



RESEARCH AND ENGINEERING, INC.

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Emily Molden
Nantucket Land Council, Inc.
6 Ash Lane
Nantucket, MA 02554

Re: Discussion of the Mitigation and Sediment Dynamics associated with Siasconset Beach Preservation Fund, Notice of Intent Application for Expanded Baxter Road and Sconset Bluff Storm Damage Prevention Project

The following discussion and comments focus on the mitigation and sediment dynamics associated with Siasconset Beach Preservation Fund (SBPF) application to the Nantucket Conservation Commission for the Expanded Baxter Road and Sconset Bluff Storm Damage Prevention Project, as well as, the existing 950-foot geotextile revetment along Sconset Bluff. The comments focus on the responses and presented material SBPF has provided to the Commission during the hearing process for the proposed project.

In our comment letters dated September 27 and October 26, 2018 we highlighted that SBPF was incorrectly interpreting their bluff erosion data while calculating the compensatory mitigation volumes for the proposed geotextile revetment expansion project. SBPF's approach of using the time period from 2003-2017 neglects to account for the changes in coastal geologic features that have transpired and the increase in shoreline erosion rates that have occurred across the proposed project reach since SBPF's installation of the existing geotextile revetment. Along the southern reach of the proposed project, coastal dunes front and have fronted the coastal bank, thus until those dune features fully erode the magnitude of the current and future bluff contribution rates cannot not be measured. Additionally, the rate of coastline retreat has increased since the existing geotextile revetment was complete in January 2013. We initially highlighted the changes in shoreline change rates and the influence those have upon bluff contribution rates at monitoring Profile 90. The review of shoreline change rates utilized the data presented in SBPF's monitoring reports for the period from 2003-2017 (14-year period SBPF is using to calculate mitigation volumes) as well as the period after construction, 2015-2017. The data showed that the shoreline at Profile 90 retreated on average 1.9 feet per year over the 14-year period SBPF is using to calculate mitigation volumes. However, if the period prior to SBPF installation of the geotextile revetment was evaluated, the data shows that the shoreline was accreting on average 1.3 feet per year at Profile 90. The period after installation beginning in 2015 shows significant changes in shoreline movement across the littoral system. The shoreline began to retreat, with an average retreat rate of 14.8 feet per year. To highlight what that equates to in terms of compensatory mitigation, SBPF has proposed 7.7 cubic yards/linear foot/per year (cy/lf/yr), while the current erosion rate of 14.8 feet per year would represent a contribution rate of 32.8 cy/lf/yr. That is a marked increase from the existing requirement of 22 cy/lf/yr, as well as the proposed volume.

The trend of increased erosion rates across the proposed project reach is not limited to

Corporate Headquarters: 766 Falmouth Road, Suite A-1, Mashpee, MA 02649, (508) 539-3737
Gulf Coast Office: Executive Tower, 3500 North Causeway Boulevard, Suite 1480, Metairie, LA 70002
www.appliedcoastal.com

Profile 90. Erosion rates across the entire proposed project reach have increased since the geotextile revetment was constructed. Plotting the rate of shoreline change across all of the long-term monitoring profiles provided in SBPF's monitoring reports and comparing the time period before the installation of the revetment with the time period post construction shows a significant increase in erosion across the entire project area and a majority of the monitored coastline. The increased rate of erosion is illustrated in Figure 1. The period pre-geotube is represented by the blue line and the period post-geotube is represented by the red-line. The rate of erosional shoreline change has increased along the entirety of the monitored shoreline since the geotextile revetment was installed 5-years ago. The exception is the shoreline at Codfish Park which was accretional during both time periods. To the north of the project, erosion rates are consistently higher after the geotextile revetment was constructed. South of the project, the rate of change is not consistent, though it has increased along a significant portion of the coastline. The increase in erosion north and south of the existing geotextile revetment, also suggests that at the present mitigation volume of 22 cy/lf/yr there is not oversupplying sediment to the system as SBPF has suggested. Instead, it suggests that the mitigation volume is possibly significantly lower than the natural bank contribution rate, leading to adverse increase in erosion along adjoining shorelines.

SBPF counters their own measured shoreline retreat data by highlighting the reduction in volumetric change occurring across the entire measured profile, which is presented in Table 2 of the Monitoring Reports. The rate of volumetric change has decreased since the geotextile revetment was constructed, but the assertion by SBPF that the change is the result of over mitigating negates the much larger contribution that increased bluff erosion is having upon the sediment that is available to the littoral system. The shoreline change rates clearly illustrate that the decrease in volumetric erosion rates are not corresponding to decreased erosion of the shoreline and coastal bluff. Exactly the opposite has occurred since SBPF geotextile revetment was installed. As SBPF's data shows, the current mitigation plan has not prevented the revetment system from having an adverse impact on adjoin coastal bluffs and shorelines. The increase in erosion rates associated with the current project and the proposed project will further jeopardize SBPF's neighbors to the north and south. A properly designed shoreline stabilization project using best-available measures should not transfer the burden of losing a home or property from project location to the neighboring properties.

