Table 1.2-1

List of Required Permits and Approvals for the Project

Agency	Jurisdiction	Permit Description	ID Number	Date Applied	Date Approved
FEDERAL					
Department of Interior - Minerals Management Service	Outer Continental Shelf	Lease, Easement or Right-of-way Under Sec. 8 of the OCS Lands Act		9/14/05	
Council on Environmental Quality, National Environmental Policy Act (NEPA)	NEPA jurisdiction is over the entire project	USACE Draft Environmental Impact Statement	(Formerly USACE NAE-2004-338-1)	November 2004	
		MMS Draft Environmental Impact Statement		January 2008	
		Final Environmental Impact Statement		To be filed	
		Record of Decision		Pending	
United States Army Corps of Engineers	Rivers and Harbors Act Section 10 jurisdiction is for work in navigable waters of the United States; Clean Water Act Section 404 jurisdiction is for work in waters of the United States and wetlands located within the 3-mile limit.	Individual Permit – Section 10/Section 404	USACE NAE-2004-338-1 (formerly 200102913)	11/22/01	
United States Environmental Protection Agency (USEPA)	USEPA jurisdiction is on the upland component of the Project and under the Clean Air Act for emissions and for NEPA (Section 309) review	National Pollutant Discharge Elimination System (NPDES) General Stormwater Permit		To be filed	
	Outer Continental Shelf	40 CFR Part 55 Air Permit for OCS Sources		12/7/07	
Federal Aviation Administration	Structures exceeding 200 feet into navigable airspace	Notice of Proposed Construction or Alteration Form (FAA Form 7460-1)	Aeronautical Studies #2006-ANE-1078-OE through 2006-ANE-1207-OE	9/27/06	Pending
US Coast Guard	Structures located in navigable waters of the U.S.	Permit to Establish and Operate a Private Aid-to-Navigation to a Fixed Structure		To be filed	

Table 1.2-1

List of Required Permits and Approvals for the Project

Agency	Jurisdiction	Permit Description	ID Number	Date Applied	Date Approved
STATE					
Massachusetts Environmental Policy Act (MEPA)	Jurisdiction is within three-mile state territorial seas limit	Environmental Notification Form (ENF)	12643	11/15/01	4/22/02
		Draft Environmental Impact Report (DEIR)		11/15/04	3/3/05
		Notice of Project Change (NPC)		6/30/05	8/8/05
		Final Environmental Impact Report (FEIR)		2/15/07	
		Issuance of Certificate			3/29/07
Massachusetts Energy Facilities Siting Board (EFSB)	Jurisdiction is within three-mile state territorial seas limit	Petition to Construct Jurisdictional Facilities	EFSB 02-2	9/17/02	5/11/05
		Approval under G.L. c. 164, § 69J			
		Approval under G.L. c. 164 § 72	D.T.E. 02-53	11/19/07	5/2/08
Massachusetts Department of Environmental Protection (MADEP) – Wetlands and Waterways Regulation Program	Jurisdiction is within three-mile state territorial seas limit	Chapter 91 Waterways License	W08-2480	10/6/08	
		MADEP Water Quality Certification	W133633	11/2/07	8/15/08
		Superceding Order of Conditions		To be filed, if required	
Massachusetts Coastal Zone Management (MCZM)	State jurisdiction is within the three-mile limit under the Coastal Zone Management Act (CZMA). Federal Consistency Review jurisdiction is three mile limit and specific activities beyond three miles that may affect Massachusetts Coastal Zone	Concurrence with Federal Consistency Certification Statement		The CZM Review is currently being coordinated	
Massachusetts Ocean Sanctuaries Act Department of Environmental Management	Jurisdiction is within three-mile state territorial seas limit	Regulatory Review		ongoing	
Massachusetts Highway Department (MHD)	Jurisdiction is within 3-mile limit	Permit to Access State Highway and Access Agreement	5-2008-0246	11/1/07	7/22/08
Massachusetts Executive Office of	Jurisdiction is within 3-mile limit	License/Permit Approval for Use and Occupancy		11/2/07	

Table 1.2-1

List of Required Permits and Approvals for the Project

Agency	Jurisdiction	Permit Description	ID Number	Date Applied	Date Approved
Transportation (EOT)					
State Historic Preservation Officer (SHPO)	Invited to participate as a cooperating agency, to provide comments to MMS under National Historic Preservation Act.	Regulatory Review		ongoing	
Massachusetts Historical Commission (MHC): State Archaeologist	Jurisdiction is within three-mile state territorial seas limit	Permit for Upland Reconnaissance Archaeological Survey	2246	3/12/03	3/28/03
		Permit for Upland Intensive Archaeological Survey	2595	9/18/03	9/23/03
REGIONAL					
Cape Cod Commission	Jurisdiction is within three-mile state territorial seas limit	Development of Regional Impact (DRI) Review	JR#20084	11/15/01	
		Issuance of DRI			Procedural Denial 10/18/07
LOCAL					
Yarmouth Conservation Commission	Jurisdiction is within three-mile state territorial seas limit	Notice of Intent		11/15/07	
		Issuance of Order of Conditions			
Barnstable Conservation Commission	Jurisdiction is within three-mile state territorial seas limit	Notice of Intent		11/15/07	
		Issuance of Order of Conditions			
Yarmouth Department of Public Works (DPW)	Jurisdiction is within three-mile state territorial seas limit	Street Opening Permit and Request for Transmission Line Location		11/13/03	
Barnstable DPW	Jurisdiction is within three-mile state territorial seas limit	Street Opening Permit and Request for Transmission Line Location		To be filed	

Table 3.2.1-1

Physical Screening and Economic Modeling Results

Site	No-Action Alternative	Alternatives that Meet Physical Siting Criteria and are Economically Comparable			Non-Geographic Alternatives that are Economically Comparable			Alternatives not selected for further environmental analysis due to Physical Siting Constraints and or Cost						
		Proposed Action at Horseshoe Shoal	**South of Tuckermuck Island**	**Monomoy Shoals**	**Phased Development a/**	**Smaller Project**	**Condensed Array a/**	**Block Island b/**	**Cape Ann b/**	**Boston Outer Harbor b/**	**Portland Outer Harbor b/**	**Nantucket Shoals**	**Phelps Bank**	**Nauset**
Cost of Energy ($/kwh) c/	NA	$0.128	$0.148	$0.209	NA	$0.159	NA	$0.137 c/	$0.155 c/	$0.217 c/	$0.228 c/	$0.240	$0.288	$0.301
Energy Capture (MWh/year/ 130WTGs)	NA	1,608,600	1,688,000	1,172,700	NA	804,300	NA	1,610,900	1,515,800	1,600,300	1,430,300	1,046,100	1,035,200	1,184,100
Capacity Factor	NA	39.24%	41.17%	28.60%	NA	39.24%	NA	39.29%	36.97%	39.04%	34.89%	25.52%	25.25%	28.88%
Physical Site Screening Criteria d/														
Water depth > 100 feet (30 meters)									X	X	X		X	X
Extreme storm wave (ESW) height > 20 feet (6.1 meters) high in 50 feet (15.2 meters) of water depth);			X	X				X	X	X	X	X	X	X
Areas with rock or bedrock near surface								X	X	X	X			
Distance to onshore transmission system > 31 miles (50 kilometers)												X	X	
The availability of technology to develop the site (development of floating platform technology for use in water depths > 150 feet (45 meters) is beyond the milestones scheduled for project development).										X	X			X

NA = Not Available
a/ Economic issues with respect to Phased Development and Condensed Array Alternative are discussed in Section 3.
b/ Economic model does not take into account added costs associated with construction of a foundation in rocky areas and or installation of interconnecting lines in rocky areas and is not representative of complete project costs.
c/ Results from the MMS analysis, which were calculated with cost estimates that wind energy developers might rely upon today, should not be construed as a profitability forecast intended to either endorse or condemn the action proposed by the applicant. Economic conditions will continue to evolve over time, changing the outlook for the project.
d/ Physical Siting Criteria whereby sites were not selected for further environmental analysis.

Table 3.3.3-1

Coordinates Bounding Alternative Location Areas

	Lat.	Long.
Portland, ME - Outer Harbor		
NW Corner of Box	41d 22' 19"	70d 26' 37"
NE Corner of Box	41d 22' 20"	70d 11' 57"
SE Corner of Box	41d 08' 01"	70d 12' 01"
SW Corner of Box	41d 08' 02"	70d 26' 38"
Cape Ann, MA		
NW Corner of Box	41d 37' 20"	70d 27' 27"
NE Corner of Box	41d 37' 19"	70d 12' 37"
SE Corner of Box	41d 23' 09"	70d 12' 41"
SW Corner of Box	41d 23' 10"	70d 27' 27"
Boston, MA		
NW Corner of Box	42d 31' 32"	70d 40' 22"
NE Corner of Box	42d 31' 32"	70d 25' 12"
SE Corner of Box	42d 17' 07"	70d 25' 13"
SW Corner of Box	42d 17' 06"	70d 40' 20"
Nauset, MA		
NW Corner of Box	42d 00' 39"	69d 46' 13"
NE Corner of Box	42d 00' 28"	69d 24' 09"
SE Corner of Box	41d 51' 11"	69d 24' 19"
SW Corner of Box	41d 51' 21"	69d 46' 19"
Block Island, RI		
NW Corner of Box	41d 28' 49"	71d 24' 18"
NE Corner of Box	41d 28' 55"	71d 09' 36"
SE Corner of Box	41d 14' 36"	71d 09' 27"
SW Corner of Box	41d 14' 30"	71d 24' 06"
Nantucket Shoals		
NW Corner of Box	41d 19' 58"	70d 00' 58"
NE Corner of Box	41d 19' 53"	69d 46' 12"
SE Corner of Box	41d 05' 35"	69d 46' 21"
SW Corner of Box	41d 05' 40"	70d 01' 04"
Monomoy Shoals		
NW Corner of Box	41d 36' 39"	70d 04' 21"
NE Corner of Box	41d 36' 34"	69d 49' 35"
SE Corner of Box	41d 22' 27"	69d 49' 44"
SW Corner of Box	41d 22' 31"	70d 04' 26"
Phelps Bank		
NW Corner of Box	40d 56' 37"	69d 27' 26"
NE Corner of Box	40d 56' 28"	69d 12' 40"
SE Corner of Box	40d 42' 16"	69d 12' 57"
SW Corner of Box	40d 42' 25"	69d 27' 40"
South of Tuckernuck Island		
NW Corner of Box	41d 22' 20"	70d 26' 37"
NE Corner of Box	41d 22' 19"	70d 11' 57"
SE Corner of Box	41d 08' 01"	70d 12' 01"
SW Corner of Box	41d 08' 02"	70d 26' 38"

Table 3.3.5-1

Summary of Impacts for Main Alternatives Relative to Proposed Action

No.	Resource Type	South of Tuckernuck Island Alternative Compared to Horseshoe Shoal Alternative	Smaller Project Alternative Compared to Horseshoe Shoal Alternative	Monomoy Shoals Alternative Compared to Horseshoe Shoal Alternative	Condensed Array Alternative	Phased Development Alternative
1	Regional Geologic Setting	0	0	0	0	0
2	Noise	0	+	0	+(construction)	0
3	Physical Oceanography	0	0	0	0	0
4	Climate & Meteorology	0	0	0	0	0
5	Air Quality	0	+	0	0	-(construction)/-(decommissioning)
6	Water Quality	0	+	0	+(construction)	-(construction)/-(decommissioning)
7	Electrical and Magnetic Fields	0	0	0	0	0
8	Terrestrial Vegetation	0	0	0	0	0
9	Coastal and Intertidal Vegetation	0	0	0	0	0
10	Terrestrial and Coastal Faunas other than Birds	0	0	0	0	0
11	Avifauna	-	+	-	+(construction)/ +(decommissioning)/ -(operation)	-(construction)/-(decommissioning)
12	Subtidal Offshore Resources	-	+	0	+(construction)/ +(decommissioning)	-(construction)/-(decommissioning)
13	Non-ESA Marine Mammals:	-	+ (maintenance expected to be the same amount of impact)	-	+(construction)/ +(decommissioning)	-(construction)/-(decommissioning)
14	Fish and Fisheries	-	+	- (construction)	+(construction)/ +(decommissioning)	-(construction)/-(decommissioning)
15	Essential Fish Habitat	-	+	- (construction)	+(construction)/ +(decommissioning)/ -(operation)	-(construction)/-(decommissioning)
16	Threatened and Endangered Species	0	+	-	+(construction)/ +(decommissioning)/ -(operation)	-(construction)/-(decommissioning)
17	Socioeconomic Analysis Area	0	+ *	0	0	0
18	Urban and Suburban Infrastructure	0	0	0	0	0

Table 3.3.5-1

Summary of Impacts for Main Alternatives Relative to Proposed Action

No.	Resource Type	South of Tuckernuck Island Alternative Compared to Horseshoe Shoal Alternative	Smaller Project Alternative Compared to Horseshoe Shoal Alternative	Monomoy Shoals Alternative Compared to Horseshoe Shoal Alternative	Condensed Array Alternative	Phased Development Alternative
19	Population and Economics	0	0	0	0	0
20	Environmental Justice	0	0	0	0	0
21	Visual Resources	+	+	+	0	-(construction)/-(decommissioning)
22	Cultural Resources	0	-	+ impacts to cultural resources (no difference for undersea historic resources)	0	0
23	Recreation and Tourism	0	0	0	0	-(construction)/-(decommissioning)
24	Competing Uses of Waters and Sea Bed	0	+	0	-	0
25	Overland Transportation Arteries	0	0	0	0	0
26	Airport Facilities	0	0	0	0	0
27	Port Facilities	0	+	0	0	0
28	Communications: EMF, Signals, and Beacons	0	0	0	0	0

Note: The rating system is defined as:
(+) Less impact than the proposed action
(0) No difference to the proposed action
(-) more impact than the proposed action
+(construction) Less impact than proposed action during construction.
-(construction) More impact than proposed action during construction.
-(decommissioning) More impact than proposed action during decommissioning.
+(decommissioning) Less impact than proposed action during decommissioning.
-(operation) More impact than propose action during operation.
* The smaller project would provide less of a positive socio-economic impact

Table 3.3.5-2

Interconnect Cable System Distance From The Monomoy Shoals Alternative Site To The Barnstable Substation

115 kV Cable Length	Total Distance
Electric Service Platform to Barnstable Substation	29.8 miles
Upland cable	5.9 miles
Submarine cable	23.9 miles
Submarine cable Outside of 3-mile limit	2.9 miles
Submarine cable Inside of 3-mile limit	21.0 miles

Table 3.3.6-1

Examples of WTG Grid Spacing for Offshore Wind Parks

Wind Park/Location	Spacing (rotor diameter)			Ratio
Horns Rev/Denmark	7.0	x	7.0	1.0
Nysted/Denmark	10.4	x	5.8	1.8
Kentish Flats/Denmark	7.8	x	7.8	1.0
Barrow/United Kingdom	8.3	x	5.6	1.5
Burbo/United Kingdom	6.7	x	5.0	1.4
North Hoyle/United Kingdom	10.0	x	4.4	2.3
Average	**8.4**	**x**	**5.9**	**1.5**
Cape Wind	**9.0**	**x**	**5.7**	**1.6**

Table 3.3.5-2

Interconnect Cable System Distance From The Monomoy Shoals Alternative Site To The Barnstable Substation

115 kV Cable Length	Total Distance
Electric Service Platform to Barnstable Substation	29.8 miles
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Kentish Flats/Denmark	7.8	x	7.8	1.0
Barrow/United Kingdom	8.3	x	5.6	1.5
Burbo/United Kingdom	6.7	x	5.0	1.4
North Hoyle/United Kingdom	10.0	x	4.4	2.3
Average	**8.4**	**x**	**5.9**	**1.5**
Cape Wind	**9.0**	**x**	**5.7**	**1.6**

Table 3.3.6-2

Distances from Turbines to On-Shore Locations for Condensed Array Alternative

Offshore Distances to Point of Land	Distance to Closest Wind Turbine		
	Proposed Action	Condensed Array Alternative	Change
From Point Gammon	5.2 miles (8.4 km)	5.8 miles (9.4 km)	+0.6 miles (1 km)
From Cotuit	5.6 miles (9 km)	6.3 miles (10.1 km)	+0.7 miles (1.1 km)
From Craigville Beach	6.5 miles (10.5 km)	6.7 miles (10.8 km)	+0.2 miles (0.3 km)
From Great Point	11.0 miles (17.7 km)	12.1 miles (19.5 km)	+1.1 miles (1.8 km)
From Cape Poge	5.5 miles (8.9 km)	6.7 miles (10.8 km)	+1.2 miles (1.9 km)
From Oak Bluffs	9.3 miles (15 km)	10.5 miles (16.9 km)	+1.2 miles (1.9 km)
From Popponessett	4.8 miles (7.7 km)	5.9 miles (9.5 km)	+1.1 miles (1.8 km)
From Wianno	5.0 miles (8.1 km)	5.2 miles (8.4 km)	+0.2 miles (0.3 km)
From Edgartown	9.0 miles (14.5 km)	10.2 miles (16.4 km)	+1.2 miles (1.9 km)
From Nantucket	13.8 miles (22.2 km)	14.6 miles (23.5 km)	+0.8 miles (1.3 km)
From Dry Rocks (offshore near Bishop and Clerks)	3.8 miles (6.1 km)	4.1 miles (6.6 km)	+0.3 miles (0.5 km)

Table 4.1.2-1

Various Indoor and Outdoor Sound Levels

Outdoor Sound Levels	Sound Level (dBA)	Indoor Sound Levels
	110	Rock Band at 5 m
Jet Over-Flight at 300 m	105	
	100	Inside New York Subway Train
Gas Lawn Mower at 1 m	95	
	90	Food Blender at 1 m
Diesel Truck at 15 m	85	
Noisy Urban Area--Daytime	80	Garbage Disposal at 1 m
	75	Shouting at 1 m
Gas Lawn Mower at 30 m	70	Vacuum Cleaner at 3 m
Suburban Commercial Area	65	Normal Speech at 1 m
Quiet Urban Area -- Daytime	60	
	55	Quiet Conversation at 1m
Quiet Urban Area--Nighttime	50	Dishwasher Next Room
	45	
Quiet Suburb--Nighttime	40	Empty Theater or Library
	35	
Quiet Rural Area--Nighttime	30	Quiet Bedroom at Night
	25	Empty Concert Hall
Rustling Leaves	20	Average Whisper
	15	Broadcast and Recording Studios
	10	
	5	Human Breathing
Reference Pressure Level	0	Threshold of Hearing

Table 4.1.2-2

Existing Sound Levels at Three Representative Coastal Sites (dBA) (November-December 2002)

	3 meter wind speed (mph)	Point Gammon Yarmouth	Oregon Beach Barnstable	Cape Poge Martha's Vineyard
Average (L_{eq}) Levels				
All Conditions	0-28	35-71	41-61	40-73
Cut-In Wind Speed	5	47-57	46-58	41-63
Design Wind Speed				
On-Shore	16	61-68	54-60	62-71
Off-Shore	16	51-67	48-58	51-69
Background (L_{90}) Levels				
All Conditions	0-28	27-66	34-57	37-70
Cut-In Wind Speed	5	39-54	34-52	39-66
Design Wind Speed				
On-Shore	16	59-65	50-56	59-67
Off-Shore	16	46-58	36-54	45-64

Table 4.1.4-1

Representative Temperature Data

Station	Annual Average (°F / °C)	Average Maximum (°F / °C)	Average Minimum (°F / °C)
Coastal Division (average) a/	49.9 / 9.9	na	na
Nantucket b/	50.1 / 10.1	56.9 / 13.8	43.2 / 6.2
Provincetown b/	49.7 / 9.8	57.2 / 14.0	42.2 / 5.7
Hyannis c/	49.5 / 9.7	57.0 / 13.9	42.1 / 5.6
New Bedford c/	51.2 / 10.7	59.9 / 15.5	42.5 / 5.8
Buzzard's Bay Buoy d/	50.7 / 10.4	na	na
Nantucket Buoy e/	51.6 / 10.9	na	na

a/ Data from NCDC, 2002.
b/ Data from NCDC, 2007.
c/ Data from NCDC, 2004.
d/ Data from NDBC, 2003a.
e/ Located 62 miles southeast of Nantucket. Data from NDBC, 2003b.

Table 4.1.2-2

Existing Sound Levels at Three Representative Coastal Sites (dBA) (November-December 2002)

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Design Wind Speed				
On-Shore	16	61-68	54-60	62-71
Off-Shore	16	51-67	48-58	51-69
Background (L_{90}) Levels				
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Cut-In Wind Speed	5	39-54	34-52	39-66
Design Wind Speed				
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Hyannis c/	49.5 / 9.7	57.0 / 13.9	42.1 / 5.6
New Bedford c/	51.2 / 10.7	59.9 / 15.5	42.5 / 5.8
Buzzard's Bay Buoy d/	50.7 / 10.4	na	na
Nantucket Buoy e/	51.6 / 10.9	na	na

a/ Data from NCDC, 2002.
b/ Data from NCDC, 2007.
c/ Data from NCDC, 2004.
d/ Data from NDBC, 2003a.
e/ Located 62 miles southeast of Nantucket. Data from NDBC, 2003b.

Table 4.1.4-2

Representative Monthly Temperature Data a/

Month	Monthly Average (°F / °C)	Maximum Hourly b/ (°F / °C)	Minimum Hourly b/ (°F / °C)
January	33.8 / 1.0	56.5 / 13.6	3.9 / -15.6
February	33.3 / 0.7	51.4 / 10.8	4.6 / -15.2
March	37.4 / 3.0	66.7 / 19.3	9.7 / -12.4
April	44.8 / 7.1	64.0 / 17.8	31.8 / -0.1
May	53.1 / 11.7	82.2 / 27.9	38.3 / 3.5
June	61.7 / 16.5	83.3 / 28.5	48.2 / 9.0
July	67.6 / 19.8	84.9 / 29.4	54.0 / 12.2
August	68.5 / 20.3	81.1 / 27.3	53.6 / 12.0
September	64.0 / 17.8	80.8 / 27.1	42.8 / 6.0
October	55.6 / 13.1	77.0 / 25.0	34.9 / 1.6
November	47.5 / 8.6	84.2 / 29.0	18.5 / -7.5
December	37.9 / 3.3	61.5 / 16.4	6.3 / -14.3

a/ Data from NDBC, 2003a
b/ Maximum hourly and minimum hourly temperature values are the monthly extremes measured over the 1985-2001 period

Table 4.1.4-3

Representative Wind Speed Data a/

Month	Monthly Average (mph / km/hr)	Monthly Average Peak (mph / km/hr)	Peak Hourly b/ (mph / km/hr)
January	20.0 / 32.2	22.4 / 36.1	69.2 / 111.3
February	19.0 / 30.6	21.1 / 33.9	60.2 / 96.9
March	18.9 / 30.4	20.8 / 33.5	75.8 / 122.0
April	17.3 / 27.8	18.8 / 30.2	69.4 / 111.7
May	15.9 / 25.6	17.3 / 27.8	49.0 / 78.9
June	15.2 / 24.4	16.2 / 26.1	49.7 / 80.0
July	13.8 / 22.2	14.7 / 23.7	55.9 / 90.0
August	13.7 / 22.0	14.8 / 23.9	88.8 / 143.0
September	15.1 / 24.3	16.6 / 26.7	74.9 / 120.6
October	17.8 / 28.7	19.9 / 32.0	72.0 / 115.9
November	20.1 / 32.2	22.4 / 36.1	68.5 / 110.2
December	20.4 / 32.8	22.9 / 36.9	68.5 / 110.2
Annual Average	17.3 / 27.8	na	na

a/ Data from NDBC, 2003a.
b/ Peak hourly based on maximum 5-second average during two or nine minute period prior to observation time.

Table 4.1.4-2

Representative Monthly Temperature Data a/

Month	Monthly Average (°F / °C)	Maximum Hourly b/ (°F / °C)	Minimum Hourly b/ (°F / °C)
January	33.8 / 1.0	56.5 / 13.6	3.9 / -15.6
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March	37.4 / 3.0	66.7 / 19.3	9.7 / -12.4
April	44.8 / 7.1	64.0 / 17.8	31.8 / -0.1
May	53.1 / 11.7	82.2 / 27.9	38.3 / 3.5
June	61.7 / 16.5	83.3 / 28.5	48.2 / 9.0
July	67.6 / 19.8	84.9 / 29.4	54.0 / 12.2
August	68.5 / 20.3	81.1 / 27.3	53.6 / 12.0
September	64.0 / 17.8	80.8 / 27.1	42.8 / 6.0
October	55.6 / 13.1	77.0 / 25.0	34.9 / 1.6
November	47.5 / 8.6	84.2 / 29.0	18.5 / -7.5
December	37.9 / 3.3	61.5 / 16.4	6.3 / -14.3

a/ Data from NDBC, 2003a
b/ Maximum hourly and minimum hourly temperature values are the monthly extremes measured over the 1985-2001 period

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February	19.0 / 30.6	21.1 / 33.9	60.2 / 96.9
March	18.9 / 30.4	20.8 / 33.5	75.8 / 122.0
April	17.3 / 27.8	18.8 / 30.2	69.4 / 111.7
May	15.9 / 25.6	17.3 / 27.8	49.0 / 78.9
June	15.2 / 24.4	16.2 / 26.1	49.7 / 80.0
July	13.8 / 22.2	14.7 / 23.7	55.9 / 90.0
August	13.7 / 22.0	14.8 / 23.9	88.8 / 143.0
September	15.1 / 24.3	16.6 / 26.7	74.9 / 120.6
October	17.8 / 28.7	19.9 / 32.0	72.0 / 115.9
November	20.1 / 32.2	22.4 / 36.1	68.5 / 110.2
December	20.4 / 32.8	22.9 / 36.9	68.5 / 110.2
Annual Average	17.3 / 27.8	na	na

a/ Data from NDBC, 2003a.
b/ Peak hourly based on maximum 5-second average during two or nine minute period prior to observation time.

Table 4.1.4-4

Representative Percent Frequency of Wind Direction a/

Month	Wind Direction (degrees) b/												
	Calm	**345 to 15**	**15 to 45**	**45 to 75**	**75 to 105**	**105 to 135**	**135 to 165**	**165 to 195**	**195 to 225**	**225 to 255**	**255 to 285**	**285 to 315**	**315 to 345**
January	0.4	8.3	6.8	4.3	3.1	3.1	3.5	4.5	8.3	13.6	15.3	18.1	10.7
February	0.5	10.1	8.8	5.0	3.1	3.3	2.8	4.5	10.4	11.3	11.8	17.4	11.0
March	0.8	9.5	9.3	6.8	2.8	4.4	4.9	7.4	13.0	10.5	9.5	12.0	9.1
April	0.7	8.0	13.6	7.7	4.2	4.9	5.7	9.2	14.8	9.9	6.7	7.8	6.8
May	0.8	6.0	12.9	8.3	4.6	5.7	5.9	9.9	17.6	13.7	5.9	5.6	3.2
June	0.7	4.4	6.5	5.1	3.5	5.1	5.5	9.4	26.3	17.3	7.0	5.6	3.5
July	1.6	3.6	5.5	4.9	3.1	3.9	5.6	11.9	25.6	18.1	7.2	5.8	3.3
August	1.5	5.2	7.0	5.3	4.1	5.2	6.9	13.1	22.9	14.0	6.0	4.7	4.1
September	1.0	8.2	6.9	5.8	4.6	6.3	5.9	10.6	19.3	12.2	5.3	7.5	6.5
October	0.5	9.5	7.0	4.9	3.5	5.8	5.2	7.8	13.1	12.0	9.8	12.7	8.4
November	0.3	8.4	6.6	4.4	3.7	4.2	4.4	5.3	11.6	13.2	12.2	16.2	9.5
December	0.3	9.3	4.9	4.6	3.4	2.9	3.2	3.3	7.8	12.1	16.8	19.2	12.2
Annual Average	0.8	7.6	7.9	5.6	3.6	4.6	5.0	8.0	15.8	13.1	9.5	11.1	7.4

a/ Data from NDBC, 2003a.
b/ Represents the direction the wind is coming from clockwise from true north.

Table 4.1.4-5

Representative Monthly Precipitation Data a/

Month	Average Precipitation (in / cm)
January	4.32 / 10.97
February	3.59 / 9.12
March	4.31 / 10.95
April	4.15 / 10.54
May	3.55 / 9.02
June	3.51 / 8.92
July	3.39 / 8.61
August	3.75 / 9.53
September	3.86 / 9.80
October	4.06 / 10.31
November	4.38 / 11.13
December	4.29 / 10.90
Annual Average	47.16 / 119.79

a/ Precipitation is recorded in melted inches (i.e., snow and ice are melted to determine water equivalent). Data from NCDC, 2002.

Table 4.1.4-6

Representative Visibility and Fog Data a/

Month	Average Number of Days with Low Visibility b/	Average Number of Days with Fog Reported c/
January	4.6	4.6
February	6.6	6.2
March	8.4	8.2
April	4.8	4.8
May	9.0	8.8
June	7.0	6.8
July	5.6	5.6
August	2.6	2.2
September	4.0	4.0
October	3.2	3.2
November	4.2	4.2
December	4.6	4.4
Annual Average Total	64.6	63.0

a/ Data from Weather Underground, 2007a.
b/ Visibility listed as 0 miles.
c/ Visual range threshold is less than 1 mile.

Table 4.1.4-5

Representative Monthly Precipitation Data a/

Month	Average Precipitation (in / cm)
January	4.32 / 10.97
February	3.59 / 9.12
March	4.31 / 10.95
April	4.15 / 10.54
May	3.55 / 9.02
June	3.51 / 8.92
July	3.39 / 8.61
August	3.75 / 9.53
September	3.86 / 9.80
October	4.06 / 10.31
November	4.38 / 11.13
December	4.29 / 10.90
Annual Average	47.16 / 119.79

a/ Precipitation is recorded in melted inches (i.e., snow and ice are melted to determine water equivalent). Data from NCDC, 2002.

Table 4.1.4-6

Representative Visibility and Fog Data a/

Month	Average Number of Days with Low Visibility b/	Average Number of Days with Fog Reported c/
January	4.6	4.6
February	6.6	6.2
March	8.4	8.2
April	4.8	4.8
May	9.0	8.8
June	7.0	6.8
July	5.6	5.6
August	2.6	2.2
September	4.0	4.0
October	3.2	3.2
November	4.2	4.2
December	4.6	4.4
Annual Average Total	64.6	63.0

a/ Data from Weather Underground, 2007a.
b/ Visibility listed as 0 miles.
c/ Visual range threshold is less than 1 mile.

Table 4.1.4-7

Representative Monthly Snowfall Data a/

Month	Monthly Average (in / cm)	Highest Monthly Average (in / cm)	Highest Daily (in / cm)
January	6.9 / 17.5	20.3 / 51.6	7.5 / 19.1
February	5.5 / 14.0	19.0 / 48.3	12.0 / 30.5
March	1.7 / 4.3	7.5 / 19.1	6.0 / 15.2
April	0.5 / 1.3	4.0 / 10.2	4.0 / 10.2
May	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
June	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
July	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
August	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
September	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
October	0.0 / 0.0	0.0 / 0.0	0.0 / 0.0
November	0.2 / 0.5	1.5 / 3.8	1.5 / 3.8
December	3.6 / 9.1	12.0 / 30.5	5.0 / 12.7
Annual Average	18.4 / 46.7	na	na

a/ Data from NCDC, 2004.

Table 4.1.4-8

Representative Seasonal Mixing Height Data

Season a/	Data Hours Included b/	Nantucket Average Mixing Height (m) c/	Chatham Average Mixing Height (m) d/
Winter	Morning – No Precipitation Hours	780	668
	Morning – All Hours	905	655
	Afternoon – No precipitation Hours	791	774
	Afternoon – All Hours	890	747
Spring	Morning – No Precipitation Hours	588	681
	Morning – All Hours	734	664
	Afternoon – No precipitation Hours	746	1,218
	Afternoon – All Hours	827	1,110
Summer	Morning – No Precipitation Hours	389	569
	Morning – All Hours	448	568
	Afternoon – No precipitation Hours	609	1,421
	Afternoon – All Hours	667	1,295
Autumn	Morning – No Precipitation Hours	625	566
	Morning – All Hours	739	583
	Afternoon – No precipitation Hours	765	1,036
	Afternoon – All Hours	831	945
Annual Average	Morning – No Precipitation Hours	595	620
	Morning – All Hours	707	618
	Afternoon – No precipitation Hours	727	1,121
	Afternoon – All Hours	804	1,028

a/ Seasons designated by the following months:
Winter = December, January, February
Spring = March, April, May
Summer = June, July, August
Autumn = September, October, November
b/ Missing values were not included in the analysis.
c/ Data from EPRI, 1984.
d/ Data from USEPA, 2007a.

Table 4.1.5-1

Existing Onshore Background Concentrations of Criteria Pollutants a/

Pollutant	Averaging Period	NAAQS ($\mu g/m^3$)	Monitored Background Concentration ($\mu g/m^3$) b/, c/			Monitor Location
			2004	2005	2006	
SO_2	3-Hour	1,300	152	157	147	659 Globe St, Fall River, MA
	24-Hour	365	55	52	52	
	Annual	80	10	13	13	
PM_{10} d/	24-Hour	150	45	54	50	Vernon Street Trailer, Pawtucket, RI (2004-2005) 111 Dorrance St, Providence, RI (2006)
$PM_{2.5}$	24-Hour	35	26	22	25	659 Globe St, Fall River, MA
	Annual	15	10.3	10.1	8.1	
NO_2	Annual	100	6	6	6	Fox Bottom Area, Truro, MA
CO	1-Hour	40,000	4,025	9,085	11,155	76 Dorrance St, Providence, RI
	8-Hour	10,000	2,875	2,875	2,300	
O_3	8-hour	157 e/	141	171	174	Herring Creek Rd off State Rd at Aquinn, Oak Bluffs, MA
			169	176	159	Tarzwell Road, Narragansett, RI

a/ These data do not represent background concentrations in the Outer Continental Shelf area. Data from USEPA, 2007b.
b/ Highest second-high short-term (1-, 3-, 8- & 24-hour) and maximum annual average concentrations presented, except for 24-hour $PM_{2.5}$, which is the 98^{th} percentile concentration, and 8-hour O_3, which is the highest fourth-highest concentration.
c/ Where multiple sites were approximately equal in distance to Nantucket Sound, all were evaluated and the highest value was presented into the table.
d/ Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, the USEPA revoked the annual PM_{10} standard in 2006 (effective December 17, 2006).
e/ The 8-hour ozone NAAQS is not to be exceeded on the highest fourth-highest 8-hour average during a three year period. The three year (2004-2006) highest fourth-highest 8-hour average at the Oak Bluffs ozone monitor was 162 $\mu g/m^3$, while the three year highest fouth-highest 8-hour ozone 8-hour average at the Narragansett ozone monitor was 168 $\mu g/m^3$.

Table 4.1.5-2

Air Quality Monitor Information a/

Monitor Location	Pollutant(s) Monitored	Land Use	Location Type	Dominant Source Type	Monitoring Objective
659 Globe Street, Fall River, MA	SO_2	Commercial	Suburban	Area	Highest Concentration for Fall River, MA-RI
Vernon Street, Trailer, Pawtucket, RI	PM_{10}	Residential	Urban and Center City	Mobile	Population Exposure for Providence, RI – Pawtucket, MA
111 Dorrance Street, Providence, RI	PM_{10}	Commercial	Urban and Center City	None	Upwind Background from New Loudon, CT – Norwich, CT
659 Globe Street, Fall River, MA	$PM_{2.5}$	Commercial	Suburban	Area	Population Exposure and Highest Concentration for Fall River, MA-RI
Fox Bottom Area, Truro, MA	NO_2	Forest	Rural	Area	General/Background for Providence, RI -Pawtucket, MA
76 Dorrance Street, Providence, RI	CO	Commercial	Urban and Center City	Mobile	Highest Concentration for Providence, RI -Pawtucket, MA
Herring Creek Road off State Road at Aquinn, Oak Bluffs, MA	O_3	Residential	Rural	Point	Upwind Background from Providence, RI -Pawtucket, MA
Tarzwell Road, Narragansett, RI	O_3	Residential	Suburban	None	Population Exposure for Providence, RI - Fall River, MA – Warwick, RI

a/ Data from USEPA, 2007b

Table 4.1.5-3

8-Hour Ozone Exceedences (2004-2006)

Date	8-Hour Ozone Concentration (ppm) a/
June 5, 2005	0.087
August 2, 2005	0.104
August 11, 2005	0.106
September 12, 2005	0.088
July 29, 2006	0.089
August 1, 2006	0.112
August 2, 2006	0.111
August 3, 2006	0.101

a/ Recorded at the Oak Bluff, MA, ozone monitor. Date from USEPA, 2007c.
b/ 8-hour ozone NAAQS is 0.08 ppm.

Table 4.1.5-2

Air Quality Monitor Information a/

Monitor Location	Pollutant(s) Monitored	Land Use	Location Type	Dominant Source Type	Monitoring Objective
659 Globe Street, Fall River, MA	SO_2	Commercial	Suburban	Area	Highest Concentration for Fall River, MA-RI
Vernon Street, Trailer, Pawtucket, RI	PM_{10}	Residential	Urban and Center City	Mobile	Population Exposure for Providence, RI – Pawtucket, MA
111 Dorrance Street, Providence, RI	PM_{10}	Commercial	Urban and Center City	None	Upwind Background from New Loudon, CT – Norwich, CT
659 Globe Street, Fall River, MA	$PM_{2.5}$	Commercial	Suburban	Area	Population Exposure and Highest Concentration for Fall River, MA-RI
Fox Bottom Area, Truro, MA	NO_2	Forest	Rural	Area	General/Background for Providence, RI -Pawtucket, MA
76 Dorrance Street, Providence, RI	CO	Commercial	Urban and Center City	Mobile	Highest Concentration for Providence, RI -Pawtucket, MA
Herring Creek Road off State Road at Aquinn, Oak Bluffs, MA	O_3	Residential	Rural	Point	Upwind Background from Providence, RI -Pawtucket, MA
Tarzwell Road, Narragansett, RI	O_3	Residential	Suburban	None	Population Exposure for Providence, RI - Fall River, MA – Warwick, RI

a/ Data from USEPA, 2007b

Table 4.1.5-3

8-Hour Ozone Exceedences (2004-2006)

Date	8-Hour Ozone Concentration (ppm) a/
June 5, 2005	0.087
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August 11, 2005	0.106
September 12, 2005	0.088
July 29, 2006	0.089
August 1, 2006	0.112
August 2, 2006	0.111
August 3, 2006	0.101

a/ Recorded at the Oak Bluff, MA, ozone monitor. Date from USEPA, 2007c.
b/ 8-hour ozone NAAQS is 0.08 ppm.

Table 4.1.6-1

Classification of Dredge Material by Chemical Constituents

Parameter	Category One Classification (ppm)	Category Two Classification (ppm)	Category Three Classification (ppm)	Results VC04-01 (ppm)	Results VC04-02 (ppm)	Results VC04-03 (ppm)
Arsenic	< 10	10 - 20	> 20	0.77	0.53	0.95
Cadmium	< 5	5 - 10	> 10	ND	ND	ND
Chromium	< 100	100 - 300	> 300	ND	ND	ND
Copper	< 200	200 - 400	> 400	0.67	0.69	0.97
Lead	< 100	100 - 200	> 200	1.1	1	1.3
Mercury	< 0.5	0.5 - 1.5	> 1.5	ND	ND	ND
Nickel	< 50	50 - 100	> 100	0.84	0.81	0.97
Polychlorinated Biphenyls	< 0.5	0.5 - 1.0	> 1.0	ND	ND	ND
Vanadium	< 75	75 - 125	> 125	3	3.1	3.1
Zinc	< 200	200 - 400	> 400	3.1	2.7	3.5
Sediment Sample Classification				Category 1	Category 1	Category 1

Notes:
Category One materials are those which contain no chemicals listed in Table I in concentrations exceeding those listed in the first column.
Category Two materials are those which contain any one or more of the chemicals listed in Table I in the concentration range shown in the second column.
Category Three materials are those materials which contain any chemical listed in Table I in a concentration greater than shown in the third column.
Other important man-induced chemicals or compounds not included in Table I which are known or suspected to be in the sediments at the dredge site would of course be given weight in the classification of the material and the choice of dredging and disposal methods.
When the Department has reason to suspect the presence of any other toxins due to a nearby discharge, additional testing for that element may be required.
Table 4.1.6-1 adapted from Table I MassDEP-DWPC Regulations, 314 CMR 9.07, Effective 3/1/95.

Table 4.1.6-2

Classification of Sediment Material by Physical Constituents

Parameter	Type A	Type B	Type C	Results VC04-01	Results VC04-02	Results VC04-03
Percent Silt-Clay	< 60	60 - 90	> 90	1.5	1.7	2.9
Percent Water	< 40	40 - 60	> 60	17	18	16
Percent Vol. Solids	< 5	5 - 10	> 10	0.42	0.55	0.4
Percent Oil & Grease	< 0.5	0.5 - 1.0	> 1.0	not tested	not tested	not tested
Sediment Sample Classification				Type A	Type A	Type A

Notes:
Type A materials are those materials which contain no substances listed in Table II exceeding the amounts indicated in the first column.
Type B materials are those materials which contain any one or more of the substances listed in Table II in the concentration range shown in the second column.
Type C materials are those materials which contain any substance listed in Table II in a concentration greater than shown in the third column.
When the Department has reason to suspect that biological contaminants are present (for example, because of the physical parameters) additional testing may be required.
Table 4.1.6-2 adapted from Table II MassDEP-DWPC Regulations, 314 CMR 9.07, Effective 3/1/95.

Table 4.1.6-1

Classification of Dredge Material by Chemical Constituents

Parameter	Category One Classification (ppm)	Category Two Classification (ppm)	Category Three Classification (ppm)	Results VC04-01 (ppm)	Results VC04-02 (ppm)	Results VC04-03 (ppm)
Arsenic	< 10	10 - 20	> 20	0.77	0.53	0.95
Cadmium	< 5	5 - 10	> 10	ND	ND	ND
Chromium	< 100	100 - 300	> 300	ND	ND	ND
Copper	< 200	200 - 400	> 400	0.67	0.69	0.97
Lead	< 100	100 - 200	> 200	1.1	1	1.3
Mercury	< 0.5	0.5 - 1.5	> 1.5	ND	ND	ND
Nickel	< 50	50 - 100	> 100	0.84	0.81	0.97
Polychlorinated Biphenyls	< 0.5	0.5 - 1.0	> 1.0	ND	ND	ND
Vanadium	< 75	75 - 125	> 125	3	3.1	3.1
Zinc	< 200	200 - 400	> 400	3.1	2.7	3.5
Sediment Sample Classification				Category 1	Category 1	Category 1

Notes:
Category One materials are those which contain no chemicals listed in Table I in concentrations exceeding those listed in the first column.
Category Two materials are those which contain any one or more of the chemicals listed in Table I in the concentration range shown in the second column.
Category Three materials are those materials which contain any chemical listed in Table I in a concentration greater than shown in the third column.
Other important man-induced chemicals or compounds not included in Table I which are known or suspected to be in the sediments at the dredge site would of course be given weight in the classification of the material and the choice of dredging and disposal methods. When the Department has reason to suspect the presence of any other toxins due to a nearby discharge, additional testing for that element may be required.
Table 4.1.6-1 adapted from Table I MassDEP-DWPC Regulations, 314 CMR 9.07, Effective 3/1/95.

Table 4.1.6-2

Classification of Sediment Material by Physical Constituents

Parameter	Type A	Type B	Type C	Results VC04-01	Results VC04-02	Results VC04-03
Percent Silt-Clay	< 60	60 - 90	> 90	1.5	1.7	2.9
Percent Water	< 40	40 - 60	> 60	17	18	16
Percent Vol. Solids	< 5	5 - 10	> 10	0.42	0.55	0.4
Percent Oil & Grease	< 0.5	0.5 - 1.0	> 1.0	not tested	not tested	not tested
Sediment Sample Classification				Type A	Type A	Type A

Notes:
Type A materials are those materials which contain no substances listed in Table II exceeding the amounts indicated in the first column.
Type B materials are those materials which contain any one or more of the substances listed in Table II in the concentration range shown in the second column.
Type C materials are those materials which contain any substance listed in Table II in a concentration greater than shown in the third column.
When the Department has reason to suspect that biological contaminants are present (for example, because of the physical parameters) additional testing may be required.
Table 4.1.6-2 adapted from Table II MassDEP-DWPC Regulations, 314 CMR 9.07, Effective 3/1/95.

Table 4.1.6-3

Normally Approvable Dredging, Handling and Disposal Options

CHEMICAL TYPE (TABLE I)	Category One			Category two			Category three		
PHYSICAL TYPE (TABLE II)	**A**	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**
Dredging Methods									
Hydraulic	X	X	X	X	X	X	X	X	X
Mechanical	X	X	X	X	X	X	X	X	X
Disposal Methods									
Hydraulic: Sidecast	X	X	o	o	o	o	o	o	o
Hydraulic: Pipeline	X	X	X	X	X	X	X	X	X
Mechanical: Sidecast	X	X	o	o	o	o	o	o	o
Mechanical: Barge	X	X	X	X	X	X	X	X	X
Placement									
Land or in-harbor disposal with bulk-heading	X	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Open ocean disposal at high energy, sandy sites	X	o	o	o	o	o	o	o	o
Open ocean disposal at low energy, salty sites	o	X	(b)	o	(b)	(b)	(b)	(b)	(b)
Unconfined in-harbor	X	o	o	o	o	o	o	o	o
Beach Replenishment	X	o	o	o	o	o	o	o	o
Other Conditions									
Timing and placement to Avoid Fisheries Impacts (spawning and running periods and areas)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)	(c)

Legend

x = Normally approvable
o = Not normally approvable
(a) = Normally approvable but control of effluent would be required
(b) = Approvable only after bioassay, performed in accordance with established USEPA procedures, indicates no significant biological impact. A statistically comparable project which has successfully passed the bioassay test may be substituted. If a significant biological impact is found, this material is unsuitable for open water disposal.
(c) = Required in all cases.

Table 4.1.6-3 adapted from Table III MassDEP-DWPC Regulations, 314 CMR 9.07, Effective 3/1/95.

Table 4.1.6-4

Sediment Bulk Chemistry Analytical Results for 2004 and 2005 Marine Vibracores
Total Metals, Total Organic Carbon (TOC), and Total Petroleum Hydrocarbons

Parameter	Core Number		VC04-01		VC04-02		VC04-03		VC04-04		VC05-3A		VC05-3A		VC05-4B-S1	
	Sample Designation		VC04-01		VC04-02		VC04-03		VC04-04		VC05-3A-S1		VC05-3A-S2		VC05-4B-S1	
	Sample Interval (ft below seabottom)		Composite 0 – 9		Composite 0 – 9		Composite 0 – 4		Composite 0 – 10		Composite 0 – 5		Composite 5 – 7.2		Composite 0 – 4.7	
	Marine Sediment Guidelines		Results		Results		Results		Results		Results		Results		Results	
Total Metals (mg/kg)	**ER-L**	**ER-M**														
Arsenic	8.2	70	**0.77**		**0.53**		**0.95**		**1.1**		**1.3**		**1.0**		**0.73**	
Cadmium	1.2	9.6	0.041	U	0.034	U	0.035	U	0.031	U	**0.019**		0.018	U	0.019	U
Chromium	81	370	4.1	U	3.4	U	3.5	U	3.1	U	**3.6**		**2.3**		**4.6**	
Copper	34	270	**0.67**		**0.69**		**0.97**		**1.2**		**0.96**		**0.61**		**1.5**	
Lead	46.7	218	**1.1**		**1**		**1.3**		**1.3**		**1.5**		**0.94**		**2.4**	
Mercury	0.15	0.71	0.0055	U	0.0059	U	0.0054	U	**0.0077**		0.0058	U	0.006	U	0.0059	U
Nickel	20.9	51.6	**0.84**		**0.81**		**0.97**		**0.99**		**2.1**		**1.5**		**1.9**	
Vanadium	NL	NL	**3**		**3.1**		**3.1**		**3.5**		**5.9**		**4.0**		**6.2**	
Zinc	150	410	**3.1**		**2.7**		**3.5**		**3.6**		**5.5**		**3.3**		**7.4**	
Volatile Solids	NL	NL	**0.42**		**0.55**		**0.4**		**0.45**		NA		NA		NA	
TOC Run 1 (mg/kg)	NL	NL	NA		NA		NA		NA		**0.08**		**0.06**		**0.06**	
TOC Run 2 (mg/kg)	NL	NL	NA		NA		NA		NA		**0.09**		**0.05**		**0.05**	
Total Petroleum Hydrocarbons (mg/kg)	NL	NL	NA		NA		NA		NA		**140**		**270**		**240**	

Table 4.1.6-4 (Continued)

Sediment Bulk Chemistry Analytical Results for 2004 and 2005 Marine Vibracores
Polychlorinated Biphenyls and Pesticides

Parameter	Core Number		VC04-01		VC04-02		VC04-03		VC04-04		VC05-3A		VC05-3A		VC05-4B-S1	
	Sample Designation		VC04-01		VC04-02		VC04-03		VC04-04		VC05-3A-S1		VC05-3A-S2		VC05-4B-S1	
	Sample Interval (ft below seabottom)		Composite 0 – 9		Composite 0 – 9		Composite 0 – 4		Composite 0 – 10		Composite 0 – 5		Composite 5 – 7.2		Composite 0 – 4.7	
	Marine Sediment Guidelines		Results		Results		Results		Results		Results		Results		Results	
	ER-L	ER-M														
PCB Aroclors (ug/kg)											NA		NA		NA	
Aroclor 1016			46	U	44	U	43	U	46	U						
Aroclor 1221			46	U	44	U	43	U	46	U						
Aroclor 1232			46	U	44	U	43	U	46	U						
Aroclor 1242			46	U	44	U	43	U	46	U						
Aroclor 1248			46	U	44	U	43	U	46	U						
Aroclor 1254			46	U	44	U	43	U	46	U						
Aroclor 1260			46	U	44	U	43	U	46	U						
Aroclor 1262			46	U	44	U	43	U	46	U						
Aroclor 1268			46	U	44	U	43	U	46	U						
Total PCBs	22.7	180		U		U		U		U						
PCB Congeners (ug/kg)			NA		NA		NA		NA							
BZ8*											0.45	U	0.44	U	0.48	U
BZ18*											0.45	U	0.44	U	0.48	U
BZ28*											0.45	U	0.44	U	0.48	U
BZ44*											0.45	U	0.44	U	0.48	U
BZ49*											0.45	U	0.44	U	0.48	U
BZ52*											0.45	U	0.44	U	0.48	U
BZ66*											0.45	U	0.44	U	0.48	U
BZ87*											0.45	U	0.44	U	0.48	U
BZ101*											0.45	U	0.44	U	0.48	U
BZ105*											0.45	U	0.44	U	0.48	U
BZ118*											0.45	U	0.44	U	0.48	U

Table 4.1.6-4 (Continued)

**Sediment Bulk Chemistry Analytical Results for 2004 and 2005 Marine Vibracores
Polychlorinated Biphenyls and Pesticides**

Parameter	Core Number		VC04-01		VC04-02		VC04-03		VC04-04		VC05-3A		VC05-3A		VC05-4B-S1	
	Sample Designation		VC04-01		VC04-02		VC04-03		VC04-04		VC05-3A-S1		VC05-3A-S2		VC05-4B-S1	
	Sample Interval (ft below seabottom)		Composite 0 – 9		Composite 0 – 9		Composite 0 – 4		Composite 0 – 10		Composite 0 – 5		Composite 5 – 7.2		Composite 0 – 4.7	
	Marine Sediment Guidelines		Results		Results		Results		Results		Results		Results		Results	
	ER-L	ER-M														
BZ128*											0.45	U	0.44	U	0.48	U
BZ138*											0.45	U	0.44	U	0.48	U
BZ153*											0.45	U	0.44	U	0.48	U
BZ170*											0.45	U	0.44	U	0.48	U
BZ180*											0.45	U	0.44	U	0.48	U
BZ183*											0.45	U	0.44	U	0.48	U
BZ184*											0.45	U	0.44	U	0.48	U
BZ187*											0.45	U	0.44	U	0.48	U
BZ195*											0.45	U	0.44	U	0.48	U
BZ206*											0.45	U	0.44	U	0.48	U
BZ209*											0.45	U	0.44	U	0.48	U
Total PCBs	22.7	180														
Pesticides (ug/kg)			NA		NA		NA		NA							
Aldrin	NL	NL									0.45	U	0.44	U	0.48	U
Alpha-BHC	NL	NL									0.45	U	0.44	U	0.48	U
Alpha-chlordane	NL	NL									0.45	U	0.44	U	0.48	U
Beta-BHC	NL	NL									0.45	U	0.44	U	0.48	U
Delta-BHC	NL	NL									0.45	U	0.44	U	0.48	U
Gamma-BHC	NL	NL									0.45	U	0.44	U	0.48	U
Gamma-chlordane	NL	NL									0.45	U	0.44	U	0.48	U
4,4'-DDD	NL	NL									0.45	U	0.44	U	0.48	U
4,4'-DDE	2.2	27									0.45	U	0.44	U	0.48	U
4,4'-DDT	1.58	46.1									0.45	U	0.44	U	0.48	U

Table 4.1.6-4 (Continued)

Sediment Bulk Chemistry Analytical Results for 2004 and 2005 Marine Vibracores
Polychlorinated Biphenyls and Pesticides

Parameter	Core Number		VC04-01		VC04-02		VC04-03		VC04-04		VC05-3A		VC05-3A		VC05-4B-S1	
	Sample Designation		VC04-01		VC04-02		VC04-03		VC04-04		VC05-3A-S1		VC05-3A-S2		VC05-4B-S1	
	Sample Interval (ft below seabottom)		Composite 0 – 9		Composite 0 – 9		Composite 0 – 4		Composite 0 – 10		Composite 0 – 5		Composite 5 – 7.2		Composite 0 – 4.7	
	Marine Sediment Guidelines		Results		Results		Results		Results		Results		Results		Results	
	ER-L	ER-M														
Dieldrin	NL	NL									0.45	U	0.44	U	0.48	U
Endosulfan I	NL	NL									0.45	U	0.44	U	0.48	U
Endosulfan II	NL	NL									0.45	U	0.44	U	0.48	U
Endosulfan sulfate	NL	NL									0.45	U	0.44	U	0.48	U
Endrin	NL	NL									0.45	U	0.44	U	0.48	U
Endrin ketone	NL	NL									0.45	U	0.44	U	0.48	U
Endrin aldehyde	NL	NL									0.45	U	0.44	U	0.48	U
Heptachlor	NL	NL									0.45	U	0.44	U	0.48	U
Heptachlor epoxide (B)	NL	NL									0.45	U	0.44	U	0.48	U
Methoxychlor	NL	NL									0.45	U	0.44	U	0.48	U
Toxaphene	NL	NL									11	U	11	U	12	U

Table 4.1.6-4 (Continued)

Sediment Bulk Chemistry Analytical Results for 2004 and 2005 Marine Vibracores
Polynuclear Aromatic Hydrocarbons (PAHs)

Parameter	Core Number		VC04-01		VC04-02		VC04-03		VC04-04		VC05-3A		VC05-3A		VC05-4B-S1	
	Sample Designation		VC04-01		VC04-02		VC04-03		VC04-04		VC05-3A-S1		VC05-3A-S2		VC05-4B-S1	
	Sample Interval (ft below seabottom)		Composite 0 – 9		Composite 0 – 9		Composite 0 – 4		Composite 0 – 10		Composite 0 – 5		Composite 5 – 7.2		Composite 0 – 4.7	
	Marine Sediment Guidelines		Results		Results		Results		Results		Results		Results		Results	
	ER-L	ER-M														
PAH (ug/kg)																
Naphthalene	160	2100	570	U	550	U	550	U	580	U	22	U	22	U	24	U
2-Methylnaphthalene	70	670	570	U	550	U	550	U	580	U	22	U	22	U	24	U
1-Methylnaphthalene	NL	NL									22	U	22	U	24	U
Biphenyl	NL	NL									22	U	22	U	24	U
2,6-Dimethylnaphthalene	NL	NL									22	U	22	U	24	U
Acenaphthylene	44	640	570	U	550	U	550	U	580	U	22	U	22	U	24	U
Acenaphthene	16	500	570	U	550	U	550	U	580	U	22	U	22	U	24	U
Fluorene	19	540	570	U	550	U	550	U	580	U	22	U	22	U	24	U
Phenanthrene	240	1500	570	U	550	U	550	U	580	U	22	U	22	U	24	U
Anthracene	85.3	1100	570	U	550	U	550	U	580	U	22	U	22	U	24	U
1-Methylphenanthrene	NL	NL									22	U	22	U	24	U
Fluoranthene	600	5100	570	U	550	U	550	U	580	U	22	U	22	U	24	U
Pyrene	665	2600	570	U	550	U	550	U	580	U	22	U	22	U	24	U
Benzo[a]anthracene	261	1600	570	U	550	U	550	U	580	U	22	U	22	U	24	U
Chrysene	384	2800	570	U	550	U	550	U	580	U	22	U	22	U	24	U
Benzo[b]fluoranthene	NL	NL	570	U	550	U	550	U	580	U	22	U	22	U	24	U
Benzo[k]fluoranthene	NL	NL	570	U	550	U	550	U	580	U	22	U	22	U	24	U
Benzo[e]pyrene	NL	NL									22	U	22	U	24	U
Benzo[a]pyrene	430	1600	570	U	550	U	550	U	580	U	22	U	22	U	24	U
Perylene	NL	NL									22	U	22	U	24	U
Indeno[1,2,3-cd]pyrene	NL	NL	570	U	550	U	550	U	580	U	22	U	22	U	24	U
Dibenz[a,h]anthracene	63.4	260	570	U	550	U	550	U	580	U	22	U	22	U	24	U
Benzo[g,h,i]perylene	NL	NL	570	U	550	U	550	U	580	U	22	U	22	U	24	U

Notes:

2004 Analyses by Woods Hole Group Environmental Laboratories, Raynham, Massachusetts, in support of MADEP State Water Quality Certification. Total Metals (9 metals) by USEPA Methods 6020A and 7471 A; Extractable Hydrocarbons by GC/FID and the MADEP Method; Semi-Volatile Organics by USEPA Method 8270C; PCB Aroclors by USEPA Method 8082; Pesticides by USEPA Method 8081; Volatile Solids on surface grab sample by USEPA Method 2540G.

