Town and County of Nantucket
Select Board • County Commissioners

16 Broad Street
Nantucket, Massachusetts 02554

Telephone (508) 228-7255
Facsimile (508) 228-7272
www.nantucket-ma.gov

C. Elizabeth Gibson
Town & County Manager

AGENDA FOR THE MEETING OF THE
SELECT BOARD
OCTOBER 6, 2021 - 5:30 PM
REMOTE PARTICIPATION VIA ZOOM WEBINAR
NANTUCKET, MASSACHUSETTS

YOU TUBE LINK:
https://youtu.be/C44Y62eD2tk

ZOOM WEBINAR REGISTRATION LINK TO VIRTUALLY ATTEND MEETING:
https://us06web.zoom.us/webinar/register/WN_jYYtLsCSSW6Tb-2rg3FQVw

I. CALL TO ORDER

II. SELECT BOARD ACCEPTANCE OF AGENDA

III. ANNOUNCEMENTS

1. The Select Board Meeting is Being Audio/Video Recorded.

2. COVID Vaccine Clinic: 131 Pleasant Street Trailer, Sundays from 12:00 to 3:00 PM. See https://www.nantucket-ma.gov/2028/COVID-Vaccine for Full Schedule.

3. Select Board Announcements/Comments.

IV. FOLLOW-UP ON COMMENTS FROM PRIOR SELECT BOARD MEETINGS

*V. PUBLIC COMMENT**

VI. COVID-19 UPDATE

1. Public Health Department Update.

*VII. NEW BUSINESS**

VIII. APPROVAL OF MINUTES, WARRANTS AND PENDING CONTRACTS

1. Approval of Minutes of September 29, 2021 at 5:30 PM.

2. Approval of Payroll Warrants for October 3, 2021.

3. Approval of Treasury Warrants for October 6, 2021.

4. Approval of Pending Contracts for October 6, 2021 - as Set Forth on the Spreadsheet Identified as Exhibit 1, Which Exhibit is Incorporated Herein by Reference.

IX. REPORTS

1. Arcadis Presentation of Final Baxter Road Long-Term Planning Summary of Findings.

X. CONSENT ITEMS

1. Gift Acceptance: Fire Department; Our Island Home.

XI. CITIZEN/DEPARTMENTAL REQUESTS

1. Finance Department: Request for Approval of Sale of General Obligation Bonds in the Amount of $20,315,000 Made up of $15,977,500 in General Obligation Bonds and Debt Refunding in the Amount of $4,337,500.

2. Finance Department: Request for Approval of Sale of Bond Anticipation Notes (BAN) in the Amount of $35,818,400 Made up of Series A Notes in the Amount of $26,818,400 and Series B Notes in the Amount of 9,000,000.

XII. PUBLIC HEARINGS

1. Public Hearing to Consider Amending Chapter 250, Harbors and Town Pier Regulations (to be Known as Chapter 278, Harbors and Waterways) (Continued from July 14, 2021; August 18, 2021).

XIII. TOWN MANAGER'S REPORT

XIV. SELECT BOARD'S REPORTS/COMMENT

1. Review and Determination as to Outdoor Dining Parameters.

2. Committee Reports.

XV. ADJOURNMENT

**Identified on Agenda Protocol Sheet*

SELECT BOARD AGENDA PROTOCOL:

Roberts Rules: The Select Board follows Roberts Rules of Order to govern its meetings as per the Town Code Charter.

Public Comment: Public Comment is to bring matters of public interest to the attention of the Board. The Board welcomes concise statements on matters that are within the purview of the Select Board. At the Board's discretion, matters raised under Public Comment may be directed to Town Administration or may be placed on a future agenda, allowing all viewpoints to be represented before the Board takes action, if any. Except in emergencies, the Board will not normally take any other action on Public Comment in its sole discretion.

To facilitate that any individual who wishes to provide Public Comment has the opportunity and to ensure the ability of the Board to conduct its business in an orderly fashion, the following rules and procedures are adopted consistent with state and federal free speech laws:

- The agenda for regular Select Board meetings will include a Public Comment period at the beginning of the meeting unless there is more urgent business for the Board to take up first. This time is reserved for speakers to address the Board on matters that are not related to any other Agenda item. If a speaker wishes to address the Board on a matter that is related to another Agenda item, the Chair will accept public comment when that Agenda item is reached during the meeting.

- All speakers are encouraged to present their remarks in a respectful manner.

- All remarks will be addressed through the Chair of the meeting.

- The Chair of the meeting may not interrupt speakers who have been recognized to speak, except that the Chair reserves the right to terminate speech which is not constitutionally protected because it constitutes true threats, incitement to imminent lawless conduct, comments that were found by a court of law to be defamatory, and/or sexually explicit comments made to appeal to prurient interests. Verbal comments may also be curtailed if they exceed three (3) minutes and to the extent they exceed the scope of the Board's authority.

Disclaimer: Public Comment is not a time for debate or response to comments by the Board. Comments made during the Public Comment period do not reflect the views or positions of the Board. Because of constitutional free speech principles, the Board does not have authority to prevent all speech that may be upsetting and/or offensive made during the Public Comment period.

New Business: For topics not reasonably anticipated by the Chair 48 hours in advance of the meeting may be brought up for discussion in accordance with the Open Meeting Law.

Public Participation: The Board welcomes valuable input from the public at appropriate times during the meeting with recognition from the Chair at his/her sole discretion. For appropriate agenda items, the Chair will introduce the item and take public input. Individual Board Members may have questions on the clarity of the information presented. The Board will hear any staff input and then deliberate on a course of action.

Select Board Report and Comment: Individual Board Members may have matters to bring to the attention of the Board during a meeting. If the matter contemplates action by the Board, Board Members will consult with the Chair and/or Town Manager in advance and provide any needed information by the Thursday before the meeting and/or schedule the matter for a future Board meeting. Otherwise, except in emergencies, the Board will not normally take action on Select Board Comment.

