Submerged Aquatic Vegetation Investigation

Cape Wind Energy Project

NANTUCKET SOUND, MASSACHUSETTS

PREPARED FOR

Cape Wind Associates, LLC
75 Arlington Street,
Suite 204
Boston, MA 02116

PREPARED BY

ESS Group, Inc.
888 Worcester Street, Suite 240
Wellesley, Massachusetts 02482

Project No. E159-503.9

August 24, 2006

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EXECUTIVE SUMMARY

ESS Group, Inc. (ESS) was contracted by Cape Wind Associates LLC to conduct an investigation of several areas of Horseshoe Shoal in Nantucket Sound, where previous side-scan sonar observations indicated potential submerged aquatic vegetation (SAV) beds. This investigation was conducted on July 25, 2006, to ground-truth these potential SAV signatures in the general area of the proposed Cape Wind Energy Project. The major goal of this study was to determine the presence or absence, and to qualitatively assess the composition of, SAV in these areas of variable side-scan sonar returns.

The vegetative composition within the study area was found to consist primarily of attached red (*Grinnellia americana, Dasya pedicellata and Gracillaria tikvahiae*), and green (*Codium fragile, Ulva lactuca*) macro-algae. Of the 20 observation points, only one location included patches of eelgrass (*Zostera marina).* Of the species identified above, only *C. fragile* is not native to New England waters; however its presence since its introduction has rapidly expanded to range from emergent tidal pools to depths of -12 meters (Villard-Bohnsack 2003).

The data collected during this investigation indicates that while there is significant SAV present on Horseshoe Shoal, it is primarily macro-algae and not seagrass. Many of the macro-algae observed are considered seasonal, beginning its growth in early to mid-summer and disappearing by late August (Hillson 1982, Kingsburry and Sze 1997, Villard-Bohnsac 2003). Of the species observed, *G. americana* is potentially the most likely responsible for the variable side-scan sonar readings collected during previous geophysical studies conducted in 2003 and 2005. *G. americana* is a fast growing red alga, with a two- to four-inch-wide blade capable of growing to 50 centimeters in length within a single summer growth season (Hillson 1982). These algae would potentially show as an irregularity on side-scan sonar surveys during the summer growth season, and is likely the reason for the original variable sonar returns.

ESS Group, Inc.

1.0 INTRODUCTION

Submerged Aquatic Vegetation (SAV) beds are important components of benthic ecosystems. Marine SAV beds in New England are generally composed of a variety of macro-algae and/or two types of seagrasses; eelgrass (*Zostera marina*) or widgeon grass (*Ruppia maritima*). These beds provide important nursery areas for commercially and recreationally important species, act as a food source for a variety of marine and aquatic organisms, and can aid in the dissipation of wave energy in shallow water systems (Green and Short 2003).

Previous geophysical studies, utilizing side-scan sonar of Horseshoe Shoal, completed by Ocean Surveys Inc. (OSI) in 2002, 2003 and 2005, identified two areas (approximately 4,300 acres) of potential SAV. These areas are located along the western and central sections of the shoal in waters ranging from approximately two to thirty feet in depth (Figure 1). This investigation was conducted in response to a request from the Massachusetts Coastal Zone Management Staff for a qualitative assessment, or ground-truthing, of these areas on Horseshoe Shoal.

Due to the methods used in the previous study (side-scan sonar), only a "potential" SAV signature was able to be distinguished. Variable sonar returns; such as those observed, may represent seagrass beds, macro-algae or hard substrate such as large rocks and boulders. The goal of this study was to verify the presence/absence of SAV and the potential composition of the vegetative beds found.

2.0 METHODS AND APPROACH

On July 25, 2006, ESS and OSI scientists conducted a SAV study within the two previously identified target areas. The commercial vessel Eastwind was utilized as an observation platform. Scientists began collecting observations at 0630 hours and continued until weather conditions made it unsafe to deploy and retrieve the observation/sample gear (approximately 1500 hours). Nine transects were established through the study areas. Each transect consisted of one to four observation points (Figure 1). These observation points roughly approximated several of the proposed Cape Wind Energy Project's turbine locations. These points were selected in order to maximize the breadth of the surveyed area. Shallow water areas (<30 feet) were only sampled if they displayed a potential SAV signature from earlier OSI geophysical survey studies. While there is potential for SAV to be present in any water less than 30 feet in depth, the previous side-scan sonar studies allowed for a more precise search area.

At each observation point, a Simrad OE9030/9031 Diver Television System (Figure 2) was lowered from the observation platform to the seabed using an electronic winch. The platform and the camera system were then allowed to drift with the prevailing currents for approximately five minutes. The camera provided a view field of approximately three foot by three foot; beyond this distance shadows were visible but not identifiable. Scientists onboard the observation platform monitored the color video feed in real time and digital files of the video feed were recorded for later analysis. A copy of the DVD containing the video feed is included as Appendix A. A Trimble DSM12/212 Differential Global Positioning System was used to navigate to all points and to track the location of all samples.

After the camera system was retrieved from the seafloor, a VanVeen Grab (Figure 3) was utilized to sample the vegetative communities observed at several observation points. The samples were used to verify the observations made using the camera system. Representative vegetative samples were collected and stored in seawater for later processing and or identification.

