Engineering, Planning,
Landscape Architecture
and Environmental Science

MILONE & MACBROOM®

November 12, 2013

Mr. Ernest Steinauer, Chairman
Nantucket Conservation Commission
2 Bathing Beach Road
Nantucket, MA 02554

RE: Clarification of Sand Mitigation Protocols
Baxter Road Temporary Stabilization Application
Town of Nantucket
Nantucket, Massachusetts
MMI #2967-11-4

Dear Chairman Steinauer and Members of the Conservation Commission:

During two recent hearings of the Conservation Commission, there was much discussion of sand mitigation volumes for the above-referenced project. Milone & MacBroom, Inc. (MMI) has reviewed these comments with the project team and given a great deal of consideration to the issues at hand. This letter is intended to address two critical technical issues associated with the application: 1) sand nourishment rates; and 2) monitoring and replenishment protocols. In addition, the consultant to Quidnet Squam raised other points that we have addressed here. We attempted to discuss the comments with Mr. O'Connell, but Quidnet Sqaum would not allow their consultant to provide the applicant team with feedback.

Sand Nourishment Rates

As stated in the application materials and subsequent submittals, the calculated average annual retreat <u>within our project area</u> is 4.6 feet per year, which leads to an average sand volume of 14.3 cubic yards per linear foot (cy/lf). Our letter of November 5, 2013 included supporting computations for this number. Nonetheless, some comments submitted through the course of the hearing have suggested that a higher rate should be used.

The values presented by the applicant are for the bank contribution to the littoral cell. Questions have been raised about the beach contribution to this system. Base mapping used for the application was obtained in July 2013 and so reflects a summer profile of the beach of approximately elevation 8.0 mean low water (MLW). Historically, based on Woods Hole Group (WHG) survey data, the winter profile has been around elevation 5.0 MLW. In a previous letter, MMI stated that excavation for the lowest geotubes plus the scour apron would require some 18 cy/lf of excavation. This is intended to serve as a general rule of thumb. In fact, the excavation volume will vary over the 1,500-foot project length. This number was then referenced multiple times, and it was implied that the entire 18 cy/lf is permanently unavailable for transport, but this is not true. In fact, the only sand volume that has normally been available to the system and will

now be encapsulated within the geotubes is the 2.7 cy/lf between elevations 5.0 MLW and 8.0 MLW.

The years of monitoring data available for this reach of coastal Massachusetts and number of calculations completed cannot overcome the incredible amount of variation in the natural system here. For example, if one reviews the transect surveys completed by WHG in August 2013 (see Attachment A of MMI's November 5, 2013 letter), we see that between September 2012 and March 2013 the beach in our project area (transects 91, 91.5, 92) accreted. The point of this is not to suggest that nourishment is not needed or warranted but rather to state that any combination of numbers and calculations can be done to derive different answers to the question of appropriate nourishment volume. The computations provided by the applicant are based on site-specific scientific data, and using any other source to estimate nourishment volumes is not technically justifiable. In the end, it seems logical (and in keeping with standard practice for beach nourishment projects) that the annual average be used as the baseline condition, after which time adaptive protocols need to be implemented to support the long-term mitigation. The truth is that future conditions are just as likely to demand a lower nourishment volume as a higher one in any given year.

To that end, we continue to believe that the 14.3 cy/lf of nourishment proposed in our application materials was calculated using methods and data appropriate to this site. If the beach volumes of 2.7 cy/lf are added to the 14.3, then a volume of 17.0 cy/lf results. Given the vagaries associated with the calculations, the dynamic nature of the system, and complexity of the proposed activity, ***the Town of Nantucket proposes a nourishment rate of 17 cy/lf, which may be modified based on the results of the monitoring program outlined below***. If the Conservation Commission believes additional sand must be required in order to grant approval for the project, then the town would accept a condition that requires 20 cy/lf of mitigation for this project provided that this volume may be modified after three years based on the results of the monitoring program outlined below. If 20 cy/lf is required as a condition, then the nourishment protocols outlined below will be increased proportionally.

Monitoring and Replenishment Protocols

Our initial application materials included a monitoring plan that has been modified and adjusted during the last hearings. At this time, we feel it necessary to outline a final, complete monitoring plan for the proposed project in one concise summary. Much of this is repetitive, having been presented previously, but this is intended to present the information in one location so the commission and the public are provided a complete plan for their consideration.

The geotube installation will be visually inspected monthly and following significant storm events throughout its life. The inspection will consist of:

1. Photodocumentation of the condition of the geotube and nourishment sand
2. Observation of the sacrificial sand layer and beach level in front of the seaward geotube to determine if replenishment is needed

3. Identification of the location of any exposed geotextile
4. Identification of any repair required to the geotextile
5. Visual observation of the ends of the tubes to determine if flanking is occurring

Results of the inspection will be submitted in writing to the Town of Nantucket Public Works Director. If inspection reveals that repair work is needed, the Public Works Director will coordinate having this completed as soon as possible. The schedule of repair will be determined based upon the severity of the work required. For example, repair of torn geotextile will be completed as soon as the beach is accessible for such activity.