2005 Analyses by Alpha Woods Hole Labs, Raynham, Massachusetts. Total Metals (9 metals) by USEPA Methods 6020A and 7471 A; Total Organic Carbon by USEPA Method 9080; Total Petroleum Hydrocarbons by USEPA Method 8015; Semi-Volatile Organics by USEPA Method 8270C-SIM; PCB Congeners by GC/MS and USEPA Method 8082; and Pesticides by USEPA Method 8081.

ER-L = Effects Range-Low; from Long, E. R., D. D. MacDonald, S. L. Smith, and F. D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environmental Management 19 (1): 81-97.

ER-M = Effects Range-Median; from Long *et al.,* (above)

U = The analyte was analyzed for, but not detected at, sample-specific level reported

NA = Not analyzed for

NL = Not listed (i.e., ER-L or ER-M not listed in marine sediment guidelines)

Table 4.1.6-5

Summary of Sediment Chemical Analytical Results (Metals, Total Organic Carbon, and Total Petroleum Hydrocarbons) for the Cape Wind Project

Parameter	Core Number		VC01-G4		VC01-G1		VC01-G3		VC01-MT1		VC01-L3		VC01-G13		VC01-G5	
	Sample Designation		VC01-G4-S1		VC01-G1-S2		VC01-G3-S1		VC01-MT1-S1		VC01-L3-S1		VC01-G13-S1		VC01-G5-S1	
	Sample Interval (ft below seabottom)[1]		Composite 0 - 10		Composite 10 - 16.5		Composite 0 - 10		Composite 0 - 10		Composite 0 - 5		Composite 0 - 10		Composite 0 - 10	
	NOAA Marine Sediment Guidelines[2]		Results		Results		Results		Results		Results		Results		Results	
Total Metals (mg/kg)	**ERL**	**ERM**														
Arsenic	8.2	70	**0.84**		**1.9**		**1.4**		**0.76**		**0.65**		**0.79**		**0.71**	
Cadmium	1.2	9.6	**0.051**	U	**0.053**		**0.043**	U	**0.039**	U	**0.040**	U	**0.040**	U	**0.040**	U
Chromium	81	370	**1.8**		**3.6**		**1.4**		**0.68**		**0.65**		**1.4**		**1.4**	
Copper	34	270	**0.76**		**1.1**		**0.43**	U	**0.39**	U	**0.40**	U	**0.82**		**0.72**	
Lead	46.7	218	**1.2**		**1.8**		**1.2**		**0.66**		**0.56**		**0.80**		**1.2**	
Mercury	0.15	0.71	**0.013**	U	**0.013**	U	**0.011**	U	**0.011**	U	**0.010**	U	**0.011**	U	**0.011**	U
Nickel	20.9	51.6	**0.96**		**2.1**		**1**		**0.30**		**0.25**		**1.5**		**0.83**	
Vanadium			**3.1**		**5.9**		**5.1**		**1.7**		**1.4**		**1.7**		**2.7**	
Zinc	150	410	**5.5**		**6.1**		**3.2**		**2.9**		**1.4**		**3.1**		**2.8**	
TOC Run 1 (mg/kg)	--	--	7618		1173		236		120		ND		ND		143	
TOC Run 2 (mg/kg)	--	--	7780		1263		230		117		ND		ND		144	
Total Petroleum Hydrocarbons (mg/Kg)																
C9-C18 Hydrocarbons	--	--														
C19-C36 Hydrocarbons	--	--														
TOTAL			**130**		**11**		**7.1**		5.6	U	5.6	U	5.6	U	5.8	U

Table 4.1.6-5 (continued)

Summary of Sediment Chemical Analytical Results (Metals, Total Organic Carbon, and Total Petroleum Hydrocarbons) for the Cape Wind Project

Parameter	Core Number		VC01-G11		VC01-P1		VC01-Y1		VC01-Y1		VC01-Y4		VC01-C5		VC01-C1	
	Sample Designation		VC01-G11-S1		VC01-P1-S1		VC01-Y1-S1		VC01-Y1-S2		VC01-Y4-S1		VC01-C5-S1		VC01-C1-S1	
	Sample Interval (ft below seabottom)[1]		Composite 0 - 10		Composite 0 - 5		Composite 0 - 5		Composite 5 - 9.5		Composite 0 - 5		Composite 0 - 5		Composite 0 - 5	
	NOAA Marine Sediment Guidelines[2]		Results		Results		Results		Results		Results		Results		Results	
Total Metals (mg/kg)	**ERL**	**ERM**														
Arsenic	8.2	70	**5.7**		**0.40**		**0.62**		**3.1**		**0.24**	U	**0.74**		**1.2**	
Cadmium	1.2	9.6	**0.32**		**0.051**	U	**0.053**	U	**0.053**		**0.048**	U	**0.053**	U	**0.055**	
Chromium	81	370	**11**		**0.50**		**1.2**		**13**		**0.96**		**0.91**		**2.3**	
Copper	34	270	**5.0**		**0.51**	U	**0.72**		**6.9**		**0.48**	U	**0.53**	U	**1.2**	
Lead	46.7	218	**4.2**		**0.81**		**1.0**		**5.1**		**0.48**	U	**0.75**		**1.7**	
Mercury	0.15	0.71	**0.012**	U	**0.011**	U	**0.012**	U	**0.011**	U	**0.013**	U	**0.012**	U	**0.011**	U
Nickel	20.9	51.6	**7.8**		**0.43**		**0.70**		**10**		**0.41**		**0.37**		**1.6**	
Vanadium			**24**		**1.4**		**2.2**		**16**		**1.2**		**1.2**		**4.2**	
Zinc	150	410	**21**		**6.4**		**3.8**		**30**		**2.4**		**1.8**		**7.5**	
TOC Run 1 (mg/kg)	--	--	9569		150		228		667		214		256		1055	
TOC Run 2 (mg/kg)	--	--	9588		154		235		662		201		244		1041	
Total Petroleum Hydrocarbons (mg/Kg)																
C9-C18 Hydrocarbons	--	--														
C19-C36 Hydrocarbons	--	--														
TOTAL			**21**		5.6	U	**12**		6.0	U	5.8	U	5.9	U	5.6	U

Table 4.1.6-5 (continued)

Summary of Sediment Chemical Analytical Results (Metals, Total Organic Carbon, and Total Petroleum Hydrocarbons) for the Cape Wind Project

Parameter	Core Number		VC01-Y2		VC01-P4		VC01-P4		VC01-P3		VC01-C7		VC01-Y8		VC01-PB1	
	Sample Designation		VC01-Y2-S1		VC01-P4-S1		VC01-P4-S2		VC01-P3-S1		VC01-C7-S1		VC01-Y8-S2		VC01-PB1-S1	
	Sample Interval (ft below seabottom)[1]		Composite 0 - 5		Composite 0 - 5		Composite 5 - 9.5		Composite 0 - 5		Composite 0 - 5		Composite 0 - 5		Composite 0 - 5	
	NOAA Marine Sediment Guidelines[2]		Results		Results		Results		Results		Results		Results		Results	
Total Metals (mg/kg)	**ERL**	**ERM**														
Arsenic	8.2	70	**0.67**		**2.3**		**4.0**		**1.0**		**4.6**		**5.4**		**7.0**	
Cadmium	1.2	9.6	**0.048**	U	**0.048**		**0.053**	U	**0.050**	U	**0.17**		**0.031**	U	**0.76**	
Chromium	81	370	**1.7**		**5.9**		**32**		**2.9**		**6.4**		**11**		**26**	
Copper	34	270	**0.70**		**3.2**		**12**		**1.2**		**2.6**		**6.2**		**11**	
Lead	46.7	218	**1.1**		**2.8**		**12**		**1.7**		**2.5**		**5.4**		**9.5**	
Mercury	0.15	0.71	**0.011**	U	**0.013**	U	**0.016**		**0.013**	U	**0.014**	U	**0.012**	U	**0.025**	U
Nickel	20.9	51.6	**0.77**		**4.2**		**21**		**1.4**		**12**		**7.9**		**17**	
Vanadium			**2.5**		**7.7**		**37**		**3.8**		**13**		**14**		**43**	
Zinc	150	410	**4.7**		**11**		**53**		**5.1**		**57**		**22**		**44**	
TOC Run 1 (mg/kg)	--	--	178		1193		3235		240		10186		220		27434	
TOC Run 2 (mg/kg)	--	--	169		1159		3217		240		10374		227		27137	
Total Petroleum Hydrocarbons (mg/Kg)																
C9-C18 Hydrocarbons	--	--														
C19-C36 Hydrocarbons	--	--														
TOTAL			5.7	U	7.9	U	6.5	U	5.9	U	**24**		**6.1**		**25**	

Table 4.1.6-5 (continued)

Summary of Sediment Chemical Analytical Results (Metals, Total Organic Carbon, and Total Petroleum Hydrocarbons) for the Cape Wind Project

Parameter	Core Number		VC01-PB1		VC01-D1		VC01-PB2		VC01-PB2		VC01-L1		VC01-L1	
	Sample Designation		VC01-PB1-S2		VC01-D1-S1		VC01-PB2-S1		VC01-PB2-S2		VC01-LI-S1		VC01-L1-S2	
	Sample Interval (ft below seabottom)[1]		Composite 5 - 7.7		Composite 0 - 5		Composite 0 - 5		Composite 5 - 7.8		Composite 0 - 5		Composite 5 - 10	
	NOAA Marine Sediment Guidelines[2]		Results		Results		Results		Results		Results		Results	
Total Metals (mg/kg)	**ERL**	**ERM**												
Arsenic	8.2	70	**7.2**		**6.1**		**6.2**		**4.7**		**3.4**		**3.3**	
Cadmium	1.2	9.6	**0.79**		**0.68**		**0.56**		**0.54**		**0.16**		**0.092**	
Chromium	81	370	**25**		**24**		**22**		**14**		**5.5**		**4.6**	
Copper	34	270	**11**		**10**		**9.8**		**5.8**		**2.7**		**1.8**	
Lead	46.7	218	**7.8**		**8.6**		**9**		**4.2**		**2.3**		**2.1**	
Mercury	0.15	0.71	**0.021**	U	**0.021**	U	**0.022**	U	**0.016**	U	**0.013**	U	**0.013**	U
Nickel	20.9	51.6	**16**		**15**		**14**		**8.4**		**3.7**		**3.6**	
Vanadium			**36**		**37**		**36**		**22**		**11**		**7.7**	
Zinc	150	410	**41**		**38**		**40**		**21**		**8.8**		**8.2**	
TOC Run 1 (mg/kg)	--	--	22891		27053		21711		17258		6319		9754	
TOC Run 2 (mg/kg)	--	--	24043		27149		21266		18783		6183		9446	
Total Petroleum Hydrocarbons (mg/Kg)														
C9-C18 Hydrocarbons	--	--												
C19-C36 Hydrocarbons	--	--												
TOTAL			**49**		**12**		**19**		**14**		6.8	U	**54**	

Table 4.1.6-5 (continued)

Summary of Sediment Chemical Analytical Results (Metals, Total Organic Carbon, and Total Petroleum Hydrocarbons) for the Cape Wind Project

Parameter	**Core Number**		**VC03-13**				**VC03-19**				**VC03-20**				**VC03-23**			
	Sample Designation		**VC03-13 S1**		**VC03-13 S2**		**VC03-19 S1**		**VC03-19 S2**		**VC03-20 S1**		**VC03-20 S2**		**VC03-23 S1**		**VC03-23 S2**	
	Sample Interval (ft below seabottom)[1]		**Composite 0-5'**		**Composite 5-9.8**		**Composite 0-5**		**Composite 5-9.8**		**Composite 0-5.2**		**Composite 5.2-8**		**Composite 0-5**		**Composite 5-7.8**	
	NOAA Marine Sediment Guidelines[2]		**Results**		**Results**		**Results**		**Results**		**Results**		**Results**		**Results**		**Results**	
Total Metals (mg/kg)	**ERL**	**ERM**																
Arsenic	8.2	70	**3.5**		**3.8**		**5.7**		**6.3**		**0.67**		**2.2**		**0.92**		**0.36**	
Cadmium	1.2	9.6	**0.029**		**0.12**		**0.85**		**0.41**		0.024	U	**0.260**		0.024	U	0.025	U
Chromium	81	370	**4.3**		**4.4**		**21**		**14**		**1.7**		**9.0**		**2.6**		**1.4**	
Copper	34	270	**1.4**		**2.3**		**10**		**6.4**		**0.70**		**4.1**		**1.2**		**0.8**	
Lead	46.7	218	**2.6**		**1.8**		**7.1**		**4.5**		**1.2**		**3.50**		**2.6**		**0.98**	
Mercury	0.15	0.71	0.009	U	**0.016**		**0.015**		0.0095	U	0.010	U	0.0094	U	0.0091	U	0.0098	U
Nickel	20.9	51.6	**2.4**		**3.8**		**14**		**9.3**		**1.4**		**5.8**		**1.3**		**0.84**	
Vanadium			**9.8**		**9.5**		**33**		**26**		**3.2**		**14**		**4.1**		**2.0**	
Zinc	150	410	**7.5**		**8.8**		**35**		**23**		**5.3**		**14**		**3.6**		**2.7**	
TOC Run 1 (mg/kg)	--	--	**0.27**		**1.5**		**3.2**		**1.2**		**0.02**		**1.0**		**1.0**		0.01	U
TOC Run 2 (mg/kg)	--	--	**0.22**		**1.5**		**3.1**		**1.5**		**0.01**		**1.3**		**1.2**		0.01	U
Total Petroleum Hydrocarbons (mg/Kg)																		
C9-C18 Hydrocarbons	--	--																
C19-C36 Hydrocarbons	--	--																
TOTAL			48	U	**250**		85	U	64	U	45	U	54	U	46	U	45	U

Notes:
Analysis Conducted by Woods Hole Group Environmental Laboratories; Raynham, Massachusetts
1. Samples composited over core depth intervals.
2. Guidelines from Long et al (1995) used for evaluation of risk from contaminants in marine and estuarine sediments.
Long, E.R., D.D. MacDonald, S. L. Smith, F.D. Calder. 1995. Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments. Environmental Management. Vol. 19, No. 1, p. 81-97
ER-L = Effects range- low; ER-M = Effects range- median; ND= Not Applicable; U= The analyte was analyzed for but not detected at the sample specific level reported; mg/kg = milligrams per kilogram

Table 4.1.6-6

Summary of Sediment Chemical Analytical Results (Polychlorinated Biphenyl Congeners and Pesticides) for the Cape Wind Project

Parameter	Core Number		VC01-G4		VC01-G1		VC01-G3		VC01-MT1		VC01-L3		VC01-G13		VC01-G5	
	Sample Designation		VC01-G4-S1		VC01-G1-S2		VC01-G3-S1		VC01-MT1-S1		VC01-L3-S1		VC01-G13-S1		VC01-G5-S1	
	Sample Interval (ft below seabottom)[1]		Composite 0 - 10		Composite 10 - 16.5		Composite 0 - 10		Composite 0 - 10		Composite 0 - 5		Composite 0 - 10		Composite 0 - 10	
	NOAA Marine Sediment Guidelines[2]		Results		Results		Results		Results		Results		Results		Results	
PCB Congeners (ug/kg)	**ERL**	**ERM**														
BZ8*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
BZ18*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
BZ28*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
BZ44*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
BZ49*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
BZ52*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	**0.55**	P	0.12	U
BZ66*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
BZ87*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
BZ101*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
BZ105*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
BZ118*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
BZ128*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
BZ138*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
BZ153*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
BZ170*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
BZ180*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
BZ183*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
BZ184*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
BZ187*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
BZ195*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
BZ206*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
BZ209*	--	--	0.12	U	0.12	U	0.11	U	0.11	U	0.11	U	0.11	U	0.12	U
Total PCBs	22.7	180														

Table 4.1.6-6 (continued)

Summary of Sediment Chemical Analytical Results (Polychlorinated Biphenyl Congeners and Pesticides) for the Cape Wind Project

Parameter	Core Number		VC01-G4		VC01-G1		VC01-G3		VC01-MT1		VC01-L3		VC01-G13		VC01-G5	
	Sample Designation		VC01-G4-S1		VC01-G1-S2		VC01-G3-S1		VC01-MT1-S1		VC01-L3-S1		VC01-G13-S1		VC01-G5-S1	
	Sample Interval (ft below seabottom)[1]		Composite 0 - 10		Composite 10 - 16.5		Composite 0 - 10		Composite 0 - 10		Composite 0 - 5		Composite 0 - 10		Composite 0 - 10	
	NOAA Marine Sediment Guidelines[2]		Results		Results		Results		Results		Results		Results		Results	
Pesticides (ug/kg)																
Aldrin	--	--	0.62	U	0.60	U	0.57	U	0.55	U	0.56	U	0.56	U	0.58	U
Alpha-BHC	--	--	0.62	U	0.60	U	0.57	U	0.55	U	0.56	U	0.56	U	0.58	U
Alpha-chlordane	--	--	0.62	U	0.60	U	0.57	U	0.55	U	0.56	U	0.56	U	0.58	U
Beta-BHC	--	--	0.62	U	0.60	U	0.57	U	0.55	U	0.56	U	0.56	U	0.58	U
Delta-BHC	--	--	0.62	U	0.60	U	0.57	U	0.55	U	0.56	U	0.56	U	0.58	U
Gamma-BHC	--	--	0.62	U	0.60	U	0.57	U	0.55	U	0.56	U	0.56	U	0.58	U
Gamma-chlordane	--	--	0.62	U	0.60	U	0.57	U	0.55	U	0.56	U	0.56	U	0.58	U
4,4'-DDD	--	--	0.62	U	0.60	U	0.57	U	0.55	U	0.56	U	0.56	U	0.58	U
4,4'-DDE	2.2	27	0.62	U	0.60	U	0.57	U	0.55	U	0.56	U	0.56	U	0.58	U
4,4'-DDT	1.58	46.1	0.62	U	0.60	U	0.57	U	0.55	U	0.56	U	0.56	U	0.58	U
Dieldrin	--	--	0.62	U	0.60	U	0.57	U	0.55	U	0.56	U	0.56	U	0.58	U
Endosulfan I	--	--	0.62	U	0.60	U	0.57	U	0.55	U	0.56	U	0.56	U	0.58	U
Endosulfan II	--	--	0.62	U	0.60	U	0.57	U	0.55	U	0.56	U	0.56	U	0.58	U
Endosulfan sulfate	--	--	0.62	U	0.60	U	0.57	U	0.55	U	0.56	U	0.56	U	0.58	U
Endrin	--	--	0.62	U	0.60	U	0.57	U	0.55	U	0.56	U	0.56	U	0.58	U
Endrin ketone	--	--	0.62	U	0.60	U	0.57	U	0.55	U	0.56	U	0.56	U	0.58	U
Endrin aldehyde	--	--	0.62	U	0.60	U	0.57	U	0.55	U	0.56	U	0.56	U	0.58	U
Heptachlor	--	--	0.62	U	0.60	U	0.57	U	0.55	U	0.56	U	0.56	U	0.58	U
Heptachlor epoxide (B)	--	--	0.62	U	0.60	U	0.57	U	0.55	U	0.56	U	0.56	U	0.58	U
Methoxychlor	--	--	0.62	U	0.60	U	0.57	U	0.55	U	0.56	U	0.56	U	0.58	U
Toxaphene	--	--	12	U	12	U	11	U	11	U	11	U	11	U	12	U

Table 4.1.6-6 (continued)

Summary of Sediment Chemical Analytical Results (Polychlorinated Biphenyl Congeners and Pesticides) for the Cape Wind Project

Parameter	Core Number		VC01-G11		VC01-P1		VC01-Y1		VC01-Y1		VC01-Y4		VC01-C5	
	Sample Designation		VC01-G11-S1		VC01-P1-S1		VC01-Y1-S1		VC01-Y1-S2		VC01-Y4-S1		VC01-C5-S1	
	Sample Interval (ft below seabottom)[1]		Composite 0 - 10		Composite 0 - 5		Composite 0 - 5		Composite 5 - 9.5		Composite 0 - 5		Composite 0 - 5	
	NOAA Marine Sediment Guidelines[2]		Results		Results		Results		Results		Results		Results	
PCB Congeners (ug/kg)	**ERL**	**ERM**												
BZ8*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
BZ18*	--	--	0.13	U	1.11	U	1.11	U	1.12	U	1.11	U	1.12	U
BZ28*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
BZ44*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
BZ49*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
BZ52*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
BZ66*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
BZ87*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
BZ101*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
BZ105*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
BZ118*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
BZ128*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
BZ138*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
BZ153*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
BZ170*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
BZ180*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
BZ183*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
BZ184*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
BZ187*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
BZ195*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
BZ206*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
BZ209*	--	--	0.13	U	0.11	U	0.11	U	0.12	U	0.11	U	0.12	U
Total PCBs	22.7	180												

Table 4.1.6-6 (continued)

Summary of Sediment Chemical Analytical Results (Polychlorinated Biphenyl Congeners and Pesticides) for the Cape Wind Project

Parameter	Core Number		VC01-G11		VC01-P1		VC01-Y1		VC01-Y1		VC01-Y4		VC01-C5	
	Sample Designation		VC01-G11-S1		VC01-P1-S1		VC01-Y1-S1		VC01-Y1-S2		VC01-Y4-S1		VC01-C5-S1	
	Sample Interval (ft below seabottom)[1]		Composite 0 - 10		Composite 0 - 5		Composite 0 - 5		Composite 5 - 9.5		Composite 0 - 5		Composite 0 - 5	
	NOAA Marine Sediment Guidelines[2]		Results		Results		Results		Results		Results		Results	
Pesticides (ug/kg)														
Aldrin	--	--	0.66	U	0.54	U	0.56	U	0.59	U	0.56	U	0.58	U
Alpha-BHC	--	--	0.66	U	0.54	U	0.56	U	0.59	U	0.56	U	0.58	U
Alpha-chlordane	--	--	0.66	U	0.54	U	0.56	U	0.59	U	0.56	U	0.58	U
Beta-BHC	--	--	0.66	U	0.54	U	0.56	U	0.59	U	0.56	U	0.58	U
Delta-BHC	--	--	0.66	U	0.54	U	0.56	U	0.59	U	0.56	U	0.58	U
Gamma-BHC	--	--	0.66	U	0.54	U	0.56	U	0.59	U	0.56	U	0.58	U
Gamma-chlordane	--	--	0.66	U	0.54	U	0.56	U	0.59	U	0.56	U	0.58	U
4,4'-DDD	--	--	0.66	U	0.54	U	0.56	U	0.59	U	0.56	U	0.58	U
4,4'-DDE	2.2	27	0.66	U	0.54	U	0.56	U	0.59	U	0.56	U	0.58	U
4,4'-DDT	1.58	46.1	0.66	U	0.54	U	0.56	U	0.59	U	0.56	U	0.58	U
Dieldrin	--	--	0.66	U	0.54	U	0.56	U	0.59	U	0.56	U	0.58	U
Endosulfan I	--	--	0.66	U	0.54	U	0.56	U	0.59	U	0.56	U	0.58	U
Endosulfan II	--	--	0.66	U	0.54	U	0.56	U	0.59	U	0.56	U	0.58	U
Endosulfan sulfate	--	--	0.66	U	0.54	U	0.56	U	0.59	U	0.56	U	0.58	U
Endrin	--	--	0.66	U	0.54	U	0.56	U	0.59	U	0.56	U	0.58	U
Endrin ketone	--	--	0.66	U	0.54	U	0.56	U	0.59	U	0.56	U	0.58	U
Endrin aldehyde	--	--	0.66	U	0.54	U	0.56	U	0.59	U	0.56	U	0.58	U
Heptachlor	--	--	0.66	U	0.54	U	0.56	U	0.59	U	0.56	U	0.58	U
Heptachlor epoxide (B)	--	--	0.66	U	0.54	U	0.56	U	0.59	U	0.56	U	0.58	U
Methoxychlor	--	--	0.66	U	0.54	U	0.56	U	0.59	U	0.56	U	0.58	U
Toxaphene	--	--	13	U	11	U	11	U	12	U	11	U	12	U

Table 4.1.6-6 (continued)

Summary of Sediment Chemical Analytical Results (Polychlorinated Biphenyl Congeners and Pesticides) for the Cape Wind Project

Parameter	Core Number		VC01-C1		VC01-Y2		VC01-P4		VC01-P4		VC01-P3		VC01-C7		VC01-Y8	
	Sample Designation		VC01-C1-S1		VC01-Y2-S1		VC01-P4-S1		VC01-P4-S2		VC01-P3-S1		VC01-C7-S1		VC01-Y8-S2	
	Sample Interval (ft below seabottom)[1]		Composite 0 - 5		Composite 0 - 5		Composite 0 - 5		Composite 5 - 9.5		Composite 0 - 5		Composite 0 - 5		Composite 0 - 5	
	NOAA Marine Sediment Guidelines[2]		Results		Results		Results		Results		Results		Results		Results	
PCB Congeners (ug/kg)	ERL	ERM														
BZ8*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
BZ18*	--	--	1.11	U	1.12	U	1.11	U	1.13	U	1.12	U	1.14	U	1.11	U
BZ28*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
BZ44*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
BZ49*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
BZ52*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
BZ66*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
BZ87*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
BZ101*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
BZ105*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
BZ118*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
BZ128*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
BZ138*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
BZ153*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
BZ170*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
BZ180*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
BZ183*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
BZ184*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
BZ187*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
BZ195*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
BZ206*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
BZ209*	--	--	0.11	U	0.12	U	0.11	U	0.13	U	0.12	U	0.14	U	0.11	U
Total PCBs	22.7	180														

Table 4.1.6-6 (continued)

Summary of Sediment Chemical Analytical Results (Polychlorinated Biphenyl Congeners and Pesticides) for the Cape Wind Project

Parameter	Core Number		VC01-C1		VC01-Y2		VC01-P4		VC01-P4		VC01-P3		VC01-C7		VC01-Y8	
	Sample Designation		VC01-C1-S1		VC01-Y2-S1		VC01-P4-S1		VC01-P4-S2		VC01-P3-S1		VC01-C7-S1		VC01-Y8-S2	
	Sample Interval (ft below seabottom)[1]		Composite 0 - 5		Composite 0 - 5		Composite 0 - 5		Composite 5 - 9.5		Composite 0 - 5		Composite 0 - 5		Composite 0 - 5	
	NOAA Marine Sediment Guidelines[2]		Results		Results		Results		Results		Results		Results		Results	
Pesticides (ug/kg)																
Aldrin	--	--	0.54	U	0.58	U	0.57	U	0.63	U	0.58	U	0.72	U	0.57	U
Alpha-BHC	--	--	0.54	U	0.58	U	0.57	U	0.63	U	0.58	U	0.72	U	0.57	U
Alpha-chlordane	--	--	0.54	U	0.58	U	0.57	U	0.63	U	0.58	U	0.72	U	0.57	U
Beta-BHC	--	--	0.54	U	0.58	U	0.57	U	0.63	U	0.58	U	0.72	U	0.57	U
Delta-BHC	--	--	0.54	U	0.58	U	0.57	U	0.63	U	0.58	U	0.72	U	0.57	U
Gamma-BHC	--	--	0.54	U	0.58	U	0.57	U	0.63	U	0.58	U	0.72	U	0.57	U
Gamma-chlordane	--	--	0.54	U	0.58	U	0.57	U	0.63	U	0.58	U	0.72	U	0.57	U
4,4'-DDD	--	--	0.54	U	0.58	U	0.57	U	**0.80**		0.58	U	0.72	U	0.57	U
4,4'-DDE	2.2	27	0.54	U	0.58	U	0.57	U	0.63	U	0.58	U	0.72	U	0.57	U
4,4'-DDT	1.58	46.1	0.54	U	0.58	U	0.57	U	0.63	U	0.58	U	0.72	U	0.57	U
Dieldrin	--	--	0.54	U	0.58	U	0.57	U	0.63	U	0.58	U	0.72	U	0.57	U
Endosulfan I	--	--	0.54	U	0.58	U	0.57	U	0.63	U	0.58	U	0.72	U	0.57	U
Endosulfan II	--	--	0.54	U	0.58	U	0.57	U	0.63	U	0.58	U	0.72	U	0.57	U
Endosulfan sulfate	--	--	0.54	U	0.58	U	0.57	U	0.63	U	0.58	U	0.72	U	0.57	U
Endrin	--	--	0.54	U	0.58	U	0.57	U	0.63	U	0.58	U	0.72	U	0.57	U
Endrin ketone	--	--	0.54	U	0.58	U	0.57	U	0.63	U	0.58	U	0.72	U	0.57	U
Endrin aldehyde	--	--	0.54	U	0.58	U	0.57	U	0.63	U	0.58	U	0.72	U	0.57	U
Heptachlor	--	--	0.54	U	0.58	U	0.57	U	0.63	U	0.58	U	0.72	U	0.57	U
Heptachlor epoxide (B)	--	--	0.54	U	0.58	U	0.57	U	0.63	U	0.58	U	0.72	U	0.57	U
Methoxychlor	--	--	0.54	U	0.58	U	0.57	U	0.63	U	0.58	U	0.72	U	0.57	U
Toxaphene	--	--	11	U	12	U	11	U	13	U	12	U	14	U	11	U

Table 4.1.6-6 (continued)

Summary of Sediment Chemical Analytical Results (Polychlorinated Biphenyl Congeners and Pesticides) for the Cape Wind Project

Parameter	Core Number		VC01-PB1		VC01-PB1		VC01-D1		VC01-PB2		VC01-PB2		VC01-L1		VC01-L1	
	Sample Designation		VC01-PB1-S1		VC01-PB1-S2		VC01-D1-S1		VC01-PB2-S1		VC01-PB2-S2		VC01-LI-S1		VC01-L1-S2	
	Sample Interval (ft below seabottom)[1]		Composite 0 - 5		Composite 5 - 7.7		Composite 0 - 5		Composite 0 - 5		Composite 5 - 7.8		Composite 0 - 5		Composite 5 - 10	
	NOAA Marine Sediment Guidelines[2]		Results		Results		Results		Results		Results		Results		Results	
PCB Congeners (ug/kg)	**ERL**	**ERM**														
BZ8*	--	--	0.25	U	1.20	U	1.22	U	1.21	U	1.17	U	1.13	U	1.13	U
BZ18*	--	--	1.25	U	**1.7**		0.22	U	0.21	U	0.17	U	0.13	U	0.13	U
BZ28*	--	--	0.25	U	**2.7**		0.22	U	0.21	U	0.17	U	0.13	U	**0.91**	
BZ44*	--	--	0.25	U	0.20	U	0.22	U	0.21	U	0.17	U	0.13	U	0.13	U
BZ49*	--	--	0.25	U	0.20	U	0.22	U	0.21	U	0.17	U	0.13	U	0.13	U
BZ52*	--	--	0.25	U	**3.8**	IB	0.22	U	0.21	U	0.17	U	0.13	U	0.13	U
BZ66*	--	--	0.25	U	0.20	U	0.22	U	0.21	U	0.17	U	0.13	U	0.13	U
BZ87*	--	--	0.25	U	0.20	U	0.22	U	0.21	U	0.17	U	0.13	U	0.13	U
BZ101*	--	--	0.25	U	0.20	U	0.22	U	0.21	U	0.17	U	0.13	U	0.13	U
BZ105*	--	--	0.25	U	0.20	U	0.22	U	0.21	U	0.17	U	0.13	U	0.13	U
BZ118*	--	--	0.25	U	0.20	U	0.22	U	0.21	U	0.17	U	0.13	U	0.13	U
BZ128*	--	--	0.25	U	0.20	U	0.22	U	0.21	U	0.17	U	0.13	U	0.13	U
BZ138*	--	--	0.25	U	0.20	U	0.22	U	0.21	U	0.17	U	0.13	U	0.13	U
BZ153*	--	--	0.25	U	0.20	U	0.22	U	0.21	U	0.17	U	0.13	U	0.13	U
BZ170*	--	--	0.25	U	0.20	U	0.22	U	0.21	U	0.17	U	0.13	U	0.13	U
BZ180*	--	--	0.25	U	0.20	U	0.22	U	0.21	U	0.17	U	0.13	U	0.13	U
BZ183*	--	--	0.25	U	0.20	U	0.22	U	0.21	U	0.17	U	0.13	U	0.13	U
BZ184*	--	--	0.25	U	0.20	U	0.22	U	0.21	U	0.17	U	0.13	U	0.13	U
BZ187*	--	--	0.25	U	0.20	U	0.22	U	0.21	U	0.17	U	0.13	U	0.13	U
BZ195*	--	--	0.25	U	0.20	U	0.22	U	0.21	U	0.17	U	0.13	U	0.13	U
BZ206*	--	--	0.25	U	0.20	U	0.22	U	0.21	U	0.17	U	0.13	U	0.13	U
BZ209*	--	--	0.25	U	1.20	U	1.22	U	1.21	U	1.17	U	1.13	U	1.13	U
Total PCBs	22.7	180														

Table 4.1.6-6 (continued)

Summary of Sediment Chemical Analytical Results (Polychlorinated Biphenyl Congeners and Pesticides) for the Cape Wind Project

	Core Number		**VC01-PB1**		**VC01-PB1**		**VC01-D1**		**VC01-PB2**		**VC01-PB2**		**VC01-L1**		**VC01-L1**	
	Sample Designation		**VC01-PB1-S1**		**VC01-PB1-S2**		**VC01-D1-S1**		**VC01-PB2-S1**		**VC01-PB2-S2**		**VC01-LI-S1**		**VC01-L1-S2**	
	Sample Interval (ft below seabottom)[1]		**Composite 0 - 5**		**Composite 5 - 7.7**		**Composite 0 - 5**		**Composite 0 - 5**		**Composite 5 - 7.8**		**Composite 0 - 5**		**Composite 5 - 10**	
Pesticides (ug/kg)																
Aldrin	--	--	1.3	U	1.0	U	1.1	U	1.1	U	0.84	U	0.66	U	0.66	U
Alpha-BHC	--	--	1.3	U	1.0	U	1.1	U	1.1	U	0.84	U	0.66	U	0.66	U
Alpha-chlordane	--	--	1.3	U	1.0	U	1.1	U	1.1	U	0.84	U	0.66	U	0.66	U
Beta-BHC	--	--	1.3	U	1.0	U	1.1	U	1.1	U	0.84	U	0.66	U	0.66	U
Delta-BHC	--	--	1.3	U	1.0	U	1.1	U	1.1	U	0.84	U	0.66	U	0.66	U
Gamma-BHC	--	--	1.3	U	1.0	U	1.1	U	1.1	U	0.84	U	0.66	U	**0.88**	
Gamma-chlordane	--	--	1.3	U	1.0	U	1.1	U	1.1	U	0.84	U	0.66	U	0.66	U
4,4'-DDD	--	--	1.3	U	1.0	U	1.1	U	1.1	U	0.84	U	0.66	U	0.66	U
4,4'-DDE	2.2	27	1.3	U	1.0	U	1.1	U	1.1	U	0.84	U	0.66	U	0.66	U
4,4'-DDT	1.58	46.1	1.3	U	1.0	U	1.1	U	1.1	U	0.84	U	0.66	U	0.66	U
Dieldrin	--	--	1.3	U	1.0	U	1.1	U	1.1	U	0.84	U	0.66	U	0.66	U
Endosulfan I	--	--	1.3	U	1.0	U	1.1	U	1.1	U	0.84	U	0.66	U	0.66	U
Endosulfan II	--	--	1.3	U	1.0	U	1.1	U	1.1	U	0.84	U	0.66	U	0.66	U
Endosulfan sulfate	--	--	1.3	U	1.0	U	1.1	U	1.1	U	0.84	U	0.66	U	0.66	U
Endrin	--	--	1.3	U	1.0	U	1.1	U	1.1	U	0.84	U	0.66	U	0.66	U
Endrin ketone	--	--	1.3	U	1.0	U	1.1	U	1.1	U	0.84	U	0.66	U	0.66	U
Endrin aldehyde	--	--	1.3	U	1.0	U	1.1	U	1.1	U	0.84	U	0.66	U	0.66	U
Heptachlor	--	--	1.3	U	1.0	U	1.1	U	1.1	U	0.84	U	0.66	U	0.66	U
Heptachlor epoxide (B)	--	--	1.3	U	1.0	U	1.1	U	1.1	U	0.84	U	0.66	U	0.66	U
Methoxychlor	--	--	1.3	U	1.0	U	1.1	U	1.1	U	0.84	U	0.66	U	0.66	U
Toxaphene	--	--	25	U	20	U	22	U	21	U	17	U	13	U	13	U

Table 4.1.6-6 (continued)

Summary of Sediment Chemical Analytical Results (Polychlorinated Biphenyl Congeners and Pesticides) for the Cape Wind Project

Parameter	Core Number		VC03-13						VC03-19		VC03-20				VC03-23			
	Sample Designation		VC03-13 S1		VC03-13 S2		VC03-19 S1		VC03-19 S2		VC03-20 S1		VC03-20 S2		VC03-23 S1		VC03-23 S2	
	Sample Interval (ft below seabottom)[1]		Composite 0-5'		Composite 5-9.8		Composite 0-5		Composite 5-9.8		Composite 0-5.2		Composite 5.2-8		Composite 0-5		Composite 5-7.8	
	NOAA Marine Sediment Guidelines[2]		Results		Results		Results		Results		Results		Results		Results		Results	
PCB Congeners (ug/kg)	**ERL**	**ERM**																
BZ8*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
BZ18*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
BZ28*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
BZ44*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
BZ49*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
BZ52*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	**1.7**	P	0.47	U	0.45	U
BZ66*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
BZ87*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
BZ101*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
BZ105*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
BZ118*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
BZ128*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
BZ138*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
BZ153*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
BZ170*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
BZ180*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
BZ183*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
BZ184*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
BZ187*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
BZ195*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
BZ206*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
BZ209*	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
Total PCBs	22.7	180																

Table 4.1.6-6 (continued)

Summary of Sediment Chemical Analytical Results (Polychlorinated Biphenyl Congeners and Pesticides) for the Cape Wind Project

Parameter	Core Number		VC03-13						VC03-19		VC03-20				VC03-23			
	Sample Designation		VC03-13 S1		VC03-13 S2		VC03-19 S1		VC03-19 S2		VC03-20 S1		VC03-20 S2		VC03-23 S1		VC03-23 S2	
	Sample Interval (ft below seabottom)[1]		Composite 0-5'		Composite 5-9.8		Composite 0-5		Composite 5-9.8		Composite 0-5.2		Composite 5.2-8		Composite 0-5		Composite 5-7.8	
	NOAA Marine Sediment Guidelines[2]		Results		Results		Results		Results		Results		Results		Results		Results	
Pesticides (ug/kg)																		
Aldrin	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
Alpha-BHC	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
Alpha-chlordane	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
Beta-BHC	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
Delta-BHC	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
Gamma-BHC	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
Gamma-chlordane	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
4,4'-DDD	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
4,4'-DDE	2.2	27	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
4,4'-DDT	1.58	46.1	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
Dieldrin	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
Endosulfan I	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
Endosulfan II	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
Endosulfan sulfate	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
Endrin	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
Endrin ketone	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
Endrin aldehyde	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
Heptachlor	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
Heptachlor epoxide (B)	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
Methoxychlor	--	--	0.48	U	0.55	U	0.85	U	0.62	U	0.45	U	0.55	U	0.47	U	0.45	U
Toxaphene	--	--	48	U	55	U	85	U	62	U	45	U	55	U	47	U	45	U

Notes:

Analysis Conducted by Woods Hole Group Environmental Laboratories; Raynham, Massachusetts

1. Samples composited over core depth intervals.
2. Guidelines from Long et al (1995) used for evaluation of risk from contaminants in marine and estuarine sediments.

Long, E.R., D.D. MacDonald, S. L. Smith, F.D. Calder. 1995. Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments. Environmental Management. Vol. 19, No. 1, p. 81-97

ER-L = Effects range- low; ER-M = Effects range- median; ND= Not Applicable; U= The analyte was analyzed for but not detected at the sample specific level reported; mg/kg = milligrams per kilogram

Table 4.1.6-7

Summary of Sediment Chemical Analytical Results (Polynuclear Aromatic Hydrocarbon Results) for the Cape Wind Project

Parameter	Core Number		VC01-G4		VC01-G1		VC01-G3		VC01-MT1		VC01-L3		VC01-G13		VC01-G5	
	Sample Designation		VC01-G4-S1		VC01-G1-S2		VC01-G3-S1		VC01-MT1-S1		VC01-L3-S1		VC01-G13-S1		VC01-G5-S1	
	Sample Interval (ft below seabottom)[1]		Composite 0 - 10		Composite 10 - 16.5		Composite 0 - 10		Composite 0 - 10		Composite 0 - 5		Composite 0 - 10		Composite 0 - 10	
	NOAA Marine Sediment Guidelines[2]		Results		Results		Results		Results		Results		Results		Results	
Polynuclear Aromatic Hydrocarbons (ug/kg)	**ERL**	**ERM**														
Naphthalene	160	2100	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
2-Methylnaphthalene	70	670	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
1-Methylnaphthalene	--	--	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
Biphenyl	--	--	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
2,6-Dimethylnaphthalene	--	--	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
Acenaphthylene	44	640	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
Acenaphthene	16	500	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
Fluorene	19	540	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
Phenanthrene	240	1500	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
Anthracene	85.3	1100	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
1-Methylphenanthrene	--	--	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
Fluoranthene	600	5100	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
Pyrene	665	2600	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
Benzo[a]anthracene	261	1600	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
Chrysene	384	2800	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
Benzo[b]fluoranthene	--	--	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
Benzo[k]fluoranthene	--	--	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
Benzo[e]pyrene	--	--	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
Benzo[a]pyrene	430	1600	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
Perylene	--	--	**21**		6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
Indeno[1,2,3-cd]pyrene	--	--	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
Dibenz[a,h]anthracene	63.4	260	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U
Benzo[g,h,i]perylene	--	--	6.2	U	6.0	U	5.7	U	5.5	U	5.6	U	5.6	U	5.8	U

Table 4.1.6-7 (continued)

Summary of Sediment Chemical Analytical Results (Polynuclear Aromatic Hydrocarbon Results) for the Cape Wind Project

Parameter	Core Number		VC01-G11		VC01-P1		VC01-Y1		VC01-Y1		VC01-Y4		VC01-C5		VC01-C1	
	Sample Designation		VC01-G11-S1		VC01-P1-S1		VC01-Y1-S1		VC01-Y1-S2		VC01-Y4-S1		VC01-C5-S1		VC01-C1-S1	
	Sample Interval (ft below seabottom)[1]		Composite 0 - 10		Composite 0 - 5		Composite 0 - 5		Composite 5 - 9.5		Composite 0 - 5		Composite 0 - 5		Composite 0 - 5	
	NOAA Marine Sediment Guidelines[2]		Results		Results		Results		Results		Results		Results		Results	
Polynuclear Aromatic Hydrocarbons (ug/kg)	**ERL**	**ERM**														
Naphthalene	160	2100	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
2-Methylnaphthalene	70	670	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
1-Methylnaphthalene	--	--	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
Biphenyl	--	--	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
2,6-Dimethylnaphthalene	--	--	**10**		5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
Acenaphthylene	44	640	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
Acenaphthene	16	500	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
Fluorene	19	540	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
Phenanthrene	240	1500	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
Anthracene	85.3	1100	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
1-Methylphenanthrene	--	--	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
Fluoranthene	600	5100	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
Pyrene	665	2600	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
Benzo[a]anthracene	261	1600	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
Chrysene	384	2800	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
Benzo[b]fluoranthene	--	--	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
Benzo[k]fluoranthene	--	--	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
Benzo[e]pyrene	--	--	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
Benzo[a]pyrene	430	1600	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
Perylene	--	--	**8.4**		5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
Indeno[1,2,3-cd]pyrene	--	--	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
Dibenz[a,h]anthracene	63.4	260	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U
Benzo[g,h,i]perylene	--	--	6.6	U	5.4	U	5.6	U	5.9	U	5.6	U	5.8	U	5.4	U

Table 4.1.6-7 (continued)

Summary of Sediment Chemical Analytical Results (Polynuclear Aromatic Hydrocarbon Results) for the Cape Wind Project

Parameter	Core Number		VC01-Y2		VC01-P4		VC01-P4		VC01-P3		VC01-C7		VC01-Y8		VC01-PB1	
	Sample Designation		VC01-Y2-S1		VC01-P4-S1		VC01-P4-S2		VC01-P3-S1		VC01-C7-S1		VC01-Y8-S2		VC01-PB1-S1	
	Sample Interval (ft below seabottom)[1]		Composite 0 - 5		Composite 0 - 5		Composite 5 - 9.5		Composite 0 - 5		Composite 0 - 5		Composite 0 - 5		Composite 0 - 5	
	NOAA Marine Sediment Guidelines[2]		Results		Results		Results		Results		Results		Results		Results	
Polynuclear Aromatic Hydrocarbons (ug/kg)	**ERL**	**ERM**														
Naphthalene	160	2100	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
2-Methylnaphthalene	70	670	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
1-Methylnaphthalene	--	--	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
Biphenyl	--	--	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
2,6-Dimethylnaphthalene	--	--	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
Acenaphthylene	44	640	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
Acenaphthene	16	500	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
Fluorene	19	540	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
Phenanthrene	240	1500	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
Anthracene	85.3	1100	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
1-Methylphenanthrene	--	--	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
Fluoranthene	600	5100	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
Pyrene	665	2600	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
Benzo[a]anthracene	261	1600	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
Chrysene	384	2800	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
Benzo[b]fluoranthene	--	--	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
Benzo[k]fluoranthene	--	--	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
Benzo[e]pyrene	--	--	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
Benzo[a]pyrene	430	1600	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
Perylene	--	--	5.8	U	5.8	U	**11**		5.8	U	**17**		5.7	U	**83**	
Indeno[1,2,3-cd]pyrene	--	--	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
Dibenz[a,h]anthracene	63.4	260	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U
Benzo[g,h,i]perylene	--	--	5.8	U	5.8	U	6.3	U	5.8	U	7.2	U	5.7	U	13	U

Table 4.1.6-7 (continued)

Summary of Sediment Chemical Analytical Results (Polynuclear Aromatic Hydrocarbon Results) for the Cape Wind Project

Parameter	Core Number		VC01-PB1		VC01-D1		VC01-PB2		VC01-PB2		VC01-L1		VC01-L1	
	Sample Designation		VC01-PB1-S2		VC01-D1-S1		VC01-PB2-S1		VC01-PB2-S2		VC01-LI-S1		VC01-L1-S2	
	Sample Interval (ft below seabottom)[1]		Composite 5 - 7.7		Composite 0 - 5		Composite 0 - 5		Composite 5 - 7.8		Composite 0 - 5		Composite '5 - 10	
	NOAA Marine Sediment Guidelines[2]		Results		Results		Results		Results		Results		Results	
Polynuclear Aromatic Hydrocarbons (ug/kg)	**ERL**	**ERM**												
Naphthalene	160	2100	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U
2-Methylnaphthalene	70	670	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U
1-Methylnaphthalene	--	--	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U
Biphenyl	--	--	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U
2,6-Dimethylnaphthalene	--	--	10	U	11	U	11	U	**13**		6.6	U	6.6	U
Acenaphthylene	44	640	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U
Acenaphthene	16	500	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U
Fluorene	19	540	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U
Phenanthrene	240	1500	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U
Anthracene	85.3	1100	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U
1-Methylphenanthrene	--	--	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U
Fluoranthene	600	5100	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U
Pyrene	665	2600	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U
Benzo[a]anthracene	261	1600	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U
Chrysene	384	2800	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U
Benzo[b]fluoranthene	--	--	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U
Benzo[k]fluoranthene	--	--	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U
Benzo[e]pyrene	--	--	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U
Benzo[a]pyrene	430	1600	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U
Perylene	--	--	**88**		**100**		**15**		8.4	U	6.6	U	**6.6**	
Indeno[1,2,3-cd]pyrene	--	--	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U
Dibenz[a,h]anthracene	63.4	260	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U
Benzo[g,h,i]perylene	--	--	10	U	11	U	11	U	8.4	U	6.6	U	6.6	U

Table 4.1.6-7 (continued)

Summary of Sediment Chemical Analytical Results (Polynuclear Aromatic Hydrocarbon Results) for the Cape Wind Project

Parameter	Core Number		VC03-13				VC03-19				VC03-20				VC03-23			
	Sample Designation		VC03-13 S1		VC03-13 S2		VC03-19 S1		VC03-19 S2		VC03-20 S1		VC03-20 S2		VC03-23 S1		VC03-23 S2	
	Sample Interval (ft below seabottom)[1]		Composite 0-5'		Composite 5-9.8		Composite 0-5		Composite 5-9.8		Composite 0-5.2		Composite 5.2-8		Composite 0-5		Composite 5-7.8	
	NOAA Marine Sediment Guidelines[2]		Results		Results		Results		Results		Results		Results		Results		Results	
Polynuclear Aromatic Hydrocarbons (ug/kg)	**ERL**	**ERM**																
Naphthalene	160	2100	12	U	14	U	21	U	16	U	11	U	14	U	12	U	11	U
2-Methylnaphthalene	70	670	12	U	**15**		21	U	16	U	11	U	14	U	12	U	11	U
1-Methylnaphthalene	--	--	12	U	14	U	21	U	16	U	11	U	14	U	12	U	11	U
Biphenyl	--	--	12	U	14	U	21	U	16	U	11	U	14	U	12	U	11	U
2,6-Dimethylnaphthalene	--	--	12	U	**16**		21	U	16	U	11	U	14	U	12	U	11	U
Acenaphthylene	44	640	12	U	14	U	21	U	16	U	11	U	14	U	12	U	11	U
Acenaphthene	16	500	12	U	14	U	21	U	16	U	11	U	14	U	12	U	11	U
Fluorene	19	540	12	U	14	U	21	U	16	U	11	U	14	U	12	U	11	U
Phenanthrene	240	1500	12	U	14	U	21	U	16	U	11	U	14	U	12	U	11	U
Anthracene	85.3	1100	12	U	14	U	21	U	16	U	11	U	14	U	12	U	11	U
1-Methylphenanthrene	--	--	12	U	14	U	21	U	16	U	11	U	14	U	12	U	11	U
Fluoranthene	600	5100	12	U	14	U	21	U	16	U	11	U	14	U	12	U	11	U
Pyrene	665	2600	12	U	14	U	21	U	16	U	11	U	14	U	12	U	11	U
Benzo[a]anthracene	261	1600	12	U	14	U	21	U	16	U	11	U	14	U	12	U	11	U
Chrysene	384	2800	12	U	14	U	21	U	16	U	11	U	14	U	12	U	11	U
Benzo[b]fluoranthene	--	--	12	U	14	U	21	U	16	U	11	U	14	U	12	U	11	U
Benzo[k]fluoranthene	--	--	12	U	14	U	21	U	16	U	11	U	14	U	12	U	11	U
Benzo[e]pyrene	--	--	12	U	14	U	21	U	16	U	11	U	14	U	12	U	11	U
Benzo[a]pyrene	430	1600	12	U	14	U	21	U	16	U	11	U	14	U	12	U	11	U
Perylene	--	--	12	U	**44**		21	U	16	U	11	U	**830**		12	U	11	U
Indeno[1,2,3-cd]pyrene	--	--	12	U	14	U	21	U	16	U	11	U	14	U	12	U	11	U
Dibenz[a,h]anthracene	63.4	260	12	U	14	U	21	U	16	U	11	U	14	U	12	U	11	U
Benzo[g,h,i]perylene	--	--	12	U	14	U	21	U	16	U	11	U	14	U	12	U	11	U

Notes: Analysis Conducted by Woods Hole Group Environmental Laboratories; Raynham, Massachusetts
1. Samples composited over core depth intervals.
2. Guidelines from Long et al (1995) used for evaluation of risk from contaminants in marine and estuarine sediments. Long, E.R., D.D. MacDonald, S. L. Smith, F.D. Calder. 1995. Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments. Environmental Management. Vol. 19, No. 1, p. 81-97
ER-L = Effects range- low; ER-M = Effects range- median; ND = Not Applicable; U = The analyte was analyzed for but not detected at the sample specific level reported;
mg/kg = milligrams per kilogram

Table 4.1.7-1

Characteristics of Electric and Magnetic Fields

Characteristic	Electric Fields	Magnetic Fields
Unit of Measurement	Volts/meter	Weber/meter^2 (Tesla or Gauss)
Attenuated by Objects	Yes	No
Field Results from	Strength of Electric Charge	Motion of Electric Charge
Primary Determinant	Voltage	Current Flow

Table 4.1.7-2

Magnetic Flux Densities

Device, Phenomenon, Location, or Standard	Magnetic Flux Density (mG)
Magnetic Resonance Imaging (MRI) scan	20,000,000
Permanent magnet	100,000
ACGIH* standard	10,000
ICNIRP** occupational guideline (1998)	4,167
ACGIH guideline for occupational exposures	10,000
ACGIH guideline for individuals with pacemakers	1,000
ICNIRP general public guideline (1998)	833
Earth's magnetic field	470 to 590
Hair dryers and electric blankets	100 to 500
Typical household appliance	40 to 80

Table 4.1.7-1 Characteristics of Electric and Magnetic Fields		
Characteristic	**Electric Fields**	**Magnetic Fields**
Unit of Measurement	Volts/meter	Weber/meter^2 (Tesla or Gauss)
Attenuated by Objects	Yes	No
Field Results from	Strength of Electric Charge	Motion of Electric Charge
Primary Determinant	Voltage	Current Flow

Table 4.1.7-2 Magnetic Flux Densities	
Device, Phenomenon, Location, or Standard	**Magnetic Flux Density (mG)**
Magnetic Resonance Imaging (MRI) scan	20,000,000
Permanent magnet	100,000
ACGIH* standard	10,000
ICNIRP** occupational guideline (1998)	4,167
ACGIH guideline for occupational exposures	10,000
ACGIH guideline for individuals with pacemakers	1,000
ICNIRP general public guideline (1998)	833
Earth's magnetic field	470 to 590
Hair dryers and electric blankets	100 to 500
Typical household appliance	40 to 80

Table 4.1.7-3

State Transmission Line Standards and Guidelines

State	Electric Field		Magnetic Field	
	On ROW*	Edge ROW	On ROW	Edge ROW
Florida	8 kV/m a/ 10 kV/m b/	2 kV/m	-	150 mG a/ (max. load) 200 mG b/ (max. load) 250 mG c/ (max. load)
Minnesota	8 kV/m	-	-	-
Montana	7 kV/m	1 kV/m e/	-	-
New Jersey	-	3 kV/m	-	-
New York	11.8 kV/m 11.0 kV/m f/ 7.0 kV/m d/	1.6 kV/m	-	200 mG (max. load)
Oregon	9 kV/m	-	-	-

*ROW = right-of-way (or in the Florida standard, certain additional areas adjoining the right-of-way).
kV/m = kilovolt per meter. One kilovolt = 1,000 volts.
a/ For lines of 69-230 kV.
b/ For 500 kV lines.
c/ For 500 kV lines on certain existing ROW.
d/ Maximum for highway crossings.
e/ May be waived by the landowner.
f/ Maximum for private road crossings.
Source - EMF Electric and Magnetic Fields Associated with the Use of Electric Power, Questions & Answers, June 2002, National Institute of Environmental Health Sciences, National Institutes of Health

Table 4.2.2-1

Coastal Wetland Resources

Wetland	Jurisdiction: Federal	Jurisdiction: State	Jurisdiction: Local	Significant MWPA Interests	Impacts	Mitigation
Coastal Wetland Resource Areas						
Lewis Bay	Yes	Land Under Ocean Nearshore Areas Land Containing Shellfish	Land Under Ocean Land Containing Shellfish 100’ Buffer Zone	Protection of Marine Fisheries Protection of Land Containing Shellfish Flood Control Storm Damage Prevention Wildlife Habitat	Installation of transmission line by hydraulic jet-plow	Minimization of impacts through use of hydraulic jet-plow
Coastal Bank	No	Coastal Bank 100’ Buffer Zone	Coastal Bank 100’ Buffer Zone 50’ No-Build Zone 35’ Vegetated Buffer	Flood Control Storm Damage Prevention	HDD beneath Coastal Bank and temporary work (trenching, installing vault and transmission line, backfilling and repaving) within paved portions of 100’ Buffer Zone	No direct impacts through use of HDD at landfall No above-ground structures in 50’ No-Build Zone and no vegetation disturbance in 35’ Vegetated Buffer Erosion and sedimentation controls (coffer-dam)
100-year Floodplain	No	Land Subject to Coastal Storm Flowage	Land Subject to Coastal Storm Flowage	None Under WPA	Temporary work (trenching, installing vault and transmission line, backfilling, repaving) within paved roads	No change to contours of land within floodplain or ability of floodplain to provide flood control
Coastal Beach	No	Coastal Beach 100’ Buffer Zone Land Containing Shellfish	Coastal Beach, Land Containing Shellfish 100’ Buffer Zone 50’ No-Build Zone 35’ Vegetated Buffer	Storm Damage Prevention Flood Control Wildlife Habitat Protection of Marine Fisheries Protection of Land Containing Shellfish	HDD beneath Coastal Beach 1 and temporary work (trenching, installing vault and transmission line, backfilling, repaving) within paved portions of 100’ Buffer Zone	No direct impacts through use of HDD at landfall No structures in 50’ No-Build Zone and no disturbance of vegetation in 35’ Vegetated Buffer Erosion and sedimentation controls (coffer-dam)
Salt Marsh	Yes	Salt Marsh 100’ Buffer Zone	Salt Marsh 100’ Buffer Zone 50’ No-Build Zone 35’ Vegetated Buffer	Protection of Marine Fisheries Wildlife Habitat Protection of Land Containing Shellfish Storm Damage Prevention Prevention of Pollution Ground Water Supply	Temporary work (trenching, installing vault and transmission line, backfilling, repaving) within paved portions of 100’ Buffer Zone	No work in salt marsh, its 50’ No-Build Zone or 35’ Vegetated Buffer Erosion and sedimentation controls
Land Subject to Tidal Action	No	Land Subject to Tidal Action	Land Subject to Tidal Action, 100’ Buffer Zone	None Under WPA	HDD beneath Land Subject to Tidal Action and temporary work within paved portions of 100’ Buffer Zone	No direct impacts through use of HDD at landfall Erosion and sedimentation controls (coffer-dam)

