximum output of 45 MMBtu/hr (id.).[3] The Company stated that the portable LNG units are intended for use a few days a year to bolster pressure when demand for gas is especially high (id. at 2-7). The Company indicated that it also operates, supplemental to its other Cape Cod system facilities, a small LNG facility off Cape Cod in Wareham (id.). The Company stated that its Wareham facility has a storage capacity of 9130 MMBtu and a maximum output of 120 MMBtu/hr (id. at 2-6 to 2-7).

3. Need for Additional Resources

a. Sendout Projections

To document the future requirements of its Cape Cod customers, the Company provided a copy of its most recently approved forecast, the Long-Range Resource and Requirements Plan for the years 2001/2002 to 2005/2006, developed in 2001 ("2001 LRRP") (Exh. EFSB-N-1(1)). In addition, the Company submitted its current Long-Range Resource and Requirements Plan for the years 2005/2006 to 2009/2010, developed in 2005 ("2005 LRRP") (Exh.EFSB-N-1(2)(S)).[4]

The Company stated that, in its 2001 LRRP, it forecasted an average annual growth rate of 3.3% for design day sendout over the 2001/2002 to 2005/2006 period (Exhs. EFSB-N-1(1); EFSB-N-7). For the period 2004/2005 to 2008/2009, the Company's forecast projected an average annual growth rate of 2.3% for design day sendout (Exhs. EFSB-N-1(1); EFSB-N-1(2)(S); EFSB-N-7). The Company asserted that, in a review of forecast accuracy, it determined its 2001 LRRP sendout amounts (i.e., projected sendout) had provided reasonable approximations of actual firm sendout for its forecast period (Exh. EFSB-N-7).

To assess need for the proposed project, the Company prepared a project-specific forecast (described by the Company as a ten-year forecast) to establish load and resource requirements in

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3 The Company indicated that, for back-up purposes, it maintains a second, identical unit at the Chatham site, but not in Eastham (Exh. KED-1, at 2-6 to 2-7) .

4 The Company indicated that the 2005 LRRP, pending with the Department, is docketed as D.T.E. 05-68 (Exh. EFSB-N-1(2)(S)).

the Cape Cod Division for the period 2004/2005 to 2014/2015 (Exh. KED-1, at 2-22 to 2-24).[5] The Company noted that based on its analysis for the period, design day sendout for Cape Cod would increase by an annual average of 2.1% over the first five years, 2005/2006 through 2010/2011 (Exh. RR-EFSB-3). The Company also explained that as part of its analysis, it calculated customer load growth on Cape Cod by town (id.).[6] The Company stated that the five-year growth rate broke down by region as follows: 2.4% across the western Cape, comprised of Bourne, Falmouth, Mashpee, Sandwich, and Wareham; 1.5% across the mid-Cape, Barnstable, Dennis, and Yarmouth; and 3.2% across the fastest growing of the three regions, the eastern Cape (Brewster, Chatham, Eastham, Harwich, and Orleans) (id.).

KeySpan conducted a sensitivity analysis of the need for the proposed project. The Company provided high load growth ("high case") and low load growth ("low case") scenarios in addition to its base load growth ("base case") projection developed from the project-specific forecast (Exhs. KED-1, at 2-14 to 2-25, table 2-5; EFSB-N-8(S); RR-EFSB-8). The Company used a yearly load growth rate of 2.6% for the high case and 1.8% for the low case, compared to 2.1% for the base case (Exh. RR-EFSB-8).

With respect to forecast methods, the Company indicated that it used the same forecast methods approved by the Department in the Company's 2001 LRRP to develop the 2005 LRRP and the project-specific forecast for 2004/2005 to 2014/2015 (Exhs. KED-1, at 2-8 to 2-25; EFSB-N-1(1); EFSB-N-1(2)(S). The Company explained that it examined the actual sendout data for the twelve-month period May 1, 2003 through April 30, 2004, then weather-normalized these data to establish sendout for a reference year (Exhs. KED-1, at 2-15 to 2-18; EFSB-N-1(1)).

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5 The Company indicated that it relied primarily on the Advantica/SynerGEE gas flow model ("SynerGEE model") to evaluate KeySpan's Cape Cod distribution system (Exh. KED-1, at 2-22 to 2-23). The Company explained that it used the SynerGEE model to simulate performance of the distribution system under defined conditions (design day weather conditions, for example) and to identify specific locations and conditions where pressure problems would likely occur (id.).

6 The Company explained that it determined a growth factor for each town in conjunction with use of the SynerGEE model (Exh. RR-EFSB-3). The Company further explained that its determination of growth factors reflected a review of the geographic distribution of recent load additions associated with new customers on the Cape (id.).

With a reference year developed, the Company then used forecasted incremental sales volumes and reference year sendout to project its split-year normalized customer requirements over the project-specific forecast period; load requirement subsequently became an input in the Company's forecasted year-by-year, design year and design day resource requirements for future years (id.).[7] The Company indicated that it thus took into consideration the total resources available to the KeySpan consolidated resource portfolio and the firm sendout requirement (id.).[8]

b. Delivery Volumes and Pressures

KeySpan presented results of hourly system pressure analyses, using the SynerGEE model to predict the ability of the existing Cape Cod distribution system to deliver gas over the project-specific forecast period (Exh. KED-1, at 2-22 to 2-25, table 2-5).[9]

The Company indicated that it first analyzed the ability of its existing Cape Cod system to deliver gas to customer connections at a minimum pressure of 10 psig (id.). The Company's model predicted that in 2006/2007, delivery pressures of less than 10 psig would occur under design weather and load conditions in two areas of the Cape Cod system, including modeled pressures of 9 psig at a location in Dennis and zero at a location in Harwich (id. at 22 to 2-23,

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7 The Company indicated that sendout requirements were developed using Department-approved design year and design day weather-planning standards (Exh. KED-1, at 2-15 to 2-18).

8 KeySpan indicated that, contingent on enhancement of its ability to distribute gas to its Cape Cod system customers, the Company anticipated contracting for incremental increases in deliveries from Algonquin beginning with 2000 MMBtu/day of added gas supplies over 2005 levels in the 2005/2006 heating season (Exh. KED-1, at 2-16). Based on its sendout analysis, the Company estimated it would need added gas supplies for its Cape Cod system, after the 2005/2006 heating season, as follows: an added 6000 MMBtu/day by 2006/2007, an added 10,000 MMBtu/day by 2008/2009 and an added 23,000 MMBtu/day by 2014/2015 (id. at 2-24).

9 The Company indicated that, to ensure that the peak-hour capability of its distribution system was sufficient to meet the peak hour requirement of the system under design day conditions, it assumed the peak-hour capability must be at least 5% of the peak-day requirement (Exh. KED-1, at 2-24).

table 2-5; Exh. RR-EFSB-2).[10] In 2007/2008, according to the Company's analysis, a modeled pressure of zero is shown under design conditions at locations in Eastham and Dennis, as well as at the Harwich location (Exh. KED-1, at 2-22 to 2-23, table 2-5). The Company's analysis showed a modeled pressure of zero recurring in those locations under design conditions by 2008/2009, and also occurring at an additional location, in Chatham (id.).

The Company stated that it also analyzed the ability of its Cape Cod system to deliver gas consistent with other Company operating criteria, including maintaining a minimum inlet pressure of 70 psig at all regulators supplying the system's 60 psig lines from higher pressure lines.[11] Along KeySpan's high pressure system, the results of the Company's analysis show that, beginning in 2006/2007, declining pressures would occur along eastern portions of the Sagamore Line and along the connecting Depot Street lateral,[12] including at two modeled transfer points to the 60 psig system – 41 psig at the Church Street regulator and 40 psig at the Depot Street regulator (Exh. KED-1, at table 2-5). Inlet pressures would drop to 22 psig and 20 psig at the Church Street regulator and the Depot Street regulator, respectively, in 2007/2008, and to a modeled inlet pressure at zero at both regulators by 2008/2009 (Exh. KED-1, at table 2-5).

The Company also analyzed the ability of its Cape Cod distribution system to deliver gas consistent with operating its Chatham and Eastham LNG units at no more than 45 MMBtu/hr

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10 The Company indicated that, without the proposed project, it would expect to operate the Chatham LNG facility at up to 218 MMBtu/hr in 2006/2007 and at up to 250 MMBtu/hr in subsequent years (Exh. KED-1, at 2-23, table 2-5).

11 The Company explained that a pressure of at least 70 psig at each regulator inlet is necessary to maintain a pressure of 60 psig coming out of the regulator (Exhs. KED-1, at 2-23; EFSB-RR-2). The Company used the level of 60 psig coming out of the regulator as an intermediate criterion, i.e., an indicator of the system's ability to maintain 10 psig at the eastern end of its distribution system on the Cape (Exh. KED-1, at 2-23).

12 The Company noted that its analysis showed significant drops in pressure for successive points extending eastward along some portions of the Sagamore Line – in particular, the portion extending eastward from the connection of the line at the South Yarmouth LNG facility (Exh. KED-1, at 2-22 to 2-23, table 2-5). In 2006/2007, for example, the pressure was modeled as dropping from 140 psig at the South Yarmouth LNG facility to 77 psig at Depot Street/Main Street in Harwich near the Dennis boundary (these are the endpoints of the Middle Segment of the proposed project), a distance of 4.9 miles (id.).

(id. at 2-18, 2-22 to 2-23, table 2-5). The Company asserted that its current level of reliance on its portable units in Chatham and Eastham presents a growing operational and related reliability issue that completion of the proposed project would resolve (Exh. KED-1, at 2-7).[13] The Company indicated that results of its analysis show a pressure of zero under design conditions beginning in year 2006/2007 at extremity locations of the 60 psig system in Dennis, Harwich, Eastham, and Chatham, as well as at transfer points to the 60 psig system including the Stony Brook, Church Street, and Depot Street regulators (id. at 2-25, table 2-5).

Based on its analyses, KeySpan asserted there would be a need for 751 MMBtu/hr of added peak-hour flow capability by the 2006/2007 heating season to meet the peak-hour requirement of its Cape Cod system under design day conditions (Exh. KED-1, at 2-24). The Company stated that its base case shows a need for an increase in its Cape Cod peak-hourly flow capacity of 961 MMBtu/hr by 2008/2009 and 1591 MMBtu/hr by 2014/2015, relative to its current system capacity (id.). KeySpan's sensitivity analysis showed an incremental need in 2014/2015 of 1311 MMBtu/hr for the low case and 2575 MMBtu/hr for the high case (Exh. RR-EFSB-8, at 3).

In conjunction with analyzing required increases in gas deliverability over the project-specific forecast period, KeySpan also undertook an analysis relating to the location and timing of the principal bottlenecks (i.e., areas of capacity constraint) along the Sagamore Line. KeySpan's analysis identified Sagamore Line constraints (1) extending eastward from the intermediate point on the Sagamore Line where the South Yarmouth LNG facility is connected; (2) existing near the eastern extremity of the line; and (3) existing along western portions of the line downstream of the present and prospective delivery points for gas volumes supplied via the Algonquin G Lateral (Exhs. KED-1, at 2-22, 2-23; EFSB-N-5). The Company provided results of its analyses of bottlenecks along the Sagamore Line, in support of its selection of a project approach. These are discussed in Section II.B.6, below.

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[13] The Company indicated that trucks now deliver LNG to fuel its portable units: when operating, the Chatham unit requires one truckload of LNG every 3 to 4 hours; the Eastham unit requires one truckload of LNG every 15 to 18 hours (Exh. KED-1, at 2-7). The Company noted that truck deliveries to Chatham and Eastham are in addition to those needed for deliveries at its South Yarmouth LNG facility (id.).

c. Demand Side Management

KeySpan considered accelerated implementation of demand side management ("DSM") programs to offset need for the proposed project (Exh. KED-1, at 3-6 to 3-7, 3-12 to 3-14). The Company indicated that such an effort would require finding DSM measures to counter anticipated growth in normalized sendout on the Cape (id.). KeySpan indicated that with its current 3% participation rate, existing DSM program savings provide total annual savings of 58,911 MMBtu/yr across all customer sectors (id.).

The Company asserted that each year through 2014/2015, it would need to achieve 315,000 MMBtu of new DSM savings, on average, beyond that achieved in the previous year, in order to offset forecasted load growth (id.). KeySpan estimated that by the winter heating season of 2014/2015, it would need cumulative DSM program savings of 3,500,000 MMBtu/yr (id.). KeySpan further estimated that, to achieve DSM savings of 3,500,000 MMBtu/yr through annual increments of 315,000 MMBtu/yr, immediate participation in all of the Company's existing energy-efficiency programs by more than 50% of its residential as well as its commercial and industrial customers would be required (id. at 3-13 to 3-14). The Company concluded, based on its forecast of sendout and its evaluation of the likely availability of DSM, that DSM measures alone would not address the identified need (id. at 3-6 to 3-7, 3-12 to 3-14; Exh. EFSB-A-1).

d. Analysis

In order to meet its statutory mandate, the Siting Board first evaluates whether there is a need for additional energy resources to meet reliability, economic efficiency, or environmental objectives. The Siting Board must find that additional energy resources are needed as a prerequisite to approving a proposed energy facility. 2006 Berkshire Gas Decision, EFSB 05-1, at 9; 2005 NSTAR Electric Decision, 14 DOMSB 233, at 7; MECo/NEPCo Decision, 18 DOMSC 383, at 396-403.

Here, KeySpan has proposed to increase its distribution system capacity by constructing additional pipeline, in segments, to augment the existing Sagamore Line. KeySpan has argued its need for gradually increasing peak hourly flow capability over the long-term planning horizon 2004/2005 to 2014/2015 to meet the peak-hour requirement of its Cape Cod system under design

day conditions. Specifically, the Company has indicated a need for added peak-hour flow capability of 751 MMBtu/hr by the 2006/2007 heating season, increasing to 961 MMBtu/hr by 2008/2009, and to 1591 MMBtu/hr by planning year 2014/2015.

KeySpan has submitted information and analyses to the Siting Board demonstrating a need for expanded system capacity on Cape Cod to provide increased gas supply deliverability within the project-specific forecast period. With respect to distribution system criteria, KeySpan has demonstrated a need for additional gas resources: (1) to ensure continued gas delivery to the eastern extremities of KeySpan's distribution system on Cape Cod at a minimum operating pressure of 10 psig, and to the regulator outlets serving those extremities at a minimum operating pressure of 60 psig; and (2) to avoid operating the Company's LNG facilities in excess of its operating criteria. The Company has demonstrated that bringing additional energy resources to the Company's Cape Cod distribution system would allow it to operate its LNG facilities without exceeding injection rates of 120 MMBtu/hr at KeySpan's Wareham facility, 1150 MMBtu/hr at the South Yarmouth facility, and 45 MMBtu/hr each at portable facilities in Chatham and Eastham.

The Company has explored the potential to meet the identified resource need through accelerated implementation of DSM. In so doing, the Company has compared its forecast of normalized sendout on the Cape with its evaluation of existing and potential DSM availability over the planning horizon, 2004/2005 through 2014/2015. KeySpan has estimated that over this forecast period it would need annual incremental DSM program savings of 315,000 MMBtu/yr – a cumulative DSM program savings of 3,500,000 MMBtu/yr by the winter of 2014/2015. The Company's estimates show that, for the 2004/2005 to 2014/2015 forecast period, annual incremental DSM program savings would have to be five times the current cumulative level. To reach cumulative DSM savings of 3,500,000 MMBtu/yr would require immediate enrollment of 50% of KeySpan's Cape Cod customers across all sectors in 100% of the Company's existing energy-efficiency programs.

The level of DSM required to offset projected sendout growth on Cape Cod, given levels of DSM attained there currently, and feasibly attainable through 2014/2015, supports the Company's conclusion that it is unlikely that accelerated DSM could reasonably be implemented

to meet the identified need. Therefore, the Siting Board finds that accelerated DSM would not eliminate the need for additional energy resources.

Overall, the Company has provided information showing the need for the proposed project, in combination with the Algonquin G Lateral extension, to meet KeySpan's gas supply needs and pressure requirements on the Cape. The Siting Board finds, therefore, that there is a need for additional energy resources to maintain reliable gas service to customers of KeySpan's Cape Cod distribution system.

4. Consistency with Long-Range Forecast

G.L. c. 164, § 69J requires that a facility proposed by a gas company required to file a long-range forecast pursuant to G.L. c. 164, § 69I be consistent with that company's most recently approved long-range forecast. G.L. c. 164, § 69J. KeySpan is a gas company required to file a long-range forecast pursuant to G.L. c. 164, § 69I. See G.L. c. 164, §§ 75B, 75H. Consequently, to satisfy the statutory requirement, the Siting Board reviews the consistency of the proposed gas pipeline with KeySpan's most recently approved long-range forecast.

In keeping with G.L. c. 164, § 69J, the Company submitted for its proposed project a forecast analysis over the 2004/2005 to 2014/2015 planning horizon that it developed using the same methods approved by the Department in the 2001 LRRP, the Company's most recently approved forecast (Exhs. KED-1, at 2-8 to 2-25; EFSB-N-1(1)). See Section II.A.3.a, above. The Company further provided a detailed explanation as to how it established load and resource requirements over the ten-year planning horizon 2004/2005 to 2014/2015. The Company provided base case, low case, and high case scenarios. In addition, the Company submitted growth factors, and an explanation of their development and application, for each town served by its Cape Cod system.

In this case, the Company has identified a need for incremental design day and design year capacity that begins with the 2006/2007 heating season and increases with load growth throughout the ten-year planning horizon. The Company's forecast analysis drives the projections of need for additional energy resources and infrastructure to serve the Cape Cod area. The Company has established that the load assumptions in its system analysis for the proposed

project are consistent with forecasts for its Cape Cod system and stem from the information presented in its most recently approved long-range forecast. Accordingly, the Siting Board finds that the proposed project is consistent with the Company's most recently approved long-range forecast.

B. Comparison of Proposed Project and Alternative Approaches

1. Standard of Review

G.L. c. 164, § 69H requires the Siting Board to evaluate proposed projects in terms of their consistency with providing a reliable energy supply to the Commonwealth with a minimum impact on the environment at the lowest possible cost. General Laws, c. 164, § 69H requires a project proponent to present "alternatives to planned action" which may include: (a) other methods of generating, manufacturing, or storing electricity or natural gas; (b) other sources of electrical power or natural gas; and (c) no additional electric power or natural gas.[14]

In implementing its statutory mandate, the Siting Board requires an applicant to show that, on balance, its proposed project is superior to alternative approaches in terms of cost, environmental impact, and ability to meet the identified need. 2005 NSTAR Electric Decision, 14 DOMSB 233, at 266; Cambridge Electric Light Company, 12 DOMSB 305, at 321 (2001) ("CELCo Decision"); Boston Edison Company - Hopkinton and Milford, 6 DOMSB 208, at 252 (1997) ("1997 BECo Decision"). 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. 2005 NSTAR Electric Decision, 14 DOMSB 233, at 266; CELCo Decision, 12 DOMSB 305, at 321 (2001); 1997 BECo Decision, 6 DOMSB 208, at 253-257.

2. Identification of Approaches for Analysis

The Company indicated that, based on its analysis of need, it sought project alternatives that would meet the following objectives: (1) ensure continued gas delivery to the eastern

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[14] G.L. c. 164, § 69J also requires an applicant to provide a description of "other site locations." G.L. c. 164, § 69J. The Siting Board reviews the Company's primary route, as well as other possible routes, in Section III.B, below.

extremities of KeySpan's 60 psig distribution system on Cape Cod at a minimum operating pressure of 10 psig, and to the regulator outlets serving those extremities at a minimum operating pressure of 60 psig; and (2) avoid over-reliance on the on-system peaking facilities maintained by KeySpan (Exhs. KED-1, at 2-23, 3-1 to 3-4; RR-EFSB-2; see Section II.A.3.b, above. The Company stated that to meet the enumerated objectives reliably through the Company's ten-year planning horizon, potential project alternatives would have to incorporate either additional pipeline facilities or additional storage and vaporization capability (Exh. KED-1, at 3-1 to 3-4).

The Company presented in-depth analyses of five project approaches[15] with the potential to resolve the identified gas-supply and system-pressure issues: (1) the proposed project; (2) expansion of the South Yarmouth LNG facility; (3) construction of new LNG satellite facilities; (4) construction of propane/air facilities; and (5) installation of additional compression (id. at 3-3 to 3-4).

The Company indicated that while primarily addressing delivery capability, its identified project alternatives would also entail the use of higher gas volumes over time, whether from pipeline gas, LNG, or propane, to meet higher sendout requirements. In the case of the proposed project, the Company indicated that obtaining the required gas volumes would entail procurement of incremental transportation capacity on Algonquin's G Lateral (Exh. EFSB-G-4). The Company stated that it had approached Algonquin in 2004 to determine whether KeySpan would be able to secure additional pipeline capacity on the G Lateral (id.). The Company

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[15] G.L. c. 164, § 69J requires the Company to consider the alternative of no additional gas. The Company considered a no-build alternative, but concluded that it would not be an effective long-term solution to supply and pressure issues associated with increasing growth on the Cape (Exh. KED-1, at 3-5 to 3-6). The Siting Board notes that the no-build alternative would not meet the needs identified in Section II.A.3, above, and therefore eliminates it from further consideration. In Section II.A.3.d, above, KeySpan also analyzed additional conservation and load management options and the Siting Board determined that these options would not meet the identified need.

indicated that Algonquin, in response to the Company's inquiry, is now undertaking a pipeline extension within the time frame required by KeySpan (id.).[16]

a. The Proposed Project

The Company proposes supplementing the Sagamore Line with new construction (id. at 3-4 to 3-5). The new construction would consist of three segments (the Middle Segment, Western Segment, and Eastern Segment) constructed sequentially, in the order listed, over an approximately ten-year period (id.).[17] The Company's reasoning with respect to development of its proposed project in three segments is discussed at greater length in Section II.B.6, below. Along with constructing the proposed project, the Company would require gas deliveries from Algonquin at 270 psig at a new take station at Route 130 (Exhs. EFSB-G-4; EFSB-N-3).

b. South Yarmouth LNG Expansion Approach

The South Yarmouth LNG expansion approach would enlarge the Company's existing South Yarmouth LNG facility, which is supplied with LNG by truck from Distrigas of Massachusetts in Everett (Exh. KED-1, at 3-15 to 3-16). Specifically, off-load, storage and vaporization at South Yarmouth would be increased (id.). KeySpan indicated that, to pursue the South Yarmouth LNG expansion approach, the Company would need to demolish the existing LNG storage tank at South Yarmouth and replace it with a larger unit (id. at 3-20; Exh. EFSB-A-5). KeySpan explained that the limited size of the present site and the lack of abutting parcels would constrain the Company's ability to expand at South Yarmouth (Exh. KED-1, at 3-20).

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16 The Company explained that although the interconnection for KeySpan's distribution system and Algonquin's pipeline extension could be placed in a number of locations along the Sagamore Line, the point of interconnection would have to allow for the construction of a new take station accessible by both Algonquin and KeySpan (Exh. EFSB-G-4). The Company indicated that, to ensure the required access, the intersection of Route 130 and Service Road would be the optimal location for the take station (id.).

17 See Summary of the Proposed Project, Sections I.A.1 to I.A.3, above.

c. New LNG Facility Approach

This approach would involve construction of a new LNG satellite facility in Harwich and would provide KeySpan with greater LNG storage and vaporization capacity (Exh. KED-1, at 3-16 to 3-17). The new LNG facility would have a maximum hourly vaporization output of 1000 MMBtu/hr and storage capacity of 300,000 MMBtu, and would, in addition, include truck unloading, gas liquefaction, and odorization capability, along with spill containment structures, piping, and controls (id.). The Company indicated the new LNG facility approach would be sized to meet both seasonal gas-supply requirements and hourly output requirements only through 2008/2009 (id.). The Company noted it would not be practical to develop the new LNG facility approach to meet identified needs including seasonal gas supply requirements on the Cape through the ten-year planning horizon (id.; see Section II.B.3.c, below). The Company explained that this was due to the large size of the storage tank that would be required and associated difficulties with its siting in Harwich near the Sagamore Line (id.). KeySpan suggested that even this scaled-down version of the new LNG facility approach would require a fairly large block of land near the eastern end of the Sagamore Line to construct, and therefore siting such a facility would be controversial and permitting would be difficult (id.).

d. New Propane/Air Facility Approach

This approach would involve construction of four propane/air storage and vaporization facilities in the Company's Cape Cod service area (Exh. KED-1, at 3-14 to 3-15). Specifically, the Company would locate a 550 MMBtu/hr facility in South Yarmouth (storage capability of 350,000 MMBtu), a 500 MMBtu/hr unit at Depot Road and Main Street in Harwich (storage capability of 300,000 MMBtu), plus two 50 MMBtu/hr units at separate locations in Harwich (with storage capability of 35,000 MMBtu each) (id.).

e. Compression Addition Approach

The compression addition approach would include construction of five compressor stations, adding a total of 6600 horsepower ("hp") along the Sagamore and Bourne Lines (Exh. KED-1, at 3-17 to 3-18). The Company stated that three compressor stations would be

installed on the Sagamore Line, one each in Barnstable (2300 hp), South Yarmouth (1000 hp), and Dennis (1000 hp); compressor stations would be installed on the Bourne Line in Falmouth (1250 hp) and Mashpee (1050 hp) (id.). The Company indicated that the compression addition approach would include a backup compressor station at each location and appropriate controls to ensure continuous service in the event of a compressor failure (id.).[18]

f. Analysis

KeySpan has identified five approaches, described in Sections II.B.2.a to II.B.2.e, above, with the potential to address gas supply and pressure issues in its Cape Cod service area. Below, the Siting Board compares these approaches with respect to reliability, environmental impacts, and cost. The Siting Board then considers the three-segment configuration of the proposed project.

3. Reliability Comparison

a. The Proposed Project

The Company stated that the proposed project along either the primary or the alternative route would provide KeySpan with the necessary pressure and additional gas supply to meet the requirements of its Cape Cod area system reliably through the forecast period (Exh. KED-1, at 3-18 to 3-19). The Company indicated that the first phase of the Middle Segment could be completed in time to alleviate projected low-pressure problems on the eastern end of the Cape by the 2006/2007 heating season (id. at 3-4 to 3-5, 3-18 to 3-19). See Sections II.A.3.b, above, and II.B.7, below. The Company stated that the Middle Segment would also help reduce reliance on KeySpan's on-system peaking facilities, beginning in 2006/2007 (id.). The Company stated that it did not anticipate increased mechanical or operational control complexity to its Cape system as a result of construction of the proposed project (id. at 3-18 to 3-19).

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[18] The Company indicated that the compression addition approach assumed that sufficient gas supply would be available over the forecast period at the Bourne and Sagamore take stations to meet customer requirements (Exh. KED-1, at 3-18).

b. South Yarmouth LNG Expansion Approach

The Company stated that implementation of the South Yarmouth LNG expansion approach would improve the Company's ability to regulate system pressures as well as increase the sendout capabilities of KeySpan's Cape Cod system (Exh. KED-1, at 3-15 to 3-16). The Company stated, however, that the South Yarmouth LNG expansion approach also would present several reliability concerns (id. at 3-20). The Company noted that the operation of its existing South Yarmouth LNG facility is critical to maintaining distribution system pressures and gas supply (id.). KeySpan anticipated that replacement of the storage tank would likely require temporarily shutting down the South Yarmouth LNG facility with attendant impacts on the reliability of its distribution system on the Cape (id.). Furthermore, the Company anticipated that it would not be able to complete the South Yarmouth LNG expansion approach in sufficient time to alleviate the identified low-pressure problems on the eastern end of the Cape by the 2006/2007 heating system (id.).

The Company also indicated that the equipment needed to store and vaporize LNG involved greater potential for mechanical failure during periods of high gas consumption and/or cold weather than did the proposed project and some of the other considered alternatives (id.; Exh. EFSB-A-9).

c. New LNG Facility Approach

KeySpan stated this approach would provide the Company with additional LNG supplies, located to support the Company's ability to maintain adequate system pressures and increase sendout capabilities (Exh. KED-1, at 3-16 to 3-17). The Company indicated, however, that the large size of the storage facility that would be required would make the new LNG facility approach impractical with respect to meeting identified needs including seasonal gas-supply requirements on the Cape through the ten-year planning horizon (id.). Instead, the Company considered construction of an LNG facility adequate to meet both seasonal gas-supply requirements and hourly output requirements through 2008/2009 (id.).

The Company indicated that even its scaled-down version of the new LNG facility approach would involve purchase of at least ten to twelve acres for construction of an LNG

storage facility (Exhs. KED-1, at 3-20 to 3-21; EFSB-A-15). The Company expressed concern with respect to the potential difficulty of securing ten to twelve industrially-zoned acres near the eastern end of the Sagamore Line (Exh. EFSB-A-15). The Company specifically expressed concern that a short supply of appropriately-zoned parcels of sufficient size might result in permitting and construction delays that would prevent timely resolution (prior to the 2006/2007 heating season) of low-pressure issues on the eastern end of the Cape (id.; Exh. KED-1, at 3-21).

The Company also anticipated that equipment for storage and vaporization required in conjunction with the new LNG facility approach would likely fail more frequently during periods of high gas consumption and/or cold weather than would equipment required for the proposed project and some of the other considered alternatives (id. at 3-20 to 3-21; Exh. EFSB-A-10).

d. New Propane/Air Facility Approach

KeySpan indicated that, with respect to the Company's Cape Cod distribution system, the new propane/air facility approach would potentially: (1) increase maximum peak hourly flow capability; (2) meet design day gas supply requirements; and (3) alleviate low-pressure problems at the eastern end of the system (Exh. KED-1, at 3-14 to 3-15). However, the Company indicated the new propane/air facility approach would present a significant reliability concern if inadequate volumes of pipeline gas were available along the eastern end of the Sagamore Line to blend with propane (id. at 3-20). The Company explained that using propane in its system required injecting the propane with air and mixing it with the proper amount of pipeline gas, a consequence of the higher specific gravity and Btu content of propane relative to pipeline gas (id.). KeySpan indicated that release of propane into its distribution system in improper proportions to pipeline gas might adversely affect the operation of its customers' appliances (id.). The Company stated that a second reliability concern potentially associated with the new propane/air facility approach would involve the equipment for storing and vaporizing propane and compressing air for its use (id.). The Company stated that this equipment involved greater potential for mechanical failure during periods of high resource consumption and/or cold weather than did the proposed project and some of the other considered alternatives (id.; Exh. EFSB-A-8).

The Company noted that it would need to secure a minimum of 16 acres of cleared land

to accommodate the new propane/air facility approach (Exh. KED-1, at 3-14 to 3-15). The Company stated that these acres would have to be located near the Sagamore Line or that additional pipeline facilities would have to be constructed to tie the new propane/air facility unit into the Sagamore Line (id.). The Company stated that due to the likely difficulties of siting, permitting and construction, completion of the new propane/air facility approach in time for operation by the 2006/2007 heating season would not be feasible (id.).

e. Compression Addition Approach

The Company stated that the compression addition approach would involve construction of five compressor stations, each with backup facilities, to maintain system reliability (Exh. KED-1, at 3-21). The Company indicated that the five compressor stations would be located at sites in Barnstable, South Yarmouth, Dennis, Falmouth, and Mashpee, with attendant permitting and construction issues (id. at 3-18, fig. 3-2). The new construction would increase the maximum peak hourly flow capability of KeySpan's Cape Cod distribution system and increase pressure at its eastern end (id. at 3-17 to 3-18). KeySpan indicated, however, that it was unlikely that construction for the compression addition approach could be completed by the 2006/2007 heating season, when the Company projects pressure problems at the eastern end of its distribution system on the Cape (id. at 3-21; Exh. EFSB-A-11). The Company also indicated that the installation of additional compression would not resolve gas supply constraints projected over the project-specific forecast period (Exh. KED-1, at 3-21). The Company maintained, therefore, that the installation of additional system compression would not compare favorably to the proposed project in terms of ensuring the reliability of its distribution system on Cape Cod (id.; Exh. EFSB-A-11).

f. Analysis

The record shows that the five approaches analyzed by the Company would meet the projected needs of KeySpan customers on the Cape in some years of the forecast period. However, only the proposed project would provide additional energy resources by the 2006/2007 heating season.