The project will be monitored as follows:

- Perform transect surveys in the locations previously monitored by WHG each year in April and August. These will be conducted in the locations noted on the attached Figure 1 and represent historic survey locations supplemented by additional cross sections around the proposed geotube installation and additional locations in Quidnet Squam.
- Perform additional transect survey at all locations noted as soon as possible following all significant nor'easter storms.
- Survey the location of the top of the bank each year within the 1,500-foot project reach and for approximately 300 feet north and south of the project.

The monitoring data will be used to estimate the volume of nourishment sand remaining on the geotubes as well as the accretion of sand on downdrift beaches. Results of the monitoring will be compiled into an annual report in April of each year documenting the data collection and analysis and recommending a nourishment protocol. Analysis of the data is proposed as follows:

1. Review beach transect data to estimate accretion and erosion at each monitored transect.
2. Calculate accretion and erosion volumes at transect locations.
3. Compare top of bank locations and estimate bank retreat over the previous calendar year.
4. Calculate bank volume loss in the project area and 300 feet north and south.
5. Submit data and computations to the Conservation Commission for review with a recommendation for nourishment.

The following is proposed for nourishment on this project:

1. Annually every April following survey of transects, provide 14.3 cy/lf of bank-compatible sand.
2. Provide additional nourishment sand through the fall and winter as needed to meet the annual minimum of 17 cy/lf.
    - Alternatively, the 17 cy/lf could be delivered on a staggered schedule through the year to address the concern that a storm may come when there is little or no sand left on top of the geotubes to feed the littoral system. This staggered delivery approach was suggested by Jim O'Connell and is something we could accommodate if the Conservation Commissions prefers it. This approach could

even be something that is done on an experimental basis in the first few years to see if it is an improvement.

3. Evaluate annually the need for additional sand in excess of 17 cy/lf based on the results of the computations and analysis described above.
4. Based on visual observation, replenish the sand fill at a minimum rate of two cy/lf when the beach immediately in front of the geotube is at elevation 3.5 MLW or lower (i.e., half the height of the lower geotube is exposed). Replenishment will be directly in front of the geotube as soon after the erosion event as possible.
5. At no time will more than twice the original volume of sand (17 cy/lf) be placed in any calendar year.

Delivery tickets from the sand supplier will be provided to the Conservation Commission through its agent to document the total volume of sand provided.

Adverse Impact Evaluation and Assessment

The consultant for Quidnet Squam, Jim O'Connell, asked how project-related impacts will be monitored and how the applicant will distinguish between impacts from the geotubes and natural shoreline change in Quidnet Squam. As Mr. O'Connell noted at the hearing of November 6, specifically defining the cause of shoreline changes at Quidnet Squam would not be easy to accomplish. In particular, if mitigation volume equals the amount of sand that would have been contributed to the littoral process in the absence of the project, and if there is no indication of erosion caused by sand deprivation between the project and Quidnet Squam, there would be no basis for attributing unusual erosion in Quidnet Squam to the project. Given the dynamic nature of Nantucket's eastern shorefront, there is no reason to expect that Quidnet Squam could not develop a "hotspot" characterized by increased erosion over a period of time.

The monitoring plan outlined above is intended to evaluate the changes and includes both shoreline change monitoring and top of bank monitoring. The applicant is responsible for providing to the littoral system the volume of sand that would have been provided by the eroding coastal bank absent the project. By conducting top of bank monitoring within the project area and 300 feet to the north and south, we can get a sense of what the natural coastal bank contribution volume would be in a given year and can compare that volume to the nourishment volume to assess the adequacy of the nourishment volume. This top of bank monitoring will augment the shoreline monitoring to provide another data source that can be used to evaluate potential impacts. WHG will be asked to provide their opinion regarding the changes and their sources in their annual reports. The data presented will then need to be reviewed collectively by professionals for the interested parties. It is critical to state again that the proposed project is temporary in nature, which minimizes the risk of long-term impacts. Furthermore, if adverse impacts are detected, the commission can order the town to remove the geotubes.

We would recommend that the Conservation Commission, as a condition of approval, appoint a panel of three professionals that have no current involvement in the project to evaluate the data

presented and come to conclusions regarding the adequacy of the nourishment program and existence of adverse project impacts, if any.

Beach and Dune Sand Mitigation Plan

The consultant for Quidnet Squam has suggested that a plan be proposed whereby mitigation sand would be added to that shoreline area if impacts are detected. As noted by the Conservation Commission's staff, this is not possible. The town cannot propose mitigation on property where the owners have not signed on to the application. As noted above, the town is willing to accept a larger annual minimum mitigation requirement of up to 20 cy/lf. Further, if adverse impacts are occurring and the impacts are determined to be caused by the geotubes, then the Conservation Commission can order the geotubes to be removed.