SBPF has provided a thorough explanation of the coastal processes governing cross-shore sediment and along-shore sediment transport. At the conclusion of the explanation, SBPF contends that the sediment eroded off the face of the geotubes remains available within the littoral drift system during coastal storms and is not "lost" or "unavailable" during storms and thus a lack of available sediment during storms will not result in increased erosion along adjoining coastal bluff and shoreline. Sediment is conserved and is transported throughout the littoral system, that is not in question. However, mitigation that is improperly designed will not prevent accelerated erosion from occurring and resulting in adverse impacts beyond the structure SBPF is proposing. The goal of a properly designed mitigation plan should be to avoid impacts to the littoral system and not adversely impact neighboring shorelines and properties. If SBPF is confident that 7.7cy/lr/yr will prevent the accelerated erosion of the coastal bank, then by providing a volume just greater than their calculated the bluff contribution rate, the threat of future erosion along the proposed project length could be addressed without the need for structural stabilization of the bluff. SBPF has proposed utilizing beach nourishment in the past, however after oversites in the implementation and design of the project were pointed out, SBPF decided to rescind their application for beach nourishment rather than addressing those issues.

SPBF has presented an alternative to their proposed adaptive mitigation plan which would provide a fixed volume of sediment similar to the mitigation program that is ongoing along the

existing geotextile revetment. We have shown that the basis for that volume calculation is flawed and underrepresents the bluff contribution to the littoral system. Thus, any proposal for fixed or adaptive mitigation programs first need to be based on appropriate calculations of contribution rates before discussions of the short comings of the implementation and design can be productive. Without accurately representing the bluff's natural contribution to the system, any mitigation program will fail to mitigate for the adverse impacts caused by this project.

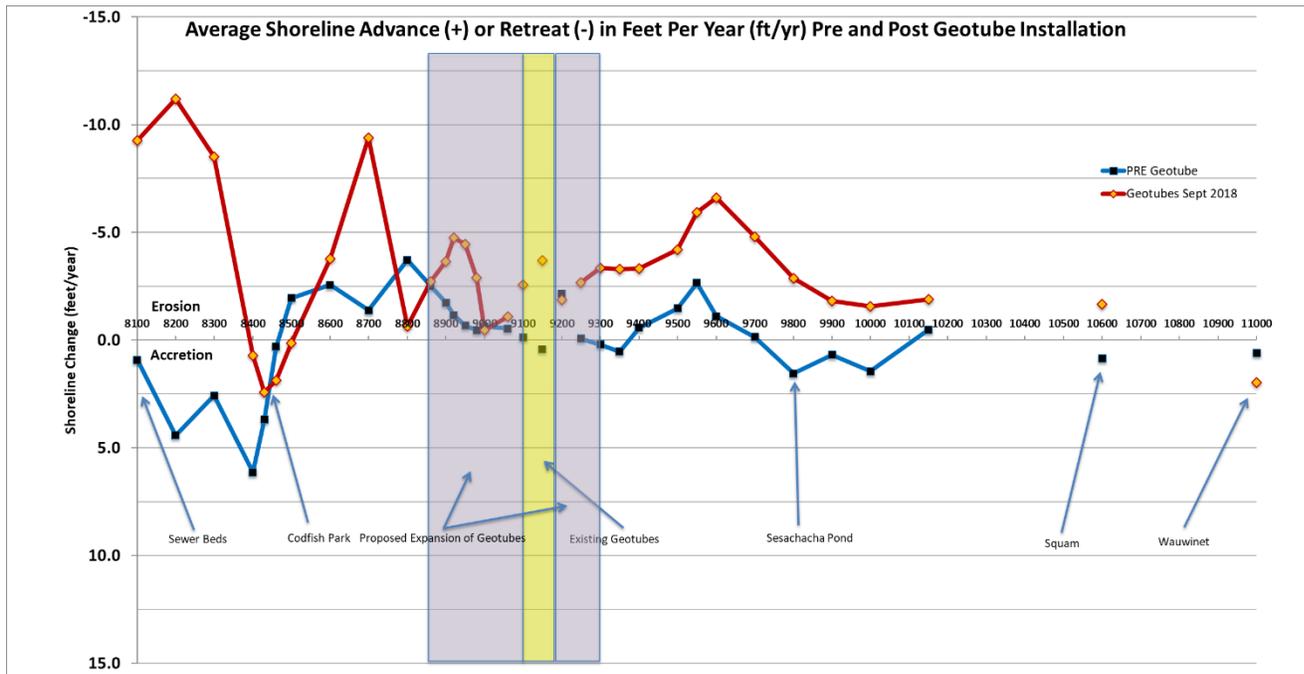


Figure 1. Shoreline change plot utilizing data from the 77th Southeast Nantucket Beach Monitoring Report, dated September 2018. This figure is set-up differently than Figure 3 from the September 2018 Monitoring Report. This figure is set up to assist the reader in visualizing the shoreline changes pre- and post-geotube installation. The perspective is that you are looking at the shoreline (x-axis) from the ocean. South is to the left, north is to the right. The average rate of shoreline retreat (erosion of land) is plotted above the x-axis (negative y-axis values toward the top) while the average rate of shoreline advance (beach expansion toward the ocean) is plotted below the x-axis (positive y-axis values toward the bottom).