Approved on February 17, 2021

CAPE COD AND ISLANDS COMMISSION ON THE STATUS OF WOMEN &

NANTUCKET COMMUNITY SCHOOL

ENGAGING, STRENGTHENING & CONNECTING OUR COMMUNITY

HEARING MORE VOICES

Cape Cod & Islands Commission on the Status of Women (CCICSW) in partnership with Nantucket Community School invites you to an informal listening circle.

Goal of the informal circle:

To talk freely about what needs you feel are important. Share your concerns along with others.

Remove fear of isolation and replace it with knowledge, resources and support.

Come and Have Your Voice Heard!

We need your insights so together we can reach big GOALS!

WHEN: Saturday, Oct 23, 2021
TIME: 1:30-3:00pm
WHERE: 56 Centre Street

*Open to the public

please REGISTER @:
CCICSWinfo@gmail.com

*For the health and safety of all, masks are required.

Cape Cod and Islands Commission on the Status of Women
ccicsw.com

@CCISCSW **@CCISCSW** **@CCISCSW1**

EXHIBIT 1
AGREEMENTS TO BE EXECUTED BY TOWN MANAGER
UNLESS RESOLUTION OF DISAPPROVAL BY SELECT BOARD
October 6, 2021

Type of Agreement/Description	Department	With	Amount	Other Information	Source of Funding	Term
Amendment to Professional Service Agreement	DPW	Weston & Sampson Engineers, Inc.	Add $38,000 to original contract amount of $137,000 for new contract total of $175,000	Add funding to contract for designer services for Nobadeer Field House project to allow for additional work during design and bid phase	DPW Budget	October 6, 2021 - August 1, 2022
Amendment to Professional Service Agreement	DPW	Weston & Sampson Engineers, Inc.	Add $96,000 to original contract amount of $175,000 for new contract total of $271,000	Add funding to contract for designer services for Nobadeer Field House project to allow for construction phase services	Article 31 2012 ATM	October 6, 2021 - August 1, 2022
Amendment to Professional Service Agreement	DPW	Architectural Consulting Group, Inc.	Add $192,000 to original contract amount of $52,560 for new contract total of $244,560	Add funding to contract for Owner's Project Manager (OPM) services for Nobadeer Field House project to allow for construction phase oversight services	Article 31 2012 ATM & Article 10 2021 ATM	October 6, 2021 - August 1, 2022
Amendment to Professional Service Agreement	DPW	Beta Group, Inc.	n/a	Extend date of contract for Sparks/Williams/Pleasant multi-use path design to allow for continued work	n/a	October 6, 2021 - November 5, 2022
Software Agreement	Finance	OpenGov Inc.	$28,500	Annual software support for OpenGov budget software	Finance Budget	July 1, 2021 - June 30, 2024
Purchase Agreement	Fire	Cape Cod Trailer Storage, Inc.	$12,014	Purchase of cargo trailer	Ambulance Revolver	October 6, 2021 - June 30, 2022

Service Agreement	Fire	Mobile Fire Apparatus & Repair Service	$100,000	Repairs and maintenance for Fire Department fleet	Fire Budget	July 1, 2021 – June 30, 2024
Service Agreement	Fire	Plan B Construction Co.	$7,900	Repainting exterior of Madaket Fire Station	Fire Budget	October 6, 2021 – June 30, 2022
Hosting & Maintenance Agreement	Health & Human Services	Trilogy Integrated Resources, LLC.	$24,000	Annual hosting and maintenance fee for Network of Care website for aging, mental health, public health and veterans	Nantucket Cottage Hospital CHIP Gift	September 10, 2021 – September 10, 2022
Professional Service Agreement	PLUS	Public Archaeology Laboratory	$12,500	Island-wide historic properties survey and survey plan	Massachusetts Historical Commission Grant	September 10, 2021 – June 30, 2022