3.0 RESULTS

Due to weather conditions, two observation locations originally identified were not able to be sampled. One of these locations (T1A) was located outside of the potential SAV areas, and the second (T3A) was located at the westernmost edge of the western potential SAV area. All other observation points were sampled. Table 1 depicts the species observed at each sample location.

Several small patches of eelgrass (*Zostera marina*) were found at location T2B, ranging in size from 1 to several meters in diameter (due to the limited field of view of the camera system, size estimates are approximations). The eelgrass beds observed can be seen on Appendix A (DVD of Sample Sites). No other seagrass was observed during the survey.

The vast majority of SAV observed consisted of red macro-algae (*Grinnellia americana, Dasya pedicellata and Gracillaria tikvahiae*), and green macro-algae (*Codium fragile, Ulva lactuca)*. The only brown macro-algae observed was *Sargassum filipendula,* which was only observed drifting in two of the sample locations. Most of the macro-algae observed were found attached via holdfasts to limpet (*Crepidula* sp.) shells along the seafloor. Very little gravel or other hard-substrate was observed. In addition to the documented vegetation, an unidentified species of sponge was found in several of the observation points. This yellow sponge ranged from one to six inches in height and was found scattered along the substrate.

All macro-algae observed consisted of specimens ranging from one to eight inches in height. The most common species observed was *G. americana*. In addition to live *G. americana*, much of the drift algae observed during the video survey consisted of dead *G. americana*, which is easily identified by its bright yellow translucent color. The second most common species observed was *C. fragile*, which was present both attached and in the drift.

Most of the macro-algae observed is considered seasonal, beginning its growth in early to mid-summer and disappearing by late August (Hillson 1982, Kingsburry and Sze 1997, Villard-Bohnsac 2003). Other macro-algae species may succeed these species as the season progresses; however, new seagrass bed development would not be expected this late in the growing season.

Additional sample points (i.e., random samples in addition to the pre-determined transect points), were not collected due to time and weather constraints.

Macro-algae has the ability to colonize an area very quickly after a disturbance, whereas seagrasses may take decades (Green and Short 2003) to colonize a given area. The previous side-scan sonar study indicated variable sonar returns indicative of SAV beds. This study may have been observing large beds of *G. americana*, which is known to grow to a length of 50 centimeters in a single, short, summer growing season (Villard-Bohnsack 2003, Hillson 1982). *G. americana* was the most commonly observed species during the July 2006 survey and was observed in large patches throughout the study area.

The results of this survey indicate that while the area of Horseshoe Shoal surveyed can support eelgrass beds, it is dominated by fast-growing and opportunistic macro-algae. One single controlling factor cannot be singled out as the main reason for a lack of eelgrass beds; however, the constant shifting nature of the sediment on the shoal may prohibit extensive seagrass growth. Additional factors may include inadequate irradiance, and/or competition from opportunistic macro-algae during the short summer growth season.