In addition to the common issue of untimely completion of all the alternative approaches to the proposed project, the record shows each alternative approach to be flawed by at least one other significant reliability concern. The record shows the South Yarmouth LNG expansion would involve a temporary shut down of the existing South Yarmouth LNG facility with attendant impacts on the reliability of KeySpan's Cape Cod distribution system. With respect to the new LNG facility approach, the record shows that siting constraints would likely require the Company to construct a scaled-down unit too small to meet hourly output requirements on the Cape through the ten-year planning horizon. The record shows the new propane/air facility approach would present a significant reliability concern if inadequate volumes of pipeline gas were available along the eastern end of the Sagamore Line to blend with propane. With respect to the compression addition approach, the record shows that the need to install facilities in five locations for this approach, with associated permitting and construction issues, could result in partial or delayed implementation.

The record also shows that, during periods of high resource consumption and/or cold weather, mechanical failure would be somewhat more likely for the South Yarmouth LNG expansion, new LNG facility, or new propane/air facility approaches than for the proposed project or the compression addition approach. The record further shows that installation of additional compression would not resolve gas supply constraints projected over the project-specific forecast period.

Accordingly, with respect to reliability, the Siting Board finds that the proposed project along either the primary or the alternative route would be superior to the South Yarmouth LNG expansion approach, the new LNG facility approach, the new propane/air facility approach, and the compression addition approach.

4. Environmental Impacts

a. The Proposed Project

The Company explained that it would confine construction of the proposed project along the primary route to the shoulders or pavement of existing state and local roads, and, similarly, confine installation of the alternative route to the shoulders or pavement of an electric

transmission utility easement, a railroad right-of-way and existing state and local roads (Exhs. KED-1, at 3-21; EFSB-A-13; EFSB-A-14). The Company anticipated some tree-trimming along portions of the Western and Middle Segments, but no significant long-term environmental impacts with use of the primary route (Exhs. KED-1, at 3-21; EFSB-A-13; EFSB-A-14; EFSB-E-4).

With respect to the proposed project along the portion of the primary route through the South Dennis Historic District, the Company indicated that impacts to traffic and roadside shrubbery and plants might occur as a result of construction, but that these impacts could be mitigated and would be temporary (Exh. YAR/DEN 1-57). The Company stated, in addition, that it would not disturb mature trees or historic homes in the South Dennis Historic District in the process of constructing and operating the proposed project (id.). KeySpan also indicated that it anticipated no significant or permanent impact on wetlands, water resources, protected species or protected lands with construction of the proposed project along either the primary or the alternative route (Exh. KED-1, at 3-21 to 3-22). The Company further stated that it would, as a matter of general practice, use all appropriate erosion controls and other mitigation measures as necessary to limit environmental impacts of the proposed project (id.; Exhs. RR-EFSB-5; RR-EFSB-5(1)).

b. South Yarmouth LNG Expansion Approach

KeySpan stated that it would need to acquire, and clear for construction, additional property for the South Yarmouth LNG expansion approach (Exhs. RR-EFSB-5; RR-EFSB-5(1); Tr. 1, at 110-111). The Company also anticipated that vaporizers operating in conjunction with the identified approach would emit increased air emissions and low-level continuous noise (Exhs. KED-1, at 3-22; RR-EFSB-5; RR-EFSB-5(1)). The Company further stated that the South Yarmouth LNG expansion approach would require increased trucking to meet system needs over the forecast period (Tr. 1, at 110-111).

c. New LNG Facility Approach

The Company indicated that the new LNG facility approach would involve both temporary, construction-related, environmental impacts and permanent environmental impacts (Exhs. KED-1, at 3-23; RR-EFSB-5; RR-EFSB-5(1)). Permanent environmental impacts would likely include visual impacts of an industrial facility in a non-industrial setting and a long-term increase in truck traffic (Exhs. KED-1, at 3-23; RR-EFSB-5; RR-EFSB-5(1); Tr. 1, at 110).

d. New Propane/Air Facility Approach

KeySpan asserted that implementation of the new propane/air facility approach would involve land clearing and tree removal impacts at four locations (Exhs. RR-EFSB-5; Tr. 1, at 110; see Section II.B.2.d, above). The Company further indicated that the new propane/air facility approach would likely produce low-level background noise over the long term as a result of the air-compression process and air emissions in conjunction with vaporizer operation (Exh. KED-1, at 3-22). The Company also stated that the new propane/air facility approach would result in a long-term increase in truck traffic associated with delivery of propane (id.).

e. Compression Addition Approach

According to the Company, the compression addition approach would involve construction of five compression stations, each of which would require construction of an enclosure to protect equipment against the weather and to buffer sensitive receptors against noise from compressor operation (Exhs. KED-1, at 3-23; RR-EFSB-5; RR-EFSB-5(1); Tr. 1, at 110). The Company explained that it would site each enclosure in a small cleared area adjoining pipelines, and that each enclosure would contain natural gas-fired reciprocating engine sets, a compressor and associated piping, and valves and other control equipment (Exh. KED-1, at 3-23). The Company anticipated temporary environmental impacts at five locations due to construction of facilities for the compression addition approach, in addition to modest increases to air emissions and noise impacts on a permanent basis as a result of compressor operation (id.).

f. Analysis

The record shows there would be temporary environmental impacts from construction of the proposed project along the primary or alternative route. However, as the Company has asserted, the construction would result in no significant long-term environmental impacts, with use of the primary route and some tree-clearing for widening along portions of the Western and Middle Segments. The record shows that due to land acquisition and clearing for the South Yarmouth LNG expansion, new LNG facility, new propane/air facility and compression addition approaches, environmental impacts related to the construction of the identified approaches would likely be more extensive than for the proposed project. The record also shows that, for each of the alternative project approaches, overall environmental impacts of operation, including noise, visual, air and traffic impacts, would likely be comparable or greater than those of the proposed project. Consequently, the Siting Board finds that the proposed project along either the primary or alternative route would be superior to the South Yarmouth LNG expansion approach, the new LNG facility approach, the new propane/air facility approach, and the compression addition approach with respect to environmental impacts.

5. Cost

a. Description

The Company estimated costs at: (1) $15,280,000 to $24,500,000 for construction of the proposed project, depending on route, with fixed annual operating costs of approximately $10,600; (2) $55,000,000 for construction of the South Yarmouth LNG expansion approach, with fixed annual operating costs of approximately $600,000; (3) $50,000,000 for construction of the new LNG facility approach, with fixed annual operating costs of approximately $850,000; (4) $50,000,000 for the propane/air facilities approach; and (5) $104,100,000 for construction of the compression addition approach, with fixed annual operating costs of $100,000 or more.

b. Analysis

The Siting Board analyzed costs projected by the Company for installation of the proposed project and four project alternatives. The record shows that installation costs of the

proposed project would be at least $25,000,000 less over the Company's planning horizon than those of the other four project alternatives. In addition, the record shows lower fixed annual costs for the proposed project. Based on its review, the Siting Board concludes that costs for the proposed project would be significantly less than for the four evaluated alternatives. Consequently, the Siting Board finds that the proposed project would be superior to the South Yarmouth LNG expansion approach, the new LNG facility approach, the new propane/air facility approach, and the compression addition approach with respect to cost.

6. Configuration of the Proposed Project

As previously noted in Section II.A.3.b, above, KeySpan analyzed the location and timing of three principal gas delivery bottlenecks along the Sagamore Line over the project-specific forecast period: (1) one extending eastward from the intermediate point on the Sagamore Line where the South Yarmouth LNG facility is connected; (2) one existing near the eastern extremity of the line; and (3) one existing along western portions of the line downstream of present and prospective delivery points for gas volumes supplied via the Algonquin G Lateral.

The Company indicated that the Middle Segment, which would address pipeline constriction issues with respect to the first bottleneck, would facilitate distribution of new gas supplies and ensure adequate system pressure primarily for the geographic area from the outlet of the South Yarmouth LNG facility to Harwich (Exh. EFSB-N-5). The Company explained that construction of the Middle Segment was critical because it would mitigate pressure drops that, according to KeySpan's engineering models, are already occurring on the existing Sagamore Line in Yarmouth, Dennis and surrounding communities east of the South Yarmouth LNG facility (id.). The Company further explained that the Sagamore Line east of the South Yarmouth LNG facility was the section of KeySpan's existing Cape Cod supply system experiencing the highest pressure drop per unit length of pipe (id.). The Company stated that it proposed starting construction of the Middle Segment at the South Yarmouth LNG terminal because this was the point from which the Company needed to move combined pipeline gas and vaporized LNG supplies eastward (id.). The Company projected that, without construction of the proposed project, the modeled pressure drop would be 63 psig (from 140 psig to 77 psig) in 2005/2006 and

that by 2014/2015 the modeled pressure at the end of that length of main would be zero (Exh. KED-1, at table 2-5). The Company noted that with construction of the proposed project, the pressure drop on the Middle Segment would be only 16 psig (from 160 psig to 144 psig) as of 2013/2014 (id.).

The Company indicated that the Eastern Segment, which would address pipeline constriction issues with respect to the second bottleneck, would serve to maintain acceptable pressures at one supply point, the Church Street Regulator Station (Exh. EFSB-N-6). The Company explained that the Church Street Regulator Station is key to maintaining acceptable pressures on the 60-psig distribution system in the greater Chatham area and to limiting the Company's dependence on portable LNG in Chatham (id.). The Company stated that the Eastern Segment, as proposed, would start at Depot Road, the location of the beginning of the lateral that extends to the Church Street Regulator Station (id.). The Company projected that, without construction of the proposed project, the modeled pressure drop would be 14 psig (from 55 psig to 41 psig) in 2005/2006 and that by 2014/2015 the modeled pressure for that length of main would be zero (Exh. KED-1, at table 2-5). The Company noted that with construction of the proposed project, the pressure drop on the Eastern Segment would be only 1 psig (from 87 psig to 86 psig) as of 2014/2015 (id.).

KeySpan indicated that the Western Segment would address pipeline constriction issues with respect to the third bottleneck (Exhs. EFSB-N-3). The Company indicated that pressures at the western end of its system would be inadequate to maintain pressures at the eastern end of the system (id.). The Company stated that its proposed Western Segment would start at Route 130 to make use of a new take station to interconnect KeySpan's facilities with those of Algonquin's planned G Lateral extension (Exh. EFSB-N-5). The Company stated that its modeling indicated that, absent construction of the Western Segment, significant pressure drops would develop between the proposed start and terminus of the Western Segment at Routes 130 and 149, respectively, over a ten-year horizon (Exh. EFSB-N-3). Specifically, the Company projected that, assuming construction of the Algonquin project but without construction of the proposed project, the modeled pressure drop across the existing service main along the length of the proposed Western Segment would be 39 psig (from 234 psig to 195 psig) in 2005/2006, and that

by 2014/2015 the modeled pressure drop over that length of main would increase to 96 psig (from 198 psig to 102 psig) (id.). The Company noted that with construction of the proposed project, the pressure drop on the Western Segment would be only 4 psig (from 270 psig to 266 psig) as of 2014/2015 (id.).

The Company indicated that, due to continuing load growth across the Cape, a need exists for KeySpan to ensure reliability to its customers on an immediate, widespread and sustained basis along the Company's existing Sagamore Line (see Sections II.A and II.B, above). The Company also indicated the relationship of the three segments of the proposed project in time, place and function with respect to their overall purpose: each segment loops additional pipeline along specific portions of KeySpan's Cape Cod distribution system to optimize system pressures and the Company's ability to deliver energy resources to its customers (see Section II.A.3.b, above). The Company stated that because construction of each segment affects installation of the others, the timing of construction of the three segments would overlap during a ten-year construction schedule (Exh. KED-1, at 1-5 to 1-6). The Company noted that in conducting its analysis of potential project alternatives, it investigated options to meet the need for the proposed project as a whole, not for each of the segments individually, and argued that this was further support for the integral relationship of the configuration of its proposed project (id. at 2-2 to 2-3; Company Brief at 6).

The Company's analysis indicates that the phased construction, as the Company proposes, of three segments of pipeline would reinforce KeySpan's Cape Cod system and, in addition, would enable KeySpan to tie into a planned Algonquin pipeline extension. Therefore, the Company's proposed project, as indicated in Sections II.B.3 through II.B.5, above, would best serve the Company's gas supply and system pressure needs on the Cape over the long term. Consequently, the Siting Board concludes that the Company's decision to construct three separate segments of pipeline – two 200 psig segments and one 270 psig segment – is reasonable.

7. Conclusions

The Company presented seven project approaches to meet the long-term gas-supply and distribution system pressure issues on Cape Cod identified in Section II.A.3, above. In Sections

II.B.2 to II.B.6, above, the Siting Board reviewed the information provided by the Company and determined that two of the presented approaches, demand side management and the no-build alternative, did not have the potential to meet the identified need. The Siting Board therefore focused its review on the remaining five approaches – the proposed project, new propane/air facilities, the South Yarmouth LNG expansion, new LNG facilities, and installation of additional compression. Based on its analysis, the Siting Board found that the proposed project along either the primary or the alternative route would be superior to the South Yarmouth LNG expansion approach, the new LNG facility approach, the new propane/air facility approach, and the compression addition approach with respect to reliability, environmental impacts and cost. In addition, in Section II.B.6, above, the Siting Board reviewed the Company's proposal to conduct construction in three segments over an approximately ten-year construction period. The Siting Board concluded that with respect to the Company's phased construction plan, the Company's proposed project would again, of all the considered project alternatives, best serve the Company's gas supply and system pressure needs on Cape Cod over the long term.

Accordingly, the Siting Board finds that the proposed project would be superior to the South Yarmouth LNG expansion approach, the new LNG facility approach, the new propane/air facility approach, and the compression stations approach with respect to providing a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost.

III. ANALYSIS OF THE PRIMARY AND ALTERNATIVE ROUTES

The Siting Board has a statutory mandate to implement the policies of G.L. c. 164, §§ 69J-69Q to provide a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost. G.L. c. 164, §§ 69H and 69J. Further, G.L. c. 164, § 69J requires the Siting Board to review alternatives to planned projects, including "other site locations." In implementing this statutory mandate, the Siting Board requires a petitioner to demonstrate that it has examined a reasonable range of practical siting alternatives, and that its proposed facilities are sited at locations that minimize costs and environmental impacts while ensuring supply reliability. 2006 Berkshire Gas Decision, EFSB 05-1, at 21;

2005 NSTAR Electric Decision, 14 DOMSB 233, at 277; New England Power Company, 21 DOMSC 325, at 376 (1991).

A. Site Selection

1. Standard of Review

G.L. c. 164, § 69J provides that a petition to construct a proposed facility must include "a description of alternatives to [the applicant's] planned action" including "other site locations." G.L. c. 164, § 69J. In past reviews of alternative site locations identified by an applicant, the Siting Board has required the applicant to demonstrate that it examined a reasonable range of practical siting alternatives. See 2006 Berkshire Gas Decision, EFSB 05-1, at 22; 2005 NSTAR Electric Decision, 14 DOMSB 233, at 277; New England Power Company, 7 DOMSB 333, at 374 (1998) ("1998 NEPCo Decision"). In order to determine whether an applicant has considered a reasonable range of practical alternatives, the Siting Board has required the applicant to 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 sites or routes in a manner which ensures that it has not overlooked or eliminated any sites or routes which, on balance, are clearly superior to the proposed site or route. 2006 Berkshire Gas Decision, EFSB 05-1, at 22; 2005 NSTAR Electric Decision, 14 DOMSB 233, at 277; 1998 NEPCo Decision, 7 DOMSB 333, at 374. Second, the applicant must establish that it identified at least two noticed sites or routes with some measure of geographic diversity. 2006 Berkshire Gas Decision, EFSB 05-1, at 22; 2005 NSTAR Electric Decision, 14 DOMSB 233, at 277-278; 1998 NEPCo Decision, 7 DOMSB 333, at 374.

2. Site Selection Process

a. Company Position

i. Screening Criteria and Weights

KeySpan stated that its route selection process included the development of route selection guidelines, identification of a study area for each of the three identified segments, initial route selection, development of route evaluation criteria, and scoring of the alternative routes

based on the route evaluation criteria (Exh. KED-1, at 4-3 to 4-5).

The Company developed the following guidelines for use in identifying possible routes:

- Use direct routes, as opposed to more circuitous routes;
- Use existing corridors, rights of way, and easements where possible;
- Avoid crossing cemeteries, war memorials, and similar public or quasi-public lands;
- Minimize crossings of public lands that have been acquired for purposes of wildlife conservation, public recreation or other uses subject to Article 97 of the Massachusetts Constitution;
- Minimize routing in residential areas and densely developed commercial and mixed use areas;
- Minimize potential disruption of existing utilities;
- Minimize routing that would require significant disruption of rare and endangered species habitat; and
- Minimize routing in wetlands and significant water resources (id. at 4-9 to 4-10).

KeySpan characterized the principal land uses in the study areas for each of the three segments. After reviewing aerial photos or other mapping to assess the availability of existing rights-of-way for each segment, KeySpan stated that it selected a study area corridor that encompassed a number of reasonable route alternatives with a measure of geographic diversity (Exh. KED-1, at 4-6). The Western Segment study area encompassed Route 6A, the Bay Colony Railroad right-of-way, and the multi-circuit electric transmission right-of-way operated by NSTAR (id., at 4-6, 4-12). The Middle Segment study area encompassed the Bay Colony Railroad right-of-way, Route 6, and the existing Sagamore Line alignment (id., at 4-7). The Eastern Segment study area included Route 39 as well as a potential street alignment along Queen Anne Road and Church Street (id., at 4-8).

The Company identified four potential routes for the Western Segment:

- *Service Road:* From the intersection of Route 130 and Service Road, this route follows Service Road 6.6 miles to Route 149. KeySpan's existing 12-inch diameter pipeline follows Service Road along this section.

- *NSTAR right-of-way:* From the intersection of Route 130 and Service Road, this route runs southerly on Route 130 approximately one mile, then easterly on the NSTAR multi-circuit transmission right-of-way to its intersection with Service Road just to the west of the Route 6 / Route 149 interchange. The total length is approximately 6.6 miles.

- *Railroad right-of-way:* From the intersection of Route 130 and Service Road, this route runs northerly on Route 130 to Old Main Street to Beale Street to Dewey Avenue to the Bay Colony Railroad right-of-way, which it follows easterly 6.8 miles, then runs southerly along Route 149 to Service Road. The total length is approximately 9.7 miles.

- *Route 6A:* From the intersection of Route 130 and Service Road, this route runs northerly on Route 130 and Old Main Street, easterly 7.1 miles on Route 6A, and southerly on Route 149 to Service Road, for a total distance of 9.9 miles (Exh. KED-1, at 4-10 to 4-12).

The Company identified three potential routes for the Middle Segment:

- *Whites Path:* From the Company's South Yarmouth LNG facility driveway, this route runs easterly on Whites Path, southerly on North Main Street, easterly on Great Western Road, which becomes Highbank Road, and continues over the Bass River into Dennis. In Dennis, the route continues easterly on Highbank Road, Upper County Road, Great Western Way, and Great Western Road, to the intersection with Depot Street in Harwich, then northeasterly on Depot Street to its intersection with Main Street. This 4.9-mile route follows KeySpan's existing Sagamore pipeline.

- *Old rail right-of-way:* From the South Yarmouth LNG facility, this route runs easterly on the old Bay Colony Railroad right-of-way approximately 2.6 miles, including crossing the Bass River into Dennis, then easterly for 1.3 miles on the Cape Cod Rail Trail to the intersection of the Rail Trail with Depot Street in Harwich, then northerly on Depot Street to its intersection with Main Street. The total length is approximately 4.6 miles.

- *Route 6:* From the South Yarmouth LNG facility, this route runs easterly on Whites Path, continues ahead on the adjacent Route 6 right-of-way, crossing the Bass River into Dennis, and continuing on Route 6 until it diverges onto Main Street in Harwich, which it follows southeasterly to its intersection with Depot Street. The total length is approximately 4.7 miles (Exh. KED-1, at 4-12 to 4-14, fig. 4-3).

The Company identified two potential routes for the Eastern Segment:

- *Route 39:* From the intersection of Depot Road and Route 39 in Harwich, this route runs northeasterly on Route 39 to the Church Street regulator station, located at the intersection of Route 39 and Church Street in Harwich. This 1.6-mile route parallels KeySpan's existing 6-inch diameter Sagamore pipeline.

- *Queen Anne Road:* From the intersection of Depot Road and Route 39, this route runs northerly on Route 39, easterly on Queen Anne Road, and then northerly on Church Street to the end point. For 3000 feet on Queen Anne Road, the route runs along the boundary between Harwich and Chatham; otherwise, the route is in Harwich. The total length is approximately 2.2 miles (id. at 4-14 to 4-15, fig. 4-4; Exh. EFSB-S-1).

The Company stated that it undertook a comparison of these various routes based on the environmental, reliability, and cost attributes of the routes (Exh. KED-1, at 4-15 to 4-16). To compare the routes' environmental attributes, the Company developed nine environmental criteria, grouped into two categories: natural resources and community resources (id. at 4-16). Each criterion was given a weight of 1, representing the lowest weight, to 3, representing the highest weight (id.), as follows (weights are in parentheses):

Natural Resources

- Wetlands and vernal pools (3)
- Streams and water bodies (2)
- Groundwater protection (2)
- Vegetation clearing (2)
- Protected lands (3)

Community Resources

- Residences (2)
- Sensitive receptors (2)
- Traffic (2)
- Historic districts (1)

In its site selection process, the Company rated the potential route alternatives for each of these enumerated criteria, then weighted the ratings, using the weights listed above. The Company described the impacts that would warrant particular ratings for each criterion

(id. at 4-16 to 4-17). For each criterion, the Company rated each route according to a scale of 1 to 5, with "1" representing the lowest potential impact, "5" representing the highest potential impact, and "3" representing the midpoint (Exh. KED-1, at 4-16). Next, the Company multiplied each rating by the weight for the criterion to arrive at a weighted score (one for each criterion) (id. at 4-17). For each route, the Company then summed the weighted scores for all the criteria, to calculate an overall environmental screening score (id.).

ii. Western Segment

The Company noted that in its Western Segment study area, located between Route 130 in Sandwich and the intersection of Route 149 and Service Road in Barnstable, existing land use is a mix of residential development and open space/conservation areas, with mostly residential land north of Route 6 and both municipal lands and residential subdivisions to the south of Route 6 (Exh. KED-1, at 4-6 to 4-7). Table 1, below, shows how KeySpan scored the four potential Western Segment routes based on the Company's chosen environmental criteria:

Table 1. Weighted Environmental Criteria Scores for the Four Western Segment Routes

Environmental Criteria	Service Road	NSTAR Right-of-Way	Railroad Right-of-Way	Route 6A
Wetlands & Vernal Pools	3	3	15	15
Streams & Water Bodies	2	2	10	10
Groundwater Protection	6	10	4	4
Vegetation Clearing	2	4	10	2
Protected Lands	3	15	12	15
Residences	2	2	6	10
Sensitive Receptors	6	2	4	10
Traffic	4	4	6	10
Historic Districts	1	1	5	5
Total	**29**	**43**	**72**	**81**

Source: Exh. KED-1, at table 4-3

With respect to natural resource criteria, the Company indicated that the railroad right-of-way and Route 6A alternatives would include numerous stream crossings, some direct wetlands crossings, and extensive work near water bodies and/or vernal pools, resulting in the potential for permanent changes in wetlands vegetation and temporary impacts to other water resources, and that these two routes therefore received the highest (least favorable) scores of 5 for both the wetlands-and-vernal-pools and the streams-and-water-bodies criteria (Exh. KED-1, at 4-18, table 4-3). Along the railroad right-of-way, the Company expects that it would be necessary to route the pipeline directly through wetlands, due to space constraints (Tr. 3, at 557). Tree clearing would be required for pipeline location and construction access for most of the railroad right-of-way route; consequently, only that route received a high (unfavorable) score of 5 for vegetation clearing (Exh. KED-1, at 4-18, table 4-3). The Company indicated that it gave the NSTAR right-of-way route a high (unfavorable) score of 5 for the groundwater-protection criterion because only that route is largely within designated groundwater protection areas (id. at 4-19, table 4-3). Article 97 approval would be required for a small section on each of the Western Segment routes, for facilities associated with the future Algonquin gate station (Exhs. EFSB-G-2(a)(Supp), att.; EFSB-G-3 (Supp. 2), att. at 1-15).[19] Only the NSTAR right-of-way route would cross additional Article 97 lands (Exh. KED-1, at table 4-1). With respect to priority and estimated rare species habitat, only the Service Road route crosses none of these protected lands (id.)."

For community resource criteria, the Route 6A alternative passes more than 15 residences per mile, passes several sensitive receptors, could cause significant traffic delays during

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[19] In its petition, KeySpan indicated that no portion of the Western Segment would require Article 97 approval (Exh. KED-1, at 5-24). However, KeySpan later indicated during the proceeding that, pursuant to subsequent discussions with Algonquin regarding the G lateral expansion, KeySpan would own certain facilities within the gate station as well as approximately 150 feet of pipeline between the gate station and the roadway layout of Route 130. KeySpan stated that Article 97 approval would be required for construction of the gate station and the 150 feet of interconnecting pipeline, using any of the Western segment routes (Exhs. EFSB-G-2 (Supp.); EFSB-G-3 (Supp. 2), att. at 1-15; EFSB-G-2 (a)(Supp.), att.).

construction, and is largely within a historic district; thus, it was scored unfavorably overall for community resources criteria compared to the NSTAR right-of-way and Service Road routes (id. at 4-21 to 4-22, table 4-3). As shown in Table 1, above, the Company concluded that the Service Road route had the best overall environmental score (id. at 4-33).

KeySpan indicated that the lengths of the four Western Segment route alternatives range in length from 6.6 to 9.9 miles and that, once in place, each route would have a similar degree of reliability (id. at 4-27, table 4-1). The Company indicated that, regardless of route, the pipeline would be a 20-inch diameter coated steel pipe buried with a minimum of three feet of cover and operated at 270 psig (Exhs. EFSB-S-2; EFSB-S-5). The Company stated that all four routes would be accessible for periodic inspection (Exh. EFSB-S-5). The Company indicated that the NSTAR right-of-way and railroad right-of-way route alternatives may have a lower chance of disruption from utility work than the Service Road route, but any unauthorized excavations would be less detectable away from public roads (id.). On the other hand, the Company pointed out that the greater density of development and length of the Route 6A alternative could lead to a higher chance of such disruption (id.). The Company asserted, however, that regardless of route differences, the risk of disruption is low (id.; Exh. EFSB-S-3).

KeySpan stated that there would likely be differences among the Western Segment alternatives with respect to the certainty with which they could be placed into service in a timely manner, due to differing needs for easements or other means of access, and potential permitting complications (Exh. KED-1, at 4-27).[20] The Company also differentiated the segments in terms of the availability of tie-in locations to link the new pipeline to the existing Sagamore Line, and

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[20] The Company indicated that some route alternatives would require more significant permitting with local Conservation Commissions, the Massachusetts Natural Heritage and Endangered Species Program ("NHESP"), the Army Corps of Engineers, and the Massachusetts Department of Environmental Protection ("MADEP") due to work in wetlands, water bodies or areas mapped by NHESP (Exh. KED-1, at 4-28). Some would require extensive work in historical districts, thus requiring consultation with and review by the Massachusetts Historical Commission and local historic commissions (id.). The Company stated that it considered route alternatives requiring Article 97 approval for one or more parcels as the most unfavorable with respect to difficulty of permitting (id.). See fn. 20, below.

indicated that flexibility in selecting tie-in locations provides greater certainty for making newly constructed pipeline useable (id. at 4-27). The Company presented these construction certainty and tie-in flexibility differences as differences in the reliability of the various potential routes (id. at 4-27 to 4-28). Because no private easements would be required, permitting complexity would be minimized, and tie-in flexibility would be maximized, the Company indicated that the Service Road route would be the most reliable among the four potential Western Segment routes (id. at 4-28, table 4-4).

KeySpan also estimated the costs of construction and construction access for the four Western Segment route alternatives. The Company derived cost estimates based on unit costs per foot of installation for each type of roadway or easement location; costs for clearing, repaving, and reseeding, as applicable; present value ("PV") savings from phasing construction work; and the need to obtain easements from private property owners (id. at 4-23 to 4-27; Exh. EFSB-S-4). Although unit construction costs would be lower along the NSTAR right-of-way, the Service Road route was considered least costly because the PV cost would be reduced by approximately $1,050,000 by phasing construction; because the NSTAR right-of-way route has an estimated $3,000,000 in easement costs which could be avoided with the Service Road route; and because the Service Road route is significantly shorter than the Route 6A and railroad right-of-way alternatives (Exhs. EFSB-S-4; EFSB-S-8). Table 2, below, presents the Company's cost estimates for the four Western Segment route alternatives:

Table 2. Cost Estimates for the Four Western Segment Routes

Service Road	NSTAR Right-of-Way	Railroad Right-of-Way	Route 6A
$10,450,000	$11,600,000 *	$18,550,000 **	$18,100,000

* Includes $3,000,000 cost of easements from landowners but no payment to NSTAR as compensation for co-locating on NSTAR's easements.

** Includes present value of lease payment to railroad right-of-way owner, $5,850,000 over 30 years.

Source: Exh. KED-1, at 4-32

Based on this analysis, the Company concluded that the Service Road route had the lowest estimated cost (Exh. KED-1, at 4-33). KeySpan stated that it chose the Service Road route as the primary route for the Western Segment because it had the best environmental score, the best reliability evaluation, and the lowest cost (id. at 4-32 to 4-33).

In selecting a route to serve as the noticed alternative, KeySpan observed that the NSTAR right-of-way route had an environmental score better than the remaining two alternatives and a significantly lower cost, but that its reliability score was worse because of the Article 97 approvals and approximately 75 or 80 individual easements that would be needed (id. at 4-33; Tr. 2, at 254-266).[21] The Company predicted that with enough money and effort, it could overcome the potential difficulties in obtaining easements and Article 97 approvals by 2009, and noted that the Route 6A and railroad right-of-way routes also carry some uncertainties with respect to permitting the project (Tr. 2, at 254-257). Overall, KeySpan concluded any differential uncertainty associated with right-of-way acquisition costs for the NSTAR right-of-way route was small enough to be outweighed by the route's significant environmental and cost advantages relative to the Route 6A and railroad right-of-way alternatives (id. at 254-257). The Company therefore selected the NSTAR right-of-way as the noticed alternative route (id.).

The Company added that the Service Road and NSTAR right-of-way routes would provide better pipeline performance, relative to the other two alternatives, because their shorter lengths would result in less pressure drop between endpoints (id. at 222-227). The Company noted that this factor was not included in the Company's site selection scoring and fortifies its choice of Service Road and the NSTAR right-of-way as the two noticed routes (id. at 223-230).

iii. Middle Segment

In its Middle Segment study area, located between the South Yarmouth LNG facility and the intersection of Depot Street and Main Street in Harwich, the Company identified extensive residential areas, several commercial/industrial developments, and limited conservation land open space (Exh. KED-1, at 4-7 to 4-8, fig. 4-3). Table 3, below, presents KeySpan's scoring of the three potential Middle Segment routes based on its chosen environmental criteria:

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[21] See Mass. Const. art. amend. 97 (1972) (disposition by a municipality of certain open space land requires a two-thirds vote of the state legislature). Disposition or Article 97 land also may require a unanimous vote of the municipal Conservation Commission and Park Commission, and a two-thirds vote of Town Meeting. See EOEA Article 97 Land Disposition Policy (February 19, 1998).