Baxter Road Long-Term Planning

Project Update

October 6, 2021

Photo of Sconset Bluff, Jennifer Kelly Lachmayr, August 2021

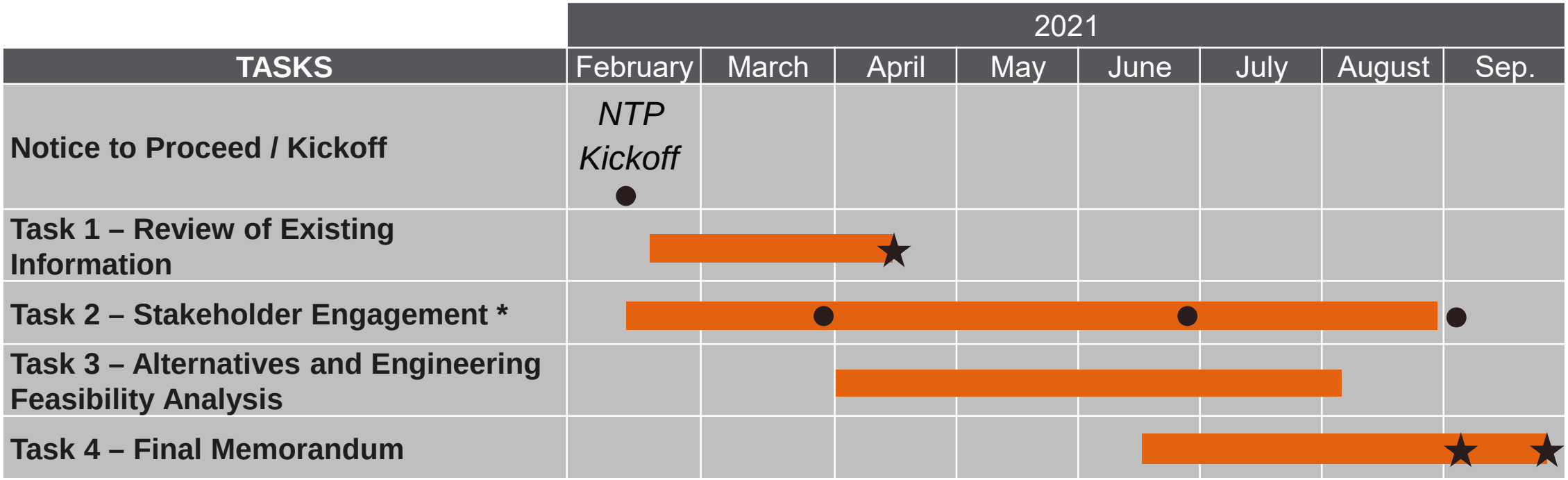
Agenda

1. Where We Are
2. What We've Heard
3. Orientation to Summary of Findings
4. Next Steps

Project Updates

Where We Are

Project Schedule



We are here

★ **Deliverable**

● **Meetings**

*** Meetings assumed to be virtual**

Scope of Work

1. Review of Existing Information *(complete)*

2. Stakeholder Engagement *(complete)*

3. Alternatives / Feasibility Analysis *(complete)*

4. Summary of Findings & Recommendations *(complete)*

Project Updates

What We’ve Heard

Stakeholder Engagement

Stakeholder Groups

ORANGE	MAGENTA	TOWN
Nantucket Land Council	The ‘Sconset Trust	Nantucket Select Board
Nantucket Coastal Conservancy	‘Sconset Beach Preservation Fund	Coastal Resiliency Advisory Committee (CRAC)
Quidnet Squam Association	Sankaty Head Golf Club	Town of Nantucket department representatives
Mass Audubon	Sconset Civic Association	
Greenhills		

First Focus Groups: March 23, April 13
Second Focus Groups: June 22, 23, 29
Large Group Meeting: September 14

What We Heard at the last Meeting

Desire to understand where this project fits in among the Town's Coastal Resilience Plan priorities

Need for an island wide sediment transport study and sediment budget

Removal of existing system will cause some bluff collapse

Continued concern about review of documents, downdrift impacts, sand mitigation

Orientation to

Summary of Findings Memorandum

Summary of Findings Contents

1. **Introduction**
   - Goals and Scope
   - Coordination with and Relationship to the Town's Coastal Resilience Plan
   - Project Mission Statement
2. **Past, Present, and Future Conditions: Erosion Hazards and Interventions**
   - Review of Existing Information
3. **Stakeholder Engagement**
4. **Alternatives Analysis**
   - Coastal Zone Background
   - Alternative Development
   - Environmental, Ecological, and Habitat Considerations
   - Cost and Structural Considerations
   - Description of Alternatives
   - Evaluation of Alternatives
   - Removal, Relocation of Baxter Road and Utilities, Retreat
   - Cost Estimate
   - Best Management Practices
5. **Recommendations**
   - Adaptation Pathways
   - Comprehensive Retreat Planning
   - Recommended Action Plan
6. **References**

Appendices

- Abbreviations & Glossary
- Homeowner Best Management Practices
- Property Tax Analysis

Project Goals, Scope, and Mission

Goals

Reaching consensus among the stakeholders is a very challenging goal, with the interested parties having strong opposing visions of desirable outcomes. This is discussed in further detail in Section 3. Stakeholder Engagement.

Scope

The study is not a comprehensive study of the coastal processes in the area or an engineering study to design any particular intervention. Section 2.2 outlines how existing information was compiled, as it was the key data source for the assessment.

Mission

The Baxter Road Long Term Planning Project will create a community-supported actionable roadmap to implementation of short- and long-term solutions for the Baxter Rd area that help the community respond to rising seas and eroding coastlines through adaptation practices such as protection, accommodation, shoreline realignment, or no action.

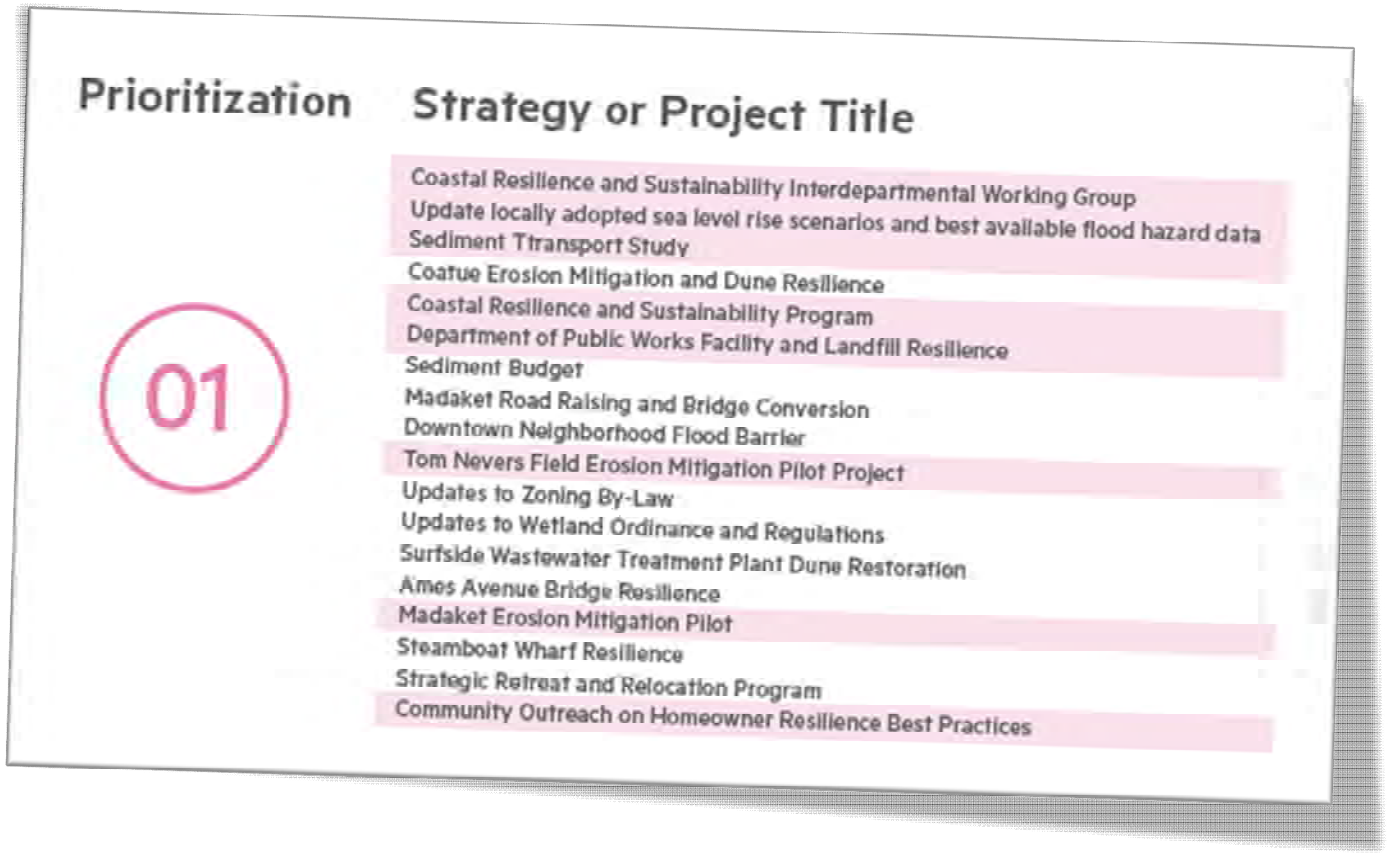
Coordination with the Coastal Resilience Plan