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Tables

TABLE 1: Species Observed

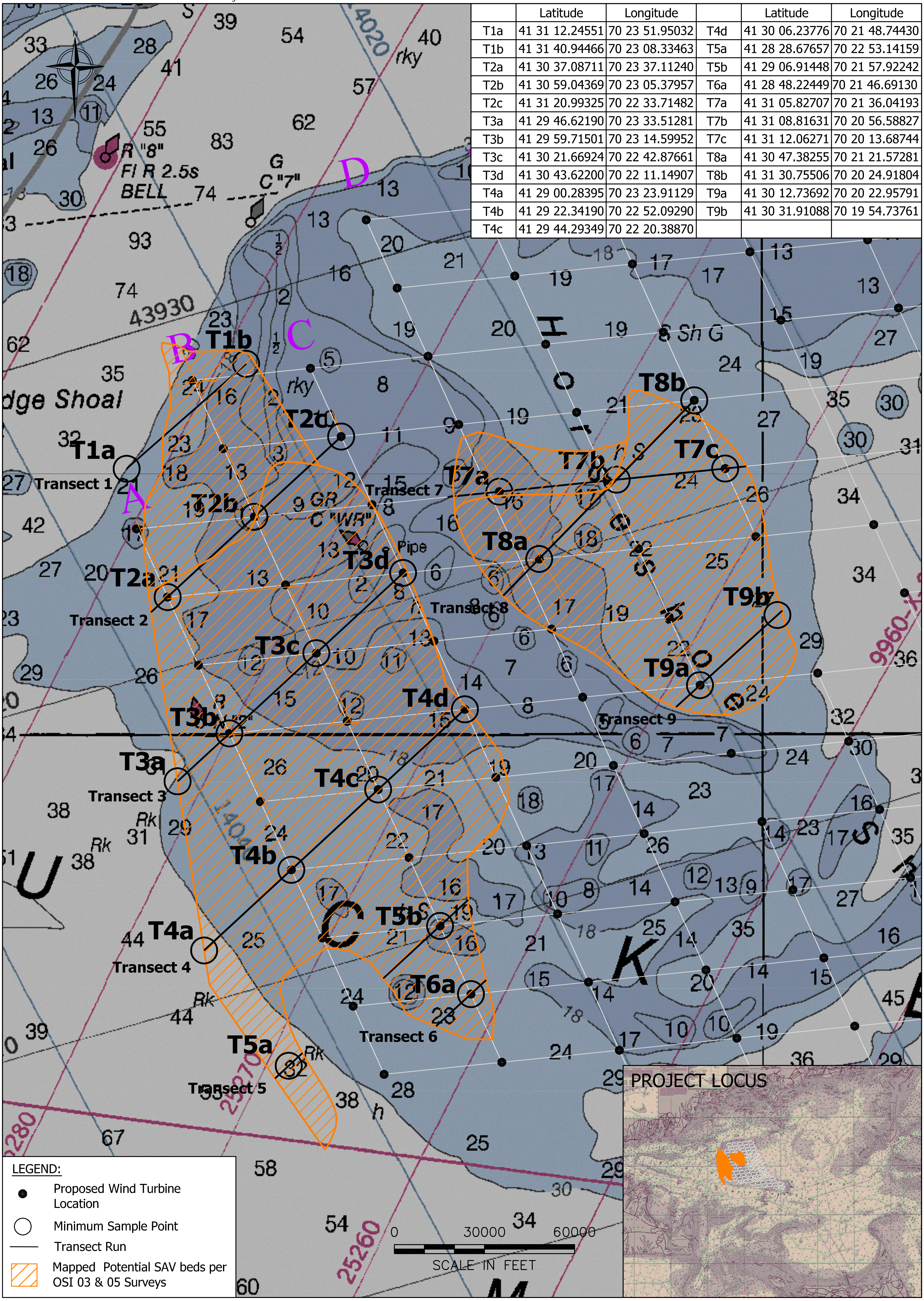
Location	Depth in Feet*	Species Present
T1A	NS	
T1B	26	*C. fragile, G. americana,* un-identified yellow sponge
T2A	24	*C. fragile, G. americana, U. lactuca,*
T2B	15	*Z. marina, C. fragile, G. americana, U. lactuca*
T2C	15	*C. fragile, U. lactuca, G. takvahiae*
T3A	NS	
T3B	26	*C. fragile, G. americana*
T3C	26	*C. fragile, G. americana, S. filipendula*
T3D	14	*C. fragile, S. filipendula*
T4A	42	*C. fragile, G. americana,* un-identified yellow sponge
T4B	25	*C. fragile, G. americana*
T4C	23	*C. fragile, G. americana*
T4D	20	*C. fragile, G. americana*
T5A	43	*C. fragile,* un-identified yellow sponge
T5B	23	*C. fragile, G. americana*
T6A	35	*C. fragile, G. americana*
T7A	18	*C. fragile, G. americana*
T7B	28	*C. fragile, G. americana*
T7C	28	*C. fragile, G. americana*
T8A	15	*C. fragile, G. americana*
T8B	35	*C. fragile, G. americana, G. takvahiae*
T9A	23	*C. fragile, G. americana,* un-identified yellow sponge
T9B	32	*C. fragile, G. americana*

* Depth reported is as collected on the RV Eastwind
NS = Not Sampled

Figures

DATE: Aug 28, 2006 - 2:27PM
FILENAME: H:E159107-FEIRE159-SAV-Transects.dwg

	Latitude	Longitude		Latitude	Longitude
T1a	41 31 12.24551	70 23 51.95032	T4d	41 30 06.23776	70 21 48.74430
T1b	41 31 40.94466	70 23 08.33463	T5a	41 28 28.67657	70 22 53.14159
T2a	41 30 37.08711	70 23 37.11240	T5b	41 29 06.91448	70 21 57.92242
T2b	41 30 59.04369	70 23 05.37957	T6a	41 28 48.22449	70 21 46.69130
T2c	41 31 20.99325	70 22 33.71482	T7a	41 31 05.82707	70 21 36.04193
T3a	41 29 46.62190	70 23 33.51281	T7b	41 31 08.81631	70 20 56.58827
T3b	41 29 59.71501	70 23 14.59952	T7c	41 31 12.06271	70 20 13.68744
T3c	41 30 21.66924	70 22 42.87661	T8a	41 30 47.38255	70 21 21.57281
T3d	41 30 43.62200	70 22 11.14907	T8b	41 31 30.75506	70 20 24.91804
T4a	41 29 00.28395	70 23 23.91129	T9a	41 30 12.73692	70 20 22.95791
T4b	41 29 22.34190	70 22 52.09290	T9b	41 30 31.91088	70 19 54.73761
T4c	41 29 44.29349	70 22 20.38870			



ESS Group, Inc.
Engineers
Scientists
Consultants

Cape Wind Associates, LLC
Cape Wind Project
Nantucket Sound

NOAA Chart# 13237, Nantucket Sound & Approaches

Submerged Aquatic Vegetation Transects

Figure 1

Figure 2. Simrad OE9030/9031 Diver Television System

Figure 3. Deployment of VanVeen Grab from the deck of the observation platform

Appendix A

DVD of Sample Sites