Table 3. Weighted Environmental Criteria Scores for the Three Middle Segment Routes

Environmental Criteria	Whites Path	Old Rail Right-of-Way	Route 6
Wetlands & Vernal Pools	3	15	15
Streams & Water Bodies	2	2	2
Groundwater Protection	6	6	8
Vegetation Clearing	2	10	6
Protected Lands	3	9	9
Residences	10	6	6
Sensitive Receptors	4	4	2
Traffic	6	2	6
Historic Districts	3	3	1
Total	**39**	**57**	**55**

Sources: Exh. KED-1, at table 4-3; Tr. 1, at 22-23

The old rail right-of-way and Route 6 alternatives each received the highest (least favorable) scores of 5 for the wetlands-and-vernal-pools criterion, while the Whites Path route received the lowest score of 1 (Exh. KED-1, at table 4-3). According to the Company, the old rail right-of-way and Route 6 alternatives directly cross 400 and 500 feet of wetlands, respectively, and cross 100-foot wetland buffer areas for 2000 and 2400 feet, respectively, compared to 1400 feet of buffer area on the Whites Path route (id. at table 4-1; Exh. YAR/DEN 1-8). The Company stated that it would attempt to avoid any impacts to the wetlands along the old rail right-of-way route, and indicated that differences between the two routes, with respect to wetland impacts, are relatively subtle (Tr. 3, at 444).

With respect to vegetation, the Company stated that west of Route 134 in Dennis, the old rail right-of-way is overgrown with trees and brush (Exh. KED-1, at 4-13). The Company stated that tree clearing would be required for pipeline location and construction along the old rail right-of-way route, and only that route received a high (unfavorable) score of 5 for vegetation clearing; the Whites Path route is located within roadways, so vegetative impacts would likely be limited to minor tree trimming (id. at 4-19, table 4-3). With respect to protected lands none of the routes

cross Article 97 protected open space (Exh. KED-1, at table 4-1). Maps provided by the Company show that the Route 6 and old rail right of way pass through priority habitat for rare species;[22] only the White's path route crosses no protected lands and therefore received a low (favorable) score of 1 in that category (id. at tables 4-1, 4-3; fig. 4-6).

For community resource criteria, the Whites Path route score was overall relatively unfavorable, largely because it has three and four times the number of residences within 100 feet, compared to the old rail right-of-way and Route 6 alternatives (id. at tables 4-1, 4-3). Under the Company's weighted scoring procedure, the Whites Path route was better than the other two routes on natural resources criteria by 25 to 27 points, and worse than each by 8 points on community resources criteria (id. at table 4-3; Tr. 1, at 22-23). Combining all environmental criteria, the Company concluded that the Whites Path route had the best overall environmental score (id. at 4-33, table 4-3).[23]

KeySpan indicated that the three Middle Segment route alternatives, once in place, would compare closely with respect to the reliability of gas delivery (Exh. KED-1, at 4-27). The Company indicated that, regardless of route, the pipeline would be constructed of the same material, would be buried with a minimum of three feet of cover, and would operate at the same pressure (Exhs. EFSB-S-2; EFSB-S-6). The Company also indicated that the three route alternatives were comparable in length (4.6 to 4.9 miles) and that all would be accessible for periodic inspection (Exhs. EFSB-S-6; EFSB-S-9). The Company asserted that there are no meaningful differences among the three route alternatives with respect to the potential for third-party disruption (Exh. EFSB-S-6).

The Company asserted that the routes present differences with respect to the certainty with which they can be placed into service in a timely manner (Exh. KED-1, at 4-27). The

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22 The maps are not sufficiently precise to determine whether the old rail right-of-way runs just inside or just outside the edge of the estimated rare species habitat.

23 During hearings, KeySpan acknowledged that a closer scoring of the two routes could reasonably be adopted (Tr. 3, at 442-445, 455-456). However, the Company argued that under any reasonable scoring of the Middle Segment, the selection of the primary route and the noticed alternative would not change (Company Brief at 73, n.19).

Company indicated that, among the three potential Middle Segment routes, the Whites Path route could most reliably be timely constructed, because no private easements would be required and permitting complexity would be minimized (id. at 4-28, table 4-4). The Company stated that, to construct along the alternative route, it would need to negotiate a license agreement with the Massachusetts Executive Office of Transportation, which currently owns the old railroad right-of-way, and that the Office of Transportation would first have to obtain a precedent agreement from the Bay Colony Railroad Corporation, the railroad of record (id. at 4-33, 5-46; Tr. 3, at 461). The Company estimated that negotiating the lease agreement with the Office of Transportation would require approximately six to nine months (Tr. 3, at 463). Additionally, for the segment of the alternative route that would be co-located on a section of the Cape Cod Rail Trail ("Rail Trail"), an agreement with the Massachusetts Department of Conservation and Recreation ("DCR"), the operator of the Rail Trail, would be required (Exhs. KED-1, at 5-46 to 5-47;YAR/DEN 1-40(1)).[24] The Company further indicated that the Whites Path route offers maximum flexibility for tie-ins (Exhs. KED-1, at 4-28, 4-33, table 4-4; EFSB-S-11).

KeySpan estimated the costs of construction and access for construction for the three Middle Segment route alternatives. The Company derived cost estimates based on unit costs per foot of installation for each type of roadway or easement location; costs for clearing, repaving,

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[24] The Company's list of required approvals assumes that KeySpan would approach the Commonwealth for rights to use the old railroad right-of-way. The Towns described the approvals that would be necessary if the Company were required to seek access rights from the Town of Yarmouth, rather than the state, which the record indicates is a possible outcome. The Towns stated that the Rail Tail currently begins in Wellfleet and ends in Dennis, and that the Town of Yarmouth has been working for many years to extend it into and through Yarmouth, to Barnstable (Exh. YAR/DEN-GA at 2). Mr. Allaire of Yarmouth stated that approximately four to six years ago, the Massachusetts Department of Capital Asset Management declared the old rail right-of-way surplus property and offered it to the Town of Yarmouth (id.). Mr. Allaire stated that the Yarmouth Town Meeting voted in 2002 to accept the property and further stated that it is his understanding that the state will transfer title to the Town as soon as the state receives permission from the National Transportation Board to abandon the line (id.; Exh. KED-GA-10(1)). Should the Company seek to construct on the old rail right-of-way after title is transferred to the Town of Yarmouth, the record indicates that Article 97 approval from the state legislature may be required (Exh. YAR/DEN 1-32(1)).

and re-seeding, as applicable; savings from phasing construction work; and the need to obtain easements from private property owners (Exhs. KED-1, at 4-23 to 4-27; EFSB-S-9). The Company also estimated that the Route 6 alternative would have a 20% cost premium for fast-track construction because the entire segment would have to be completed in the fall of 2006 due to the absence of an intermediate tie-in point (Exhs. KED-1, at 4-32; EFSB-S-9; Tr. 2, at 266-268). The Company asserted that the Whites Path route would be least costly because construction can be divided into three segments over a four-year period and also because the Company would not be charged for any lease payments (Exh. EFSB-S-9). Table 4, below, presents the Company's cost estimates for the three Middle Segment route alternatives:

Table 4. Cost Estimates for the Three Middle Segment Routes

Route	Whites Path	Old Rail Right-of-Way	Route 6
Estimated Cost *	$3,500,000	$4,200,000 **	$3,900,000 ***

* All costs assume Bass River will be crossed on bridges, not by directional drill.
** Includes PV lease payment to railroad, estimated as $116,000 per year for 30 years.
*** Does not include any payments to Massachusetts Highway Department.
Sources: Exh. KED-1, at 4-32; Tr. 2, at 216.

Based on this analysis, the Company concluded that the Whites Path route had the lowest estimated cost (Exh. KED-1, at 4-33).

The Company noted that the Whites Path route had the best environmental score, the best reliability score, and the lowest cost, and therefore was the Company's choice as the primary route along the Middle Segment (id.). In selecting a route to serve as the noticed alternative, the Company noted that the two remaining routes had comparable environmental scores and that the Route 6 alternative had a lower cost (id.). However, the Company noted that obtaining Massachusetts Highway Department ("MHD") approval for the Route 6 alternative is uncertain because at least one viable alternative exists and it is MHD's policy to deny access when there is any feasible alternative (id.; Tr. 3, at 568-569). The Company therefore decided that the old rail right-of-way route was the more appropriate choice for the noticed alternative (Exh. KED-1, at 4-33 to 4-34).

iv. Eastern Segment

In the Eastern Segment study area, located between the intersection of Depot Road and Route 39 and the Church Street regulator station in Harwich, land use includes commercial development, a gravel pit, residential areas, and privately owned open space (Exh. KED-1, at 4-8). Table 5, below, presents KeySpan's scoring of the two potential Eastern Segment routes based on its chosen environmental criteria:

Table 5. Weighted Environmental Criteria Scores for the Two Eastern Segment Routes

Environmental Criteria	Route 39	Queen Anne Road
Wetlands & Vernal Pools	3	3
Streams & Water Bodies	2	2
Groundwater Protection	10	10
Vegetation Clearing	2	2
Protected Lands	3	3
Residences	6	10
Sensitive Receptors	6	4
Traffic	6	6
Historic Districts	3	5
Total	**41**	**45**

Source: Exh. KED-1, at table 4-3

The two routes were scored differently only with respect to sensitive receptors, for which the Queen Anne Road route was scored as slightly more favorable, and residences and historic districts, for which the Route 39 alternative scored more favorably (Exh. KED-1, at 4-33). Based on this analysis, the Company concluded that the Route 39 alternative had the best overall environmental score (id. at 4-34).

KeySpan indicated that the Route 39 alternative would be more reliable than the Queen Anne Road route, based on the certainty with which the Route 39 alternative can be placed into service in a timely manner, because permitting complexity would be minimized, and because the

Route 39 alternative offers maximum flexibility for tie-ins (id. at 4-28, table 4-4). The Company also stated that the shorter length of the Route 39 alternative would afford better pipeline performance because the pressure drop would be less (Tr. 2, at 233-234). The Company asserted that there would be no meaningful difference between the routes with respect to the potential for disruption (Exh. EFSB-S-7).

KeySpan estimated the costs of construction and access for construction for the two Eastern Segment route alternatives. The Company derived cost estimates based on unit costs per foot of installation for each type of roadway or easement location; costs for clearing, repaving, and reseeding, as applicable; and the necessity of obtaining easements from private property owners (Exh. KED-1, at 4-23 to 4-27). According to the Company, the Route 39 alternative would allow for construction in three separate segments over a four-year period; however, the associated savings from the time value of money would be offset by the cost of multiple crew mobilizations (id. at table 4-5).[25] The Route 39 alternative was modeled to be less costly primarily due to its shorter length (Exh. EFSB-S-10). Table 6, below, presents the Company's cost estimates for the two Eastern Segment route alternatives:

Table 6. Cost Estimates for the Two Eastern Segment Routes

Route	Route 39	Queen Anne Road
Estimated Cost	$1,330,000	$1,750,000

Source: Exh. KED-1, at 4-32

Based on this analysis, the Company concluded that the Route 39 alternative had the lowest estimated cost (Exh. KED-1, at 4-33).

The Company stated that it selected the Route 39 alternative as its primary route because it had the best environmental score, the best reliability score, and the lowest cost (id. at 4-32 to

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25 The Siting Board notes that if the Eastern Segment were to be built in stages, each stage would be relatively short, and therefore mobilization/demobilization costs would be significant relative to the reduction in PV cost that would be obtained by postponing some construction costs.

4-33). The Company selected Queen Anne Road route as the noticed alternative route (id. at 4-34).

v. Geographic Diversity

KeySpan indicated that on the Western Segment, the primary and alternative routes do not overlap and are located 1000 to 6000 feet apart for most of the segment (Exh. KED-1 at fig. 4-2; Tr. 2, at 269). The Company indicated that on the Middle Segment, the primary route and the alternative route overlap for about 2000 feet along Depot Street in Harwich but are otherwise distinct (Exh. KED-1 at fig. 4-3; Tr. 2, at 269). The Company indicated that the two Eastern Segment routes overlap for about 700 feet at the Depot Road end, but are otherwise distinct (Exh. KED-1 at fig. 4-4; Tr. 2, at 269).

b. Intervenor Position

The Towns disagreed with the scores given by KeySpan for the Whites Path and old rail right-of-way routes for the Middle Segment. The Towns advocated changing raw scores for several criteria, changing weights for two criteria, and adding one criterion (Towns Brief at 4 to 15). The Towns did not contest scoring for the Western or Eastern segments.

The Towns argued that wetlands impacts would be greater on the Whites Path route and less on the old rail right-of-way route than indicated by Company scoring, that the two routes should have the same scores for vegetation clearing impacts, and that the score for protected lands should be lower (to show less impact) for the old rail right-of-way route (id. at 4 to 9, 36). Compared to the Company's scoring, the Towns would give wetlands impacts a weight of 2, not a 3, and would weight historic impacts with a 2, not a 1, thus giving a medium level weight to each of these criteria (id. at 6, 12, 36). The Towns would score the old rail right-of-way route as having the least impact on residences among the three routes, and would score impacts on historic resources to indicate that the Whites Path route has higher impacts while the old rail right-of-way route has minimum historic impacts (id. at 9 to 13, 36). The Towns repeatedly expressed concerns about preserving the ambience of the South Dennis Historical District along the primary route of the Middle Segment (Exh. YAR/DEN-ERN; Tr. 3, at 499-547). The Towns

also expressed concern about maintaining traffic flow through South Dennis and indicated that potential detour routes are long and congested (Tr. 4, at 262-263).

The Towns argued in essence that the primary and alternative routes are roughly comparable with regard to natural resources impacts, but that the alternative route would have fewer impacts on residences and traffic (Towns Brief at 16). In such circumstances, the Towns argued that, based on Siting Board precedent, the impacts on residents and traffic are decisive (id.). Therefore, according to the Towns, because the alternative route would have significantly fewer impacts on residences and traffic, the alternative route is superior to the primary route (id.).

The Towns noted that the Company's route selection criteria did not contain a criterion for community acceptance (id. at 14). Citing Siting Board precedent, the Towns argued that community acceptance is an important consideration and recommended its inclusion with a score indicating maximum acceptance for the old rail right-of-way route, versus minimal acceptance for the Whites Path route (id. at 14,15, 36).[26]

The Towns did not propose changing the scores of the Route 6 alternative, even for criteria for which it proposed to change weightings, and did not propose a score for the proposed community acceptance criterion for the Route 6 alternative (id. at 35). Table 7, below, presents the Towns' proposed revised scoring of the three potential Middle Segment routes based on environmental criteria:

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[26] In a rebuttal to the Towns' comments regarding community acceptance, KeySpan asserted that Siting Board precedent does not require that a community acceptance criterion be included among an applicant's site selection criteria (Company Reply Brief at 25). The Company stated that its site selection process did account for community concerns, because it included criteria pertaining to commonly raised community issues such as impacts on traffic and local residences (id.). KeySpan also stated that, for each Company project, it is standard practice for community relations staff to coordinate with local governments and private individuals that may be affected by a project, and that this coordination continues throughout the life of the project (Exh. YAR/DEN 1-42). With respect to the proposed pipeline project, KeySpan stated that, beginning in 2004, it has held numerous meetings with public officials from each of the affected municipalities (id.). The Company asserted that inclusion of a community acceptance criterion in the Company's site selection criteria would not have resulted in a conclusion that the alternative route was superior to the primary route (id.).

Table 7. Environmental Scores Proposed by the Towns for the Middle Segment Routes

Environmental Criteria	Whites Path	Old Rail Right-of-Way	Route 6
Wetlands & Vernal Pools	4	6	15
Streams & Water Bodies	2	2	2
Groundwater Protection	6	6	8
Vegetation Clearing	4	4	6
Protected Lands	3	6	9
Residences	10	4	6
Sensitive Receptors	4	4	2
Traffic	6	2	6
Historic Districts	8	2	1
Community Acceptance	8	2	no score given
Total	**55**	**38**	**55**

Source: Towns Brief at 36

The Towns also questioned the Company's reliability and cost evaluations for the Middle Segment routes. The Towns indicated that the Town of Yarmouth is pursuing acquisition of the old rail right-of-way to extend the existing Rail Trail (Exh. YAR/DEN-GA at 2). With respect to ability to construct in a short time-frame, the Towns argued that had the Company persevered in efforts to acquire rights to use the old rail right-of-way, it might have been able to acquire those rights in a timely manner (Towns Brief at 17-19). The Towns argued further that acquiring the necessary approvals from the Towns to use the Whites Path route presents a yet greater probability of rejection or delay (id. at 19-20). The Towns suggested that there is insufficient time in any case to obtain the set of necessary approvals for either route before the 2006/2007 heating season (id. at 22). With regard to the Company's stated preference for the Whites Path route because of flexibility to tie in to the existing lines, the Towns pointed out that the old rail right-of-way route can tie in to the existing Sagamore Line at an intermediate point in Yarmouth and also at an intermediate point in Dennis (id. at 23-24).

With respect to cost, the Towns pointed out that, absent the assumed cost of lease payments for use of the old rail right-of-way, KeySpan's estimates of construction costs show the old rail right-of-way route to be less expensive than the Whites Path route by $400,000 (id. at 24). Furthermore, the Towns asserted that the Company's estimate for lease payments lacked reliable supporting evidence, and that the difference in total cost is small both by percentage and in total dollars (id.).

c. Analysis

KeySpan has developed a set of route selection guidelines and a set of environmental criteria that address environmental impacts, land use concerns, and community issues – types of criteria that the Siting Board has found to be appropriate for the siting of energy facilities. See NSTAR Gas Company, 13 DOMSB 143, at 177 (2001) ("NSTAR Gas Decision"); MMWEC Decision, 12 DOMSB 18, at 125; New England Power Company, 4 DOMSB 109, 167 (1995).

The Company considered route options separately for each of the three identified pipeline segments. To develop route options for further evaluation, the Company identified study areas that would encompass the starting and ending points for the three pipeline segments and a reasonable selection of routes to connect those points. The Company then created multiple possible routes, each of which made use of existing roadways and/or utility easements within each study area. The Company next rated the routes based on environmental criteria, weighted the scores, and presented the total environmental score for each route. The Company also evaluated the reliability of each route and estimated the cost of each route. In each segment, the route that had the best environmental score, the best evaluation for reliability, and the lowest cost was selected as the Company's primary route. With a few exceptions, the route selected by the Company to be the noticed alternative route had the second-best environmental score, the second-best reliability, and the second-lowest cost.[27]

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[27] One exception to the noticed alternative being second best in three categories was in the Western Segment, where the NSTAR right-of-way route presented somewhat greater potential difficulties in acquiring permits and approvals than other routes, but a much better environmental score and lower costs. On the Middle Segment, the Route 6

(continued...)

For certain of the criteria used by the Company, the Towns disagreed with the relative scoring of the primary route and noticed alternative for the Middle Segment.[28] In addition, the Towns argued that KeySpan's set of siting criteria was deficient because it did not include a criterion for community acceptance.

The Towns' criticism of the large difference in the wetland criterion scores between the Whites Path route and the old rail right-of-way route has merit because the evidence suggests that wetlands will not be adversely impacted along either route. In elucidating some subtle distinctions about the nature of work that would be required for each route – in all cases to be done at a distance from wetlands – it is not reasonable to score the two routes at extremes; the least favorable rating should be reserved for circumstances such as the railroad right-of-way route on the Western Segment, where it was anticipated that actual construction in wetlands would be needed. Additionally, though both noticed routes pass through the South Dennis Historic District, the old center of South Dennis is traversed only by the Whites Path route. The Towns' argument that the Whites Path route should have scored higher for the historical resources criterion is therefore reasonable.

The Towns' contention that tree clearing is equivalent among the route alternatives does not appear as reasonable as its other arguments because the Whites Path route would be within paved streets, while extensive secondary vegetation has grown up on the old rail right-of-way. The maps of protected habitat indicate that a portion of the old rail right-of-way runs inside an area of Priority Habitat. However, at a screening level, it is uncertain whether actual impacts to endangered species would result. Thus, the differential between the White's Path route (score of 3) and the old rail right-of-way (worse score of 6) with respect to protected lands at a screening

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27 (...continued)
alternative generally scored slightly better than the old rail right-of-way route; the route was excluded based on the Company's expectation that MHD would likely deny the Company access to work along the highway.

28 The Siting Board views the numerical scoring of routes in the site selection section as a screening level analysis only. 2006 Berkshire Gas Decision, EFSB 05-1, at 27. A separate and more in-depth analysis occurs in the facility-level comparison of the proposed and alternative routes. Id. See Section III.C, below.

level may be overstated.

As noted above, the Towns objected that the Company did not incorporate a criterion for community acceptance in its site selection methodology. However, while the Siting Board encourages applicants to develop a site selection process, or other mechanism, to provide for community input in the siting of proposed energy facilities, Siting Board precedent does not require the inclusion of a community acceptance criterion, or any other specific criterion, in an applicant's set of site selection criteria. ANP Blackstone Decision, 8 DOMSB 1, at 106, 113; US Generating Company, 6 DOMSB 1, 113-115 (1997); Berkshire Gas Company (Phase II), 20 DOMSC 109, 163 (1990). The absence of a community acceptance criterion does not render the Company's site selection process invalid.[29]

If KeySpan's screening scores are adjusted to incorporate the Towns' suggested scores specifically for the wetlands/vernal pools and historic districts criteria, the Whites Path environmental score would increase to 45 and the old rail right-of-way would be reduced to 48; some other combination of reasonable adjustments could readily give these two routes screening scores that are essentially equivalent.

With respect to KeySpan's screening-level reliability analysis, it is not unreasonable that KeySpan, as a company whose business involves the routine installation of gas supply lines, is experienced in assessing the relative difficulty of permitting routes. The record shows that use of the old rail right-of-way route would require a series of approvals and agreements. The Siting Board notes that some agreement would need to be made with railroad system managers, which could entail some consideration of the residual value of the right-of-way, and some determination as to whether installation of a gas pipeline along the old rail right-of-way would be compatible with potential future use. The record supports the Company's view that timely completion of

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[29] Consistent with the Towns' argument, a fuller consideration of community views might have usefully informed the site selection process. First, the weighting of various impacts could have been refined if the Company had had a more timely understanding of issues of interest to the community. Second, community input might have helped to identify potential consistency with local land use plans (e.g., town aspirations for future use of the old rail right-of-way) as a worthwhile criterion for site selection screening. Third, the Company might well have decided to add community acceptance as a separate criterion for site selection screening.

the necessary permitting for the Whites Path route would be more certain than for the old rail right-of-way route. Also, the record supports the Company's position that ability to tie in to the existing line at virtually any point, available only on the Whites Path route, offers more construction flexibility than the availability on the old rail right-of-way route of only two tie-in points. This flexibility could be useful in the event of weather, construction, or permitting issues that arise during the construction process. The Company's approach to evaluating reliability was reasonable for screening purposes. On a screening-level basis, the reliability of the Whites Path route, in terms of whether the Company can rely on being able to permit and construct it in advance of 2006/2007 winter peak use, was reasonably scored as better than the Route 6 and old rail right-of-way routes.

With respect to cost, the uncertainty in lease payments and other costs on the old rail right-of-way route appears to exceed KeySpan's predicted cost differential. On a screening-level basis, KeySpan reasonably concluded that distinguishing among the routes on the basis of expected cost was unwarranted at that point in project development, given the uncertainty as to costs of leasing arrangements or other property-use rights.

The Whites Path and old rail right-of-way routes could reasonably have been scored differently by the Company on environmental screening criteria, and additional engineering work could have provided firmer cost projections for the two routes. However, within the site selection screening process, the Company was reasonable in concluding that the Whites Path route was better than the old rail right-of-way route, when reliability, environmental impacts, and cost were considered together. Furthermore, and more importantly for the result of the site selection screening process, there is no record evidence that another route would be better than the two noticed routes, or hybrid combinations of these routes (see Section III.B.1.b, below). While the Towns criticized the relative scoring of the Whites Path and the old rail right-of-way routes, the Towns did not address the scoring of the Route 6 alternative. The Towns also did not show or argue that a superior route was eliminated when the Whites Path and old rail right-of-way routes were selected for further evaluation. Thus, there is no evidence that the Company was unreasonable in selecting the two Middle Segment routes that it brought forward to the detailed facility evaluation.

The Company's site selection process used reasonable criteria and methods to select two routes for further consideration and did not exclude a superior route. On this basis, the Siting Board finds that the Company has developed and applied a reasonable set of criteria for identifying and evaluating alternative routes in a manner the ensures that it has not overlooked or eliminated any routes that are, on balance, clearly superior to the proposed route.

3. Geographic Diversity

For the Western Segment, the two routes selected by KeySpan for further evaluation are separated by at least 1000 feet for most of their length. The two routes offer different sets of constraints and advantages with respect to many environmental factors, as well as the difficulty and cost of acquiring easements. For the Middle Segment, the two routes selected for further evaluation overlap for about 2000 feet along Depot Street in Harwich but are otherwise distinct. The two routes offer different sets of constraints and advantages with respect to many environmental factors, as well as the difficulty and cost of acquiring easements. For the Eastern Segment, the two routes selected for further evaluation overlap for about 700 feet at the Depot Road end, but are distinct for most of their length.

Consequently, the Siting Board finds that the Company has identified a range of practical gas pipeline routes with some measure of geographic diversity.

4. Conclusions on Site Selection

The Siting Board has found that the Company has 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 route. In addition, the Siting Board has found that the Company identified a range of practical pipeline routes with some measure of geographic diversity. Consequently, the Siting Board finds that KeySpan examined a reasonable range of practical siting alternatives.

B. Construction Plans for the Primary and Alternative Routes

1. Route Descriptions and Construction Schedule

a. Western Segment

The Company stated that it selected the 6.6-mile long Service Road route as its primary route for the Western Segment (Exh. KED-1, at 4-10, 4-34). The primary route begins on the west side of Route 130 at its intersection with Service Road in Sandwich, then runs east along Service Road, crossing Quaker Meetinghouse Road and Chase Road (id. at 4-10, fig. 4-2). Continuing in an easterly direction on Service Road in Barnstable, the route ends at the NSTAR right-of-way crossing of Service Road, just short of Route 149 (id. at 4-10 to 4-11, fig. 4-2; Tr. 1, at 15; Tr. 2, at 219). KeySpan would complete construction of one section of the Service Road route in 2009, with the remaining work to be completed in stages between 2010 and 2014 (Exhs. KED-1, at 3-4, 4-11, 4-33; EFSB-S-4).[30]

The Company selected the 6.6-mile NSTAR right-of-way route as its noticed alternative route (Exh. KED-1, at 4-11, 4-34). The Company envisioned building pipeline primarily along the south side of the existing NSTAR easement (Exh. KED-1, at 5-7). From the west side of Route 130 in Sandwich, at its intersection with Service Road, the alternative route runs one mile south along Route 130 to the existing NSTAR right-of-way and then continues east along the right-of-way to the Service Road crossing, just short of Route 149 in Barnstable (Exh. KED-1, at 4-11; Tr. 1, at 15). This alternative would be built in a single year (Exh. KED-1, at 4-11). To allow use of a hybrid route combining parts of the primary route and the alternative route, the Company proposed 0.6 miles of Great Hill Road in Sandwich, between the primary route at Service Road and the alternative route at the NSTAR right-of-way, as a connector (id. at 4-15).

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30 The Company explained that construction in phases would be possible because the primary route is adjacent to the existing pipeline, allowing the new pipeline to be tied back into the existing pipeline at intermediate points (Exh. KED-1, at 4-11, 4-28, 4-31). Dates for future construction would depend on the actual rate of growth in customer demand, and might vary from dates projected here (Tr. 1, at 147-148).

b. Middle Segment

The Company stated that it selected the 4.9-mile long Whites Path route as its primary route for the Middle Segment (Exh. KED-1, at 4-13, 4-34). The primary route begins at KeySpan's South Yarmouth LNG facility, runs generally easterly through Yarmouth on Whites Path, Great Western Road, a short stretch of North Main Street, Great Western Road, and then Highbank Road (id. at 4-13, fig. 4-3). The route crosses the Bass River on the Highbank Road bridge from Yarmouth into Dennis (id.). The route continues in an easterly direction in Dennis on Highbank Road and Upper County Road, crossing Main Street and Route 134, then continues northerly on Great Western Way, and easterly on Great Western Road into Harwich, where it turns northerly on Depot Street and ends at the intersection of Depot Street and Main Street (id.). KeySpan stated it would complete construction of one section of the Whites Path route in 2006, with the remaining work to be completed between 2007 and 2009 (id. at 4-29; Exh. EFSB-S-4).[31]

Subject to final discussions with the Towns of Yarmouth and Dennis, the new pipeline for the Middle Segment would be installed on the north side of Whites Path, the southwest side of North Main Street, the south side of Great Western Road in Yarmouth, and the south side of Great Western Road in Dennis (Exhs. EFSB-E-2; RR-EFSB-9; Tr. 1, at 13-14; Tr. 2, at 185-186, 194-197).

The Company selected the 4.6-mile old rail right-of-way route as its noticed alternative route (Exh. KED-1, at 4-13, 4-34). From the South Yarmouth LNG facility, the alternative route runs east along an inactive railroad right-of-way to Route 134 in Dennis (id. at 4-13, fig. 4-3). East of Route 134, the right-of-way becomes the Rail Trail (id. at 4-14). The alternative route follows the Rail Trail to Depot Street, heads north along Depot Street, and ends at the intersection of Depot Street and Main Street in Harwich (id.). The Company would build this entire alternative for use in the 2006/2007 heating season (id. at 4-34). To allow use of a hybrid route combining parts of the primary route and the alternative route, the Company also evaluated

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31 The Company explained that construction in phases would be possible because the primary route is adjacent to the existing pipeline, allowing the new pipeline to be tied back into the existing pipeline at intermediate points (Exhs. KED-1, at 4-13, 4-28, 4-31; EFSB-S-11).

using 0.3 miles of Route 134 in Dennis, between the alternative route at the start of the Rail Trail and the primary route along Great Western Road, for routing of the pipeline (id. at 4-15).

c. Eastern Segment

The Company stated that it selected the 1.6-mile long Route 39 alternative as its primary route for the Eastern Segment (Exh. KED-1, at 4-14, 4-34). The primary route runs along Route 39 in Harwich from the intersection of Route 39 with Depot Road to the Church Street regulator at the intersection of Route 39 and Church Street (id. at 4-14, fig. 4-7). KeySpan indicated that it had not yet determined which side of the road to install the pipeline, but that, prior to actual construction, it would make that determination in consultation with the Town of Harwich (Exh. EFSB-E-2). KeySpan stated that it could construct the Eastern Segment in one phase (i.e., in a single year), in two phases, or in three phases (e.g., in 2010, 2011, and 2013), depending largely on the expressed preference of the Town of Harwich (Exhs. KED-1, at 3-4; EFSB-S-4; EFSB-E-24; Tr. 2, at 270-272).[32]

The Company selected the 2.2-mile Queen Anne Road route as its noticed alternative route (Exh. KED-1, at 4-15, 4-34). From the intersection of Depot Road and Route 39 in Harwich, the alternative route continues east on Route 39 and Queen Anne Road in Harwich and along the boundary between Harwich and Chatham, and then continues north in Harwich along Church Street, ending at the existing Church Street regulator station (id. at 4-15, fig. 4-4; Exh. EFSB-S-1).

2. Methods of Pipeline Installation

KeySpan stated that where it follows roads (i.e., along all of the primary route in each segment, all of the Eastern Segment alternative route, and parts of the alternative routes for the Western and Middle Segments) the pipeline would be constructed primarily within roadway layouts, either in the shoulder or near the edge of pavement (Exhs. KED-1, at 5-3;

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32 The Company explained that construction in phases would be possible because the primary route is adjacent to the existing pipeline, allowing the new pipeline to be tied back into the existing pipeline at intermediate points (Exh. KED-1, at 4-14, 4-28, 4-31).