Related Island-Wide Recommendations

- Sediment Transport Study (Prioritization: 1 / by 2024)
- Sediment Budget (Prioritization: 1 / 2024)
- Community Outreach on Homeowner Resilience Best Practices (Prioritization: 1 / ongoing)

Baxter Road & Sconset

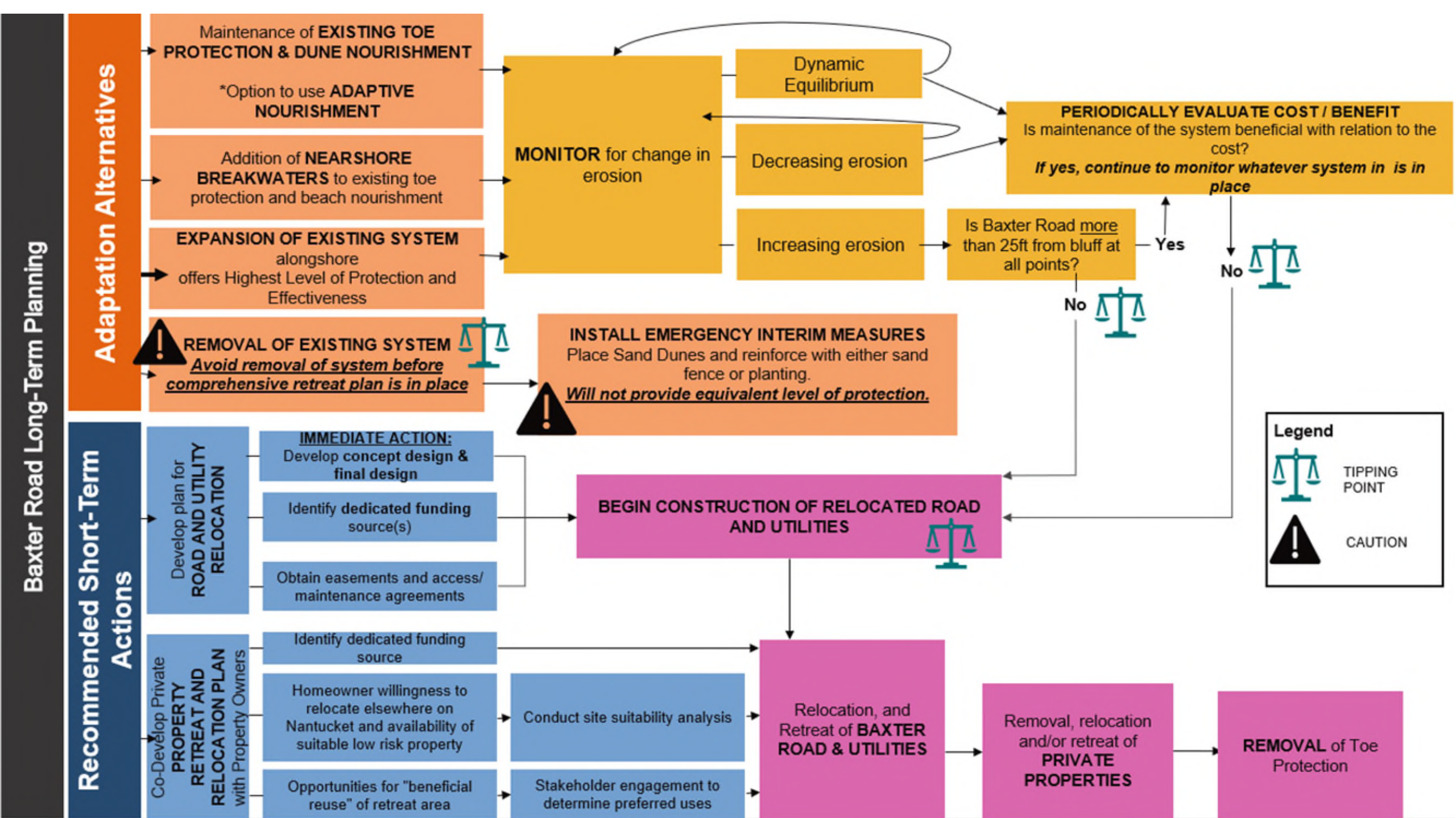
- Baxter Road Relocation (Prioritization: 2 / by 2030)
- Sconset Bluff Nearshore Breakwaters Feasibility Study (Prioritization: 2 / by 2025)
- Sconset Bluff Dune Restoration (Prioritization: 2 / by 2025)