We hope this information addresses any concerns of the commission members. As we have mentioned during past hearings, timely implementation of stabilization measures at this location is critically important to public health and safety.

Very truly yours,

MILONE & MACBROOM, INC.

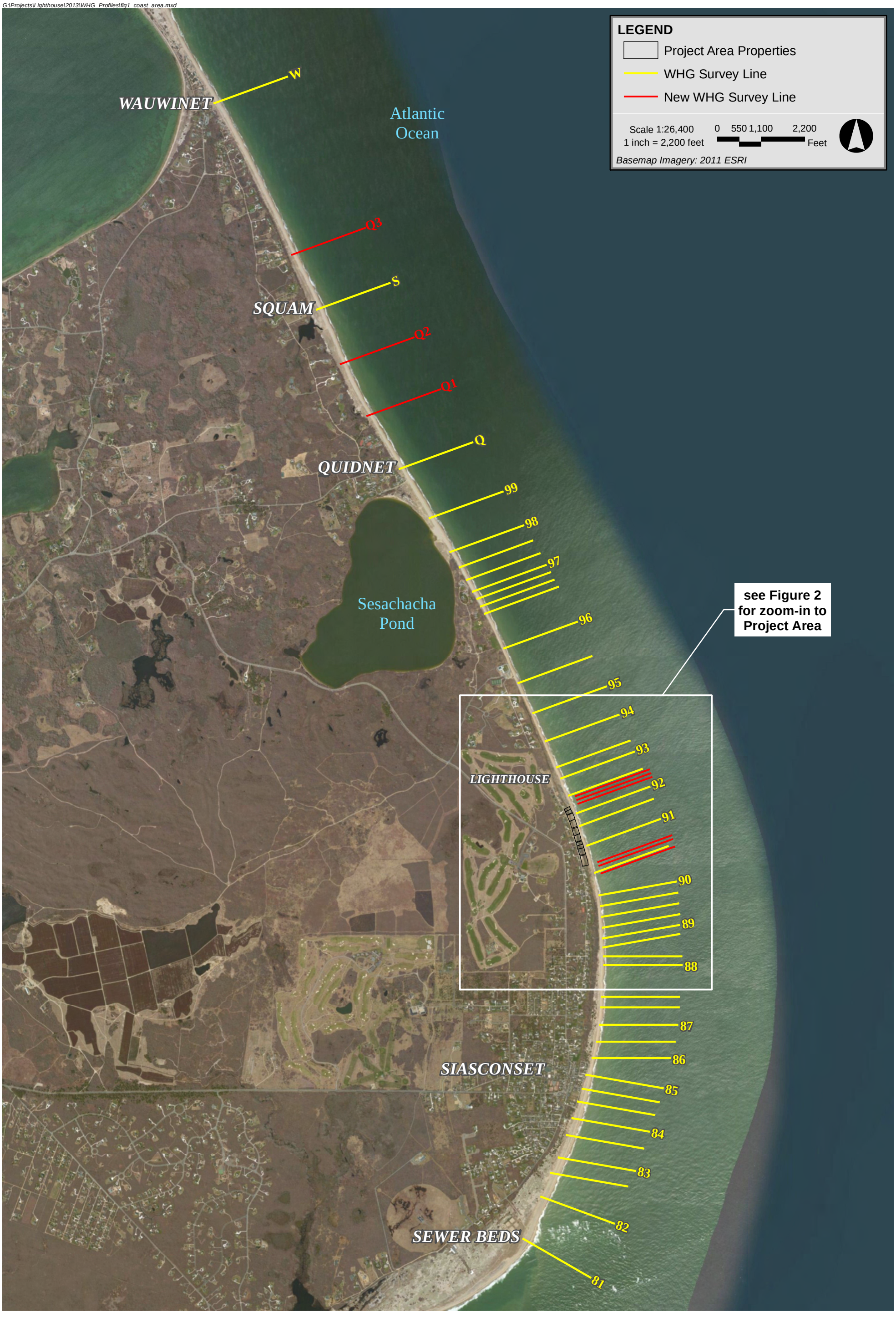
Nicolle E. Burnham, P.E., CFM
Principal

Enclosures: Figure 1 – WHG Survey Lines prepared by Epsilon

cc: Kara Buzanoski, Public Works Director – Town of Nantucket

2967-11-4-n1213-ltr.docx

G:\Projects\Lighthouse\2013\WHG_Profiles\fig1_coast_area.mxd



Baxter Road Nantucket, MA

Figure 1

WHG Survey Lines - Wauwinet to Sewer Beds

G:\Projects\Lighthouse\2013\WHG_Profiles\fig2_project_area.mxd

Baxter Road Nantucket, MA

Figure 2

WHG Survey Lines - Project Area