YAR/DEN 1-43). Along roadways, the Company would use so-called "stove-pipe construction" methods, in which one to three lengths of pipe are installed at a time, with welding, radiography, and coating work completed within the trench (Exhs. KED-1, at 5-4; EFSB-E-3). The trench would be 4 feet wide and 5 to 6 feet deep for 20-inch pipeline and 3 feet wide and 4 to 5 feet deep for 12-inch pipeline (Exhs. KED-1, at 5-4; EFSB-E-13).

Pipe sections would be trucked in as needed; excavated soil would be stored next to the trench when space is available (Exh. KED-1, at 5-4 to 5-5). The width of work space required for the stove-pipe construction method would typically be 20 to 25 feet (Exh. EFSB-E-3). Generally, construction equipment would be in the shoulder and all or part of one lane of travel (Exh. KED-1, at 5-4). Each day, new pipeline would be backfilled and pavement would be replaced (id.). The Company stated that it would comply with G.L. c. 164, § 70, which it quotes as requiring gas companies to "put all streets, lanes and highways in as good a repair as they were when opened" (Exh. YAR/DEN 1-44). In addition, the Company committed to following the Department's road restoration standards established in D.T.E. 98-22 ("D.T.E. Road Restoration Standards") (Tr. 2, at 321-322).[33] The Company indicated that it would not necessarily repave entire roadways except for streets that had been repaved in the previous five years (Exh. YAR/DEN 1-45).

Away from roads (i.e., for much of the alternative routes for the Western and Middle Segments), the Company would use either stove-pipe construction or cross-country construction (Exh. EFSB-E-3). With the cross-country method, many sections would be welded together into a long string of pipe that is then lowered into a long trench (id.). The Company indicated that the typical work space for the cross-country method is 75 feet wide (id.).

On any route, valves and cathodic protection test station boxes and covers would be installed at various points (Exh. EFSB-E-18). These boxes and covers would be constructed to be flush with the ground (id.). According to the Company, the only above-ground structures

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[33] See Public Utility Road Restoration Standards, D.T.E. 98-22, att., §§ 1.0-12.0 (August 26, 1999).

constructed as part of the project would be vent posts for casing pipes for pipeline constructed by pipe jacking or boring and warning markers (id.).

The Company proposes to cross the Bass River by placing the new pipeline in an existing utility chase under the north side of the Highbank Road bridge, if it follows the primary route for the Middle Segment (Exh. KED-1, at 5-14; Tr. 2, at 201). The Company stated that it would construct pipeline rollers, attach the pipeline rollers to the bridge and install the pipeline on the pipeline rollers (Tr. 1, at 11). Construction under the bridge would be supported with spud barges in the river or similar technology (Tr. 2, at 285-287). If it follows the alternative route for the Middle Segment, the Company stated that the pipeline would cross the Bass River at the no-longer-used railroad bridge ("railroad bridge") (Exh. KED-1, at 5-15). The Company indicated that it would support the pipeline on a new lattice bridge which would be installed between the existing railroad bridge abutments (Tr. 2, at 287-296). The Company indicated that it would likely need to reconstruct the existing granite railroad abutments prior to their use as supports for the pipe bridge (id. at 287-293).

After installation, the pipeline would be pressure tested with air or nitrogen before being put into service (Exh. KED-1, at 5-5). In areas subject to regrowth of vegetation, the Company would keep a 10- to 25-foot corridor clear for inspection and maintenance of the pipeline (Tr. 2, at 206-207).

C. Environmental Impacts, Cost, and Reliability of the Primary and Alternative Routes

1. Standard of Review

In implementing its statutory mandate to ensure a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost, 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 site for the facility is superior to the noticed alternatives on the basis of balancing cost, environmental impact, and reliability of supply. 2006 Berkshire Gas Decision,

EFSB 05-1, at 31; 2005 NSTAR Electric Decision, 14 DOMSB 233, at 296; 1997 BECo Decision, 6 DOMSB 208, at 287.

An assessment of all impacts of a proposed facility is necessary to determine whether an appropriate balance is achieved both among conflicting environmental concerns as well as among environmental impacts, cost, and reliability. A facility which achieves that appropriate balance thereby meets the Siting Board's statutory requirement to minimize environmental impacts at the lowest possible cost. 2006 Berkshire Gas Decision, EFSB 05-1, at 31; 2005 NSTAR Electric Decision, 14 DOMSB 233, at 297; 1997 BECo Decision, 6 DOMSB 208, at 287.

The Siting Board recognizes that an evaluation of the environmental, cost and reliability trade-offs associated with a particular proposal must be clearly described and consistently applied from one case to the next. Therefore, in order to determine if a petitioner has achieved the proper balance among various environmental impacts and among environmental impacts, cost and reliability, the Siting Board must first determine if 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 can determine whether environmental impacts would be minimized. Similarly, the Siting Board must find that the petitioner has provided sufficient cost and reliability information in order to determine if the appropriate balance among environmental impacts, cost, and reliability would be achieved. 2006 Berkshire Gas Decision, EFSB 05-1, at 31-32; 2005 NSTAR Electric Decision, 14 DOMSB 233, at 297; Commonwealth Electric Company, 5 DOMSB 273, at 337 (1997).

Accordingly, in the sections below, the Siting Board examines the environmental impacts, reliability, and cost of the proposed facilities along KeySpan's primary and noticed alternative routes to determine: (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. In this examination, the Siting Board compares the primary and alternative 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.

2. Western Segment

a. Environmental Impacts - Western Segment

In this section, the Siting Board compares the environmental impacts of the proposed facilities along the primary and alternative routes for the Western Segment, considers the proposed mitigation for such impacts, evaluates any options for additional mitigation and determines whether the environmental impacts along the primary route would be minimized. The subsections below consider wetlands and water resources impacts, land use and land resources impacts, and noise and traffic impacts.

i. Wetlands and Water Resources

KeySpan stated that, with use of the primary route, the Western Segment would be built primarily along the edge of pavement of existing roads and within roadway layouts (Exh. KED-1, at 5-3). The Company stated that there are no bordering vegetated wetlands, isolated wetlands, or wetland buffer crossings along the primary route for the Western Segment (id. at 5-13). The Company stated that Massachusetts Geographic Information System ("MassGIS") mapping shows a perennial stream near the Western Segment primary route, but that neither the U.S. Geological Survey ("USGS") topographic map nor the Company's field surveys confirm the existence of such a water body (id. at 5-17 and fig. 4-5; Exh. EFSB-G-18; Tr. 2, at 219-222). Also, although small pools of standing water containing mosquito larvae were observed, there are no mapped certified or potential vernal pools within 100 feet of the route (Exh. KED-1, at 5-13).

KeySpan stated that the Western Segment alternative route does not cross any streams, bordering vegetated wetlands, isolated wetlands, or associated wetland buffer zones (id. at 5-14, 5-17). The Company stated that it would manage construction to avoid adverse effects on the one mapped potential vernal pool within 100 feet of the alternative route (id. at 5-14; Tr. 2, at 284-285).

The Company concluded that the Western Segment primary and alternative routes would be comparable with respect to streams and water bodies (Exh. KED-1, at 5-18). However, based on the one potential vernal pool within 100 feet of the alternative route, the Company identified the primary route as advantageous with respect to wetlands and vernal pools (id. at 5-14).

The Company stated that it would use filter fabric barriers and would sweep road surfaces to keep soil materials from washing into storm drains (id. at 5-11). KeySpan stated that it would develop and implement a Spill Prevention Control and Countermeasures ("SPCC") Plan to ensure against inadvertent releases of fuel or equipment maintenance materials during pipeline construction (id.). The Company indicated that it would prepare a Stormwater Pollution Prevention Plan ("SWPPP") and implement erosion and sedimentation control best management practices (id. at 5-11; Exh. EFSB-E-26). The Company also indicated that it would prepare an Environmental Construction Plan, that would address erosion control, dust control, and vehicle fueling and maintenance (Exh. YAR/DEN 1-5).

KeySpan stated that there are no mapped public water supply wells proximate to the proposed routes (Exh. KED-1, at 5-19). However, the Company stated that the primary route for the Western Segment crosses through a total of 10,100 linear feet of Wellhead Protection Area as identified by the Cape Cod Commission (id.). The alternative route crosses through 17,500 linear feet of Wellhead Protection Area and 22,300 linear feet of Potential Public Water Supply Area as identified by the Cape Cod Commission (id.).[34] Based on the shorter distance in groundwater resource areas, the Company identified the primary route as advantageous with respect to groundwater (id. at 5-20).

KeySpan noted that all of Cape Cod has been designated as a Sole Source Aquifer under the federal Safe Drinking Water Act (id. at 5-19). The Cape Cod Commission has identified groundwater protection areas based on their importance for drinking water supplies (id.). The Company indicated that development and implementation of an SPCC Plan would protect against impacts to groundwater (id. at 5-20). Further, the Company stated that it would perform no equipment maintenance within 100 feet of a wellhead protection area (Tr. 3, at 549-551).

KeySpan asserted that current information from the MADEP Bureau of Waste Site Cleanup indicates that Massachusetts Contingency Plan ("MCP") sites identified in accordance with 310 CMR 40.0000 would not affect pipeline construction (Exh. KED-3, at 12-1 to 12-2). Notwithstanding, the Company indicated that it would follow Utility-related Abatement Measure

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[34] The Company did not quantify the linear distance over which the primary route traverses Potential Public Water Supply area.

("URAM") procedures required under the MCP, in the event that contamination is encountered (id. at 12-2 to 12-3; Exh. EFSB-G-3(1) at A-1; Tr. 2, at 311).

The record shows that the primary route on the Western Segment is along roads and not in wetland areas. The record also shows that the Company is committed to erosion and sedimentation control and spill prevention procedures that would minimize water impacts. To further reduce the risk of contaminating groundwater supplies, the Siting Board directs the Company to refrain from all refueling and equipment-maintenance activities that have the potential for fluid spills, when vehicles are within identified Wellhead Protection Areas. Based on the use of roadway layouts, the limited encroachment into wetland buffer areas, and the Company's expressed commitment to control erosion and sedimentation, the Siting Board concludes that construction of the proposed pipeline along the primary route would result in no permanent impacts, and only minimal temporary impacts to wetlands and water resources. With the specified mitigation, the Siting Board finds that the wetlands and water resources impacts of the proposed pipeline along the Western Segment primary route would be minimized.

The record shows neither the primary nor the alternative route on the Western Segment traverses significant wetland resources. According to the record, the primary route would be confined to roads and not traverse wetland areas, while the alternative route along the NSTAR right-of-way would traverse the 100-foot buffer zone of a potential vernal pool. However, it is expected that impacts could be avoided or mitigated during construction of the alternative route. Therefore, there do not appear to be significant differences between the primary and alternative routes on the Western Segment with respect to surface water and wetlands impacts. The record shows that the primary route would extend through Wellhead Protection Areas for a considerably shorter distance than the alternative route. Considering wetlands, surface water, and groundwater impacts, the Siting Board finds that, on the Western Segment, the primary route would be preferable to the alternative route with respect to wetlands and water resources impacts.

ii. Land Use and Land Resources

KeySpan indicated that the areas traversed by the primary route are largely residential and woodland (Exh. KED-1, at fig. 4-5). The Company indicated that a total of 27 homes are within

100 feet of Service Road on the primary route (id.). The Company stated that these residences are on the south side of the Service Road, while it would generally install the pipeline on the north side of the street (id. at 5-25). The Company listed three sensitive receptors along the primary route: a church, a rehabilitation hospital, and a hospice – all with entrances or addresses on Service Road (id. at 5-27 to 5-28).

KeySpan stated that it did not expect any extensive clearing of roadside vegetation, which includes oaks and pitch pine, along the Western Segment if the primary route were selected (id. at 5-21). The Company noted that to install the proposed pipeline along the primary route, it might clear some scrub vegetation along pavement edges (id. at 5-4). However, the Company indicated that few trees would need to be removed on the primary route (Exh. KED-3, at 5-2). The Company stated that it would assess the potential for damage to trees with a professional arborist and local tree wardens (id. at 5-2). The Company stated that graded areas would be fertilized, seeded, and mulched, and that these areas would be inspected after the first and second growing seasons (id.). The Company stated that shrubs would be restored in accordance with any individual landowner agreements (id.).

KeySpan indicated that 3700 linear feet of the primary route, along Service Road, is adjacent to Estimated Habitat designated by NHESP, and 10,500 linear feet of the route is adjacent to town-owned open land (Exh. KED-1, at 5-23, fig. 4-5). The Company stated that, except for the proposed Algonquin gate station and approximately 150 feet of pipeline between the gate station and the roadway layout of Route 130, the primary route does not cross lands for which approval of the Legislature under Article 97 would be required to allow such use (id. at 5-24; Exhs. EFSB-G-2 (Supp.); EFSB-G-3 (Supp. 2), att. at 1-15).

The Company indicated that no stone walls would likely be disturbed along roadsides (Exh. KED-3, at 5-2). However, if either stone walls or fences were to be temporarily removed for construction, the Company committed to their restoration (id.).

KeySpan indicated that it hired Public Archaeology Lab, Inc. ("PAL") to identify documented locations of archaeological sites, historic structures, cemeteries, and areas of archeological sensitivity within the project area (Exh. EFSB-E-5). In response to comments from the Massachusetts Historical Commission, PAL conducted an archaeological reconnaissance

survey of the primary and alternative routes, to identify areas that may require further testing to locate and identify any important archaeological resources (id.). The Company stated that there are no above-ground historic resources along the primary route for the Western Segment, and that a preliminary assessment indicated that the segment is unlikely to contain unidentified archaeological resources (Exh. KED-1, at 5-35). The Company stated that it would perform additional surveys as directed by the Massachusetts Historical Commission (Exh. EFSB-E-5). The Company stated that if significant eligible deposits are found in any further survey directed by the Massachusetts Historical Commission, KeySpan would consult with the Massachusetts Historical Commission, and would consider using alternative alignments and reducing its workspace; if avoidance were not feasible, the Company would undertake a site examination (Exh. EFSB-E-6).

KeySpan indicated that the areas traversed by the Western Segment alternative route are largely residential and woodland (Exh. KED-1, at fig. 4-5, fig. 5.3-3). The Company stated that vegetation along the alternative route alignment is regularly cleared by NSTAR (id. at 5-21). The Company stated that 23 homes are within 100 feet of the alternative route and that 20 of these homes are located along the southern edge of the NSTAR right-of-way portion of the route, where there would be permanent changes to vegetation (id. at 5-25, 5-26). The Company stated that there are no sensitive receptors along the alternative route (id. at 5-28). The Company stated that larger construction equipment would likely be used along the alternative route, but that paving equipment would not be required (Exh. EFSB-E-15).

The Company stated that the alternative route extends approximately 15,000 linear feet across Priority Habitat for rare species mapped by NHESP in Sandwich and Barnstable and a total of 14,800 linear feet across open space protected by Article 97; these distances partly overlap (Exh. KED-1, at 5-23; Tr. 2, at 305-306). A map printed from MassGIS data shows the Priority Habitat as closely aligned with the NSTAR right-of-way (Exh. KED-1, at fig. 4-5). However, the Company stated that pipeline construction would have no impacts on rare species (Exh. KED-3, at 16-4). The Company did state that if the alternative route were selected, it would conduct further evaluations of how to protect rare species (Exh. KED-1, at 5-8).

The Company stated that there also are no above-ground historic resources along the alternative route, but that a preliminary assessment indicated that the segment is sensitive for containing previously unidentified archaeological resources (id. at 5-35). The Company concluded that the Western Segment primary route is better than the alternative route with respect to historic resources (id.).

The Company concluded that the primary route would be advantageous with respect to residential impacts, because the alternative route would require some vegetation clearing near homes along the NSTAR right-of-way and thus have more permanent adverse impacts (id. at 5-26). However, the Company concluded that the primary and alternative routes are essentially comparable with respect to sensitive receptors because of limited impacts and use of mitigation (id. at 5-28). The Company concluded that the primary and alternative routes would be comparable with respect to vegetation, and that the primary route is significantly better than the alternative route with respect to protected lands (id. at 5-21, 5-24).

The record demonstrates that the land resources impacts of the proposed pipeline along the primary route would be temporary and minimal due to the placement of the pipeline under and directly adjacent to streets and because the Company has stated that it will assess the potential for damage to trees on the route with a professional arborist and local tree wardens.[35] To protect shade trees and other landscaping features, the Siting Board directs the Company: (1) to arrange for a professional arborist to conduct an on-site inspection of the construction zone within 6 months before construction begins in an area; (2) based on recommendations by the arborist and, where applicable, tree wardens, to take all reasonable precautions to avoid removing or damaging trees; (3) to minimize damage to shrubbery and other plantings, as well as damage to or removal of fences, stone walls, lampposts, and other landscaping features; (4) to repair or replace any damaged or removed trees, shrubbery, or plantings, in consultation with the arborist and, where applicable, tree wardens, and with the agreement of the owner of damaged or removed vegetation; and (5) to repair or replace any damaged or removed fences, walls, or other landscaping features, with the agreement, as applicable, of the owner of the landscaping feature.

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35 The Company is required by § 6.8 of the D.T.E. Road Restoration Standards to hand-cut around roots of trees.

With the specified mitigation and implementation of the above condition, the Siting Board finds that the land resources impacts of the proposed pipeline along the Western Segment primary route would be minimized.

The record shows that both routes pass fewer than 30 houses but that as a result of edge-of-right-of-way vegetation near homes, the alternative route would have more permanent impacts on residential areas. The record shows that there are more sensitive receptors along the primary route than the alternative route. While the alternative route would therefore be advantageous with respect to sensitive receptors, adherence to limits on construction hours, described in Section III.C.2.a.iii, below, should mitigate the impacts.

The record shows that the alternative route would extend directly through protected rare species habitat and Article 97 land, while the primary route, with the exception of the small segment of Article land associated with the Algonquin gate station, generally is adjacent to such areas. It was not established whether species inhabiting the disturbed habitats along the NSTAR right-of-way would be sensitive to disturbance caused by pipeline construction. However, the record does show that natural upland habitats would be minimally affected by the primary route. Therefore, the primary route would be advantageous with respect to upland habitat impacts. The record shows that the alternative route would go through an area that may contain archaeological resources. Therefore, for purposes of avoiding possible disturbance to archaeological resources, the primary route would be advantageous.

While the primary route follows existing roadways, the alternative route is largely away from roads. Underground pipelines are generally compatible with roads from a land use perspective, while pipelines might restrict future land use at off-road locations. Roads and road shoulders tend to have relatively little in the way of land resources such as undisturbed archaeological resources, vegetation, and valuable upland habitat; as discussed above, construction on the alternative route would have greater impacts on land resources. Therefore, the Siting Board finds that, on the Western Segment, the primary route would be preferable to the alternative route with respect to land use and land resources impacts.

iii. Noise and Traffic

KeySpan indicated that the project would have noise and traffic impacts only during its construction (Exh. KED-1, at 5-9 to 5-10). These impacts are evaluated below, for the primary and alternative routes.

KeySpan stated that the principal sources of noise during construction would be pavement saws, a backhoe, and a welding rig (Exh. EFSB-E-15). The Company indicated that other sources of noise such as dump trucks and crew vehicles would be present intermittently (id.). The loudest piece of equipment evaluated by the Company, the pavement saw, has a maximum sound level of approximately 90 decibels, A-weighted ("dBA") at 50 feet (id.).

KeySpan noted that sound levels at any given location would be dominated by the piece of equipment nearest the receptor of interest (id.). According to KeySpan's calculations, construction would typically generate sound levels that would be exceeded for 10% of a time period ("L_{10}") in excess of 60 dBA outside a residence located 50 feet back from pipeline construction in a road for a total of approximately 7 to 9 days, as machinery used in the construction sequence moves along the roadway (Exh. RR-EFSB-12). The Company indicated that it measured ambient L_{10} sound levels in the project area on May 19, 2005 (id.). The Company reported that ambient sound levels ranged from 66 dBA to 78 dBA on various primary route segments, and from 42 dBA to 76 dBA on various alternative route segments (id.).

The Company stated that the typical work hours would be on weekdays between 7:00 a.m. and 6:00 p.m. (Exhs. KED-1, at 5-9; EFSB-E-15). However, the Company indicated that night or weekend work might on occasion be needed to meet construction deadlines (Exhs. KED-1, at 5-9; EFSB-E-15; EFSB-E-16). The Company indicated that days and hours of work would be circumscribed by the street opening permits issued by each town (Tr. 2, at 316-317). The Company indicated its belief that it would be able to obtain permission from the various towns to extend the scheduled construction hours if it became essential to do so (id. at 315-316).

The Company noted that traffic impacts would occur along all 6.6 miles of the primary route on Service Road, compared to just 1.0 mile along the alternative route where it follows Route 130 (Exh. KED-1, at 5-31). However, the Company also stated that traffic volumes on

Route 130 are more than ten times the volumes on Service Road (id.). Also, the Company stated that Route 6 is available as an alternative route for Service Road traffic, while there is no practical alternative for most drivers on Route 130 (id.). The Company stated that one of the two travel lanes would be closed on Service Road (the primary route), while no travel lanes would be closed on Route 130 (part of the alternative route) (id.). The Company concluded that the two routes would be comparable with respect to traffic impacts (id.).

The record shows that KeySpan has not yet developed final engineering plans for construction on any of the three proposed pipeline segments (Exhs. EFSB-A-13; RR-EFSB-10; Tr. 2, at 196). The Company has developed 95%-complete engineering plans for the first 12,000 feet of the Middle Segment (Exh. RR-EFSB-9; Tr. 2, at 189). KeySpan stated that once a set of engineering plans is approximately 95% complete, the Company will meet with appropriate town officials, provide a copy of the engineering plans for comment and input, and then finalize the plans (Tr. 2, at 189-190). With respect to the first phase of the Middle Segment specifically, the Company indicated that it would meet with the Town of Yarmouth engineers and public works officials several times to review the 95%-complete plans, and would discuss the engineering on which the plans were based, traffic management issues, and any other issues that the town wishes to address either in the engineering plans or in contract specifications (Tr. 2, at 194-196). KeySpan estimated that, depending on how quickly the town could review the plans and provide its comments to the Company, this review process would likely require 4 to 6 weeks (Tr. 2, at 196).

KeySpan stated that it would develop traffic management plans for construction (Exh. KED-1, at 5-6). The Company indicated that it would limit construction along roads to the off-season – from after Labor Day to before Memorial Day – except in any locations such as along Service Road for which the Towns of Sandwich or Barnstable may determine that traffic impacts would be acceptable in the summer (Tr. 2, at 313-314). The Company indicated that the traffic management plans could limit construction to outside rush hour periods, specify the use of traffic control officers, and require maintenance of at least one lane of traffic flow (Exh. YAR/DEN 1-25). The primary route crosses Route 130 and then, following Service Road, also crosses Quaker Meetinghouse Road and Chase Road, all in Sandwich (Exh. KED-1, at 5-31;

Tr. 1, at 15). KeySpan stated that it expects to prepare site-specific traffic management plans for the crossings of Route 130, Quaker Meetinghouse Road, and Chase Road, each of which would be crossed by a direct cut (Exhs. EFSB-G-2(S); EFSB-E-8; YAR/DEN 1-4; Tr. 1, at 17). The Company stated that it would cover any street openings with steel plates at the end of the day, and that it would protect and barricade openings in the shoulder to ensure traffic and pedestrian safety (Exh. KED-1, at 5-6). The Company stated that it would restore streets in accordance with the D.T.E. Road Restoration Standards (Exh. YAR/DEN 1-45; Tr. 3, at 487).

The record demonstrates that the noise impacts of the proposed project would be limited to temporary noise associated with construction activities. The record shows that, given the presence of residences along substantial portions of the route, construction noise impacts would be minimized by confining construction work to daytime hours, 7:00 a.m. to 6:00 p.m., unless contingencies require work outside such hours. The Siting Board understands that the Company will communicate with the various municipalities regarding the extent of any work outside of normal daytime hours. To underscore this commitment, the Siting Board directs the Company to limit construction work on the Western Segment to the hours from 7:00 a.m. to 6:00 p.m. unless otherwise authorized by the affected municipality. With the identified mitigation and implementation of the above condition, the Siting Board finds that the noise impacts of the proposed project along the Western Segment primary route would be minimized.

The record shows that construction would be on the road shoulder where practical, and otherwise along the edge of pavement. The record also shows that the Company would follow D.T.E. Road Restoration Standards after pipeline installation.

The record shows that the Company has committed to finalizing engineering plans for the proposed project in consultation with the affected municipalities, and that this review process likely would require approximately 4 to 6 weeks, based on experience with the first stage of the project (see Section III.C.3, below). The record shows that the Company has committed to mitigate traffic impacts during construction in accordance with traffic management plans to be approved by each municipality, including site-specific traffic management plans the Company expects to prepare at key intersections. Further, the record shows that the Company has committed to avoid work between Memorial Day and Labor Day, and to limit work to the hours

from 7:00 a.m. to 6:00 p.m., except by approval of the affected municipality. In addition, the record shows that the Company would need to obtain road opening permits from the municipalities, which gives the Towns of Sandwich and Barnstable the opportunity to limit work to reasonable dates and hours.

The Siting Board notes that, to allow effective coordination between the Company and the municipalities in the development of engineering and traffic plans for the project, there must be a reasonable lead time for municipal review of the plans before they are finalized. Therefore, the Siting Board directs the Company to provide the municipalities, at least 60 days prior to commencement of construction, with substantially completed engineering plans, and substantially completed traffic management plans including all site-specific traffic management plans, for review and comment. The Company is further directed to file with the Siting Board a copy of each traffic management plan, including each site-specific traffic management plan, when the plan has been finalized.

Therefore, with the above condition, the Siting Board finds that traffic impacts along the Western Segment primary route would be minimized.

The record indicates that fewer than 30 homes are immediately adjacent to each route. The Siting Board notes that while some noisy construction activities are common to both routes, noise from pavement cutting would be predominantly on the primary route and that noise from tree clearing would be predominately on the alternative route. However, no comparison of modeled sound levels was made between abutters to the primary route and abutters to the alternative route. Based on the information in the record, noise levels generated by construction would be generally comparable between the primary and alternative routes, and the number of receptors is generally comparable.

The record shows that on the Western Segment, there would be more construction with the potential to directly affect traffic on the primary route than the alternative route because the primary route involves a greater length of in-street construction. However, construction on the alternative route would occur on Route 130, which has heavy traffic and no ready detours, while construction on the primary route would occur on Service Road, which has light traffic and ready

detours. These are countervailing factors and lead to a conclusion that traffic disturbance would be of similar magnitude on the two routes.

Noise impacts on the two routes appear to be comparable. Traffic impacts on the two routes also appear to be comparable. Therefore, the Siting Board finds that, on the Western Segment, the primary route and the alternative route would be comparable with respect to noise and traffic impacts.

iv. Conclusions on Environmental Impact - Western Segment

In the sections above, the Siting Board has reviewed the evidence presented regarding the environmental impacts of the proposed project along the primary and alternative routes. The Siting Board finds that KeySpan has provided sufficient information on the environmental impacts of the proposed project, including information on the potential for mitigation, for the Siting Board to determine whether the environmental impacts would be minimized.

In Sections III.C.2.a.i, ii, and iii, above, the Siting Board found that, on the Western Segment primary route, wetlands and water resources, land use and land resources, and noise and traffic impacts would be minimized. Therefore, the Siting Board finds that, for the Western Segment, environmental impacts would be minimized. The Siting Board further found that the Western Segment primary route would be preferable to the alternative route with respect to wetlands and water resources impacts and with respect to land use and land resources impacts, and comparable to the alternative route with respect to noise and traffic impacts. Therefore, the Siting Board finds that, for the Western Segment, the primary route would be preferable to the alternative route with respect to environmental impacts.

b. Facility Cost - Western Segment

KeySpan estimated that the PV cost of constructing the Western Segment along the primary route would be $10,450,000, based on construction in three phases (Exh. KED-1, at 4-32, 5-48). The Company estimated that the PV cost of constructing the project along the alternative route would be $11,600,000, based on construction in a single phase (id.). KeySpan stated that its cost evaluation was based primarily on two factors: (1) construction labor and

material costs; and (2) costs of obtaining easements or other access to rights-of-way (id. at 4-23). The Company discounted the cost of phased construction by calculating PV costs based on a 10% per year cost of capital (id. at 4-25; Exh. EFSB-S-4). KeySpan indicated that it did not refine or alter its cost estimates between its site selection process and facilities comparison (Exh. KED-1, at 5-48).

The Company indicated that it assumed unit prices of $330 per foot and $146 per foot for construction in public roadways of 20-inch and 12-inch pipeline, respectively (id. at 4-25). The Company assumed construction costs of $229 per foot for 20-inch pipeline in the NSTAR right-of-way and construction costs of $131 per foot for 12-inch pipeline along inactive railroad right-of-way (id.). Additional costs representing mobilization and demobilization, and for crossing state highways were added to these unit costs (id.; Exh. YAR/DEN 2-3). The cost estimate for the alternative route includes $3,000,000 to obtain easements from private landowners along the NSTAR right-of-way, but does not include any figure for possible payments to NSTAR (Exh. KED-1, at 4-27, 4-32).

The record shows that the alternative route would cost approximately $1,000,000 more than the primary route. Based on the lower cost of constructing the primary route rather than the alternative route, the Siting Board finds that, on the Western Segment, the primary route would be preferable to the alternative route with respect to cost.

c. Reliability - Western Segment

KeySpan stated that the proposed pipeline along either the primary route or the alternative route would provide the necessary pressure and supply on a safe and reliable basis over the forecast period (Exh. KED-1, at 3-18). The Company stated that the proposed project would not add complexity to its gas distribution or to KeySpan's operation of the system (id. at 3-19). In these terms, the Company stated that the primary route and the alternative route are very similar (id. at 5-45). Also, the Company indicated that the primary and alternative routes are essentially the same length, 6.6 miles (id. at table 4-3). As a second-order consideration, the Company indicated that the proposed pipeline on the primary route would be built with multiple tie-ins to the existing line, which would afford later opportunities to isolate shorter sections of pipeline to

perform maintenance work without shutting down a long section of gas main (Tr. 2, at 241-246). In addition, the Company stated that it could more reliably construct the pipeline using the primary route because it would require less extensive property rights acquisition and Article 97 legislation than required for the alternative route (Exhs. KED-1, at 5-46; EFSB-G-2 (Supp.); Tr. 2, at 256).

The record shows that the primary route and the alternative route are of similar length, but that legislative approval would be necessary to construct the alternative route. Given the greater certainty with which the segment can be approved and constructed, the Siting Board finds that, on the Western Segment, the primary route would be preferable to the alternative route with respect to reliability.

d. Conclusions on Proposed Facilities - Western Segment

The Siting Board has found, for the Western Segment, that environmental impacts would be minimized, that the primary route would be preferable to the alternative route with respect to environmental impacts and cost, and reliability. Accordingly, the Siting Board finds that the Western Segment primary route would be superior to the alternative route with respect to providing a reliable energy supply to the Commonwealth with a minimum impact on the environment at the lowest possible cost.

The Siting Board finds that KeySpan has provided sufficient cost and reliability information in order to determine whether the appropriate balance among environmental impacts, cost, and reliability would be achieved. The Siting Board also finds that the Western Segment of the proposed project along the primary route would achieve an appropriate balance among conflicting environmental concerns, as well as among environmental impacts, reliability and cost.

3. Middle Segment

a. Environmental Impacts - Middle Segment

In this section, the Siting Board compares the environmental impacts of the proposed facilities along the primary and alternative routes for the Middle Segment, considers the proposed mitigation for such impacts, evaluates any options for additional mitigation and determines

whether the environmental impacts along the primary route would be minimized. The subsections below consider wetlands and water resources impacts, land use and land resources impacts, impacts to the South Dennis Historic District, and noise and traffic impacts.

i. Wetlands and Water Resources

(a) Company

KeySpan indicated that the Middle Segment would traverse the Bass River and one unnamed stream, as well as associated buffer zones defined under the Massachusetts Wetland Protection Act (Exh. KED-1, at 5-14 to 5-18). In addition, the pipeline would cross groundwater protection districts (id. at 5-20). If the primary routing is used, the Middle Segment pipeline would be constructed generally along the edge of pavement of existing roads and within roadway layouts (id. at 5-3).