Review of Documentation

While a detailed analysis of the substantial available beach and bluff monitoring data was beyond the scope of this study, a preliminary review of several reports suggesting downdrift impacts indicated that the analysis was based on selective data analysis as opposed to a more comprehensive analysis. Changes in beach position occur on multiple time scales, from hours to decades with significant variability over those time frames, and as such, a more comprehensive review is more likely to accurately capture long-term trends. One of the more comprehensive analyses reviewed for this study noted:

> Long term shoreline change plots are presented for continued insight into beach response. Although there is substantial variability, no post-geotube changes have yet been observed that deviate substantially from past observations. The present shoreline is at a similar location as more than ~10 years ago at many profiles and no significant accelerated erosion has been noted.(Woods Hole Group, 2021)


Baxter Road Long-Term Planning
Adaptation Alternatives
Maintenance of EXISTING TOE PROTECTION & DUNE NOURISHMENT
*Option to use ADAPTIVE NOURISHMENT
Addition of NEARSHORE BREAKWATERS to existing toe protection and beach nourishment
EXPANSION OF EXISTING SYSTEM alongshore offers Highest Level of Protection and Effectiveness
REMOVAL OF EXISTING SYSTEM
Avoid removal of system before comprehensive retreat plan is in place
MONITOR for change in erosion
Dynamic Equilibrium
Decreasing erosion
Increasing erosion
PERIODICALLY EVALUATE COST / BENEFIT
Is maintenance of the system beneficial with relation to the cost?
If yes, continue to monitor whatever system in is in place
Is Baxter Road more than 25ft from bluff at all points?
Yes
No
No
INSTALL EMERGENCY INTERIM MEASURES
Place Sand Dunes and reinforce with either sand fence or planting.
Will not provide equivalent level of protection.
Recommended Short-Term Actions
Develop plan for ROAD AND UTILITY RELOCATION
IMMEDIATE ACTION:
Develop concept design & final design
Identify dedicated funding source(s)
Obtain easements and access/ maintenance agreements
BEGIN CONSTRUCTION OF RELOCATED ROAD AND UTILITIES
Legend
TIPPING POINT
CAUTION
Co-Develop Private PROPERTY RETREAT AND RELOCATION PLAN with Property Owners
Identify dedicated funding source
Homeowner willingness to relocate elsewhere on Nantucket and availability of suitable low risk property
Conduct site suitability analysis
Opportunities for "beneficial reuse" of retreat area
Stakeholder engagement to determine preferred uses
Relocation, and Retreat of BAXTER ROAD & UTILITIES
Removal, relocation and/or retreat of PRIVATE PROPERTIES
REMOVAL of Toe Protection

Recommended Action Plan

Immediate Next Steps for Planning for Retreat:

- Continue public education and outreach to gain consensus on funding needed for utility and road relocation.
- Appropriate dedicated funding ($2-4 million) to begin the work to solidify utility and road relocation route.
- Proceed to field surveys and discussions with homeowners on possible routing.

Short Term Actions

- Start to identify funding
- Continue to monitor
- Plan out the road relocation
- Removal of the existing toe protection is not recommended until comprehensive retreat planning is complete
- Perform required maintenance and consider adaptive nourishment for existing system
- Develop comprehensive retreat plan
- Plant, stabilize, and maintain the bluff face
- Implement homeowner BMPs
- Develop a feasibility assessment for nearshore breakwaters.
- Develop a Sediment Budget.
- Work collaboratively with all stakeholders to set a timeline for retreat.

Mid Term Actions

- Continue to monitor
- Install nearshore breakwaters if shown to be feasible.
- Begin Construction of the new road as soon as planning is complete, and funding is in place.
- Continued development of retreat plan
- Relocate homes.

Long Term Actions

- Continue to monitor erosion rates and other indicators.
- Implement the Retreat Plan fully
- Support the eventual removal of existing toe protection and relocation of homes.
- Manage the beach/bluff for public access and habitat. This may still involve some nourishment and breakwaters could be beneficial for this purpose.

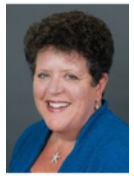
Project Updates

Next Steps

Next Steps

1. Final Memo has been Delivered
2. Implement Recommended Action Plan
3. Implement Coastal Resilience Plan

Thank You



Jennifer Kelly Lachmayr, PE, BCEE

Principal in Charge / Project Director

Jennifer.Lachmayr@arcadis.com

Kathryn Edwards, PE

Principal Engineer / Project Manager

Kate.Edwards@arcadis.com

https://www.bostonglobe.com/metro/2014/09/28/battle-over-bluff-nantucket/L41admApMtz3ZGqsO8XITI/story.html

Arcadis. Improving quality of life.

ARCADIS

TO

Vincent Murphy on behalf of Select Board and Town Administration of Nantucket

Baxter Road Long-Term Planning
Summary of Findings

DATE
October 1, 2021

PROJECT NUMBER
30078051

Photo credit: Jennifer Lachmayr, Arcadis (Aug 8, 2021)

Contents

APPENDICES

1. Introduction

Arcadis was engaged by the Town of Nantucket to lead an alternatives analysis for the unique Baxter Road area, located along the Siasconset (Sconset) bluffs. The assessment, entitled "**Baxter Road Long-Term Planning**" included an alternatives analysis for technically feasible solutions to address bluff and toe erosion in the area.