Table 4.2.4-9 A Summary of Wilson's Storm-Petrel Counts in the Survey Area as Observed by ESS During Summer Aerial Surveys Conducted in 2002 and 2003, Nantucket Sound, Massachusetts			
Survey Area	**May-August 2002 Total No/Mean Per Survey (n=6)**	**June- August 2003 Total No/Mean Per Survey (n=6)**	**Total No.**
Horseshoe Shoal	0/0.0	0/0.0	0/0.0
Monomoy-Handkerchief Shoal	0/0.0	0/0.0	0/0.0
Tuckernuck Shoal	1/0.2	4/0.7	5/0.8
Outside Shoal Areas	12/2.0	11/1.8	23/3.8
Totals	13/2.2	15/2.5	28/4.7

Table 4.2.4-10 A Summary of Wilson's Storm-Petrel Counts as Observed by MAS During Winter and Summer Aerial and Boat Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts							
Survey Area	**Aug-Sep 2002 Total No/Mean Per Survey (n=15)**	**May-July 2003 Total No/Mean Per Survey (n=16)**	**Aug-Sep 2003 Total No/Mean Per Survey (n=17)**	**Dec-Apr 2003-2004 Total No/Mean Per Survey (n=15)**	**May-Jul 2003-2004 Total No/Mean Per Survey (n=15)**	**Aug-Sep 2004 Total No/Mean Per Survey (n=17)**	**Total No.**
Horseshoe Shoal (Boat)	1/.08	20	0	0/0.0	13/1.1	0/0.0	34
Nantucket sound (Aerial)	7/.6	1/.33	2/.2	0/0.0	9/3	53/5.3	72
Monomoy-Handkerchief Shoal	NA	NA	NA	NA	NA	NA	NA
Tuckernuck Shoal	NA	NA	NA	NA	NA	NA	NA
Outside Survey Area	NA	NA	NA	NA	NA	NA	NA

Table 4.2.4-11

A Summary of Northern Gannet Counts as Observed by ESS During Winter and Summer Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Mar-Apr 2002 Total No/Mean Per Survey (n=5)	May-Aug 2002 Total No/Mean Per Survey (n=6)	Sept 2002- Feb 2003 Total No/Mean Per Survey (n=11)	Mar-Jun 2003 Total No/Mean Per Survey (n=6)	Jun- Aug. 2003 Total No/Mean Per Survey (n=6)	Sept 2003-Feb 2004 Total No/Mean Per Survey (n=12)	Total No.	Percent
Horseshoe Shoal	21/**4.2**	1/0.2	10/**0.9**	97/16.2	0/0.0	11/0.9	140	10
Monomoy-Handkerchief Shoal	13/**2.6**	12/**2.0**	0/0.0	7/1.2	0/0.0	3/0.2	35	3
Tuckernuck Shoal	32/**6.4**	0/0.0	17/**1.5**	101/**16.8**	0/0.0	9/0.8	159	11
Outside Shoal Areas	294/58.8	76/12.7	160/14.5	268/44.7	0/0.0	283/23.6	1,081	76
Totals	360/72.0	89/14.8	187/17.0	473/78.8	0/0.0	306/25.5	1,415	100

Table 4.2.4-12

A Summary of Northern Gannet Counts as Observed by MAS During Winter and Summer Aerial and Boat Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Aug-Sep 2002 Total No/Mean Per Survey (n=15)	May-July 2003 Total No/Mean Per Survey (n=16)	Aug-Sep 2003 Total No/Mean Per Survey (n=17)	Dec-Apr 2003-2004 Total No/Mean Per Survey (n=15)	May-Jul 2003-2004 Total No/Mean Per Survey (n=15)	Aug-Sep 2004 Total No/Mean Per Survey (n=17)	Total No.
Horseshoe Shoal (Boat)	0/0.0	7/.5	0/0.0	1/.5	172/14.3	0/0.0	180
Nantucket sound (Aerial)	13/1.2	1/.33	0/0.0	629/48.4	29/7.25	0/0.0	672
Monomoy-Handkerchief Shoal	NA	NA	NA	NA	NA	NA	NA
Tuckernuck Shoal	NA	NA	NA	NA	NA	NA	NA
Outside Survey Area	NA	NA	NA	NA	NA	NA	NA

Table 4.2.4-13

A Summary of Cormorant Counts as Observed by ESS During Winter and Summer Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Mar-Apr 2002 Total No/Mean Per Survey (n=5)	May-Aug 2002 Total No/Mean Per Survey (n=6)	Sept 2002- Feb 2003 Total No/Mean Per Survey (n=11)	Mar-Jun 2003 Total No/Mean Per Survey (n=6)	Jun- Aug. 2003 Total No/Mean Per Survey (n=6)	Sept 2003-Feb 2004 Total No/Mean Per Survey (n=12)	Total No.
Inside Survey Area	n/a	1	n/a	3	0	0	4
Outside Shoal Areas	n/a	292	n/a	111	743	103	1,249
Totals	10	293	1,247	114	744	103	2,511

Table 4.2.4-12

A Summary of Northern Gannet Counts as Observed by MAS During Winter and Summer Aerial and Boat Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Aug-Sep 2002 Total No/Mean Per Survey (n=15)	May-July 2003 Total No/Mean Per Survey (n=16)	Aug-Sep 2003 Total No/Mean Per Survey (n=17)	Dec-Apr 2003-2004 Total No/Mean Per Survey (n=15)	May-Jul 2003-2004 Total No/Mean Per Survey (n=15)	Aug-Sep 2004 Total No/Mean Per Survey (n=17)	Total No.
Horseshoe Shoal (Boat)	0/0.0	7/.5	0/0.0	1/.5	172/14.3	0/0.0	180
Nantucket sound (Aerial)	13/1.2	1/.33	0/0.0	629/48.4	29/7.25	0/0.0	672
Monomoy-Handkerchief Shoal	NA	NA	NA	NA	NA	NA	NA
Tuckernuck Shoal	NA	NA	NA	NA	NA	NA	NA
Outside Survey Area	NA	NA	NA	NA	NA	NA	NA

Table 4.2.4-13

A Summary of Cormorant Counts as Observed by ESS During Winter and Summer Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Mar-Apr 2002 Total No/Mean Per Survey (n=5)	May-Aug 2002 Total No/Mean Per Survey (n=6)	Sept 2002- Feb 2003 Total No/Mean Per Survey (n=11)	Mar-Jun 2003 Total No/Mean Per Survey (n=6)	Jun- Aug. 2003 Total No/Mean Per Survey (n=6)	Sept 2003-Feb 2004 Total No/Mean Per Survey (n=12)	Total No.
Inside Survey Area	n/a	1	n/a	3	0	0	4
Outside Shoal Areas	n/a	292	n/a	111	743	103	1,249
Totals	10	293	1,247	114	744	103	2,511

Table 4.2.4-14

A Summary of Cormorant Counts as Observed by MAS During Winter and Summer Aerial and Boat Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Aug-Sep 2002 Total No/Mean Per Survey (n=15)	May-July 2003 Total No/Mean Per Survey (n=16)	Aug-Sep 2003 Total No/Mean Per Survey (n=17)	Dec-Apr 2003-2004 Total No/Mean Per Survey (n=15)	May-Jul 2003-2004 Total No/Mean Per Survey (n=15)	Aug-Sep 2004 Total No/Mean Per Survey (n=17)	Total No.
Horseshoe Shoal (Boat)	11/2.75	20/1.5	1/.25	0/0.0	8/.7	4/.7	44
Nantucket sound (Aerial)	2,702/245.6 (612/55.6)*	258/86	46/3.5(45/3.5)*	7/.7	7/.33	680/68	3700(1611)*
Monomoy-Handkerchief Shoal	NA	NA	NA	NA	NA	NA	NA
Tuckernuck Shoal	NA	NA	NA	NA	NA	NA	NA
Outside Survey Area	NA	NA	NA	NA	NA	NA	NA

* Final MAS numbers in parentheses were adjusted due to birds outside study area and exclusion of resting on beaches and shallows

Table 4.2.4-15

A Summary of Common Eider Counts in the Survey Area as Observed by ESS During Winter and Summer Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Mar-Apr 2002 Total No/Mean Per Survey (n=5)	May-Aug 2002 Total No/Mean Per Survey (n=6)	Sept 2002- Feb 2003 Total No/Mean Per Survey (n=11)	Mar-Jun 2003 Total No/Mean Per Survey (n=6)	Jun- Aug. 2003 Total No/Mean Per Survey (n=6)	Sept 2003 -Feb 2004 Total No/Mean Per Survey (n=12)	Total No.
Horseshoe Shoal	594/**99.0**	0/0.0	1,488/**135.3**	371/**61.8**	0/0.0	3,347/**278.9**	5,800
Monomoy-Handkerchief Shoal	162/**27.0**	0/0.0	100/**9.1**	272/**45.3**	0/0.0	257/**21.4**	791
Tuckernuck Shoal	310/**51.7**	0/0.0	68/**6.2**	76/12.7	0/0.0	666/**55.5**	1,120
Outside Shoal Areas	19,554/3,259.0	181/30.2	23,462/2,132.9	21,274/3,545.7	11/1.8	38,362/3,196.8	102,844
Totals	20,620/3,436.7	181/30.2	25,118/2,283.5	21,993/3,665.5	11/1.8	42,632/3,552.7	110,555

Table 4.2.4-14

A Summary of Cormorant Counts as Observed by MAS During Winter and Summer Aerial and Boat Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Aug-Sep 2002 Total No/Mean Per Survey (n=15)	May-July 2003 Total No/Mean Per Survey (n=16)	Aug-Sep 2003 Total No/Mean Per Survey (n=17)	Dec-Apr 2003-2004 Total No/Mean Per Survey (n=15)	May-Jul 2003-2004 Total No/Mean Per Survey (n=15)	Aug-Sep 2004 Total No/Mean Per Survey (n=17)	Total No.
Horseshoe Shoal (Boat)	11/2.75	20/1.5	1/.25	0/0.0	8/.7	4/.7	44
Nantucket sound (Aerial)	2,702/245.6 (612/55.6)*	258/86	46/3.5(45/3.5)*	7/.7	7/.33	680/68	3700(1611)*
Monomoy-Handkerchief Shoal	NA	NA	NA	NA	NA	NA	NA
Tuckernuck Shoal	NA	NA	NA	NA	NA	NA	NA
Outside Survey Area	NA	NA	NA	NA	NA	NA	NA

* Final MAS numbers in parentheses were adjusted due to birds outside study area and exclusion of resting on beaches and shallows

Table 4.2.4-15

A Summary of Common Eider Counts in the Survey Area as Observed by ESS During Winter and Summer Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Mar-Apr 2002 Total No/Mean Per Survey (n=5)	May-Aug 2002 Total No/Mean Per Survey (n=6)	Sept 2002- Feb 2003 Total No/Mean Per Survey (n=11)	Mar-Jun 2003 Total No/Mean Per Survey (n=6)	Jun- Aug. 2003 Total No/Mean Per Survey (n=6)	Sept 2003 -Feb 2004 Total No/Mean Per Survey (n=12)	Total No.
Horseshoe Shoal	594/**99.0**	0/0.0	1,488/**135.3**	371/**61.8**	0/0.0	3,347/**278.9**	5,800
Monomoy-Handkerchief Shoal	162/**27.0**	0/0.0	100/**9.1**	272/**45.3**	0/0.0	257/**21.4**	791
Tuckernuck Shoal	310/**51.7**	0/0.0	68/**6.2**	76/12.7	0/0.0	666/**55.5**	1,120
Outside Shoal Areas	19,554/3,259.0	181/30.2	23,462/2,132.9	21,274/3,545.7	11/1.8	38,362/3,196.8	102,844
Totals	20,620/3,436.7	181/30.2	25,118/2,283.5	21,993/3,665.5	11/1.8	42,632/3,552.7	110,555

Table 4.2.4-16

A Summary of Common Eider Counts as Observed by MAS During Winter and Summer Aerial and Boat Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Aug-Sep 2002 Total No/Mean Per Survey (n=15)	May-July 2003 Total No/Mean Per Survey (n=16)	Aug-Sep 2003 Total No/Mean Per Survey (n=117)	Dec-Apr 2003-2004 Total No/Mean Per Survey (n=15)	May-Jul 2003-2004 Total No/Mean Per Survey (n=15)	Aug-Sep 2004 Total No/Mean Per Survey (n=17)	Total No.
Horseshoe Shoal (Boat)	0/0.0	0/0.0	0/0.0	794/397	86/7.2	0/0.0	880
Nantucket sound (Aerial)	8/.73	0/0.0	1/.08	280,000/21538.5	1/.33	23/2.3	280,033
Monomoy-Handkerchief Shoal	NA	NA	NA	NA	NA	NA	NA
Tuckernuck Shoal	NA	NA	NA	NA	NA	NA	NA
Outside Survey Area	NA	NA	NA	NA	NA	NA	NA

Table 4.2.4-17

A Summary of Long-Tailed Duck Counts in the Survey Area as Observed by ESS During Winter Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Mar-Apr 2002 Total No/Mean Per Survey (n=5)	Sept 2002- Feb 2003 Total No/Mean Per Survey (n=11)	Mar-Jun 2003 Total No/Mean Per Survey (n=6)	Sept 2003-Feb 2004 Total No/Mean Per Survey (n=12)	Total No.	Percent
Horseshoe Shoal	1,054/**210.8**	938/**85.3**	732/122.0	1,379/**114.9**	4,103	8
Monomoy-Handkerchief Shoal	566/113.2	773/**70.3**	585/**97.5**	761/**63.4**	2,685	5
Tuckernuck Shoal	131/**26.2**	1,706/**155.1**	212/**35.3**	444/**37.0**	2,493	5
Outside Shoal Areas	9,324/1,864.8	20,298/1,845.3	3,334/555.7	9,955/829.6	42,911	82
Totals	11,075/2,215	23,715/2,155.9	4,863/810.5	12,539/1,044.9	52,192	100

Table 4.2.4-16

A Summary of Common Eider Counts as Observed by MAS During Winter and Summer Aerial and Boat Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Aug-Sep 2002 Total No/Mean Per Survey (n=15)	May-July 2003 Total No/Mean Per Survey (n=16)	Aug-Sep 2003 Total No/Mean Per Survey (n=117)	Dec-Apr 2003-2004 Total No/Mean Per Survey (n=15)	May-Jul 2003-2004 Total No/Mean Per Survey (n=15)	Aug-Sep 2004 Total No/Mean Per Survey (n=17)	Total No.
Horseshoe Shoal (Boat)	0/0.0	0/0.0	0/0.0	794/397	86/7.2	0/0.0	880
Nantucket sound (Aerial)	8/.73	0/0.0	1/.08	280,000/21538.5	1/.33	23/2.3	280,033
Monomoy-Handkerchief Shoal	NA	NA	NA	NA	NA	NA	NA
Tuckernuck Shoal	NA	NA	NA	NA	NA	NA	NA
Outside Survey Area	NA	NA	NA	NA	NA	NA	NA

Table 4.2.4-17

A Summary of Long-Tailed Duck Counts in the Survey Area as Observed by ESS During Winter Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Mar-Apr 2002 Total No/Mean Per Survey (n=5)	Sept 2002- Feb 2003 Total No/Mean Per Survey (n=11)	Mar-Jun 2003 Total No/Mean Per Survey (n=6)	Sept 2003-Feb 2004 Total No/Mean Per Survey (n=12)	Total No.	Percent
Horseshoe Shoal	1,054/**210.8**	938/**85.3**	732/122.0	1,379/**114.9**	4,103	8
Monomoy-Handkerchief Shoal	566/113.2	773/**70.3**	585/**97.5**	761/**63.4**	2,685	5
Tuckernuck Shoal	131/**26.2**	1,706/**155.1**	212/**35.3**	444/**37.0**	2,493	5
Outside Shoal Areas	9,324/1,864.8	20,298/1,845.3	3,334/555.7	9,955/829.6	42,911	82
Totals	11,075/2,215	23,715/2,155.9	4,863/810.5	12,539/1,044.9	52,192	100

Table 4.2.4-18

A Summary of Long-Tailed Duck Counts as Observed by MAS During Winter and Summer Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Aug-Sep 2002 Total No/Mean Per Survey (n=15)	May-July 2003 Total No/Mean Per Survey (n=16)	Aug-Sep 2003 Total No/Mean Per Survey (n=17)	Dec-Apr 2003-2004 Total No/Mean Per Survey (n=15)	May-Jul 2003-2004 Total No/Mean Per Survey (n=15)	Aug-Sep 2004 Total No/Mean Per Survey (n=17)	Total No.
Horseshoe Shoal (Boat)	0	0	0	1,209/604.5	4/2	0	1,213
Nantucket Sound (Aerial)	0	0	0	33,379/2538.5	0	0	33,379
Monomoy-Handkerchief Shoal	NA	NA	NA	NA	NA	NA	NA
Tuckernuck Shoal	NA	NA	NA	NA	NA	NA	NA
Outside Survey Area	NA	NA	NA	NA	NA	NA	NA

Table 4.2.4-19

A Summary of Scoter Counts in the Survey Area as Observed by ESS during Winter and Summer Aerial and Boat Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Mar-Apr 2002 Total No/Mean Per Survey (n=5)	May-Aug 2002 Total No/Mean Per Survey (n=6)	Sept 2002- Feb 2003 Total No/Mean Per Survey (n=11)	Mar-Jun 2003 Total No/Mean Per Survey (n=6)	Jun-Aug. 2003 Total No/Mean Per Survey (n=6)	Sept 2003-Feb 2004 Total No/Mean Per Survey (n=12)	Total No.
Horseshoe Shoal	2,701/**540.2**	0/0.0	2,229/**202.6**	1,076/**179.3**	0/0.0	9,216/**768.0**	15,222
Monomoy-Handkerchief Shoal	2,139/**427.8**	0/0.0	6,628/**602.5**	2,634/**439.0**	0/0.0	7,277/**606.4**	18,678
Tuckernuck Shoal	4,166/**293.2**	0/0.0	8,868/**806.2**	1,199/**199.8**	0/0.0	16,186/**1,348.8**	30,419
Outside Shoal Areas	32,076/ 6,415.2	18/3.0	37,199/3,381.7	8,682/1,447.0	4/0.7	63,504/5,292	141,483
Totals	41,082/ 8,216.4	18/3.0	54,924/4,993.1	13,591/2,265.2	4/0.7	96,183/8,015.2	205,802

Table 4.2.4-18

A Summary of Long-Tailed Duck Counts as Observed by MAS During Winter and Summer Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Aug-Sep 2002 Total No/Mean Per Survey (n=15)	May-July 2003 Total No/Mean Per Survey (n=16)	Aug-Sep 2003 Total No/Mean Per Survey (n=17)	Dec-Apr 2003-2004 Total No/Mean Per Survey (n=15)	May-Jul 2003-2004 Total No/Mean Per Survey (n=15)	Aug-Sep 2004 Total No/Mean Per Survey (n=17)	Total No.
Horseshoe Shoal (Boat)	0	0	0	1,209/604.5	4/2	0	1,213
Nantucket Sound (Aerial)	0	0	0	33,379/2538.5	0	0	33,379
Monomoy-Handkerchief Shoal	NA	NA	NA	NA	NA	NA	NA
Tuckernuck Shoal	NA	NA	NA	NA	NA	NA	NA
Outside Survey Area	NA	NA	NA	NA	NA	NA	NA

Table 4.2.4-19

A Summary of Scoter Counts in the Survey Area as Observed by ESS during Winter and Summer Aerial and Boat Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Mar-Apr 2002 Total No/Mean Per Survey (n=5)	May-Aug 2002 Total No/Mean Per Survey (n=6)	Sept 2002- Feb 2003 Total No/Mean Per Survey (n=11)	Mar-Jun 2003 Total No/Mean Per Survey (n=6)	Jun-Aug. 2003 Total No/Mean Per Survey (n=6)	Sept 2003-Feb 2004 Total No/Mean Per Survey (n=12)	Total No.
Horseshoe Shoal	2,701/**540.2**	0/0.0	2,229/**202.6**	1,076/**179.3**	0/0.0	9,216/**768.0**	15,222
Monomoy-Handkerchief Shoal	2,139/**427.8**	0/0.0	6,628/**602.5**	2,634/**439.0**	0/0.0	7,277/**606.4**	18,678
Tuckernuck Shoal	4,166/**293.2**	0/0.0	8,868/**806.2**	1,199/**199.8**	0/0.0	16,186/**1,348.8**	30,419
Outside Shoal Areas	32,076/ 6,415.2	18/3.0	37,199/3,381.7	8,682/1,447.0	4/0.7	63,504/5,292	141,483
Totals	41,082/ 8,216.4	18/3.0	54,924/4,993.1	13,591/2,265.2	4/0.7	96,183/8,015.2	205,802

Table 4.2.4-1

Studies Conducted by the Applicant's Consultant that Were Used During the Preparation of this Description

Applicant Report No.	Title	Author	Type of Report
4.2.4-1	Preliminary Avian Risk Assessment for the Cape Wind Energy Project	Kerlinger and Hatch	Desktop assessment
4.2-4.2	Summary of Cape Wind and MAS Aerial Surveys - 2002 - 2006	ESS Group, Inc.	Summary of aerial surveys
4.2.4-3	Spring and Summer 2002 Waterbirds Survey	ESS, Hatch, and Kerlinger	Six aerial and seven boat surveys of marine birds
4.2.4-4	A Late Winter and Early Spring 2002 Waterbirds Survey	ESS, Hatch, and Kerlinger	Five aerial and one boat surveys of marine birds
4.2.4-5	Mobile Avian Radar System (MARS®) 2002 Monitoring Report: Data Reanalysis, Nantucket Sound	Geo-Marine, Inc.	Radar surveys
4.2.4-6	Fall 2005 Mobile Avian Radar System (MARS®) Monitoring Report, Nantucket Sound	Geo-Marine, Inc.	Radar surveys
4.2.4-7	Spring 2006 Mobile Avian Radar System (MARS®) Monitoring Report, Nantucket Sound	Geo-Marine, Inc.	Radar surveys
4.2.4-8	Summer 2003 Waterbirds Survey	ESS, Hatch, and Kerlinger	Six aerial and two boat surveys of marine birds
4.2.4-9	Fall 2002 and Winter 2003 Waterbirds Survey	ESS, Hatch, and Kerlinger	Eleven aerial and two boat surveys of marine birds
4.2.4-10	Six Surveys of Waterbirds in Nantucket Sound	ESS, Hatch, and Kerlinger	Six aerial and one boat surveys of marine birds
4.2.4-11	Fall 2003 and Winter 2004 Waterbirds Survey	ESS, Hatch, and Kerlinger	Twelve aerial and one boat surveys of marine birds
4.2.4-12	Long-tailed Duck Report, Winter 2005-2006	ESS Group, Inc.	Targeted aerial, boat and land surveys of ducks
4.2.4-13	Winter/Nocturnal Duck Survey, Nantucket Sound	ESS Group, Inc.	Two aerial and two boat surveys of ducks

Table 4.2.4-2

Summary of the Cape Wind and MassAudubon Aerial Survey Methodologies

	Number of Surveys	Number of Transects	Survey Width (m)	Survey Length (km)	Survey Height (m)	Survey Area (km^2)
Applicant	46	16	400	415 km	76	168
MAS	79	16 – 15 a/	183	398 – 401 b/	152	73 - 78 c/

a/ 16 transects during the tern breeding and fall staging survey periods and 15 during the winter sea duck and waterbirds surveys
b/ 398 km during the tern breeding and fall staging survey periods and 401 km during the winter sea duck and waterbirds surveys
c/ 73 km^2 during the tern breeding and fall staging survey periods and 78 km^2 during the winter sea duck and waterbirds surveys

Table 4.2.4-20

A Summary of Scoter Counts as Observed by MAS During Winter and Summer Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Aug-Sep 2002 Total No/Mean Per Survey (n=15)	May-July 2003 Total No/Mean Per Survey (n=16)	Aug-Sep 2003 Total No/Mean Per Survey (n=17)	Dec-Apr 2003-2004 Total No/Mean Per Survey (n=15)	May-Jul 2004 Total No/Mean Per Survey (n=15)	Aug-Sep 2004 Total No/Mean Per Survey (n=17)	Total No.
Horseshoe Shoal (Boat)	15/3.8	35/11.7	18/4.5	1,750/875	414/34.5	9/1.5	2241
Nantucket sound (Aerial)	14/1.28	0/0.0	44/3.38	91,244/7036.2	2/.67	1,086/108.6	92,390
Monomoy-Handkerchief Shoal	NA	NA	NA	NA	NA	NA	NA
Tuckernuck Shoal	NA	NA	NA	NA	NA	NA	NA
Outside Survey Area	NA	NA	NA	NA	NA	NA	NA

Table 4.2.4-21

A Summary of Merganser Counts in the Survey Area as Observed by ESS During Winter and Summer Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Mar-Apr 2002 Total No/Mean Per Survey (n=5)	May-Aug 2002 Total No/Mean Per Survey (n=6)	Sept 2002- Feb 2003 Total No/Mean Per Survey (n=11)	Mar-Jun 2003 Total No/Mean Per Survey (n=6)	Jun- Aug. 2003 Total No/Mean Per Survey (n=6)	Sept 2003 - Feb 2004 Total No/Mean Per Survey (n=12)	Total No.
Horseshoe Shoal		0		2	0	115	
Monomoy-Handkerchief Shoal	40 a/	0	194 a/	0	0	0	351
Tuckernuck Shoal		0		0	0	0	
Outside Shoal Areas	n/a	0	n/a	164	0	937	1,101
Totals	40	0	194	166	0	1,052	1,452

a/ Numbers of mergansers not distinguished between alternative sites.

Table 4.2.4-20

A Summary of Scoter Counts as Observed by MAS During Winter and Summer Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Aug-Sep 2002 Total No/Mean Per Survey (n=15)	May-July 2003 Total No/Mean Per Survey (n=16)	Aug-Sep 2003 Total No/Mean Per Survey (n=17)	Dec-Apr 2003-2004 Total No/Mean Per Survey (n=15)	May-Jul 2004 Total No/Mean Per Survey (n=15)	Aug-Sep 2004 Total No/Mean Per Survey (n=17)	Total No.
Horseshoe Shoal (Boat)	15/3.8	35/11.7	18/4.5	1,750/875	414/34.5	9/1.5	2241
Nantucket sound (Aerial)	14/1.28	0/0.0	44/3.38	91,244/7036.2	2/.67	1,086/108.6	92,390
Monomoy-Handkerchief Shoal	NA	NA	NA	NA	NA	NA	NA
Tuckernuck Shoal	NA	NA	NA	NA	NA	NA	NA
Outside Survey Area	NA	NA	NA	NA	NA	NA	NA

Table 4.2.4-21

A Summary of Merganser Counts in the Survey Area as Observed by ESS During Winter and Summer Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Mar-Apr 2002 Total No/Mean Per Survey (n=5)	May-Aug 2002 Total No/Mean Per Survey (n=6)	Sept 2002- Feb 2003 Total No/Mean Per Survey (n=11)	Mar-Jun 2003 Total No/Mean Per Survey (n=6)	Jun- Aug. 2003 Total No/Mean Per Survey (n=6)	Sept 2003 - Feb 2004 Total No/Mean Per Survey (n=12)	Total No.
Horseshoe Shoal		0		2	0	115	
Monomoy-Handkerchief Shoal	40 a/	0	194 a/	0	0	0	351
Tuckernuck Shoal		0		0	0	0	
Outside Shoal Areas	n/a	0	n/a	164	0	937	1,101
Totals	40	0	194	166	0	1,052	1,452

a/ Numbers of mergansers not distinguished between alternative sites.

Table 4.2.4-22

A Summary of Merganser Counts as Observed by MAS During Winter and Summer Aerial and Boat Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Aug-Sep 2002 Total No/Mean Per Survey (n=15)	May-July 2003 Total No/Mean Per Survey (n=16)	Aug-Sep 2003 Total No/Mean Per Survey (n=17)	Dec-Apr 2003-2004 Total No/Mean Per Survey (n=15)	May-Jul 2004 Total No/Mean Per Survey (n=15)	Aug-Sep 2004 Total No/Mean Per Survey (n=17)	Total No.
Horseshoe Shoal (Boat)	0	0	0	1/.5	0	0	1
Nantucket sound (Aerial)	0	0	1/.08	55/4.2	0	0	56
Monomoy-Handkerchief Shoal	NA	NA	NA	NA	NA	NA	
Tuckernuck Shoal	NA	NA	NA	NA	NA	NA	
Outside Survey Area	NA	NA	NA	NA	NA	NA	

Table 4.2.4-23

A Summary of Gull Counts in the Survey Area as Observed by ESS During Winter and Summer Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Mar-Apr 2002 Total No/Mean Per Survey (n=5)	May-Aug 2002 Total No/Mean Per Survey (n=6)	Sept 2002- Feb 2003 Total No/Mean Per Survey (n=11)	Mar-Jun 2003 Total No/Mean Per Survey (n=6)	Jun- Aug. 2003 Total No/Mean Per Survey (n=6)	Sept 2003-Feb 2004 Total No/Mean Per Survey (n=12)	Total No.
Horseshoe Shoal	45/**9.0**	10/**1.7**	91/**8.3**	48/**8.0**	22/**3.7**	61/**5.1**	277
Monomoy-Handkerchief Shoal	4/0.8	28/**4.7**	39/**3.5**	5/0.8	25/**4.2**	31/**2.6**	132
Tuckernuck Shoal	19/**3.8**	7/1.2	346/**31.5**	46/**7.7**	15/**2.5**	119/**9.9**	552
Outside Shoal Areas	213/42.6	365/60.8	1,311/119.2	223/**37.2**	501/83.5	1,926/160.5	4,539
Totals	281/56.2	410/68.3	1,787/162.5	322/**53.7**	563/93.8	2,137/178.1	5,500

Table 4.2.4-22

A Summary of Merganser Counts as Observed by MAS During Winter and Summer Aerial and Boat Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Aug-Sep 2002 Total No/Mean Per Survey (n=15)	May-July 2003 Total No/Mean Per Survey (n=16)	Aug-Sep 2003 Total No/Mean Per Survey (n=17)	Dec-Apr 2003-2004 Total No/Mean Per Survey (n=15)	May-Jul 2004 Total No/Mean Per Survey (n=15)	Aug-Sep 2004 Total No/Mean Per Survey (n=17)	Total No.
Horseshoe Shoal (Boat)	0	0	0	1/.5	0	0	1
Nantucket sound (Aerial)	0	0	1/.08	55/4.2	0	0	56
Monomoy-Handkerchief Shoal	NA	NA	NA	NA	NA	NA	
Tuckernuck Shoal	NA	NA	NA	NA	NA	NA	
Outside Survey Area	NA	NA	NA	NA	NA	NA	

Table 4.2.4-23

A Summary of Gull Counts in the Survey Area as Observed by ESS During Winter and Summer Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Mar-Apr 2002 Total No/Mean Per Survey (n=5)	May-Aug 2002 Total No/Mean Per Survey (n=6)	Sept 2002- Feb 2003 Total No/Mean Per Survey (n=11)	Mar-Jun 2003 Total No/Mean Per Survey (n=6)	Jun- Aug. 2003 Total No/Mean Per Survey (n=6)	Sept 2003- Feb 2004 Total No/Mean Per Survey (n=12)	Total No.
Horseshoe Shoal	45/**9.0**	10/**1.7**	91/**8.3**	48/**8.0**	22/**3.7**	61/**5.1**	277
Monomoy-Handkerchief Shoal	4/0.8	28/**4.7**	39/**3.5**	5/0.8	25/**4.2**	31/**2.6**	132
Tuckernuck Shoal	19/**3.8**	7/1.2	346/**31.5**	46/**7.7**	15/**2.5**	119/**9.9**	552
Outside Shoal Areas	213/42.6	365/60.8	1,311/119.2	223/**37.2**	501/83.5	1,926/160.5	4,539
Totals	281/56.2	410/68.3	1,787/162.5	322/**53.7**	563/93.8	2,137/178.1	5,500

Table 4.2.4-24

A Summary of Alcid Counts in the Survey Area as observed by ESS During Winter and Summer Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Mar-Apr 2002 Total No/Mean Per Survey (n=5)	May-Aug 2002 Total No/Mean Per Survey (n=6)	Sept 2002- Feb 2003 Total No/Mean Per Survey (n=11)	Mar-Jun 2003 Total No/Mean Per Survey (n=6)	Jun- Aug. 2003 Total No/Mean Per Survey (n=6)	Sept 2003- Feb 2004 Total No/Mean Per Survey (n=12)	Total No.
Horseshoe Shoal	65	n/a	77	204	0	80	
Monomoy-Handkerchief Shoal	57	n/a	98	103	0	32	
Tuckernuck Shoal	47	n/a	97	149	0	115	
Outside Shoal Areas	393	n/a	808	537	0	592	
Totals	562	1	1080	993	0	819	

Table 4.2.4-1

Studies Conducted by the Applicant's Consultant that Were Used During the Preparation of this Description

Applicant Report No.	Title	Author	Type of Report
4.2.4-1	Preliminary Avian Risk Assessment for the Cape Wind Energy Project	Kerlinger and Hatch	Desktop assessment
4.2-4.2	Summary of Cape Wind and MAS Aerial Surveys - 2002 - 2006	ESS Group, Inc.	Summary of aerial surveys
4.2.4-3	Spring and Summer 2002 Waterbirds Survey	ESS, Hatch, and Kerlinger	Six aerial and seven boat surveys of marine birds
4.2.4-4	A Late Winter and Early Spring 2002 Waterbirds Survey	ESS, Hatch, and Kerlinger	Five aerial and one boat surveys of marine birds
4.2.4-5	Mobile Avian Radar System (MARS®) 2002 Monitoring Report: Data Reanalysis, Nantucket Sound	Geo-Marine, Inc.	Radar surveys
4.2.4-6	Fall 2005 Mobile Avian Radar System (MARS®) Monitoring Report, Nantucket Sound	Geo-Marine, Inc.	Radar surveys
4.2.4-7	Spring 2006 Mobile Avian Radar System (MARS®) Monitoring Report, Nantucket Sound	Geo-Marine, Inc.	Radar surveys
4.2.4-8	Summer 2003 Waterbirds Survey	ESS, Hatch, and Kerlinger	Six aerial and two boat surveys of marine birds
4.2.4-9	Fall 2002 and Winter 2003 Waterbirds Survey	ESS, Hatch, and Kerlinger	Eleven aerial and two boat surveys of marine birds
4.2.4-10	Six Surveys of Waterbirds in Nantucket Sound	ESS, Hatch, and Kerlinger	Six aerial and one boat surveys of marine birds
4.2.4-11	Fall 2003 and Winter 2004 Waterbirds Survey	ESS, Hatch, and Kerlinger	Twelve aerial and one boat surveys of marine birds
4.2.4-12	Long-tailed Duck Report, Winter 2005-2006	ESS Group, Inc.	Targeted aerial, boat and land surveys of ducks
4.2.4-13	Winter/Nocturnal Duck Survey, Nantucket Sound	ESS Group, Inc.	Two aerial and two boat surveys of ducks

Table 4.2.4-2

Summary of the Cape Wind and MassAudubon Aerial Survey Methodologies

	Number of Surveys	Number of Transects	Survey Width (m)	Survey Length (km)	Survey Height (m)	Survey Area (km^2)
Applicant	46	16	400	415 km	76	168
MAS	79	16 – 15 a/	183	398 – 401 b/	152	73 - 78 c/

a/ 16 transects during the tern breeding and fall staging survey periods and 15 during the winter sea duck and waterbirds surveys
b/ 398 km during the tern breeding and fall staging survey periods and 401 km during the winter sea duck and waterbirds surveys
c/ 73 km^2 during the tern breeding and fall staging survey periods and 78 km^2 during the winter sea duck and waterbirds surveys

Table 4.2.4-3

Summary of the Cape Wind and MassAudubon Aerial Survey Methodologies

		Spring (tern breeding) early April to late July		Fall (tern breeding) mid August to late September		Winter mid October to early April	
		Number of Surveys	Number of Hours	Number of Surveys	Number of Hours	Number of Surveys	Number of Hours
Applicant	Aerial	11	48	11	48	29	117
	Boat	22	51	20	32	6	22
	Land	--	--	--	--	19	26
MAS	Aerial	8	28	35	99	38	95
	Boat	25	38	14	21	2	3

Table 4.2.4-4

A Summary of Radar Surveys in the Study Area during 2002-2006, Nantucket Sound, Massachusetts

Season	Location	Dates of Survey	Diurnal Mean Passage Rate (t/km/hr)	Diurnal Median Flight Height (m AMSL)	Diurnal Percent below Turbine Height	Nocturnal Mean Passage Rate (t/km/hr)	Nocturnal Median Flight Height (m AMSL)	Nocturnal Percent below Turbine Height
Spring 2002	Horseshoe Shoal	May 7 – Jun 7	66	34	76	61	278	36
Fall 2002	Cape Pogue	Sep 3 – Oct 1	98	325	32	146	464	14
Fall 2005	Cape Pogue	Sep 18 – Nov 15	60	30	80	43	76	63
Spring 2006	Horseshoe Shoal	Apr 18 – Jun 3	397	13	74	293	23	68

Table 4.2.4-3

Summary of the Cape Wind and MassAudubon Aerial Survey Methodologies

		Spring (tern breeding) early April to late July		Fall (tern breeding) mid August to late September		Winter mid October to early April	
		Number of Surveys	Number of Hours	Number of Surveys	Number of Hours	Number of Surveys	Number of Hours
Applicant	Aerial	11	48	11	48	29	117
	Boat	22	51	20	32	6	22
	Land	--	--	--	--	19	26
MAS	Aerial	8	28	35	99	38	95
	Boat	25	38	14	21	2	3

Table 4.2.4-4

A Summary of Radar Surveys in the Study Area during 2002-2006, Nantucket Sound, Massachusetts

Season	Location	Dates of Survey	Diurnal Mean Passage Rate (t/km/hr)	Diurnal Median Flight Height (m AMSL)	Diurnal Percent below Turbine Height	Nocturnal Mean Passage Rate (t/km/hr)	Nocturnal Median Flight Height (m AMSL)	Nocturnal Percent below Turbine Height
Spring 2002	Horseshoe Shoal	May 7 – Jun 7	66	34	76	61	278	36
Fall 2002	Cape Pogue	Sep 3 – Oct 1	98	325	32	146	464	14
Fall 2005	Cape Pogue	Sep 18 – Nov 15	60	30	80	43	76	63
Spring 2006	Horseshoe Shoal	Apr 18 – Jun 3	397	13	74	293	23	68

Table 4.2.4-5

A Summary of Loon Counts in Study Area as Observed by ESS During Winter and Summer Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Mar-Apr 2002 Total No/Mean Per Survey (n=5) a/	May-Aug 2002 Total No/Mean Per Survey (n=6) a/	Sept 2002- Feb 2003 Total No/Mean Per Survey (n=11) a/	Mar-Jun 2003 Total No/Mean Per Survey (n=6) a/	Jun- Aug. 2003 Total No/Mean Per Survey (n=6) a/	Sept 2003 - Feb 2004 Total No/Mean Per Survey (n=12) a/	Total No.	Percent
Horseshoe Shoal	371/**74.2**	14/**2.3**	235/**21.4**	301/**50.2**	1/0.2	88/**7.3**	1,010	12.30
Monomoy-Handkerchief Shoal	303/**60.6**	13/**2.2**	104/**9.5**	78/13.0	0/0.0	132/**11.0**	632	7.70
Tuckernuck Shoal	391/**78.2**	9/1.5	241/**21.9**	248/**41.3**	2/0.3	129/**10.8**	1,020	12.40
Outside Shoal Areas	2,174/434.8	47/7.8	1,283/116.6	1126/**187.7**	28/**4.7**	911/**75.9**	5,567	67.60
Totals	3,239/647.8	83/13.8	1,863/169.4	1,753/292.2	31/5.2	1,260/105.0	8,229	100

a/ n= aerial = boat

Table 4.2.4-6

A Summary of Loon Counts as Observed by MAS During Winter and Summer Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Aug-Sep 2002 Total No/Mean Per Survey (n=x)	May - July 2003 Total No/Mean Per Survey (n=x)	Aug-Sep 2003 Total No/Mean Per Survey (n=x)	Dec-Apr 2003-2004 Total No/Mean Per Survey (n=x)	May-Jul 2004 Total No/Mean Per Survey (n=x)	Aug-Sep 2004 Total No/Mean Per Survey (n=x)	Total No.
Horseshoe Shoal (Boat)	0/0.0	48/3.7	0/0.0	2/1	120/10	2/.33	172
Nantucket sound (Aerial)	1/.1	32/10.7	3/.2	3,754/288.8	30/10	125/12.5	3945
Monomoy-Handkerchief Shoal	NA	NA	NA	NA	NA	NA	
Tuckernuck Shoal	NA	NA	NA	NA	NA	NA	
Outside Survey Area	NA	NA	NA	NA	NA	NA	

Table 4.2.4-5

A Summary of Loon Counts in Study Area as Observed by ESS During Winter and Summer Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Mar-Apr 2002 Total No/Mean Per Survey (n=5) a/	May-Aug 2002 Total No/Mean Per Survey (n=6) a/	Sept 2002- Feb 2003 Total No/Mean Per Survey (n=11) a/	Mar-Jun 2003 Total No/Mean Per Survey (n=6) a/	Jun- Aug. 2003 Total No/Mean Per Survey (n=6) a/	Sept 2003 - Feb 2004 Total No/Mean Per Survey (n=12) a/	Total No.	Percent
Horseshoe Shoal	371/**74.2**	14/**2.3**	235/**21.4**	301/**50.2**	1/0.2	88/**7.3**	1,010	12.30
Monomoy-Handkerchief Shoal	303/**60.6**	13/**2.2**	104/**9.5**	78/13.0	0/0.0	132/**11.0**	632	7.70
Tuckernuck Shoal	391/**78.2**	9/1.5	241/**21.9**	248/**41.3**	2/0.3	129/**10.8**	1,020	12.40
Outside Shoal Areas	2,174/434.8	47/7.8	1,283/116.6	1126/**187.7**	28/**4.7**	911/**75.9**	5,567	67.60
Totals	3,239/647.8	83/13.8	1,863/169.4	1,753/292.2	31/5.2	1,260/105.0	8,229	100

a/ n= aerial = boat

Table 4.2.4-6

A Summary of Loon Counts as Observed by MAS During Winter and Summer Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Aug-Sep 2002 Total No/Mean Per Survey (n=x)	May - July 2003 Total No/Mean Per Survey (n=x)	Aug-Sep 2003 Total No/Mean Per Survey (n=x)	Dec-Apr 2003-2004 Total No/Mean Per Survey (n=x)	May-Jul 2004 Total No/Mean Per Survey (n=x)	Aug-Sep 2004 Total No/Mean Per Survey (n=x)	Total No.
Horseshoe Shoal (Boat)	0/0.0	48/3.7	0/0.0	2/1	120/10	2/.33	172
Nantucket sound (Aerial)	1/.1	32/10.7	3/.2	3,754/288.8	30/10	125/12.5	3945
Monomoy-Handkerchief Shoal	NA	NA	NA	NA	NA	NA	
Tuckernuck Shoal	NA	NA	NA	NA	NA	NA	
Outside Survey Area	NA	NA	NA	NA	NA	NA	

Table 4.2.4-7

A Summary of Grebe Counts in the Survey Area as Observed by ESS During Winter Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Mar-Apr 2002 Total No/Mean Per Survey (n=5)	Sept 2002 - Feb 2003 Total No/Mean Per Survey (n=11)	Mar-Jun 2003 Total No/Mean Per Survey (n=6)	Sept 2003 - Feb 2004 Total No/Mean Per Survey (n=12)	Total No.	Percent
Horseshoe Shoal	1/0.2	10/**0.9**	11/**1.8**	14/**1.2**	1,010	12.30
Monomoy-Handkerchief Shoal	0/0.0	5/0.5	3/0.5	1/0.1	632	7.70
Tuckernuck Shoal	0/0.0	12/**1.1**	19/**3.2**	5/0.8	1,020	12.40
Outside Shoal Areas	1/0.2	70/6.4	91/15.2	71/11.8	5,567	67.60
Totals	2/0.4	97/8.8	124/20.7	91/7.6	8,229	100

Table 4.2.4-8

A Summary of Grebe Counts as Observed by MAS During Winter and Summer Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Aug-Sep 2002 Total No/Mean Per Survey (n=15)	May – July 2003 Total No/Mean Per Survey (n=16)	Aug-Sep 2003 Total No/Mean Per Survey (n=17)	Dec-Apr 2003-2004 Total No/Mean Per Survey (n=15)	May-Jul 2003-2004 Total No/Mean Per Survey (n=15)	Aug-Sep 2004 Total No/Mean Per Survey (n=17)	Total No.
Horseshoe Shoal (Boat)	0/0.0	0/0.0	0/0.0	1/.5	0/0.0	0/0.0	1
Nantucket sound (Aerial)	0/0.0	0/0.0	0/0.0	6/.5	0/0.0	0/0.0	6
Monomoy-Handkerchief Shoal	NA	NA	NA	NA	NA	NA	NA
Tuckernuck Shoal	NA	NA	NA	NA	NA	NA	NA
Outside Survey Area	NA	NA	NA	NA	NA	NA	NA

Table 4.2.4-7

A Summary of Grebe Counts in the Survey Area as Observed by ESS During Winter Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Mar-Apr 2002 Total No/Mean Per Survey (n=5)	Sept 2002 - Feb 2003 Total No/Mean Per Survey (n=11)	Mar-Jun 2003 Total No/Mean Per Survey (n=6)	Sept 2003 - Feb 2004 Total No/Mean Per Survey (n=12)	Total No.	Percent
Horseshoe Shoal	1/0.2	10/**0.9**	11/**1.8**	14/**1.2**	1,010	12.30
Monomoy-Handkerchief Shoal	0/0.0	5/0.5	3/0.5	1/0.1	632	7.70
Tuckernuck Shoal	0/0.0	12/**1.1**	19/**3.2**	5/0.8	1,020	12.40
Outside Shoal Areas	1/0.2	70/6.4	91/15.2	71/11.8	5,567	67.60
Totals	2/0.4	97/8.8	124/20.7	91/7.6	8,229	100

Table 4.2.4-8

A Summary of Grebe Counts as Observed by MAS During Winter and Summer Aerial Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Aug-Sep 2002 Total No/Mean Per Survey (n=15)	May – July 2003 Total No/Mean Per Survey (n=16)	Aug-Sep 2003 Total No/Mean Per Survey (n=17)	Dec-Apr 2003-2004 Total No/Mean Per Survey (n=15)	May-Jul 2003-2004 Total No/Mean Per Survey (n=15)	Aug-Sep 2004 Total No/Mean Per Survey (n=17)	Total No.
Horseshoe Shoal (Boat)	0/0.0	0/0.0	0/0.0	1/.5	0/0.0	0/0.0	1
Nantucket sound (Aerial)	0/0.0	0/0.0	0/0.0	6/.5	0/0.0	0/0.0	6
Monomoy-Handkerchief Shoal	NA	NA	NA	NA	NA	NA	NA
Tuckernuck Shoal	NA	NA	NA	NA	NA	NA	NA
Outside Survey Area	NA	NA	NA	NA	NA	NA	NA

Table 4.2.4-9

A Summary of Wilson's Storm-Petrel Counts in the Survey Area as Observed by ESS During Summer Aerial Surveys Conducted in 2002 and 2003, Nantucket Sound, Massachusetts

Survey Area	May-August 2002 Total No/Mean Per Survey (n=6)	June- August 2003 Total No/Mean Per Survey (n=6)	Total No.
Horseshoe Shoal	0/0.0	0/0.0	0/0.0
Monomoy-Handkerchief Shoal	0/0.0	0/0.0	0/0.0
Tuckernuck Shoal	1/0.2	4/0.7	5/0.8
Outside Shoal Areas	12/2.0	11/1.8	23/3.8
Totals	13/2.2	15/2.5	28/4.7

Table 4.2.4-10

A Summary of Wilson's Storm-Petrel Counts as Observed by MAS During Winter and Summer Aerial and Boat Surveys Conducted in 2002, 2003, and 2004, Nantucket Sound, Massachusetts

Survey Area	Aug-Sep 2002 Total No/Mean Per Survey (n=15)	May-July 2003 Total No/Mean Per Survey (n=16)	Aug-Sep 2003 Total No/Mean Per Survey (n=17)	Dec-Apr 2003-2004 Total No/Mean Per Survey (n=15)	May-Jul 2003-2004 Total No/Mean Per Survey (n=15)	Aug-Sep 2004 Total No/Mean Per Survey (n=17)	Total No.
Horseshoe Shoal (Boat)	1/.08	20	0	0/0.0	13/1.1	0/0.0	34
Nantucket sound (Aerial)	7/.6	1/.33	2/.2	0/0.0	9/3	53/5.3	72
Monomoy-Handkerchief Shoal	NA	NA	NA	NA	NA	NA	NA
Tuckernuck Shoal	NA	NA	NA	NA	NA	NA	NA
Outside Survey Area	NA	NA	NA	NA	NA	NA	NA

Table 4.2.5-1

Dominant Macroinvertebrate Taxa on Horseshoe Shoal, Monomoy Shoal and Tuckernuck Shoal, Spring 2002, and on Horseshoe Shoal, Summer 2001

Monomoy Shoal		Tuckernuck Shoal		Horseshoe Shoal		Horseshoe Shoal (2001 Survey)	
Dominant taxa	**% of total community**	**Dominant taxa**	**% of total community**	**Dominant taxa**	**% of total community**	**Dominant taxa**	**% of total community**
Nematoda	50.1	Nematoda	80.9	Nematoda	45.3	Ampeliscidae	26.99
Ampeliscidae	29.5	Oligocheata	2.8	Ampeliscidae	30.4	Ischyroceridae	21.23
Syllides spp.	3.8	Syllides spp.	2.7	Oligocheata	8.4	Crepidula convexa	9.59
Oligocheata	3.7	Glycera dibranchiata	2.3	Aoridae	4.5	Crepidula fornicata	8.76
Tellina agilis	2.1	Caecum johnsoni	1.5	Syllides spp.	2.1	Nematoda	5.01
Aoridae	1.9	Tellina agilis	1.2	Glycera dibranchiata	0.9	Aoridae	3.32
% of total community represented	91.1		91.4		91.6		74.9

Table 4.2.5-2

Macroinvertebrate Sampling Data at the Meteorological Tower, Nantucket Sound (6/3/2005)

Taxa	Number of Individuals per m_2		
	T3B	T2M	T1S
Bivalvia			
Mytilus edulis	24	28	12
Crustacea			
Amphipoda			
Ampeliscidae	4		
Caprella penantis	12	12	148
Corophiidae	560	144	40
Photidae	544	292	1100
Cirripedia			
Balanus sp.	84	40	8
Decapoda			
Panopeus herbstii	4	4	
Unidentified crab larvae		24	68
Entoprocta	8		
Gastropoda			
Crepidula plana	4		
Crepidula fornicata			
Mitrella lunata	8		
Sacoglossa			4
Urosalpinx cinerea	4		
Nematoda	76	4	
Nemertea	16		
Polychaeta			
Glycera spp.		4	
Harmothoe sp.	16		
Lepidonotus sp.	4	16	4
Paronidae	12		
Phyllodocidae	4		
Polydora spp.	16		
Potamilla reniformis	4		
Syllidae	44	4	
Porifera			
Scypha ciliata			4
Pycnogonida			
Tanystylum orbiculare	8	12	
Turbellaria	8		
Total	1464	584	1388
Number of Taxa	22	12	9

Table 4.2.5-3

Total Federally-Reportable Shellfish Species Landed (pounds) in Nantucket Sound from 1994-2004

Shellfish Species	Total Federally-Reportable Shellfish Landings (lbs) Area 075	Percent of Total Shellfish Landings
Channeled Whelk	1,149,753	65.59%
Whelk (Conch Species Not Specified)	148,372	8.46%
Clam, Species Not Specified	137,936	7.87%
Knobbed Whelk	108,836	6.21%
Sea Scallop	74,085	4.23%
Clam, Ocean Quahog	69,972	3.99%
Clam, Hard	30,900	1.76%
Horseshoe Crab	10,431	0.60%
Clams/Bushel (Species not Specific)	7,771	0.44%
Knobbed Whelk - Bushel	3,906	0.22%
Shrimp (Pandalid)	3,852	0.22%
American Lobster	3,250	0.19%
Lightning Whelk	1,275	0.07%
Quahogs – Bushel	1,121	0.06%
Spider Crab	500	0.03%
Crab, Species Not Specified	295	0.02%
Clam, Hard (Bay Quahog)	292	0.02%
Razor Clam	283	0.02%
Bay Scallops	226	0.01%
Rock Crab	17	0.001%
Grand Total	1,753,073	100.00%

Source: NMFS Vessel Trip Report Data for Area 075.

Table 4.2.5-4

Total State-Regulated Landings of Shellfish Species in DMF Area 10 from 1990 through 2004

Shellfish Species harvested	Total lbs Landed (1990 - 2004)
Sea Clam*	12,816,980
Mussel	8,592,273
Conch	3,798,311
Quahog (mixed)	1,115,443
Quahog (littleneck)	220,985
Quahog (cherrystone)	149,802
Bay scallop	129,658
Quahog (chowder)	119,036
Ocean Quahogs*	71,600
Soft Shell Clam	52,285
Sea Scallops (no shells)*	413
Grand Total	27,066,786

Table 4.2.5-3

Total Federally-Reportable Shellfish Species Landed (pounds) in Nantucket Sound from 1994-2004

Shellfish Species	Total Federally-Reportable Shellfish Landings (lbs) Area 075	Percent of Total Shellfish Landings
Channeled Whelk	1,149,753	65.59%
Whelk (Conch Species Not Specified)	148,372	8.46%
Clam, Species Not Specified	137,936	7.87%
Knobbed Whelk	108,836	6.21%
Sea Scallop	74,085	4.23%
Clam, Ocean Quahog	69,972	3.99%
Clam, Hard	30,900	1.76%
Horseshoe Crab	10,431	0.60%
Clams/Bushel (Species not Specific)	7,771	0.44%
Knobbed Whelk - Bushel	3,906	0.22%
Shrimp (Pandalid)	3,852	0.22%
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Source: NMFS Vessel Trip Report Data for Area 075.

Table 4.2.5-4

Total State-Regulated Landings of Shellfish Species in DMF Area 10 from 1990 through 2004

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Bay scallop	129,658
Quahog (chowder)	119,036
Ocean Quahogs*	71,600
Soft Shell Clam	52,285
Sea Scallops (no shells)*	413
Grand Total	27,066,786

Table 4.2.7-10

Comparison of MasDMF and NOAA Fisheries Summary Statistics for the Leading Finfish Products in Nantucket Sound: 1998-2007

MassDMF	AVG	S.D.	Cum. % of Total Catch	Est. Avg. Value	Gear	NOAA Fisheries	AVG	S.D.	Cum. % of Total Catch	Est. Avg. Value
Bass, Black Sea	265,937	103,916	20%	$0.600	P,W	Squid, general	379,585	252,358	50%	$0.300
Mackerel, Atlantic	254,775	221,148	39%	$0.060	W,G	Fluke	109,224	64,937	64%	$0.200
Squid, general	242,793	219,441	57%	$0.200	W	Mackerel, Atlantic	105,976	97,527	78%	$0.030
Fluke*	229,106	89,938	75%	$0.500	T,W,G	Bass, Black Sea	76,303	28,052	88%	$0.200
Scup	121,957	44,792	84%	$0.100	W,P	Scup	44,126	31,336	94%	$0.040
Bass, Striped	98,667	59,678	91%	$0.200	P	Bluefish	12,072	17,693	95%	$0.007
Menhaden	45,173	52,024	95%	$0.005	W	Menhaden	11,286	22,839	97%	$0.001
Bluefish	39,233	16,117	98%	$0.020	W,G	Butterfish	5,637	6,312	98%	$0.003
Butterfish	9,505	13,105	98%	$0.006	W	Flounder, Winter	5,130	7,269	98%	$0.008
Bonito	7,225	10,807	99%	$0.020	W	Whiting, King	4,153	6,289	99%	$0.004

Notes:
Annual average catches in pounds and estimated average value in $m.
*MassDMF Fluke catches are trawl catches averaged over 2006-2007 only.
MassDMF Gear Codes: P=pot; W=weir; G=gillnet; T=trawl

Table 4.2.7-11

Comparison of MassDMF and NOAA Fisheries Summary Statistics for the Leading Shellfish Products in Nantucket Sound: 1998-2007

MassDMF	AVG	S.D.	Cum % of Total Catch	Est. Avg. Value	NOAA Fisheries	AVG	S.D.	Cum % of Total Catch	Est. Avg. Value
Conch	1,190,370	483,365	72%	$3.200	Conch	220,333	155,994	88%	$0.600
Clam, Hard	274,724	303,685	89%	$2.800	Quahog, Ocean	16,486	23,731	94%	$0.009
Lobster	29,953	10,043	99%	$0.200	Clam, Surf	6,258	13,120	97%	$0.005
					Clam, Hard	3,126	9,759	98%	$0.030
					Crab, Horseshoe	2,251	3,749	99%	$0.002

Annual average catches in pounds and estimated average value in $m.