KeySpan stated that the Bass River is a tidal estuary that includes designated Riverfront Area (id. at 5-14, 5-18). The Company indicated that to cross the Bass River it would install the pipeline in an existing utility chase under the existing Highbank Road bridge (Tr. 3, at 383). According to the Company, such an installation would likely require the use of spud barges, but that spud holes in the riverbed would fill back in with sand, resulting in minimal impact (Tr. 2, at 285-287). The Company stated that the Bass River shoreline is stabilized with stone rip-rap at the base of the bridge (Exh. KED-1, at 5-14).

KeySpan stated that the primary route also crosses an unnamed perennial stream which passes in a culvert beneath Great Western Road (id. at 5-18). The Company stated that along Great Western Road in Yarmouth, the primary route also travels alongside Cat Swamp Pond, which has banks 15 feet from the road pavement (id. at 5-14). Altogether, the Middle Segment primary route would require approximately 1400 linear feet of work in wetland buffer area (id. at 5-15). The Company stated that there are no mapped vernal pools within 100 feet of the primary route (id.).

KeySpan stated that for the Middle Segment alternative route Bass River crossing, it would position the pipeline on a new supporting structure (e.g., a pipe bridge) that would extend across the Bass River at the railroad bridge, using the existing abutments (Tr. 2, at 287-288;

Tr. 3, at 491). The Company asserted that restorative work on the existing stone abutments of the railroad bridge could be required, which would entail in-water or shoreline construction (Exh. YAR/DEN 1-9).[36] The alternative route also crosses the same unnamed perennial stream as the primary route, running through a culvert beneath the Rail Trail approximately 1000 feet west of Depot Street (Exh. KED-1, at 5-18).

The Company stated that the Middle Segment alternative route traverses wetlands defined under the Massachusetts Wetland Protection Act; these include Riverfront Area at the Bass River, which would be spanned; a wetland adjacent to the Bass River containing saltmarsh vegetation, phragmites, and forested upland buffer;[37] and the unnamed stream west of Depot Street (id. at 5-15 to 5-16). According to the Company, the Middle Segment alternative route would require approximately 400 linear feet of work in wetland resource areas and 2000 linear feet of work in wetland buffer area (id. at 5-16). The Company stated that there are no mapped vernal pools within 100 feet of the alternative route (id.).

KeySpan concluded that the primary route has a substantial advantage over the alternative route with respect to the potential for sedimentation and erosion impacts during construction, noting both the greater number of wetland resources sensitive to sedimentation along the alternative route and the asserted difficulties of effecting a crossing at the railroad bridge (id. at 5-45). The Company concluded that the primary and alternative routes would be comparable with respect to spill control, asserting that prevention and containment measures would be implemented equally on the two routes (id.).

KeySpan stated that there are no mapped public water supply wells proximate to the primary or alternative route for the Middle Segment (Exh. KED-1, at 5-19). However, the Company stated that the primary route crosses through 9900 linear feet of Wellhead Protection

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36 The Company did not compare the need for or extent of in-water or shoreline construction work between the primary route on the Highbank Road bridge and the alternative route on the railroad bridge.

37 Plans and aerial photos provided by the Company indicate that there is an unpaved vehicle track between the old rail right-of-way and the wetland adjacent to the Bass River; the distance between the edge of the right-of-way and the wetland appears to be at least 40 feet, according to these sources (Exhs. EFSB-E-25(1); EFSB-E-28(1)).

Area and 600 linear feet of Potential Public Water Supply Area, as identified by the Cape Cod Commission (id. at 5-20). The Company stated that the alternative route crosses through 8000 linear feet of Wellhead Protection Area (id.). The Company stated that it considered the distances of the primary and alternative routes through groundwater resource areas to be comparable and therefore concluded that the primary and alternative routes are comparable with respect to groundwater impacts (id.).

The Company noted that all of Cape Cod has been designated as a Sole Source Aquifer under the federal Safe Drinking Water Act and that the Cape Cod Commission has identified groundwater protection areas based on their importance for drinking water supplies (id. at 5-19). The Company indicated that development and implementation of an SPCC Plan would protect against impacts to groundwater (id. at 5-20). Further, the Company stated that it would perform no equipment maintenance within 100 feet of a wellhead protection area (Tr. 3, at 549-551).

For both the primary and alternative routes, the Company stated that it would use filter fabric barriers and would sweep road surfaces to keep soil materials from washing into storm drains (Exh. KED-1, at 5-11). KeySpan stated it would also develop and implement an SPCC Plan to ensure against inadvertent releases of fuel or equipment maintenance materials during pipeline construction (id.). For areas subject to the Massachusetts Wetland Protection Act, KeySpan stated that it would obtain and comply with all necessary Determinations of Applicability and Orders of Conditions (id.). The Company also stated that it would comply with all local wetlands bylaws (id.). The Company indicated that it would prepare an SWPPP and implement erosion and sedimentation control best management practices (id.; Exh. EFSB-E-26). The Company also indicated that it would prepare an Environmental Construction Plan, that would address erosion control, dust control, and vehicle fueling and maintenance (Exh. YAR/DEN 1-5).

KeySpan asserted that current information from the MADEP Bureau of Waste Site Cleanup indicates that MCP sites would not affect pipeline construction (Exh. KED-3, at 12-1 to 12-2). Notwithstanding, the Company indicated that it would follow URAM procedures required under the MCP, in the event that contamination is encountered (id. at 12-2 to 12-3; Tr. 2, at 311).

(b) Intervenor

According to Mr. Joseph A. Rodricks, witness for the Towns and Town Engineer for the Town of Dennis, removal of railroad tracks and pine saplings appears unlikely to have any impact on the saltmarsh and cranberry bog wetland adjacent to the Bass River near the alternative route or on adjacent upland areas (Exh. YAR/DEN-JAR; Tr. 4, at 616-620). Mr. Rodricks pointed out that based on his own knowledge and on evidence presented by the Company, an NSTAR right-of-way with an access road separates the old rail right-of-way from the saltmarsh and cranberry bog, so the old rail right-of-way route is not directly adjacent to any wetlands at that point (Tr. 4, at 616-620; see Exhs. KED-1, at fig. 4-6; EFSB-E-25(1); EFSB-E-28(S)). The Towns suggested that, with respect to wetlands impacts, the primary route is only marginally advantageous compared to the alternative route (Towns Brief at 6).

(c) Analysis

The record shows that the primary route on the Middle Segment is along roads and not in wetland areas. The record also shows that the Company would implement erosion control, sedimentation control, and spill prevention procedures that would minimize water impacts. To further reduce the risk of contaminating groundwater supplies, the Siting Board directs the Company to refrain from all refueling and equipment-maintenance activities that have the potential for fluid spills, when vehicles are within identified Wellhead Protection Areas. Based on the use of roadway layouts, the limited encroachment into wetland buffer areas, and the Company's expressed commitment to control erosion and sedimentation, the Siting Board concludes that construction of the proposed pipeline along the primary route would result in no permanent impacts, and only minimal temporary impacts to wetlands and water resources. With the identified mitigation and implementation of the above condition, the Siting Board finds that the wetlands and water resources impacts of the proposed pipeline along the Middle Segment primary route would be minimized.

The record shows that both the primary and alternative routes would cross the Bass River at existing bridge locations and that both routes cross bridges that may require in-water construction work. Otherwise, as noted by the Towns, neither route would be constructed in

wetlands resource areas. Along the primary route, the pipeline would be installed below pavement up to the bridge span and then, continuing in a straight line, hung underneath the bridge in an existing pipe chase. The railroad embankment on the alternative route is narrower than the road on the primary route, so work would be close to wetlands areas where the railbed crosses wetlands, including in areas next to the Bass River; a new structure would likely be required to support the pipeline between the railroad bridge abutments; and there are large rocks on the facing of the embankment, which may complicate construction. The record shows that in-water work could be necessary to recondition the abutments of the railroad bridge. However, evidence of the nature and extent of required in-water work is not sufficient for either river crossing to determine which crossing would likely have greater impacts on wetlands or water resources.

On the primary route, construction would occur in a paved road or immediately adjacent shoulder, affording greater control over surface water and wetland impacts than would be available on the alternative route. Therefore, the primary route would be more advantageous with respect to surface water and wetlands impacts. However, the difference is likely to be minor because proper construction practices would minimize adverse effects on surface water and wetlands on either route.

The record also shows that the alternative route crosses through Wellhead Protection Areas for a slightly shorter distance than does the primary route. However, on the primary route, construction would occur in a paved road or immediately adjacent shoulder, affording greater control over any inadvertent spills than would be available on the alternative route. Both of these differences are minor because proper construction practices would minimize potential impacts to groundwater. Overall, the primary and alternative routes would be comparable with respect to the potential for impacts to groundwater. Considering wetlands, surface water, and groundwater impacts, the Siting Board finds that, on the Middle Segment, the primary route would be preferable to the alternative route with respect to wetlands and water resources impacts.

ii. Land Use and Land Resources

(a) Company

KeySpan indicated that the primary route traverses areas that are residential and areas that are of commercial use (Exh. KED-1, at fig. 4-6). The Company stated that, in Yarmouth, the primary route goes past Wilbur Park, which contains a boat ramp, beach, and picnic area (id. at 5-24). KeySpan stated that 135 homes, along with commercial and industrial uses, are located along the primary route (id. at 5-26). The Company stated that one sensitive receptor – a church – is located on the primary route (id. at 5-28).

KeySpan indicated that it expects vegetation clearing along the primary route for the Middle Segment to be limited to tree branch trimming and some shrubbery removal (id. at 5-21 to 5-22; Tr. 3, at 457-459). The Company stated that it would assess the potential for damage to trees with a professional arborist and local tree wardens (Exh. KED-3, at 5-2). The Company stated that graded areas would be fertilized, seeded, and mulched, and that these areas would be inspected after the first and second growing seasons (id.). The Company stated that shrubs would be restored in accordance with any agreements it may make with individual landowners (id.).

The Company stated that Highbank Road in Dennis is a designated scenic road, and construction along that portion of the primary route would require a scenic roadway approval from the Town of Dennis Board of Selectmen (id. at table 1.6-1; Tr.3, at 385).[38] The Company indicated that no stone walls would likely be disturbed along roadsides (Exh. KED-3, at 5-2). However, if stone walls or fences were to be temporarily removed for construction, the Company committed to their restoration (id.).

The Company indicated that there is Priority Habitat for rare species behind several homes on Highbank Road in Dennis, where the primary route passes in front of those homes (Exh. KED-1, at fig. 4-6). The Company stated that pipeline construction would have no impacts

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[38] Pursuant to M.G.L. c. 40, § 15C, a city or town may designate certain roads within its boundaries as scenic roads. Once designated as a scenic road, repair, maintenance, construction, or paving of the road may not involve the cutting or removal of trees, or the tearing down or destruction of stone walls, except with prior written permission of the planning board or the board of selectmen.

on rare species (Exh. KED-3, at 16-4). The Company stated that the primary route does not cross lands for which approval of the Legislature under Article 97 would be required to allow such use (Exh. KED-1, at 5-24).

KeySpan indicated that PAL reviewed the documented locations of archaeological sites, historic structures, cemeteries, and areas of archeological sensitivity within the project area (Exh. EFSB-E-5). In response to comments from the Massachusetts Historical Commission, PAL conducted an archaeological reconnaissance survey to identify areas that may require further testing to locate and identify any important archaeological resources (id.). The Company stated that large portions of the primary route were identified as sensitive for containing previously unidentified archaeological resources (Exh. KED-1, at 5-35). The Company stated that it would perform additional surveys as directed by the Massachusetts Historical Commission (Exh. EFSB-E-5). The Company stated that if significant eligible deposits are found in any further survey directed by the Massachusetts Historical Commission, KeySpan would consider alternative alignments, reduce its workspace, or undertake a site examination and consult with the Massachusetts Historical Commission (Exh. EFSB-E-6).

KeySpan stated that the primary route also passes by the North Harwich Cemetery, which is included in the Inventory of Historic and Archaeological Assets of the Commonwealth (Exh. KED-1, at 5-34 to 5-35). According to the Company, implementation of a traffic management plan (see Section III.C.3.a.iv(a), below) and dust controls would mitigate any impacts to cemeteries or historical structures (id. at 5-35).

KeySpan indicated that the alternative route traverses areas that are residential, areas that are woodland, and areas that are of commercial use (Exh. KED-1, at fig. 4-6). The Company stated that 44 homes are within 100 feet of the alternative route (id. at 5-26). The Company stated that one sensitive receptor – a church – is located on the alternative route (id. at 5-28).

KeySpan noted that there has been local interest in extending the Rail Trail into Yarmouth, along the abandoned or inactive rail right-of-way comprising a portion of the alternative route (Exh. YAR/DEN 1-12). The Company indicated that elements of its construction work – tree clearing, and removal of tracks and ties – could potentially facilitate extension of the Rail Trail (id.). The Company asserted that any such extension, and thus any

potential benefit, was speculative and not directly related to the project (id.). The Company stated that if the pipeline were placed in the old rail right-of-way, maintenance or repairs of the pipeline would not interfere with its possible future use as a bike trail (Exh. YAR/DEN 1-37).

KeySpan indicated that over half of the length of the alternative route is unimproved railroad bed that has grown in with young pitch pines, except for a 5- to 15-foot wide gap in the middle with no trees (Exh. KED-1, at fig. 4-3, 5-22, fig. 5.3-6; Tr. 3, at 459). The Company indicated that about one quarter of the length of the alternative route is Rail Trail, and indicated that the Rail Trail is densely vegetated to the sides and has overhanging branches, so vegetation clearing would be needed in this area as well (Exh. KED-1, at fig. 4-3, 5-22). The Company stated that clearing of vegetation, including some mature trees, would be required along approximately 21,000 linear feet of the alternative route and that this would include loss of existing vegetation near approximately 44 residences (id. at 4-24, 5-22; Exh. YAR/DEN 1-15; Tr. 3, at 459). For this area, the Company indicated that it would use either the stovepipe construction method, which uses a construction area 20 to 25 feet wide, or the cross-country construction method, which typically has a construction width of 75 feet (Exh. EFSB-E-3). The Company indicated that, assuming the corridor it cuts were to include the existing clearing along the tracks, it would widen the existing clearing (e.g., by cutting an additional 15 feet on one side in a location where the existing gap in vegetation is 10 feet wide) (Tr. 3, at 401-402). The Company explained that this would diminish the vegetative screening that exists for residents along the old rail right-of-way, and noted that there are several locations along the old rail right-of-way where there are rows of homes, some of which are opposite commercial and industrial facilities (Exh. KED-1, at 4-3; Tr. 3, at 402). The Company stated that, following construction, it would maintain a cleared width of 20 to 25 feet (Tr. 2, at 206-209). The Company noted the concerns expressed at the Siting Board's public comment hearing about the loss of vegetation along the old rail right-of-way (Reply Brief at 14, citing Tr. July 28, 2005, at 33, 37-38, 40).

According to the Company, the existing Rail Trail east of Route 134 was slated to be rehabilitated and improved beginning in September 2005 (Exh. YAR/DEN 1-1). The Company indicated that it expects that its construction vehicles would be excluded from what will be newly

repaved Rail Trail, so supplemental clearing along the Rail Trail would be required for pipeline construction to take place (Tr. 2, at 210-211, 215).

KeySpan indicated that in Dennis, the alternative route extends along the edge of approximately 1600 linear feet of Priority Habitat, overlapping 1200 linear feet of Estimated Habitat; and the route is adjacent to municipal open land in both Dennis and Yarmouth (Exh. KED-1, at 5-24, fig. 4-6). The Company stated that it would not need a scenic roadway approval for construction of the pipeline on the alternative route (Tr. 3, at 385).

KeySpan stated that a preliminary assessment identified the majority of the alternative route as sensitive for containing previously unidentified archaeological resources (Exh. KED-1, at 5-35). The alternative route also passes by the North Harwich Cemetery, which is included in the Inventory of Historic and Archaeological Assets of the Commonwealth (id. at 5-34, 5-35).

The Company asserted that, with implementation of a traffic management plan, dust controls, and avoidance of working at noise-sensitive times, there would be no anticipated impacts at residences (id. at 5-26). The Company concluded that the primary route would be advantageous with respect to residential impacts, on the basis that vegetation clearing along the alternative route would be permanent and would occur in the vicinity of approximately 44 residences (id.). With the same church identified for both routes, the Company concluded that the two routes are comparable with respect to sensitive receptors (id. at 5-28). With considerably more tree clearing required for construction and maintenance, the Company concluded that the primary route is significantly better than the alternative route with respect to vegetation clearing (id. at 5-22). Noting that both routes are adjacent to Article 97 property, but only the alternative route extends along Priority and Estimated Habitat, the Company concluded that the primary route is significantly better than the alternative route with respect to impacts on protected lands (id. at 5-24). Asserting that potential impacts on historic resources can be mitigated, the Company concluded that the primary route and alternative routes are comparable with respect to historical resources (id. at 5-35 to 5-36).

(b) Intervenor

Regarding the alternative route, the Towns discounted the value of the existing vegetation that may be cleared for the project, along the old rail right-of-way, describing the vegetation as pine saplings with minimal value as a vegetative buffer (Exhs. YAR/DEN-JAR at 4; YAR/DEN-GA at 3). Mr. George Allaire, witness for the Towns and Director of the Yarmouth Public Works Department, stated that the old rail right-of-way had been cleared of trees by the railroad within the last 10 years (Tr. 4, at 614, 657). With respect to the identified rare species or rare species habitat, the Towns point out that there is no record evidence showing that installing a pipeline along the alternative route would cause harm to any rare species (Towns Brief at 9).

The Towns asserted that the old rail right-of-way in Yarmouth will soon be converted to use as an extension of the Rail Trail, which currently extends east from Route 134 in Dennis to South Wellfleet (see Exhs. EFSB-E-22(1); YAR/DEN-GA at 2).[39] The Towns asserted that at least some of the vegetation along the old rail right-of-way will therefore eventually be removed, indicating its loss for construction of the proposed project would be of little consequence (Tr. 4, at 773). Mr. Allaire also stated that the tree clearing which would be performed along the alternative route would be of benefit to the Town of Yarmouth because it would greatly facilitate use of the right-of-way for the proposed extension of the Rail Trail (Exh. YAR/DEN-GA at 2-3).

(c) Analysis

The record demonstrates that the land resources impacts of the proposed pipeline along the primary route would be temporary and minimal due to the placement of the pipeline under and directly adjacent to streets and because the Company has stated that it will assess the potential for damage to trees on the route with a professional arborist and local tree wardens.[40] To protect shade trees and other landscaping features, the Siting Board directs the Company:

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39 The Towns argued that the existing Rail Trail is popular and its extension to Yarmouth is logical and foreseeable (Towns Brief at 7). Mr. Allaire stated that he hoped to start design of an extension within six months (Tr. 4, at 737).

40 The Company is required by § 6.8 of the D.T.E. Road Restoration Standards to hand-cut around roots of trees.

(1) to arrange for a professional arborist to conduct an on-site inspection of the construction zone within 6 months before construction begins in an area; (2) based on recommendations by the arborist and, where applicable, tree wardens, to take all reasonable precautions to avoid removing or damaging trees; (3) to minimize damage to shrubbery and other plantings, as well as damage to or removal of fences, stone walls, lampposts, and other landscaping features; (4) to repair or replace any damaged or removed trees, shrubbery, or plantings, in consultation with the arborist and, where applicable, tree wardens, and with the agreement of the owner of damaged or removed vegetation; and (5) to repair or replace any damaged or removed fences, walls, or other landscaping features, with the agreement, as applicable, of the owner of the landscaping feature. With the specified mitigation and implementation of the above condition, the Siting Board finds that the land resources impacts of the proposed pipeline along the Middle Segment primary route would be minimized.

While the primary route would be placed within or near the edge of existing roadways, the alternative route would entail considerable clearing of vegetation. The width of the vegetation to be cleared west of Route 134 would be up to 15 feet along the old railbed, to establish a permanent right-of-way of approximately 25 feet. West of Route 134, much of the vegetation may be cleared for the proposed extension of the Rail Trail. Based on the record, the Siting Board notes it is possible that the old rail right-of-way will be cleared of some amount of vegetation at some point in the future, in connection with an extension of the Rail Trail. Based on the evidence, it is unclear whether the Rail Trail extension project, including associated vegetation clearing, will go forward in the near future. Areas east of Route 134 where the Rail Trail is scheduled for rehabilitation would likely require less clearing.[41]

There is no record evidence that this vegetation serves as habitat for any species of notable rarity. Also, because some of the old rail right-of-way may be cleared in some future

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41 Using a hybrid route consisting of the old rail right-of-way route east to Route 134, following Route 134 south one-half mile and then the Whites Path route east to the end of the Middle Segment would result in fewer impacts to vegetation and consequently less visual impact than the old rail right-of-way route in its entirety. However, the vegetation and visual impacts would still be considerably greater than on the Whites Path route in its entirety. See fn. 41, below.

year even without the project, the differential impact of much of the clearing of the alternative route might exist only for a few years, and thus it is possible that the buffer effect of the existing vegetation that would be lost might have only persisted for a relatively short time. Nevertheless, until the vegetation is cleared for other purposes, the young pitch pine trees along the abandoned right-of-way serves as a vegetative buffer and as a belt of woods habitat. By comparison, upland impacts of the primary route would be generally limited to a small amount of tree limb removal. Therefore, the primary route is advantageous with respect to impacts to vegetation and upland habitat.

While the primary route follows existing roadways, the alternative route is largely away from roads. Underground pipelines are generally compatible with roads from a land use perspective, while pipelines might restrict future use of the area traversed in off-road locations. In general, roads and road shoulders have relatively little in the way of land resources such as undisturbed archaeological resources, vegetation, and valuable upland habitat. For the Middle Segment, no significant differences between routes were found relative to impacts on rare species or archaeological resources. However, construction on the alternative route would involve considerable clearing of existing trees, which could be a long-lasting effect of the project, depending to some extent on whether the Rail Trail is extended in the future. Therefore, the Siting Board finds that, on the Middle Segment, the primary route would be preferable to the alternative route with respect to land use and land resources impacts.

iii. South Dennis Historic District

(a) Company

KeySpan stated that for 2400 linear feet, the primary route for the Middle Segment passes through the South Dennis Historic District and that six properties on Highbank and Upper County Roads are listed on the State Register as contributors to this district (Exh. KED-1, at 5-35). The Company stated that the proposed project would be installed in the existing roadway and that it would not cause permanent impacts to buildings or structures within the historical district (Exh. KED-3, at 10-12). According to the Company, no blasting and no jackhammering is anticipated in the South Dennis Historic District (Exh. YAR/DEN 1-6).

KeySpan indicated that, where the pipeline is under pavement, it would install in-street pipeline markers, and where the pipeline is in the road shoulder, it would install upright markers or place placards on utility poles along the route (Exh. RR-EFSB-14). The Company indicated that upright markers would generally be placed at shrub-lines or at otherwise visually sheltered locations (Tr. 3, at 589). The Company indicated that in the South Dennis Historic District, it would be placing the pipeline under pavement, so it would install cast-iron in-street markers and it would also inset, at grade level, valve boxes and possibly test box covers of approximately 8-inch diameter (Exh. RR-EFSB-14; Tr. 3, at 579-585).

KeySpan stated that for 4300 linear feet, the alternative route also passes through the South Dennis Historic District (Exh. KED-1, at 5-35). However, the Company indicated that no individually listed or inventoried property within the South Dennis Historic District is located along the alternative route (id. at 5-34 to 5-35).

The Company indicated that although both routes pass through the South Dennis Historic District, there are individually listed historic properties only along the primary route (id.). However, the Company anticipated that there would be no permanent impacts to historic structures with use of either route (Exh. YAR/DEN 1-20). Also, the Company anticipated that, using the primary route, it would cut down no trees in the historic district (Tr. 3, at 460). Asserting that the potential for any impacts to historic structures can be mitigated, the Company concluded that the primary route and the alternative route are comparable with respect to impacts to historic and archaeologic resources (Exh. KED-1, at 5-36).

(b) Intervenor

Mr. Edmond R. Nickerson, witness for the Towns and Chairman of the South Dennis Historic District Commission, stated that, given the location of streets, trees, and structures, it seems difficult to imagine that the pipeline can be installed in the South Dennis Historic District without tree cutting or alteration of fences or lampposts (Exh. YAR/DEN-ERN). The Towns noted that Highbank Road is designated as a local scenic road, which affords some protection to mature trees and other scenic features (Exh. YAR/DEN-JAR at 3). Mr. Nickerson asserted that

the two routes are not comparable with respect to historic resources because the old rail right-of-way route is not near the architecturally significant buildings of the district (Exh. YAR/DEN-ERN).

The Towns requested that the Siting Board require that KeySpan consult with the South Dennis Historic District Commission before applying for any local permits for work in Dennis (id.). The Towns requested that a condition be written to require that if the South Dennis Historic District Commission determines that the work will impair any mature trees in the district, that KeySpan would be required to replace such trees with trees of comparable species, size and maturity and that KeySpan would be responsible for feeding and watering, and possibly replacing such trees for at least two years (id.). Finally, the Towns requested that KeySpan be required to replace any damaged fences, street signs, or other structures to the reasonable satisfaction of the South Dennis Historic District Commission (id.).

(c) Analysis

There is merit to the Towns' interest in preserving the historic qualities of the South Dennis area. The record shows that the Company has stated that it will cut down no trees in the Historic District along the primary route. In Section III.C.3.a.ii(c), above, the Siting Board has already established a condition relative to vegetation and landscaping. We note that this condition includes the South Dennis Historic District. To further protect historic resources, the Siting Board directs the Company: (1) to consult with the South Dennis Historic District Commission prior to finalizing construction plans for the district; and (2) in consultation with the South Dennis Historic District Commission, to restore vegetation and any fences or other structures that are disturbed in the South Dennis Historic District due to construction of the proposed pipeline.

The record indicates that in most locations, the only permanent visible features of the proposed pipeline would be pipeline safety markers. The record indicates that safety markers along Highbank Road in the South Dennis Historic District would be mounted flush with the pavement surface. In other locations, where free-standing safety markers may be used, the record indicates that the safety markers would be discreetly sited. With the identified mitigation and

implementation of the above condition, the Siting Board finds that impacts of the proposed pipeline to the South Dennis Historic District would be minimized.

The record shows that the alternative route would traverse more linear feet of historic district but pass no individual registered properties. Because the primary route would pass closer to recognized historical features within the district, more care may be necessitated on the part of the Company during construction along the primary route, relative to the alternative route, to avoid historical features located close to the construction zone. The Siting Board recognizes that, as a result of the tight working space along the primary route, there remains some possibility of unanticipated impacts. However, the only expected permanent impact to the South Dennis Historic District would be pipeline markers, expected to consist of only a few cast iron markers embedded into the street surface. Overall, the record indicates that, based on this minor impingement and the limited risk of any additional impact resulting from the tight working space, the impact to the South Dennis Historic District would be small. Therefore, the Siting Board finds that the alternative route for the Middle Segment would be preferable to the primary route with respect to potential impacts to the South Dennis Historic District.

iv. Noise and Traffic

(a) Company

KeySpan indicated that the project would have noise and traffic impacts only during its construction (Exh. KED-1, at 5-9 to 5-10). These impacts are evaluated below, for the primary and alternative routes.

KeySpan stated that the principal sources of noise during construction would be pavement saws, a backhoe, and a welding rig (Exh. EFSB-E-15). The Company indicated that other sources of noise such as dump trucks and crew vehicles would be present intermittently (id.). The loudest piece of equipment evaluated by the Company, the pavement saw, has a maximum sound level of approximately 90 dBA at 50 feet (id.). KeySpan noted that sound levels at any given location would be dominated by the piece of equipment nearest the receptor of interest (id.). According to KeySpan's calculations, the L_{10} of construction noise, outside a residence located 50 feet back from pipeline construction in a road typically would exceed

60 dBA for a total of approximately 7 to 9 days, as machinery used in the construction sequence moves along the roadway (Exh. RR-EFSB-12). The Company indicated that it measured ambient sound levels measured on May 19, 2005 (id.). The Company reported ambient L_{10} sound levels ranged from 66 dBA to 78 dBA on various primary route segments, and from 42 dBA to 76 dBA on various alternative route segments (id.).

The Company stated that the typical work hours would be on weekdays between 7:00 a.m. and 6:00 p.m. (Exhs. KED-1, at 5-9; EFSB-E-15). However, the Company indicated that night or weekend work might on occasion be needed to meet construction deadlines (Exhs. KED-1, at 5-9; EFSB-E-15; EFSB-E-16). The Company indicated that days and hours of work would be circumscribed by the street opening permits issued by each town (Tr. 2, at 316-317). The Company indicated its belief that it would be able to obtain permission from the towns to extend the scheduled construction hours if it became essential to do so (id. at 315-316).

As noted in Section III.C.3.a.ii(a), above, the Company stated that there are 135 residences along the primary route and 44 residences along the alternative route (Exh. KED-1, at 5-26). The Company stated that mechanized vegetation clearing equipment would likely be used along the old rail right-of-way route (Exh. EFSB-E-15).

KeySpan stated that it would develop traffic management plans for construction (Exh. KED-1, at 5-6). The Company stated that it would limit construction along roads to the off-season – from after Labor Day to before Memorial Day – except in any locations such as along Service Road for which the appropriate town determines that traffic impacts would be acceptable in the summer (Tr. 2, at 313-314). The Company indicated that the traffic management plans could limit construction to outside rush hour periods, specify the use of traffic control officers, and require maintenance of at least one lane of traffic flow (Exh. YAR/DEN 1-25). The Company stated that it would cover any street openings with steel plates at the end of the day, and that it would protect and barricade openings in the shoulder to ensure traffic and pedestrian safety (Exh. KED-1, at 5-6).

KeySpan indicated that it likely would use jacking or drilling to cross Route 134 (Exh. EFSB-E-8). KeySpan committed to preparing a site-specific traffic management plan for

the intersection of Highbank Road and Main Street in Dennis and possibly would also prepare such a plan for the Bass River crossing (Exh. YAR/DEN 1-4; Tr. 1, at 16).

The Company stated that it would restore streets in accordance with the D.T.E. Road Restoration Standards (Exh. YAR/DEN 1-45; Tr. 3, at 487). Also, the Company stated that, in Yarmouth and Dennis, it intends to repave to a minimum depth of four inches (Exh. YAR/DEN 1-49).

KeySpan stated that the primary route is almost entirely along traveled roads, while the alternative route is off roads except for road crossings (Exh. KED-1, at 5-32). The Company concluded that the alternative route would be better with respect to traffic (id.).

(b) Intervenor

The Towns stated that the intersection of Highbank Road and Main Street in Dennis currently operates at a poor level of service due to the combination of heavy traffic on Highbank Road and poor roadway geometry (Exh. YAR/DEN-JAR at 2). Under an assumption that the pipeline would be installed under the pavement of Highbank Road, the Towns anticipated major disruptions to traffic at this location (id.). Also, having resurfaced the area in 2002, the Town of Dennis strongly opposes cutting and patching Highbank Road, according to Mr. Joseph A. Rodricks, witness for the Towns and Town Engineer for the Town of Dennis (id. at 3).