Historically, the bluffs have been subject to periodic erosion, and the rate of bluff erosion is expected to be exacerbated by sea level rise (SLR) and increased storm intensity due to climate change.[1] Over time, the upland area behind the bluffs has been developed with residential uses and supporting infrastructure including roads and utilities. With ongoing bluff erosion, the homes and infrastructure are or will soon be at risk.

Over the years, the Town, property owners, and the public have debated the best long-term solution for the erosion in this area. Groups of involved residents have commissioned copious studies and implemented a series of interventions intended to address erosion concerns. Currently, the erosion protection methods being used include:

- Sand Nourishment
- Maintenance activities such as management of drainage
- Vegetation for bluff stabilization (where the slope allows)
- Sand-filled jute-fiber bags at the bluff's toe
- Geotextile tubes (geotubes) along a high-risk portion of the bluff

Of these existing interventions, the geotubes are the ones at the center of the ongoing debate, running 947 ft alongshore from 87 to 101 Baxter Rd (protecting 3 houses and that portion of the road and infrastructure). Homeowners to the north and south of the geotubes have been striving to have them expanded since their emergency installation process began in 2013. Since then, there have been a long series of notices of intent and appeals. While geotubes are often considered "softer" than other shore protection alternatives such as riprap (stone revetments) or seawalls, they still may be considered hard armoring, which is restricted by the Massachusetts Wetlands Protection Act and the Nantucket bylaws.[2] There are challengers to the spectrum of stabilization alternatives due to concerns such as sand source and quality, aesthetics, beach access, potential environmental impacts, and unintended consequences such as sand migration, deposition and downdrift erosion.

The intent of this study was not to debate the use of geotubes, but to assess a range of innovating alternatives and their feasibility within the area. However, as the geotubes are an existing system, they must be considered in this assessment. Analyses were completed with the existing system in place for most alternatives, with a single variable changing each iteration.

The Town also wished to explore the range of perspectives, priorities, life cycle costs, and preferences within the community. For this reason, strategic stakeholder engagement was crucial from the outset of the project. To prevent damage to existing infrastructure there is a clear need to maintain and increase protection, while planning for eventual retreat. There are a multitude of sensitivities and complexities within these issues, and this memo aims to capture the key ones. However, the focus here is on the alternatives and recommendations.

In late June 2021, the Nantucket Conservation Commission voted to remove the geotube project after finding that the permit requirements were not being met, most recently for a lack of required sand nourishment.[3] Removal of the current system and replacement with another form of toe stabilization will have environmental and cost impacts. It will take time for the system to establish a new dynamic equilibrium. If the geotubes are removed without any plan or protection in place, each violent storm will lead to further bluff collapse. Potential consequences will leave the

[1] https://www.nantucket-ma.gov/1977/FEMA-Coastal-Erosion-Hazard-Map
[2] Chapter 67 of the Nantucket Bylaws pertains to coastal management https://ecode360.com/12120302
[3] https://www.ack.net/stories/concom-orders-sbpf-to-remove-geotubes-from-sconset-beach,24933

Town and the community exposed to a range of risks including damage to roadways and utilities, emergency and public access limitations, and environmental impacts from damage to residential properties. It is likely that this removal decision will be appealed, and efforts have been proposed to make up the sand shortfalls.[4]

1.1 Baxter Road Long-Term Planning Goals and Scope

The goals of the project are to:

1. **Compare technically feasible alternatives** - Bluff protection (which is required to protect public infrastructure and buildings) cannot be achieved without toe stabilization. Therefore, all alternatives that provide bluff protection include toe stabilization.
2. **Develop a prioritized action plan** for adaptation over time, based on the alternatives analysis and stakeholder engagement.
    - The engagement process was integral to the project because stakeholders have been divided for decades on how to address or to adapt to erosion risks in the area. There are erosion risks related to the economy, ecology, development, infrastructure, and public safety.

Reaching consensus among the stakeholders is a very challenging goal, with the interested parties having strong opposing visions of desirable outcomes. This is discussed in further detail in Section 3. Stakeholder Engagement.

The project tasks were designed to provide an overview of near-term actions and longer-term critical decision points which the Town can use to focus investments, depending on changing conditions. The work completed includes:

1. Compiling and reviewing existing information
2. Engaging stakeholders
3. Analyzing alternatives
4. Developing this summary of findings memo

Caveat: The study is not a comprehensive study of the coastal processes in the area or an engineering study to design any particular intervention. Section 2.2 outlines how existing information was compiled, as it was the key data source for the assessment.

The study area includes Baxter Road and related public infrastructure from the Sankaty Head Lighthouse to Butterfly Lane in Sconset, including the adjacent private parcels (Figure 1).