Table 4.2.7-12

NOAA Fisheries Proportion of Total Annual Shellfish Catch by Gear in Nantucket Sound: 1998-2007

Gear	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	AVG
Conch Pot	96.96%	99.90%	99.37%	61.13%	40.27%	62.40%	99.81%	64.69%	65.72%	91.70%	78.20%
Clam Dredge	0.00%	0.00%	0.00%	38.57%	59.58%	37.29%	0.00%	33.95%	33.97%	8.19%	21.15%
Lobster Pot	2.56%	0.10%	0.63%	0.30%	0.15%	0.31%	0.00%	1.22%	0.02%	0.11%	0.54%
Scallop Dredge	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.19%	0.14%	0.30%	0.00%	0.06%
Scallop Otter Trawl	0.48%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05%

Table 4.2.7-13

MassDMF Catch Data for Finfish in Nantucket Sound: 1990-2007 (Pounds)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	98-07 Avg.
Albacore	6,955	5,273	5,005	1,375	898	5,823	405	1,800	2,585	6,670	1,363	3,673	7,070	2,114	2,819	5,002	636	1,259	3,319
Amberjack	0	0	0	0	0	47	0	0	0	0	27	0	0	0	0	0	0	0	3
Bass, Black Sea	336,606	148,638	36,388	40,508	48,338	83,546	63,322	103,934	136,613	419,830	343,481	278,098	436,015	213,623	236,762	209,121	238,804	147,026	265,937
Bass, Sea, Unspec.	2,681	361	160	12	197	141	5	1,796	11	912	14,630	0	0	0	0	0	0	0	1,555
Bass, Striped	5,897	17,722	13,859	11,684	6,945	29,536	47,282	63,304	92,371	59,152	48,295	51,153	62,824	93,767	82,842	84,352	226,812	185,105	98,667
Bluefish	57,865	43,342	40,290	42,609	37,594	34,008	9,204	8,693	18,915	37,799	11,076	24,550	51,374	40,690	55,387	54,874	42,704	54,962	39,233
Bonito	3,802	2,886	62,852	83,880	57,190	38,953	13,167	24,647	21,278	29,403	356	15,712	2,397	356	164	1,304	1,075	207	7,225
Butterfish	22,823	7,023	2,801	1,147	1,915	5,229	17,990	46,053	5,899	5,293	12,464	45,400	7,413	1,587	8,777	600	2,073	5,543	9,505
Cod, General	0	0	0	0	0	230	0	0	0	715	0	0	2,401	0	0	0	0	0	312
Cusk	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	1
Dogfish	0	0	0	1,850	0	158,807	0	0	0	803	0	0	0	0	0	0	0	0	80
Flounder, Plaice	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flounder, Unspec.	0	68	40	0	0	81	41	35	100	43	0	11	0	0	0	0	0	0	15
Flounder, Windopane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flounder, Winter	0	0	0	0	86	2,302	0	0	1,980	27	0	2	245	0	0	0	0	0	225
Flounder, Witch	1,579	37	0	10	0	3,303	367	0	2,625	1	0	0	1	2	0	0	0	0	263
Flounder, Yellowtail	0	0	0	0	0	3,656	0	0	0	1	0	0	205	0	0	0	0	0	21
Fluke	1,123	4,235	2,611	2,759	9,714	86	982	4,370	1,360	4,011	3,924	6,370	5,397	2,296	5,185	735	292,702	165,510	229,106
Haddock, General	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	1
Hake, General	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	1
Herring, Atlantic	41,620	2,000	2,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring, Blueback	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring, Sea	0	0	0	0	0	0	0	0	0	0	0	0	685	0	12,700	20,300	0	0	3,369
Herring, Unspec.	0	0	0	10	0	0	0	0	500	0	0	15,500	0	0	0	0	0	0	1,600
Hogfish	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mackerel, Atlantic	342,477	154,582	263,044	220,282	540,827	184,930	718,675	876,160	500,880	535,673	430,785	318,969	445,575	7,088	251,671	45,755	9,696	1,658	254,775
Mackerel, King	562	1,214	107	0	81	210	4	0	86	179	1,615	6	0	769	77	1,236	0	4	397
Mackerel, Spanish	22,039	19,698	278	0	3,488	3,997	25	77	68	2,131	11,046	3,734	523	399	184	239	7,130	12	2,547
Menhaden	0	0	0	0	0	5,850	35,700	0	30,000	15,800	0	200	81,000	4,000	2,475	139,000	118,300	60,950	45,173
Monkfish	0	0	0	21	0	601	0	0	0	13,778	0	0	0	0	0	0	0	0	1,378
Other Finfish	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pollock	0	0	0	0	0	0	0	0	0	2,414	0	0	0	0	0	0	0	0	241
Pompano, Common	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pout, Ocean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Raven, Sea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Robin, Sea	0	0	0	0	0	0	0	0	0	0	0	170	0	0	0	0	0	0	17
Sculpins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scup	199,184	77,633	334,537	143,360	428,256	360,045	236,293	242,664	102,709	104,774	94,479	86,532	108,369	141,942	230,960	159,866	98,312	91,631	121,957
Shark, Unspec.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Skate, General	0	0	0	0	0	0	0	0	0	371	0	0	0	0	0	0	0	0	37
Squid, general	755,495	727,768	424,941	636,684	239,673	309,322	241,370	308,540	159,808	124,742	322,608	172,449	200,550	23,323	79,542	737,187	494,596	113,125	242,793
Tautog	4,092	4,368	3,951	918	5,563	383	167	198	227	395	51	65	81	0	48	0	0	0	87
Tuna, Bluefin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tuna, Unspec.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Weakfish	0	0	0	0	0	0	0	0	0	5	18	24	0	0	0	0	0	0	5
Whiting, King (Kingfish)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	1,804,800	1,216,848	1,192,864	1,187,109	1,380,765	1,231,086	1,384,999	1,682,271	1,078,015	1,364,949	1,296,218	1,022,618	1,412,125	531,956	969,592	1,459,571	1,532,840	826,993	1,149,488

Table 4.2.7-14

MassDMF Shellfish Catch Data for Nantucket Sound: 1998-2007

Species	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	AVG	S.D.
Clam, Hard	50	0	0	0	200	300	325	50	60	2,400	800	807,125	598,056	0	207,900	494,175	598,124	313,274	274,724	303,685
Clam, Hard (Bushels)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.		
Clam, Not Specified	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.		
Clam, Softshell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10,000	0	0	0	909	0
Clam, Surf*	0	1,228,800	5,067,120	1,291,540	4,341,280	0	0	0	887,360	880	0	0	0	0	0	0	0	0	80,749	267,523
Clam, Surf (Bushels)*	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.		
Conch	52,174	2,186,847	2,227,960	1,825,945	1,062,975	1,372,130	1,316,723	875,265	604,798	995,511	1,051,961	723,258	1,477,409	1,081,961	1,316,555	916,075	1,887,306	2,163,967	1,190,370	483,365
Crab, Horseshoe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lobster	8,078	12,278	24,086	50,737	36,211	27,796	43,522	38,676	47,535	37,743	18,363	23,828	41,741	23,862	27,796	30,200	21,699	18,037	29,953	10,043
Mussel, Blue	100	115,283	0	0	3,538,150	3,476,550	767,980	646,635	550	1,925	1,100	44,000	0	0	0	0	0	0	63,110	193,976
Quahog, Ocean*	0	0	0	66,560	0	0	0	0	0	0	0	320	0	4,720	0	0	0	0	458	1,417
Quahog, Ocean (Bushels)*	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.		
Scallop, Bay	26,082	6,757	162	58	7,340	68,746	9,830	1,192	1,961	538	4,443	0	1,300	1,250	4,500	4,375	240	0	1,800	1,799
Scallop, Sea*	0	0	0	0	0	50	51	0	0	0	312	0	0	0	0	0	0	0	28	94
Scallop, Sea (Bushels)*	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.		
TOTALS	86,484	3,549,964	7,319,328	3,234,840	8,986,156	4,945,572	2,138,431	1,561,819	1,542,264	1,038,997	1,076,979	1,598,531	2,118,506	1,111,793	1,566,751	1,444,825	2,507,369	2,495,277	86,484	1,650,129

Table 4.2.7-15

MassDMF SAFIS Landings Data for Shellfish by Designated Shellfish Growing Area (DSGA) in Nantucket Sound: 2006-2007

DSGA	Species	2006	2007	06-07 Avg.
NS1	CLAM, NORTHERN QUAHOG	1,003,195	3,941,064	2,472,129
	CLAM, SURF	2,138	427,584	214,861
	CRAB, HORSESHOE	612,477	702,897	657,687
	SCALLOP, BAY	1,651	5,136	3,394
	SNAILS (CONCHS)		154	154
	WHELK, CHANNELED	7,851,597	9,106,420	8,479,009
	WHELK, KNOBBED	9,540	1,790,966	900,253
NS1 Total		9,480,598	15,974,221	12,727,409
NS2	CLAM, NORTHERN QUAHOG	7,562	4,121	5,841
	CLAM, SURF		855,168	855,168
	SCALLOP, BAY	1,043		1,043
	WHELK, CHANNELED	90,420	41,301	65,861
	WHELK, KNOBBED		240	240
NS2 Total		99,025	900,830	499,928
NS3	CRAB, HORSESHOE	31,944		31,944
	WHELK, CHANNELED	2,809,203	2,775,874	2,792,538
	WHELK, KNOBBED		275,977	275,977
NS3 Total		2,841,147	3,051,851	2,946,499
NS4	WHELK, CHANNELED	239,394	499,532	369,463
NS4 Total		39,394	499,532	369,463
Grand Total		12,660,163	20,426,434	16,543,299

Table 4.2.7-16

MassDMF SAFIS Shellfish Landings for Nantucket Sound: Average Landings and Value: 2006-2007

Species	Landings (lbs)	% of Total	Est. Value
Conch	12,745,309	77.04%	$34.412
Hard Clam	2,477,971	92.02%	$14.769
Horseshoe Crab	673,659	96.09%	$0.472
Sea Clams	642,445	99.98%	$0.533
Bay Scallop	3,915	100.00%	$0.041

(Pounds and $millions)

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	CRAB, HORSESHOE	612,477	702,897	657,687
	SCALLOP, BAY	1,651	5,136	3,394
	SNAILS (CONCHS)		154	154
	WHELK, CHANNELED	7,851,597	9,106,420	8,479,009
	WHELK, KNOBBED	9,540	1,790,966	900,253
NS1 Total		9,480,598	15,974,221	12,727,409
NS2	CLAM, NORTHERN QUAHOG	7,562	4,121	5,841
	CLAM, SURF		855,168	855,168
	SCALLOP, BAY	1,043		1,043
	WHELK, CHANNELED	90,420	41,301	65,861
	WHELK, KNOBBED		240	240
NS2 Total		99,025	900,830	499,928
NS3	CRAB, HORSESHOE	31,944		31,944
	WHELK, CHANNELED	2,809,203	2,775,874	2,792,538
	WHELK, KNOBBED		275,977	275,977
NS3 Total		2,841,147	3,051,851	2,946,499
NS4	WHELK, CHANNELED	239,394	499,532	369,463
NS4 Total		39,394	499,532	369,463
Grand Total		12,660,163	20,426,434	16,543,299

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(Pounds and $millions)

Table 4.2.7-17

MassDMF Proportion of Total Annual Finfish Catch by Gear in Nantucket Sound: 1998-2007

Gear	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	AVG
Fish Weir	69.33%	60.11%	68.40%	68.10%	63.83%	34.69%	63.62%	77.12%	47.15%	34.96%	58.73%
Gillnet	0.00%	1.38%	0.00%	0.00%	0.20%	0.00%	2.01%	1.66%	2.04%	2.52%	0.98%
Fish Pot*	22.10%	34.18%	27.87%	26.90%	31.52%	47.69%	25.82%	15.44%	17.06%	20.13%	26.87%
Handline**	8.57%	4.33%	3.73%	5.00%	4.45%	17.63%	8.54%	5.78%	14.80%	22.38%	9.52%
Trawl***	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	18.96%	20.01%	3.90%

*Black sea bass and scup catches.
*Striped bass landings recorded by seafood dealers located in Nantucket Sound.
**Fluke trawl catches for 2006 and 2007 only

Table 4.2.7-18

MassDMF Proportion of Total Annual Shellfish Catch by Gear in Nantucket Sound: 1998-2007

Gear	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	AVG
Conch Pot	39.21%	95.81%	97.68%	45.25%	69.74%	97.32%	84.03%	63.40%	75.27%	86.72%	75.44%
Clam Dredge a/	57.58%	0.50%	0.18%	53.26%	28.23%	0.42%	13.91%	34.20%	23.85%	12.55%	22.47%
Lobster Pot	3.08%	3.63%	1.71%	1.49%	1.97%	2.15%	1.77%	2.09%	0.87%	0.72%	1.95%
Scallop Dredge	0.13%	0.05%	0.44%	0.00%	0.06%	0.11%	0.29%	0.30%	0.01%	0.00%	0.14%

a/ Assumes all hard clams, surf clams, ocean quahogs, blue mussels are taken by dredge (some may be grown and taken by hand).

Table 4.2.7-19

**MRFSS Estimated Total Nantucket Sound Recreational Catch: 2005-07
(sound-based catch in pounds for Barnstable, Dukes, and Nantucket Counties)**

	2005	2006	2007	Avg.	% of Total Avg. Catch
Bluefish	589,894	304,990	302,590	399,158	30%
Scup	251,373	407,547	427,584	362,168	58%
Striped Bass	194,657	387,326	272,772	284,918	79%
Flounder, Fluke	137,764	101,194	66,910	101,956	87%
Bass, Black Sea	74,380	12,409	138,727	75,172	93%
Tunny, Little	36,057	34,455	65,278	45,263	96%
Bonito	19,680	15,724	15,358	16,921	98%
Tautog	32,651	9,500	3,046	15,066	99%
Dogfish, Spiny	9,770	983	8,719	6,491	99%
Cunner	0	0	10,172	3,391	99%
Skate (Unspecified)	1,981	4,384	2,497	2,954	100%
Robin, Sea (Unspecified)	0	3,656	936	1,531	100%
Dogfish, Smooth	4,371	0	0	1,457	100%
Robin, Smooth Sea	0	1,966	0	655	100%
Robin, Northern Sea	0	1,701	0	567	100%
Total (All Species)	1,352,578	1,285,835	1,314,589	1,317,667	

Table 4.2.7-1

MDMF Fall Research Trawl Survey (Number of Fish): 1978-2007

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
AFRICAN POMPANO													1									1								
ALEWIFE										2									1	5	5		1				3			
AMERICAN EEL			4																											
AMERICAN LOBSTER	4	1	2	3	3		1	1	9	9	5	29	32	15	26	16	1		2	4	1	1	4	2						3
ATLANTIC COD																											6			
ATLANTIC HERRING				1						2	53		9	21	17		4							26			1		6	
ATLANTIC MENHADEN			1																			11			9		1			45
ATLANTIC MOONFISH							1	9	1		2		5	33	1				3	28	503	79	12	4	74	44	28	23	198	31
ATLANTIC ROCK CRAB	18	2	23	11	86	148	24	64	369	200	30	87	38	47	70	14	226	24	405	31	3	26	8	11	2	10	63	29	7	5
ATLANTIC SURFCLAM			3	25	4	1	1			2				6			8	1	1			5				1	3		9	
BANDED RUDDERFISH							1																	1						
BAY ANCHOVY			11145	43		1		4	296				944	1		53		1421		65	10252		422	26	1877				1541	22705
BAY SCALLOP		10	36	4	137	102	20	5	16		6			41	2		2			1		1	2	2	8	1	1	1	1	
BIGEYE							6				19	4		1		1		1	9	1	24				29	1				
BIGEYE SCAD												4		2													1			
BLACK SEA BASS	3882	1423	3729	255	7029	6517	5993	7218	3034	1402	2169	316	135	181	332	24	403	1122	352	118	278	202	3861	789	2192	2623	7925	963	1562	263
BLUE CRAB										2	1						1			1		1								
BLUE MUSSEL				47										6			2					0			3			1		
BLUE RUNNER																1		1			2	6	1							1
BLUEBACK HERRING		5					1					15									1									
BLUEFISH	10	1	5	35	1	4	38	10	27	354	31	3	13	183	1	49	28	2		37	584	69	18	10	11	11	10	6	19	61
BLUESPOTTED CORNETFISH	4										5			3				1		6	5	38		1				9	5	
BUTTERFISH	4394	1181	16685	3003	1676	2365	1114	2216	4070	338	20176	1253	4545	4007	13925	12156	8549	3510	2167	3979	32470	11334	4714	2691	8939	42391	2720	7275	2761	16786
CANCER CRAB UNCL										2																				
CHANNELED WHELK	139	71	106	3	45	51	41	138	147	112	87	31	11	77	25	6	94	11	82	3	1	8	39		15	14	79	48	43	3
CLEARNOSE SKATE																													1	
CONGER EEL																						1						1		
CUNNER	10	16	284	1	16		1	15	17	1	9	165	3	11	15	10	21	18	26	21	21	66	14	1	15	59	71	3	19	2
DWARF GOATFISH																												1	48	
FLAME BOX CRAB																								1						
FLYING GURNARD																		12									1			
FOURBEARD ROCKLING									1	1																				
FOURSPOT FLOUNDER	2	4	2	1	1	1		3	15		1	2			3	5	4	3	1	1		2	1			4	3	2	7	
GAG																						1								
GLASSEYE SNAPPER																						36						3	16	2
GOBY UNCL																		3												
GRAY TRIGGERFISH											5									9										1
GRUBBY			19		1							7								5										
GUAGUANCHE								3														1					1			
GULF STREAM FLOUNDER						1	1	123	49											3				4				2		
HOGCHOKER																	1													
HORSESHOE CRAB	34	9	22	3	15	1	6	15	35	40	6	6	13	6	4	9	20	20	37	10	4	5	25	3	7		49	23	1	3
INSHORE LIZARDFISH									3								2					2		2					22	1
JONAH CRAB			1									1							1											
KNOBBED WHELK	245	197	402	8	112	191	42	169	188	134	131	30	16	104	38	6	136	158	142	5	1	93	176	3	97	15	34	69	94	5

Table 4.2.7-1

MDMF Fall Research Trawl Survey (Number of Fish): 1978-2007

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
LADY CRAB	294	74	275	60	290	432	204	1496	1545	2123	1053	964	1004	4031	2906	572	2880	989	1120	442	64	319	74	220		3	76	23	298	13
LITTLE SKATE	365	308	298	63	579	134	88	344	196	151	48	22	12	481	277	127	465	91	397	178	94	69	340	40	114	856	397	262	436	37
LIZARDFISH UNCL		1								1											1									
LONGFIN SQUID	12310	8283	12136	7658	17350	6442	2808	19192	7549	11731	6814	2773	7819	4083	10303	6815	9875	9937	17282	3794	4879	3648	1547	13662	3410	13200	3386	6692	4435	10102
LONGHORN SCULPIN														3											1					
LOOKDOWN																										3				
MACKEREL SCAD	59	22		4	12	3	5	10	2	2	21	46	2	8	3	2	9		16	118	3		44	3	7	13		63		21
MANTIS SHRIMP UNCL									1					1						1		1								
NORTHERN KINGFISH	15	11	15	5			9	7	4	2	2	14		4	17	4	20	14	3	33	10	12	8		9	3	2	12	20	2
NORTHERN PIPEFISH	18	30	54	10		1		18	29	34	48	43	2	3	1	2	54	19	9	6	2	5	1	47	1	11	90		10	4
NORTHERN PUFFER	2	4	8	1	12	10	1	7	3	1				4	2	1	3	5		4	5	4	4	11	2	22	3	6	2	12
NORTHERN QUAHOG																											2		1	
NORTHERN SAND LANCE	8	59		408	19		2	9			62	2	1			13														
NORTHERN SEAROBIN	2012	1854	757	64	929	887	201	814	932	741	258	115	12	209	774	33	485	759	573	69	14	6	82	45	54	97	496	190	51	19
NORTHERN SENNET														3							1	1							1	2
OCEAN QUAHOG																		1												
ORANGE FILEFISH											1	1	1	4			4													
OYSTER TOADFISH										1																				
PLANEHEAD FILEFISH	23	11	2		14		1	13			1	3				3	2	2	8			1		7	1	1	2		34	1
RAINBOW SMELT			2																											
RAZOR AND JACKKNIFE CLAM UNCL									1																					
RED CORNETFISH																										2	1			
RED GOATFISH			11								1			1						2		4								
RED HAKE			1					5		5		2								8	2				6		13	13		1
ROCK GUNNEL					1							61			1		1	2	3		1		1				25	6		
ROCK HIND																			1											
ROUGH SCAD								1	38		2	1					1								2	9	1	3		
ROUGHTAIL STINGRAY				1																				1	1	1		2		
ROUND SCAD																											1	1	8	13
SAND TIGER				1															1											
SCAMP																						1			1					
SCRAWLED FILEFISH																		1											1	
SCUP	125280	37875	46342	21190	63865	59043	34666	17365	37725	28366	58920	19277	43423	52764	135840	35252	53455	25880	62326	48152	26462	66976	39392	85253	34538	216284	71074	99271	60412	41126
SEA BASS UNCL																													3	
SEA RAVEN	4																													
SHORT BIGEYE							8							1			15					4					1			
SILVER HAKE					37		19	2	3					4	7		67			1							3			
SMALLMOUTH FLOUNDER										37	13	16		58	57	1	236	181	11	21	7	50	43	74	151	87	251	80	244	66
SMOOTH DOGFISH	340	393	451	120	232	371	659	824	739	288	55	22	204	303	61	37	59	152	162	172	61	32	55	37	154	103	72	258	42	84
SNAKEFISH	32							1			1			1								1								
SNOWY GROUPER					1															1	1	1								
SPIDER CRAB UNCL	141	77	260	80	545	409	218	673	715	1242	460	580	122	245	112	116	636	634	468	127	184	460	262	73	37	243	417	189	224	78
SPINY DOGFISH									3		1				19						2		6	41	8	48		5		9
SPOT								1		1																				
SPOTFIN BUTTERFLYFISH																						9					1			
SPOTTED HAKE								1								4	11		1				1				2			

Table 4.2.7-1

MDMF Fall Research Trawl Survey (Number of Fish): 1978-2007

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
STRIPED ANCHOVY	6109	22			594		56	132		4975		20	1381	2140			145			9	184	1223	1	1			138		653	11
STRIPED BASS																		1				1								
STRIPED SEAROBIN	59	6	3	1	2	1	4	3	5	3	3	1		12	16		8	5	8	8	4	7	9	3	17	32	11	6	33	2
SUMMER FLOUNDER	28	3	16	8	45	16	13	55	86	73	39	12	6	29	33	25	120	23	62	83	30	38	181	73	102	203	99	192	297	70
TAUTOG	21	22	295	26	34	3	8	72	19	3	12	7	1	2	2	5	1	11	1	5		99	34	8	28	13	55	14	36	1
TRUNKFISH														1																
WEAKFISH		1																												
WHITE HAKE		29						5	14			5			1	2		4					1							
WINDOWPANE	75	60	35	29	61	11	15	30	88	19	5	11	3	11	15	14	80	8	29	5	2	3	11	1	10	8	16	8	4	4
WINTER FLOUNDER	336	12	60	11	25	2	6	34	36	62	12	47	4	24	64	14	136	19	78	28	1	8	59	5	2		9	10	2	2
WINTER SKATE	67	40	119	58	365	81	30	82	133	85	41	31	26	329	152	214	1101	233	446	69	105	50	9	18	55	147	119	17	174	9
YELLOW JACK														1																

Table 4.2.7-20

MRFSS Estimated Total Nantucket Sound Recreational Fishing Trips by Mode: 2005-2007
(sound-based fishing trips for Barnstable, Dukes, Nantucket Counties)

Wave	Fishing Mode	2005	2006	2007	Avg.
Mar-Apr	Shore	371	7,799	1,791	3,320
May-Jun	Shore	88,144	170,052	87,394	115,197
	Party/Charter Boat	1,625	6,238		3,931
	Private/Rental Boat	15,452	39,992	74,635	43,360
Jul-Aug	Shore	166,125	227,354	152,309	181,929
	Party/Charter Boat	10,404	10,457		10,430
	Private/Rental Boat	100,542	58,967	81,378	80,296
Sep-Oct	Shore	196,732	117,746	132,293	148,924
	Party/Charter Boat	9,216	611		4,913
	Private/Rental Boat	39,142	16,998	32,762	29,634
Nov-Dec	Shore	19,713	21,715	8,341	16,589
	Private/Rental Boat	1,447	606	6,794	2,949
Annual	Shore	471,085	544,665	382,128	465,959
	Party/Charter Boat	21,244	17,305		19,275
	Private/Rental Boat	156,584	116,563	195,569	156,238
	All Modes	648,912	678,534	577,696	635,047

Table 4.2.7-21

NMFS Charter and Party Boat (CPB) Catches in Nantucket Sound: 1994-2007 (pounds)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	1998-07 Avg.
Bass, Black Sea	82	1,708	1,516	1,833	986	2,640	2,056	2,739	3,086	3,563	4,755	1866	3251	5991	3,093
Bass, Striped	0	0	0	7	15	13	45	5	67	109	269	280	457	532	179
Blowfish	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Bluefish	11	302	130	111	649	293	32	38	113	64	229	326	358	350	245
Bonito	6	2	0	0	1	0	0	0	0	0	0	0	0	0	0
Butterfish	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Cod	0	0	0	0	0	0	0	0	0	0	0	0	45	0	5
Croaker, Atlantic	0	0	0	0	0	5	0	0	0	0	0	0	0	0	1
Cunner	0	0	1	11	5	0	0	0	0	0	0	0	0	0	1
Dogfish, Smooth	0	0	14	11	11	7	0	4	6	0	2	0	14	5	5
Dogfish, Spiny	22	0	30	0	4	5	0	0	0	0	0	0	0	0	1
Dogfish, Unspecified	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Flounder, Plaice	0	0	3	1	0	0	0	1	0	0	0	0	0	0	0
Flounder, Summer	66	53	82	3,042	685	337	152	93	184	168	245	472	524	252	311
Flounder, Unspecified	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
Flounder, Winter	2	0	33	45	19	7	0	1	0	0	0	0	0	0	3
Haddock	0	0	0	0	0	0	0	0	0	0	0	0	40	0	4
Mackerel, Atlantic	0	0	1	1	0	0	0	0	0	0	0	0	5	0	1
Robin, Sea	0	185	198	158	94	360	20	77	62	80	35	38	0	4	77
Scup	1,784	30,604	28,735	15,330	21,899	43,061	32,512	20,902	13,922	16,940	27,546	25675	36888	63552	30,290
Shark	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Shark	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Skate	35	40	30	15	21	9	0	0	0	0	0	0	0	0	3
Squid, Ilex	0	0		0	0	500	0	0	0	0	0	0	0	0	50
Squid, Loligo	0	0	0	0	0	709	2,886	7,060	1,200	0	3,850	13208	16880	19300	6,509
Squid, Unspecified	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Tautog	17	904	846	403	474	450	135	57	149	130	101	98	128	409	213
Triggerfish	0	0	0	0	0	0	0	0	0	0	0	0	13	0	1
Wolffish	0	0	0	0	0	0	0	4	0	0	0	0	2	0	1
Total Catch (lbs)	2,025	33,805	31,621	20,968	24,863	48,398	37,838	30,981	18,791	21,054	37,032	41,963	58,605	90,395	40,992

Table 4.2.7-22

NMFS Charter and Party Boat Summary Statistics for Primary Species Kept

NMFS	AVG	S.D.	Cum. % of Total Catch
Scup	30,290	14,725	74%
Squid, Loligo	6,509	7,327	90%
Bass, Black Sea	3,093	1,444	97%
Flounder, Summer	311	191	98%
Bluefish	245	193	99%
Tautog	213	162	99%
Bass, Striped	179	194	100%
Robin, Sea	77	105	100%

Table 4.2.7-2

MDMF Spring Research Trawl Survey (Numbers of Fish): 1978-2007

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
ALEWIFE	1111						8	16	2	14	30	1	1	29	81	38	22	11	29	23	299	159	5	9		7	2	203	2	185
ALLIGATORFISH		2																												
AMERICAN EEL									1																					
AMERICAN LOBSTER	11	1		40	4	10	7	20	6	11	13	19	34	34	24	24	12	16	3	44	16	16	5	2	5	1	12	15	16	7
AMERICAN SHAD											1	1		12	4			4	4		4	1	1			3		78		13
ATLANTIC COD	243	30	32	528	150	29	8	56	112	4	41	9	8	2	25	322	158	66	129	39	1041	14	18	69	1	1631	257	844	28	87
ATLANTIC HERRING			15						593	175	2		1	30	44	1105	3	89	1	2	3	10839	27	648		59	27	107	824	12
ATLANTIC MACKEREL	3		2	1			7	1	1			1		37	3					1	14							20	6	
ATLANTIC MENHADEN	1						1		1		1			1				1												
ATLANTIC ROCK CRAB	90	125	75	257	21	142	46	525	398	495	254	35	77	26	1771	369	383	318	795	219	132	140	159	169	45	58	31	298	248	110
ATLANTIC SEASNAIL																1												1		
ATLANTIC SILVERSIDE																					1					4				
ATLANTIC SURFCLAM			1	4			1	3	5									1							1		1	9	7	6
ATLANTIC TOMCOD													1																	
BAY ANCHOVY				4										1														1	1	
BAY SCALLOP	9	89	17	6	6	5	8	16	8		1			5	24				2		2	1	2	6	8				1	
BLACK SEA BASS	98	34	21	74	95	182	37	42	28	10	10	7	14	14	2	4	9	10	3	2		7	156	39	46	4	13	5	13	7
BLUE CRAB												1								1		2						1		3
BLUE MUSSEL	471	0		200			7						1				2				11	0		78				28	1	
BLUEBACK HERRING				1			18			5					18				25			1	1			1		6	1	16
BLUEFISH									3	1	2											1								
BUTTERFISH	36	5	2		2	86	7	216	41	41	20		522	1300	4	1	9	424		104	160	27	1901	842	140	699	2	109	60	3782
CHANNELED WHELK	147	126	53	127	33	12	50	113	91	94	138	17	13	12	48	18	26	61	106	13	22	24	23	15	3	3	5	53	109	51
CUNNER	38	8		28	11	5	2	3	2	3	1	30			6	8	6	6	26	34	21	4	2	1	4	1	4	12	9	1
FOURBEARD ROCKLING		1																												
FOURSPOT FLOUNDER	4	2	2	10	3	7	2	6	8	1	10	20	27	2		1	25	15	2	10	1		1		1				1	1
GOOSEFISH											1																			
GRUBBY	38	3			5			1			1								3	2	3							7		
GULF STREAM FLOUNDER									11												6					1				
HADDOCK																					5									
HORSESHOE CRAB	27	8	8	8	2	2		4	12	6	3	6	4	2	14	11	8	16	22	17	10	15	6	7	4	5	4	5	15	
JONAH CRAB				10																		2							1	
KNOBBED WHELK	155	142	43	11	3	48	34	325	116	19	58	2	3	17	55	5	1	54	100	4	7	28	30	14	1		1	7	94	52
LADY CRAB	8	1	1	37	8	9	4	73	17	60	303	136	523	138	253	217	28	164	349	151	26	152	61	39	4	4	93	1	60	105
LITTLE SKATE	612	573	451	899	209	309	260	280	151	145	217	100	278	41	688	332	480	535	404	125	79	62	72	41	32	12	23	76	83	53
LONGFIN SQUID	427	1028	1607	294	427	2754	2242	3813	2263	2593	7518	1699	4577	955	472	954	454	2273	1177	606	1117	1589	6969	713	3524	93	2537	259	1387	4216
LONGHORN SCULPIN	224	65	8	18	53	23	18	12	11	22	1	20	4	1	62	171	165	95	43	22	8		2				1	4	8	
LUMPFISH		2														1					1									
MANTIS SHRIMP UNCL																2						2	2				1	3	1	
NORTHERN KINGFISH	1																	1											2	
NORTHERN PIPEFISH	74	1	21	15		1					1				1	1	2	8	3	3	50		5		5	1			52	6
NORTHERN QUAHOG			1																											
NORTHERN SAND LANCE	41	426	163	625	6	2	1	156	6			2		550	5	54	1	45		3	58	597		352	7	56	1547	34	906	387
NORTHERN SEAROBIN	7183	5373	4661	13660	30577	25202	1011	14722	2022	3709	161	99	230	594	8006	1587	1146	2124	943	250	26	31	78	72	123	5	78	60	122	23
NORTHERN SHORTFIN SQUID	14				1																									5
OCEAN POUT	9																													

Table 4.2.7-2

MDMF Spring Research Trawl Survey (Numbers of Fish): 1978-2007

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
OCEAN QUAHOG								2																						
OYSTER TOADFISH							1																							
POLLOCK	42	39	2	2	169	1			1	14					1	22	1	4	54	33	202	7	10	58	3	1277	2	14	54	9
RAINBOW SMELT																1														
RAZOR AND JACKKNIFE CLAM UNCL																														1
RED HAKE	22	1	1	13	5	6		6	11	19	6	2	6	1	6	1	16	3	9	5	2	5	2		1			126	4	4
ROCK GUNNEL	12		1	1	4	2	4	3	1			2		1	5	2	3	6	16	21	9		1		1		2	129	26	14
SCUP	3712	2207	154	3467	169	464	303	379	1637	218	532	264	1158	1302	646	218	396	980	112	46	18	203	1316	8	1993	4	485	10	1117	124
SEA LAMPREY																										1				
SEA RAVEN	8	1	14	11	1	2	5	2	2	9	2		6	2			1	1		7	1	3	2	1	1		1	4	8	5
SEA SCALLOP				1		4	1							2									1	5			1			
SILVER HAKE	6		1	6	2	1	31	4	11	26	3	6	39	2	9	3	11	24			3	8		2				4		2
SMALLMOUTH FLOUNDER													1		4	1	4	18	7	6		6	7					8	6	5
SMOOTH DOGFISH	32	22	94	9	4	11	8	8	23	1	4	1	31	18	5		14	2				12	113	2	12		3	4	3	2
SNAKEBLENNY	1																													
SPIDER CRAB UNCL	225	266	163	488	282	4486	196	1692	933	1531	1707	230	364	954	5438	553	395	1050	6518	676	555	14872	783	1340	670	994	1763	5929	887	561
SPINY DOGFISH	155	20	34	14	2	2	68		38	1	4	2	8	4						1			1							
SPOTTED HAKE						2		1	3	1								8			11	1	5			1		3	67	3
STRIPED BASS														3		1	10	256		2		2	25	8	1	1	4	24		
STRIPED SEAROBIN	53			2		11			1				4	1			9	17	6	4		2	11	4	3		1	5	1	3
SUMMER FLOUNDER	41	15	23	30	16	56	3	32	44	61	48	9	15	1	30	29	62	40	17	48	17	62	54	49	54	11	11	27	83	35
TAUTOG	68	137	82	63	147	60	59	67	33	14	31	14	3	8	6	12	16	7	41	40	2	23	4	34	14	6	3	4	7	4
THORNY SKATE	4																													
WHITE HAKE	2	1	5	8	13		1	4	4		1				7	6	20	5	14	2	5	2	2		1	10	2		3	
WINDOWPANE	2590	1307	1507	1742	986	1219	462	556	434	402	191	1012	745	151	1262	818	971	1766	1655	871	172	120	190	63	24	41	57	142	94	70
WINTER FLOUNDER	1540	822	785	900	581	740	392	386	363	912	616	342	657	211	704	712	892	829	515	636	238	261	322	161	73	230	192	434	130	123
WINTER SKATE	122	101	224	693	146	375	252	406	495	408	323	201	235	3	416	172	459	290	193	21	41	7	9	6	8	3	1	3	2	3
YELLOWTAIL FLOUNDER	15	3		2		1	1			2	1			1		1			2										1	

Table 4.2.7-3

MDMF Fall Research Trawl Survey (Pounds of Fish): 1978-2007

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
AFRICAN POMPANO													0									0								
ALEWIFE										0									0	0.2	0.3		0				0			
AMERICAN EEL			0.4																											
AMERICAN LOBSTER	4.1	0.3	0.2	0.7	3.2		0	0	5	2.7	0.8	11.3	8.1	7	9.8	4.8	0.3		0.8	1.5	1.3	0.2	1.5	1.5						2.1
ATLANTIC COD																											0			
ATLANTIC HERRING				0						0	0.6		0.1	0.1	0		0.1							0			0		0	
ATLANTIC MENHADEN			0.5																			0			0		0			0.1
ATLANTIC MOONFISH							0	0.1	0		0		0	0.3	0				0	0.1	2.9	0.4	0	0	0.4	0.2	0.1	0.1	0.8	0.1
ATLANTIC ROCK CRAB	2.5	0.1	0.3	0	7.1	3.8	2.6	1.8	26.1	14.2	0.9	3.8	2.2	2.7	3.1	0.7	16.9	1	4.8	1.4	0	0.1	0.2	0.4	0.2	0.1	7	0	0.1	0
ATLANTIC SURFCLAM			0.2	1	0.1	0	0.1			0.3				2.5			0.3	0.6	0.1			0.4				0.1	1.2		1	
BANDED RUDDERFISH							0.3																	0.1						
BAY ANCHOVY			13.5	0.1		0		0	0.2				1.2	0		0		1.5		0	10.4		0.3	0	1.7				1.7	11.8
BAY SCALLOP		0.5	2.8	0.1	6.3	9.8	1.6	0.4	1		0.1			3	0.1		0			0		0	0.1	0.1	0.6	0	0	0.1	0	
BIGEYE							0.1				0.3	0		0		0		0	0	0	0.4				0.2	0				
BIGEYE SCAD												0.1		0													0			
BLACK SEA BASS	41.2	35.3	25.3	23.6	35	30	67.5	35	38.1	14.4	14.5	3.1	0.6	0.6	3.2	0	1.8	6.6	1.3	9.3	1.5	13.8	70.2	36.9	126.8	48.5	28.2	11	23	9
BLUE CRAB										0.3	0.2						0.2			0.2		0								
BLUE MUSSEL				1										0			0.2					9.2			0.1			0		
BLUE RUNNER																0		0.1			0.1	0.2	0							0
BLUEBACK HERRING		0.3					0.1					0.4									0									
BLUEFISH	13.5	0.2	6.2	2.6	3.7	3.7	5.1	10.6	9	14.9	8.1	4.6	3.1	13.4	2	3.3	2.1	1.8		8.6	5.7	1.2	3.3	3	0.6	0.5	13.1	2.8	0.5	5.3
BLUESPOTTED CORNETFISH	0.2										0.1			0				0		0.1	0.2	1		0				0.1	0	
BUTTERFISH	44.3	12.3	158.5	49.4	12.1	16.4	32.7	27	35	13.9	192.5	16.3	42.1	47.8	140.6	148.7	147.9	21.9	13.5	37.2	369	174	108.3	42.2	88.6	122.2	38.7	62.9	46.1	155.8
CANCER CRAB UNCL										0																				
CHANNELED WHELK	43.6	17.9	26.4	0.9	21.8	10.5	12.7	34.6	38.5	20.9	19.4	7	2.4	20.5	7.8	1.6	24.2	3	20.2	0.9	0.5	2.5	11.7		3.9	3.1	16.6	13.5	13.2	0.7
CLEARNOSE SKATE																													1.5	
CONGER EEL																						0						0		
CUNNER	0	0.3	2	0	0.2		0	0.3	0.1	0	0.1	1.9	0	0	0	0	0.2	0.2	0.1	0.2	0	0.7	0.1	0	0.2	0.2	0.3	0	0.2	0
DWARF GOATFISH																												0	1.5	
FLAME BOX CRAB																								0						
FLYING GURNARD																		0.6									0			
FOURBEARD ROCKLING									0.1	0																				
FOURSPOT FLOUNDER	0.1	0.2	0	0.1	0.2	0.1		0.4	0.7		0	0			0.4	0.5	0.4	0	0.1	0		0.1	0.2			0	0.2	0	0.4	
GAG																						0.1								
GLASSEYE SNAPPER																						0.7						0	0.2	0
GOBY UNCL																		0												
GRAY TRIGGERFISH											1.7									9										0.5
GRUBBY			0.1		0							0								0										
GUAGUANCHE								0.1														0.1					0			
GULF STREAM FLOUNDER						0	0	1.1	1.5											0				0				0		
HOGCHOKER																	0.1													
HORSESHOE CRAB	47.1	16.2	27.2	3.1	25.1	3	9.1	27.1	62.4	68.4	8.3	11.5	21	12.9	9.3	16	36.7	38.8	62	14	5.7	12.5	46.3	7	14.6		79.8	43.7	0.8	8.5
INSHORE LIZARDFISH									0.2								0					0.1		0.2					1.2	0
JONAH CRAB			0									0.2							0.2											
KNOBBED WHELK	86.8	68.6	154	2.9	65.5	91.2	20.4	66.3	68.7	40.3	43.4	13.6	3.7	37.5	13.3	1.6	60.3	55.4	48.5	1.6	0.3	38.1	72.4	1.5	30	5.8	13.4	27.4	40.5	2
LADY CRAB	12.3	2.1	3.7	2.2	12.5	9.7	12.2	67.7	99.4	76.8	53	68.5	51.8	171.7	109.2	23.5	177.4	56.6	67.5	26.8	5.6	13.1	1.6	2.3		0	1.4	0.1	15.4	0.5

Table 4.2.7-3

MDMF Fall Research Trawl Survey (Pounds of Fish): 1978-2007

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
LITTLE SKATE	235.9	201.5	170.1	31.9	317.1	84.2	55.2	207.7	121.3	90.7	27.2	12.2	6	274.4	160.6	71.1	275.5	60.6	227.4	97.5	54	39	201.8	22.9	65.9	453.5	221.3	148.8	250.6	20.8
LIZARDFISH UNCL		0								0											0									
LONGFIN SQUID	158.5	43.9	107	103.3	68.2	96.3	34.9	89.7	62.5	88	63.5	70.3	73.7	33.4	95.8	112.2	103.5	74.2	98.8	48.3	56.5	47.6	17.1	35.9	43.8	78.8	41.5	42.5	27.9	74.7
LONGHORN SCULPIN														0											0					
LOOKDOWN																										0				
MACKEREL SCAD	2.1	0.3		0	0.1	0	0.1	0.2	0	0	0.3	0.7	0	0	0	0	0.1		0.1	0.2	0		0.3	0	0	0.2		0.4		0.1
MANTIS SHRIMP UNCL									0					0						0		0								
NORTHERN KINGFISH	1.6	1.2	1.4	0.5			1.2	1.1	0.5	0.3	0.2	1.3		0.4	1.1	0.5	1.9	0.8	0.3	2.4	0.9	1.8	0.6		0.6	0.1	0.3	1.2	1.7	0
NORTHERN PIPEFISH	0.1	0.4	0.3	0		0		0	0.1	0	0.1	0	0	0	0	0	0.2	0	0	0	0	0	0	0.1	0	0	0.1		0	0
NORTHERN PUFFER	0	0.1	0.1	0	0.6	0	0	1.1	0	0				0	0	0	0.1	0		0	0	0	0	0.4	0	0.3	0	0	0.1	0
NORTHERN QUAHOG																											0.1		0	
NORTHERN SAND LANCE	0	0.3		1.3	0.1		0	0			0.6	0	0			0.1														
NORTHERN SEAROBIN	373.4	322.6	56.8	10.9	75.4	25.2	48.3	74.8	33.7	23.7	8.8	2.6	0.1	2.8	4.5	0.2	4.5	10.3	4.5	0.7	0	0.3	8.6	0.9	6.2	1.6	2.5	2	0.7	0.1
NORTHERN SENNET														0							0	0							0	0.1
OCEAN QUAHOG																		0.6												
ORANGE FILEFISH											0.1	0	0	0.1			0.1													
OYSTER TOADFISH										0.2																				
PLANEHEAD FILEFISH	0.1	0.5	0.2		0.1		0	0.2			0	0				0	0.1	0	0			0		0.3	0	0	0		0.5	0
RAINBOW SMELT			0																											
RAZOR AND JACKKNIFE CLAM UNCL									0.1																					
RED CORNETFISH																										0	0.1			
RED GOATFISH			0.3								0			0						0		0								
RED HAKE			0					0		0.1		0								0.3	0				0		0	0		0
ROCK GUNNEL					0							0.4			0		0	0	0		0		0				0.1	0		
ROCK HIND																			0											
ROUGH SCAD								0.1	1.3		0.1	0					0								0.1	0.2	0	0.1		
ROUGHTAIL STINGRAY				70																				110.9	115.3	39.9		69.9		
ROUND SCAD																											0	0	0.1	0.1
SAND TIGER				13.1															12.3											
SCAMP																						0			0					
SCRAWLED FILEFISH																		0											0.1	
SCUP	861.4	353.7	499.4	452.3	342.4	511.4	427.4	630	354.2	335.9	559.7	236.2	244.9	337.5	576.6	348	621.9	170.3	486.7	355.7	258.2	893.6	342	629.3	333	788.5	457.1	731.7	506.1	379
SEA BASS UNCL																													0.1	
SEA RAVEN	0.3																													
SHORT BIGEYE							0.3							0			0.3					0.1					0			
SILVER HAKE					0.5		0	0	0.1					0	0		0.5			0							0			
SMALLMOUTH FLOUNDER										0.5	0	0.1		0.4	0.8	0	0.6	1.5	0.2	0.4	0	0.5	0.6	0.2	1.5	0.5	1.8	0.7	1.3	0.4
SMOOTH DOGFISH	202.7	192.4	301.6	71.3	100.6	222.8	356.1	358.9	392.7	148.3	51.3	45.8	224.9	205.8	109.2	55.6	81.9	107.7	189.9	179.3	136.8	70.8	71.8	101.8	393.2	253	168	806.7	106.5	270.6
SNAKEFISH	0.3							0			0			0								0								
SNOWY GROUPER					0															0	0	0								
SPIDER CRAB UNCL	8.4	10	16.8	6.3	41.5	37.7	20.5	38.2	58.5	67.6	37.4	57.6	7.8	18.4	12.2	11.4	45.2	86.9	33.1	13.8	9.8	62.4	40	9.1	4.8	10.7	33.9	10.7	20.6	9.3
SPINY DOGFISH									11.7		2.9				55.8						3.2		2	74.2	17.9	97.9		10.1		16.5
SPOT								0.8		0.1																				
SPOTFIN BUTTERFLYFISH																						0					0			
SPOTTED HAKE								0.2								0.4	1.4		0.1				0.1				0.4			
STRIPED ANCHOVY	8.4	0.1			0.9		0.1	0.1		4		0	1.8	4.4			0.3			0	0.3	1.5	0	0			0.4		1.7	0
STRIPED BASS																		6.9				3.5								

Table 4.2.7-3

MDMF Fall Research Trawl Survey (Pounds of Fish): 1978-2007

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
STRIPED SEAROBIN	4.6	2.3	1.8	0	0.1	0.1	0.3	1	1	0.2	0.2	0.1		1	4.2		1.3	0.4	2.5	3.3	2	2.8	2.8	1.4	5.9	16.6	5.8	0.2	12.6	0.6
SUMMER FLOUNDER	34.9	4.4	24	7	28.6	18.4	15	46.1	52.7	45.7	35.5	15.7	6.7	34.1	28.9	30	89.7	27	59	68.3	29.9	37.1	145.2	58.3	58	126.2	76.7	163.6	235.4	60.6
TAUTOG	34.5	18.9	33.3	13.3	15	0.6	3.2	13.9	0	0	0.9	0.5	0.2	3	0.3	1.1	0.1	0.1	0	0.3		7.8	14.3	0.3	7.8	5.6	1.6	10.4	12.3	0.2
TRUNKFISH														0																
WEAKFISH		2.6																												
WHITE HAKE		0.3						0.3	0.5			0.2			0.1	0.2		0.3					0							
WINDOWPANE	17.9	13.2	9.1	9.3	17.2	2.6	5.4	11.3	19.2	1	0.7	2.5	1	1.4	2.1	2.9	14.6	1.1	6.6	0.7	0.5	0.8	2	0.2	2.4	1.4	3.9	1.3	0.9	0.5
WINTER FLOUNDER	26.8	2.5	6.5	3.2	6.6	0.6	1.6	3.4	4.7	4.6	1.5	3.2	0.5	2.8	1.9	1.5	19.9	1.8	8.7	2	0.2	1.2	4.6	0.5	0.2		0.9	0.4	0.2	0.1
WINTER SKATE	72.5	57.5	71.3	50.7	321.3	50.7	29	74.5	112.8	121.8	29.3	41.1	25.3	200.6	140.6	166.2	843.5	240.7	407.2	99.1	155.4	53	6	34.9	135.3	175.2	77.4	14.6	110.5	7.6
YELLOW JACK														0																

Table 4.2.7-4

MDMF Spring Research Trawl Survey (Pounds of Fish): 1978-2007

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
ALEWIFE	83.1						0.4	2.4	0.3	1.4	2.7	0.1	0.3	2.4	5	1.7	2	1.1	0.6	2.4	10.6	8.9	0.4	1.1		0.2	0.1	14	0.2	11.7
ALLIGATORFISH		0																												
AMERICAN EEL									0.3																					
AMERICAN LOBSTER	3.8	0.5		8.3	1.6	3.7	1.2	3.7	1.3	1.1	2.6	4.5	6	7.8	5.2	3.6	2.8	4.3	0.8	9.4	3.9	6	3.2	0.5	1.3	0.5	1.4	2.6	7.2	1
AMERICAN SHAD											0.1	0.1		1	0.5			0.2	0.2		0.2	0	0			0		5.1		0.9
ATLANTIC COD	2.9	0	0	2.7	0.2	0	0	0	0.7	0	0.1	0	0	0	0	0.4	0.2	0.1	0.1	0	1.2	0	0	0	0	1.3	0.3	1.3	0	0
ATLANTIC HERRING			0						1	0.7	0.4		0.3	0	4.7	1.4	0.4	0.8	0	0.3	0.1	8.1	0	0.7		0.5	0	0.3	1	0.6
ATLANTIC MACKEREL	0.3		1.1	0.8			6.1	0.7	0.8			0.9		19.2	1.5					0.4	1.1							1.7	1.6	
ATLANTIC MENHADEN	0.2						0.3		0.7		0.6			0.3				0.5												
ATLANTIC ROCK CRAB	7.7	11.7	5.3	15.8	1.3	20.3	8.3	54.9	43.4	52	31.6	4.8	10.3	2	134.6	42.8	52.4	42	82.4	17.7	10.4	13.8	13.2	12.5	3.8	8.1	2.7	36	14.8	12.5
ATLANTIC SEASNAIL																0												0		
ATLANTIC SILVERSIDE																					0					0				
ATLANTIC SURFCLAM			0	0.4			0.1	0.6	0.7									0							0		0.2	0.5	0.6	0.5
ATLANTIC TOMCOD													0.2																	
BAY ANCHOVY				0										0														0	0	
BAY SCALLOP	0.4	2.9	0.7	0.1	0.6	0.3	0.5	1.2	0.7		0.1			0.1	0.1				0.1		0	0	0.1	0.4	0.2				0.1	
BLACK SEA BASS	71.2	27.7	16.9	44.9	37.9	56	17.6	18.2	14.8	2.8	5	1.7	6.4	16.2	0.5	1.7	7.9	4.5	2.2	1.7		3.3	81.2	21.6	37	3.9	10.5	4.5	11	3.7
BLUE CRAB												0.2								0.1		0.4						0.1		0.5
BLUE MUSSEL	5.9	3.5		5			0.7						0				0.2				2.6	0.1		5.3				1.2	0.5	
BLUEBACK HERRING				0			0.9			0.4					1.4				0.5			0	0			0		0.5	0.1	0.5
BLUEFISH									6.9	1.8	4.6											1.9								
BUTTERFISH	5.5	0.4	0		0.4	10.1	0.7	13.2	4.3	3.2	2.1		30.2	52.7	0.4	0.1	0.2	15.9		4.3	14.2	1.8	70.4	62.9	5.9	44.7	0	7.2	3.8	140.5
CHANNELED WHELK	30.6	30.4	18.2	32.6	12.3	3.5	12.7	31.3	18.1	22.6	17.5	3.4	4	3.1	9.9	5	3.7	12.4	19.9	2.2	6	7.4	7.3	3.8	1.2	0.5	1	13.3	23.2	10.4
CUNNER	0.6	0.2		0.3	0.2	0.1	0	0	0	0	0	0			0	0	0	0	0.1	0.3	0	0	0	0	0	0	0	0	0	0
FOURBEARD ROCKLING		0.1																												
FOURSPOT FLOUNDER	1.1	0.7	0.3	2.8	1	2.7	0.6	1.2	2.1	0.3	2.7	3.2	5.3	0.3		0.2	7	3.4	0.6	1.9	0.2		0.2		0.2				0.2	0.3
GOOSEFISH											23.1																			
GRUBBY	0.1	0			0			0			0								0	0	0							0		
GULF STREAM FLOUNDER									0.1												0					0				
HADDOCK																					0									
HORSESHOE CRAB	17.3	11.4	8.2	11.4	3.7	1.1		8	18	10.3	1.8	6.7	6.1	3.5	17.3	17.3	14.3	27.1	23	20	13.1	20.2	8.2	7.2	7.1	5.2	5.5	11.1	14.8	
JONAH CRAB				1.4																		0.4							0	
KNOBBED WHELK	38.4	47.4	15.6	5	0.7	21.6	11.8	109.9	34.4	5.8	15.8	1.1	1.4	3.3	10.9	0.7	0.4	19.5	23.8	1.1	3	12.1	10	5	0.2		0.3	3.5	35.8	17.3
LADY CRAB	0.4	0.2	0	0.9	0.4	0.4	0.3	2.8	1.8	7.8	21.4	10.1	45.6	14.1	20.5	20.3	2.8	15	28.8	12.6	2.5	13.8	4.5	3	0.2	0.3	7.6	0.1	3.8	7.6
LITTLE SKATE	378.1	367.9	272.9	535.4	112.5	195.2	141.1	174.8	89	88	121.1	53.7	143.8	17.3	388.6	196.2	305.4	349.7	262	72.1	47.9	39.7	46.7	25.6	18.6	6.7	12	43	49.9	30.3
LONGFIN SQUID	43.4	98.8	228	41.9	31.1	303.4	176.1	256.3	291.7	254.8	484.5	161.3	339.8	97.2	54	157.8	44.4	162	138.6	39.5	22.3	90.5	210.1	58.9	100.2	4.7	100.5	23.5	122.3	162.3
LONGHORN SCULPIN	66.7	22.4	2.2	6.1	16.7	6	6	4.1	3.9	7.6	0.1	5.2	1.1	0.1	19.4	58.1	48.1	28.7	13.9	6	2.1		0.4				0.3	0.8	2.3	
LUMPFISH		0														0.1					0.1									
MANTIS SHRIMP UNCL																0						0	0.1				0.1	0.2	0.1	
NORTHERN KINGFISH	0.2																	0.2											0.4	
NORTHERN PIPEFISH	0.4	0	0	0.1		0					0				0	0	0	0	0	0	0		0		0	0			0.1	0
NORTHERN QUAHOG			0.6																											
NORTHERN SAND LANCE	0.6	1.7	0.6	5.1	0	0.1	0	1.1	0			0		2.5	0	0.4	0	0.2		0	0.2	1.4		0.4	0	0.3	5.7	0.1	2.5	1.8
NORTHERN SEAROBIN	1394	1003.9	1070.3	2724	5656.9	4236.1	257.1	3131.6	269.8	653.8	24.9	15.1	34.7	135.4	1226.6	248.4	186.4	309.4	150.6	33.2	4	4.8	11.9	12.6	27	0.7	18	5.4	8.6	3
NORTHERN SHORTFIN SQUID	0				0																									0.4
OCEAN POUT	13.7																													

Table 4.2.7-4

MDMF Spring Research Trawl Survey (Pounds of Fish): 1978-2007

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
OCEAN QUAHOG								0.9																						
OYSTER TOADFISH							0.6																							
POLLOCK	0.2	0.3	0	0.5	0.5	0			0	0					0	0	0	0	0.1	0.1	0.1	0	0	0.2	0	1.4	0	0	0.1	0
RAINBOW SMELT																0														
RAZOR AND JACKKNIFE CLAM UNCL																														0
RED HAKE	1.2	1	0	0.4	1.2	2.6		1	2.2	2.6	0.6	0	1.1	0.2	0.2	0	0.3	0.1	0.3	0.1	0	0.1	0.3		0.1			1.5	0.1	0
ROCK GUNNEL	0.1		0	0.1	0.1	0	0	0.1	0			0		0	0	0	0	0	0	0.2	0.1		0		0		0	0.9	0.1	0.1
SCUP	1453.3	564.9	53.9	344.1	23.5	79.9	151.1	45.7	270.7	51.3	75.8	27.3	137.3	282.5	104.1	59.3	127.5	78.4	14.7	11.6	2.6	35	61.6	2.3	154.1	1.1	185.3	1.6	198.8	18
SEA LAMPREY																										0				
SEA RAVEN	5.7	1.2	7.2	3.1	1.8	1.6	4.7	2.2	0.5	3.8	0.2		2.4	0.2			0.1	0.4		3.8	0.1	2.6	0.2	0.2	1.1		0.1	0.8	8.2	0.6
SEA SCALLOP				0.2		0.3	0.1							0.1									0	0.2			0			
SILVER HAKE	0.8		0	1	0	0	6.7	1.4	0.2	1.9	0.8	1	7.4	0	0	0.1	0	0.9			0	0.3		0.2				0		0
SMALLMOUTH FLOUNDER													0		0	0	0	0	0.1	0.1		0	0					0	0	0
SMOOTH DOGFISH	88	104.2	254.5	28.6	18.4	31	24.6	25.6	74.3	2.8	14	4	60.7	54.5	20.1		89.4	6.6				36.6	604.2	7.1	48.5		8	13.1	7.5	6.8
SNAKEBLENNY	0																													
SPIDER CRAB UNCL	18.3	29.6	12.9	44.1	28.6	350.5	33.9	197.5	109.5	132.9	149.6	25.1	42	75.2	643.8	85.2	81.8	176.7	981.1	124.2	91.2	1083.7	116.9	225.2	121.5	165.2	252.6	522.2	62.3	52.4
SPINY DOGFISH	627.8	86.6	143.7	74.5	10.3	8.8	162.9		173.5	4	18.1	0.9	43.2	28.1						0.9			3.3							
SPOTTED HAKE						0		0	0.1	0								0.2			0.4	0	0			0		0.1	2	0.1
STRIPED BASS														11.6		2.9	17.8	118		3.3		6	40.4	17.6	3	4	4.6	46.9		
STRIPED SEAROBIN	12.3			1		5.3			0.6				1.4	0.2			2.8	8.5	1.1	1.2		1.1	6.5	1.8	1.2		0.5	2.6	0.5	0.9
SUMMER FLOUNDER	48.2	29.7	41.3	33.6	17.5	54	3.9	23.9	21.3	20.4	26.3	8.1	7	0.4	20.2	28.7	40.5	36.8	14.9	29.9	13.3	54.8	55.7	52.1	51.8	6.7	9.5	19.4	48.7	32.1
TAUTOG	152.8	254.9	170.4	135.1	225.8	74.8	115	100.3	81.7	23.8	65.7	28.1	4.4	9.5	7.6	19.4	18.2	11.5	54.9	36.5	2.4	26.8	3.7	52.2	17.5	2.4	7	7.2	6.8	4.1
THORNY SKATE	2																													
WHITE HAKE	0.2	0	0	0.4	0.3		0	0	0.5		0				0	0	0	0	0	0	0	0	0		0	0	0		0	
WINDOWPANE	799.8	405	471.5	584.7	331.9	430.5	162.8	191	136.6	120.6	55.8	268.4	203.8	35.3	349.2	227.9	242.9	415	395.3	218.6	40.8	30.4	48	17.3	5.5	11.3	15.4	32.9	20.8	16.2
WINTER FLOUNDER	718.8	305.1	305.2	324.1	223.5	324.7	144	130.3	106	185.3	135.1	129.2	122.3	38.2	183	175.7	169.9	170.3	206.4	191.1	58.1	39.1	57.6	35.2	28	51.1	58.5	47.7	34.2	26.5
WINTER SKATE	421	335.5	447.8	950.7	342.7	339.8	255.2	514	561	742.2	633	216.3	177.9	5.2	389.1	166.4	405.3	294.1	245.9	17.8	64.3	16.8	13.1	11.4	9.8	9.5	0.4	1.6	3.9	5.8
YELLOWTAIL FLOUNDER	2.2	1.3		0.1		0	0			0	0			0		0.1			0										0.2	

