*Engineering, Planning*
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MILONE & MACBROOM®

August 2, 2013

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

**RE: Sconset Bluff Stabilization Application**
**Sconset Beach Preservation Fund**
**Nantucket, Massachusetts**
**MMI #2967-11-1**

Dear Chairman Steinauer and Members of the Conservation Commission:

Milone & MacBroom, Inc. (MMI) was contracted by the Town of Nantucket to provide technical review of the current Sconset Bluff Stabilization project that is before your commission. At this time, we have observed existing site conditions and reviewed the following materials:

1. Project Plans entitled "Sconset Beach Preservation Fund Sconset Bluff Erosion Control Project Notice of Intent" (14 sheets) dated 6/28/13 prepared by Ocean and Coastal Consultants
2. Report entitled "Notice of Intent Baxter Road and Sconset Bluff Storm Damage Prevention Project"
3. March 2013 Beach Profiles of Sconset Bluff
4. Figure S-1 2003-2012 Coastal Bank Retreat (Average of 3.18 feet per year)
5. Figure S-2 Existing Revetments Prepared by Epsilon
6. Figure S-3 Pacific Coast Highway Revetment North of Point Magu State Park, California Prepared by Epsilon
7. Report entitled "Siasconset Coastal Bank Stabilization and Beach Preservation Project Alternatives Analysis" prepared by Ocean and Coastal Consultants dated September 2010
8. Computation worksheet (one page) entitled "Project: Sconset Group: A Case 20130528 – Riprap 5.5; Rubble Mount Revetment Design"
9. Computation worksheets (18 pages) entitled "Sconset Beach Stabilization Marine mattress and Gabion Concept 100-Year Storm Design Calculations" dated 8/20/10 prepared by Ocean and Coastal Consultants
10. Document entitled "Baxter Road and Sconset Bluff Storm Damage Prevention Project Notice of Intent Responses to Questions from Nantucket Conservation Commission Asked at Public Hearing on July 24, 2013"

MMI was assisted in this review by Roberge Associates Coastal Engineers (RACE) of Stratford, Connecticut.

The current application proposes armoring approximately 4,200 linear feet (0.8 miles) of shoreline in two phases. Phase 1 extends from 73 Baxter Road north to 119 Baxter Road and would be completed in fall 2013. Phase 2 would extend from 51A to 71 Baxter Road and would be completed in 2014.

The proposed plan calls for placement of geotextile fabric, an 18-inch thick layer of four- to eight-inch diameter filter stone, and stone revetment from elevation 0.0 Mean Low Water to elevation 27.0 Mean Low Water. The stone used in the revetment will range from 18 to 54 inches in diameter and will be finished at a slope of 1.5:1. Sacrificial sand will be placed over the finished stone revetment at a slope of 2:1 with an average rate of placement of 9.3 cubic yards per linear foot. The plan further calls for the coastal bank extending from the top of the finished revetment to the crest of the bluff to be vegetated.

There are limited options available for stabilizing this bluff. In our opinion, if hard armoring is to be installed, the plan currently presented by the applicant offers the best solution for this area. Unfortunately, "soft armoring" using only slope stabilization and vegetation techniques would not produce a stable slope and is not a viable long-term solution for this site. While we believe the concepts presented for stabilization and the supporting computations are sound, we offer the following technical comments based on our site observations and review of the application materials provided to date. At this point, there is insufficient evidence provided by the applicant to support the proposed design. Until such information is provided, the application is incomplete.

1. The plans were developed based on survey from 2010 and do not reflect existing site conditions. The existing bank in some areas is much steeper than is reflected on the plans. The steepness of the slope would not affect the type of stabilization proposed although there may be areas where the coastal bank is too steep to revegetate without regrading. It is not recommended that the finished revetment slope be any steeper than the proposed 1.5:1.

2. The plans presented are for permitting purposes only and are not intended to be suitable for construction. In our opinion, the construction documents should include cross sections of the revetment and slope improvements at 100-foot intervals to more fully detail the proposed activities.

3. Rill erosion and gullies are forming on the bank as a result of stormwater runoff from the top of the bluff. This should be corrected as part of the improvements by diverting the stormwater to a controlled and managed discharge location.

4. The coastal bank plantings should be specified in detail, and the applicant should take steps to accelerate the rooting of the plantings. This may include installing larger plants and providing irrigation. Stability would be achieved more quickly by incorporating a geogrid-type system. The current design reduces potential environmental impact by not including such a stability system but, if the Conservation Commission were amenable, this additional reinforcement may prove beneficial to the project and increase its likelihood for success.