The Towns requested that the Siting Board impose a number of conditions on the Company relative to road restoration following installation of the pipeline on the primary route in Yarmouth and Dennis. The Towns requested that the Siting Board require KeySpan to:

- fill trenches under the pavement with flowable fill for the full width, length, and depth of the trench or, in the alternative, to provide independent certification that the backfill meets the 95% modified Proctor density;
- sawcut and tack coat pavement edges or, in the alternative, to specifically allow the Towns to impose this standard if the Towns deem it warranted;
- ensure a replacement pavement thickness equal to the existing thickness or four inches, whichever is greater or, in the alternative, to specifically allow the Towns to impose this standard if the Towns deem it warranted;

- ensure that this new pavement be placed on six inches of a dense graded stone base and 12 inches of gravel or, in the alternative, to specifically allow the Town of Dennis to impose this standard if the Town of Dennis deems it warranted;

- mill and overlay with 1.5 inches of hot-mix asphalt the entire width and length of Highbank Road from the Highbank Road bridge over the Bass River to Route 134 approximately one year after the completion of the pipeline installation;

- inspect all pavement excavations within one year, to notify the Yarmouth Public Works Department or Dennis Town Engineer, as applicable, of the inspection at least 14 days before the inspection, and to repair any pavement that deviates more than 0.25 inches from the existing street surface;

- reinspect the trenches after the first winter, and mill off and replace the top one inch of the pavement on any failed portions; and

- pay for inspection by the Towns of the Company's work (Exhs. YAR/DEN-GA at 6-7; YAR/DEN-JAR at 5-7).[42]

The Towns stated that the Highbank Road bridge is a critical feature of regional traffic flow, and that possible detour routes may be several miles in length (Tr. 4, at 646, 762-763). The Towns stated that Highbank Road carries heavy traffic in a constricted area (id. at 645).

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[42] The Towns requested that the Siting Board determine that the Company would be subject to D.T.E. Road Restoration Standards § 9.16, which would apply when the pavement of existing streets has been installed for less than five years, for two streets in Yarmouth, on the basis that a rubberized membrane has been laid down within the five year span, and for one street in Dennis, on the basis that the five-year period should end at the date of the Company's petition, should the primary route be selected (Towns Brief at 30-33). Under D.T.E. Road Restoration Standards § 9.16, the Towns would seek to require the Company to use pavement repair methods selected by the Towns, should the primary route be chosen (see Exh. YAR/DEN-GA at 5). Several of the Towns' pavement repair requests were phrased as alternatives to a Siting Board ruling that D.T.E. Road Restoration Standards § 9.16 would apply. In response, the Company argued that its work would be outside of the five-year window for the Towns to specify pavement repair methods pursuant to § 9.16, and further that street restoration is a matter to be discussed between the Company and the Towns and, if unsatisfied, the Towns can take any concerns to the Department for enforcement (Company Reply Brief at 44-46). Application of Department standards is not a Siting Board role. The Siting Board therefore interprets the Towns' alternative recommendations regarding pavement repair methods to be outright requests for conditions on approval.

The Towns also stated that the intersection of Highbank Road and Main Street is the most sensitive and most difficult intersection in which to do work within Dennis (Exh. YAR/DEN-JAR at 2). In contrast, the Towns pointed out that the alternative route would avoid this constricted area (id. at 3).[43]

The Towns noted that summer residents would have a major portion of their season disrupted if work occurred during the summer, and that the area is at peak use during this time (id. at 8). The Towns requested that the Siting Board impose conditions that no work occur in Dennis and Yarmouth between Memorial Day and Labor Day, and no work occur before 7:00 a.m. or after 6:00 p.m., unless advance permission is given in writing by the Towns (id.; Exh. YAR/DEN-GA at 8). The Towns requested that work at the intersection of Highbank Road and Main Street in Dennis be limited to the hours between 8:30 a.m. and 4:00 p.m. (Exh. YAR/DEN-JAR at 8).[44]

Responding to several of the Towns' requests with respect to street restoration work, the Company asserted that flowable fill is inappropriate for use with an underground gas line, citing potential concerns about corrosion, deformation stress from frost, leak detection, and difficulty of re-excavating the backfill (Exh. YAR/DEN 1-47). The Company re-iterated that it would restore streets in accordance with the D.T.E. Road Restoration Standards, and also stated that it would place backfill to achieve a 95% modified Proctor density (id.; Exh. YAR/DEN 1-48). With respect to the Towns' request for a minimum of four inches of replacement asphalt, the Company indicated that it would repave to a minimum of four inches in Dennis and Yarmouth (Exh. YAR/DEN 1-49). The Company also committed to inspect the replacement asphalt between 30 and 60 days after completion of repair, and again after one year, and to repair any pavement that deviates more than 0.25 inches from the existing street surface, in compliance with

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[43] Route 134 crossover would allow use of a hybrid route, substantially routing along roads, in lieu of the Bike Path between Route 134 and the crossing of the primary and alternative routes further to the east. The hybrid would have fewer advantages with respect to traffic impacts than the alternative route. See fn. 39, above.

[44] According to the Towns, the Town of Yarmouth has a noise bylaw which does not allow noise to be generated significantly before 7:00 a.m. or after 6:00 p.m. (Tr. 4, at 660).

the D.T.E. Road Restoration Standards (Exh. YAR/DEN 1-50). With respect to reimbursing the Towns for the cost of their inspection of the Company's work, the Company indicated that it did not plan to pay for the costs of on-site inspections done by a municipality (Exh. YAR/DEN 1-46).

(c) Analysis

The record demonstrates that the noise impacts of the proposed project would be limited to temporary noise associated with construction activities. The record shows that, given the presence of residences along substantial portions of the route, construction noise impacts would be minimized by confining construction work to daytime hours, 7:00 a.m. to 6:00 p.m., unless contingencies require work outside such hours. The Siting Board understands that the Company will communicate with the various municipalities regarding the extent of any work outside of normal daytime hours. To underscore this commitment, the Siting Board directs the Company to limit construction work on the Middle Segment to the hours from 7:00 a.m. to 6:00 p.m. unless otherwise authorized by the affected municipality. With application of this condition, the Siting Board finds that the noise impacts of the proposed project along the Middle Segment primary route would be minimized.

The record shows that construction would be on the road shoulder where practical, and otherwise along the edge of pavement. However, on Highbank Road, construction would be within the travel lane. The Towns have requested various specific conditions on restoring roadways after pipeline installation. The record shows that the Company will follow D.T.E. Road Restoration Standards after pipeline installation and has committed to achieving a 95% modified Proctor density for backfill. In addition, the record shows that the Company stated its intentions to repave the in-street trenches in Yarmouth and Dennis with four inches of asphalt and to repair any areas where road settlement causes a deviation from the existing road surface of more than 0.25 inch. The above commitments, together with the Department's standards including provisions therein regarding coordination between the Company and municipalities and steps municipalities can take to ensure compliance with the standards, reasonably ensure that

road restoration will be undertaken so as to minimize any impacts on traffic as well as the Towns' responsibilities for maintaining roads.

The Town of Dennis argued that the Siting Board should require full-width repaving of Highbank Road between the bridge crossing of the Bass River and the intersection with Route 134, traversing the South Dennis Historical District. The record shows this length of road was repaved recently, in 2002. Further, the record shows that unlike proposed construction along other portions of the primary route, it is likely that the use of this length of road would generally entail in-road trenching within or proximate to travel lanes.

As mentioned, the Department road restoration standards would allow the Town to require restoration measures such as full-width repaving for additional gas company work, were the work to be undertaken within five years after the previous repaving project. However, the year of the Company's proposed installation along the Highbank Road portion of the Middle Segment is 2007 at the earliest – just at the end of five years from the Town's recent repaving – although the work also may occur one to two years later than 2007 if the proposed Algonquin supply is available for the 2007/2008 heating season.

The Company has maintained that adhering to the specific requirements of the Department's restoration standards is all that is warranted. However, the record indicates that the proposed primary route along Highbank Road is sensitive for two reasons related to possible impact of pipeline construction on community concerns during and after construction. First, the route traverses an important traffic link in the Dennis-Yarmouth area, crossing the Bass River, which consists of narrow two-way road with little or no shoulder. While road restoration would be subject to Department standards intended to ensure adequate road performance consistent with pre-existing road conditions, full-width repaving would best ensure the continuing performance of Highbank Road consistent with pre-existing road conditions, in light of its narrow width and important traffic function. Second, the route traverses the central area of the South Dennis Historic District and a designated scenic roadway, representing a visually sensitive area of importance to the Town (see Sections III.C.2.a.i and ii, above). Full-width repaving would best ensure that the visual integrity of Highbank Road following construction, consistent with the pre-existing road conditions.

Overall, the Siting Board concludes that full-width repaving is warranted to minimize environmental impacts from the Company's proposed use of Highbank Road in Dennis as part of the primary route. Therefore, in order to help ensure the quality of road restoration in terms of both its performance as a travel surface and its visual integrity as a part of the South Dennis Historic District and a scenic roadway, and provided the Town continues to so request, the Siting Board requires that the Company use full-width repaving to restore Highbank Road in Dennis following construction of the proposed pipeline.

In order to minimize environmental impacts, the Siting Board directs the Company to provide for the repaving of Highbank Road for its full width from the Bass River to Route 134, unless directed by the Town of Dennis not to provide for such full-width repaving. In implementing the required repaving, the Company should: (1) coordinate with the Town regarding specifications the Town may request, and (2) follow the Town's specifications to the greatest extent possible, consistent with other applicable requirements.

The record shows that the Company has committed to finalizing engineering plans for the proposed project in consultation with the affected municipalities, and that this review process likely would require approximately 4 to 6 weeks. The record shows that the Company has committed to mitigate traffic impacts during construction in accordance with traffic management plans to be approved by each municipality, including site-specific traffic management plans the Company expects to prepare at key intersections. Further, the record shows that the Company has committed to avoid work between Memorial Day and Labor Day, and to limit work to the hours from 7:00 a.m. to 6:00 p.m., except by approval of the affected municipality. Also, the record shows that the Company would need to obtain road opening permits from the municipalities, which gives the Towns of Yarmouth, Dennis, and Harwich the opportunity to limit work to reasonable dates and hours. Specifically with respect to the intersection of Highbank Road and Main Street, the Company will need to work with the Town of Dennis to determine appropriate hours for times of construction and the geographic delineation of any additional limitations to be reflected in the traffic management plan and street opening permit.

The Siting Board notes that, to allow effective coordination between the Company and the municipalities in the development of engineering and traffic plans for the project, there must

be a reasonable lead time for municipal review of the plans before they are finalized. Therefore, the Siting Board directs the Company to provide the municipalities, at least 60 days prior to commencement of construction, with substantially completed engineering plans, and substantially completed traffic management plans including all site-specific traffic management plans, for review and comment. The Company is further directed to file with the Siting Board a copy of each traffic management plan, including each site-specific traffic management plan, when the plan has been finalized.

With the above conditions, the Siting Board finds that traffic impacts along the Middle Segment primary route would be minimized.

No comparison of sound levels was made between abutters to the primary route, who would experience street excavation, and abutters to the alternative route, who would experience noise from tree clearing and soil excavation but not from pavement cutting. The record shows that the primary route is close to a larger number of residences than the alternative route. Construction noise impacts to neighbors would likely be greater along the primary route, due to the larger number of nearby homes. Based on the lower number of nearby residents, the alternative route is preferable with respect to noise impacts.

The record shows that construction along the primary route would have an adverse impact on traffic flow when construction was ongoing, especially on Highbank Road. The record shows that the alternative route crosses roads but only follows roads at the east end of the Middle Segment. It would thus include less construction in heavily traveled roadways. Thus, the alternative route is also preferable with respect to traffic impacts. Therefore, the Siting Board finds that, for the Middle Segment, the alternative route would be preferable to the primary route with respect to noise and traffic impacts.

v. Conclusions on Environmental Impact - Middle Segment

(a) Company

KeySpan asserted that loss of vegetation near approximately 44 residences on the Middle Segment alternative route would be more consequential than temporary construction effects that would affect 135 residences on the primary route (Exhs. KED-1, at table 4-1; YAR/DEN 1-15;

Tr. 3, at 563-565). So, overall, the Company asserted that the primary route for the Middle Segment would have fewer construction impacts than the alternative route (Exh. KED-1, at 5-43).

(b) Intervenor

Mr. George Allaire, witness for the Towns and Director of the Yarmouth Public Works Department, and Mr. Joseph A. Rodricks, witness for the Towns and Town Engineer for the Town of Dennis, each stated that the Towns urge the Siting Board in the strongest possible terms to approve the alternative route rather than the primary route (Exhs. YAR/DEN-GA at 3; YAR/DEN-JAR at 5). Mr. Allaire stated that the major advantage of the alternative route is lack of disruption to homeowners along the primary route and to motorists using the streets of the primary route (Exh. YAR/DEN-GA at 1). Mr. Rodricks stated that the issue of most concern to the Town of Dennis is construction on streets extending through the intersection of Highbank Road and Main Street, which can be avoided by selection of the alternative route (Exh. YAR/DEN-JAR; Tr. 4, at 710, 762). The Towns therefore argued that the alternative route is far superior to the primary route for the Middle Segment (Towns Brief at 1).

(c) Analysis

In the sections above, the Siting Board has reviewed the evidence presented regarding the environmental impacts of the proposed project along the primary and alternative routes. The Siting Board finds that KeySpan has provided sufficient information on the environmental impacts of the proposed project, including information on the potential for mitigation, for the Siting Board to determine whether the environmental impacts would be minimized.

In Sections III.C.3.a.i, ii, iii, and iv, above, the Siting Board found that, for the Middle Segment, wetland and water resources, land use and land resources, South Dennis Historic District, and noise and traffic impacts along the primary route would be minimized. Therefore, the Siting Board finds that, for the Middle Segment, environmental impacts would be minimized.

The Siting Board further found that the Middle Segment primary route would be preferable to the alternative route with respect to wetlands and water resources impacts, and with

respect to land use and land resources impacts; and also that the Middle Segment alternative route would be preferable to the primary route with respect to impacts to the South Dennis Historic District, and with respect to noise impacts and traffic impacts. Land uses and land resources impacts and noise and traffic impacts would occur along much or all of the routes. The noise and traffic impacts would appear to affect a greater number of people; however, the land use and land resources impacts would appear to be more long-lasting. Potential wetlands and water resources impacts and potential impacts to the South Dennis Historic District would generally be mitigated with erosion and sediment controls and with in-street construction, respectively.

The advantages of the primary route with respect to expected land use and land resources impacts and potential wetlands and water resources impacts are balanced by the advantages of the alternative route with respect to expected noise and traffic impacts and potential impacts to the South Dennis Historic District. Therefore, the Siting Board finds that, for the Middle Segment, the primary and alternative routes would be comparable with respect to environmental impacts.

b. Facility Cost - Middle Segment

i. Company

KeySpan estimated that the PV cost of constructing the Middle Segment along the primary route would be $3,500,000, based on construction in three phases (Exh. KED-1, at 4-25, 5-48). The Company estimated that the PV cost of constructing the project along the alternative route would be $4,200,000, based on construction in two phases (id. at 4-32). KeySpan stated that its cost evaluation was based primarily on two factors: (1) construction labor and material costs; and (2) costs of obtaining easements or other access to rights-of-way (id.). The Company calculated discounted costs of phased construction by assuming a 10% per year cost of capital (id. at 4-25; Exhs. EFSB-S-4; YAR/DEN 2-3). KeySpan indicated that it did not refine or alter its cost estimates between its site selection process and facilities comparison (Exh. KED-1, at 5-48).

The Company indicated that it assumed unit prices of $330 per foot and $146 per foot for construction in public roadways of 20-inch and 12-inch pipeline, respectively (id. at 4-25). The Company assumed construction costs of $229 per foot for 20-inch pipeline in the NSTAR right-of-way and construction costs of $131 per foot for 12-inch pipeline along inactive railroad right-of-way (id.). Additional costs representing mobilization and demobilization, and for crossing state highways were added to these unit costs (id.; Exh. YAR/DEN 2-3). The cost estimate for the alternative route includes $1,100,000 as the net present value of paying $116,000 per year for 30 years to lease rights along the old rail right-of-way (Exh. KED-1, at 4-32). The Company may incur additional costs on the alternative route, such as building a support structure for the pipe across the Bass River at the railroad bridge (Tr. 2, at 287-294). However, the cost estimate for the alternative route does not include the expected higher costs to bridge the Bass River, or possible additional costs to repair the railroad bridge abutments (Exh. KED-1, at 4-32; Tr. 2, at 287-294). The Company stated that the actual lease cost for the old rail right-of-way would be the subject of future negotiations between KeySpan and the Massachusetts Executive Office of Transportation (Exh. YAR/DEN 1-36).

ii. Intervenor

The Towns argued that the alternative route could be less expensive than the primary route because the cost of rights to the old rail right-of-way make the difference in the Company's estimate, and the cost of those rights are speculative; because construction challenges on Highbank Road may not have been incorporated into the Company's cost estimate; and because the Company should have assumed it would pay for full pavement restoration in parts of Yarmouth and Dennis (Towns Brief at 24-27). The Towns suggested that a way to reduce the cost of the Middle Segment alternative route would be to combine the western part of the alternative route with the eastern part of the primary route by using Route 134 to join the routes; however, the Towns' witnesses did not project specific cost savings (Exh. YAR/DEN-JAR at 4-5; Tr. 4, at 710-711).

iii. Analysis

The record shows that the difference in costs between the two Middle Segment route options would be fairly small, relative to the total cost of the Middle Segment. The record shows that engineering a pipe bridge at the railroad bridge location was not carried out in sufficient detail to obtain an accurate cost estimate for this element of the work. The record also shows that lease costs for the right-of-way would be subject to negotiations and that without going through the negotiation process, it is not possible to accurately estimate this cost. As a result, the uncertainties with respect to the cost of bridge construction, lease costs, and other issues appear to be greater than the cost differential estimated by the Company. The cost savings of a hybrid route, relative to the alternative route, depend on costs to obtain rights to use the existing Rail Trail, which are also unknown. Based on the high uncertainties relative to the calculated cost differential, the Siting Board finds that, on the Middle Segment, the primary route and the alternative route would be comparable with respect to cost.

c. Reliability - Middle Segment

i. Company

KeySpan stated that the proposed pipeline along either the primary route or the alternative route would provide the necessary pressure and supply on a safe and reliable basis over the forecast period (Exh. KED-1, at 3-18). The Company stated that the proposed project would not add complexity to the operation of the gas distribution system (id. at 3-19). In these terms, the Company stated that the primary and alternative routes are very similar (id. at 5-45). As a second-order consideration, the Company indicated that regular tie-ins, available only on the primary route, would afford later opportunities to close a series of valves and to perform maintenance work without shutting down a long section of gas main (Tr. 2, at 241-246).

KeySpan indicated that the Middle Segment primary route is 0.3 miles longer than the alternative route (Exh. KED-1, at table 4-1). The Company stated that the alternative route would have a pressure drop approximately 1.0 pounds per square inch less than the primary route (Exh. RR-EFSB-11). For perspective, the Company noted that this improvement in pressure is less than the modeled pressure reduction due to one year's modeled growth on the system

(Exh. RR-EFSB-11; Tr. 2, at 246-248). The Company indicated that it did not believe the difference in length would create any meaningful difference with respect to the potential for third-party disruption (Exh. EFSB-S-6).

KeySpan stated that the Middle Segment alternative route requires negotiation of a lease agreement with the Commonwealth's Executive Office of Transportation, which in turn requires a precedent agreement with Bay Colony Railroad (Exh. KED-1, at 5-46). The Company indicated its understanding that reaching these agreements could be a long process (id.; Tr. 3, at 461-462). In addition, the Company stated that use of the Rail Trail section of the alternative route would require the Company to obtain an access agreement with the DCR (Exh. KED-1, at 5-46 to 5-47).

The Company asserted that the primary route, being entirely within road layouts, would be more quickly and reliably permitted (id.). The Company identified several local permits that might be required on the primary or alternative routes: a determination of applicability or an order of conditions from the Yarmouth and Dennis Conservation Commissions; grants of location from the Yarmouth and Dennis Boards of Selectmen; street opening permits from the Yarmouth and Dennis Departments of Public Works; a certificate of appropriateness for work within the South Dennis Historic District (or a determination that the certificate is not required) from the South Dennis Historic Commission; and approval under scenic roadway bylaws from the selectmen; and permission under water resource protection overlay districts from zoning boards or selectmen (Exhs. EFSB-G-2(1); YAR/DEN 1-40(1)).

KeySpan stated that its modeling shows that the Company needs to build 12,000 feet of new pipeline on the Middle Segment by the fall of 2006 (Exh. EFSB-S-4; Tr. 2, at 238-240). The primary route could be tied back to the existing pipeline at 12,000 feet after the first year of construction (Exh. KED-1, at 5-46). The Company stated that, using the alternative route, it would have to build a total of 18,500 feet of new pipeline by the fall of 2006 in order to reach the next tie-in point beyond the required 12,000 feet of new pipeline (id. at 5-47; Tr. 2, at 239).[45]

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[45] Maps provided by the Company indicated that, using a hybrid route using Route 134, the Company could reach a tie-in point approximately 16,000 feet from the Middle Segment (continued...)

The Company argued that there is uncertainty about whether it could obtain the necessary rights in a timely fashion from the Executive Office of Transportation in order to build the Middle Segment alternative route by the winter of 2006/2007 (Company Brief at 106). The Company asserted that this uncertainty represented a significant difference from the primary route, and categorized this difference as a reliability factor (Exh. KED-1, at 5-47).

ii. Intervenor

The Towns argued that any difference in the level of permitting uncertainty between the primary and alternative routes is the fault of the Company's, asserted that the permitting the primary route poses at least as much uncertainty due to local opposition to the primary route, and argued that the issue should not be considered by the Siting Board as an advantage (Towns Brief at 17, 19-20). Responding to questioning by the Towns, the Company indicated that it had identified the old rail right-of-way as a potential route for the proposed pipeline in early 2005 (Tr. 3, at 466). The Towns argued that licensing should have been seriously pursued starting at that time, and that if it had done so, the approvals would now be in hand (Towns Brief at 17-19).

iii. Analysis

The difference in lengths between the primary and alternative routes is not large enough to create a substantial difference in pipeline performance, and the two routes are otherwise similar in physical reliability. The record shows that the Company and its environmental consultants have significant experience in permitting the installation of gas pipelines, including the acquisition of access rights and necessary permits and approvals. In this case, the opinion of the Company and its consultants is that permitting of the proposed project in the roadways along the primary route can be accomplished with reasonable certainty in time to allow construction of

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45 (...continued)
start point (Exh. KED-1, at fig. 4-3). The hybrid route would avoid the need to obtain DCR approval. However, use of the hybrid route would not avoid the use of the railroad bridge over the Bass River, which would need to be engineered, nor use of the old rail right-of-way, which would require a licensing agreement. Also, the hybrid route would require construction along a state highway, which would require approval from MHD.

the first 12,000 feet of the Middle Segment prior to the peak loads of the 2006/2007 heating season. It is the Company's opinion, supplemented by its consultants, that it is less certain, and perhaps not possible, to obtain rights to build on the railroad right-of-way within the same period of time. In addition, because it would not follow the route of the existing Sagamore Line, the alternative route would require significantly more extensive pipeline construction during 2006 to reach a possible tie-in point in Dennis, as necessary to meet need in winter 2006-2007. The added construction would include not only an additional 4000 to 6000 feet of pipeline to reach a possible tie-in point, compared to the 12,000 feet required for the primary route, but also the completion of the spanning of the Bass River, which would not be required as part of the 12,000 feet to be constructed in 2006 under the primary route. The ability of the project to reliably serve customers for all years of the forecast period is dependent on its being timely constructed. Given the greater certainty with which the proposed work can be completed in a timely fashion, the Siting Board finds that on the Middle Segment, the primary route would be preferable to the alternative route with respect to reliability.

d. Conclusions on Proposed Facilities - Middle Segment

i. Company

The Company argued that the primary route is superior to the alternative route in terms of cost, reliability, and environmental impacts (Company Brief at 108).

ii. Intervenor

Mr. Joseph A. Rodricks, witness for the Towns and Town Engineer for the Town of Dennis, stated that the alternative route appears to be superior to the primary route for the Middle Segment and urged its selection (Exh. YAR/DEN-JAR at 1, 5).

iii. Analysis

The Siting Board has found, for the Middle Segment, that environmental impacts would be minimized, that the primary route and the alternative route would be comparable with respect to environmental impacts and with respect to cost, and that the primary route would be preferable

with respect to reliability. Accordingly, the Siting Board finds that the Middle Segment primary route would be superior to the alternative route with respect to providing a reliable energy supply to the Commonwealth with a minimum impact on the environment at the lowest possible cost.

The Siting Board finds that KeySpan has provided sufficient cost and reliability information in order to determine whether the appropriate balance among environmental impacts, cost, and reliability would be achieved. The Siting Board also finds that the Middle Segment of the proposed project along the primary route would achieve an appropriate balance among conflicting environmental concerns, as well as among environmental impacts, reliability and cost.

4. Eastern Segment

a. Environmental Impacts - Eastern Segment

In this section, the Siting Board compares the environmental impacts of the proposed facilities along the primary and alternative routes for the Eastern Segment, considers the proposed mitigation for such impacts, evaluates any options for additional mitigation and determines whether the environmental impacts along the primary route would be minimized. The subsections below consider wetlands and water resources impacts, land use and resources impacts, and noise and traffic impacts.

i. Wetlands and Water Resources

KeySpan stated that the Eastern Segment would be built primarily along the edge of pavement of existing roads and within roadway layouts, if the primary route were selected (Exh. KED-1, at 5-3). The Company stated that there are no surface water bodies, mapped vernal pools, or wetlands adjacent to either the primary or alternative route for the Eastern Segment (id. at 5-17 to 5-18; Tr. 2, at 204, 305). Therefore, the Company concluded that the primary and alternative routes would be comparable with respect to wetlands and vernal pools and also comparable with respect to streams and water bodies (Exh. KED-1, at 5-17, 5-19).

KeySpan stated that the primary route for the Eastern Segment crosses through 8600 linear feet of Wellhead Protection Area as identified by the Cape Cod Commission (id. at 5-20). The alternative route crosses through 11,500 linear feet of Wellhead Protection Area (id.). Based

on the shorter distance in groundwater resource areas, the Company identified the primary route as advantageous with respect to groundwater (id. at 5-21).

The Company stated that it would use filter fabric barriers and would sweep road surfaces to keep soil materials from washing into storm drains (id. at 5-11). For both the primary and the alternative routes, KeySpan would develop and implement an SPCC Plan to ensure against inadvertent releases of fuel or equipment maintenance materials during pipeline construction (id.). For areas subject to the Massachusetts Wetland Protection Act, KeySpan stated that it would obtain and comply with all necessary Determinations of Applicability and Orders of Conditions (id.). The Company also stated that it would comply with all local wetlands bylaws (id.). The Company indicated that it would prepare an SWPPP and implement erosion and sedimentation control best management practices (id.; Exh. EFSB-E-26). The Company also indicated that it would prepare an Environmental Construction Plan, that would address erosion control, dust control, and vehicle fueling and maintenance (Exh. YAR/DEN 1-5).

KeySpan stated that there are no mapped public water supply wells proximate to the proposed routes (Exh. KED-1, at 5-19). However, the Company noted that all of Cape Cod has been designated as a Sole Source Aquifer under the federal Safe Drinking Water Act (id.). The Cape Cod Commission has identified groundwater protection areas based on their importance for drinking water supplies (id.). The Company indicated that development and implementation of an SPCC Plan would protect against impacts to groundwater (id. at 5-20). Further, the Company stated that it would perform no equipment maintenance within 100 feet of a wellhead protection area (Tr. 3, at 549-551).

KeySpan asserted that current information from the MADEP Bureau of Waste Site Cleanup indicates that MCP sites would not affect pipeline construction (Exh. KED-3, at 12-1 to 12-2). Notwithstanding, the Company indicated that it would follow URAM procedures required under the MCP, in the event that contamination is encountered (id. at 12-2 to 12-3; Tr. 2, at 311).

The record shows that the primary route on the Eastern Segment is along roads and not in wetland areas. The record also shows that the Company is committed to erosion control, sedimentation control, and spill prevention procedures that would minimize water impacts. To further reduce the risk of contaminating groundwater supplies, the Siting Board directs the

Company to refrain from all refueling and equipment-maintenance activities that have the potential for fluid spills, when vehicles are within identified Wellhead Protection Areas. Based on the use of roadway layouts, the limited encroachment into wetland buffer areas, and the Company's expressed commitment to control erosion and sedimentation, the Siting Board concludes that construction of the proposed pipeline along the primary route would result in no permanent impacts, and only minimal temporary impacts to wetlands and water resources. Consequently, the Siting Board finds that the wetlands and water resources impacts of the proposed pipeline along the Eastern Segment primary route would be minimized.

The record shows that there are no significant wetland resources along either the primary or alternative route, so there would be no significant differences between the primary and alternative routes on the Eastern Segment with respect to surface water and wetlands impacts. The record also shows that the primary route on the Eastern Segment crosses through Wellhead Protection Areas for a somewhat shorter distance than does the alternative route. Considering wetlands, surface water, and groundwater impacts, the Siting Board finds that, on the Eastern Segment, the primary route would be preferable to the alternative route with respect to wetlands and water resources impacts.

ii. Land Use and Land Resources

KeySpan indicated that the Eastern Segment primary route traverses areas that are a mix of residential, woodland, and commercial use (Exh. KED-1, at fig. 4-7). KeySpan listed three sensitive receptors along the primary route: a fire station, a police station, and a church (id. at 5-28). However, the Company asserted that its mitigation would lead to no anticipated impacts to sensitive receptors (id. at 5-29).

KeySpan noted that to install the proposed pipeline along the primary route, it may clear some scrub vegetation along pavement edges (id. at 5-4). However, the Company indicated that few trees would need to be removed on the primary route (Exh. KED-3, at 5-2). KeySpan stated that the primary route is on roadways with overhanging tree branches in various locations (Exh. KED-1, at 5-22 to 5-23). The Company indicated that these branches are high enough to allow truck traffic, but that some might have to be trimmed to permit construction (id.; Tr. 2,

at 306-307). The Company stated that it would assess the potential for damage to trees with a professional arborist and local tree wardens (Exh. KED-3, at 5-2). The Company stated that graded areas would be fertilized, seeded, and mulched, and that these areas would be inspected after the first and second growing seasons (id.). The Company stated that shrubs would be restored in accordance with any individual landowner agreements (id.).

KeySpan stated that there are no protected lands along the primary route for the Eastern Segment (Exh. KED-1, at 5-24). In addition, the Company stated that pipeline construction would have no impacts on rare species (Exh. KED-3, at 16-4).

KeySpan indicated that no stone walls would likely be disturbed along roadsides (id. at 5-2). However, if stone walls or fences were to be temporarily removed for construction, the Company committed to their restoration (id.).

KeySpan indicated that PAL reviewed documented locations of archaeological sites, historic structures, cemeteries, and areas of archeological sensitivity within the project area (Exh. EFSB-E-5). In response to comments from the Massachusetts Historical Commission, PAL conducted an archaeological reconnaissance survey to identify areas that may require further testing to locate and identify any important archaeological resources (id.). KeySpan stated that the primary route for the Eastern Segment passes no historical resources and is not considered sensitive for archaeological resources (Exh. KED-1, at 5-36). The Company stated that it would perform additional surveys as directed by the Massachusetts Historical Commission (Exh. EFSB-E-5). The Company stated that if significant eligible deposits are found in any further survey directed by the Massachusetts Historical Commission, KeySpan would consider alternative alignments, reduce its workspace, or undertake a site examination and consult with the Massachusetts Historical Commission (Exh. EFSB-E-6).

KeySpan indicated that the alternative route for the Eastern Segment traverses areas that are a mix of residential use and woodland (Exh. KED-1, at fig. 4-7, fig. 5.3-9). The Company stated that there is one sensitive receptor – a church – along the alternative route (id. at 5-28). The Company asserted that its mitigation would lead to no anticipated impacts with respect to sensitive receptors (id. at 5-29).

As with the primary route, KeySpan stated that the alternative route is on roadways with overhanging tree branches in various locations (id. at 5-22 to 5-23). The Company indicated that these branches are high enough to allow truck traffic, but that some might have to be trimmed to permit construction (id.; Tr. 2, at 306-307).