Table 4.2.7-5

Occurrence of Fish and Shellfish Species in MDMF Fall Research Trawl Surveys in Nantucket Sound: 1978-2008

Region/ Season	Spp Code	Common Name	Scientific Name	% Occ.	Mean #/Tow	Mean Wt/Tow	Cruise Count
2F	503	LONGFIN SQUID	LOLIGO PEALEII	99.8	427.2	3.6	30
2F	143	SCUP	STENOTOMUS CHRYSOPS	99.7	2987.7	24.0	30
2F	131	BUTTERFISH	PEPRILUS TRIACANTHUS	91.8	416.1	4.1	30
2F	141	BLACK SEA BASS	CENTROPRISTIS STRIATA	81.0	113.3	1.3	30
2F	317	SPIDER CRAB UNCL	MAJIDAE	77.9	17.1	1.4	30
2F	13	SMOOTH DOGFISH	MUSTELUS CANIS	71.5	11.2	10.2	30
2F	322	LADY CRAB	OVALIPES OCELLATUS	67.5	40.8	2.0	29
2F	171	NORTHERN SEAROBIN	PRIONOTUS CAROLINUS	65.3	23.1	1.9	30
2F	103	SUMMER FLOUNDER	PARALICHTHYS DENTATUS	64.6	3.5	2.8	30
2F	26	LITTLE SKATE	LEUCORAJA ERINACEA	61.5	12.4	7.2	30
2F	337	KNOBBED WHELK	BUSYCON CARICA	53.8	5.2	2.0	30
2F	336	CHANNELED WHELK	BUSYCOTYPUS CANALICULATUS	48.7	2.6	0.7	29
2F	23	WINTER SKATE	LEUCORAJA OCELLATA	46.5	7.5	6.7	30
2F	313	ATLANTIC ROCK CRAB	CANCER IRRORATUS	35.9	3.6	0.2	30
2F	108	WINDOWPANE	SCOPHTHALMUS AQUOSUS	32.8	1.1	0.3	30
2F	117	SMALLMOUTH FLOUNDER	ETROPUS MICROSTOMUS	30.4	2.9	0.0	20
2F	106	WINTER FLOUNDER	PSEUDOPLEURONECTES AMERICANUS	23.8	1.9	0.2	29
2F	318	HORSESHOE CRAB	LIMULUS POLYPHEMUS	23.1	0.7	1.3	29
2F	135	BLUEFISH	POMATOMUS SALTATRIX	22.9	2.8	0.3	29
2F	172	STRIPED SEAROBIN	PRIONOTUS EVOLANS	18.8	0.5	0.1	28
2F	116	NORTHERN PIPEFISH	SYNGNATHUS FUSCUS	17.1	0.9	0.0	27
2F	146	NORTHERN KINGFISH	MENTICIRRHUS SAXATILIS	17.1	0.4	0.0	26
2F	177	TAUTOG	TAUTOGA ONITIS	15.9	1.4	0.3	29
2F	208	MACKEREL SCAD	DECAPTERUS MACARELLUS	14.5	0.9	0.0	25
2F	196	NORTHERN PUFFER	SPHOEROIDES MACULATUS	11.8	0.2	0.0	26
2F	176	CUNNER	TAUTOGOLABRUS ADSPERSUS	10.6	1.6	0.0	29
2F	201	PLANEHEAD FILEFISH	MONACANTHUS HISPIDUS	10.3	0.2	0.0	19
2F	301	AMERICAN LOBSTER	HOMARUS AMERICANUS	9.7	0.3	0.1	25
2F	43	BAY ANCHOVY	ANCHOA MITCHILLI	9.4	86.8	0.1	16
2F	132	ATLANTIC MOONFISH	SELENE SETAPINNIS	9.2	1.8	0.0	19
2F	44	STRIPED ANCHOVY	ANCHOA HEPSETUS	8.9	30.4	0.0	18
2F	338	MOON SNAIL, SHARK EYE, AND BABY-EAR	NATICIDAE	8.2	0.2	0.0	19
2F	104	FOURSPOT FLOUNDER	PARALICHTHYS OBLONGUS	8.0	0.1	0.0	22
2F	109	GULF STREAM FLOUNDER	CITHARICHTHYS ARCTIFRONS	5.8	0.3	0.0	7
2F	134	BIGEYE	PRIACANTHUS ARENATUS	4.8	0.2	0.0	11
2F	402	BAY SCALLOP	ARGOPECTEN IRRADIANS	4.8	0.7	0.0	21
2F	120	BLUESPOTTED CORNETFISH	FISTULARIA TABACARIA	4.6	0.1	0.0	10
2F	72	SILVER HAKE	MERLUCCIUS BILINEARIS	4.3	0.2	0.0	9
2F	15	SPINY DOGFISH	SQUALUS ACANTHIAS	3.4	0.2	0.5	10
2F	181	NORTHERN SAND LANCE	AMMODYTES DUBIUS	3.4	1.0	0.0	10
2F	403	ATLANTIC SURFCLAM	SPISULA SOLIDISSIMA	3.1	0.1	0.0	14
2F	77	RED HAKE	UROPHYCIS CHUSS	2.9	0.1	0.0	10
2F	435	INSHORE LIZARDFISH	SYNODUS FOETENS	2.9	0.1	0.0	6
2F	180	ROCK GUNNEL	PHOLIS GUNNELLUS	2.7	0.2	0.0	10
2F	520	LONGFIN SQUID EGG MOPS	LOLIGO PEALEII EGG MOPS	2.6	0.0	0.0	6
2F	32	ATLANTIC HERRING	CLUPEA HARENGUS	2.4	0.2	0.0	10

Table 4.2.7-5

Occurrence of Fish and Shellfish Species in MDMF Fall Research Trawl Surveys in Nantucket Sound: 1978-2008

Region/ Season	Spp Code	Common Name	Scientific Name	% Occ.	Mean #/Tow	Mean Wt/Tow	Cruise Count
2F	76	WHITE HAKE	UROPHYCIS TENUIS	2.2	0.1	0.0	8
2F	212	ROUGH SCAD	TRACHURUS LATHAMI	2.1	0.1	0.0	9
2F	36	ATLANTIC MENHADEN	BREVOORTIA TYRANNUS	1.9	0.1	0.0	5
2F	556	GLASSEYE SNAPPER	PRIACANTHUS CRUENTATUS	1.9	0.1	0.0	4
2F	343	BLUE MUSSEL	MYTILUS EDULIS	1.7	0.1	0.0	6
2F	557	SHORT BIGEYE	PRISTIGENYS ALTA	1.7	0.0	0.0	5
2F	129	BLUE RUNNER	CARANX CRYSOS	1.5	0.0	0.0	6
2F	4	ROUGHTAIL STINGRAY	DASYATIS CENTROURA	1.4	0.0	1.3	7
2F	78	SPOTTED HAKE	UROPHYCIS REGIA	1.2	0.0	0.0	6
2F	187	RED GOATFISH	MULLUS AURATUS	1.2	0.0	0.0	5
2F	211	ROUND SCAD	DECAPTERUS PUNCTATUS	1.2	0.0	0.0	4
2F	832	ORANGE FILEFISH	ALUTERUS SCHOEPFI	1.2	0.0	0.0	5
2F	33	ALEWIFE	ALOSA PSEUDOHARENGUS	1.0	0.0	0.0	6
2F	314	BLUE CRAB	CALLINECTES SAPIDUS	1.0	0.0	0.0	5
2F	439	SNAKEFISH	TRACHINOCEPHALUS MYOPS	1.0	0.1	0.0	5
2F	34	BLUEBACK HERRING	ALOSA AESTIVALIS	0.9	0.0	0.0	4
2F	166	GRUBBY	MYOXOCEPHALUS AENAEUS	0.9	0.1	0.0	4
2F	202	GRAY TRIGGERFISH	BALISTES CAPRISCUS	0.9	0.0	0.0	3
2F	209	BIGEYE SCAD	SELAR CRUMENOPHTHALMUS	0.9	0.0	0.0	3
2F	694	NORTHERN SENNET	SPHYRAENA BOREALIS	0.9	0.0	0.0	5
2F	695	GUAGUANCHE	SPHYRAENA GUACHANCHO	0.9	0.0	0.0	3
2F	175	FLYING GURNARD	DACTYLOPTERUS VOLITANS	0.7	0.0	0.0	2
2F	323	MANTIS SHRIMP UNCL	STOMATOPODA	0.7	0.0	0.0	4
2F	342	NORTHERN HORSEMUSSEL	MODIOLUS MODIOLUS	0.7	0.0	0.0	4
2F	537	SNOWY GROUPER	EPINEPHELUS NIVEATUS	0.7	0.0	0.0	4
2F	657	DWARF GOATFISH	UPENEUS PARVUS	0.7	0.1	0.0	2
2F	12	SAND TIGER	CARCHARIAS TAURUS	0.5	0.0	0.1	3
2F	312	JONAH CRAB	CANCER BOREALIS	0.5	0.0	0.0	3
2F	348	NORTHERN MOONSNAIL	EUSPIRA HEROS	0.5	0.0	0.0	3
2F	413	NORTHERN QUAHOG	MERCENARIA MERCENARIA	0.5	0.0	0.0	2
2F	489	RED CORNETFISH	FISTULARIA PETIMBA	0.5	0.0	0.0	2
2F	662	SPOTFIN BUTTERFLYFISH	CHAETODON OCELLATUS	0.5	0.0	0.0	2
2F	852	LIZARDFISH UNCL	SYNODONTIDAE	0.5	0.0	0.0	3
2F	63	CONGER EEL	CONGER OCEANICUS	0.3	0.0	0.0	2
2F	83	FOURBEARD ROCKLING	ENCHELYOPUS CIMBRIUS	0.3	0.0	0.0	2
2F	133	LOOKDOWN	SELENE VOMER	0.3	0.0	0.0	1
2F	139	STRIPED BASS	MORONE SAXATILIS	0.3	0.0	0.0	2
2F	149	SPOT	LEIOSTOMUS XANTHURUS	0.3	0.0	0.0	2
2F	163	LONGHORN SCULPIN	MYOXOCEPHALUS OCTODECEMSPINOSUS	0.3	0.0	0.0	2
2F	204	BANDED RUDDERFISH	SERIOLA ZONATA	0.3	0.0	0.0	2
2F	311	CANCER CRAB UNCL	CANCRIDAE	0.3	0.0	0.0	1
2F	542	SCAMP	MYCTEROPERCA PHENAX	0.3	0.0	0.0	2
2F	568	AFRICAN POMPANO	ALECTIS CILIARIS	0.3	0.0	0.0	2
2F	833	SCRAWLED FILEFISH	ALUTERUS SCRIPTUS	0.3	0.0	0.0	2
2F	24	CLEARNOSE SKATE	RAJA EGLANTERIA	0.2	0.0	0.0	1
2F	45	RAINBOW SMELT	OSMERUS MORDAX	0.2	0.0	0.0	1

Table 4.2.7-5

Occurrence of Fish and Shellfish Species in MDMF Fall Research Trawl Surveys in Nantucket Sound: 1978-2008

Region/ Season	Spp Code	Common Name	Scientific Name	% Occ.	Mean #/Tow	Mean Wt/Tow	Cruise Count
2F	73	ATLANTIC COD	GADUS MORHUA	0.2	0.0	0.0	1
2F	118	HOGCHOKER	TRINECTES MACULATUS	0.2	0.0	0.0	1
2F	145	WEAKFISH	CYNOSCION REGALIS	0.2	0.0	0.0	1
2F	164	SEA RAVEN	HEMITRIPTERUS AMERICANUS	0.2	0.0	0.0	1
2F	185	OYSTER TOADFISH	OPSANUS TAU	0.2	0.0	0.0	1
2F	305	SHRIMP UNCL	CRUSTACEA SHRIMP	0.2	0.0	0.0	1
2F	328	FLAME BOX CRAB	CALAPPA FLAMMEA	0.2	0.0	0.0	1
2F	330	SAND DOLLAR UNCL	CLYPEASTEROIDA	0.2	0.0	0.0	1
2F	384	AMERICAN EEL	ANGUILLA ROSTRATA	0.2	0.0	0.0	1
2F	409	OCEAN QUAHOG	ARCTICA ISLANDICA	0.2	0.0	0.0	1
2F	416	RAZOR AND JACKKNIFE CLAM UNCL	SOLENIDAE	0.2	0.0	0.0	1
2F	531	ROCK HIND	EPINEPHELUS ADSCENSIONIS	0.2	0.0	0.0	1
2F	541	GAG	MYCTEROPERCA MICROLEPIS	0.2	0.0	0.0	1
2F	554	SEA BASS UNCL	SERRANIDAE	0.2	0.0	0.0	1
2F	569	YELLOW JACK	CARANX BARTHOLOMAEI	0.2	0.0	0.0	1
2F	739	GOBY UNCL	GOBIIDAE	0.2	0.0	0.0	1
2F	840	TRUNKFISH	LACTOPHRYS TRIGONUS	0.2	0.0	0.0	1

Table 4.2.7-6

Occurrence of Fish and Shellfish Species in MDMF Spring Research Trawl Surveys in Nantucket Sound: 1978-2008

Region/ Season	Spp Code	Common Name	Scientific Name	% Occ.	Mean #/Tow	Mean Wt/Tow	Cruise Count
2S	503	LONGFIN SQUID	LOLIGO PEALEII	90.5	100.4	7.1	30
2S	317	SPIDER CRAB UNCL	MAJIDAE	88.2	93.7	10	30
2S	106	WINTER FLOUNDER	PSEUDOPLEURONECTES AMERICANUS	87.9	26	7.8	30
2S	108	WINDOWPANE	SCOPHTHALMUS AQUOSUS	79.6	35.9	10.4	30
2S	26	LITTLE SKATE	LEUCORAJA ERINACEA	78.6	12.6	7.6	30
2S	313	ATLANTIC ROCK CRAB	CANCER IRRORATUS	69	13	1.3	30
2S	171	NORTHERN SEAROBIN	PRIONOTUS CAROLINUS	68.8	205.4	37.9	30
2S	23	WINTER SKATE	LEUCORAJA OCELLATA	60.9	9.3	12.6	30
2S	103	SUMMER FLOUNDER	PARALICHTHYS DENTATUS	55.4	1.7	1.4	30
2S	336	CHANNELED WHELK	BUSYCOTYPUS CANALICULATUS	54.7	2.7	0.6	30
2S	73	ATLANTIC COD	GADUS MORHUA	53.4	9.9	0	30
2S	143	SCUP	STENOTOMUS CHRYSOPS	47.9	39.2	7.7	30
2S	322	LADY CRAB	OVALIPES OCELLATUS	44.3	5	0.4	30
2S	141	BLACK SEA BASS	CENTROPRISTIS STRIATA	30	1.6	0.9	29
2S	163	LONGHORN SCULPIN	MYOXOCEPHALUS OCTODECEMSPINOSUS	27.9	1.8	0.5	25
2S	301	AMERICAN LOBSTER	HOMARUS AMERICANUS	27.7	0.7	0.2	29
2S	337	KNOBBED WHELK	BUSYCON CARICA	26.4	2.4	0.8	29
2S	177	TAUTOG	TAUTOGA ONITIS	26.2	1.7	2.9	30
2S	131	BUTTERFISH	PEPRILUS TRIACANTHUS	24.7	17.5	0.8	27
2S	338	MOON SNAIL, SHARK EYE, AND BABY-EAR	NATICIDAE	24.4	1.8	0.1	27
2S	318	HORSESHOE CRAB	LIMULUS POLYPHEMUS	20.7	0.4	0.5	28
2S	176	CUNNER	TAUTOGOLABRUS ADSPERSUS	16.4	0.5	0	27
2S	13	SMOOTH DOGFISH	MUSTELUS CANIS	15.1	0.7	2.7	25
2S	75	POLLOCK	POLLACHIUS VIRENS	13.9	3.4	0	24
2S	77	RED HAKE	UROPHYCIS CHUSS	13.8	0.5	0	26
2S	181	NORTHERN SAND LANCE	AMMODYTES DUBIUS	13.8	10	0	25
2S	104	FOURSPOT FLOUNDER	PARALICHTHYS OBLONGUS	12.8	0.3	0.1	24
2S	33	ALEWIFE	ALOSA PSEUDOHARENGUS	12.3	3.8	0.3	24
2S	164	SEA RAVEN	HEMITRIPTERUS AMERICANUS	11.6	0.2	0.1	25
2S	180	ROCK GUNNEL	PHOLIS GUNNELLUS	11.4	0.4	0	23
2S	72	SILVER HAKE	MERLUCCIUS BILINEARIS	11.3	0.3	0	22
2S	32	ATLANTIC HERRING	CLUPEA HARENGUS	9.5	24.2	0	21
2S	76	WHITE HAKE	UROPHYCIS TENUIS	9.3	0.2	0	22
2S	117	SMALLMOUTH FLOUNDER	ETROPUS MICROSTOMUS	8.3	0.1	0	12
2S	15	SPINY DOGFISH	SQUALUS ACANTHIAS	7.5	0.6	2.3	15
2S	116	NORTHERN PIPEFISH	SYNGNATHUS FUSCUS	7.5	0.4	0	18
2S	172	STRIPED SEAROBIN	PRIONOTUS EVOLANS	7.1	0.2	0.1	18
2S	78	SPOTTED HAKE	UROPHYCIS REGIA	5.6	0.2	0	12
2S	520	LONGFIN SQUID EGG MOPS	LOLIGO PEALEII EGG MOPS	5.6	0	0.2	8
2S	402	BAY SCALLOP	ARGOPECTEN IRRADIANS	5.1	0.4	0	19
2S	35	AMERICAN SHAD	ALOSA SAPIDISSIMA	4.5	0.2	0	12
2S	403	ATLANTIC SURFCLAM	SPISULA SOLIDISSIMA	3.6	0.1	0	11
2S	121	ATLANTIC MACKEREL	SCOMBER SCOMBRUS	3.3	0.2	0.1	13
2S	139	STRIPED BASS	MORONE SAXATILIS	3.3	0.6	0.5	12
2S	348	NORTHERN MOONSNAIL	EUSPIRA HEROS	3.2	0.3	0	6
2S	105	YELLOWTAIL FLOUNDER	LIMANDA FERRUGINEA	2.7	0	0	11
2S	166	GRUBBY	MYOXOCEPHALUS AENAEUS	2.5	0.1	0	9
2S	343	BLUE MUSSEL	MYTILUS EDULIS	2.3	1.3	0	11
2S	34	BLUEBACK HERRING	ALOSA AESTIVALIS	2	0.2	0	11
2S	109	GULF STREAM FLOUNDER	CITHARICHTHYS ARCTIFRONS	2	0	0	3
2S	401	SEA SCALLOP	PLACOPECTEN MAGELLANICUS	1.7	0	0	7

Table 4.2.7-6

Occurrence of Fish and Shellfish Species in MDMF Spring Research Trawl Surveys in Nantucket Sound: 1978-2008

Region/ Season	Spp Code	Common Name	Scientific Name	% Occ.	Mean #/Tow	Mean Wt/Tow	Cruise Count
2S	323	MANTIS SHRIMP UNCL	STOMATOPODA	1.5	0	0	6
2S	314	BLUE CRAB	CALLINECTES SAPIDUS	1.2	0	0	5
2S	36	ATLANTIC MENHADEN	BREVOORTIA TYRANNUS	1	0	0	6
2S	135	BLUEFISH	POMATOMUS SALTATRIX	0.8	0	0	4
2S	502	NORTHERN SHORTFIN SQUID	ILLEX ILLECEBROSUS	0.8	0	0	3
2S	43	BAY ANCHOVY	ANCHOA MITCHILLI	0.7	0	0	4
2S	146	NORTHERN KINGFISH	MENTICIRRHUS SAXATILIS	0.7	0	0	3
2S	168	LUMPFISH	CYCLOPTERUS LUMPUS	0.7	0	0	3
2S	193	OCEAN POUT	MACROZOARCES AMERICANUS	0.7	0	0	1
2S	312	JONAH CRAB	CANCER BOREALIS	0.5	0	0	3
2S	28	THORNY SKATE	AMBLYRAJA RADIATA	0.3	0	0	1
2S	74	HADDOCK	MELANOGRAMMUS AEGLEFINUS	0.3	0	0	1
2S	113	ATLANTIC SILVERSIDE	MENIDIA MENIDIA	0.3	0	0	2
2S	170	ATLANTIC SEASNAIL	LIPARIS ATLANTICUS	0.3	0	0	2
2S	331	SEA URCHIN AND SAND DOLLAR UNCL	ECHINOIDEA	0.3	0	0	2
2S	335	HERMIT CRAB UNCL	PAGUROIDEA	0.3	0	0	2
2S	409	OCEAN QUAHOG	ARCTICA ISLANDICA	0.3	0	0	1
2S	2	SEA LAMPREY	PETROMYZON MARINUS	0.2	0	0	1
2S	45	RAINBOW SMELT	OSMERUS MORDAX	0.2	0	0	1
2S	83	FOURBEARD ROCKLING	ENCHELYOPUS CIMBRIUS	0.2	0	0	1
2S	165	ALLIGATORFISH	ASPIDOPHOROIDES MONOPTERYGIUS	0.2	0	0	1
2S	182	SNAKEBLENNY	LUMPENUS LUMPRETAEFORMIS	0.2	0	0	1
2S	185	OYSTER TOADFISH	OPSANUS TAU	0.2	0	0	1
2S	197	GOOSEFISH	LOPHIUS AMERICANUS	0.2	0	0	1
2S	326	GREEN CRAB	CARCINUS MAENAS	0.2	0	0	1
2S	330	SAND DOLLAR UNCL	CLYPEASTEROIDA	0.2	0	0	1
2S	384	AMERICAN EEL	ANGUILLA ROSTRATA	0.2	0	0	1
2S	413	NORTHERN QUAHOG	MERCENARIA MERCENARIA	0.2	0	0	1
2S	416	RAZOR AND JACKKNIFE CLAM UNCL	SOLENIDAE	0.2	0	0	1
2S	453	ATLANTIC TOMCOD	MICROGADUS TOMCOD	0.2	0	0	1

Table 4.2.7-7

NOAA Fisheries Landings Data for Finfish in Nantucket Sound: 1990-2007 (Pounds)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	98-07 Avg.
Albacore	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amberjack	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bass, Black Sea	n.d.	n.d.	n.d.	n.d.	17	273	38	62	52,231	101,992	117,234	66,403	87,081	50,079	38,251	100597	99293	49866	76,303
Bass, Sea, Unspec.	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bass, Striped	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	1,869	0	0	1	459	1,186	0	0	0	352
Bluefish	n.d.	n.d.	n.d.	n.d.	0	194	325	347	475	77	3,361	2,195	978	5,282	4,107	43271	46001	14974	12,072
Bonito	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	23	0	0	0	6	15	4
Butterfish	n.d.	n.d.	n.d.	n.d.	0	0	900	575	9,759	1,175	2,755	19,110	5,007	13,015	2,802	666	31	2051	5,637
Cod, General	n.d.	n.d.	n.d.	n.d.	0	150	0	0	180	0	0	0		0	0	0	0	0	20
Cusk	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	15	0	30	250	0	0	0	0	0	30
Dogfish	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	84	0	108	370	0	0	56
Flounder, Plaice	n.d.	n.d.	n.d.	n.d.	0	2,600	0	0	0	0	20	0	0	148	0	0	0	0	17
Flounder, Unspec.	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	0	0	211	0	21
Flounder, Windopane	n.d.	n.d.	n.d.	n.d.	0	5	0	0	340	0	0	0	38	344	1,772	0	0	0	249
Flounder, Winter	n.d.	n.d.	n.d.	n.d.	0	767	466		2,900	170	5,520	3,065	4,222	12,154	22,907	310	50	0	5,130
Flounder, Witch	n.d.	n.d.	n.d.	n.d.	0	2,240	0	0	0	0	0	0	0	1,500	0	0	0	0	150
Flounder, Yellowtail	n.d.	n.d.	n.d.	n.d.	0	1,300	0	0	0	0	0	0	0	0	0	0	0	0	0
Fluke	n.d.	n.d.	n.d.	n.d.	22,328	30,847	22,253	17,430	13,903	57,109	101,847	64,378	148,974	78,933	98,286	176,853	239,147	112,805	109,224
Haddock, General	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hake, General	n.d.	n.d.	n.d.	n.d.	4,881	0	0	900	0	0	0	0	330	648	40	955	2,786	200	496
Herring, Atlantic	n.d.	n.d.	n.d.	n.d.	0	0	0	0	500	0	0	5,600	1,700	1,200	9,000	0		0	2,000
Herring, Blueback	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring, Sea	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Herring, Unspec.	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hogfish	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mackerel, Atlantic	n.d.	n.d.	n.d.	n.d.	0	0	1,650	0	227,525	196,889	209,494	85,490	209,907	21,480	107,985	357	615	17	105,976
Mackerel, King	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mackerel, Spanish	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0
Menhaden	n.d.	n.d.	n.d.	n.d.	0	0	0	0	30,000	9,460	0	0	70,500	2,900	0	0	0	0	11,286
Monkfish	n.d.	n.d.	n.d.	n.d.	0	2,270	0	200	30	0	0	0	0	0	8	0	115	184	34
Other Finfish	n.d.	n.d.	n.d.	n.d.	0	79	0	0	0	0	0	3	902	0	0	1	45	0	95
Pollock	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pompano, Common	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pout, Ocean	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	200	0	0	0	20
Raven, Sea	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	17	0	0	0	0	2
Robin, Sea	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	3	0	0	2	0	0	0	0	1
Sculpins	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	100		0	0	0	710	0	90
Scup	n.d.	n.d.	n.d.	n.d.	1,096	6,158	1,276	4,966	6,101	8,291	15,509	11,216	57,067	72,271	94,562	56,595	54,644	65,004	44,126

Table 4.2.7-7

NOAA Fisheries Landings Data for Finfish in Nantucket Sound: 1990-2007 (Pounds)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	98-07 Avg.
Shark, Unspec.	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Skate, General	n.d.	n.d.	n.d.	n.d.	0	274	91	300	305	100	0	0	100	5,507	500	1,900	1,600	1,000	1,101
Squid, general	n.d.	n.d.	n.d.	n.d.	14,000	69,020	100,262	83,513	53,365	179,175	569,424	293,927	741,659	117,543	414,776	169,494	713,094	543,388	379,585
Tautog	n.d.	n.d.	n.d.	n.d.	104	129	107	264	5,233	3,558	7,232	4,904	5,253	1,721	4,508	0	0	0	3,241
Tuna, Bluefin	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tuna, Unspec.	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Weakfish	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	5	30	10	0	0	8,180	3,590	0	1,182
Whiting, King (Kingfish)	n.d.	n.d.	n.d.	n.d.	100	20	0	0	0	698	1,296	1,840	20,318	8,993	4,850	1,602	1,729	200	4,153
TOTALS	n.d.	n.d.	n.d.	n.d.	42,526	116,326	127,368	108,557	402,847	560,578	1,033,704	558,291	1,354,404	394,196	805,848	561,151	1,163,667	789,704	762,650

Table 4.2.7-8

NOAA Fisheries Shellfish Catch Data for Nantucket Sound: 1998-2007

NMFS	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	AVG	S.D.
Clam, Hard	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	30,900	0	0	363	0	0	3,126	9,759
Clam, Hard (Bushels)	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	286		0	0	1,174	0	0	162	391
Clam, Not Specified	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	15,100	5,150	0	0	0	0	0	2,025	4,871
Clam, Softshell	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clam, Surf	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	0	316	32,260	30,000	6,258	13,120
Clam, Surf (Bushels)	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	0	1,275	1,491	526	329	581
Conch	n.d.	n.d.	n.d.	n.d.	28,032	23,133	10,568	33,360	7,484	89,787	282,408	224,169	121,354	76,381	155,702	363,887	437,083	445,072	220,333	155,994
Crab, Horseshoe	n.d.	n.d.	n.d.	n.d.	0	310		545	50	773	665	2,398	2,460	1,103	1,135	35	1,227	12,660	2,251	3,749
Lobster	n.d.	n.d.	n.d.	n.d.	0	0	0	0	468	53	364	250	215		33	2,546	403	432	529	772
Mussel, Blue	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Quahog, Ocean	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	150	39,820	23,572	0	66,665	34,650	0	16,486	23,731
Quahog, Ocean (Bushels)	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	591	421	0		0	0	112	227
Scallop, Bay	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	226	0	0	0	23	
Scallop, Sea	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	400	0	1,200	0	5,160	0	0	242		778	1,690
Scallop, Sea (Bushels)	n.d.	n.d.	n.d.	n.d.	0	0	0	0	0	0	0	0	0	0	0	0	15	0	2	
TOTALS	n.d.	n.d.	n.d.	n.d.	28,032	23,443	10,568	33,905	8,002	91,013	283,437	243,267	199,899	106,216	157,096	433,812	505,865	488,164	251,808	

n.d. = no data

Table 4.2.7-9

NOAA Fisheries Proportion of Total Annual Finfish Catch by Gear in Nantucket Sound: 1998-2007

Gear	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	AVG
Otter Trawl, Bottom Fish	21.86%	37.05%	66.84%	55.85%	68.96%	53.74%	70.14%	61.13%	74.33%	89.11%	59.90%
Fish Weir	9.71%	33.98%	18.42%	33.23%	24.93%	34.17%	22.20%	0.00%	0.00%	0.00%	17.66%
Fish Pot	21.39%	28.35%	11.00%	9.47%	4.81%	5.91%	3.36%	29.65%	16.67%	5.86%	13.65%
Trap	43.42%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.34%
Handline	1.52%	0.60%	0.81%	0.36%	0.49%	2.76%	1.53%	4.06%	3.47%	2.75%	1.84%
Scottish Seine	0.00%	0.00%	1.30%	1.09%	0.65%	3.42%	2.76%	0.00%	0.00%	0.00%	0.92%
Runaround Gillnet	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.14%	2.80%	0.00%	0.69%
Shrimp Bottom Trawl	0.14%	0.00%	1.47%	0.00%	0.16%	0.00%	0.00%	0.00%	1.88%	1.32%	0.50%
Beam Trawl	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.86%	0.85%	0.96%	0.27%
Pot (other)	1.67%	0.00%	0.16%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.18%
Mixed Pot	0.24%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%
Midwater Pair Trawl	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.16%	0.00%	0.00%	0.02%
Other	0.06%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%
Shrimp Pot	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%

Table 4.2.8-1

Summary of Specific Life Stage EFH Designations for Species in the NMFS Designated 10 x 10 Minute Squares Encompassing the Site of the Proposed Action in Nantucket Sound

SPECIES Common Name	Scientific Name	Eggs	Larvae	Juveniles	Adults	Spawning Adults
Atlantic cod	*Gadus morhua*	a/			X	
Scup	*Stenotomus chrysops*			X	X	
Black sea bass	*Centropristis striata*		X	X	X	
Winter flounder	*Pseudopleuronectes Americanus*	X	X	X	X	X
Summer flounder	*Paralichthys dentatus*	X	X	X	X	
Windowpane	*Thalamus aquosus*				X	X
Yellowtail flounder	*Limanda ferruginea*			X b/		
Atlantic butterfish	*Peprilus triscanthus*	X	X	X	X	
Atlantic mackerel	*Scomber scombrus*	X	X	X	X	
King mackerel	*Scomberomorus cavalla*	X b/	X b/	X	X	
Spanish mackerel	*Scomberomorus maculates*	X b/	X b/	X	X	
Cobia	*Rachycentron canadum*	X b/	X b/	X	X	
Blue shark	*Prionace glauca*				X	
Shortfin mako shark	*Isurus oxyrhinchus*			X		
Bluefin tuna	*Thunnus thynnus*			X b/	X b/	
Little skate	*Leucoraja erinacea*			X	X	
Winter skate	*Leucoraja ocellata*			X	X	
Long-finned squid	*Loligo pealei*			X	X	
Short finned squid	*Illex illecebrosus*			X	X	
Surf clam	*Spisula solisissima*			X	X	

a/ Empty space denotes that EFH has not been designated for the life stage of the given species.
b/ Detailed EFH descriptions revealed that EFH is not designated for this species/lifestage in Nantucket Sound.

Table 4.2.8-2

Summary of Federal and State Fisheries Databases Reporting the Presence of EFH Designated Species

EFH Species	NOAA VTR Commercial	NOAA VTR Charter	NOAA MRFSS recreational	DMF Commercial	DMF Resource Trawl
Atlantic cod	X	-	X	X	X a/, b/
Scup	X	X	X	X	X a/, b/
Black sea bass	X	X	X	X	X a/, b/
Winter flounder	X	X	X	X	X a/, b/
Summer flounder	X	X	X	X	X a/, b/
Windowpane	X	-	X	X[3]	X a/, b/
Yellowtail flounder	X	-	X	X	X a/
Atlantic butterfish	X	X	X	X	X a/, b/
Atlantic mackerel	X	X	X	X	X a/
King mackerel	-	-	-	X	-
Spanish mackerel	X	X	X	X	-
Cobia	-	-	-	-	-
Blue shark	-	-	X c/	-	-
Shortfin mako shark	-	-	X	-	-
Bluefin tuna	X	-	X	-	-
Little skate	X c/	X c/	X	X c/	X a/, b/
Winter skate	X c/	X c/	X	X c/	X a/, b/
Long-finned squid	X	X	-	X c/	X a/, b/
Short-finned squid	X	X	-	X c/	X a/
Surf clam/sea clam	X c/	-	-	X	X a/, b

Notes:
X = reported
\- = not reported
a/ Spring
b/ Fall
c/ Not specific species

Table 4.3.3-1

1990 and 2000 Census Data for Nantucket County, MA; Dukes County, MA; Barnstable County, MA; Washington County, RI; and Bristol County, MA

Category	Nantucket County		Dukes County		Barnstable County			Washington County			Bristol County	
	1990	2000	1990	2000	1990	2000	2005	1990	2000	2005	1990	2000
POPULATION												
Total Population	6,012	9,520	11,639	14,987	186,605	222,230	220,838	110,006	123,546	123,322	506,325	534,678
AGE												
Persons under 5 years old	421	525	826	817	11,904	10,599	9,501	7,256	7,260	6,658	35,729	34,286
Persons under 18 years old	1,254	7,692	2,704	11,589	39,230	176,790	179,307	25,366	94,664	96,466	116,884	131,718
Persons 65 years old and over	819	1,000	1,833	2,153	41,135	51,265	50,929	13,508	15,766	16,592	73,310	75,512
RACE/ETHNICITY												
White	5,787	8,363	10,979	13,592	179,551	209,398	209,622	106,212	117,141	117,045	482,426	486,434
Black or African American	151	789	332	359	2,827	3,969	3,746	1,058	1,132	546	8,054	10,856
American Indian and Alaska Native	5	1	253	256	1,180	1,235	870	1,024	1,143	878	937	1,308
Asian (Asian or Pacific Islander for 1990 Census)	18	61	44	69	968	1,401	1,752	1,445	1,858	2,187	4,404	6,728
Native Hawaiian and Other Pacific Islander	NA	4	NA	11	NA	55	0	NA	30	199	74	145
Some other race	51	152	31	222	2,079	2,475	1,793	267	574	404	10,430	16,695
One race	NA	9,370	NA	14,509	NA	218,533	217,783	NA	121,878	121,259	NA	522,166
Two or more races	NA	150	NA	478	NA	3,697	3,055	NA	1,668	2,063	NA	12,512
Hispanic or Latino (of any race)	50	212	121	155	2,287	3,000	3,643	1,062	1,780	2,122	13,578	19,242
SOCIAL CHARACTERISTICS												
High school graduate or higher (population 25 yrs or over)	1,164	6,393	2,431	9,667	41,186	151,594	155,105	19,885	71,623	72,945	254,561	261,910
Bachelor's degree or higher (population 25 yrs or over)	1,032	2,681	1,784	4,102	25,186	55,463	59,402	12,042	28,692	32,865	55,816	71,117

Table 4.3.3-1

1990 and 2000 Census Data for Nantucket County, MA; Dukes County, MA; Barnstable County, MA; Washington County, RI; and Bristol County, MA

Category	Nantucket County		Dukes County		Barnstable County			Washington County			Bristol County	
	1990	2000	1990	2000	1990	2000	2005	1990	2000	2005	1990	2000
ECONOMIC CHARACTERISTICS												
Number Employed in Construction	770	1,184	971	1,451	8,191	9,741	9,595	3,668	4,465	5,060	15,381	17,979
Number Employed in Manufacturing (non-durable and durable goods for 1990 Census)	81	174	190	231	6421	4,875	3,991	9,948	8,199	7,490	61,354	47,863
Number Employed in Service Occupations (except protective and household for 1990 Census)	428	919	582	1,268	11,042	18,345	23,826	7,137	10,264	13,022	26,325	39,759
Percent Population Living Below Poverty Level	5.66 percent	7.48 percent	6.61 percent	7.23 percent	7.39 percent	6.76 percent	6.6 percent	6.40 percent	6.97 percent	6.2 percent	10.2 percent	10.0 percent
Total Population Living Below Poverty Level	340	712	769	1,083	13,796	15,021	14,575	7,044	8,607	7,646	45,167	52,236
Unemployment Rate (percent of civilian labor force)	2.06	4.28	6.08	2.71	7.03	5.16	7.4	5.57	5.10	5.5	NA	3.8
Median family income (dollars)	49,209	66,786	41,369	55,018	38,117	54,728	68,290	42,343	64,112	76,794	38,003	53,733
Median nonfamily household income (dollars)	26,059	NA	21,035	NA	18,404	NA	32,454	20,234	NA	34,241	13,402	20,978
Median household income (dollars)	40,331	55,522	31,994	45,559	31,766	45,933	54,439	36,948	53,103	62,536	31,520	43,496

Reference: 1990, 2000, 2005 U.S. Census Bureau; American FactFinder; <http://factfinder.census.gov>
NA = Not Available. 2005 data are estimates and not available for Nantucket and Dukes County.

Table 4.3.4-1

Historic Properties and Districts Assessed for Wind Park Visibility for the Cape Wind Project

Site, Location MHC No. (shown on Figure 5.10-1); Historic Designation	Field Visit	Potential Visibility Of WP	Viewpoint Distance to WP	Visual Simulation
CAPE COD				
Town of Falmouth				
Nobska Point Light Station, Woods Hole FAL.LF (S/NRHP)	Yes	Yes	VP 1 13.4 Miles ESE	Yes
Woods Hole Historic District Near Little Harbor, Woods Hole; FAL.AL (local)	Yes	Limited	VP 2 13.4 Miles ESE	No
Woods Hole School, 24 School Street; Woods Hole; FAL.428 (S/NRHP)	Yes	No	VP 3 14.1 Miles ESE	No
East Falmouth Historic District at 481 Davisville Road; Falmouth; FAL.AF (local)	Yes	No	VP 4 8.9 Miles ESE	No
Falmouth Heights Historic District(2) Falmouth, FAL.I (S/NRHP)	Yes	Yes	10.7 Miles SSE	No
Maravista Historic District(2) Falmouth, FAL.K (S/NRHP)	Yes	Yes	10.0 Miles SSE	No
Menahaunt Historic District(2) Falmouth, FAL.J (S/NRHP)	Yes	Yes	8.4 Miles SSE	No
Church Street Historic District(2) Falmouth, FAL.M (S/NRHP)	Yes	Yes	VP1 13.6 Miles SSE	Yes
Town of Barnstable				
Cotuit Historic District(1) At 249 Ocean View Avenue; Cotuit BRNK.HD (S/NRHP)	Yes	Yes	VP 5 5.7 Miles SE	Yes
Col. Charles Codman Estate 43 Ocean Avenue, Cotuit; BRN.367 (S/NRHP)	No: Posted	Expected	6.0 Miles SSE	Yes Same as above
Wianno Historic District(1) At 71 Seaview Avenue, Osterville; BRN.J (S/NRHP)	Yes	Yes	VP 6 5.3 Miles SSE	Yes
Wianno Club, Historic Property 107 Seaview Avenue, Osterville; BRN.769 (S/NRHP)	Yes	Yes	VP 6 5.3 Miles SSE	Yes Same as above
Centerville Historic District(1) Main Street, between Church Hill Rd and Briarcliff Lane BRN.X (S/NRHP)	Yes	No	7.0 Miles SSW	No
Craigville Area At 6 Butler Avenue, Craigville No visibility within Historic District BRN.I (S/NRHP)(1)	Yes	Yes	VP 7 6.6 Miles SSE	Yes
Hyannis Port Historic District (shoreline)(1) at 61 Scudder Avenue; BRN.E (S/NRHP)	Yes	Yes	VP 8 6.0 Miles S	Yes
Kennedy Compound, Erving and Merchant Avenues, BRN.AJ (S/NRHP); National Historic Landmark	No: Posted	Expected	Similar to VP 8	See VP 8
Hyannis Port Historic District (elevated) BRN.E (S/NRHP)	Yes	Yes	VP 9 5.9 Miles SSE	No
Hyannis Main Street Waterfront District, Main, North and South Streets; BRN.AD (Local, SRHP)	Yes	No	7.7 Miles SSW	No

Table 4.3.4-1

Historic Properties and Districts Assessed for Wind Park Visibility for the Cape Wind Project

Site, Location MHC No. (shown on Figure 5.10-1); Historic Designation	Field Visit	Potential Visibility Of WP	Viewpoint Distance to WP	Visual Simulation
Capt. Alexander Crocker House 358 Sea Street, Hyannis; BRN.607; (S/NRHP)	Yes	No	VP 10 6.7 Miles SSE	No
Town of Yarmouth				
South Yarmouth/Bass River Historic District(1) at 162 Old Main Street, South Yarmouth; YAR.H (S/NRHP)	Yes	No	VP 11 9.7 Miles SSW	No
Yarmouth Campground Historic District, YAR.B (S/NRHP)	Yes	No	9.6 Miles S	No
Judith Baker Windmill River Street at Wouldow Street; YAR.901 (S/NRHP)	Yes	Limited	VP 12 9.8 Miles SSW	No
205 South Street(2), YAR.365 (S/NRHP)	Yes	No	9.3 Miles SSW	No
Park Avenue Historic District(2), (Not listed in MHC Inventory) (S/NRHP)	Yes	Yes	7.5 Miles SSW	No
Massachusetts Avenue Historic District(2), (Not listed in MHC Inventory) (S/NRHP)	Yes	No	7.5 Miles SSW	No
Town of Dennis				
West Dennis Grade School 67 School Street; DEN.283; (S/NRHP)	Yes	No	VP 13 11.1 Miles SW	No
Town of Harwich				
Capt. Berry House 37 Main Street; HRW.221; (S/NRHP)	Yes	No	VP 14 13.4 Miles SW	No
Wychmere Harbor Club/Snow Inn Not listed in MHC Inventory	Yes	Yes	VP 15 15.2 Miles SW	No[2]
South Harwich Methodist Church 270 Chatham Road; HRW.382; (S/NRHP)	Yes	No	VP 16 16.7 Miles WSW	No
Ocean Grove Historic District(2) HAR.L (S/NRHP)	Yes	Yes	14.6 Miles SW	No
Hithe Cote(2), 32 Snow Inn Road, HAR.211 (S/NRHP)	Yes	Yes	VP 15 15.3 Miles SW	No
Town of Chatham				
Chatham Light Station, Main Street CHA.LH (S/NRHP)	Yes	No	VP 17 20.6 Miles WSW	No
Chatham Historic Business District Main Street, Crowell and Stony Hill Roads; CHA.U (Local)	Yes	No	17.5 Miles SW	No
Old Village Historic District (shoreline) Along Bearses/Bridge Street CHA.W	Yes	Yes	VP 18 20.5 Miles WSW	No
Monomoy Point Light(1) Monomoy National Wildlife Refuge CHA.LS, CHA.92 (S/NRHP)	Yes	Yes	VP 26 14.5 Miles WSW	Yes (day only)
Stage Harbor Light(2), CHA.917 (S/NRHP)	Yes	Yes	18.8 Miles SW	No
Capt. Joshua Nickerson House(2) 190 Bridge Street, CHA.260 (S/NRHP)	Yes	No	20.3 Miles SSW	No

Table 4.3.4-1

Historic Properties and Districts Assessed for Wind Park Visibility for the Cape Wind Project

Site, Location MHC No. (shown on Figure 5.10-1); Historic Designation	Field Visit	Potential Visibility Of WP	Viewpoint Distance to WP	Visual Simulation
Jonathan Higgins House(2) 300 Stage Neck Road, CHA.419 (Undetermined)	No	No	19.0 Miles SW	No
Stage Harbor Road Historic District(2), CHA.K (S/NRHP)	Yes	None to very limited	19.9 Miles SW	No
Champlain Road Historic District(2), CHA.J (S/NRHP)	Yes	Yes	19.7 Miles SW	No
MARTHA'S VINEYARD				
Town of Edgartown				
Cape Poge Light(1) Chappaquiddick Island, EDG.900; (S/NRHP)	Yes	Yes	VP 19 5.6 Miles NE	Yes
Edgartown Village Historic District(1) Vicinity of Water Street and Pease's Point Way; EDG.A (S/NRHP)	Yes	Yes	VP 20 8.9 Miles NE	Yes
Edgartown Harbor Lighthouse(1) EDG.901 (S/NRHP)	Yes	Yes	See VP 20 8.9 Miles NE	Yes (see VP 20)
Town of Oak Bluffs				
Dr. Harrison A. Tucker Cottage 65 (formerly 42 Ocean Avenue) on Ocean Park OAK.637 (S/NRHP)	Yes	Yes	VP 21 9.3 miles ENE	Yes
Martha's Vineyard Campground Historic District(1) Lake, Siloam, Central, Circuit & Clinton Sts. & Court House; OAK.E (S/NRHP)	Yes	No	9.3 miles ENE	No
East Chop Lighthouse(1) at northern tip of East Chop; OAK.AA (S/NRHP)	Yes	Yes	See VP 21 9.4 Miles ENE	Yes (see VP 21)
Flying Horses Carousel (S/NRHP; NHL) 33 Oak Bluffs Avenue; OAK.621; OAK.91	Yes	No	9.2 miles ENE	No
The Arcade (S/NRHP) 31 (formerly 134) Circuit Avenue; OAK.593	Yes	No	9.3 miles ENE	No
Oak Bluffs Christian Union Chapel (S/NRHP) Circuit/Kennebec/Narragansett/Grove; OAK.326	Yes	No	9.4 miles ENE	No
Cottage City Historic District(2), Multiple Area forms (S/NRHP)	Yes	Yes	VP 21 9.2 Miles NE	No
Vineyard Highlands Historic District(2), OAK.B (S/NRHP)	Yes	Yes	VP 21 9.2 Miles NE	No
Town of Tisbury				
West Chop Station at northern tip of West Chop; TIS.LH (S/NRHP)	No	Limited	See VP 21 10.8 Miles ENE	No
Seaman's Reading Room(2) (In Williams Street Historic District) Tisbury, TIS.135 (S/NRHP)	Yes	No	11.3 Miles NE	No
West Chop Historic District(2), Tisbury, TIS.D (S/NRHP)	Yes	Yes	10.9 Miles NE	No

Table 4.3.4-1

Historic Properties and Districts Assessed for Wind Park Visibility for the Cape Wind Project

Site, Location MHC No. (shown on Figure 5.10-1); Historic Designation	Field Visit	Potential Visibility Of WP	Viewpoint Distance to WP	Visual Simulation
NANTUCKET				
Nantucket Cliffs north of Village(1)	Yes	Yes	VP 22 13.6 Miles NNW	Yes
Crooked Record, 150 Main Street(1)	Yes	No	--	No
Nantucket Village(1)	Yes	No	--	No
Great Point	Yes	Yes	VP 23 11.2 Miles NW	Yes
Wauwinet(1)	Yes	Yes	16.2 Miles NW	See VP 23
Tuckernuck Island(1) (SRHP only)	Yes	Yes	VP 24 10.3 Miles N	Yes
UNDISCLOSED LOCATION				
Undisclosed Native American Sacred Site (S/NRHP)	No	Yes	undisclosed	Yes

Notes:
(1) Included in MEPA Certificate on the ENVIRONMENTAL NOTIFICATION FORM dated 4/22/02.
(2) Properties identified and evaluated subsequent to publication of the DEIS.
Abbreviations:
MHC No.: Massachusetts Historical Commission Site Number in MHC's Inventory of Historic and Archaeological Assets of the Commonwealth
S/NRHP= Listed or eligible for listing on the State and National Register of Historic Places
SRHP= Listed or eligible for listing on the State National Register of Historic Places
Local: Locally designated and listed on MHC's Inventory
WP= Wind Park
VP= Viewpoint

Table 4.3.4-2

Compilation of Recreational Resources Within Viewshed of Wind Park (from West to East)

Map ID (Refer to Figure 4.3.4-3)	Resource Name	Description of Resource	Approximate Distance to WTG (Miles)	Representative Simulation
SOUTH SHORE OF CAPE COD (from West to East)				
Town of Falmouth				
1	Nobska Pt. Light House	Federal, historical/cultural resource	14.0	VP 1
2	Nobska Point	Municipal, scenic resource	14.0	VP 1
3,7	Shining Sea Bikeway	Municipal, recreational resource. 3.3-mile long bike path along shore	14.0, 13.0	VP 1, 2.0 miles NE of VP 1
	Town Landing, Falmouth Inner Harbor	Boat Landing	14.0	VP1
4	Trunk River Beach	Municipal, recreational resource	13.5	1.5 miles NE of VP 1
	Quissett Beach	Beach	13.0	1.5 miles NE of VP 1
	Falmouth Beach	Beach	13.0	2.0 miles NE of VP 1
5	Salt Pond/Surf Dr. Frontage	Municipal, conservation resource	13.0	2.0 miles NE of VP 1
6	Salt Pond Acres Wildlife Area	Private nonprofit, conservation resource. 40 acres	13.0	2.0 miles NE of VP 1
8	Welsh Parcel	Municipal, conservation resource	13.0	2.5 miles NE of VP 1
9	Salt Pond Reservation	Private nonprofit, conservation resource	13.0	2.5 miles NE of VP 1
10	Corcoran Parcel	Municipal, recreational resource	13.0	2.5 miles NE of VP 1
11	Surf Drive Beach	Municipal, recreational resource	13.0	2.5 miles NE of VP 1
12	Marina Park	Municipal, recreational resource	12.0	3.0 miles NE of VP 1
	Falmouth Harbor Park	Parkland	12.0	3.0 miles NE of VP 1
13	Deacon's Pond Park	Municipal, recreational resource	12.0	3.0 miles NE of VP 1
14,15	Hotel Park	Municipal, recreational resource, parkland. Two areas of parkland.	12.0	3.0 miles NE of VP 1
	Waterfront Park	Parkland	12.0	3.0 miles NE of VP 1
16	Central Park	Municipal, recreational resource. Parkland.	11.5	3.0 miles NE of VP 1
	Worcester Park	Parkland	11.5	3.0 miles NE of VP 1
17	Falmouth Heights Town Beach	Municipal, recreational resource	11.5	3.5 miles NE of VP 1
	Harbor Entrance Beach	Beach	11.0	3.5 miles NE of VP 1
18	Bristol Beach	Municipal, recreational resource	11.0	4.0 miles NE of VP 1
19	Great Pond Access	Municipal, conservation resource	11.0	4.5 miles NE of VP 1
20	Green Pond Town Landing	Municipal, recreational resource	10.5	5.0 miles NE of VP 1
21	Menauhant Beach	Municipal, recreational resource	10.0	6.0 miles NE of VP1; 7 miles SW of VP 5

Table 4.3.4-2

Compilation of Recreational Resources Within Viewshed of Wind Park (from West to East)

Map ID (Refer to Figure 4.3.4-3)	Resource Name	Description of Resource	Approximate Distance to WTG (Miles)	Representative Simulation
22	Menauhant Yacht Club	Private for profit, recreational resource	9.5	6.0 miles NE of VP 1; 7 miles SW of VP 5
23	Washburn Island	State, recreational and conservation resource. Approximately 300 acres.	9.0	6.0 miles SW of VP 5, 6.5 miles NE of VP 1
	Waquoit Bay National Esturine Research Reserve	Area of Critical Environmental Concern (ACEC). 3,000 acres of land and water, incorporates Washburn Island (in Falmouth) and South Cape Beach State Park (in Mashpee)	8.0	5.0 miles SW of VP 5, 7.0 miles NE of VP 1
Town of Mashpee				
	Waquoit Bay National Esturine Research Reserve	Area of Critical Environmental Concern (ACEC). 3,000 acres of land and water, incorporates Washburn Island (in Falmouth) and South Cape Beach State Park (in Mashpee)	8.0	5.0 miles SW of VP 5, 7.0 miles NE of VP 1
24	South Cape Beach State Park	State, recreational and conservation resource. Approximately 400 acres.	7.0	5.0 miles SW of VP 5, 7.0 miles NE of VP 1
	New Seabury Country Club	Ocean Golf Course	6.0	4.0 miles SW of VP 5; 9 miles NE of VP 1
	Beach at New Seabury	Beach	6.0	4.0 miles SW of VP 5; 9 miles NE of VP 1
25	Popponesset Beach	Private for profit, recreational resource	5.5	2.0 miles SW of VP 5, 10 miles NE of VP 1
26	Popponesset Beach	State, conservation resource	5.5	2.0 miles SW of VP 5, 10 miles NE of VP 1
27	Little Thatch Island	Private nonprofit, conservation resource. Approximately 2 acres of land.	5.5	2.0 miles SW of VP 5, 10 miles NE of VP 1
28	Popponesset Beach	Private nonprofit, conservation resource.	5.5	2.0 miles SW of VP 5, 10 miles NE of VP 1
Town of Barnstable				
	Town Landing at Oregon Road	Boat Landing	6.0	VP5
	Town Landing at Cross Street	Boat Landing	6.0	VP5
29		Private nonprofit, conservation resource.	6.0	1.5 miles SW of VP 5
30		Private for profit, conservation resource.	6.0	1.0 mile SW of VP 5
	Loop Beach, Cotuit	Beach	6.0	VP 5
31	Sampsons Island	Private nonprofit, conservation resource. 15 acre wildlife sanctuary and barrier beach owned by Massachusetts Audubon Society	6.0	VP 5
	Oyster Harbors Club	Golf Course	6.0	1.0 mile E of VP 5
	Oyster Harbors Beach	Beach	6.0	1.0 mile E of VP 5

Table 4.3.4-2

Compilation of Recreational Resources Within Viewshed of Wind Park (from West to East)

Map ID (Refer to Figure 4.3.4-3)	Resource Name	Description of Resource	Approximate Distance to WTG (Miles)	Representative Simulation
32	Rokeby Farms	Private for profit, conservation resource. Approximately 100 acres.	5.5	1.0 mile E of VP 5, 2.0 miles W of VP 6
	Town Landing at Wianno and Sea View Avenues	Boat Landing	6.5	VP 6
	Wianno Beach, Wianno	Beach	6.5	VP 6
	Dowses Beach	Beach	6.5	0.5 miles NE of VP 6
	The Beach Club, Centerville	Private Beach Club	7.0	Between VPs 6 and 7
	Long Beach Conservation Area, Centerville	3.5-acre barrier beach protected by the Barnstable Conservation Commission	7.0	1.0 mile NE of VP 6, 1.5 miles SW of VP 7
33		Municipal, conservation resource	7.0	2.0 miles NE of VP6, 1.0 mile SW of VP 7
	Craigville Beach	Public Beach	7.0	2.0 miles NE of VP6, 1.0 mile SW of VP 7
	Craigville Beach Association	Semi-private Beach	7.0	2.0 miles NE of VP6, 1.0 mile SW of VP 7
34,35		Municipal, conservation resource	7.0	2.0 miles NE of VP6, 0.5 miles W of VP 7
	Wouldiam H. Covell Memorial Beach	Beach	7.0	2.0 miles NE of VP6, 0.5 miles W of VP 7
36,37	Hyannisport Club	Private for profit, recreational resource. Golf course and club. 35 acres.	6.0	VP 8
	Sea Street (Keyes) Beach	Beach	7.0	1.5 miles E of VP 8
	Kalmus Park Beach	Beach	7.0	1.5 miles E of VP 8
38,39,40		Municipal, conservation resource	7.0	1.5 miles E of VP 8
Town of Yarmouth				
41	Bayview Beach	Municipal, recreational resource.	7.5	2.0 miles NE of VP 8
42	Lewis Bay	Private nonprofit, recreational resource	7.0	2.5 miles E of VP 8
43	Colonial Acres Beach	Municipal, recreational resource. Shorefront park	7.5	2.5 miles E of VP 8
	Town Landing off Bay Road	Boat Landing	7.5	2.5 miles E of VP 8
44	Englewood Beach	Municipal, recreational resource	7.0	3.0 miles NE of VP 8
45	Pine Island	Private for profit, conservation resource. 25 acres.	6.5	3.0 miles E of VP 8
46	Point Gammon	Private for profit, conservation resource	5.0	3.0 miles E of VP 8
47,48	Great Island	Private for profit, conservation resource. Approximately 200 acres.	5.5	2.5 miles SE of VP 8
49	Lewis Pond Marsh	Private for profit, conservation resource	7.0	4.0 miles E of VP 8
	Rucknicks Beach	Beach	7.0	4.0 miles E of VP 8

Table 4.3.4-2

Compilation of Recreational Resources Within Viewshed of Wind Park (from West to East)