5. We would like the applicant to comment on the need to provide additional lateral stability on the coastal bank to minimize future sloughing.

6. The transition from the lower end of the vegetated coastal bluff to the top of the finished revetment stone is inherently an unstable boundary. Sand from the toe, even after vegetation is established, will migrate into the interstitial spaces between the armor stones. This will destabilize the toe of the slope. We would suggest providing a hard "curb" at the top of the revetment to lend stability to the coastal bank above.

7. The total volume of sacrificial sand needed for the proposed construction should be provided and equated to truck trips. This information should be broken into Phases 1 and 2.

8. As with past work in the area, sand will be brought to the top of the bluff and transported to the bottom using a conveyor system. Trucks on the beach will transport the material to the specific work location. The applicant should comment on the stability of the bluff at the access locations and its ability to support the delivery trucks.

9. The proposed plans call for a crest width at the top of the revetment of approximately 10 feet. The U.S. Army Corps of Engineers, Coastal Engineering Manual (CEM), EM 1110-2-1100, August 2008 (Change 2) provides design guidance for beach fills and suggests that a crest width greater than the proposed 10 feet may be more appropriate. In general, a more detailed assessment of the beach fill volume and geometry is strongly encouraged so as to maximize the potential for success of the proposed filling.

10. Sacrificial sand is proposed at a slope of 2H:1V to limit intrusion into the beach. A shallower slope would likely be more stable. As noted above, the CEM provides significant guidance for beach fill design. The optimum slope is dependent on the native beach sand gradation, the proposed fill material characteristics, beach morphology, and related environmental conditions. The applicant is proposing the relatively steep slope so as to minimize beach intrusion. Appropriate optimization of the fill shape can be realized with the application of proper model simulation, SBEACH, BMAP, etc.

11. We did not receive any information regarding the gradation of the existing beach or of the sacrificial sand. Is it the applicant's intent to match the existing beach gradation or use a coarser material?

12. The proposed revetment stone will range in size from 1.5 feet to 4.5 feet in diameter based on the significant wave design criteria and the proposed revetment geometry. This design makes no account for potential scour at the toe of the structure. Such scour will, effectively, increase the design water depth and subsequently the stone gradation. We recommend that the applicant consider the effects of scour as a part of the design approach. This will likely result in modifying the stone gradation to include a larger top-sized stone and increasing the size of the smaller stone elements. This would appear to be a relatively easy revision of the ACES revetment design module.

13. The proposed design does not seem to address the potential for wave action and flanking at the terminal ends of the revetment structure. This potential exists around the isolated revetment sections following completion of Phase 1, as well as around the ends of the completed continuous structure following completion of the entire project. Since Phase 1 will consist of discontinuous armoring at the locations identified as being in imminent danger of failure, flanking may occur in a number of locations during the interim period between Phase 1 and Phase 2. The applicant should address both the interim condition and the final condition and provide details for how this condition will be prevented.

14. Application materials indicate that the stone will be barged to the site. A temporary landing barge will be run ashore and grounded using spuds, and rock will be moved from transport

barges, transferred to the landing barge, and then transported to the beach. As noted previously, sand will be trucked from the delivery location to the work area in question. The applicant should clarify what environmental impacts, if any, would result from this proposed truck movement on the beach.

15. Failure of the bank during work seems to be a real possibility. The applicant should comment on this and explain how the existing bank will be stabilized during excavation for the toe of the revetment.

16. The applicant has stated that the town cannot stabilize Baxter Road within its right-of-way and that the armoring is needed not just for private property but for the public good as well. We also understand that the Board of Selectmen, in entering into the Memorandum of Understanding with the applicant, has made a determination that the stabilization of the bank is necessary to protect Baxter Road and the associated public infrastructure. While it is our opinion that if hard armoring is proposed the project as presented by the applicant is the best solution for protecting Baxter Road, there may be other alternatives for the stabilization of Baxter Road that should be evaluated. For example, driving steel sheeting along the edge of the right-of-way may be feasible for the short term (i.e., five to 10 years) of stability.

In summary, the following technical information is necessary for the commission to evaluate the proposed plan in accordance with the Nantucket Wetland Protection Regulations:

- Current survey depicting existing topographic data and property boundaries
- Gradation data for the existing beach and sacrificial sand
- Design modifications that address the potential for flanking
- Assessment of the stability of the coastal bank during construction
- Discussion of the impacts associated with construction access on the beach

Please do not hesitate to contact me with any questions regarding these comments.

Very truly yours,

MILONE & MACBROOM, INC.

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

cc: C. Elizabeth Gibson, Town Manager
Town of Nantucket, Board of Selectmen

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