KeySpan stated that there are no protected lands along the alternative route (Exh. KED-1, at 5-24). In addition, the Company stated that pipeline construction would have no impacts on rare species (Exh. KED-3, at 16-4).

KeySpan indicated that no stone walls would likely be disturbed along roadsides (id. at 5-2). However, if stone walls or fences were to be temporarily removed for construction, the Company committed to their restoration (id.).

On behalf of the Company, PAL conducted an archaeological reconnaissance survey to identify areas that may require further testing to locate and identify any important archaeological resources (Exh. EFSB-E-5). The Company stated that the alternative route passes many above-ground historical resources, approximately 4100 linear feet of historical area in East Harwich, and areas sensitive for containing previously unidentified archaeological resources (Exh. KED-1, at 5-36).

The Company concluded that the primary route would be advantageous with respect to residential impacts, on the basis of there being fewer residents on the primary route (id. at 5-27). While the number of sensitive receptors differs between routes, KeySpan anticipated that mitigation would lead to no impacts to sensitive receptors, and concluded that the primary and alternative routes are therefore comparable with respect to sensitive receptors (id. at 5-29). With only roadside vegetation and no protected lands on either route, the Company concluded that the primary route and the alternative route would be comparable with respect to impacts to both vegetation and protected lands (id. at 5-23, 5-25). Based on an extensive historical area in East Harwich, and the potential for archaeological resources along the alternative route, the Company concluded that the primary route is substantially better than the alternative route with respect to impacts to historic resources (id. at 5-36).

The record demonstrates that the land resources impacts of the proposed pipeline along the primary route would be temporary and minimal due to the placement of the pipeline under and directly adjacent to streets and because the Company has stated that it will assess the potential for damage to trees on the route with a professional arborist and local tree wardens.[46] To protect shade trees and other landscaping features, the Siting Board directs the Company: (1) to arrange for a professional arborist to conduct an on-site inspection of the construction zone within 6 months before construction begins in an area; (2) based on recommendations by the arborist and, where applicable, tree wardens, to take all reasonable precautions to avoid removing or damaging trees; (3) to minimize damage to shrubbery and other plantings, as well as damage to or removal of fences, stone walls, lampposts, and other landscaping features; (4) to repair or replace any damaged or removed trees, shrubbery, or plantings, in consultation with the arborist and, where applicable, tree wardens, and with the agreement of the owner of damaged or removed vegetation; and (5) to repair or replace any damaged or removed fences, walls, or other landscaping features, with the agreement, as applicable, of the owner of the landscaping feature. With the specified mitigation and implementation of the above condition, the Siting Board finds that the land resources impacts of the proposed pipeline along the Eastern Segment primary route would be minimized.

The record shows that the primary and alternative routes would be within roadways and that, as a result, impacts to upland habitats would be minimal. Neither Eastern Segment route is superior with respect to upland habitat impacts. The record shows that the alternative route would go through an area with historic and potential archaeologic resources, whereas the primary route would not. Accordingly, the primary route would be preferable with respect to cultural resources. Therefore, the Siting Board finds that, on the Eastern Segment, the primary route would be preferable to the alternative route with respect to land use and land resources.

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46 The Company is required by § 6.8 of the D.T.E. Road Restoration Standards to hand-cut around roots of trees.

iii. Noise and Traffic

KeySpan indicated that the project would have noise and traffic impacts only during its construction (Exh. KED-1, at 5-9 to 5-10). These impacts are evaluated below, for the primary and alternative routes.

KeySpan stated that the principal sources of noise during construction would be pavement saws, a backhoe, and a welding rig (Exh. EFSB-E-15). The Company indicated that other sources of noise such as dump trucks and crew vehicles would be present intermittently (id.). The loudest piece of equipment evaluated by the Company, the pavement saw, has a maximum sound level of approximately 90 dBA at 50 feet (id.). KeySpan noted that sound levels at any given location would be dominated by the piece of equipment nearest the receptor of interest (id.). According to KeySpan's calculations, the L_{10} of construction noise, outside a residence located 50 feet back from pipeline construction in a road would typically exceed 60 dBA for a total of approximately 7 to 9 days, as machinery used in the construction sequence moves along the roadway (Exh. RR-EFSB-12). The Company indicated that it measured ambient sound levels on May 19, 2005 (id.). The Company reported that ambient L_{10} sound levels ranged from 66 dBA to 78 dBA on various primary route segments, and from 42 dBA to 76 dBA on various alternative route segments (id.).

The Company stated that the typical work hours would be on weekdays between 7:00 a.m. and 6:00 p.m. (Exhs. KED-1, at 5-9; EFSB-E-15). However, the Company indicated that night or weekend work might on occasion be needed to meet construction deadlines (Exhs. KED-1, at 5-9; EFSB-E-15; EFSB-E-16). The Company indicated that days and hours of work would be circumscribed by the street opening permits issued by each town (Tr. 2, at 316-317). The Company indicated its belief that it would be able to obtain permission from the towns to extend the scheduled construction hours if it became essential to do so (id. at 315-316).

KeySpan stated that 24 residences are located along Route 39, generally set back at least 100 feet from the road (Exh. KED-1, at 5-26). KeySpan stated that 97 homes are within 100 feet of the alternative route, as well as a church, several small businesses and an animal hospital (id. at 5-27). The Company stated that there would no permanent changes on the Eastern

Segment (id.). On the basis of the lower number of adjacent residents that would be affected by construction impacts, the Company concluded that the primary route would be advantageous with respect to residences (id.).

KeySpan stated that it would develop traffic management plans for construction (id. at 5-6). The Company indicated that it would limit construction along roads to the off-season – from after Labor Day to before Memorial Day – except in any locations such as along Service Road for which the Town of Harwich determines that traffic impacts would be acceptable in the summer (Tr. 2, at 313-314). The Company indicated that the traffic management plans could limit construction to outside rush hour periods, specify the use of traffic control officers, and require maintenance of at least one lane of traffic flow (Exh. YAR/DEN 1-25). The Company indicated that it expects to use jacking or drilling to cross Route 137 on the primary route (Exh. EFSB-E-8). The Company stated that it would cover any street openings with steel plates at the end of the day, and that it would protect and barricade openings in the shoulder to ensure traffic and pedestrian safety (Exh. KED-1, at 5-6). The Company stated that it would restore streets in accordance with the D.T.E. Road Restoration Standards (Exh. YAR/DEN 1-45; Tr. 3, at 487).

KeySpan stated that the primary route, along Route 39, is broad and straight with an adequate shoulder in which to work (id. at 5-33). The alternative route is longer and narrower, with a number of bends and grade changes, resulting in worse sight-lines for motorists (id.; Exh. EFSB-E-17). On this basis, the Company concluded that the primary route would be better with respect to traffic (Exh. KED-1, at 5-33). The Company stated that it would consult with the Town of Harwich to determine local preference regarding scheduling work over either one, two, or three seasons (Tr. 2, at 270).

The record demonstrates that the noise impacts of the proposed project would be limited to temporary noise associated with construction activities. The record shows that, given the presence of residences along substantial portions of the route, construction noise impacts would be minimized by confining construction work to daytime hours, 7:00 a.m. to 6:00 p.m., unless contingencies require work outside such hours. The Siting Board understands that the Company will communicate with the various municipalities regarding the extent of any work outside of

normal daytime hours. To underscore this commitment, the Siting Board directs the Company to limit construction work on the Eastern Segment to the hours from 7:00 a.m. to 6:00 p.m. unless otherwise authorized by the Town of Harwich. With the identified mitigation and implementation of the above condition, the Siting Board finds that the noise impacts of the proposed project along the Eastern Segment primary route would be minimized.

The record shows that construction would be on the road shoulder where practical, and otherwise along the edge of pavement. The record shows that the Company would to follow the D.T.E. Road Restoration Standards after pipeline installation.

The record shows that the Company has committed to finalizing engineering plans for the proposed project in consultation with the affected municipalities, and that this review process likely would require approximately 4 to 6 weeks, based on experience with the first stage of the project (see Section III.C.3, above). The record shows that the Company has committed to mitigate traffic impacts during construction in accordance with traffic management plans to be approved by the Town of Harwich, including site-specific traffic management plans the Company expects to prepare at key intersections. Further, the record shows that the Company has committed to avoid work between Memorial Day and Labor Day, and to limit work to the hours from 7:00 a.m. to 6:00 p.m., except by approval of the Town of Harwich. Also, the record shows that the Company would need to obtain road opening permits from the municipalities, which gives the Town of Harwich the opportunity to limit work to reasonable dates and hours.

The Siting Board notes that, to allow effective coordination between the Company and the municipalities in the development of engineering and traffic plans for the project, there must be a reasonable lead time for municipal review of the plans before they are finalized. Therefore, the Siting Board directs the Company to provide the municipalities, at least 60 days prior to commencement of construction, with substantially completed engineering plans, and substantially completed traffic management plans including all site-specific traffic management plans, for review and comment. The Company is further directed to file with the Siting Board a copy of each traffic management plan, including each site-specific traffic management plan, when the plan has been finalized.

Therefore, with the above condition, the Siting Board finds that traffic impacts along the Eastern Segment primary route would be minimized.

No comparison of sound levels was made between abutters to the primary route and abutters to the alternative route, but the two Eastern Segment routes both follow streets and would involve the same type of work. The alternative route has more residents in the immediate vicinity, so the primary route would be preferable with respect to noise impacts. The record shows that the primary route is shorter by comparison, and is on a road with wider shoulders and better sight-lines. Thus, the primary route is preferable with respect to traffic impacts. Therefore, the Siting Board finds that, on the Eastern Segment, the primary route would be preferable to the alternative route with respect to noise and traffic impacts.

iv. Conclusions on Environmental Impact - Eastern Segment

In the sections above, the Siting Board has reviewed the evidence presented regarding the environmental impacts of the proposed project along the primary and alternative routes. The Siting Board finds that KeySpan has provided sufficient information on the environmental impacts of the proposed project, including information on the potential for mitigation, for the Siting Board to determine whether the environmental impacts would be minimized.

In Sections III.C.4.a.i, ii, and iii, above, the Siting Board found that, for the Eastern Segment, wetlands and water resources, land use and land resources, and noise and traffic impacts would be minimized. Therefore, the Siting Board finds that, for the Eastern Segment, environmental impacts would be minimized. The Siting Board further found that the Eastern Segment primary route would be preferable to the alternative route with respect to wetlands and water resources impacts, land use and land resource impacts, and noise and traffic impacts. Therefore, the Siting Board finds that, for the Eastern Segment, the primary route would be preferable to the alternative route with respect to environmental impacts.

b. Facility Cost - Eastern Segment

KeySpan estimated that the PV cost of constructing the Eastern Segment along the primary route would be $1,330,000, based on construction in three phases (Exh. KED-1, at 4-32, 5-48). The Company indicated that the PV cost would be nearly the same if construction were performed along the primary route were completed in a single phase (id. at 4-32). The Company estimated that the PV cost of constructing the project along the alternative route would be $1,750,000 (id. at 5-48; Tr. 2, at 243-244). KeySpan stated that its cost evaluation was based primarily on two factors: (1) construction labor and material costs; and (2) costs of obtaining easements or other access to rights-of-way (Exh. KED-1, at 4-23). The Company calculated discounted cost of phased construction by assuming a 10% per year cost of capital (id. at 4-25; Exh. EFSB-S-4). However, the Company noted that, for the Eastern Segment, the financial savings from phasing would be lost due to the need for additional mobilizations and demobilizations (Exh. KED-1, at 4-32). KeySpan indicated that it did not refine or alter its cost estimates between its site selection process and facilities comparison (id. at 5-48).

The Company indicated that it assumed unit prices of $330 per foot and $146 per foot for construction in public roadways of 20-inch and 12-inch pipeline, respectively (id. at 4-25). The Company assumed construction costs of $229 per foot for 20-inch pipeline in the NSTAR right-of-way and construction costs of $131 per foot for 12-inch pipeline along inactive railroad right-of-way (id.). Additional costs representing mobilization and demobilization, and for crossing state highways were added to these unit costs (id.; Exh. YAR/DEN 2-3).

The record shows that the alternative route would cost approximately $400,000 more than the primary route. Based on the lower cost of constructing the primary route rather than the alternative route, the Siting Board finds that, on the Eastern Segment, the primary route would be preferable to the alternative route with respect to cost.

c. Reliability - Eastern Segment

KeySpan stated that the proposed pipeline along either the primary route or the alternative route would provide the necessary pressure and supply on a safe and reliable basis over the forecast period (Exh. KED-1, at 3-18). The Company stated that the proposed project would not

add complexity to its gas distribution or to KeySpan's operation of the system (id. at 3-19). In these terms, the Company stated that the primary and the alternative routes are very similar (id. at 5-45). As a second-order consideration, the Company indicated that regular tie-ins, available on the primary route, would afford later opportunities to close a series of valves and to perform maintenance work without shutting down a long section of gas main (Tr. 2, at 241-246).

KeySpan stated that there would be less pressure drop along the primary route for the Eastern Segment, compared to the alternative route, due to its shorter length, 1.6 miles versus 2.2 miles (Exh. KED-1, at table 4-1; Tr. 2, at 233-234). The Company stated that inlet pressures at the Church Street regulator would be reduced with the primary route, relative to the alternative route (Tr. 2, at 233-235). The Company indicated that it did not expect that the difference in length would create any meaningful difference with respect to the potential for disruption (Exh. EFSB-S-7).

The record shows that the primary route and the alternative route differ in length by less than one mile. Therefore, any length-based reliability differences would be relatively minor. The record indicates that the integrity of the pipeline would be similar on the two routes, and the pipeline could reliably be constructed using either route. Therefore, the Siting Board finds that, on the Eastern Segment, the primary route is comparable to the alternative route with respect to reliability.

d. Conclusions on Proposed Facilities - Eastern Segment

The Siting Board has found, for the Eastern Segment, that environmental impacts would be minimized, that the primary route would be preferable to the alternative route with respect to environmental impacts and cost, and that the two routes would be comparable with respect to reliability. Accordingly, the Siting Board finds that the Eastern Segment primary route would be superior to the alternative route with respect to providing a reliable energy supply to the Commonwealth with a minimum impact on the environment at the lowest possible cost.

The Siting Board finds that KeySpan has provided sufficient cost and reliability information in order to determine whether the appropriate balance among environmental impacts, cost, and reliability would be achieved. The Siting Board also finds that the Eastern Segment of

the proposed project along the primary route would achieve an appropriate balance among conflicting environmental concerns, as well as among environmental impacts, reliability and cost.

IV. 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. G.L. c. 164, § 69H. In addition, the statute requires that the Siting Board determine whether plans for the construction of energy facilities are consistent with current health, environmental protection, and resource use and development policies as adopted by the Commonwealth. G. L. c. 164, § 69J.

In Section II.A, above, the Siting Board found that there is a need for all three segments of the proposed project in combination to meet KeySpan's gas supply needs and pressure requirements in its Cape Cod service territory for the Company's ten-year forecast period, beginning with the 2006/2007 heating season and extending through 2014/2015. Further, in Section II.A, above, the Siting Board found that the proposed project is consistent with the Company's most recently approved long-range forecast.

In Section II.B, above, the Siting Board found that the proposed project would be superior to alternative approaches 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 III.B, above, the Siting Board found that the Company has examined a reasonable range of practical siting alternatives for each of the three segments.

In Section III.C, above, the Siting Board found that (1) with the implementation of specified mitigation measures regarding wetlands and water resources; land use and land resources; and noise and traffic; and (2) with implementation of specified conditions regarding water resources; land use and land resources; and noise and traffic, construction of the project on the primary route on each of the three segments would be preferable to construction on the alternative route with respect to providing a reliable energy supply for the Commonwealth with a

minimum impact on the environment at the lowest possible cost. The Siting Board also found that, with the implementation of the specified mitigation and conditions, the environmental impacts of the proposed project along the primary route on each of the three segments would achieve an appropriate balance among conflicting environmental concerns as well as among environmental impacts, reliability and cost. Therefore, based on the above, the Siting Board finds that the proposed pipeline project would achieve an appropriate balance among conflicting environmental concerns as well as among environmental impacts, reliability and cost.

In Section III, above, the Siting Board reviewed the environmental impacts of the proposed project in light of related regulatory or other programs of the Commonwealth, including programs related to wetlands protection, groundwater protection, rare and endangered species' habitat, historic preservation, and scenic roads. As evidenced by the above discussions and analyses, the Siting Board finds that the proposed project along the primary route would be generally consistent with the identified requirements of all such programs. Consequently, the Siting Board finds that the construction of the proposed project is consistent with current health, environmental protection, and land resource and development policies as adopted by the Commonwealth.

Accordingly, the Siting Board finds that, upon compliance with the mitigation measures in Section III., above, and the conditions set forth in Section III. and below, the construction and operation of the proposed project will provide a reliable energy supply for the Commonwealth with a minimum impact on the environment at the lowest possible cost.

Accordingly, the Siting Board APPROVES the proposal of Colonial Gas Company, d/b/a KeySpan Energy Delivery New England, to construct approximately 13.1 miles of natural gas pipeline to augment its existing Sagamore Line on Cape Cod, in the Towns of Sandwich, Barnstable, Yarmouth, Dennis and Harwich, along the primary route, subject to the following conditions:

A. In order to minimize construction and traffic impacts, the Siting Board directs the Company to provide the municipalities, at least 60 days prior to commencement of construction, with substantially completed engineering plans, and substantially completed traffic management plans including all site-specific traffic management plans, for review and comment. The Company is further directed to file with the Siting Board a copy of each traffic management plan, including each site-specific traffic management plan, when the plan has been finalized.

B. In order to minimize land use and land resources impacts, the Siting Board directs the Company: (1) to arrange for a professional arborist to conduct an on-site inspection of the construction zone within 6 months before construction begins in an area; (2) based on recommendations by the arborist and, where applicable, tree wardens, to take all reasonable precautions to avoid removing or damaging trees; (3) to minimize damage to shrubbery and other plantings, as well as damage to or removal of fences, stone walls, lampposts, and other landscaping features; (4) to repair or replace any damaged or removed trees, shrubbery, or plantings, in consultation with the arborist and, where applicable, tree wardens, and with the agreement of the owner of damaged or removed vegetation; and (5) to repair or replace any damaged or removed fences, walls, or other landscaping features, with the agreement, as applicable, of the owner of the landscaping feature.

C. In order to minimize environmental impacts, the Siting Board directs the Company to provide for the repaving of Highbank Road for its full width from the Bass River to Route 134, unless directed by the Town of Dennis not to provide for such full-width repaving. In implementing the required repaving, the Company should: (1) coordinate with the Town regarding specifications the Town may request, and (2) follow the Town's specifications to the greatest extent possible, consistent with other applicable requirements.

D. In order to minimize noise impacts, the Siting Board directs the Company to limit construction work on the Western, Middle, and Eastern Segments to the hours from 7:00 a.m. to 6:00 p.m. unless otherwise authorized by the affected municipality.

E. In order to minimize water resources impacts, the Siting Board directs the Company to refrain from all refueling and equipment-maintenance activities that have the potential for fluid spills, when vehicles are within identified Wellhead Protection Areas.

F. In order to minimize historic resources impacts, the Siting Board directs the Company: (1) to consult with the South Dennis Historic District Commission prior to finalizing construction plans for the district; and (2) in consultation with the South Dennis Historic District Commission, to restore vegetation and any fences or other structures that are disturbed in the South Dennis Historic District due to construction of the proposed pipeline.

In addition, because the issues addressed in this Decision relative to the Company's proposed project are subject to change over time, construction of the proposed project must begin within three years of the date of this Decision.

Also, because of the Company's intention to phase project construction over a number of years, this Decision approves construction of the proposed project over a specific period ending on December 31, 2015. This Decision does not authorize any work after December 31, 2015. If the Company has not completed work by December 31, 2015, and wishes to continue, the Company must first seek a new approval from the Siting Board. The procedure for reviewing a request for a new construction approval will be determined by the Siting Board after receiving such a request.

Further, 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 KeySpan 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. KeySpan is obligated to provide the Siting Board with sufficient information on changes to the proposed project to enable the Siting Board to make these determinations.

M. Kathryn Sedor
Presiding Officer

Dated this 17 th day of May, 2006

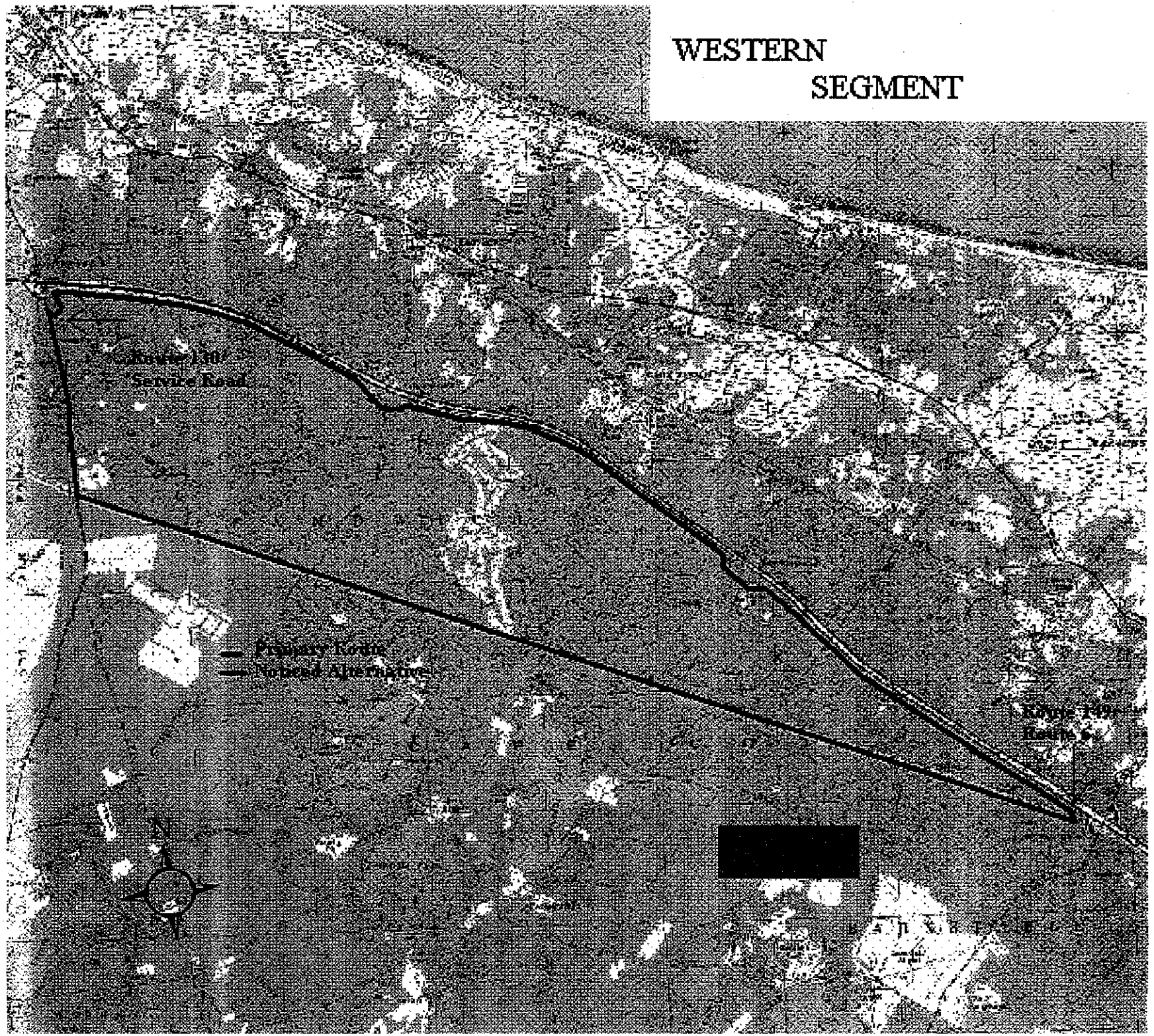
APPROVED by the Energy Facilities Siting Board at its meeting of May 16, 2006, by the members and designees present and voting: John Chapman (Acting EFSB Chairman/Designee for Ranch Kimball, Secretary of Economic Development), W. Robert Keating (Commissioner, DTE); David L. O'Connor, (Commissioner, Division of Energy Resources), Stephen Pritchard, (Secretary of Environmental Affairs), and James Connelly (Commissioner, DTE).

John Chapman, Acting Chairman
Energy Facilities Siting Board

Dated this 16th day of May, 2006

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).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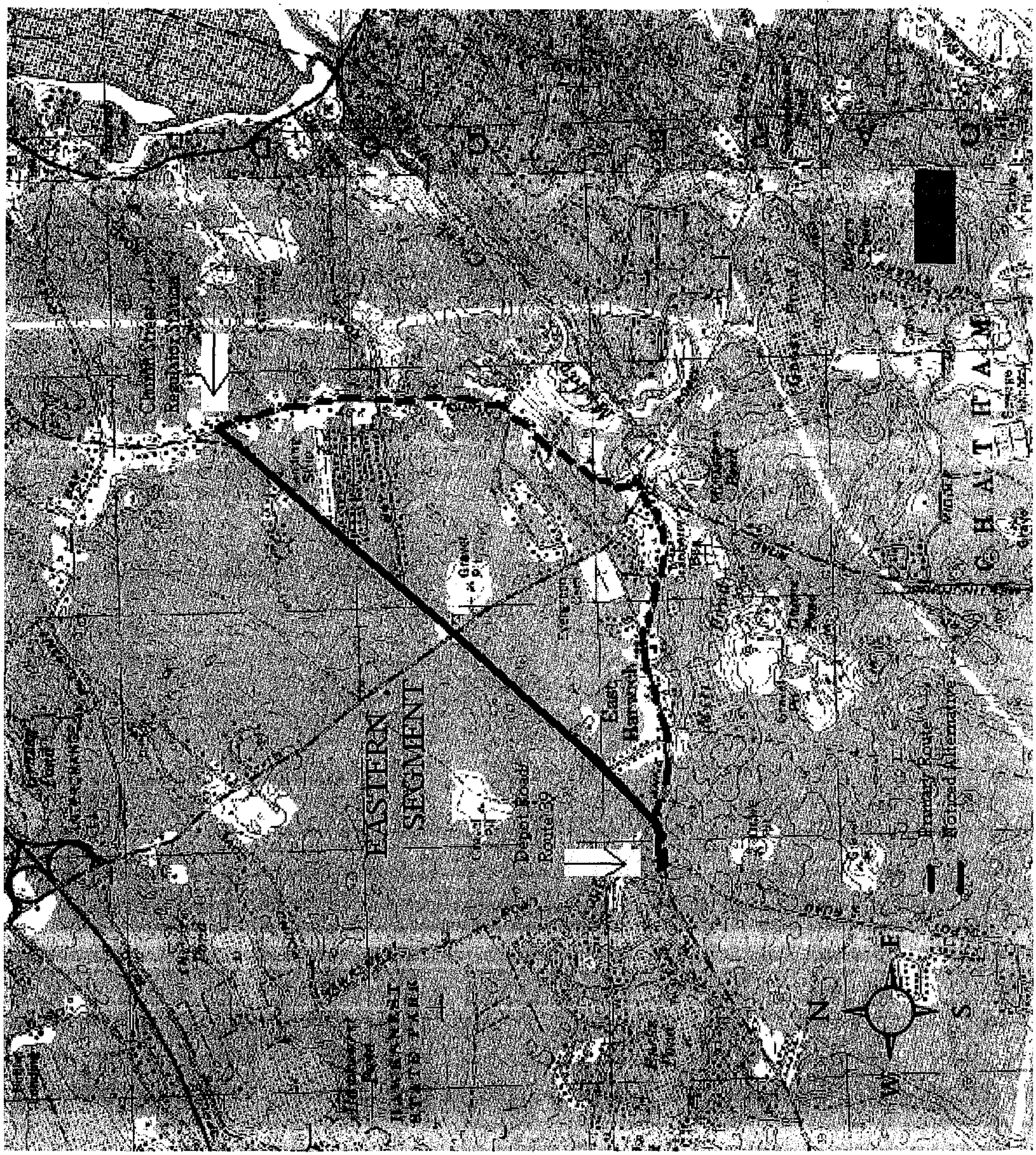
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COMMONWEALTH OF MASSACHUSETTS
Energy Facilities Siting Board

In the Matter of the Petition of Fore River Development, LLC for Approval to Construct a Bulk Generating Facility in in the Town of Weymouth, Massachusetts	)))))	EFSB 98-7C

FINAL DECISION
PROJECT CHANGE

Selma Urman
Presiding Officer
September 18, 2006

On the Decision:
Barbara Shapiro
William Febiger

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TABLE OF CONTENTS

LIST OF ABBREVIATIONS

Abbreviation	Explanation
Algonquin	Algonquin Gas Transmission Company
Alternative Fuel Plan	Applicant's proposal to increase number of days of oil burning and to use different type of oil
BACT	Best available control technology
Berkshire Compliance Decision	Berkshire Power Decision on Compliance, 7 DOMSB 423 (1997)
CO	Carbon monoxide
CO_2	Carbon dioxide
Company	Fore River Development, LLC
Conditional Air Permit	MDEP Conditional Major Comprehensive Plan Approval/Prevention of Significant Deterioration Permit
EFSB	Energy Facilities Siting Board
EPA	United States Environmental Protection Agency
Final Decision	Sithe Edgar Development LLC, 10 DOMSB 1 (2000)
Fore River	Fore River Development, LLC
gpd	Gallons per day
ISO-NE	Independent System Operator-New England
LSD	Low sulfur diesel fuel
MDEP	Massachusetts Department of Environmental Protection
mgd	million gallons per day
mmBtu	million British thermal units
MW	Megawatt
NOx	Nitrogen oxides
NPDES	National Pollution Discharge Elimination System
PM	Particulates
PM-10	Fine particulates of 10 microns or less

ppm	Parts per million
PSD	Prevention of significant deterioration
Sithe Edgar	Sithe Edgar Development, LLC
Sithe Mystic	Sithe Mystic Development, LLC
Siting Board	Energy Facilities Siting Board
SO_2	Sulfur dioxide
SOx	Sulfur oxides
Town	Town of Weymouth
tpy	Tons per year
ULSD	Ultra-Low Sulfur Diesel Oil
VOC	Volatile Organic Compound

The Energy Facilities Siting Board hereby APPROVES, subject to conditions, changes to the Fore River Development project as further described below.

I. INTRODUCTION

On February 10, 2000, the Energy Facilities Siting Board ("Siting Board") conditionally approved the petition of Sithe Edgar Development LLC[1] to construct a natural gas-fired combined-cycle, electric generating facility with a net nominal electrical output of 775 megawatts ("MW") in the Town of Weymouth, Massachusetts ("Town"). Sithe Edgar Development LLC, 10 DOMSB 1 (2000) ("Final Decision"). The Siting Board approved, inter alia, the use of low sulfur diesel oil ("LSD") as backup fuel, and referenced the Company's plan to seek a Massachusetts Department of Environmental Protection ("MDEP") permit for facility operations that included backup oil firing limited to 720 hours per year or 30 days per year during periods of gas curtailment. Final Decision at 39. To date, oil firing has not yet been commissioned at the Fore River facility (Exh. PC-AFP-1, at 4).

On April 14, 2006, Fore River filed a notice of project change with the Siting Board ("April 14, 2006 Filing")[2] seeking to increase the number of days Fore River could burn oil at the facility while using ultra-low sulfur diesel oil ("ULSD") ("Alternative Fuel Plan") (Exh. PC-AFP-1, at 4). Under the Alternative Fuel Plan, the facility would use ULSD instead of LSD as a backup fuel, when ULSD is available, and there would be no explicit limit on the number of hours of oil-firing so long as the existing maximum levels in the MDEP air permit are met (id.).[3]

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1 The Siting Board notes that since the issuance of the Final Decision, the ownership of the subject facility has changed twice. In November 2002, Sithe Edgar Development, LLC transferred ownership of the facility to Exelon Fore River Development, LLC. Thereafter, on January 2004, Fore River Development, LLC ("Fore River" or "Company") became the owner of the facility.