Map ID (Refer to Figure 4.3.4-3)	Resource Name	Description of Resource	Approximate Distance to WTG (Miles)	Representative Simulation
50	Seagull Beach	Municipal, recreational resource	7.0	4.0 miles E of VP 8
51,52	Lewis Pond Marsh	Private for profit, conservation resource. Approximately 100 acres.	7.5	4.0 miles E of VP 8
53	Former Drive-in Theatre	Municipal, recreational resource	8.0	4.5 miles E of VP 8
54	Thatchers Beach	Municipal, recreational resource	7.5	4.5 miles E of VP 8
55	Seaview Beach	Municipal, recreational resource	7.5	4.5 miles E of VP 8
56	Parker River Beach	Municipal, recreational resource	7.5	4.5 miles E of VP 8
57	Beachwood Beach	Municipal, recreational resource	8.0	5.0 miles E of VP 8
58	South Middle Beach	Municipal, recreational resource	8.0	5.0 Miles E of VP 8
	Smugglers Beach	Beach	8.0	5.5 miles E of VP 8
59	Bass River Beach and Boat Access	Municipal, conservation resource	8.0	5.5 miles E of VP 8
Town of Dennis				
60	Davis/West Dennis Beach	Municipal, recreational resource. Approximately 150 acres.	9.0	6.0 miles E of VP 8, 12.0 miles NW of VP 26
61	Conserv Land/Loring Ave	Municipal, conservation resource	9.5	7.0 miles E of VP 8, 12.0 miles NW of VP 26
62	Trotting Park Road Lndg.	Municipal, recreational resource	9.5	7.5 miles E of VP 8, 11.5 miles NW of VP 26
63	South Village Road Beach	Municipal, recreational resource	10.0	8.0 miles E of VP 8, 11.0 miles NW of VP 26
64	Bakers Way lndg.	Municipal, recreational resource	10.0	8.0 miles E of VP 8, 11.0 miles NW of VP 26
65	Lower Swan River Marsh	Municipal, conservation resource	10.0	8.0 miles E of VP 8, 11.0 miles NW of VP 26
66	Swan River Marsh	Municipal, conservation resource	10.0	8.0 miles E of VP 8, 11.0 miles NW of VP 26
67	Haigis Beach	Municipal, recreational resource	10.0	8.0 miles E of VP 8, 10.5 miles NW of VP 26
68	Glendon Road Beach	Municipal, recreational resource	10.0	8.5 miles E of VP 8, 10.5 miles NW of VP 26
69	Glendon Road Lndg.	Municipal, recreational resource	10.0	8.5 miles E of VP 8, 10.5 miles NW of VP 26
70	Sea Street Beach	Municipal, conservation resource	10.5	9.0 miles E of VP 8, 10.0 miles NW of VP 26
71	Raycroft Beach	Municipal, recreational resource	11.0	9.5 miles E of VP 8, 10.0 miles NW of VP 26
72	Depot Street Beach	Municipal, recreational resource	11.0	9.5 miles E of VP 8, 10.0 miles NW of VP 26

Table 4.3.4-2

Compilation of Recreational Resources Within Viewshed of Wind Park (from West to East)

Map ID (Refer to Figure 4.3.4-3)	Resource Name	Description of Resource	Approximate Distance to WTG (Miles)	Representative Simulation
73	Inman Road Beach	Municipal, recreational resource	11.0	9.5 miles E of VP 8, 10.0 miles NW of VP 26
Town of Harwich				
74	Belmots Road Beach	Municipal, recreational resource	11.5	10.0 miles E of VP 8, 9.5 miles N of VP 26
75	Wixon Pier	Municipal, recreational resource	11.5	10.0 miles E of VP 8, 9.5 miles N of VP 26
76	Pleasant Road Beach	Municipal, recreational and conservation resource	12.0	10.5 miles E of VP 8, 9.0 miles N of VP 26
77	Greys Neck Beach	Municipal, recreational and conservation resource	12.0	11.0 miles E of VP 8, 9.0 miles N of VP 26
78	Englewood Beach	Municipal, recreational and conservation resource	12.5	11.0 miles E of VP 8, 9.0 miles N of VP 26
79	Brooks Road	Private for profit, recreational and conservation resource	12.5	11.0 miles E of VP 8, 9.0 miles N of VP 26
80	Allen Harbor Bulkhead	Municipal, recreational resource	13.0	11.5 miles E of VP 8, 9.0 miles N of VP 26
81	Wah Wah Taysee Beach	Municipal, recreational and conservation resource	13.0	11.5 miles E of VP 8, 9.0 miles N of VP 26
82	Wyndermere Bluffs Beach	Municipal, recreational and conservation resource	13.0	11.5 miles E of VP 8, 9.0 miles N of VP 26
83	Zylpha Road Beach	Municipal, recreational and conservation resource	13.0	12.0 miles E of VP 8, 9.0 miles N of VP 26
84	Atlantic Avenue Beach	Municipal, recreational resource	13.0	12.0 miles E of VP 8, 9.0 miles N of VP 26
85	Sea Street Beach	Municipal, recreational and conservation resource	13.5	12.0 miles E of VP 8, 9.0 miles N of VP 26
86	Bank Street Beach	Municipal, recreational and conservation resource	13.5	12.5 miles E of VP 8, 8.5 miles N of VP 26
87	Merkel Beach	Municipal, recreational and conservation resource	13.5	12.5 miles E of VP 8, 8.5 miles N of VP 26
88	Larsen Park	Municipal, recreational resource	14.0	13.0 miles E of VP 8, 8.5 miles N of VP 26
89	Wychmere harbor Dock	Municipal, recreational resource	14.0	13.0 miles E of VP 8, 8.5 miles N of VP 26
90	Saquatucket Harbor Lndg.	Municipal, recreational resource	14.5	13.0 miles E of VP 8, 8.5 miles N of VP 26
91	Neel Road Beach	Municipal, recreational and conservation resource	14.5	13.5 miles E of VP 8, 8.0 miles N of VP 26
92	Walther Road	Municipal, conservation resource	14.5	13.5 miles E of VP 8, 8.0 miles N of VP 26

Table 4.3.4-2

Compilation of Recreational Resources Within Viewshed of Wind Park (from West to East)

Map ID (Refer to Figure 4.3.4-3)	Resource Name	Description of Resource	Approximate Distance to WTG (Miles)	Representative Simulation
93	Old Whard Road Lndg.	Municipal, recreational resource	15.0	14.0 miles E of VP 8, 8.0 miles N of VP 26
94,95	Red River Beach	Municipal, recreational resource (parts of beach also fall in to Chatham). Approximately 40 acres.	15.0	14.0 miles E of VP 8, 8.0 miles N of VP 26
96	Red River	Municipal, recreational resource	15.5	14.5 miles E of VP 8, 8.0 miles N of VP 26
Town of Chatham				
97	Red River	Private nonprofit, conservation resource	15.5	14.5 miles E of VP 8, 8.0 miles N of VP 26
98	Forest Beach and Landing	Municipal, recreational resource	15.5	15.0 miles E of VP 8, 8.0 miles N of VP 26
99	Cockle Cove Beach Landing	Municipal, recreational resource	16.5	16.0 miles E of VP 8, 8.0 miles N of VP 26
100	Ridgevale Beach	Municipal, recreational resource. Approximately 20 acres.	17.0	16.0 miles E of VP 8, 8.0 miles N of VP 26
	Harding Beach Landing	Boat Landing	17.0	16.0 miles E of VP 8, 8.0 miles N of VP 26
101	Harding Beach	Municipal, recreational resource. Approximately 210 acres.	17.0	16.5 miles E of VP 8, 7.5 miles N of VP 26
102	Harding Beach Point	Municipal, conservation resource. Approximately 40 acres.	17.5	17.5 miles E of VP 8, 7.0 miles N of VP 26
103	Morris Island Parcel	Private nonprofit, conservation resource	17.5	17.5 miles E of VP 8, 7.0 miles N of VP 26
104	Monomoy Natl Wildlife Refuge	Federal, conservation resource. Approximately 160 acres. Protected by U.S. Fish and Wildlife Service. Only designated wilderness area in southern New England.	17.0	18.0 miles E of VP 8, 5.5 miles N of VP 26
105	Monomoy Natl Wildlife Refuge	Federal, conservation resource. Approximately 1,250 acres. Protected by U.S. Fish and Wildlife Service. Only designated wilderness area in southern New England.	14.5	17.0 miles SE of VP 8, 1.0 mile N of VP 26
106	Monomoy Natl Wildlife Refuge	Federal, conservation resource. Approximately 130 acres. Protected by U.S. Fish and Wildlife Service. Only designated wilderness area in southern New England.	13.0	VP 26
NORTHERN SHORES OF NANTUCKET (from East to West)				
107	Great Pt.	Private nonprofit, conservation resource.	11.0	VP 23
108,109,110	Great Pt.	Private nonprofit, conservation resource.	11.5	VP 23

Table 4.3.4-2

Compilation of Recreational Resources Within Viewshed of Wind Park (from West to East)

Map ID (Refer to Figure 4.3.4-3)	Resource Name	Description of Resource	Approximate Distance to WTG (Miles)	Representative Simulation
111	Great Pt.	Private nonprofit, conservation resource.	13.5	2.5 miles SE of VP 23, 6.5 miles NE of VP 22
112	The Haulover	Private nonprofit, conservation resource.	14.5	4.0 miles SE of VP 23, 7.0 miles NE of VP 22
113		Private for profit conservation resource	15.0	4.5 miles SE of VP 23, 7.0 miles NE of VP 22
114	Fisher Land	Private for profit conservation resource	15.5	4.5 miles SE of VP 23, 7.0 miles NE of VP 22
115-123	Coskata-Coatue Wildlife Refuge, Wauwinet	Private nonprofit, conservation resource. Barrier beach on Nantucket Sound, Trustees of Reservations property.	14.0	4.5 - 5.0 miles S of VP 23, 4.0 - 5.0 miles NE of VP 22
124	South Pasture	Private nonprofit, conservation resource.	14.0	5.0 miles S of VP 23, 3.0 miles NE of VP 22
125	Coskata-Coatue Wildlife Refuge, Wauwinet	Private nonprofit, conservation resource. Barrier beach on Nantucket Sound, Trustees of Reservations property.	14.0	6.0 miles SE of VP 23, 3.0 miles NE of VP 22
126	Coskata-Coatue Wildlife Refuge, Wauwinet	Private nonprofit, conservation resource. Barrier beach on Nantucket Sound, Trustees of Reservations property.	14.0	6.5 miles SE of VP 23, 2.0 miles E of VP 22
127-132	Coskata-Coatue Wildlife Refuge, Wauwinet	Private nonprofit, conservation resource. Barrier beach on Nantucket Sound, Trustees of Reservations property.	14.0	7.0 miles SE of VP 23, 1.5 miles E of VP 22
	Coatue Point	Private nonprofit, conservation resource. Barrier beach east of the harbor protected by Nantucket Conservation Foundation	14.0	7.0 miles SE of VP 23, 1.5 miles E of VP 22
133, 134, 135	Pocomo Road	Private nonprofit, conservation resource.	15.5	5.5 miles S of VP 23, 5.5 miles NE of VP 22
	Pocomo Beach	Beach	15.5	5.5 miles S of VP 23, 5.5 miles NE of VP 22
136	Medouie Marsh	Private for profit conservation resource. Approximately 100 acres.	15.5	6.0 miles S of VP 23, 5.0 miles E of VP 22
137		Municipal, conservation resource	15.5	6.0 miles S of VP 23, 5.0 miles E of VP 22
138	Quaise Pt. Trust	Private for profit conservation resource	15.5	6.5 miles S of VP 23, 5.0 miles E of VP 22
139	Jay Property	Private for profit conservation resource	16.0	6.5 miles S of VP 23, 5.0 miles E of VP 22
140	Quaise	Private nonprofit, conservation resource.	15.5	6.5 miles S of VP 23, 4.5 miles E of VP 22

Table 4.3.4-2

Compilation of Recreational Resources Within Viewshed of Wind Park (from West to East)

Map ID (Refer to Figure 4.3.4-3)	Resource Name	Description of Resource	Approximate Distance to WTG (Miles)	Representative Simulation
141	UMASS Field Station	State, conservation resource. Approximately 100 acres.	15.5	6.5 miles S of VP 23, 4.0 miles E of VP 22
142, 143, 144	Shawkemo	Private for profit conservation resource	15.0	7.0 miles S of VP 23, 3.0 miles E of VP 22
145	Pesthouse Pond	Private nonprofit, conservation resource.	15.0	2.5 miles SE of VP 22
146	Town Dock	Municipal, conservation resource	14.5	1.5 miles SE of VP 22
147	Children's Hospital	Municipal, recreation resource	14.0	1.0 miles SE of VP 22
148	Brant Pt.	Private nonprofit, conservation resource.	14.0	1.0 miles SE of VP 22
149	Brant Pt.	Private nonprofit, conservation resource.	14.0	1.0 miles SE of VP 22
150	Jetties Beach	Municipal, recreation resource	13.5	0.5 miles E of VP 22
151	CR #74	Private for profit conservation resource	13.5	VP 22
	Cliff Beach	Beach	13.5	VP 22
152	Cliff Rd	Private nonprofit, conservation resource.	13.0	0.5 miles W of VP 22
	Capaum Beach	Beach	13.0	1.0 mile W of VP 22
153	Capaum Road	Private nonprofit, conservation resource. Approximately 30 acres.	13.0	1.0 mile W of VP 22
154	Dionis Beach	Municipal, recreation resource	12.5	2.0 miles W of VP 22
155	Fishers Landing	Public nonprofit, conservation resource	12.0	3.5 miles W of VP 22, 4.5 miles SE of VP 24
156, 157, 158	Eel Point	Private nonprofit, conservation resource. Approximately 120 acres. Protected shorefront and point.	12.0	4.5 miles W of VP 22, 4.0 miles SE of VP 24
159		Municipal, recreation resource	12.5	2.5 miles SE of VP 24
160	Lafarge Trust	Private for profit conservation resource. Approximately 70 acres.	11.5	1.5 miles SE of VP 24
161	CR #73	Private for profit conservation resource	11.0	1.5 miles SE of VP 24
162	Hopkins Land	Private for profit conservation resource. Approximately 40 acres.	11.5	1.0 mile SE of VP 24
163	Taylor Land	Private for profit conservation resource. Approximately 40 acres.	11.5	1.0 mile SE of VP 24
164	Lafarge Trust	Private for profit conservation resource. Approximately 50 acres.	11.0	1.0 mile E of VP 24
165	Carlisle Property	Private for profit conservation resource	10.5	1.0 mile E of VP 24
166	Phinney Property	Private for profit conservation resource	10.5	0.5 miles E of VP 24
167	Stevens Property	Private for profit conservation resource	10.5	VP 24
168	North Pond	Private for profit conservation resource	10.5	VP 24

Table 4.3.4-2

Compilation of Recreational Resources Within Viewshed of Wind Park (from West to East)

Map ID (Refer to Figure 4.3.4-3)	Resource Name	Description of Resource	Approximate Distance to WTG (Miles)	Representative Simulation
169	North Head Property	Private for profit conservation resource	10.5	VP 24
170	Bigelow Point	Private for profit conservation resource. Approximately 60 acres.	10.5	0.5 miles W of VP 24
171	Salt Box Property	Private for profit conservation resource. Approximately 85 acres.	11.0	0.5 miles S of VP 24
NORTHERN SHORES OF MARTHA'S VINEYARD (from Southeast to Northwest)				
Edgartown				
	Wasque Reservation, Chappaquiddick Island	200-acre Trustees of Reservation property with ocean barrier beach and sand barrens.	9.0	5.0 miles S of VP 19
172	South Barrier Beach	State, conservation resource. Approximately 120 acres	9.0	4.0 miles S of VP 19
173		Private nonprofit conservation resource	8.0	3.0 miles S of VP 19
174	Dike Bridge	Municipal, recreation resource	8.0	3.0 miles S of VP 19
175	Cape Poge Reserv/East Beach, Chappaquiddick Island	516-acre Trustees of Reservation property with salt marsh and ocean barrier beach extending to Wasque Reservation	7.0	VP 19 to 5.0 miles S of VP 19
176		Private nonprofit, conservation resource	6.0	0.5 miles S of VP 19
177	Cape Poge Lighthouse	Federal, recreation resource	5.5	VP 19
178	Cape Poge	Private for profit, conservation resource	5.5	VP 19
179	Cape Poge Elbow	Private nonprofit, recreation and conservation resource	5.5	VP 19
180	Cape Poge Elbow	Private nonprofit, recreation and conservation resource	6.0	VP 19
	Chappy Point Beach	Beach	9.0	VP 20
181, 182	Lighthouse Beach	Municipal, recreation and conservation resource	9.0	VP 20
183	Edgartown Pond Lot	Private nonprofit, conservation resource. Approximately 16 acres	9.0	VP 20
	Fuller Street Beach	Beach	9.0	VP 20
	Barrier Beach	Beach	8.5	VP 20
	Little Beach	Beach	8.5	0.5 miles N of VP 20
184	Eel Pond	Private nonprofit, conservation resource	8.5	0.5 miles N of VP 20
185, 186	Eel Pond	Private nonprofit, conservation resource	9.0	0.5 miles N of VP 20
187	Sherrif's Pond	Private nonprofit, conservation resource. Approximately 24 acres	9.0	0.5 miles NW of VP 20

Table 4.3.4-2

Compilation of Recreational Resources Within Viewshed of Wind Park (from West to East)

Map ID (Refer to Figure 4.3.4-3)	Resource Name	Description of Resource	Approximate Distance to WTG (Miles)	Representative Simulation
188		Private nonprofit, conservation resource	9.0	1.0 mile NW of VP 20
	Edgartown Beach	Beach	10.0	2.0 miles NW of VP 20
189-232	Joseph Sylvia State Beach	State, recreation and conservation resource. Approximately 50 acres.	10.0	2.0 - 3.0 miles NW of VP 20
Oak Bluffs				
233, 234	Joseph Sylvia State Beach	State, recreation and conservation resource. Approximately 55 acres.	10.0	2.0 miles S of VP 21, 3.5 miles NW of VP 20
	Sarson Island Bird Sanctuary	Protected Island	10.0	2.0 miles S of VP 21, 3.5 miles NW of VP 20
	Felix Neck Wildlife Sanctuary	350-acre Massachusetts Audubon Society Sanctuary	10.0	2.0 miles S of VP 21, 3.5 miles NW of VP 20
235, 236	Joseph Sylvia State Beach	State, recreation and conservation resource. Approximately 2 acres.	10.0	1.5 miles S of VP 21, 4.0 miles NW of VP 20
	Farm Neck Golf Course	Golf Course	10.0	1.5 miles S of VP 21, 4.0 miles NW of VP 20
	Oak Bluffs to Edgartown Beach Road	Bike Path	9.5 - 10.0	1.0 - 5.0 miles S of VP 21, 4.5 miles NW - 1.0 miles W of VP 20
237	Hathaven Beach and Harbor	Private for profit, recreation resource	9.5	1.0 mile S of VP 21
238	Farm Pond	Public nonprofit, recreation and conservation resource	9.5	1.0 mile S of VP 21
239	Joseph Sylvia State Beach	State, recreation and conservation resource. Approximately 4 acres.	9.5	0.5 miles S of VP 21
240	Waban Park	Park. Municipal, recreation and conservation resource. Approximately 10 acres.	9.5	VP 21
241	Seaview Beach	Municipal, recreation and conservation resource. Approximately 4 acres.	9.5	VP 21
242	Ocean Park	Park. Municipal, recreation and conservation resource. Approximately 10 acres.	9.5	VP 21
243	Town Beach	Municipal, recreation and conservation resource.	9.5	VP 21
	Oak Bluffs Town Pier	Pier	9.5	VP 21
244	Lake Anthony Walk	Municipal, recreation resource	9.5	VP 21
245	Lakside Park	Municipal, recreation and conservation resource.	9.5	VP 21
246	Harbor Walk	Municipal, recreation resource	9.5	VP 21
247	Washington Park	Park. Municipal, recreation and conservation resource. Approximately 6 acres.	9.5	VP 21
248	Carbarn Lot	Municipal, recreation resource	9.5	VP 21

Table 4.3.4-2

Compilation of Recreational Resources Within Viewshed of Wind Park (from West to East)

Map ID (Refer to Figure 4.3.4-3)	Resource Name	Description of Resource	Approximate Distance to WTG (Miles)	Representative Simulation
249	East Chop Beach and YTC	Private nonprofit, recreation resource	9.5	VP 21
250, 251	Arlington Park	Park. Public nonprofit, recreation and conservation resource	9.5	0.5 miles N of VP 21
252	Lincoln Park	Park. Public nonprofit, recreation and conservation resource	9.5	1.0 mile N of VP 21
253	Prospect Park	Park. Municipal, recreation and conservation resource.	9.5	1.0 mile N of VP 21
254	East Chop Cliffs	Private nonprofit, recreation and conservation resource. Approximately 10 acres	9.5	1.0 mile N of VP 21
	East Chop Beach Club	Beach	9.5	1.0 mile N of VP 21
	Morton Park	Park	9.5	1.0 mile N of VP 21
255	Hudson Park	Park. Private nonprofit, recreation and conservation resource.	9.5	1.0 mile N of VP 21
256	Telegraph Lighthouse Land	Municipal, scenic resource	9.5	1.5 miles N of VP 21
	Town Beach near ferry dock	Beach	9.5	2.0 miles W of VP 21
Tisbury				
257	West Chop Trust	Private for profit, recreation and conservation resource. Approximately 6 acres.	11.0	4.0 miles SE of VP 1, 3.0 miles NW of VP 21
258	West Chop Lighthouse	Federal, historical/cultural resource	11.0	4.0 miles SE of VP 1, 3.0 miles NW of VP 21
259	West Chop Trust	Private for profit, recreation and conservation resource	11.5	4.0 miles SE of VP 1, 3.0 miles NW of VP 21

Notes:
Numbered entries above compiled from MassGIS databases; other entries from web sites listed in References.

Table 5.1.1-1

Impact Producing Factors Summary Table

Impact- Producing Factor	**Oceanography**	**Geology & Sediments**	**Air Quality**	**Water Quality**	**Terrestrial Environment**	**T & E**	**Fisheries**	**Avian Resources**	**Noise**	**EMF**	**Archeology**	**Cultural**	**Recreation**	**Transportation & Navigation**	**Visual**	**Economics**
Vessel Activity		X	X	X		X	X	X	X				X	X	X	
Heliport Facilities			X						X							
Staging Facilities			X	X					X					X	X	X
Wind Turbine Generator (WTG), ESP, and Offshore Cable Installation	X	X	X	X		X	X	X	X		X	X	X	X	X	X
Offshore Wind Park Operations			X			X	X	X	X	X	X	X	X	X	X	X
Offshore Wind Park Decommissioning	X	X	X	X		X	X		X		X	X	X	X	X	X
Onshore Transmission Cable Installation		X	X		X			X	X		X	X		X	X	
Onshore Transmission Cable Operation										X						X
Onshore Transmission Cable Decommissioning		X	X	X	X	X	X		X		X		X	X	X	X

X = Potential Impact Exists

Table 5.2.3-1

Vessels Used for Cape Wind Project

Activity Type	Vessel Type	Count	Duration	Operating Hours (per unit)	Assumptions
Construction Activity Inside 25 Miles					
Pile Installation					
Move jack up barge to wind park	Attendant tug	4 trips	4hrs/trip	16	Done twice (once per year)
Transport piles and transition pieces to wind park	Tow tug	86 trips	4hrs/trip	344	Avg. 3 piles per trip, 130 piles, duration only within 25 miles
Pile barge handling tug at wind park	Attendant tug	130 days	4hrs/day	520	3 piles per week, attendant tugs only operate equivalent of ½ day
Put piles in place	Primary 500 ton crane	130 days	4hrs/day	520	
Pile driving	Hydraulic ram	130 piles	4hrs/pile	520	IHC S-1200 hydrohammer
Moving crew in and out	Crew boats	130 days	2hrs/day	260	
Transition piece handling tugs at wind park	Attendant tug	130 days	4hrs/day	520	3 pieces per week, attendant tugs only operate equivalent of ½ day
Set transition pieces	Primary 500 ton crane	130 days	4hrs/day	520	
Installation of Scour Protection					
Move scour protection installation equipment to wind park	Attendant tug	4 trips	4hrs/trip	16	Done twice (once per year)
Transport rock armor barges	Tow tug	276 trips	4hrs/trip	1,104	Speed of 8 knots
Transport filler material barges	Tow tug	370 trips	4hrs/trip	1,480	Speed of 8 knots
Install rock armor	Crane	65 days	8hrs/day	520	2 towers per day
Install filler material	Crane	65 days	8hrs/day	520	2 towers per day
Armor/filler barge handling tugs at wind park	Attendant tugs	130 days	4hrs/day	520	
Cable Laying					
115 kV cable laying barge to wind farm	Tow tug	4 trips	4hrs/trip	16	
Put cable in place	Crane barge	15 days	10hrs/day	150	10 hrs/day for 15 work days
Put cable in place	Attendant tug	15 days	10hrs/day	150	10 hrs/day for 15 work days
Put cable in place	Attendant tug	15 days	10hrs/day	150	10 hrs/day for 15 work days
Moving crew in and out	Crew boats	15 days	2hrs/day	30	

Table 5.2.3-1

Vessels Used for Cape Wind Project

Activity Type	Vessel Type	Count	Duration	Operating Hours (per unit)	Assumptions
33 kV cable laying barge to wind farm	Tow tug	26 trips	4hrs/trip	104	13 round trips
Put cable in place	Crane barge	130 days	10hrs/day	1,300	10 hrs/day for 10 work days/string – 13 strings
Put cable in place	Attendant tug	130 days	10hrs/day	1,300	10 hrs/day for 10 work days/string – 13 strings
Move crane barge to cofferdam location	Tow tug	4 trips	3hrs/trip	12	
HDD cofferdam excavation	Crane barge	2 days	10hrs/day	20	2 days at 10 hrs/day; speed at approx. 12 knots
Sheet pile driving for cofferdam		2 days	10hrs/day	20	2 days at 10 hrs/day
Compressor drive		2 days	8hrs/day	16	2 days at 8 hrs/day
Sheet pile removal		2 days	10hrs/day	20	S days at 10 hrs/day
Cofferdam backfill	Crane barge	2 days	10hrs/day	20	2 days at 10 hrs/day
Moving crew in and out	Crew boat	10 days	2hrs/day	20	1 hr each way per crew boat
Turbine Installation					
Turbines to wind farm	One specialized vessel	86 trips	4hrs/trip	344	Only emissions within 25 miles of wind park
Stabilizing the WTG vessel in correct location and elevation	Jacking system with 6 legs	130 days	2hrs/day	260	
Tower installation	Primary 500 ton crane	130 days	2hrs/day	260	
Nacelle installation	Primary 500 ton crane	130 days	2hrs/day	260	
Rotor installation	Primary 500 ton crane	130 days	2hrs/day	260	
Moving crew in and out	Crew boats	130 days	2hrs/day	260	2 days per WTG
ESP Installation					
Crane barge towing	Tow tug	2 trips	12hrs/trip	24	12 hours out, 12 hours back
Setting template for ESP installation	Crane	1	16hrs	16	
Handling crane barge	Attendant tug	1	16hrs	20	4 hours transit and 16 hours on site
Pile installation barge towing	Tow tug	2 trips	9hrs/trip	18	12 hours out, 6 hours back
Pile setting	Crane	6	3hrs	18	
Handling barge	Attendant crane	6	3hrs	18	

Table 5.2.3-1

Vessels Used for Cape Wind Project

Activity Type	Vessel Type	Count	Duration	Operating Hours (per unit)	Assumptions
Pile driving	Hydraulic ram	6	2hrs	12	IHC S-500 hydrohammer
ESP deck to wind farm	Tow tug	2 trips	9hrs/trip	18	12 hours out, 6 hours back
Crane barge towing	Tow tug	2 trips	12hrs/trip	24	12 hours out, 12 hours back
Setting the deck for ESP installation	Crane barge	1	16hrs	16	
Handling crane barge	Attendant tug	2 trips	9hrs/trip	18	12 hours out, 6 hours back
Moving crew in and out	Crew boats	160 trips	2hrs/trip	320	40 days, 2 round trips per day, 2 hours each way
Construction Activity Outside 25 Miles					
Transport					
Move jack up barge	Attendant tug	4 trips	12	50	
Transport piles and transition pieces	Tow tug	86 trips	12	1,075	Avg. 3 piles per trip, 130 piles
Move scour installation equipment	Attendant tug	4 trips	12	50	This is done twice (once per year)
Transport rock armor barges	Tow tug	276 trips	12	3,449	Speed of 8 knots
Transport filler material barges	Tow tug	370 trips	12	4,624	Speed of 8 knots
Cable Laying					
115 kV cable laying barge	Tow tug	4 trips	12	50	
33 kV cable laying barge	Tow tug	26 trips	12	325	13 round trips
Move crane barge to cofferdam location	Tow tug	4 trips	12	50	
Turbine Installation					
Turbines	One specialized vessel	86 trips	12	1,075	
ESP Installation					
Crane barge towing	Tow tug	2 trips	37	75	12 hours out, 12 hours back (prorated for traveling beyond 25-mile)
Pile installation barge towing	Tow tug	2 trips	28	56	12 hours out, 6 hours back (prorated for traveling beyond 25-mile)

Table 5.2.3-1

Vessels Used for Cape Wind Project

Activity Type	Vessel Type	Count	Duration	Operating Hours (per unit)	Assumptions
ESP deck to wind farm	Tow tug	2 trips	28	56	12 hours out, 6 hours back (prorated for traveling beyond 25-mile)
Crane barge towing	Tow tug	2 trips	37	75	12 hours out, 12 hours back (prorated for traveling beyond 25-mile)
Decommissioning Inside 25 Miles					
Pile Removal					
Moving crew in and out	Crew boats	130 days	2hrs/day	260	
Transport transition pieces from wind farm	Tow tug	33 trips	4hrs/trip	132	4 transition pieces per trip
Transition piece handling tug at wind park	Attendant tug	130 days	4hrs/day	520	3 pieces per week, attendant tugs only operate equivalent of ½ day
Remove transition pieces	Primary 500 ton crane	130 days	4hrs/day	520	2 days/WTG
Scour Protection Removal					
Move scour protection removal equipment to wind park	Attendant tug	4 trips	4hrs/trip	16	This is done twice
Transport rock armor barges	Tow tug	276 trips	4hrs/trip	1,104	Speed of 8 knots
Transport filler material barges	Tow tug	370 trips	4hrs/trip	1,480	Speed of 8 knots
Remove rock armor	Crane	65 days	8hrs/day	520	2 towers per day
Remove filler material	Crane	65 days	8hrs/day	520	2 towers per day
Armor/filler barge handling tugs at wind park	Attendant tugs	130 days	4hrs/day	520	
Cable Removal					
115 kV cable removal barge to wind farm	Tow tug	4 trips	4hrs/trip	16	
33 kV cable removal barge	Tow tug	26 trips	4hrs/trip	104	13 round trips
Remove cable	Crane barge	15 days	10hrs/day	150	10 hrs/day for 15 work days
Remove cable	Attendant tug	15 days	10hrs/day	150	10 hrs/day for 15 work days
Remove cable	Anchoring tug	15 days	10hrs/day	150	10 hrs/day for 15 work days
Moving crew in and out	Crew boats	15 days	2hrs/day	30	

Table 5.2.3-1

Vessels Used for Cape Wind Project

Activity Type	Vessel Type	Count	Duration	Operating Hours (per unit)	Assumptions
Remove cable	Crane barge	130 days	10 hrs/day	1,300	10 hrs/day for 10 work days/string – 13 strings
Remove cable	Attendant tug	130 days	10hrs/day	1,300	10 hrs/day for 10 work days/string – 13 strings
Move crane barge to cofferdam location	One tug	4 trips	4hrs/trip	16	
HDD cofferdam excavation	Crane barge	2 days	10hrs/day	20	2 days at 10 hrs/day; speed of 12 knots
Sheet pile driving for cofferdam		2 days	10hrs/day	20	2 days at 10 hrs/day
Compressor drive		2 days	8hrs/day	16	2 days at 8 hrs/day
Sheet pile removal		2 days	10hrs/day	20	2 days at 10 hrs/day
Cofferdam backfill	Crane barge	2 days	10hrs/day	20	2 days at 10 hrs/day
Moving crew in and out	Crew boat	10 days	2hrs/day	20	1 hour each way per crew boat
Turbine Decommissioning					
Turbines from wind farm	One specialized vessel	86 trips	4hrs/trip	344	Only emissions within 25 miles of wind park
Stabilizing the WTG vessel in correct location and elevation	Jacking system with 6 legs	130 days	2hrs/day	260	
Tower decommission	Primary 500 ton crane	130 days	2hrs/day	260	
Nacelle decommission	Primary 500 ton crane	130 days	2hrs/day	260	
Rotor decommission	Primary 500 ton crane	130 days	2hrs/day	260	
Moving crew in and out	Crew boats	130 days	2hrs/day	260	2 days per WTG
ESP Decommissioning					
Crane barge towing	Tow tug	2 trips	12hrs/trip	24	12 hours out, 12 hours back
Setting template for ESP decommission	Crane	1	16hrs	16	
Handling crane barge	Attendant tug	1	16hrs	20	4 hours transit and 16 hours on site
Pile barge	Tow tug	2 trips	9hrs/trip	18	12 hours out, 6 hours back
ESP deck from wind farm	Tow tug	2 trips	9hrs/trip	18	12 hours out, 6 hours back
Crane barge towing	Tow tug	2 trips	12hrs/trip	24	12 hours out, 12 hours back
Setting the deck for ESP decommission	Crane barge	1	16hrs	16	
Handling the crane barge	Attendant tug	1	18hrs	18	

Table 5.2.3-1

Vessels Used for Cape Wind Project

Activity Type	Vessel Type	Count	Duration	Operating Hours (per unit)	Assumptions
Moving crew in and out	Crew boats	160 trips	2hrs/trip	320	40 days, 2 round trips per day, 2 hours each way
Meteorological Tower Decommissioning					
Crane barge towing	Tow tug	2 trips	12hrs/trip	24	12 hours out, 12 hours back
Handling crane barge	Attendant tug	6 days	8hrs/day	48	
Removing mast	Crane barge	2 days	8hrs/day	16	
Removing deck	Crane barge	2 days	8hrs/day	16	
Removing pilings	Crane barge	2 days	8hrs/day	16	
Moving crew in and out	Crew boats	6 days	2hrs/day	12	
Decommissioning Outside 25 Miles					
Pile Removal					
Transport transition pieces from wind farm	Tow tug	33 trips	11	352	4 transition pieces per trip
Scour Protection Removal					
Move scour protection removal equipment to wind park	Attendant tug	4 trips	11	43	This is done twice
Transport rock armor barges	Tow tug	276 trips	11	2,945	Speed of 8 knots
Transport filler material barges	Tow tug	370	11	3,948	Speed of 8 knots
Cable Removal 115 kV cable removal barge	Tow tug	4 trips	11	43	
33 kV cable removal barge	Tow tug	26 trips	11	277	13 round trips
Move crane barge to cofferdam location	Tow tug	4 trips	11	43	
Turbine Decommissioning					
Turbines from wind farm	One specialized vessel	86 trips	11	918	
ESP Decommissioning					
Crane barge towing	Tow tug	2 trips	32	64	12 hours out, 12 hours back (prorated for traveling beyond 25-mile)
Pile barge towing	Tow tug	2 trips	24	48	12 hours out, 6 hours back (prorated for traveling beyond 25-mile)

Table 5.2.3-1

Vessels Used for Cape Wind Project

Activity Type	Vessel Type	Count	Duration	Operating Hours (per unit)	Assumptions
ESP deck from wind farm	Tow tug	2 trips	24	48	12 hours out, 6 hours back (prorated for traveling beyond 25-mile)
Crane barge towing	Tow tug	2 trips	32	64	12 hours out, 12 hours back (prorated for traveling beyond 25-mile)
Meteorological Tower Decommissioning					
Crane barge towing	Tow tug	2 trips	32	64	12 hours out, 12 hours back (prorated for traveling beyond 25-mile)

Table 5.3.1-9

Summary of Construction Air Quality Impacts

Pollutant	Averaging Period	Maximum Modeled Concentration a/ (ug/m^3)	Background Ambient Concentration b/ (ug/m^3)	Total Concentration c/ (ug/m^3)	NAAQS d/ (ug/m^3)
CO	1-Hour	32,636	3,261	35,897	40,000
	8-Hour	5,842	1,863	7,705	10,000
SO_2	3-Hour	976.2	160	1,136.2	1,300
	24-Hour	7.12	59	66.1	365
	Annual	0.02	13	13.0	80
$PM_{2.5}$	24-Hour	9.0	24.13	33.1	35
	Annual	0.03	9.11	9.1	15
PM_{10}	24-Hour	14.2	54	68.2	150
NO_2	Annual	0.8	9.6	10.4	100

a/ Maximum modeled concentration determined by the PCD model for each pollutant and averaging period.
b/ Background ambient concentration from representative monitoring stations located in Massachusetts and Rhode Island.
c/ Total concentration = maximum modeled concentration + background ambient concentration.
d/ NAAQS – National Ambient Air Quality Standard.

Table 5.3.1-10

Predicted Suspended Sediment Concentrations

Representative Route	10 mg/L Remains	100 mg/L Remains
Southwest of ESP	Generally less than 3 hours, but up to 12 hours in central east-west portion; 18 hours in one location	Generally less than 2 hours, but up to 6 hours in small part of central east-west portion
Southeast of ESP	Generally less than 3 hours, but portions up to 6 hours during slack water conditions; 9 and 12 hours at southeast end	Generally 2 to 3 hours, but exceeding 6 hours at southeasterly end
East of ESP	Generally less than 3 hours, but up to 12 hrs in east-west portions	Generally less than 2 hours, but over 6 hours in some locations
Northwest of ESP	Generally less than 3 hours, but up to 9 hrs in east-west portions	Generally 2 to 3 hours, but exceeding 6 hours in one location

Table 5.3.1-11

Biological Process Strength Compared to EMF Interaction Strength

Interaction Process	Interaction Strength in Living System	Interaction Strength for Typical "large" EMF levels (*e.g.*, E = 1,000 V/m and M = 100 μT [or 1,000 mG])
Heating	basal metabolism ~ 100 watts	absorbed 60-Hz EMF energy = ~ 0.000 01 Watts (*i.e.*, 10 μwatts is 10,000,000 fold below basal metabolism)
Photon absorption	chemical bond energies of ~ 0.1 to 5 Ev	60 Hz EMF photons = ~0.000001 electron-volt (eV) (*i.e.*, EMF ~ 1 μeV, whereas X-Rays ~ 500 to 5,000 eV)
Force (electrical)	biological forces ~1 to 100 pN	Molecule with electric charge of ±100 = ~ 0.0002 pN (pN = 10^{-12} N = 0.000 000 000 001 Newton)
Force (magnetic)	biological forces ~1 to 100 pN	Twisting force on microscopic ferromagnetic particles, (acting like compass needles), ~2 pN, but EMF force alternates direction every $1/120^{th}$ s, and averages to zero
Biochemistry	free-radical recombination lifetimes ~ 2 ns	Free-radical chemistry requires larger fields, and any effects occur over nanoseconds (ns) so that 60-Hz field with period of 17 ms appears same as static field

Table 5.3.1-12

Magnetic Fields for Most Lightly Loaded 33 kV Cable

Location	168 MW	454 MW
Sea Floor (0 ft)	1 Mg	3 mG
	(0.3 mG@10') a/	(0.7 mG@ 10') a/
+10 ft (3 meters)	0.2 mG	0.4 mG
+20 ft (6.1 meters)	<0.1 mG	0.2 mG
+30 ft (9.1 meters)	<0.1 mG	<0.1 mG

a/ Predicted field level on the sea floor 10 ft (3 meters) horizontally from the cable trench.

Table 5.3.1-11

Biological Process Strength Compared to EMF Interaction Strength

Interaction Process	Interaction Strength in Living System	Interaction Strength for Typical "large" EMF levels (*e.g.*, E = 1,000 V/m and M = 100 μT [or 1,000 mG])
Heating	basal metabolism ~ 100 watts	absorbed 60-Hz EMF energy = ~ 0.000 01 Watts (*i.e.*, 10 μwatts is 10,000,000 fold below basal metabolism)
Photon absorption	chemical bond energies of ~ 0.1 to 5 Ev	60 Hz EMF photons = ~0.000001 electron-volt (eV) (*i.e.*, EMF ~ 1 μeV, whereas X-Rays ~ 500 to 5,000 eV)
Force (electrical)	biological forces ~1 to 100 pN	Molecule with electric charge of ±100 = ~ 0.0002 pN (pN = 10^{-12} N = 0.000 000 000 001 Newton)
Force (magnetic)	biological forces ~1 to 100 pN	Twisting force on microscopic ferromagnetic particles, (acting like compass needles), ~2 pN, but EMF force alternates direction every 1/120th s, and averages to zero
Biochemistry	free-radical recombination lifetimes ~ 2 ns	Free-radical chemistry requires larger fields, and any effects occur over nanoseconds (ns) so that 60-Hz field with period of 17 ms appears same as static field

Table 5.3.1-12

Magnetic Fields for Most Lightly Loaded 33 kV Cable

Location	168 MW	454 MW
Sea Floor (0 ft)	1 Mg	3 mG
	(0.3 mG@10') a/	(0.7 mG@ 10') a/
+10 ft (3 meters)	0.2 mG	0.4 mG
+20 ft (6.1 meters)	<0.1 mG	0.2 mG
+30 ft (9.1 meters)	<0.1 mG	<0.1 mG

a/ Predicted field level on the sea floor 10 ft (3 meters) horizontally from the cable trench.

Table 5.3.1-13 Magnetic Fields for Most Heavily Loaded 33 kV Homerun Cable		
Location	**168 MW**	**454 MW**
Sea Floor (0 ft)	11 mG (3 mG @ 10’)	28 mG (8 mG @ 10’)
+10 ft(3 meters)	2 mG	4 mG
+20 ft (6.1 meters)	0.6 mG	2 mG
+30 ft (9.1 meters)	0.3 mG	1 mG

Table 5.3.1-14 ESP Peak Magnetic Field Levels Over the 33kV Cables		
Location	**168 MW**	**454 MW**
2 ft (0.61 meters) (directly over)	189 mG	473 mG
2 ft (0.61 meters) (15 ft [4.6 meters] off centerline)	10 mG	26 mG
10 ft (3 meters) (directly over)	20 mG	51 mG
10 ft (3 meters) (15 ft [4.6 meters] off centerline)	7 mG	18 mG

Table 5.3.1-15 Maximum Magnetic Flux Density (mG)		
Elevation	**168 MW**	**454 MW**
Sea Floor (0 ft)	10.80	29.2
MLLW (2 ft [0.61 meters])	6.91	18.8
MHW (5.5 ft [1.7 meters])	4.23	11.5

Table 5.3.1-16 Range of EMF Exposure Levels		
Location	**Boaters**	**Divers and Marine Organisms**
Above 115-kV sea cables	0-5 mG	0-60 mG
Above 33-kV inner-array cables	0-2 mG	0-28 mG
Vicinity of ESP	0-51 mG	0-473 mG

Table 5.3.1-13

Magnetic Fields for Most Heavily Loaded 33 kV Homerun Cable

Location	168 MW	454 MW
Sea Floor (0 ft)	11 mG (3 mG @ 10')	28 mG (8 mG @ 10')
+10 ft(3 meters)	2 mG	4 mG
+20 ft (6.1 meters)	0.6 mG	2 mG
+30 ft (9.1 meters)	0.3 mG	1 mG

Table 5.3.1-14

ESP Peak Magnetic Field Levels Over the 33kV Cables

Location	168 MW	454 MW
2 ft (0.61 meters) (directly over)	189 mG	473 mG
2 ft (0.61 meters) (15 ft [4.6 meters] off centerline)	10 mG	26 mG
10 ft (3 meters) (directly over)	20 mG	51 mG
10 ft (3 meters) (15 ft [4.6 meters] off centerline)	7 mG	18 mG

Table 5.3.1-15

Maximum Magnetic Flux Density (mG)

Elevation	168 MW	454 MW
Sea Floor (0 ft)	10.80	29.2
MLLW (2 ft [0.61 meters])	6.91	18.8
MHW (5.5 ft [1.7 meters])	4.23	11.5

Table 5.3.1-16

Range of EMF Exposure Levels

Location	Boaters	Divers and Marine Organisms
Above 115-kV sea cables	0-5 mG	0-60 mG
Above 33-kV inner-array cables	0-2 mG	0-28 mG
Vicinity of ESP	0-51 mG	0-473 mG

Table 5.3.1-13

Magnetic Fields for Most Heavily Loaded 33 kV Homerun Cable

Location	168 MW	454 MW
Sea Floor (0 ft)	11 mG	28 mG
	(3 mG @ 10')	(8 mG @ 10')
+10 ft(3 meters)	2 mG	4 mG
+20 ft (6.1 meters)	0.6 mG	2 mG
+30 ft (9.1 meters)	0.3 mG	1 mG

Table 5.3.1-14

ESP Peak Magnetic Field Levels Over the 33kV Cables

Location	168 MW	454 MW
2 ft (0.61 meters) (directly over)	189 mG	473 mG
2 ft (0.61 meters) (15 ft [4.6 meters] off centerline)	10 mG	26 mG
10 ft (3 meters) (directly over)	20 mG	51 mG
10 ft (3 meters) (15 ft [4.6 meters] off centerline)	7 mG	18 mG

Table 5.3.1-15

Maximum Magnetic Flux Density (mG)

Elevation	168 MW	454 MW
Sea Floor (0 ft)	10.80	29.2
MLLW (2 ft [0.61 meters])	6.91	18.8
MHW (5.5 ft [1.7 meters])	4.23	11.5

Table 5.3.1-16

Range of EMF Exposure Levels

Location	Boaters	Divers and Marine Organisms
Above 115-kV sea cables	0-5 mG	0-60 mG
Above 33-kV inner-array cables	0-2 mG	0-28 mG
Vicinity of ESP	0-51 mG	0-473 mG

Table 5.3.1-13

Magnetic Fields for Most Heavily Loaded 33 kV Homerun Cable

Location	168 MW	454 MW
Sea Floor (0 ft)	11 mG	28 mG
	(3 mG @ 10')	(8 mG @ 10')
+10 ft(3 meters)	2 mG	4 mG
+20 ft (6.1 meters)	0.6 mG	2 mG
+30 ft (9.1 meters)	0.3 mG	1 mG

Table 5.3.1-14

ESP Peak Magnetic Field Levels Over the 33kV Cables

Location	168 MW	454 MW
2 ft (0.61 meters) (directly over)	189 mG	473 mG
2 ft (0.61 meters) (15 ft [4.6 meters] off centerline)	10 mG	26 mG
10 ft (3 meters) (directly over)	20 mG	51 mG
10 ft (3 meters) (15 ft [4.6 meters] off centerline)	7 mG	18 mG

Table 5.3.1-15

Maximum Magnetic Flux Density (mG)

Elevation	168 MW	454 MW
Sea Floor (0 ft)	10.80	29.2
MLLW (2 ft [0.61 meters])	6.91	18.8
MHW (5.5 ft [1.7 meters])	4.23	11.5

Table 5.3.1-16

Range of EMF Exposure Levels

Location	Boaters	Divers and Marine Organisms
Above 115-kV sea cables	0-5 mG	0-60 mG
Above 33-kV inner-array cables	0-2 mG	0-28 mG
Vicinity of ESP	0-51 mG	0-473 mG

Table 5.3.1-1

Predicted Above Water Maximum Sound Levels (L_{max}) at Upland Locations from Pile Driving for the Wind Park Foundations (dBA)

Modeling Location	Winds 0-10 mph	Existing Sound Levels (L_{eq})	Pile Driving Sound (L_{max})
Bass River Beach, Yarmouth	Onshore	35 to 60	18 to 29
	Offshore	35 to 59	0 to 2
Point Gammon, Yarmouth	Onshore	35 to 60	25 to 41
	Offshore	35 to 59	0 to 14
Lewis Bay, Yarmouth	Onshore	46 to 59	23 to 38
	Offshore	41 to 58	0 to 11
Hyannisport, Barnstable	Onshore	46 to 59	23 to 29
	Offshore	41 to 58	0 to 12
Hyannis Point, Barnstable	Onshore	46 to 59	22 to 41
	Offshore	41 to 58	0 to 14
Wianno Beach, Barnstable	Onshore	46 to 59	20 to 41
	Offshore	41 to 58	0 to 14
Oregon Beach, Barnstable	Onshore	46 to 59	19 to 40
	Offshore	41 to 58	0 to 13
New Seabury, Mashpee	Onshore	46 to 59	16 to 29
	Offshore	41 to 58	0 to 2
Oak Bluffs, Martha's Vineyard	Onshore	40 to 72	18 to 29
	Offshore	40 to 62	0 to 2
Edgartown, Martha's Vineyard	Onshore	40 to 72	16 to 29
	Offshore	40 to 62	0 to 2
Cape Poge, Martha's Vineyard	Onshore	40 to 72	24 to 40
	Offshore	40 to 62	0 to 13

Table 5.3.1-2

Predicted Above Water Maximum Sound Levels (L_{max}) at Two Seaward Locations Near the Wind Park from Pile Driving for the Wind Park Foundations (dBA)

	Buoy G5	Buoy R20
Receiver Downwind	34 to 76	31 to 71
Receiver Upwind	7 to 49	4 to 44

Table 5.3.1-1

Predicted Above Water Maximum Sound Levels (L_{max}) at Upland Locations from Pile Driving for the Wind Park Foundations (dBA)

Modeling Location	Winds 0-10 mph	Existing Sound Levels (L_{eq})	Pile Driving Sound (L_{max})
Bass River Beach, Yarmouth	Onshore	35 to 60	18 to 29
	Offshore	35 to 59	0 to 2
Point Gammon, Yarmouth	Onshore	35 to 60	25 to 41
	Offshore	35 to 59	0 to 14
Lewis Bay, Yarmouth	Onshore	46 to 59	23 to 38
	Offshore	41 to 58	0 to 11
Hyannisport, Barnstable	Onshore	46 to 59	23 to 29
	Offshore	41 to 58	0 to 12
Hyannis Point, Barnstable	Onshore	46 to 59	22 to 41
	Offshore	41 to 58	0 to 14
Wianno Beach, Barnstable	Onshore	46 to 59	20 to 41
	Offshore	41 to 58	0 to 14
Oregon Beach, Barnstable	Onshore	46 to 59	19 to 40
	Offshore	41 to 58	0 to 13
New Seabury, Mashpee	Onshore	46 to 59	16 to 29
	Offshore	41 to 58	0 to 2
Oak Bluffs, Martha's Vineyard	Onshore	40 to 72	18 to 29
	Offshore	40 to 62	0 to 2
Edgartown, Martha's Vineyard	Onshore	40 to 72	16 to 29
	Offshore	40 to 62	0 to 2
Cape Poge, Martha's Vineyard	Onshore	40 to 72	24 to 40
	Offshore	40 to 62	0 to 13

Table 5.3.1-2

Predicted Above Water Maximum Sound Levels (L_{max}) at Two Seaward Locations Near the Wind Park from Pile Driving for the Wind Park Foundations (dBA)

	Buoy G5	Buoy R20
Receiver Downwind	34 to 76	31 to 71
Receiver Upwind	7 to 49	4 to 44

Table 5.3.1-3

Locations Selected for Modeling Sound Effects of the Project

Modeling Location No.	Description
1	Buoy G5, North channel
2	Buoy R20, Main Channel
3	Bass River Beach, Yarmouth
4	Point Gammon, Yarmouth
5	Lewis Bay, Yarmouth
6	Hyannisport, Barnstable
7	Hyannis Point, Barnstable
8	Wianno Beach, Barnstable
9	Oregon Beach, Barnstable
10	New Seabury, Mashpee
11	Oak Bluffs, Martha's Vineyard
12	Edgartown, Martha's Vineyard
13	Cape Poge, Martha's Vineyard

Table 5.3.1-4

Maximum Continuous Sound Levels From Project Operation Compared to Baseline Sound Levels (Leq) at Lewis Bay Upland Locations For The Cut-In Wind Speed Condition

Modeling Location	Project Operation (dBA)	Baseline Level (dBA)
Bass River Beach, Yarmouth	11.6	46.5 – 57.2
Point Gammon, Yarmouth	17.1	46.5 – 57.2
Lewis Bay, Yarmouth	13.3	45.9 – 58.1
Hyannisport, Barnstable	15.9	45.9 – 58.1
Hyannis Point, Barnstable	16.6	45.9 – 58.1
Wianno Beach, Barnstable	17.8	45.9 – 58.1
Oregon Beach, Barnstable	17.0	45.9 – 58.1
New Seabury, Mashpee	16.4	45.9 – 58.1
Oak Bluffs, Martha's Vineyard	12.0	41.0 – 62.9
Edgartown, Martha's Vineyard	11.8	41.0 – 62.9
Cape Poge, Martha's Vineyard	17.0	41.0 – 62.9

Table 5.3.1-3 Locations Selected for Modeling Sound Effects of the Project	
Modeling Location No.	**Description**
1	Buoy G5, North channel
2	Buoy R20, Main Channel
3	Bass River Beach, Yarmouth
4	Point Gammon, Yarmouth
5	Lewis Bay, Yarmouth
6	Hyannisport, Barnstable
7	Hyannis Point, Barnstable
8	Wianno Beach, Barnstable
9	Oregon Beach, Barnstable
10	New Seabury, Mashpee
11	Oak Bluffs, Martha's Vineyard
12	Edgartown, Martha's Vineyard
13	Cape Poge, Martha's Vineyard

Table 5.3.1-4 Maximum Continuous Sound Levels From Project Operation Compared to Baseline Sound Levels (Leq) at Lewis Bay Upland Locations For The Cut-In Wind Speed Condition		
Modeling Location	**Project Operation (dBA)**	**Baseline Level (dBA)**
Bass River Beach, Yarmouth	11.6	46.5 – 57.2
Point Gammon, Yarmouth	17.1	46.5 – 57.2
Lewis Bay, Yarmouth	13.3	45.9 – 58.1
Hyannisport, Barnstable	15.9	45.9 – 58.1
Hyannis Point, Barnstable	16.6	45.9 – 58.1
Wianno Beach, Barnstable	17.8	45.9 – 58.1
Oregon Beach, Barnstable	17.0	45.9 – 58.1
New Seabury, Mashpee	16.4	45.9 – 58.1
Oak Bluffs, Martha's Vineyard	12.0	41.0 – 62.9
Edgartown, Martha's Vineyard	11.8	41.0 – 62.9
Cape Poge, Martha's Vineyard	17.0	41.0 – 62.9

Table 5.3.1-5

Maximum Continuous Sound Levels From Project Operation Compared to Baseline Sound Levels (Leq) at Lewis Bay Upland Locations for the Design Wind Speed Condition

Modeling Location	Project Operation (dBA)	Baseline Level (dBA)
Bass River Beach, Yarmouth	19.2	60.8 – 68.0
Point Gammon, Yarmouth	25.2	60.8 – 68.0
Lewis Bay, Yarmouth	21.0	53.6 – 59.8
Hyannisport, Barnstable	23.8	53.6 – 59.8
Hyannis Point, Barnstable	24.6	53.6 – 59.8
Wianno Beach, Barnstable	25.9	53.6 – 59.8
Oregon Beach, Barnstable	25.1	53.6 – 59.8
New Seabury, Mashpee	24.4	53.6 – 59.8
Oak Bluffs, Martha's Vineyard	19.5	62.0 – 70.5
Edgartown, Martha's Vineyard	19.3	62.0 – 70.5
Cape Poge, Martha's Vineyard	25.0	62.0 – 70.5

Table 5.3.1-6

Maximum Continuous Sound Levels From Project Operation Compared to Baseline Sound Levels (Leq) at Buoys G5 and R20

	Buoy G5	Buoy R20
Cut-In Wind Speed Condition		
Project Operation (dBA)	29.9	34.3
Baseline Level (dBA)	46.4	51.0
Design Wind Speed Condition		
Project Operation (dBA)	39.7	44.7
Baseline Level (dBA)	60.4	65.0

Table 5.3.1-7

Potential Project Emissions by Major Activity a/

Project Activity	Potential Emission Rates (tons/year)						
	CO	SO_2	$PM_{10}/PM_{2.5}$	NO_x	VOC	CO_2	HAPs
Preconstruction	7.6	2.5	0.6	19.6	0.8	919.0	0.0 b/
Construction Year 1	182.8	111.0	24.9	838.0	25.8	39,947.9	0.4
Construction Year 2	78.3	47.6	10.7	359.1	11.0	17,120.5	0.2
Operations c/	15.4	4.2	0.9	32.2	1.3	1,521.1	0.0 d/
Decommissioning	214.8	130.2	29.4	984.7	30.5	46,905.0	0.4
Total e/	791.5	375.3	83.6	2,845.4	94.1	135,314.4	1.4

a/ Potential Project emissions do not include any emissions from onshore activities.
b/ Preconstruction potential HAP emissions are less than 0.01 tons/year.
c/ Operations potential emissions per year.
d/ Operations potential HAP emissions are less than 0.02 tons/year.
e/ Total potential Project emissions are the sum of preconstruction, two years of construction, 20 years of operations, and decommissioning activities.

Table 5.3.1-5

Maximum Continuous Sound Levels From Project Operation Compared to Baseline Sound Levels (Leq) at Lewis Bay Upland Locations for the Design Wind Speed Condition

Modeling Location	Project Operation (dBA)	Baseline Level (dBA)
Bass River Beach, Yarmouth	19.2	60.8 – 68.0
Point Gammon, Yarmouth	25.2	60.8 – 68.0
Lewis Bay, Yarmouth	21.0	53.6 – 59.8
Hyannisport, Barnstable	23.8	53.6 – 59.8
Hyannis Point, Barnstable	24.6	53.6 – 59.8
Wianno Beach, Barnstable	25.9	53.6 – 59.8
Oregon Beach, Barnstable	25.1	53.6 – 59.8
New Seabury, Mashpee	24.4	53.6 – 59.8
Oak Bluffs, Martha's Vineyard	19.5	62.0 – 70.5
Edgartown, Martha's Vineyard	19.3	62.0 – 70.5
Cape Poge, Martha's Vineyard	25.0	62.0 – 70.5

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Maximum Continuous Sound Levels From Project Operation Compared to Baseline Sound Levels (Leq) at Buoys G5 and R20

	Buoy G5	Buoy R20
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Project Operation (dBA)	29.9	34.3
Baseline Level (dBA)	46.4	51.0
Design Wind Speed Condition		
Project Operation (dBA)	39.7	44.7
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Construction Year 2	78.3	47.6	10.7	359.1	11.0	17,120.5	0.2
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a/ Potential Project emissions do not include any emissions from onshore activities.
b/ Preconstruction potential HAP emissions are less than 0.01 tons/year.
c/ Operations potential emissions per year.
d/ Operations potential HAP emissions are less than 0.02 tons/year.
e/ Total potential Project emissions are the sum of preconstruction, two years of construction, 20 years of operations, and decommissioning activities.