[4] https://www.ack.net/stories/concom-gearing-up-for-expected-sbpf-appeal,25646

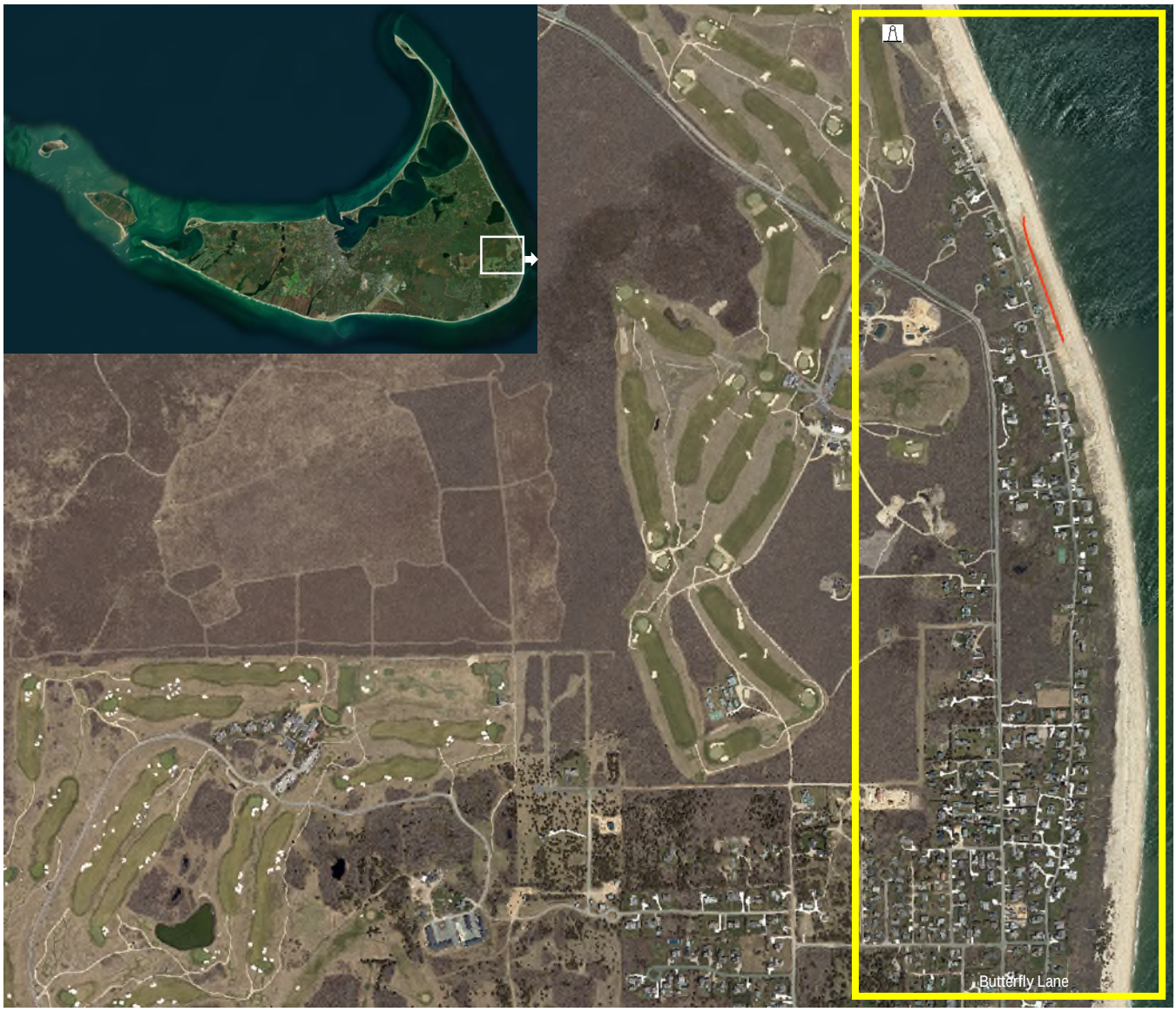


Figure 1: Study area along the coast, with Sankaty Head Lighthouse to the north and Butterfly Lane to the south and present geotubes outlined in red.

1.2 Coordination with and Relationship to the Town's Coastal Resilience Plan

The planning process for the Baxter Road Long-Term Planning Project (Project) was undertaken concurrent with the ongoing island- and county-wide Coastal Resilience Plan (CRP). The alternatives analysis, stakeholder input, and overall project continue to inform the CRP, particularly around coastal resilience solutions for the Sconset area of the island. This Study also provides a template for similar focused study that may be necessary elsewhere on the island to refine the resilience solutions under development through the CRP. The Draft CRP was published September 24, 2021 and includes targeted risk reduction projects for Sconset. Projects in the Baxter Road area, based on the alternatives analysis presented in this Summary of Findings have been included in the CRP. The Baxter Road Relocation project and Sconset Bluff Nearshore Breakwaters Feasibility Study are listed as Priority 2 projects with estimated project deadlines by 2030 and 2025, respectively. Additionally, an Island-wide Sediment

Transport Study and Sediment Budget are listed as Priority 1 projects with estimated project deadlines of 2024 for both projects.

1.3 Project Mission Statement

The project team developed a mission statement based on the scope of work and understanding of the planning context for this area. This statement was further refined based on input from stakeholders:

The Baxter Road Long-term Planning Project will create a community-supported actionable roadmap to implementation of short- and long-term solutions for the Baxter Road area that help the community respond to rising seas and eroding coastlines through adaptation practices such as protection, accommodation, shoreline retreat, or no action.

2. Past, Present, and Future Conditions: Erosion Hazards and Interventions

Previous shorelines, transects, and shoreline stabilization structures data were reviewed using the Commonwealth of Massachusetts Office of Coastal Zone Management (CZM) MORIS tool to determine past erosion processes and rates.[5] The islands of Nantucket are very prone to erosion due to their geologic history of being formed by loose sediments and rocks deposited as glaciers retreated after the last ice age (~18,000 year ago)[6]. The bluffs along the study area have the highest elevations in the island, over 70 ft above sea level.