2 The Company's April 14, 2006 Filing of Notice of Project Change is hereby marked for identification and moved into evidence as Exh. PC-AFP-1.

3 LSD is fuel oil that does not exceed a 0.05% sulfur content by weight; ULSD is fuel oil that has less than 6% of the sulfur content of LSD (Exh. PC-AFP-1, at 3, 5). The Company noted that the availability of ULSD, especially in the near term, is dependent on the ULSD producer's ability to meet the new emission regulatory requirements, as well as the changing market demand (id. at 4).

A. Procedural History

The Company filed responses to eight information requests issued by Siting Board staff.[4] Although the Siting Board afforded parties to the proceeding an opportunity to file comments and issue information requests regarding the proposed project change, no party filed comments or information requests. The Siting Board did not conduct an evidentiary hearing in this proceeding.

B. Scope of Review

In its approval of the original project, the Siting Board required the owner to notify it of any changes other than minor variations to the proposal as presented to the Siting Board, so that it might decide whether to inquire further into such issues. Final Decision at 150-151. The standard of review to determine whether further inquiry is warranted was articulated by the Siting Board in the Berkshire Power Decision on Compliance ("Berkshire Compliance Decision") 7 DOMSB 423, at 437 (1997). In the Berkshire Compliance Decision, the Siting Board declined to make further inquiry regarding certain project changes if the change did not alter in any substantive way either the assumptions or conclusions reached in its analysis of the project's environmental impacts in the underlying proceeding. Id.; see also IDC Bellingham LLC Decision on Compliance, 11 DOMSB 27, at 38-39 (2000).

In the present case, the Siting Board notes that the parameters for use of oil as a secondary fuel under the proposed Alternative Fuel Plan differ from those used by the Siting Board in the Final Decision. In the Final Decision, the Siting Board based its approval on the assumption that oil would be used as a backup fuel for a maximum of 30 days annually during periods of gas curtailment (and more likely the use of oil for 10-20 days annually) Final Decision at 38-39. Under the Alternative Fuel Plan, the assumption of a 30 day annual maximum use of oil is no longer applicable, since the Company now proposes to use oil as a backup fuel for periods expected to total up to 60 days annually. Accordingly, the Siting Board finds that further inquiry is necessary in order to determine whether Siting Board should approve the proposed project change, and if so, to determine whether: (1) additional mitigation is required regarding potential increases in environmental impacts; and (2) a re-balancing of such impacts with reliability and diversity of supply is needed.

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[4] The Company's responses to the Siting Board's information requests are hereby marked for identification and moved into evidence as Exh. EFSB-AFP-1 through Exh. EFSB-AFP-8.

II. ANALYSIS OF PROJECT CHANGES

A. Purpose of Project Change

The Company asserted that the Alternative Fuel Plan would allow the Company to operate more reliably in a regional electricity market which has changed dramatically since the Siting Board approved the facility in 2000 (Exh. PC-AFP-1, at 2). Specifically, the Company stated that the proposed change would: (1) allow the facility to operate more often and more reliably; (2) help New England address concerns relative to reliability and fuel diversity; and (3) reduce the environmental impacts associated with the emissions of sulfur dioxide and likely other pollutants at the Fore River facility (id.). The Company asserted that it would not be economical for Fore River to operate on oil for only those limited instances when natural gas is curtailed (id.). Fore River emphasized that it must have the flexibility to operate on oil when economic to do so, consistent with the strict emission limits imposed on the facility by MDEP (id. at 5).

The Company noted that developing a plan for burning oil when it is economic to do so would help ISO-NE and the region address pressing near-term reliability issues (Exh. EFSB-AFP-3). The Company provided an interim report prepared for ISO-NE that addressed the critical role that dual-fuel facilities fulfill in enhancing system reliability (the "Dual-Fuel Report") (Exh. EFSB-AFP-6).

In the underlying decision, the Company stated that it would seek a permit from MDEP to burn oil as a backup fuel for a maximum of 30 days annually during periods of gas curtailment (up to 720 hours annually). Final Decision at 33. The Company indicated that while it could not predict the exact numbers of days that it would operate on oil in an average year, it expected to use oil for 10 to 20 days in an average year, based on the number of days below 25 degrees Fahrenheit. Final Decision at 22. The Company stated that it based its decision to seek a permit allowing the use of oil as a backup fuel upon a number of factors including: (1) its inability to obtain a 365-day firm gas supply from Algonquin Gas Transmission Company ("Algonquin"); (2) its ability to minimize the air quality impacts of oil; (3) the need for fuel diversity; and (4) the location of the facility in a port area.[5] Id. at 33-34. In the Final Decision, the Siting Board noted that the air permit Sithe Edgar proposed to seek from MDEP would allow the facility to burn oil as a backup fuel during periods of gas curtailment for a maximum of 30 days annually, with a restriction limiting its use of oil to periods outside of the summer ozone season. Id. at 38. On

[5] In the underlying proceeding, the Company provided a copy of its agreement with Algonquin which provides that gas supplies are guaranteed for 335 days. Final Decision at 33.

balance, the Siting Board concluded that the air quality and limited traffic benefits that would be associated with eliminating oil firing would be outweighed by the costs and potential environmental impacts either of obtaining a 365-day supply of natural gas, or of shutting down the proposed facility when gas is unavailable. Id. Consequently, the Siting Board found that Sithe Edgar's proposal to seek a permit to burn oil as a backup fuel during periods of gas curtailment for a maximum of 30 days annually minimized environmental impacts consistent with minimizing the cost of mitigation, control and reduction of such impacts. Id. at 39.

On May 5, 2000, the MDEP issued the Conditional Major Comprehensive Plan Approval/Prevention of Significant Deterioration Permit ("Conditional Air Permit") that allowed the facility to burn up to 29,074,350 gallons of transportation distillate fuel oil that did not exceed 0.05% sulfur content per rolling 12-month period (Exh. PC-AFP-1, at 3).[6] The Company stated that under the Alternative Fuel Plan, oil operations would be restricted based on actual measured emissions compared to calculated oil firing emission allotments, rather than the limit of 29,074,350 gallons of LSD oil imposed by the MDEP in 2000 (id. at 6). Therefore, the Company explained, the most restrictive pollutant would limit the amount of oil that could be fired; as soon as the first 12-month oil-fired emission limit is reached for a single pollutant, oil firing would cease (id.). On March 20, 2006, MDEP issued a Final Air Permit that incorporated the terms contained in the Alternative Fuel Plan. (Exh. PC-AFP-1, at Att. 2).[7]

The Company asserted that the Alternative Fuel Plan would result in a reduction in air emissions compared to the emissions limits approved by the Siting Board (Exh. PC-AFP-1, at 5). Fore River noted that the use of ULSD oil would decrease sulfur dioxide (SO_2) emissions due to its lower sulfur content (id.). In addition, the Company stated that there will be no increases in any other pollutants and there may well be decreases (id.). Based on the emission limits permitted by MDEP, the "worst case" amount of oil that can be burned in any year is estimated to be two times the 29,074,350 gallon value, or 58,148,700 gallons, which is equivalent to 60 days

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6 For the facility as originally proposed, the MDEP issued a single approval covering both state and federal requirements. However, on March 3, 2003 Massachusetts returned delegation of federal Prevention of Significant Deterioration ("PSD") review authority to the Environmental Protection Agency ("EPA") (Exh. PC-AFP-1, at 7). Fore River filed a request with the EPA on March 31, 2006 for a modification of its PSD permit consistent with the provisions of the Alternative Fuel Plan (id.). As of September 6, 2006, the EPA had not issued a notice of the permit modification.

7 Both the Conditional and Final Air Permits contain a restriction which prohibits oil firing between May 1 and September 30 (the summer ozone season) during each year. The Final Decision relied on this assumption in developing its analysis. The Alternative Fuel Plan does not affect this restriction.

per year full load (Exh. EFSB-AFP-2). This comports with the established limits in tons per year ("tpy") contained in the Conditional and Final Air Permits issued by MDEP for the following criteria pollutants: oxides of nitrogen (NO_x), SO_2, particulate matter (PM), carbon monoxide (CO) and volatile organic compounds (VOC) (Exh. PC-AFP-1, at 6). The Company stated that under the Alternative Fuel Plan, the emissions of criteria pollutants other than SO_2 will be the same as or/less than the annual emissions approved for use with 29,074,350 gallons of oil (Exh. EFSB-AFP-4).

Fore River explained that in order to maintain the same emission levels (or lower) as approved by the MDEP in the Conditional and Final Air Permits, while burning more oil with a lower sulfur content, the Alternative Fuel Plan relies on improved emission rates associated with the facility equipment (Exhs. EFSB-AFP4; EFSB-AFP-5). With regard to sulfur content, the Company indicated that ULSD was not available in the U.S. market at the time of the BACT analysis for the original air permit (Exh. EFSB-AFP-5). For NOx, the Final Air Plan Approval permitted an emission rate of 6 parts per million ("ppm") on oil, however, the actual emission rate from ULSD oil is expected to be in the 3-4 ppm range (Exh. AFP-4). Further, the actual emission rates, versus the permitted emission rates, for CO, VOC and PM-10 are expected to be on the order of 50% or less than the MDEP approved ppm or lb/MMBtu emission rates for pollutants firing on oil (id.). The Company explained that the CO and VOC reductions can be realized by a combination of enhanced combustor performance as well as the oxidation catalyst, where the PM-10 is attributable to a combination of enhanced combustor performance and lower sulfur content (id.).

Upon request of the Siting Board, the Company provided data which detailed the MDEP allowable oil-fired emission rate, and the anticipated achievable oil-fired emission rates for both LSD and ULSD (Exh. EFSB-AFP-5). Based on these rates, the Company calculated the emissions in tons per year for the three categories – allowed by MDEP for 30 days, anticipated achievable if using LSD for 30 days, and anticipated achievable if using ULSD for 60 days (see Table 1, below) (id.). The data showed that the anticipated oil-fired emission rates for both LSD and ULSD were lower for all pollutants than what was permitted by MDEP in the Conditional and Final Air Permits (Exh. EFSB-AFP-5). Specifically, while all emission rates were lower than the MDEP permitted rates, two differed depending on whether ULSD or LSD was used; SO_2 and PM-10 were lower under ULSD, while NO_x, VOC and CO had the same emission rate under both ULSD and LSD (id.).

TABLE 1

	SO_2	PM-10	NOx	CO	VOC
MDEP Allowable Oil-Firing Emission Rate (lb/MMBtu)	0.0522	0.05	0.0233	0.0166	0.0095
LSD - Anticipated Achievable Oil-Fired Emission Rate (lb/MMBtu)	0.05	0.04	0.0117	0.005	0.003
ULSD-Anticipated Achievable Oil-Fired Emission Rate (lb/MMBtu)	0.003	0.02	0.0117	0.005	0.003
MDEP Allowable Oil-Firing Emission Rate (tons-30 days)	103	100	50	96	22
LSD - Anticipated Achievable Oil-Fired Emission Rate (tons-30 days)	98.1	78.5	22.9	9.8	5.9
ULSD-Anticipated Achievable Oil-Fired Emission Rate (tons-60 days)	11.8	78.5	45.7	19.6	11.8

Source: Table EFSB-AFP-5-1

Carbon dioxide (CO_2) is not a criteria pollutant and therefore is not regulated by MDEP, nor addressed in either the Conditional or Final Air Permits; however, the Siting Board does have a CO_2 mitigation requirement. Final Decision at 136-140; Nickel Hill Energy, LLC, 11 DOMSB 83, at 143-144 (2000); Dighton Power Associates, 5 DOMSB 193, at 239-240 (1997). In the underlying decision, Sithe Edgar indicated that the proposed facility would emit a maximum of 2,832,351 tpy of CO_2. Final Decision at 35. Here, the Company indicated that the annual maximum potential CO_2 emissions for the facility under the Alternative Fuel Plan for 60 days full load equivalent oil firing is calculated to be 3,089,455 tpy (Exh. EFSB-AFP-2). Therefore, the Company calculated that under the proposed Alternative Fuel Plan, the maximum CO_2 emissions for the Fore River facility are expected to increase by approximately 9% from the level relied on in the underlying decision (id.). In the Final Decision the Siting Board accepted the Company's proposal to offset 1% of the facility's CO_2 emissions using a portion of the CO_2 emission reduction from the Mystic Station Air Quality Improvement Plan. Final Decision at 43. In order to address the additional CO_2 offsets needed by Fore River under the Alternative Fuel Plan, Fore River proposes to conform to the Final Decision by modifying both: (1) the June 2004

Agreement between Mystic and Fore River; and (2) the June 2004 Agreement between Fore River and the Siting Board (id.).

With regard to water use, the Company asserted that the Alternative Fuel Plan would not result in greater water use than the water use plan approved by the Siting Board in the underlying decision (Exh. PC-AFP-1, at 6). The underlying decision relied on water usage numbers where the water usage on oil was projected to be 895,336 gallons per day ("gpd").[8] Final Decision at 55. Here, under the Alternative Fuel Plan, the Company calculated that the anticipated water usage while operating on oil would be 381,181 gpd (Exh. EFSB-AFP-7). The Company explained that the oil projections in the Final Decision were conservative and that the actual oil firing water injection to fuel ratio is lower, which equates to 60% less water use when operating on oil than was originally anticipated (id.).[9] The Company asserted that although the facility would be operating more days on oil under the Alternative Fuel Plan, the actual water use, both daily and in sum, would be less than originally projected in the underlying decision (Exh. PC-AFP-1, at 6).

Finally, with regard to the transportation of oil to the Fore River facility, the Company asserted that the Sprague oil system, which includes unloading, storage and forwarding capabilities is sufficient to accommodate the increased oil use under the Alternative Fuel Plan (Exh. EFSB-AFP-8).[10] The Company explained that while the Final Decision allows the Company to deliver oil on occasion by truck to top off the tanks, that plan is no longer necessary since Sprague is designed to meet the Fore River project's complete oil delivery needs (id.). However, in the event that the Sprague system is not able to provide sufficient oil to the Fore

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8 The water usage on gas was projected to be approximately 46,214 gpd to 129,690 gpd. Final Decision at 44.

9 The original water use numbers were based on data from Siemens-Westinghouse, the originally proposed manufacturer of the combustion turbine (Exh. EFSB-AFP-7). The turbines installed in the Fore River facility are manufactured by Mitsubishi Heavy Industries (id.).

10 In the Final Decision the Company stated that the primary means of distillate oil delivery would be ocean-going tank barges that would hold a maximum of four million gallons of oil at full load operation. Final Decision at 95. In addition, the Company indicated that while oil delivery would be primarily by barge, it may at times elect to deliver oil via truck to top off the oil storage tank. Id. at 111. On August 24, 2000, the Company filed a project change to eliminate oil delivery by barge to the Fore River facility. On September 25, 2000, the Siting Board approved the Company's proposal to have oil barged and stored at the Sprague Energy Corporation Marine Terminal located across the Fore River and then transported to the Fore River generating facility via a new pipeline constructed by the Company through an existing utility tunnel under the Fore River (August 24, 2000 Filing at 1 and 2). The new pipeline was tested on July 20, 2001 (Exh. EFSB-AFP-8).

River facility and truck delivery would be necessary, the worst-case scenario would be 95 truck deliveries per day (id.).[11] In the underlying decision, the Siting Board directed the Company to minimize traffic impacts associated with any potential oil deliveries made by truck by avoiding peak hour oil delivery. Final Decision at 113.

B. Analysis and Findings

The Company has provided information regarding expected operation of the Fore River facility and associated air emissions and water requirements under the Alternative Fuel Plan, and compared the expected impacts to the corresponding impact amounts set forth in the Final Decision and the air emission limits set by MDEP under the Conditional and Final Air Permits for the project. The information provided supports the Company's assertion that annual air emissions (in tons) as well as air emission rates (in lbs per MMBtu) under the Alternative Fuel Plan would be held to the pre-existing limits permitted by MDEP – maximum amounts that also match those which provided the basis for the Siting Board's analysis in the Final Decision. Similarly, the information provided supports the Company's assertion that water use under the Alternative Fuel Plan would be less than indicated in the Final Decision, both on a maximum daily and annual basis.

The Siting Board notes, however, that in addition to the above-mentioned comparisons to maximum amounts of air emissions and water use set forth in the Final Decision and other applicable permits, comparison of the expected facility emissions and water use under the Alternative Fuel Plan to the actual or currently achievable levels without the project change also is important for our review. The Company has acknowledged that the use of ULSD in lieu of LSD would actually reduce emission rates (in lbs per MMBtu) for only two of the criteria pollutants subject to MDEP limits, SO_2 and PM-10. The emission rates of other criteria pollutants subject to MDEP limits, including NOx, VOC and CO, would be unchanged with use of ULSD. Similarly, the facility's CO_2 emission rate and rate of water use – not subject to limits set by MDEP – would be unchanged with use of ULSD.

In the case of the MDEP-limited air pollutants, the Company explained that for those pollutants unaffected by the choice of fuel oil, i.e., besides SO_2 and PM-10, the flexibility to increase operations on oil to more than 30 days, while remaining within the permitted annual limits (tpy) from oil-fired operations, may well depend on the actual or currently achievable emission rates for these pollutants already being below the permitted limits. Further, the

[11] In the underlying decision, the Company indicated that the worst case scenario would be 100 truck trips per day. Final Decision at 111.

Company's analysis has confirmed that such differences between the permitted emission rates and the actual or currently achievable emission rates in fact exist. Therefore, the Siting Board further evaluates the project change with respect to its effect on air emissions, compared to both the permitted emission levels and the actual or currently achievable emission levels from the facility.

As mentioned, the use of ULSD in lieu of LSD consistent with the Alternative Fuel Plan would result in actual reductions in SO_2 and PM-10 emission rates. Compared to currently achievable emissions based on use of LSD, the proposed use of ULSD would reduce emission rates by 94% for SO_2 and 50% for PM-10. Further, compared to pre-existing limits set by MDEP for oil-fired operation, emission rates with use of ULSD would be lower than the maximum permitted levels by 94% for SO_2 and 60% for PM-10. See Table 2, cols. 2, 3 and 4.

Thus, assuming some periods of oil-fired operation with or without the proposed project change, the use of ULSD in lieu of LSD during such periods would significantly reduce the rate of contribution of SO_2 and PM-10 from the facility to ambient air quality. Specifically, the rates of contribution to ambient air quality would be below currently achievable levels with use of LSD, as well as below the levels corresponding to previously permitted oil-fired emission rates. Such reductions potentially would improve air quality in the project area during oil-fired operations, as may be determined for short-term averaging periods MDEP uses to predict or monitor air quality.[12]

However, as indicated in the Alternative Fuel Plan, the facility may operate on oil for additional days over 30 days, an option not considered by the Siting Board in the underlying decision. Assuming dispatch and operation of the facility remain the same in all other respects, the project change thus would result in use of oil in lieu of gas on any such additional days of oil-fired operation. Based on maximum permitted emission rates applicable to operation on gas, oil-fired operation would entail higher air emissions than gas-fired operation for all criteria pollutants, even with use of ULSD. See Table 2, cols. 1 and 4.

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12 MDEP uses average concentrations over 24-hour and 3-hour periods for SO_2, and over 24-hour periods for PM-10. Final Decision at 153.

TABLE 2

lb/MMBtu	Gas Permitted	Oil Permitted	Actual LSD	Actual ULSD
SO_2	0.0023	0.0522	0.05	0.003
PM-10	0.011	0.05	0.04	0.02
NOx	0.0074	0.0233	0.0177	0.0177
CO	0.0045	0.0166	0.005	0.005
VOC	0.0013/0.0022 unfired/duct-fired	0.0095	0.003	0.003

Source: Table EFSB-AFP-5-1; Exh. EFSB-PC-AFP-1, Att. 2.

Therefore, for all criteria pollutants, the possible substitution of oil-fired operation for gas-fired operation consistent with the Alternative Fuel Plan would have the potential to increase annual emissions from combined oil-fired and gas-fired operations. In the case of criteria pollutants for which emissions are the same with use of LSD and ULSD, including NOx, VOC and CO, substitution of oil-fired operation for gas-fired operation on at least some days of the year (i.e., corresponding to any additional days of oil-fired operation beyond the previously allowed limit of 30 days), with other operating parameters remaining unchanged, would result in a clear increase in annual emissions.

In the case of criteria pollutants for which air emissions are lower with use of ULSD in lieu of LSD, including SO_2 and PM-10, implementation of the Alternative Fuel Plan would result in a lowering of annual emissions to the extent operation on ULSD is substituted for operation on LSD, but an offsetting raising of annual emissions to the extent oil-fired operation is substituted for gas-fired operation. The Siting Board notes that, for two reasons, the specific net effect of these offsetting changes on expected annual emissions of SO_2 and PM-10 cannot be determined based on this record. First, expected actual or currently achievable emissions from gas-fired operation, as opposed to maximum permitted emissions, have not been identified.[13] Second, it is

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[13] The "gas permitted" emission rates in Table 2 represent the maximum allowable emissions during gas-fired operation based on the Final Air Permit, which may be greater than the actual or currently achievable emissions. As with the identified achievable emission rates for oil-fired operation, it is reasonable to expect that due to improved facility operation and conservative permitting assumptions, the actual or currently achievable emission rates for gas-fired operation are also lower than the MDEP permitted (continued...)

unclear whether oil-fired operation under the Alternative Fuel Plan would include use of ULSD only, or include use of LSD for some period of oil-fired operation because ULSD is not available during that period.[14]

Annual emissions thus would increase as a result of the project change for three of the criteria pollutants, and may increase or decrease for the remaining two pollutants; however, as mentioned, none of the previously set MDEP emission limits for these pollutants would either be changed or exceeded. The Siting Board also notes that two of the three pollutants that are expected to show clear annual increases, NOx and VOC, are of concern primarily as pre-cursors of ozone conditions, especially during warmer summer periods when ozone levels are highest. All oil-fired operation and thus any increase in annual emissions attributable to such operation would be limited to outside the ozone season, minimizing the significance of the additional annual emissions for those pollutants.

In the case of CO_2, which is not subject to MDEP limits, the record shows annual emissions would increase by 9% under the Alternative Fuel Plan, based on the Company's assumption of a maximum of 60 days of oil-fired operation. The Company will provide CO_2 offsets consistent with the Siting Board's mitigation requirements. While such offsets then would increase proportionately, so would the remaining amount of annual emissions net of this required offset amount. Therefore, the Siting Board directs Fore River to submit by November 1, 2006 modified agreements between Mystic and Fore River; and between Fore River and the Siting Board that incorporate the additional CO_2 offsets needed by Fore River under the Alternative Fuel Plan..

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13 (...continued)
rates. Therefore, Table 2 may overstate any apparent benefits of burning ULSD over gas and understate the benefits of burning gas over ULSD.

14 Assuming ULSD is substituted for LSD in all oil-fired operation under the Alternative Fuel Plan, the record does provide sufficient information to show that based on a maximum of 60 days of such operation with no other changes in dispatch or operation of the facility, the removal of the 30-day limit on oil-fired operation would result in no increase in maximum annual emissions for either SO_2 or PM-10, even if emissions from the displaced gas-fired operation would have been zero. In the case of SO_2, annual emissions would be lower because the emission rate with use of ULSD would be less than half that which would have occurred with use of LSD, while the maximum duration of oil-fired operation over the year would at most be double that which previously would have been allowable. For PM-10, annual emissions would be either the same or lower because the emission rate with use of ULSD would be exactly half that with use of LSD, while again the maximum duration of allowable oil-fired operation would be no more than double.

In the case of water use, the daily requirements for oil-fired operation would be the same regardless of implementation of the Alternative Fuel Plan, amounting to 381,181 gpd with use of ULSD or LSD. To the extent oil-fired operation is substituted for gas-fired operation, the rate of water use during such operation would be several times the level required to operate on gas which is 46,214 gpd to 129,690 gpd. Based on the Company's assumption of a maximum of 60 days of oil-fired operation, the maximum annual water use would increase by approximately 14% to 37 % under the Alternative Fuel Plan.[15]

Similar to the criteria air pollutants discussed above, however, maximum facility water use under the Alternative Fuel Plan would remain lower than the expected levels in the underlying decision, which were based on a usage rate of 895,336 gpd. The difference reflects a lower actual or currently achievable ratio of water to fuel oil injection attributable to an earlier change in turbine vendors, not the proposed use of ULSD or any other provision of the Alternative Fuel Plan. The Siting Board also notes that to the extent water use actually would be higher than currently achievable levels, as a result of the project change, the increases in water use would occur outside seasonal drought periods in summer and early fall.

With regard to the transportation of oil to the Fore River facility, the implementation of the Alternative Fuel plan does not affect the reliability of the Sprague oil delivery system to be used for the facility, previously approved by the Siting Board. In addition, the Company no longer intends to use delivery of oil by truck as a component of the Fore River oil transportation plan.

Overall, the project change would result in changes in environmental impacts with respect to air quality and water use. With the exception of CO_2, all expected air quality and water use impacts with the proposed project change would remain within maximum levels identified in the Final Decision, as well as all previously set MDEP emission limits for the criteria air pollutants. In the case of CO_2, maximum annual emissions would be greater than previously approved, and the Company would provide additional CO_2 offsets for the added amount of such emissions consistent with the Siting Board's offset requirement.

Compared to actual or currently achievable level of impacts from oil firing at the facility, effects of the project change would be mixed, including a number of both increases and decreases in impacts as described above. Maximum emissions of SO_2 and PM-10 for short-term periods, expected when the facility operates on oil, would be substantially lower based on the proposed

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15 For 60 days on oil the average annual water use at gpd could potentially be: (46,214 to 129,690*305) + (381,181*60)/365 = 101,277 gpd to 171,031 gpd; for 30 days on oil the average annual water use at gpd would be: (46,214 to 129,690*335) + (381,181*30)/365 = 73,746 gpd to150,360 gpd.

substitution of ULSD for LSD when ULSD is available. At the same time, annual air emissions would be higher for NOx, VOC and CO, as well as for CO_2, and would be higher or lower for SO_2 and PM-10, based on the proposed removal of the 30-day limit for oil-fired operation and assuming the facility actually operates on oil for over that limit up to as much as 60 days. Annual water use also would be higher with additional days of oil-fired operation.

As itemized above, the environmental indicators that show potential increases in impact as a result of the project change appear to outnumber those that show potential decreases. In addition, the proposed use of ULSD – on which the potential decreases in environmental impacts depend – is to be on an as-available basis. We note however, that as perhaps the most significant changes in expected impact, the proposed use of ULSD if available indeed would result in substantially lower maximum rates of SO_2 and PM-10 emissions. In addition, the proposed emissions of NOx and VOC, while higher on an annual basis assuming added days of oil-fired operation, would reflect increases actually occurring only outside the ozone season. Similarly, increases in water use with added days of oil-fired operation would occur outside seasonal drought periods. Thus, the proposed project change has the potential to provide environmental benefits that fully balance its adverse impacts.

Accordingly, the Siting Board finds that the project change likely would result in mixed changes in environmental impacts, including both increases and decreases in various air quality and water use impacts, and at the same time would result in modified environmental impact levels that largely would be consistent with maximum levels and constraints identified in the Final Decision.

In addition, based on the information in the Dual-Fuel Report, the project change would provide enhanced access to a diverse source of fuel to meet the region's needs for reliable and low cost energy. The Dual-Fuel Report sets forth the importance of increasing the generating capacity that can be operated on oil when gas supplies are constrained. Based on information provided by the Company, the project change would provide it with greater flexibility to operate on oil, and therefore may allow the plant to be dispatched more often when gas supplies are constrained or high priced. The Siting Board therefore finds that the project change has the potential to result in a more reliable energy supply, and a more diverse energy supply, for Massachusetts and the region.

On balance, the Siting Board concludes that any air quality and water impacts that would be associated with the Alternative Fuel Plan would be outweighed by the likely reliability and diversity benefits of implementing the Alternative Fuel Plan.

The Siting Board notes that the request of Fore River regarding the substitution of ULSD oil for LSD oil, and the associated increase in days on oil backup, is an issue that has not been

previously addressed by the Siting Board. Our analysis has shown that, while the Company's request is based in part on use of ULSD, the availability of this less polluting fuel is not entirely certain. In addition, given the complexity of the regional electricity market, the actual extent of necessary operation on oil is uncertain. The Siting Board therefore considers it important to develop a broad-based understanding of actual operation of dual fuel capability achievable with the Alternative Fuel Plan, and its effect on system reliability and fuel diversity. Therefore, the Siting Board directs the Company to submit an annual report for three years, starting on June 1, 2007, that documents for the preceding twelve months: (1) the number of days that the Fore River facility has run on oil, broken out by ULSD and LSD if applicable; and (2) the number of days that Fore River has run on gas. Each annual report should also include a narrative describing any constraints to operating on gas and oil, such as cost considerations, equipment/operating problems, supply availability, and /or transportation interruptions.

Accordingly, the Siting Board finds that, with the implementation of the above conditions, the environmental impacts of the proposed facility would be minimized.

The Siting Board further finds that, upon compliance with the above conditions, the Company's plans for implementation of the Alternative Fuel Plan would minimize the environmental impacts of the proposed facility consistent with the minimization of costs associated with the mitigation, control, and reduction of the environmental impacts of the proposed generating facility.

III. DECISION

Consistent with the Siting Board's directive to Fore River to inform the Siting Board of any changes to Fore River's proposed project, other than minor variations, Fore River has informed the Siting Board of one such change – a change in the number of days that oil can be burned as a back-up fuel and the sulfur content of the oil that would be burned.

The Siting Board found that further inquiry was warranted to evaluate whether additional mitigation is required regarding potential increases in environmental impacts, and to determine whether a re-balancing of such impacts with reliability and diversity of supply is needed. After conducting such inquiry above, the Siting Board found that, with the implementation of the following Conditions U and V, the environmental impacts of the proposed facility would be minimized.

Condition U

The Siting Board directs Fore River to submit by November 1, 2006 modified agreements between Mystic and Fore River; and between Fore River and the Siting Board that incorporate the additional CO_2 offsets needed by Fore River under the Alternative Fuel Plan.

Condition V

The Siting Board directs the Company to submit an annual report for three years, starting on June 1, 2007, that documents for the preceding twelve months: (1) the number of days that the Fore River facility has run on oil, broken out by ULSD and LSD if applicable; and (2) the number of days that Fore River has run on gas. Each annual report should also include a narrative describing any constraints to operating on gas and oil, such as cost considerations, equipment/operating problems, supply availability, and /or transportation interruptions.

Accordingly, the Siting Board finds that, upon compliance with Conditions U and V, as set forth in Section II.B, above, the Company's plans for implementation of the Alternative Fuel Plan would minimize the environmental impacts of the proposed facility consistent with the minimization of costs associated with the mitigation, control, and reduction of the environmental impacts of the proposed generating facility.

Findings in this decision are based upon the project change information provided by the Company examined in light of findings the Siting Board made in the Final Decision. Since the project changes outlined in this decision pertain to the facility approved by the Siting Board in the underlying proceedings, the Company must construct and operate its facility in conformance with its proposal presented in the underlying proceeding and in earlier compliance and project change filings; the only additional modifications permitted are those set forth in this decision.

The Siting Board requires the Company 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 is obligated to provide the Siting Board with sufficient information on changes to the proposed project to enable the Siting Board to make these determinations.

Selma Urman
Presiding Officer

Dated this 18th day of September, 2006

APPROVED by the Energy Facilities Siting Board at its meeting of September 18, 2006, by the members and designees present and voting: Judith F. Judson (Chairman, DTE/EFSB), David L. O'Connor (Commissioner, Division of Energy Resources); Philip Griffiths, (for Robert W. Golledge, Jr. (Secretary of Environmental Affairs); and Enrique Perez (for Ranch Kimball, Secretary of Economic Development).

Judith F. Judson, Chairman
Energy Facilities Siting Board

Dated this 18th day of September, 2006

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).