Table 5.3.1-5

Maximum Continuous Sound Levels From Project Operation Compared to Baseline Sound Levels (Leq) at Lewis Bay Upland Locations for the Design Wind Speed Condition

Modeling Location	Project Operation (dBA)	Baseline Level (dBA)
Bass River Beach, Yarmouth	19.2	60.8 – 68.0
Point Gammon, Yarmouth	25.2	60.8 – 68.0
Lewis Bay, Yarmouth	21.0	53.6 – 59.8
Hyannisport, Barnstable	23.8	53.6 – 59.8
Hyannis Point, Barnstable	24.6	53.6 – 59.8
Wianno Beach, Barnstable	25.9	53.6 – 59.8
Oregon Beach, Barnstable	25.1	53.6 – 59.8
New Seabury, Mashpee	24.4	53.6 – 59.8
Oak Bluffs, Martha's Vineyard	19.5	62.0 – 70.5
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Maximum Continuous Sound Levels From Project Operation Compared to Baseline Sound Levels (Leq) at Buoys G5 and R20

	Buoy G5	Buoy R20
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Project Operation (dBA)	29.9	34.3
Baseline Level (dBA)	46.4	51.0
Design Wind Speed Condition		
Project Operation (dBA)	39.7	44.7
Baseline Level (dBA)	60.4	65.0

Table 5.3.1-7

Potential Project Emissions by Major Activity a/

Project Activity	Potential Emission Rates (tons/year)						
	CO	SO_2	$PM_{10}/PM_{2.5}$	NO_x	VOC	CO_2	HAPs
Preconstruction	7.6	2.5	0.6	19.6	0.8	919.0	0.0 b/
Construction Year 1	182.8	111.0	24.9	838.0	25.8	39,947.9	0.4
Construction Year 2	78.3	47.6	10.7	359.1	11.0	17,120.5	0.2
Operations c/	15.4	4.2	0.9	32.2	1.3	1,521.1	0.0 d/
Decommissioning	214.8	130.2	29.4	984.7	30.5	46,905.0	0.4
Total e/	791.5	375.3	83.6	2,845.4	94.1	135,314.4	1.4

a/ Potential Project emissions do not include any emissions from onshore activities.
b/ Preconstruction potential HAP emissions are less than 0.01 tons/year.
c/ Operations potential emissions per year.
d/ Operations potential HAP emissions are less than 0.02 tons/year.
e/ Total potential Project emissions are the sum of preconstruction, two years of construction, 20 years of operations, and decommissioning activities.

Table 5.3.1-8

Potential Project Emissions by Location

Area	Potential Emission Rates (tons/year)						
	CO	**SO_2**	**$PM_{10}/PM_{2.5}$**	**NO_x**	**VOC**	**CO_2**	**HAPs**
Preconstruction							
Onshore – Rhode Island	NP	NP	NP	NP	NP	NP	NP
Onshore – Massachusetts	NP	NP	NP	NP	NP	NP	NP
State Waters – Rhode Island	--	--	--	--	--	--	--
State Waters – Massachusetts	--	--	--	--	--	--	--
OCS Covered by Permit	7.6	2.5	0.6	19.6	0.8	919.0	0.0 a/
OCS Not Covered by Permit	--	--	--	--	--	--	--
Construction b/							
Onshore – Rhode Island	39.8	2.6	4.5	96.3	5.2	7,352	0.0
Onshore – Massachusetts	69.4	2.2	2.7	23.0	8.2	1,689	0.0
State Waters – Rhode Island	91.0	7.0	12.1	260.1	12.5	19,948	0.2
State Waters – Massachusetts	35.0	2.7	4.7	99.9	4.8	7,664	0.1 c/
OCS Covered by Permit	94.0	7.1	13.3	266.4	13.8	20,427	0.2
OCS Not Covered by Permit	41.2	3.1	5.5	117.7	5.7	9,029	0.1
Operations d/							
Onshore – Rhode Island	NP	NP	NP	NP	NP	NP	NP
Onshore – Massachusetts	NP	NP	NP	NP	NP	NP	NP
State Waters – Rhode Island	--	--	--	--	--	--	--
State Waters – Massachusetts	0.2	0.0 d/	0.0 d/	0.5	0.0 d/	35.0	0.0 a/
OCS Covered by Permit	15.2	0.5	0.9	19.7	1.3	1,486	0.0 f/
OCS Not Covered by Permit	--	--	--	--	--	--	--
Decommissioning							
Onshore –Rhode Island	NP	NP	NP	NP	NP	NP	NP
Onshore – Massachusetts	NP	NP	NP	NP	NP	NP	NP
State Waters – Rhode Island	84.2	6.3	11.2	240.6	11.6	18,458	0.2
State Waters – Massachusetts	32.3	2.4	4.3	92.5	4.4	7,092	0.1
OCS Covered by Permit	82.7	6.1	11.8	234.2	12.3	17,957	0.2
OCS Not Covered by Permit	15.5	1.2	2.1	44.3	2.1	3,398	0.0 c/

a/ Potential HAP emissions are less than 0.01 tons/year.
b/ Construction will take place over a 2-year period with about 70% in Year 1 and 30% in Year 2.
c/ Potential HAP emissions are less than 0.05 tons/year.
d/ Potential emissions are less than 0.03 tons/year.
e/ Operations potential emissions per year.
f/ Potential HAP emissions are less than 0.02 tons/year.

NP – Potential emission rates not provided.
-- – No emissions anticipated in the region during this activity.

Table 5.3.1-9

Summary of Construction Air Quality Impacts

Pollutant	Averaging Period	Maximum Modeled Concentration a/ (ug/m^3)	Background Ambient Concentration b/ (ug/m^3)	Total Concentration c/ (ug/m^3)	NAAQS d/ (ug/m^3)
CO	1-Hour	32,636	3,261	35,897	40,000
	8-Hour	5,842	1,863	7,705	10,000
SO_2	3-Hour	976.2	160	1,136.2	1,300
	24-Hour	7.12	59	66.1	365
	Annual	0.02	13	13.0	80
$PM_{2.5}$	24-Hour	9.0	24.13	33.1	35
	Annual	0.03	9.11	9.1	15
PM_{10}	24-Hour	14.2	54	68.2	150
NO_2	Annual	0.8	9.6	10.4	100

a/ Maximum modeled concentration determined by the PCD model for each pollutant and averaging period.
b/ Background ambient concentration from representative monitoring stations located in Massachusetts and Rhode Island.
c/ Total concentration = maximum modeled concentration + background ambient concentration.
d/ NAAQS – National Ambient Air Quality Standard.

Table 5.3.1-10

Predicted Suspended Sediment Concentrations

Representative Route	10 mg/L Remains	100 mg/L Remains
Southwest of ESP	Generally less than 3 hours, but up to 12 hours in central east-west portion; 18 hours in one location	Generally less than 2 hours, but up to 6 hours in small part of central east-west portion
Southeast of ESP	Generally less than 3 hours, but portions up to 6 hours during slack water conditions; 9 and 12 hours at southeast end	Generally 2 to 3 hours, but exceeding 6 hours at southeasterly end
East of ESP	Generally less than 3 hours, but up to 12 hrs in east-west portions	Generally less than 2 hours, but over 6 hours in some locations
Northwest of ESP	Generally less than 3 hours, but up to 9 hrs in east-west portions	Generally 2 to 3 hours, but exceeding 6 hours in one location

Table 5.3.2-9

Predicted Underwater Sound Levels Perceived by Finfish (Hearing Threshold Sound Levels) from Pile Driving

Finfish species	Perceived Sound of Pile Driving (Hearing Threshold Sound Levels - dB_{ht} re 1 μPa)		
	At 500 m (1640 ft)	At 320 m (1050 ft)	At 30 m (98 ft)
Tautog	81	85	105
Bass	76	80	100
Cod	87	91	111
Atlantic salmon	72	76	96

Note:
Research shows marine animal avoidance reactions occur for 50% of individuals at 90 dB_{ht} re 1 μPa, occur for 80% of individuals at 98 dB_{ht} re 1 μPa, and occur for the single most sensitive individual at 70 dB_{ht} re 1 μPa. For estimating the zone of injury for marine animals, a sound pressure level of 130 dB_{ht} re 1 μPa (i.e. 130 dB above an animal's hearing threshold) is recommended.

Table 5.3.2-10

Calculated Zone of Behavioral Response for Significant Avoidance Reaction to Pile Driving

Finfish	Distance Where dB_{ht} = 90 dB re 1 μPa and Avoidance Reaction May Occur (m)
Tautog	180
Bass	100
Cod	350
Atlantic salmon	60

Table 5.3.2-11

Early Benthic and Pelagic Life Stages of Species with Designated EFH Potentially Present in the Proposed Action Area

Species	Eggs (E)	Larvae (L)	Potential Time of Year Present in Nantucket Sound
Early Benthic Life Stages			
Winter flounder	X	X	February – July
Early Pelagic Life Stages			
Atlantic butterfish	X	X	April to August
Atlantic mackerel	X	X	Unknown/water temperatures between 5-22.7°C
Black Sea Bass		X	August – September
Summer Flounder	X	X	October – May
Winter Flounder		X	L: March – July. Larvae swim upwards, then sink.

X = Potentially Present in proposed action area
R = Potentially Present in proposed action area, but would be considered rare
Note: Although king mackerel, Spanish mackerel and cobia have designated EFH for eggs and larval stages, further analysis indicates that they are unlikely to occur in Nantucket Sound (see Section 4.2.4 of the EFH Assessment).

Table 5.3.2-9

Predicted Underwater Sound Levels Perceived by Finfish (Hearing Threshold Sound Levels) from Pile Driving

Finfish species	Perceived Sound of Pile Driving (Hearing Threshold Sound Levels - dB_{ht} re 1 μPa)		
	At 500 m (1640 ft)	At 320 m (1050 ft)	At 30 m (98 ft)
Tautog	81	85	105
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Note:
Research shows marine animal avoidance reactions occur for 50% of individuals at 90 dB_{ht} re 1 μPa, occur for 80% of individuals at 98 dB_{ht} re 1 μPa, and occur for the single most sensitive individual at 70 dB_{ht} re 1 μPa. For estimating the zone of injury for marine animals, a sound pressure level of 130 dB_{ht} re 1 μPa (i.e. 130 dB above an animal's hearing threshold) is recommended.

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Tautog	180
Bass	100
Cod	350
Atlantic salmon	60

Table 5.3.2-11

Early Benthic and Pelagic Life Stages of Species with Designated EFH Potentially Present in the Proposed Action Area

Species	Eggs (E)	Larvae (L)	Potential Time of Year Present in Nantucket Sound
Early Benthic Life Stages			
Winter flounder	X	X	February – July
Early Pelagic Life Stages			
Atlantic butterfish	X	X	April to August
Atlantic mackerel	X	X	Unknown/water temperatures between 5-22.7°C
Black Sea Bass		X	August – September
Summer Flounder	X	X	October – May
Winter Flounder		X	L: March – July. Larvae swim upwards, then sink.

X = Potentially Present in proposed action area
R = Potentially Present in proposed action area, but would be considered rare
Note: Although king mackerel, Spanish mackerel and cobia have designated EFH for eggs and larval stages, further analysis indicates that they are unlikely to occur in Nantucket Sound (see Section 4.2.4 of the EFH Assessment).

Table 5.3.2-12

Older Benthic and Pelagic Life Stages of Species with Designated EFH Potentially Present in the Proposed Action Area

Species	Juvenile (J)	Adult (A)	Potential Time of Year Present in Nantucket Sound
Older Benthic Life Stages			
Atlantic cod		X	October – April. Benthopelagic
Black Sea Bass	X	X	May – October
Little skate	X	X	Year round
Scup	X	X	May to October
Surf clam	X	X	Year-round
Summer Flounder	X	X	May – October
Windowpane Flounder		X	Year round
Winter Flounder	X	X	Year round
Winter Skate	X	X	Year round
Older Pelagic Life Stages			
Atlantic butterfish	X	X	May – November
Atlantic mackerel	X	X	J: August - November; A: March, April, Oct-Dec
Blue shark		R	Summer months
Cobia	R,T	R,T	Spring and Summer months
King mackerel	R,T	R,T	Rare occurrences
Long-finned squid	X	X	May – August
Short-finned Squid	R	R	Spring months
Shortfin mako shark	R		Summer months
Spanish mackerel	R	R	Spring and Summer months

X = Potentially Present in proposed action area
T = Potentially Transient in proposed action area
R = Potentially Present in proposed action area, but would be considered rare

Notes:

Although juvenile yellowtail flounder had designated EFH within the mapped grid of 10 x 10 minute squares encompassing the Project area, the detailed EFH description indicates that NMFS has not appointed specific regions of EFH in Nantucket Sound for juvenile yellowtail flounder.[1] Therefore, this species and lifestage is not included in this summary table.

Although juvenile and adult bluefin tuna had designated EFH within the mapped grid of 10 x 10 minute squares encompassing the Project area, the detailed EFH description indicates that NMFS has not appointed specific regions of EFH in Nantucket Sound for juvenile or adult bluefin tuna[2]. Therefore, these lifestages for bluefin tuna are not included in this summary table.

[1] [NEFMC] New England Fishery Management Council. October 7, 1998. Final – Amendment #11 to the Northeast Multispecies Fishery Management Plan; Amendment #9 to the Atlantic Sea Scallop Fishery Management Plan; Amendment #1 to the Monkfish Fishery Management Plan; Components of the Proposed Atlantic Herring Fishery Management Plan for Essential Fish Habitat Incorporating the Environmental Assessment , Volume 1. Newburyport, MA, [Online] URL: www.nero.nmfs.gov/ro/doc/yellowtail.pdf. Accessed October 2006.

[2] NOAA Fisheries. 2006. Atlantic Bluefin Tuna – Life History, Summary Tables, Biological Information. [Online] URL: http://www.nmfs.noaa.gov/habitat/habitatprotection/profile/hms/atlantic_bluefin_tunahome.htm. Accessed September 2006.

Table 5.3.2-13

Potential Impacts to Benthic and Pelagic Life Stages of Species with Designated EFH Potentially Present in the Proposed Action Area

Potential Impact	Level of Impact to Life Stages*				Description
	Benthic Early	Pelagic Early	Benthic Older	Pelagic Older	
Permanent EFH loss from WTG and ESP monopile installation	MINOR	NEGLIGIBLE	MINOR	NEGLIGIBLE	0.67 acres or 0.0042% of the Project area.
Temporary finfish/benthic habitat loss (Scour Control; Jack-up barge for WTG and ESP installation; jet plow installation of inner-array cables; jet plow installation of 115kV transmission cable, vessel positioning, anchoring)	MINOR	NEGLIGIBLE	MINOR	NEGLIGIBLE	812 acres or 5.1% of the proposed action area using scour control mats; 866 acres or 5.4% of the proposed action area using rock armoring. Greatest impacts to demersal eggs and larvae if present during construction. Pelagic eggs and larvae less affected. Greatest areal impacts to surficial benthic habitat for early demersal life stages and benthic organisms would occur from anchoring activities. Some mortality or dispersal of benthic organisms (prey for fish) may temporarily disrupt feeding for some benthic-oriented juvenile and adult fish in the proposed action area. Pelagic-oriented juveniles and adults less affected by temporary benthic habitat loss. Temporary habitat impact would only affect a small portion (~5%) of the proposed action area; therefore, sufficient habitat and food base is expected to be available for benthic-oriented juvenile and adult fish species in areas adjacent to the proposed action area and in other parts of the Sound. Disturbed benthic habitat is expected to be recolonized by benthos within a time period of 1 to 2 years.
Temporary finfish/benthic habitat loss (Nearshore HDD installation - Lewis Bay)	MINOR	NEGLIGIBLE	MINOR	NEGLIGIBLE	0.12 acres. Minor, temporary impact since activity is limited and contained. Impacts to winter flounder avoided through TOY restrictions (see ESS 2007, Section 3.8.4.5).

Table 5.3.2-13

Potential Impacts to Benthic and Pelagic Life Stages of Species with Designated EFH Potentially Present in the Proposed Action Area

Potential Impact	Level of Impact to Life Stages*				Description
	Benthic Early	**Pelagic Early**	**Benthic Older**	**Pelagic Older**	
Mortality/Injury/Displacement	MINOR	MINOR	MINOR	NEGLIGIBLE	Demersal early life stages most affected (some physical abrasion, burial, mortality, displacement) if present during construction. Greatest areal impacts to demersal eggs and larvae would occur from anchoring activities during construction. Pelagic eggs and larvae less susceptible to these impacts. Those in direct path may experience some limited injury/mortality. No measurable impacts expected to adult and juvenile pelagic finfish since these life stages are mobile in water column and can move away from disturbances associated with construction. Adult and juvenile demersal finfish in direct path of bottom disturbing activities may experience some direct injury or mortality, but they too should be able to move away. During winter construction periods, demersal fish may experience higher levels of injury/mortality due to sluggish response under cold water conditions. Displacement of juvenile and adult finfish expected to be temporary and localized. (See ESS 2007, Sections 3.8.4.2 and 3.8.4.10).

Table 5.3.2-13

Potential Impacts to Benthic and Pelagic Life Stages of Species with Designated EFH Potentially Present in the Proposed Action Area

	Level of Impact to Life Stages*				
Potential Impact	**Benthic Early**	**Pelagic Early**	**Benthic Older**	**Pelagic Older**	**Description**
Elevated TSS levels (installation of monopile foundations, scour control mats, inner-array, 115kV cable systems, HDD borehole ends)	MINOR	MINOR	NEGLIGIBLE	NEGLIGIBLE	Temporary and localized increase in suspended sediment concentrations due to equipment and sediment conditions in the proposed action area. Sediments disturbed during construction are expected to settle quickly (see Section 5.3.2.7 in this final EIS and Report No. 4.1.1-2). Sediment suspension from HDD operations extremely minimal since these activities would be contained within cofferdam. Demersal early life stages most affected - those in immediate vicinity of construction may experience mortality or injury through burial or smothering. Pelagic eggs and larvae may be temporarily affected/displaced. Benthic and pelagic adults and juveniles are mobile and capable of moving away from disturbed areas and elevated TSS concentrations. Little direct impact expected to adults and juveniles from elevated TSS; however, elevated TSS concentrations could indirectly impact these life stages by making it more difficult to navigate, forage or find shelter. Fish should only be affected temporarily and are expected to rapidly return to area.
Ambient sediments/Sediment Contaminants	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	No impact (see Section 5.3.2.7 of this final EIS).
Bentonite Release	MINOR	NEGLIGIBLE	MINOR	NEGLIGIBLE	Minimal impact with protection measures in place (see ESS 2007, Section 3.8.4.4).
Impingement/Entrainment of Fish Eggs/Larvae from Vessel Water Withdrawals/Water Withdrawals Associated with Cable Jetting	NEGLIGIBLE	MINOR	NEGLIGIBLE	NEGLIGIBLE	Vessel water withdrawals expected to be periodic near-surface water withdrawals. Jet plow withdrawals expected at or near the water surface. Jet plow progresses relatively rapidly and any impacts expected to be short-term in any one area.

Table 5.3.2-13

Potential Impacts to Benthic and Pelagic Life Stages of Species with Designated EFH Potentially Present in the Proposed Action Area

	Level of Impact to Life Stages*				
Potential Impact	**Benthic Early**	**Pelagic Early**	**Benthic Older**	**Pelagic Older**	**Description**
Acoustic Injury or Damage from Monopile Driving	N/A	N/A	NEGLIGIBLE	NEGLIGIBLE	No peer-reviewed studies of effect of pile driving sound on fish eggs/larvae. Limited impact to benthic or pelagic adults/juveniles with protection measures in place (see ESS 2007, Section 3.8.4.6.2).
Acoustic Harassment from Monopile Driving	N/A	N/A	MINOR	MINOR	No peer-reviewed studies of effect of pile driving sound on fish eggs/larvae. Minimal impact (temporary avoidance) to benthic or pelagic adults/juveniles with protection measures in place. Pile driving sound levels cannot be reliably estimated for distances closer than 30 m (98 ft) due to near-field effects (see Section 5.3.2.7 of this final EIS).
Acoustic Harassment from Vessels and Cable Laying	N/A	N/A	MINOR	MINOR	No peer-reviewed studies of effect of vessel sounds on fish eggs/larvae. Minimal impact to benthic or pelagic adults/juveniles with protection measures in place (see ESS 2007, Sections 3.8.4.6.3 and 3.8.4.6.4).
Acoustic Injury or Harassment from Project Operation.	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	See ESS 2007, Section 3.8.4.6.5.
Hardened structures/reef effect	NEGLIGIBLE	NEGLIGIBLE	MINOR	MINOR	See ESS 2007, Section 3.8.4.7.
EMF	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	No impact (see Section 5.3.1.7 of this final EIS and Report No. 5.3.2-3).
Rotor Shadow Effects	N/A	N/A	NEGLIGIBLE	NEGLIGIBLE	Periodic motion of shadows can be seen ahead of time; with increase in speed shadows become less distinct and harder to perceive; dappling effect of light and dark through water column and on seafloor similar to existing light patterns.
Water flow, currents, waves, sediment transport	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	No impact (see ESS 2007, Section 3.8.4.9).

Table 5.3.2-13

Potential Impacts to Benthic and Pelagic Life Stages of Species with Designated EFH Potentially Present in the Proposed Action Area

Potential Impact	Level of Impact to Life Stages*				Description
	Benthic Early	Pelagic Early	Benthic Older	Pelagic Older	
Spills and Accidental Releases of Potential Contaminants	MINOR	MINOR	MINOR	MINOR	Equipment well-maintained and personnel trained; service vessels equipped with spill handling equipment; waste collection systems installed on each WTG; a SPPC would be developed in accordance with MMS regulations.

*Level of Impact Definitions
Negligible - No measurable impacts.
Minor - Most impacts to the affected resource could be avoided with proper mitigation; if impacts occur, the affected resource would recover completely without any mitigation once the impacting agent is eliminated.
Moderate - Impacts to the affected resource are unavoidable; the viability of the affected resource is not threatened although some impacts may be irreversible, OR; the affected resource would recover completely if proper mitigation is applied during the life of the project or proper remedial action is taken once the impacting agent is eliminated.
Major - Impacts to affected resource are unavoidable; the viability of the affected resource may be threatened, AND; the affected resource would not fully recover even if proper mitigation is applied during the life of the project or remedial action is taken once the impacting agent is eliminated.

Table 5.3.2-1

Available Raptor Mortality Data Reported at Wind Facilities in the Eastern U.S.

Location	Study period	Number of fatalities and species	Reference
Buffalo Ridge, MN	1994-1995	0	Osborn *et al.* 2000
Buffalo Ridge, MN	1996-1999	1 red-tailed hawk	Johnson *et al*. 2002
Searsburg, VT	1997	0	Kerlinger 2002
Foote Creek Rim, WY	1998-2002	1 Northern harrier, 3 American kestrel, 1 short-eared owl	Young *et al.* 2003
Vansycle, OR	1999	0	Erickson *et al.* 2000
Somerset County, PA	2000	0	Kerlinger 2006
Nine Canyon, WA	2002-2003	1 American kestrel, 1 short-eared owl	Erickson *et al.* 2003
Klondike, OR	2002-2003	0	Johnson et al. 2003
Mountaineer, WV	2003	1 red-tailed hawk, 2 turkey vultures	Kerns and Kerlinger 2004
Mountaineer, WV	2004	1 sharp-shinned hawk, 1 turkey vulture	Arnett *et al*. 2005
Myersdale, PA	2004	0	Arnett *et al.* 2005
Top of Iowa, Iowa	2004	1 red-tailed hawk	Koford *et al*. 2005
Buffalo Mountain, TN	2005	0	Fiedler *et al*. 2007
Maple Ridge, NY	2006	1 American kestrel	Jain *et al*. 2007

Table 5.3.2-2

Summary of Available Avian Radar Survey Results for Proposed Terrestrial Wind Facilities

Project Site	Landscape	Average Passage Rate (t/km/hr)	Average Flight Height (m)	Citation
Fall 1998				
Harrisburg, NY	Great Lakes plain/ADK foothills	122	182	Cooper and Mabee 2000
Wethersfield, Wyoming Cty, NY	Agricultural plateau	168	154	Cooper and Mabee 2000
Spring 2003				
Westfield Chautauqua Cty, NY	Great Lakes Shore	395	528	Cooper *et al.*2004a
Fall 2003				
Westfield Chautauqua Cty, NY	Great Lakes shore	238	532	Cooper *et al.* 2004c
Mt. Storm, Grant Cty, WV	Forested ridge	241	410	Cooper *et al.* 2004b
Fall 2004				
Franklin, Pendleton Cty, WV	Forested ridge	229	583	Woodlot 2005a
Prattsburgh, Steuben Cty, NY	Agricultural plateau	193	516	Woodlot 2005b
Prattsburgh, Steuben Cty, NY	Agricultural plateau	200	365	Mabee *et al.* 2005a
Martindale, Lancaster, Cty, PA	Reclaimed minelands	187	436	Young 2006
Casselman, Somerset Cty, PA	Reclaimed minelands	174	448	Young 2006
Deerfield, Bennington Cty, VT (Existing Facility)	Forested ridge	175	438	Woodlot 2005c
Deerfield, Bennington Cty, VT (Western Expansion)	Forested ridge	193	624	Woodlot 2005c
Deerfield, Bennington Cty, VT (Valley Site)	Forested ridge	150	503	Woodlot 2005c
Deerfield, Bennington Cty, VT (3 sites combined)	Forested ridge	178	611	Woodlot 2005c
Sheffield, Caledonia Cty, VT	Forested ridge	114	566	Woodlot 2006a
Spring 2005				
Churubusco, Clinton Cty, NY	Great Lakes plain/ADK foothills	254	422	Woodlot 2005d
Ellenberg, Clinton Cty, NY	Great Lakes plain/ADK foothills	110	338	Mabee *et al.* 2006a
Dairy Hills, Clinton Cty, NY	Great Lakes shore	117	397	ED&R 2006a
Clayton, Jefferson Cty, NY	Agricultural plateau	450	443	Woodlot 2005e
Sheldon, Wyoming Cty, NY	Agricultural plateau	112	418	Woodlot 2006b
Prattsburgh, Steuben Cty, NY	Agricultural plateau	277	370	Woodlot 2005f
Prattsburgh, Steuben Cty, NY	Agricultural plateau	170	319	Mabee *et al.* 2005a
Cohocton, Steuben Cty, NY	Agricultural plateau	371	609	ED&R 2006b
Munnsville, Madison Cty, NY	Agricultural plateau	160	291	Woodlot 2005g
Fairfield, Herkimer Cty, NY	Agricultural plateau/ADK foothills	509	419	Woodlot 2005h

Table 5.3.2-2

Summary of Available Avian Radar Survey Results for Proposed Terrestrial Wind Facilities

Project Site	Landscape	Average Passage Rate (t/km/hr)	Average Flight Height (m)	Citation
Jordanville, Herkimer Cty, NY	Agricultural plateau	409	371	Woodlot 2005i
Sheffield, Caledonia Cty, VT	Forested ridge	208	522	Woodlot 2006a
Deerfield, Bennington Cty, VT	Forested ridge	404	523	Woodlot 2005j
Franklin, Pendleton Cty, WV	Forested ridge	457	492	Woodlot 2005k
Fall 2005				
Churubusco, Clinton Cty, NY	Great Lakes plain/ADK foothills	152	438	Woodlot 2005l
Ellenberg, Clinton Cty, NY	Great Lakes plain/ADK foothills	197	333	Mabee *et al.* 2006a
Dairy Hills, Clinton Cty, NY	Agricultural plateau	94	466	Young et al. 2006
Flat Rock, Lewis Cty, NY	Great Lakes plain/ADK foothills	158	415	ED&R 2006a
Clayton, Jefferson Cty, NY	Agricultural plateau	418	475	Woodlot 2005m
Bliss, Wyoming Cty, NY	Agricultural plateau	440	411	Young 2006
Perry, Wyoming Cty, NY	Agricultural plateau	64	466	Young 2006
Sheldon, Wyoming Cty, NY	Agricultural plateau	197	422	Woodlot 2005n
Howard, Steuben Cty, NY	Agricultural plateau	481	491	Woodlot 2005o
Fairfield, Herkimer Cty, NY	Agricultural plateau	691	516	Woodlot 2005p
Jordanville, Herkimer Cty, NY	Agricultural plateau	380	440	Woodlot 2005q
Munnsville, Madison Cty, NY	Agricultural plateau	732	644	Woodlot 2005r
Deerfield, Bennington Cty, VT	Forested ridge	559	395	Woodlot 2005s
Kibby, Franklin Cty, ME (Mountain)	Forested ridge	565	370	Woodlot 2006d
Kibby, Franklin Cty, ME (Range 1)	Forested ridge	201	352	Woodlot 2006d
Kibby, Franklin Cty, ME (Valley Site)	Forested valley	452	391	Woodlot 2006d
Mars Hill, Aroostook Cty, ME	Forested ridge	512	424	Woodlot 2005t
Spring 2006				
Chateaugay, Franklin Cty, NY	Agricultural plateau	360	409	Woodlot 2006e
Wethersfield, Wyoming Cty, NY	Agricultural plateau	324	355	Mabee et al. 2006b
Centerville, Allegany Cty, NY	Agricultural plateau	290	351	Mabee et al. 2006b
Howard, Steuben Cty, NY	Agricultural plateau	440	426	Woodlot 2006f
Deerfield, Bennington Cty, VT	Forested ridge	263	435	Woodlot 2006g
Kibby, Franklin Cty, ME (Mountain)	Forested ridge	456	368	Woodlot 2006h
Kibby, Franklin Cty, ME (Range 1)	Forested ridge	197	412	Woodlot 2006h
Kibby, Franklin Cty, ME (Range 2)	Forested ridge	512	378	Woodlot 2006h

Table 5.3.2-2

Summary of Available Avian Radar Survey Results for Proposed Terrestrial Wind Facilities

Project Site	Landscape	Average Passage Rate (t/km/hr)	Average Flight Height (m)	Citation
Kibby, Franklin Cty, ME (Valley Site)	Forested valley	443	334	Woodlot 2006h
Mars Hill, Aroostook Cty, ME	Forested ridge	338	384	Woodlot 2006i
Fall 2006				
Chateaugay, Franklin Cty, NY	Agricultural plateau	643	431	Woodlot 2006j
Wethersfield, Wyoming Cty, NY	Agricultural plateau	256	344	Mabee et al. 2006c
Centerville, Allegany Cty, NY	Agricultural plateau	259	350	Mabee et al. 2006c
Lempster, Sullivan Cty, NH	Forested ridge	620	387	Woodlot 2007a
Stetson, Penobscot Cty, ME	Forested ridge	476	378	Woodlot 2007b

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_____. 2005c. Fall 2004 Avian Migration Surveys at the Proposed Deerfield Wind/Searsburg Expansion Project in Searsburg and Readsboro, Vermont. Prepared for Deerfield Wind, LLC and Vermont Environmental Research Associates.

Table 5.3.2-2

Summary of Available Avian Radar Survey Results for Proposed Terrestrial Wind Facilities

Project Site	Landscape	Average Passage Rate (t/km/hr)	Average Flight Height (m)	Citation

_____. 2005d. A Spring Radar, Visual, and Acoustic Survey of Bird and Bat Migration at the Proposed Marble River Wind Project in Clinton and Ellenburg, New York. Prepared for AES Corporation.

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_____. 2005j. A Spring 2005 Radar, Visual, and Acoustic Survey of Bird and Bat Migration at the Proposed Deerfield Wind Project in Searsburg and Readsboro, Vermont. Prepared for PPM Energy/Deerfield Wind, LLC.

_____. 2005k. A Spring 2005 Radar and Acoustic Survey of Bird and Bat Migration at the Proposed Liberty Gap Wind Project in Franklin, West Virginia. Prepared for US Wind Force, LLC.

_____. 2005l. A Fall 2005 Radar, Visual, and Acoustic Survey of Bird and Bat Migration at the Proposed Marble River Wind Project in Clinton and Ellenburg, New York. Prepared for AES Corporation.

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_____. 2006d. A Fall 2005 Radar Survey of Bird and Bat Migration at the Proposed Kibby Wind Power Project in Kibby and Skinner Townships, Maine. Prepared for TRC and TransCanada Energy, Ltd.

_____. 2006e. A Spring 2006 Survey of Bird and Bat Migration at the Proposed Chateaugay Windpark in Chateaugay, New York. Prepared for Ecology and Environment, Inc. and Noble Power, LLC.

_____. 2006f. A Spring 2006 Survey of Bird and Bat Migration at the Proposed Howard Wind Power Project in Howard, New York. Prepared for Everpower Global.

_____. 2006g. Spring 2006 Bird and Bat Migration Surveys at the Proposed Deerfield Wind Project in Searsburg and Readsboro, Vermont. Prepared for PPM Energy, Inc.

Table 5.3.2-2

Summary of Available Avian Radar Survey Results for Proposed Terrestrial Wind Facilities

Project Site	Landscape	Average Passage Rate (t/km/hr)	Average Flight Height (m)	Citation

_____. 2006h. A Spring 2006 Survey of Bird and Bat Migration at the Proposed Kibby Wind Power Project in Kibby and Skinner Townships, Maine. Prepared for TransCanada Maine Wind Development, Inc.

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Table 5.3.2-3

Summary of Maximum Anticipated Impacts to Benthic Habitat-Proposed Action

Current Scour Protection Scenario

	Area of Impact (square feet)	Area of Impact (acres)	Area of Impact (square meters)	Percent of Project Area*	Percent of Nantucket Sound**
OUTSIDE 3-MILE LIMIT - FEDERAL WATERS					
Inner-array cables (66.7 miles)					
Inner array cables	2,113,056	48.51	196,309	0.303	0.0135
Pontoon impacts	2,113,056	48.51	196,309	0.303	0.0135
Anchoring to install cables	227,781	5.23	21,162	0.033	0.0015
Anchor line sweep for installation	20,802,396	477.56	1,932,606	2.985	0.1332
Barge to hold Cables	1,260	0.03	117	0.00018	0.000008
Sub-total	**25,257,549**	**580**	**2,346,503**	**3.6**	**0.16**
Submarine cable system (4.9 miles)					
115kV submarine cable system	310,464	7.13	28,843.1	0.045	0.002
Pontoon impacts	310,464	7.13	28,843.1	0.045	0.002
Anchoring to install cable system	71,707	1.65	6,661.8	0.010	0.00054
Anchor line sweep for installation	3,056,424	70.17	283,951.1	0.439	0.02232
Sub-total	**3,749,059**	**86**	**348,299**	**0.54**	**0.03**
Construction of WTGs and ESP					
Jack-up Barges for WTGs	402,995	9.25	37,439	0.0578	0.0026
Barges for ESP	8,138	0.19	756	0.0012	0.0001
Sub-total	**411,133**	**9.4**	**38,195**	**0.06**	**0.003**
Scour Control					
WTG scour control mats	85,529	1.96	7,946	0.012	0.00054
Anchoring to Install WTG Scour Mats	17,681	0.4	1,642.62	0.0024	0.00011
ESP scour control mats	4,871	0.1	452.51	0.0007	0.00003
Anchoring to Install ESP Scour Mats	1,001	0.0	92.98	0.0001	0.00001
WTG Rock Armoring	**381,216**	**8.75**	**35,417**	**.056**	**0.0025**
Barge for Installing WTG Rock Armoring	**2,289**	**0.05**	**212.7**	**0.0003**	**0.00001**
Sub-total	**492,595**	**11**	**45,764**	**0.071**	**0.003**
Total Impacts Outside the 3-mile Limit	29,910,336	**686**	**2,778,761**	**4.27**	**0.196**

All Rock Armor Scenario

	Area of Impact (square feet)	Area of Impact (acres)	Area of Impact (square meters)	Percent of Project Area*	Percent of Nantucket Sound**
OUTSIDE 3-MILE LIMIT - FEDERAL WATERS					
Inner-array cables (66.7 miles)					
Inner array cables	2,113,056	48.51	196,309	0.303	0.0135
Pontoon impacts	2,113,056	48.51	196,309	0.303	0.0135
Anchoring to install cables	227,781	5.23	21,162	0.033	0.0015
Anchor line sweep for installation	20,802,396	477.56	1,932,606	2.985	0.1332
Barge to hold Cables	1,260	0.03	117	0.00018	0.000008
Sub-total	**25,257,549**	**580**	**2,346,503**	**3.6**	**0.16**
Submarine cable system (4.9 miles)					
115kV submarine cable system	310,464	7.13	28,843.1	0.045	0.002
Pontoon impacts	310,464	7.13	28,843.1	0.045	0.002
Anchoring to install cable system	71,707	1.65	6,661.8	0.010	0.00054
Anchor line sweep for installation	3,056,424	70.17	283,951.1	0.439	0.02232
Sub-total	**3,749,059**	**86**	**348,299**	**0.54**	**0.03**
Construction of WTGs and ESP					
Jack-up Barges for WTGs	402,995	9.25	37,439	0.0578	0.0026
Barges for ESP	8,138	0.19	756	0.0012	0.0001
Sub-total	**411,133**	**9.4**	**38,195**	**0.06**	**0.003**
Rock Armoring					
WTG Rock Armoring	2,064,964	47.41	191841.44	0.2963	0.01323
Barge for Installing WTG Rock Armoring	402,995	9.25	37439.44	0.0578	0.00258
ESP Rock Armoring	17,664	0.41	1641.04	0.0025	0.00011
Barge for Installing ESP Rock Armoring	12,400	0.28	1151.98	0.0018	0.00008
Sub-total	**2,498,023**	**57**	**232,074**	**0.4**	**0.02**
Total Impacts Outside the 3-mile Limit	**31,915,763**	**733**	**2,965,071**	**4.6**	**0.21**

Table 5.3.2-3

Summary of Maximum Anticipated Impacts to Benthic Habitat-Proposed Action

Current Scour Protection Scenario

	Area of Impact (square feet)	Area of Impact (acres)	Area of Impact (square meters)	Percent of Project Area*	Percent of Nantucket Sound**
INSIDE 3-MILE LIMIT - STATE WATERS					
Submarine cable system (7.6 miles)					
115kV submarine cable system	481,536	11.05	44,736	0.0691	0.0031
Pontoon impacts	481,536	11.05	44,736	0.0691	0.0031
Anchoring to install cable	111,218	2.55	10,333	0.0160	0.0007
Anchor line sweep for installation	4,740,576	108.83	440,414	0.6802	0.0304
Sub-total	5,814,866	133	540,219	0.83	0.037
HDD Operation					
Pre-excavation pit for HDD	2,925	0.067	272	0.0004	0.00002
Barges for HDD Operation	2,513	0.058	233	0.0004	0.00002
Sub-total	**5,438**	**0.12**	**505**	**0.0008**	**0.00003**
Total Impacts Inside the 3-mile Limit	**5,820,304**	**134**	**540,724**	**0.84**	**0.037**
TOTAL CABLE/SCOUR PROTECTION IMPACTS	**35,730,340**	**820**	**3,319,485**	**5.1**	**0.23**
Monopile Impacts					
WTG and ESP pilings					
111 WTGs (16.75' diameter pile) (0-39 feet)	24,459	0.56	2272.30	0.0035	0.0002
19 WTGs (18.0' diameter pile) (40-> feet)	4,835	0.11	449.18	0.0007	0.00003
6 ESP Piles	58	0.0013	5.3512	0.00001	0.0000004
Total Pile Impacts	**29,351**	**0.67**	**2727**	**0.0042**	**0.0002**
TOTAL FOR ALL IMPACTS	**35,759,991**	**821**	**3,322,212**	**5.1**	**0.23**

*Project Area ≅ 25 square miles (~65 km^2)
**Area of Nantucket Sound ≅ 560 square miles (1,450 km^2)

All Rock Armor Scenario

	Area of Impact (square feet)	Area of Impact (acres)	Area of Impact (square meters)	Percent of Project Area*	Percent of Nantucket Sound**
INSIDE 3-MILE LIMIT - STATE WATERS					
Submarine cable system (7.6 miles)					
115kV submarine cable system	481,536	11.05	44,736	0.0691	0.0031
Pontoon impacts	481,536	11.05	44,736	0.0691	0.0031
Anchoring to install cable	111,218	2.55	10,333	0.0160	0.0007
Anchor line sweep for installation	4,740,576	108.83	440,414	0.6802	0.0304
Sub-total	5,814,866	133	540,219	0.83	0.037
HDD Operation					
Pre-excavation pit for HDD	2,925	0.067	272	0.0004	0.00002
Barges for HDD Operation	2,513	0.058	233	0.0004	0.00002
Sub-total	**5,438**	**0.12**	**505**	**0.0008**	**0.00003**
Total Impacts Inside the 3-mile Limit	**5,820,304**	**134**	**540,724**	**0.84**	**0.037**
TOTAL CABLE/SCOUR PROTECTION IMPACTS	**37,736,067**	**866**	**3,505,795**	**5.4**	**0.24**
Monopile Impacts					
WTG and ESP pilings					
111 WTGs (16.75' diameter pile) (0-39 feet)	24,459	0.56	2272.30	0.0035	0.0002
19 WTGs (18.0' diameter pile) (40-> feet)	4,835	0.11	449.18	0.0007	0.00003
6 ESP Piles	58	0.0013	5.3512	0.00001	0.0000004
Total Pile Impacts	**29,351**	**0.67**	**2,727**	**0.0042**	**0.0002**
TOTAL FOR ALL IMPACTS	**37,765,418**	**867**	**3,508,522**	**5.4**	**0.24**

*Project Area ≅ 25 square miles (~65 km^2)
**Area of Nantucket Sound ≅ 560 square miles (1,450 km^2)

Table 5.3.2-4

A Discussion of the Tolerances of the Bivalves, Gastropods and Decapods of Horseshoe Shoal, to Sediment Deposition and Suspended Sediment

Species	Feeding Method	Sediment Deposition	Suspended Sediment	Tolerance to Sediment Deposition (low, medium, high)	Tolerance to Suspended Sediment (low, medium, high)
Bivalves					
Tellins *(Tellina agilis)*	Burrow and then use siphon to deposit feed.[28]	Smothering with 5 cm of sediment would temporarily halt feeding and respiration and require the species to relocate to its preferred depth[1]. Tellins are active burrowers[2] and would be expected to relocate with no mortality, however, growth and reproduction may be compromised.[1]	An increase in suspended sediment is likely to increase the rate of siltation and therefore the food available to Tellins, which are deposit feeders. It is therefore likely that Tellins are insensitive to changes in suspended sediment[1].	High	High
Razor shells (*Ensis sp.*)	Burrow and then use siphon to filter feed, when submerged, they suck in a current of water through their siphons and they sieve out the food particles with their enlarged gills[32]. (suspension feeder)	*Ensis sp*. generally live buried in sand, can extend their siphons and rise in their burrows and so are likely to tolerate smothering by 5 cm of sediment[3]. Note: they can move up and down through sand at a fast rate.[5]	Relatively tolerant of siltation[3] although there is a chance that juveniles could be less tolerant particularly during the time of settling, because they are thought to be susceptible to suffocation[5.]	High	Medium
Soft shell clams (*Mya arenaria*)	Burrow and then use siphon to filter feed (suspension feeder). Feed on microscopic plant and animal matter which is suspended in the water column just above the bottom. Through the beating of small hairlike cilia, a current is created which draws water through the incurrent siphon.[29]	They live in deep permanent burrows of 20-50 cm depth in mixed sediments. Its permanent burrow means that smothering may cause problems[4] Significant mortality (2 -60%) in small and large clams occurred only at burial depths of 50 cm or more in sandy substrates. However, it is suggested that in mud, clams buried under 25cm of sediment would almost certainly die[6]. Note: The level of tolerance depends on the nature of the smothering material.[6]	Studies show that prolonged exposure to suspended sediment concentrations >100mg/l results in reduced body condition and growth, however it has been shown that feeding/filtration continues even where suspended sediment concentration exceeds 300mg/l[4 & 6.] Clams may continue pumping when total suspended solids exceed 300 mg/l, but the production of mucus and the loss of energy during the ejection of pseudofaeces strain the energy budget of the clam[35.]	Medium	Medium

Table 5.3.2-4

A Discussion of the Tolerances of the Bivalves, Gastropods and Decapods of Horseshoe Shoal, to Sediment Deposition and Suspended Sediment

Species	Feeding Method	Sediment Deposition	Suspended Sediment	Tolerance to Sediment Deposition (low, medium, high)	Tolerance to Suspended Sediment (low, medium, high)
Northern Quahog *(Mercenaria mercenaria)*	Burrow and then use siphon to filter feed (suspension feeder).[30]	Quahogs live buried in the top three inches of sandy/stony/clayey bottoms beneath waters reaching up to 45-50 feet in depth. They are sedentary, i.e. they do not change locations once the juvenile clam settles on the bottom[12]. However, studies show that adults bury deeper in sand than in mud and small adults burrow deeper than larger ones. If dug up, the hard clam reburrows, and if covered, can escape upward. Also a clam can apparently escape 10 to 50 cm of overburden if the sediment dumped is the same as surroundings.[34]	The hard shell clam is less well adapted to survival in turbid conditions compared to mussels and oysters and is thus more vulnerable to temporary increases in suspended sediment loads [4]. Larvae are more sensitive to turbidity than are embryos although studies show they tolerated silt of 4 g/l[34]. However, there is the belief that a turbid layer near the bottom can enhance the growth of hard clam, because the layer may contain detrital food utilized by the clams[34].	High	Medium
Common mussel (*Mytilus edulis*)	Attach to rock by byssal thread and filter feed (suspension feeder).[27]	Although apparently sedentary, *Mytilus edulis* is able to move some distance to change its position on the shore or within a bed or to resurface when buried by sand[8]. However, studies show that although some mussels are able to move upwards through accumulated sediment, a proportion will succumb and be smothered.[8]	Studies have reported that *Mytilus edulis is* relatively tolerant of turbidity and siltation, thriving in areas that would be harmful to other suspension feeders. They possess efficient shell cleaning and pseudofaeces expulsion mechanisms to remove silt[4]. Studies indicate that *Mytilus edulis* can survive >25 days at 440 mg/l. However, their feeding rate is reduced by suspended sediment at concentrations >50 mg/l.[8]	Medium	High
Nut clam *(Nucula proxima)*	Deposit feeder[33]	Studies on another bivalve in the genus "Nucula" i.e. *Nucula nitidosa* suggest that these bivalves can tolerate anaerobic conditions for several days and are able to thrive in poorly aerated sediments. In addition, studies have suggested that their ability to tolerant anaerobic conditions and their mobility, allowed them to survive when covered by sediments during stormy weather[15]. This suggests that nut clams would be very tolerant to smothering and would be mobile enough to climb back to the surface.	*Nucula nitidosa* and *nucula proxima* are deposit feeders and therefore is not directly reliant on suspended matter as a food resource. However, an increase in suspended sediment will increase the rate of siltation at the sediment surface which may enhance the food supply for these organisms[15]. Studies have also shown that turbidity does not affect the distribution of these organisms. This suggests that not only would an increase in suspended sediment be tolerated by the nut clam, but it may even be welcomed.	High	High

Table 5.3.2-4

A Discussion of the Tolerances of the Bivalves, Gastropods and Decapods of Horseshoe Shoal, to Sediment Deposition and Suspended Sediment

Species	Feeding Method	Sediment Deposition	Suspended Sediment	Tolerance to Sediment Deposition (low, medium, high)	Tolerance to Suspended Sediment (low, medium, high)
Bay Scallop *(Argopecten irradians)*	Filter feeders, scallops use their gills to siphon diatoms and other planktonic matter from the surrounding water.[16] (suspension feeder)	Scallops are one of only a few Molluscan groups that have the ability to swim actively, especially as a predator avoidance response. They dwell on the bottom as adults, manipulating themselves through "jet propulsion" by forcefully closing their valves[16]. Studies on other scallop species such as the British "*Pecten maximus",* indicate that if scallops were smothered by a 5 cm layer of fine sediment, juveniles and adults could probably lift themselves clear of the new layer since they are capable of jumping and swimming. Newly re-laid scallops are, however, more vulnerable to predators until recessed although it is likely that the predators of the scallop such as starfish and crabs will be occupied in re-establishing their position themselves.[17]	In general, suspended sediment is not likely to have a great deal of impact on Bay scallops, although studies indicate that growth rates of adult *Pecten maximus* are adversely affected by increases in suspended sediments concentrations and excessive particle bombardment may threaten the viability of the feeding apparatus, thereby potentially decreasing ingestion rates. Since scallops have the ability to swim some individuals may be able to escape, although this ability is primarily reserved for escape reactions given the high energy expenditure involved and the distances covered by swimming or jumping are very limited[17].	High	High
Oysters *(Crassostrea virginica)*	Oysters cement themselves onto hard substrates like shells or rocks or other oysters. They do not have discrete siphons, water is simply drawn in and expelled from the body by currents that are created by the beating of the gill cilia.[31]	Studies indicate that oysters buried 1.25 cm or less can usually clear their bills of sediment if the water is warm enough for active pumping. However, burial of oysters with sediment layers exceeding 5 cm has been reported to cause adult mortality[9]. They are cemented to any hard object available, so would not be able to burrow up through deposited material. Although a thin layer (several mm) of sediments may not be fatal to adult oysters, it may affect reproduction. Because larval oysters require hard substrata for settlement, the presence of even a few millimeters of sediment covering an oyster reef may inhibit larval recruitment.[9]	Oysters respond to an increase in suspended sediment by increasing pseudofaeces production and with occasional rapid closure of their valves to expel accumulated silt. Although some studies report that an increase in suspended sediment decreases the filtration rate (studies show that filtration is completely inhibited by 10 mg/l of particulate organic matter and significantly reduced by 5 mg/l) and reduces the growth rate of adults, oyster beds can often naturally be found in relatively turbid estuarine environments. Therefore, a change in suspended sediment levels is likely to result in only sub-lethal effects. Once 'normal' conditions are restored then normal feeding will allow condition to be restored[10]. Note: an increase in suspended sediment may have longer term effects on the population by inhibiting recruitment, especially if the increase coincided with the peak settlement period in summer.	Low	High

Table 5.3.2-4

A Discussion of the Tolerances of the Bivalves, Gastropods and Decapods of Horseshoe Shoal, to Sediment Deposition and Suspended Sediment

Species	Feeding Method	Sediment Deposition	Suspended Sediment	Tolerance to Sediment Deposition	Tolerance to Suspended Sediment
				(low, medium, high)	
Transverse ark *(Anadara transversa)*	Filter feeder. They use their gills to siphon diatoms and other planktonic matter from the surrounding water. (suspension feeder)	There were no studies found that address the tolerances/sensitivities of this species, but they are known to often burrow or nestle in mud and sand, under stones[2], however due to the fact that they have chunky/bulbous shells, it is likely they will not be fast burrowers and in fact some ark shells are known to attach themselves to rocks. Therefore, if these shells were smothered it might be more likely they would die before they could pull themselves out of the sediment.	In general, suspended sediment is not likely to have a great deal of impact on this organism, although it is possible that excessive particle bombardment may threaten the viability of the feeding apparatus, thereby potentially decreasing ingestion rates. However as is seen in other bivalves these species will likely possess efficient shell cleaning and pseudofaeces expulsion mechanisms to remove silt. Therefore, as was stated for many of the other bivalves present on Horseshoe shoals, a change in suspended sediment levels is likely to result in only sub-lethal effects and once 'normal' conditions are restored then it is likely that normal feeding will allow condition to be restored.	Medium	High
Round pandora/ Gould pandora (*Pandora gouldiana*) Spoon clam/shell (*Periploma sp.*)	Burrow and then use siphon to filter feed Burrow and then use siphon to filter feed	In general, these two bivalves active burrowers (Pandora are probably fast burrowers too) and they require their inhalant siphon to be above the sediment surface for feeding and respiration (Spoon shells only make shallow burrows). There were no studies found that address the tolerances/sensitivities of each of these species, however based on what has been written about other similar bivalve species sudden smothering with sediment would be likely to only temporarily halt feeding and respiration and require these bivalves to relocate to their preferred depth. As active burrowers they would be expected to relocate with no mortality, however, growth and reproduction may be compromised owing to energetic expenditure. Growth and reproduction would be expected to return to normal following relocation.	In general, suspended sediment is not likely to have a great deal of impact on these two organisms, although it is possible that excessive particle bombardment may threaten the viability of the feeding apparatus, thereby potentially decreasing ingestion rates. However as is seen in other bivalves these species will likely possess efficient shell cleaning and pseudofaeces expulsion mechanisms to remove silt. Therefore, as was stated for many of the other bivalves present on Horseshoe shoals, a change in suspended sediment levels is likely to result in only sub-lethal effects and once 'normal' conditions are restored then it is likely that normal feeding will allow condition to be restored	Medium - High	High

Table 5.3.2-4

A Discussion of the Tolerances of the Bivalves, Gastropods and Decapods of Horseshoe Shoal, to Sediment Deposition and Suspended Sediment

Species	Feeding Method	Sediment Deposition	Suspended Sediment	Tolerance to Sediment Deposition (low, medium, high)	Tolerance to Suspended Sediment (low, medium, high)
Gastropods					
Slipper limpets *(Crepidula fornicata, Crepidula convexa and Crepidula plana)*	Attach to rock by foot and filter feed, strains microorganisms and organic debris from the water.[27]	Smothering with a 5cm layer of sediment would be expected to clog the feeding and respiration structures. However, it has been demonstrated that *Crepidula fornicata* is capable of clearing its feeding structures at some energetic cost. So, although there may be some energetic cost as a result of smothering, probably resulting in decreased growth and reproductive output, there is unlikely to be mortality[7]. Note: the fact that they live in chains of up to 12 individuals means that at least some of the chain would avoid the effects of smothering[7]. *Crepidula plana* is even less likely to suffer impact from smothering as it generally is attached to larger and more mobile organisms such as the underside of horseshoe crabs and inside large snails shells occupied by hermit crabs[46]	Crepidula are all active suspension feeders, an increase in suspended sediment is therefore likely to interfere with the feeding and respiration structures. Growth rate and filtration rate tend to decrease as turbidity increases with the greatest reduction in filtration occurring between 140-200 mg/L. When suspended sediment returns to normal levels, feeding and respiration return to normal. However, it will take a period of time to replenish food reserves, during which reproductive output will not be at maximum levels[7].	High	High
Atlantic Oyster drill *(Urosalpinx cinera)*	Predator, feeds on barnacles, mussels & oysters and other bivalves.[26]	Studies on other similar snails (such as Atlantic dog whelk "*Nucella lapillus*") indicate that dog whelks and thus the oyster drill is probably not adversely affected by temporary smothering. If smothering occurs, there will be an energetic expenditure involved in freeing itself from the smothering material.[11]	Not likely to have a great deal of impact, although the accumulation of silt or mud may restrict their ability to distribute themselves. In addition, the abundance of their prey (e.g., barnacles and mussels) may be restricted by increased suspended sediment, thus reducing their food supply.[11]	High	High

Table 5.3.2-4

A Discussion of the Tolerances of the Bivalves, Gastropods and Decapods of Horseshoe Shoal, to Sediment Deposition and Suspended Sediment

Species	Feeding Method	Sediment Deposition	Suspended Sediment	Tolerance to Sediment Deposition (low, medium, high)	Tolerance to Suspended Sediment (low, medium, high)
Knobbed Whelk *(Busycon carica)* & Channeled Whelk *(Busycotypus canaliculatus)*	Predators, feed on bivalves such as hard clams (*Mercenaria mercenaria*), oysters (*Crassostrea virginica*), and arks (*Anadara sp*).[18]	Studies have shown that whelks will burrow into the bottom substrate and remain dormant for extended periods during winter storms[18]. In addition, studies involving the collection & release of whelks has found that whelks can be naturally buried from depths of 1 to 14.4 cm (i.e. choose to bury themselves to such depths)[19]. Based on this information it is likely that Whelks would have no problem being buried with up to 20mm of sediment from the plows. In addition, they are both very active snails, using their large foot to glide across the bottom or to plow through the sand underground[20], so even if they were buried in sediment deeper than they would like, they should be able to dig themselves out very quickly.	Not likely to have a great deal of impact, although the abundance of their prey (i.e. hard clams & oysters) may be restricted by increased suspended sediment, thus reducing their food supply.	High	High
Minute hydrobia (*Hydrobia totteni*)	Deposit feeder, feeding on planktonic and minute detrital food items. [25]	Studies on other similar snails (such as *Hydrobia ulvae*) indicates that these snails are quite tolerant of smothering. However, the snails can only burrow up through certain sorts of sediment. If the silt content of the smothering sediment is high and the water content low then it is unlikely that the surface will be regained from 5 cm down. Looser sediment with high water and low silt content can be negotiated quite rapidly. The surface is generally regained within a day. If the surface cannot be regained then Hydrobia ulvae can survive burial for quite extended periods although this is highly temperature dependent. Temperatures of 20 degrees Centigrade result in all individuals dying after 10 days. Survival is much better at lower temperatures. It is thought that oxygen stress is the cause of mortality.[13]	Detritus forms one of the main food sources for Hydrobidae snails so increased siltation may be beneficial. As the snails lives in and on sediment, increases in sediment deposition will probably not affect locomotion.[13]	High	High

Table 5.3.2-4

A Discussion of the Tolerances of the Bivalves, Gastropods and Decapods of Horseshoe Shoal, to Sediment Deposition and Suspended Sediment

Species	Feeding Method	Sediment Deposition	Suspended Sediment	Tolerance to Sediment Deposition (low, medium, high)	Tolerance to Suspended Sediment (low, medium, high)
Other Gastropods					
Miniature moonsnail (*Natica pusilla*) Mud dog whelk (*Ilyanassa trivittata*) Luna dovesnail (*Mitrella lunata*) Miniature cerith (*Seila adamsi*) Pyramid shell (*Odostomia seminuda*)	Predator, feeds on bivalves[24] Scavenger, eats dead/dying organisms[27] Predator on sea squirts among other things[23] A grazing snail, eats algae and organic material[21] Ectoparasite on bay scallops[22]	In general, snails are mobile so have a good chance of finding the surface again following a smothering event. However, the type of sediment (how loose it is) will dictate how quickly the snails will be able to make their way through to the surface. For example, if the sediment is well oxygenated and fluid (as with high water, high silt content), it will be relatively easy for snails to reach the surface. In addition, the locomotive abilities of each snail will also dictate how quick they will move up. How tolerant each snail is to lack of oxygen will also dictate how long they may survive once/if they are buried for an extended period. There were no studies found that address these characteristics for each of the snail species. It is likely the snails of Horseshoe Shoals will display a range of tolerances to smothering such as *Hydrobia* surviving burial for extended periods[13] compared to the common periwinkle (*Littorina littorea*) which typically only survives for up to 24 hours once buried[14]. In addition,	In general, suspended sediment is not likely to have a great deal of impact to the snails of Horseshoe Shoals although the accumulation of silt or mud may have an impact on the distribution of larval stages. For the pyramid shell and miniature moonshell, which depend on other organisms for prey, an increase in suspended sediment may have an impact on the abundance of their prey thus reducing their food supply. However, for the scavenger snails detritus is a main food source so increased siltation may be beneficial. In addition, studies have shown that increases in siltation over an extended period may have some influence in changing substratum type and removing available habitat such as nooks and crevices. For the snail species that use nooks and crevices, if habitat type is no longer optimal then the snail populations may decrease.	Medium - High	Medium - High
Decapods					
American Lobster (*Homarous americanus*)	Predator, feeds on crabs, bivalves, shrimp and small fish. Will also scavenge dead and dying organisms.[36]	Due to their mobility, sediment deposition events would not seriously affect adult lobsters, but may temporarily affect juveniles. After a sedimentation event, adults may have to expend energy to clear the entrance to burrows, and/or temporarily leave a particular area to look for shelter. Juveniles may be affected more than adults, as they may have to spend additional time moving to a new shelter, which results in an increase in time exposed to predation.[37]	In general, suspended sediment is not likely to have a great deal of impact to the American lobster, although the accumulation of silts may affect the distribution of larval stages. The lobsters mobility would allow it to continue searching for food sources during times of high suspended sediments [36].	High	High

Table 5.3.2-4

A Discussion of the Tolerances of the Bivalves, Gastropods and Decapods of Horseshoe Shoal, to Sediment Deposition and Suspended Sediment

Species	Feeding Method	Sediment Deposition	Suspended Sediment	Tolerance to Sediment Deposition	Tolerance to Suspended Sediment
				(low, medium, high)	
Rock Crab *(Cancer irruratus)*	Opportunistic, will feed on live bivalves, crustaceans and carion. [38]	Due to their mobility, sediment deposition events generally would not affect rock crabs, they would most likely burrow out from under the silt and move to a new unaffected area[38]. Increased mortality would not be expected due to increased sedimentation.	Increased suspended sediment may result in a temporary avoidance of the disturbance site, however, a rise in mortality due to increased suspended sediment loads is not expected [38].	High	High
European Green Crab (*Carcinus maenas*)	Omnivore, feeds mainly on mollusks, arthropods, plants and algae. [39]	Adult European Green Crabs would not be affected by increased sediment deposition due to their mobility, however, post settlement mortality of juveniles, may increase if large areas of diverse habitat are impacted.[39]	Due to the wide range of habitats that the European Green Crab is known to inhabit, including turbid estuaries, it is unlikely that an increase in suspended sediment would have any negative effects[39].	High	High
Say Mud Crab *(Dyspanopeus sayi)*	Carnivore, feeds mainly bivalves [40]	Due to their mobility, increased sediment deposition would not be expected to negatively affect Say Mud Crab populations on Horseshoe shoal. Say Mud Crabs would be expected to burrow out from under any smothering event, and/or temporarily leave the area until the disturbance is complete.	Due to their mobility[41], increased suspended sediment would not be expected to negatively affect Say Mud Crab populations on Horseshoe shoal.	High	High
Lady Crab *(Ovalipes ocellatus)*	Predator, feeds mostly on bivalves and some crustaceans. [41]	Due to their mobility, increased sediment deposition would not be expected to negatively affect Lady Crab populations on Horseshoe shoal. Lady Crabs would be expected to burrow out from under any smothering event, and/or temporarily leave the area until the disturbance is complete.	Due to their mobility[41], increased suspended sediment would not be expected to negatively affect Lady Crab populations on Horseshoe shoal, crabs would be expected to migrate away from the disturbance until complete.	High	High
Hermit Crab (*Pagurus spp.*)	Scavenger, eats dead/dying organisms [42]	Due to their mobility, increased sediment deposition would not be expected to negatively affect hermit crab populations on Horseshoe shoal[42]. Hermit crabs may have to expend energy burrowing out from under a smothering event, however, increased mortality would not be expected.	Due to their mobility[42], increased suspended sediment would not be expected to negatively affect hermit crab populations on Horseshoe shoal. Hermit crabs would be expected to migrate away from the disturbance until complete.	High	High

Table 5.3.2-4

A Discussion of the Tolerances of the Bivalves, Gastropods and Decapods of Horseshoe Shoal, to Sediment Deposition and Suspended Sediment

Species	Feeding Method	Sediment Deposition	Suspended Sediment	Tolerance to Sediment Deposition	Tolerance to Suspended Sediment
				(low, medium, high)	
Pea Crab (*Pinnixa sp.*)	Commensal/parasytic on bivalves [43]	Pea Crabs, most often are found living inside bivalve shells [43]. If the commensal bivalve is affected by increased sediment deposition, then so will the Pea Crab. Since most bivalves are tolerant of sedimentation, no adverse affects are expected for the Pea Crab.	Pea Crabs, most often are found living as commensals, inside bivalve shells[43]. If the commensal bivalve is affected by an increase in suspended sediment, then so will the Pea Crab. Since most bivalves are tolerant of suspended sedimentation, limited adverse affects are expected for the Pea Crab.	High	Medium - High
Spider Crab (*Libinia dubia*)	Primarily scavenger, but can prey on small fish, and invertebrates. [44]	Due to their mobility and tolerance for pollution, increased sediment deposition would not be expected to negatively affect spider crab populations on Horseshoe shoal [44]. Jet Plow activities may actually benefit these crabs by unearthing decaying organic matter, an important food source, from deeper sediments.	Due to their mobility and tolerance for pollution [44], increased suspended sediment would not be expected to negatively affect spider crab populations on Horseshoe shoal.	High	High
Horseshoe Crab (*Limulus limulus*)	Predator, primarily preys on bivalves and polychaetes. [45]	Horseshoe crabs are not likely to be affected by an increase in sediment deposition. Horseshoe crabs are known burrowers, they locate their prey using their tactile senses as opposed to site, and their mobility would allow them to temporarily leave an area if necessary.[45]	Horseshoe crabs are not likely to be affected by an increase in suspended sediment. Horseshoe crabs locate their prey out of the sediment by tactile senses as opposed to site, and their mobility would allow them to temporarily leave an area if necessary[45].	High	High

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Table 5.3.2-4

A Discussion of the Tolerances of the Bivalves, Gastropods and Decapods of Horseshoe Shoal, to Sediment Deposition and Suspended Sediment

Species	Feeding Method	Sediment Deposition	Suspended Sediment	Tolerance to Sediment Deposition (low, medium, high)	Tolerance to Suspended Sediment (low, medium, high)

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Table 5.3.2-4

A Discussion of the Tolerances of the Bivalves, Gastropods and Decapods of Horseshoe Shoal, to Sediment Deposition and Suspended Sediment

Species	Feeding Method	Sediment Deposition	Suspended Sediment	Tolerance to Sediment Deposition	Tolerance to Suspended Sediment
				(low, medium, high)	

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40 http://www.mi.mun.ca/mi-net/fishdeve/atlantic.htm
41 http://www.biomescenter.com/ladycrab_learn.htm
42 http://www.glaucus.org.uk/crustace.htm
43 http://www.mbl.edu/marine_org/marine_org.php?func=detail&myID=BX136&source_myID=D1
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Table 5.3.2-5

Summary of Pile Driving Activities and Equipment

Number of Piles Driven	130
Duration to Drive a Single Pile	4 hours of driving; takes 24 hours to cycle through one pile driving from setting barge in place, completing driving of one monopile to moving barge to next site and setting down legs
Number of Piles Driven per Week	4
Time of Year of the Activity	year round, projected to start in late winter
Total Duration of the Pile Driving Portion of Project	monopiles and scours will be installed over a 400 day period
Diameter of the Piles	water depth 0-12.2 m use 5.1 m diameter monopile and 12.2-15.2 m water depth uses 5.5 m diameter monopile
Depth of Driving	approximately 26 m for turbine monopiles and 46 m for ESP piles
Material Composition of the Piles	tubular conical steel tower
Equipment Used	jack up barge, crane, transport barge, pile driving ram or vibratory hammer
Type of Pile Driving Method	IHC S-1200 hydrohammer (vibratory hammer) or pile driving ram [for monopiles] and IHC S-500 hydrohammer for ESP
Size of Hammer	IHC S-1200: weight [ram=60, hammer with ram in air= 138]; dimensions [outer diam. hammer= 1625, hammer length= 14065] IHC S-500: weight [ram=25, hammer with ram in air= 55]; dimensions [outer diam. hammer= 1220, hammer length= 10200]
Maximum Operating Energy Level of the Hammer	IHC S-1200: max blow energy on pile [1200]; min blow energy on pile [60]; blow rate at max energy [30] IHC S-500: max blow energy on pile [500]; min blow energy on pile [20]; blow rate at max energy [45]
Driving Rate	2 to 36 impacts per minute
Source Level of the Sound (dB re 1 µPa at 1 meter)	232 dB re 1 µPa at 1 m (rms, 1/8-second) calculated from measurement of 182 dB re 1 µPa at 320 m (rms, 1/8-second) at Utgrunden Wind Park, Sweden. a/
Spectral Energy of the Sound (center frequency and total range)	1 Hz to 20 kHz
Sound Propagation Modeling	178 dB re 1 µPa at 500 m (rms, 1/8-second) 172 dB re 1 µPa at 1 km (rms, 1/8-second) 166 dB re 1 µPa at 2 km (rms, 1/8-second)

a/ Ødegaard & Danneskiold-Samsøe A/S, "Offshore Wind-Turbine Construction, Offshore Pile-Driving Underwater and Above-Water Noise Measurements and Analysis," Report No. 00.877, Copenhagen, Denmark, October 2000.

Table 5.3.2-6

Summary of Estimated Impacts from Cable Jet Plow Entrainment to Fish and Invertebrate Eggs and Larvae and Planktonic Food Sources

Marine Resource	Representative Taxon	Life Stage	Estimated Density During Anticipated Period of Jet Plow Operation (individuals/ft^3)		Estimated Impact (individuals entrained)**	
			Nearshore*	Offshore*	Nearshore*	Offshore*
Finfish	Summer Flounder-Windowpane[c]	Eggs	<0.01		4,000	38,000
	Cunner-Tautog-Yellowtail Flounder[c]		0.37		1.8 million	16.9 million
	Scup-Weakfish-Silver Hake[c]		0.23		1.1 million	10.5 million
	Anchovies[c]		0.10		500,000	4.7 million
	Atlantic Menhaden[c]		0.06		300,000	2.8 million
	Fourbeard Rockling-Red Hake-Atlantic Butterfish[c]		<0.01		24,000	230,000
	Windowpane-Fourspot Flounder-Black Sea Bass[c]		0.02		100,000	9.7 million
	Atlantic Mackerel-Cusk[c]		<0.01		12,000	110,000
	Northern Kingfish-Hogchoker[c]		<0.01		8,000	75,000
	Searobins[c]		0.03		130,000	1.2 million
	Winter Flounder	Larvae	Low to very low (<0.001)	Very low	2,600 Winter flounder larvae are negatively buoyant and therefore generally benthic but may swim into the water column[ab]. Metamorphosis to juvenile life stage generally occurs prior to the anticipated period of jet plow operation in Lewis Bay (i.e. before May 31). Juveniles are benthic[ab] and thus not expected to be entrained by water withdrawals.	Very low densities of winter flounder larvae expected. Therefore the estimated impact is negligible.
	Summer Flounder		Very low		Minor to negligible	Minor to negligible
	Windowpane		<0.001		2,000	19,000
	Tautog		0.016		79,000	750,000
	Cunner		0.087		420,000	3.9 million
	Scup		0,008		36,000	340,000
	Anchovies		0.014		66,000	620,000
	Atlantic Menhaden		0.002		8,600	81,000

Table 5.3.2-6

Summary of Estimated Impacts from Cable Jet Plow Entrainment to Fish and Invertebrate Eggs and Larvae and Planktonic Food Sources

Marine Resource	Representative Taxon	Life Stage	Estimated Density During Anticipated Period of Jet Plow Operation (individuals/ft^3)		Estimated Impact (individuals entrained)**	
			Nearshore*	Offshore*	Nearshore*	Offshore*
	Atlantic Butterfish		<0.001		660	6,200
	Black Sea Bass		<0.001		660	6,200
	Atlantic Mackerel		Very low		Minor to negligible	Minor to negligible
Zooplankton	NA	All	934±110 [d]		An estimated 4.0 to 5.0 billion zooplankton would be entrained during the entirety of the jet plow operations in Massachusetts waters.	An estimated 37.5 to 42.5 billion zooplankton would be entrained during the entirety of the jet plow operations.

*Nearshore is here taken to mean Massachusetts waters while Offshore refers to Federal waters
**Where density data were available, mortality was estimated using the following assumptions:
1. Total jet plow distance for cable installation was estimated as 378,000 feet (71.6 miles) for federal waters and 40,000 (7.6 miles) for state waters.
2. Pumping rate of 4,500 gallons per minute (equipment maximum) assumed for the duration of water withdrawals associated with jet plow operation.
3. Average advance rate estimated at 300 feet per hour.
4. Overall volume of water withdrawals associated with jet plow operation (over the duration of the inner-array and transmission cable installation) estimated to be 376 million gallons.
5. 100% mortality assumed for all entrained organisms.
a. Bigelow and Schroeder, 1953
b. Buckley, 1989
c. Estimates for this species based on data for Buzzards Bay presented in Collings et al., 1981. Species that could not reliably be distinguished from each other during the egg life stage are grouped together.
d. Based on data for Massachusetts Bay presented in Oviatt et al., 2007

Table 5.3.2-7

Hearing Thresholds and Bandwidths for Finfish

Hearing Bandwidth 1/3 Octave Band (Hz)	Hearing Threshold			
	Tautog (dB re 1 μPa)	Bass (dB re 1 μPa)	Cod (dB re 1 μPa)	Salmon(dB re 1 μPa)
16	91			
20	90		84	
25	89		82	
31	87		85	108
40	85		86	108
50	86		83	107
63	88		83	106
80	90		82	103
100	89	98	82	100
125	87	99	84	98
160	87	99	84	96
200	93	100	87	102
250	100	100	88	108
315	104	100	91	112
400	115	102	101	132
500	128	106	111	
630		107		
800		106		
1,000		107		
1,250		112		
1,600		119		

Table 5.3.2-8

Predicted Underwater Sound Levels Perceived by Marine Animals (Hearing Threshold Sound Levels) from Operation of the Proposed Action

Marine Animal	Perceived Operational Sound Level (Hearing Threshold Sound Levels – dB_{ht} re 1 μPa)	
	At 100 m	At 20 m
Toothed Wales All Species	<0	<0
Baleen Whales All Species	0	14
Hair Seals All Species	<0	<0
Sea Turtles All Species	<0	<0
Finfish All Species	7	21

Table 5.3.2-7

Hearing Thresholds and Bandwidths for Finfish

Hearing Bandwidth 1/3 Octave Band (Hz)	Hearing Threshold			
	Tautog (dB re 1 μPa)	Bass (dB re 1 μPa)	Cod (dB re 1 μPa)	Salmon(dB re 1 μPa)
16	91			
20	90		84	
25	89		82	
31	87		85	108
40	85		86	108
50	86		83	107
63	88		83	106
80	90		82	103
100	89	98	82	100
125	87	99	84	98
160	87	99	84	96
200	93	100	87	102
250	100	100	88	108
315	104	100	91	112
400	115	102	101	132
500	128	106	111	
630		107		
800		106		
1,000		107		
1,250		112		
1,600		119		

Table 5.3.2-8

Predicted Underwater Sound Levels Perceived by Marine Animals (Hearing Threshold Sound Levels) from Operation of the Proposed Action

Marine Animal	Perceived Operational Sound Level (Hearing Threshold Sound Levels – dB_{ht} re 1 μPa)	
	At 100 m	At 20 m
Toothed Wales All Species	<0	<0
Baleen Whales All Species	0	14
Hair Seals All Species	<0	<0
Sea Turtles All Species	<0	<0
Finfish All Species	7	21

Table 5.3.2-9

Predicted Underwater Sound Levels Perceived by Finfish (Hearing Threshold Sound Levels) from Pile Driving

Finfish species	Perceived Sound of Pile Driving (Hearing Threshold Sound Levels - dB_{ht} re 1 μPa)		
	At 500 m (1640 ft)	At 320 m (1050 ft)	At 30 m (98 ft)
Tautog	81	85	105
Bass	76	80	100
Cod	87	91	111
Atlantic salmon	72	76	96

Note:
Research shows marine animal avoidance reactions occur for 50% of individuals at 90 dB_{ht} re 1 μPa, occur for 80% of individuals at 98 dB_{ht} re 1 μPa, and occur for the single most sensitive individual at 70 dB_{ht} re 1 μPa. For estimating the zone of injury for marine animals, a sound pressure level of 130 dB_{ht} re 1 μPa (i.e. 130 dB above an animal's hearing threshold) is recommended.

Table 5.3.2-10

Calculated Zone of Behavioral Response for Significant Avoidance Reaction to Pile Driving

Finfish	Distance Where dB_{ht} = 90 dB re 1 μPa and Avoidance Reaction May Occur (m)
Tautog	180
Bass	100
Cod	350
Atlantic salmon	60

Table 5.3.2-11

Early Benthic and Pelagic Life Stages of Species with Designated EFH Potentially Present in the Proposed Action Area

Species	Eggs (E)	Larvae (L)	Potential Time of Year Present in Nantucket Sound
Early Benthic Life Stages			
Winter flounder	X	X	February – July
Early Pelagic Life Stages			
Atlantic butterfish	X	X	April to August
Atlantic mackerel	X	X	Unknown/water temperatures between 5-22.7°C
Black Sea Bass		X	August – September
Summer Flounder	X	X	October – May
Winter Flounder		X	L: March – July. Larvae swim upwards, then sink.

X = Potentially Present in proposed action area
R = Potentially Present in proposed action area, but would be considered rare
Note: Although king mackerel, Spanish mackerel and cobia have designated EFH for eggs and larval stages, further analysis indicates that they are unlikely to occur in Nantucket Sound (see Section 4.2.4 of the EFH Assessment).

Table 5.3.3-1

Section 106 Assessment of Effect for Historic Properties within the Cape Wind Project Visual APE

Town	Name	Section 106 Effect
Cape Cod		
Falmouth	Nobska Point Light Station a/	Adverse Effect
	Falmouth Heights Historic District* d/	Adverse Effect
	Maravista Historic District* c/	Adverse Effect
	Menahaunt Historic District* c/	Adverse Effect
	Church Street Historic District* c/	Adverse Effect
Yarmouth	House at 205 South Street* c/	No Effect
	Park Avenue Historic District* c/	Adverse Effect
	Massachusetts Avenue Historic District* c/	No Effect
Harwich	Ocean Grove Historic District* d/	Adverse Effect
	Hithe Cote* c/	Adverse Effect
Chatham	Stage Harbor Light* c/	Adverse Effect
	Capt. Joshua Nickerson House* c/	No Effect
	Jonathan Higgins House* c/	No Effect
	Stage Harbor Road Historic District* c/	No Adverse Effect
	Champlain Road Historic District* c/	Adverse Effect
Barnstable	Cotuit Historic District a/	Adverse Effect
	Col. Charles Codman Estate a/	Adverse Effect
	Wianno Historic District a/	Adverse Effect
	Wianno Club a/	Adverse Effect
	Hyannis Port Historic District a/	Adverse Effect
	Kennedy Compound b/	Adverse Effect
Chatham	Monomoy Point Lighthouse a/	Adverse Effect
Martha's Vineyard		
Tisbury	West Chop Light Station a/	Adverse Effect
	Ritter House a/	No Effect
	William Street Historic District a/	No Effect
	Seaman's Reading Room* d/	No Effect
	West Chop Historic District* d/	Adverse Effect
Oak Bluffs	East Chop Light a/	Adverse Effect
	Martha's Vineyard Campground Historic District a/, b/	No Effect
	Flying Horses Carousel b/	No Effect
	The Arcade a/	No Effect
	Dr. Harrison A. Tucker Cottage a/	Adverse Effect
	Oak Bluffs Christian Union Chapel a/	No Effect
	Cottage City Historic District* c/	Adverse Effect
	Vineyard Highlands Historic District* c/	Adverse Effect

Table 5.3.3-1

Section 106 Assessment of Effect for Historic Properties within the Cape Wind Project Visual APE

Town	Name	Section 106 Effect
Edgartown	Edgartown Village Historic District a/	Adverse Effect
	Edgartown Harbor Lighthouse a/	Adverse Effect
	Cape Poge Light a/	Adverse Effect
Nantucket		
Nantucket	Nantucket Historic District b/	Adverse Effect
	Nantucket (Great Point) Light a/	Adverse Effect
Undisclosed		
Undisclosed	Native American Sacred Site* e/	Adverse Effect

a/ Listed on the NRHP
b/ National Historic Landmark
c/ Recommended eligible for inclusion in the NRHP
d/ Identified by MHC as eligible for inclusion in the NRHP
e/ Site location information remains confidential
* Property identified and evaluated subsequent to publication of the DEIS

Table 5.3.4-1

Frequencies Licensed by the FCC to Marine Service

Channel	Ship Tx	Ship Rx	Use
01	156.050	160.650	Ship/shore - telephone
02	156.100	160.700	Ship/shore - telephone
03	156.150	160.750	Ship/shore - telephone
04	156.200	160.800	Ship/shore - telephone
04A	156.200		Canadian Coast Guard - authorized stations
05	156.250	160.850	Ship/shore - telephone
06	156.300		Intership - Safety
07	156.350	160.950	Ship/shore - telephone
07A	156.350		Intership-Ship/shore - commercial
08	156.400		Intership - commercial
09	156.450		Intership-Ship/shore
10	156.500		Intership-Ship/shore - commercial
11	156.550		Vessel Traffic Management
12	156.600		Vessel Traffic Management
13	156.650		Bridge to bridge - 1 watt - Safety of Nav.
14	156.700		Vessel Traffic Management
15	156.750		EPIRB Buoy
16	156.800		International Distress/Safety/Calling
17	156.850		Pilotage - vessel docking/maneuvers
18	156.900	161.500	Port Operation
18A	156.900		Intership-Ship/shore - commercial
19	156.950	161.550	Port Operation
19A	156.950		Port Operation
20	157.000		Port Operation
21	157.050	161.650	Port Operation
21A	157.050		US Coast Guard - authorized stations
21B	161.650		Canadian Coast Guard - Weather Broadcasts
22	157.100	161.700	Port Operation
22A	157.100		US/Canadian Coast Guard - Public Working Freq.
23	157.150	161.750	Ship/shore - telephone (in Canada)
23A	157.150		Port Operation (USCG)
24	157.200	161.800	Ship/shore - telephone
25	157.250	161.850	Ship/shore - telephone
26	157.300	161.900	Ship/shore - telephone
27	157.350	161.950	Ship/shore - telephone
28	157.400	162.000	Ship/shore - telephone
60	156.025	160.625	Ship/shore - telephone
61	156.075	160.675	Ship/shore - telephone
61A	156.075		Intership-S/S - Can. Coast Guard Private
62	156.125	160.725	Ship/shore - telephone
62A	156.125		Intership-S/S - Can. Coast Guard Private
63	156.175	160.775	Ship/shore - telephone
63A	156.175		Intership-Ship/shore - commercial
64	156.225	160.825	Ship/shore - telephone
65	156.275	160.875	Ship/shore - telephone

Table 5.3.4-1

Frequencies Licensed by the FCC to Marine Service

Channel	Ship Tx	Ship Rx	Use
65A	156.275		Port Operation (Canadian Coast Guard Private)
66	156.325	160.925	Ship/shore - telephone, Port Operation
66A	156.325		Marinas on the BC Coast
67	156.375		Intership-Ship/shore
68	156.425		Intership-Ship/shore - non-commercial
69	156.475		Intership-Ship/shore
70	156.525		Digital Selective Calling - Distress and Safety
71	156.575		Vessel Traffic Management
72	156.625		Intership
73	156.675		Intership-Ship/shore
74	156.725		Vessel Traffic Management
(75 and 76 not used)			
77	156.875		Pilotage - vessel docking/maneuvers
78	156.925	161.525	Port Operation
78A	156.925		Intership-Ship/shore - commercial
79	156.975	161.575	Port Operation
79A	156.975		Intership-Ship/shore - commercial
79B	161.575		Commercial Fishing - Receive only
80	157.025	161.625	Port Operation
80A	157.025		Intership-Ship/shore - commercial
81	157.075	161.675	Port Operation
81A	157.075		Port Operation (USCG)(CCG anti-pollution)
82	157.125	161.725	Port Operation, s/s telephone
82A	157.125		Port Operation (USCG)(CCG)
83	157.175	161.775	Ship/shore - telephone (CCG)
83A	157.225		Intership, Port Operation (USCG)
84	157.225	161.825	Ship/shore - telephone
85	157.275	161.875	Ship/shore - telephone
86	157.325	161.925	Ship/shore - telephone
87	157.375	161.975	Ship/shore - telephone
87B	161.975		AIS - Universal Shipborne Automatic Id System
88	157.425	162.025	Ship/shore - telephone
88B	162.025		AIS - Universal Shipborne Automatic Id
88A	157.425		Intership
Weather Channels:			
Wx1	162.550		
Wx2	162.400		
Wx3	162.475		
Wx4	161.650		
Wx5	162.425		
Wx6	162.500		
Wx7	162.525		
Wx8	162.450		
Wx9	161.775		
Wx10	163.275		

Table 5.3.4-2

Summary of Radio Frequency Applications

Name of Band	Abbr.	Freq Range	Primary Application	Sample use
Low Frequency	LF	30-300 KHz.	Data & Position Info	Older Navigational beacons
Medium Frequency	MF	300-3000 KHz.	Voice/Audio Narrowband	AM Broadcast, older marine comm.
High Frequency	HF	3-30 MHz.	Voice/Audio Narrowband	Amateur Radio, Inter'l Broadcast
Very High Frequency	VHF	30-300 MHz.	Audio/Video Wideband	FM, TV, Land mobile
Ultra High Frequency	UHF	300-3000 MHz.	Audio, Video Data	TV, cellular, wireless networking
Super High Frequency	SHF	3-30 GHz.	Digital Data	Microwave and satellite links
Extremely High Frequency	EHF	30-300 GHz.	Digital Data	Microwave links & radio astronomy

Table 5.3.4-3

Potential Frequencies Affected by Wind Energy Facilities

Freq Range	Description	Primary Uses a/	Interference Potential b/	Area Affected c/	Comment
3 Hz–30 Hz	Extremely Low Frequency	Military, Pipeline Inspection	0		Wavelength > turbine height
30 Hz–300 Hz	Super Low Frequency	Military	1		Wavelength > turbine height
300 Hz–3 KHz	Ultra Low Frequency	Communications in mines, Earthquake research	1		Wavelength > turbine height
3 KHz–30 KHz	Very Low Frequency	Military; old navigation beacons	1		Wavelength > turbine height
30 KHz–300 KHz	Low Frequency	Aircraft beacons, navigation (LORAN), information & weather	1		Wavelength > turbine height
300 KHz–3 MHz	Medium Frequency	Navigation Safety; AM Broadcast Band	2 (mitigation probably not necessary)	Radius of 800 meters	Time varying signals, AGC should compensate
3 MHz–30 MHz	High Frequency	Short wave Broadcast	2 (mitigation probably not necessary)	Radius of 800 meters	Time varying signals, AGC should compensate
30 MHz–300 MHz	Very High Frequency	TV, FM Broadcast, Land Mobile, VOR, Aircraft, Public Safety	3 (mitigation possible)	Radius of 900 meters	Some impact to VHF digital TV broadcast
300 MHZ-3 GHz	Ultra High Frequency	Broadcast TV, Cellular, Public Safety, Land Mobile, Microwave	3 (mitigation possible)	Radius of 800 meters	Some impact to UHF digital TV broadcast
3 GHz-30 GHz	Super High Frequency	Wireless LANs, Satellite, Radar, uplink/downlinks & terrestrial high-speed "backhauls".	2 (mitigation probably not necessary) d/	Radius of 1,000 meters	Some impact to downlinks; LANs not protected
30 GHz-300 Ghz	Extremely High Frequency	Radio Astronomy	1		Wavelength much smaller than turbine height

a/ This is not an inclusive list, but identifies the high-use services that are most sensitive to interference.
b/ 0 to 1 = negligible, 2 = minor, 3 = moderate, 4 = significant, 5 = severe. Note: please supply definitions and examples of the desired categories. The provided levels of impact have been used by us for 25 years, and some study would be required to set up a proper mapping.
c/ For reference, the wind turbines are spaced approximately 629 meters apart.
d/ Subject to review by the FAA/DoD Liaison Long Range Radar Joint Program Office (JPO).

Table 5.4.1-1

Species Protected Under the Federal Endangered Species Act (FESA), the Massachusetts Endangered Species Act (ESA), and the Marine Mammal Protection Act (MMPA)

Species	FESA Status	MESA Status	MMPA Status
Fin whale (*Balaenoptera physalus*)	Endangered	Endangered	Protected
Humpback whale (*Megatera novaeangliae*)	Endangered	Endangered	Protected
Northern Right whale (*Eubalaena glacialis*)	Endangered	Endangered	Protected
Long-finned Pilot whale (*Clobicephala melas*)	Not listed	No special status	Protected
Minke whale (*Balaenoptera acutorostrata*)	Not listed	No special status	Protected
Common dolphin (*Delphinus delphis*)	Not listed	No special status	Protected
Harbor porpoise (*Phocoena phocoena*)	Not listed	No special status	Protected
Striped dolphin (*Stenella coeruleoalba*)	Not listed	No special status	Protected
White-sided dolphin (*Lagenorhynchus acutus*)	Not listed	No special status	Protected
Harbor seal (*Phoca vitulina concolor*)	Not listed	No special status	Protected
Harp seal (*Phoca groenlandica*)	Not listed	No special status	Protected
Hooded seal (*Cystophora cristata*)	Not listed	No special status	Protected
Kemp's ridley sea turtle (*Lepidpchelys kempii*)	Endangered	Endangered	N/A
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	Endangered	N/A
Loggerhead sea turtle (*Caretta caretta*)	Threatened	Threatened	N/A

Table 5.4.1-2

Finfish and Shellfish Resources of Cape Cod and the Islands Near the South of Tuckernuck Island Alternative

Common Name	Scientific Name
Albacore tuna	*Thunnus alalunga*
Alewife	*Alosa pseudoharengus*
Amberjack	*Seriola sp.*
Atlantic butterfish	*Poronotus triacanthus*
Atlantic herring	*Clupea harengus*
American lobster	*Homarus americanus*
Atlantic menhaden	*Brevoortia tyrannus*
Bay anchovy	*Anchoa mitchilli*
Bay scallop	*Aequipecten irradians*
Blueback herring	*Alosa aestivalis*
Bonito	*Sarda sarda*
Channeled whelk	*Busycotypus canaliculatus*
Cunner	*Tautogolabrus adspersus*
Cusk	*Brosme brosme*
Knobbed whelk	*Busycon caria*
Lightning whelk	*Busycon sinistrum*
Little skate	*Raja erinacea*
Long-finned squid	*Loligo pealei*
Longhorn sculpin	*Myoxocepalus octodecimspinosus*
Menhaden	*Brevoortia sp.*
Northern quahog	*Mercenaria mercenaria*
Northern sand lance	*Ammodytes clubius*
Northern sea robin	*Prionotus carolinus*
Ocean pout	*Macrozoarces americanus*
Red hake	*Urophycis chuss*
Round herring	*Etrumeus teres*
Scup	*Stenotomus chrysops*
Sea scallop	*Placopecten magellanicus*
Silver hake	*Meruccius bilinearis*
Smooth dogfish	*Mustelus canis*
Soft shell clam	*Mya arenaria*
Spiny dogfish	*Squalus cubensis*
Striped anchovy	*Anchoa hepsetus*
Striped bass	*Morone saxatilis*
Tautog	*Tautoga onitis*
Weakfish	*Cyroscion regalis*
Windowpane flounder	*Scophthalmus aquosus*
Winter skate	*Leucoraja ocellata*
Winter flounder	*Pleuronectes americanus*

Note: Shading denotes species most commonly sought

Table 5.4.1-3

Potential EFH Designations Within South of Tuckernuck Island Alternative Location

Species	Eggs	Larvae	Juveniles	Adults
Atlantic butterfish (*Peprilus triacanthus*)	X	X	X	X
Atlantic Cod (*Gadus morhua*)	X	X	X	X
Atlantic mackerel (*Scomber scombrust*)	X	X	X	X
Atlantic sea herring (*Clupea harengus*)		X	X	X
Black sea bass (*Centropristus striata*)		X	X	X
Bluefin tuna (*Thunnus thynnus*)			X	X
Blue shark (*Prionace glauca)*			X	X
Cobia (*Rachycentron canadum)*	X	X	X	X
Common thresher shark (*Alopias vulpinus)*		X	X	X
Dusky shark (*Carcharhinus obscurus)*			X	
Haddock (*Melanogrammus aeglefinus*)				X
King mackerel (S*comberomorus cavalla)*	X	X	X	X
Little skate (*Leucoraja erinacea)*			X	X
Long finned squid (*Loligo pealei*)			X	X
Monkfish (*Lophius americanus*)	X	X		
Ocean pout (*Macrozoarces americanus)*	X	X		X
Ocean quahog (*Artica islandica)*			X	X
Red hake (*Urophycis chus)*	X	X	X	
Sandbar shark (*Carcharhinus plumbeus)*			X	X
Scup (*Stenotomus chrysops*)			X	X
Shortfin mako shark (*Isurus oxyrhinchus)*			X	
Short finned squid (*Illex illecebrosus*)			X	X
Spanish mackerel (*Scomberomorus maculates)*	X	X	X	X
Spiny dogfish (*Squalus cubensis)*			X	X
Summer flounder (*Paralicthys dentatus*)	X	X	X	X
Surf clam (*Spisula islandica*)			X	X
Whiting (*Merluccius bilinearis)*	X	X		X
Windowpane flounder (*Scopthalmus aquosus)*	X	X	X	X
Winter flounder (*Pleuronectes americanus*)	X	X	X	X
Winter skate (*Leucoraja ocellata)*			X	X
Witch flounder *Glyptocephalus cynoglossus)*		X		
Yellowtail flounder (*Limanda ferruginea)*	X	X	X	X

Table 5.4.2-1

Dominant Benthic Invertebrate Taxonomic Groups of Monomoy Shoals

Organism	Individuals/m^2	Relative Dominance (percent)
Hydrozoa	100-500	5.0
Turbellaria	<1	<0.1
Nemertea	1-9	0.1
Nematodes	1-9	0.1
Annelids (mainly Polychaeta)	1-1,000	8.4
Mollusca	1-500	-
Gastropoda	50-100	1.3
Bivalvia	50-500	4.6
Crustacea	100-10,000	-
Amphipoda	100-9,000	76.6
Cumacea	1-49	0.4
Isopoda	1-9	<0.1
Decapoda	1-250	2.1
Echinoidea (sea urchins)	1-100	0.9
Ophiuroidea (basketstars and brittlestars)	1-49	0.4
Asteroidea (starfish)	<1	<0.1
Total	NA	100

Table 5.4.2-2

Potential EFH Designations Within Monomoy Shoals

Species	Eggs	Larvae	Juveniles	Adults
Atlantic Cod (*Gadus morhua*)				X
Haddock (*Melanogrammus aeglefinus*)				X
Winter flounder (*Pleuronectes americanus*)	X	X	X	X
Atlantic halibut (*Hippoglossus hippoglossus*)	X	X	X	X
Atlantic butterfish (*Peprilus triacanthus*)	X	X	X	X
Atlantic mackerel (*Scomber scombrust*)	X	X	X	X
Summer flounder (*Paralicthys dentatus*)	X	X		X
Scup (*Stenotomus chrysops*)			X	X
Black sea bass (*Centropristus striata*)		X	X	X
Blue shark (*Prionace glauca)*				X
Bluefin tuna (*Thunnus thynnus*)			X	X
Long finned squid (*Loligo pealei*)			X	X
Short finned squid (*Illex illecebrosus*)			X	X
Surf clam (*Spisula islandica*)			X	X

Table 5.4.2-1

Dominant Benthic Invertebrate Taxonomic Groups of Monomoy Shoals

Organism	Individuals/m^2	Relative Dominance (percent)
Hydrozoa	100-500	5.0
Turbellaria	<1	<0.1
Nemertea	1-9	0.1
Nematodes	1-9	0.1
Annelids (mainly Polychaeta)	1-1,000	8.4
Mollusca	1-500	-
Gastropoda	50-100	1.3
Bivalvia	50-500	4.6
Crustacea	100-10,000	-
Amphipoda	100-9,000	76.6
Cumacea	1-49	0.4
Isopoda	1-9	<0.1
Decapoda	1-250	2.1
Echinoidea (sea urchins)	1-100	0.9
Ophiuroidea (basketstars and brittlestars)	1-49	0.4
Asteroidea (starfish)	<1	<0.1
Total	NA	100

Table 5.4.2-2

Potential EFH Designations Within Monomoy Shoals

Species	Eggs	Larvae	Juveniles	Adults
Atlantic Cod (*Gadus morhua*)				X
Haddock (*Melanogrammus aeglefinus*)				X
Winter flounder (*Pleuronectes americanus*)	X	X	X	X
Atlantic halibut (*Hippoglossus hippoglossus*)	X	X	X	X
Atlantic butterfish (*Peprilus triacanthus*)	X	X	X	X
Atlantic mackerel (*Scomber scombrust*)	X	X	X	X
Summer flounder (*Paralicthys dentatus*)	X	X		X
Scup (*Stenotomus chrysops*)			X	X
Black sea bass (*Centropristus striata*)		X	X	X
Blue shark (*Prionace glauca)*				X
Bluefin tuna (*Thunnus thynnus*)			X	X
Long finned squid (*Loligo pealei*)			X	X
Short finned squid (*Illex illecebrosus*)			X	X
Surf clam (*Spisula islandica*)			X	X

Table 5.4.3-1

Summary of Maximum Anticipated Temporary and Permanent Impacts to Benthic Habitat-Smaller Project – Scour Mats

Smaller Project Alternative at Horseshoe Shoal - Scour Mats					
	Area of Impact (square feet)	**Area of Impact (acres)**	**Area of Impact (square meters)**	**Percent of Project Area a/**	**Percent of Nantucket Sound b/**
TEMPORARY IMPACTS					
OUTSIDE 3-MILE LIMIT - FEDERAL WATERS					
Inner-array cables (29.7 miles)					
Inner array cables	940,896	21.60	87,412	0.286	0.0060
Pontoon impacts	940,896	21.60	87,412	0.286	0.0060
Anchoring to install cables	101,426	2.33	9,423	0.031	0.0006
Anchor line sweep for installation	9,262,836	212.65	860,546	2.816	0.0593
Barge to hold Cables	1,260	0.03	117	0.00038	0.000008
Sub-total	**11,247,314**	**258**	**1,044,793**	**3.4**	**0.07**
Submarine cable system (5.9 miles)					
115kV submarine cable system	373,824	8.58	34,729.4	0.114	0.002
Pontoon impacts	373,824	8.58	34,729.4	0.114	0.002
Anchoring to install cable system	86,341	1.98	8,021.3	0.026	0.00054
Anchor line sweep for installation	3,680,184	84.49	341,900.3	1.119	0.02232
Sub-total	**4,514,173**	**104**	**419,380**	**1.37**	**0.03**
Construction of WTGs and ESP					
Jack-up Barges for WTGs	201,497	4.63	18,720	0.0613	0.0013
Barges for ESP	8,138	0.19	756	0.0025	0.0001
Sub-total	**209,636**	**4.81**	**19,476**	**0.0637**	**0.0013**
Scour Control					
WTG scour control mats	52,767	1.21	4902.21	0.0160	0.00034
Anchoring to Install WTG Scour Mats	10,842	0.25	1007.25	0.0033	0.00007
ESP scour control mats	4,871	0.11	452.51	0.0015	0.00003
Anchoring to Install ESP Scour Mats	1,001	0.02	92.98	0.0003	0.00001
Sub-total	**69,481**	**1.60**	**6,455**	**0.021**	**0.000**
Total Temporary Impacts Outside the 3-mile Limit	**16,040,602**	**368**	**1,490,104**	**4.88**	**0.101**
INSIDE 3-MILE LIMIT - STATE WATERS					
Submarine cable system (7.6 miles)					
115kV submarine cable system	481,536	11.05	44,736	0.1464	0.0031
Pontoon impacts	481,536	11.05	44,736	0.1464	0.0031
Anchoring to install cable	111,218	2.55	10,333	0.0338	0.0007
Anchor line sweep for installation	4,740,576	108.83	440,414	1.4411	0.0304
Pre-excavation pit for HDD	2,925	0.067	272	0.0009	0.0000
Barges for HDD Operation	2,513	0.058	233	0.0008	0.0000
Total Temporary Impacts Inside the 3-mile Limit	**5,820,304**	**133.62**	**540,724**	**1.7693**	**0.0373**
TOTAL TEMPORARY IMPACTS	**21,860,906**	**501.83**	**2,030,828**	**6.64**	**0.14**
PERMANENT IMPACTS					
WTG and ESP pilings					
61 WTGs (16.75' diameter pile) (0-39 feet)	13,441	0.31	1248.74	0.0041	0.0001
4 WTGs (18.0' diameter pile) (40-> feet)	1,018	0.02	94.56	0.0003	0.00001
6 ESP Piles	58	0.0013	5.3512	0.00002	0.0000004
Total Pile Impacts	**14,517**	**0.33**	**1349**	**0.0044**	**0.0001**
TOTAL PERMANENT IMPACTS	**14,517**	**0.33**	**1,349**	**0.0044**	**0.0001**
TOTAL FOR ALL IMPACTS	**21,875,423**	**502**	**2,032,176**	**6.65**	**0.1388**

a/ Project Area ≅ 11.8 square miles (~30.5 km^2)
b/ Area of Nantucket Sound ≅ 560 square miles (1,450 km^2)

Table 5.4.3-2

Summary of Maximum Anticipated Temporary and Permanent Impacts to Benthic Habitat-Smaller Project
Smaller Project Alternative on Horseshoe Shoal – Rock Armoring

	Area of Impact (square feet)	Area of Impact (acres)	Area of Impact (square meters)	Percent of Project Area a	Percent of Nantucket Sound b/
		TEMPORARY IMPACTS			
OUTSIDE 3-MILE LIMIT - FEDERAL WATERS					
Inner-array cables (29.7 miles)					
Inner array cables	940,896	21.60	87,412	0.286	0.0060
Pontoon impacts	940,896	21.60	87,412	0.286	0.0060
Anchoring to install cables	101,426	2.33	9,423	0.031	0.0006
Anchor line sweep for installation	9,262,836	212.65	860,546	2.816	0.0593
Barge to hold Cables	1,260	0.03	117	0.00038	0.000008
Sub-total	**11,247,314**	**258.17**	**1,044,793**	**3.419**	**0.0720**
Submarine cable system (5.9 miles)					
115kV submarine cable system	373,824	8.58	34,729.4	0.114	0.002
Pontoon impacts	373,824	8.58	34,729.4	0.114	0.002
Anchoring to install cable system	86,341	1.98	8,021.3	0.026	0.00054
Anchor line sweep for installation	3,680,184	84.49	341,900.3	1.119	0.02232
Sub-total	**4,514,173**	**103.63**	**419,380**	**1.372**	**0.028**
Construction of WTGs and ESP					
Jack-up Barges for WTGs	201,497	4.63	18,720	0.0613	0.0013
Barges for ESP	8,138	0.19	756	0.0025	0.0001
Sub-total	**209,636**	**4.81**	**19,476**	**0.0637**	**0.0013**
Rock Armoring					
WTG Rock Armoring	1,030,249	23.65	95713.27	0.3132	0.00660
Barge for Installing WTG Rock Armoring	201,497	4.63	18719.72	0.0613	0.00129
ESP Rock Armoring	17,664	0.41	1641.04	0.0054	0.00011
Barge for Installing ESP Rock Armoring	12,400	0.28	1151.98	0.0038	0.00008
Sub-total	**1,261,810**	**29**	**117,226**	**0.38**	**0.01**
Total Temporary Impacts Outside the 3-mile Limit	**17,232,932**	**396**	**1,600,875**	**5.24**	**0.11**
INSIDE 3-MILE LIMIT - STATE WATERS					
Submarine cable system (7.6 miles)					
115kV submarine cable system	481,536	11.05	44,736	0.1464	0.0031
Pontoon impacts	481,536	11.05	44,736	0.1464	0.0031
Anchoring to install cable	111,218	2.55	10,333	0.0338	0.0007
Anchor line sweep for installation	4,740,576	108.83	440,414	1.4411	0.0304
Pre-excavation pit for HDD	2,925	0.067	272	0.0009	0.00002
Barges for HDD Operation	2,513	0.058	233	0.0008	0.00002
Total Temporary Impacts Inside the 3-mile Limit	**5,820,304**	**134**	**540,724**	**1.77**	**0.04**
TOTAL TEMPORARY IMPACTS	**23,053,236**	**529.20**	**2,141,598.71**	**7.01**	**0.15**
PERMANENT IMPACTS					
WTG and ESP pilings					
61 WTGs (16.75' diameter pile) (0-39 feet)	13,441	0.31	1248.74	0.0041	0.0001
4 WTGs (18.0' diameter pile) (40-> feet)	1,018	0.02	94.56	0.0003	0.00001
6 ESP Piles	58	0.0013	5.3512	0.00002	0.0000004
Total Pile Impacts	**14,517**	**0.33**	**1348.66**	**0.0044**	**0.0001**
TOTAL PERMANENT IMPACTS	**14,517**	**0.33**	**1,349**	**0.0044**	**0.0001**
TOTAL FOR ALL IMPACTS	**23,067,753**	**529.53**	**2,142,947.37**	**7.0118**	**0.1465**

a/ Project Area ≅ 11.8 square miles (~30.5 km^2)
b/ Area of Nantucket Sound ≅ 560 square miles (1,450 km^2)

Table 5.4.6-1

Alternatives Versus Project Purpose and Need

Alternative	Criteria Not Met 1	2	3	4	5	6
1. Energy efficiency	X	X			X	X
2. Natural gas-fired power plant	X	X				X
3. New oil-fired power plant	X	X				X
4. Nuclear power plant	X	X	X			X
5. Clean coal fired power plant	X	X				X
6. Repowering existing facilities	X	X				X
7. Tidal, in-stream energy	X				X	
8. Wave energy	X				X	
9. Solar, photovoltaic	X	X	X		X	
10. Ocean thermal	X		X		X	
11. Floating wind turbines			X		X	

1. Alternative energy facility that uses wind resource
2. Offshore New England
3. Technology that is available, feasible and economic in New England
4. Interconnect with NEPOOL
5. Substantial contribution to enhancing electric reliability
6. Achieve RPS of 4 percent by 2009.

Table 5.4.6-2

Inputs and Outputs of Energy Generation

Input Impacts	Generation Facility Impacts	Output Impacts
Fuel supply	Land area	Air emissions
Fuel Transport	Chemical storage	Waste disposal
Water withdrawal	Water treatment	Water discharge

Table 6.1.13-1

Population and Housing Unit Increases in Barnstable, Nantucket, and Dukes Counties, Massachusetts

County	Population Increase 1990 - 2000	2000 Population	2004 Population*	Population Increase 2000 - 2004	Number of Housing Units 2000	Number of Housing Units 2004**	Change in Housing Units 2000 - 2004 **
Barnstable	19%	222,230	228,683	2.9%	147,083	153,798	4.6%
Nantucket	58%	14,987	15,518	3.5%	9,210	10,042	9.0%
Dukes	29%	9,520	10,238	7.5%	14,836	15,670	5.6%

*US Census Bureau Estimate

**2005 for Barnstable County

Table 5.4.6-1

Alternatives Versus Project Purpose and Need

Alternative	Criteria Not Met					
	1	2	3	4	5	6
1. Energy efficiency	X	X			X	X
2. Natural gas-fired power plant	X	X				X
3. New oil-fired power plant	X	X				X
4. Nuclear power plant	X	X	X			X
5. Clean coal fired power plant	X	X				X
6. Repowering existing facilities	X	X				X
7. Tidal, in-stream energy	X				X	
8. Wave energy	X				X	
9. Solar, photovoltaic	X	X	X		X	
10. Ocean thermal	X		X		X	
11. Floating wind turbines			X		X	

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*US Census Bureau Estimate

**2005 for Barnstable County

Table 5.4.6-1

Alternatives Versus Project Purpose and Need

Alternative	Criteria Not Met					
	1	2	3	4	5	6
1. Energy efficiency	X	X			X	X
2. Natural gas-fired power plant	X	X				X
3. New oil-fired power plant	X	X				X
4. Nuclear power plant	X	X	X			X
5. Clean coal fired power plant	X	X				X
6. Repowering existing facilities	X	X				X
7. Tidal, in-stream energy	X				X	
8. Wave energy	X				X	
9. Solar, photovoltaic	X	X	X		X	
10. Ocean thermal	X		X		X	
11. Floating wind turbines			X		X	

1. Alternative energy facility that uses wind resource
2. Offshore New England
3. Technology that is available, feasible and economic in New England
4. Interconnect with NEPOOL
5. Substantial contribution to enhancing electric reliability
6. Achieve RPS of 4 percent by 2009.

Table 5.4.6-2

Inputs and Outputs of Energy Generation

Input Impacts	Generation Facility Impacts	Output Impacts
Fuel supply	Land area	Air emissions
Fuel Transport	Chemical storage	Waste disposal
Water withdrawal	Water treatment	Water discharge

Table 6.1.13-1

Population and Housing Unit Increases in Barnstable, Nantucket, and Dukes Counties, Massachusetts

County	Population Increase 1990 - 2000	2000 Population	2004 Population*	Population Increase 2000 - 2004	Number of Housing Units 2000	Number of Housing Units 2004**	Change in Housing Units 2000 - 2004 **
Barnstable	19%	222,230	228,683	2.9%	147,083	153,798	4.6%
Nantucket	58%	14,987	15,518	3.5%	9,210	10,042	9.0%
Dukes	29%	9,520	10,238	7.5%	14,836	15,670	5.6%

*US Census Bureau Estimate

**2005 for Barnstable County

Table 7.2-1

Summary Table of MMS Consultations with Agencies

Agency Name	Consultation Date	Primary Area of Agency Concern
Mashpee Wampanoag Tribe	Meeting between agency and MMS was held in Mashpee in both July of 2006 and June/July of 2007	Tribe discussed concerns with the siting of the Project
Wampanoag Tribe of Gay Head	Meeting between agency and MMS was held in Aquinnah in both July of 2006 and June/July of 2007	Tribe discussed concerns with the siting of the Project
National Marine Fishery Service	MMS sent letter to agency: March 16, 2006	Requested that NMFS become cooperating agency on Project review
FAA	Agency sent letter August 8, 2005	Affirming Determination of No Hazard of Air Navigation (Determination expired February 2007)
National Park Service	MMS sent letter to agency: March 16, 2006	Monitoring possible implications to the Cape Cod National Seashore
*U.S. Environmental Protection Agency	MMS sent letter to agency March 16, 2006	Requested that EPA become cooperating agency; assistance with matters relating to Clean Air and Clean Water Acts
Office of Environmental Policy and Compliance	MMS sent letter to agency: March 16, 2006	Requested that the Office of Environmental Policy and Compliance become a cooperating agency on Project review
*U.S. Coast Guard	MMS sent letter to agency March 16, 2006	MMS requested that the USCG become cooperating agency on Project review
*U.S. Army Corps of Engineers	MMS sent letter to agency March 16, 2006	Requested that the USACE become cooperating agency on Project review
U.S. Air Force	MMS sent letter to agency: March 16, 2006	Requested that the U.S. Air Force become a cooperating agency on Project review
U.S. Department of Energy	MMS sent letter to agency March 16, 2006	Requested that the DOE become cooperating agency on Project review
U.S. Fish and Wildlife Service	MMS sent letter to agency: March 16, 2006	Document Reviewer and Endangered Species Act
U.S. Geological Survey	MMS sent letter to agency: March 16, 2006	Requested that the U.S. Geological Survey become a cooperating agency on Project review
MA Executive Office of Environmental Affairs	MMS sent letter to agency March 16, 2006	Requested that EOEA work with MMS as a joint preparer
*MA Historical Commission	MMS sent letter to agency March 16, 2006	MMS requested assistance from agency in matters related to Section 106 of NHPA
MA Department of Environmental Protection	MMS sent letter to agency: March 16, 2006	Document Reviewer
MA National Guard	MMS sent letter to agency: March 16, 2006	Providing information on the Massachusetts Military Reservation
MA Office of Coastal Zone Management	MMS sent letter to agency: March 16, 2006	Document Reviewer
MA Division of Marine Fisheries, Natural Heritage and Endangered Species Program	Mitigation Proposal sent to MMS: March 14, 2008	Proposal to mitigate impacts on Piping Plovers and Roseate Terns
MA Division of Marine Fisheries	Mitigation Proposal sent to MMS April 18, 2008	Proposal to mitigate potential impacts on marine resources and fisheries habitats in Nantucket Sound

Table 7.2-1

Summary Table of MMS Consultations with Agencies

Agency Name	Consultation Date	Primary Area of Agency Concern
*Barnstable Municipal Airport Commission	MMS sent letter to agency: May 30, 2006 Agency responded: February 27, 2007	Request to have cooperating agency status on the Project review
Barnstable Municipal Airport Commission	Letter to MMS: April 16, 2008	Comments on DEIS
*Cape Cod Commission	MMS sent letter to agency: March 16, 2006	MMS requested that CCC become a cooperating agency on the Project review
*Town of Yarmouth	Agency contacted MMS February 27, 2007	Yarmouth requested cooperating agency status for the Project review
*Town and County of Nantucket	Agency contacted MMS February 23, 2007	Nantucket requested they be involved in the regulatory process of the Project review
*Town of Barnstable	Agency Contacted MMS February 27, 2007	Requested designation as cooperating agency

Notes: * Entities that have formally requested to be Cooperating Agencies

Table E-1

Summary of Impacts

Resource	Impacts	
	Construction Impacts	***Operation Impacts***
Regional Geologic Setting	minor	minor
Noise	*Onshore:* minor *Offshore:* minor *Underwater:* minor	*Onshore:* negligible *Offshore:* negligible *Underwater:* negligible
Oceanography	*Currents:* negligible *Waves:* negligible *Salinity:* negligible *Temperature:* negligible *Sediment Transport:* minor *Water depth/bathymetry:* minor	*Currents:* minor *Waves:* negligible *Salinity:* negligible *Temperature:* negligible *Sediment Transport:* minor *Water depth/bathymetry:* minor
Climate and Meteorology	minor	negligible
Air Quality	*Public Health:* negligible *Visibility:* negligible *Emissions:* minor	*Public Health:* negligible *Visibility:* negligible *Emissions:* minor (beneficial to climate change)
Water Quality	minor	negligible (with the exception of spills)
Electric and Magnetic Fields	negligible	negligible
Terrestrial Vegetation	negligible to minor	negligible to minor
Coastal and Intertidal Vegetation	negligible to minor	negligible (negligible to minor for repairs, depending on location)
Terrestrial and Coastal Faunas other than Birds	negligible to minor	negligible (minor for migratory bats)
Avifauna	*Terrestrial Birds:* Raptors - negligible Passerines - minor *Coastal Birds:* negligible to minor *Marine Birds:* minor to moderate Pelagic Species - minor Waterfowl and Non-Pelagic Water Birds - moderate	*Terrestrial Birds:* Raptors - negligible. Passerines – minor to moderate. *Coastal Birds:* negligible to moderate *Marine Birds:* negligible to major Pelagic Species - minor Waterfowl and Non-Pelagic Water Birds - moderate
Subtidal Offshore Resources	*Soft-Bottom Benthic Invertebrate Communities:* minor *Shellfish:* minor *Meiofauna:* minor *Plankton:* negligible	*Soft-Bottom Benthic Invertebrate Communities:* minor *Shellfish:* minor *Meiofauna:* minor *Plankton:* minor
Non-ESA Marine Mammals	*Acoustical Harassment:* minor *Vessel Strikes:* minor *Vessel Harassment:* minor *Temporary Reduced Habitat:* minor *Turbidity:* negligible to moderate (due to pile driving) *Pollution/ Potential Spills:* minor	*Acoustical Harassment:* negligible *EMF:* negligible *Pollution/ Potential Spills:* minor to moderate *Vessel Strikes:* minor *Vessel Harassment:* minor *Fouling Communities:* negligible to minor

Table E-1

Summary of Impacts

Resource	**Impacts**	
	Construction Impacts	***Operation Impacts***
Fisheries	*Finfish:* minor *Finfish (juveniles)*: minor *Demersal Eggs and Larvae: minor* *Commercial & Recreational Fishing/Gear:* minor	*Commercial & Recreational Fishing/Gear:* negligible to minor *Sound and Vibration:* negligible to minor *Vessel Traffic:* minor to moderate *EMF:* negligible *Lighting:* negligible/none *Alterations to Waves, Currents, Circulation:* negligible *Habitat Change:* minor *Displacement of Prey:* none
EFH	*Benthic/Demersal:* minor *Water Column:* negligible to minor *SAV/Eelgrass:* negligible to minor	*Benthic/Demersal:* minor *Water Column:* negligible to minor *SAV/Eelgrass:* negligible to minor
T&E	*Sea turtles:* negligible to minor *Cetaceans:* negligible to minor *Avifauna:* negligible to minor *Eastern Cottontail Rabbit:* negligible	*Sea Turtles:* negligible to minor *Cetaceans:* negligible to minor *Avifauna:* minor to moderate *Eastern Cottontail Rabbit:* negligible
Urban and Suburban Infrastructure	negligible to minor	negligible
Population and Economics	minor	minor
Environmental Justice	Negligible (i.e., not a disproportionately high impact on minority or low income populations)	negligible (i.e., not a disproportionately high impact on minority or low income populations)
Visual Resources	minor	moderate Impacts on Shore (Major impacts on-water in close proximity to proposed action)
Cultural Resources	minor	Pending on the outcome of Section 106 process
Recreation and Tourism	minor	minor
Competing Uses of Waters and Seabed	minor	minor (except for impacts to Figawi Race which are moderate)
Overland Transportation Arteries	minor	negligible
Airport Facilities and Aviation Traffic	negligible to minor	minor
Port Facilities and Vessel Traffic	minor	*Ship, Container and Bulk Handling Facilities:* negligible *Cruise Ship Traffic:* negligible *Ferry Operations:* minor *Marinas and Recreational Boating:* minor to moderate *Commercial fishing:* minor to moderate *Search and Rescue:* negligible *Ice:* negligible
Communications: Radar, EMF, Signals, and Beacons	minor	minor (moderate for radar)