As a large portion of the homes along Baxter Rd. were built between 1900 and 1920[7], it is historically and architecturally significant. The area has a bluff walk, a historic lighthouse, and a long stretch of beach accessible to the public. Presently, the homes and other assets are at imminent risk due to erosion. Siasconset's bluffs have eroded over 100 ft in places between 1990 and 2014, which averages to over 4 ft per year.[8] With future SLR, bluff erosion rates are anticipated to continue their general increase.[9] The retreat of the bluff has led to the costly (minimum $500k each) relocation or removal of several homes, as well as the approximately $4,000,000 relocation of the lighthouse, over time. In a previous Town study, consultants Milone & MacBroom recommended that the road should be relocated when the top edge of the bluff was within 25 feet of the road.[10]

Figure 2 presents a timeline of events, with those related to intervention attempts on the top and main erosion-inducing storm events on the bottom. While this timeline begins in 2010, there is a history of coastal storms causing erosion (results of engagement surveys called out storms occurring in 1992, 1993, and 2005 as particularly notable). As each event caused the bluff to retreat further, homeowners came together to explore alternatives. A 2006 alternatives analysis explored a range of structural, stabilization, and nourishment options, as well as retreat and

[5] http://maps.massgis.state.ma.us/map_ol/moris.php
[6] https://pubs.usgs.gov/of/2011/1222/html/setting.html
[7] https://www.nantucket-ma.gov/AgendaCenter/ViewFile/Agenda/_10282020-9210
[8] June 2020 Woods Hole Siasconset Beach and Bluff Surveys (Semi-annual beach and bluff surveys from 1994 to date), 2018 Post-Storm Surveys, and the 2020 Town of Nantucket Coastal Risk Assessment and Resiliency Strategies https://thetrustees.org/content/state-of-the-coast-the-islands/ (p.31)
[9] https://www.nantucket-ma.gov/DocumentCenter/View/35045/Coastal-Risk-Assessment-and-Resiliency-Strategies-Report-January-2020-PDF
[10] https://records.nantucket-ma.gov/WebLink/ElectronicFile.aspx?docid=118657&dbid=0&repo=TownofNantucket

no action.[11] The report concluded that bluff toe stabilization with geotubes were a preferred alternative. It stated that they were feasible despite the Wetlands Protection Act because many homes were grandfathered before the act was enacted in 1978.[12] In 2013, emergency authorization and permits were issued, and a Memorandum of Understanding (MOU) was reached between the Town and the Siasconset Beach Preservation Fund (SBPF). The geotubes were designed and installed from 2013 to 2015 and included a requirement for dune nourishment targeted to be 22 cubic yards per linear foot per year (cy/lf/yr). The MOU included failure criteria related to sand nourishment volumes, monitoring, maintenance, and repairs. If the criteria are not met, SBPF must pay for removal of the geotubes.[13] The required sand volumes have been a challenge to maintain since 2016, due to shortages and price constraints (the cost has increased from $20 to $75-$90 per cubic yard). There has been discussion about the variations in how erosion rates are calculated, with many estimates for volume requirements being below 22 cy/lf/yr.

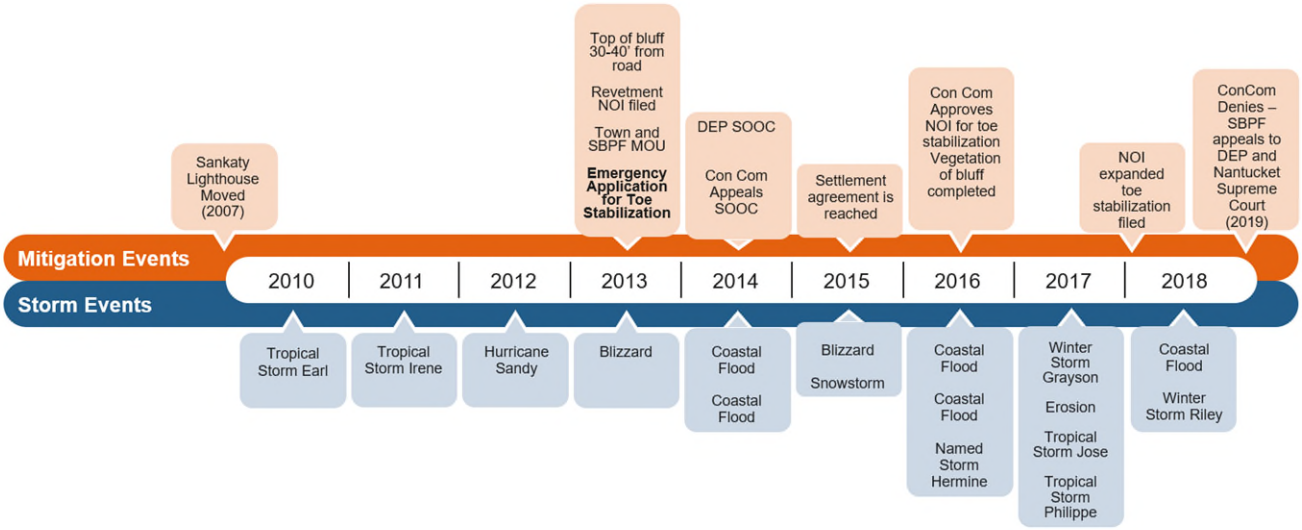


Figure 2 Timeline of recent storm and mitigation events related to the project study area [14]

Projected sea level rise is expected to increase the rate of erosion across much of the island. While estimating the effects of SLR on erosion rates is an evolving science, analysts have begun to develop methodologies for estimating potential changes. In 2019, FEMA developed Coastal Erosion Hazard Maps that provide a key dataset for estimating future conditions. These data (Figure 3) show projected coastal erosion hazard areas for 2030, 2050, and 2100, providing a baseline understanding of current and future erosion zone delineation for multiple sea level rise (SLR) scenarios. The FEMA future erosion lines in Figure 3 are based on the 2012 NOAA Intermediate High

[11] 2006 U.S. Army Corps of Engineers Sconset Beach Nourishment Project Alternatives Analysis by Epsilon Associates, Inc. in Association with Woods Hole Group, Inc.

[12] The Wetlands Regulations at 310 CMR 10.30(3) provides, in part, that a coastal engineering structure 'shall be permitted' when required to protect buildings constructed prior to 1978 from storm damage. http://sconsetbeach.org/wp-content/uploads/2014/12/DEP-decision-regarding-2014-Con-Com-appeal.pdf

[13]

[14] NOI stands for Notice of Intent, MOU for Memorandum of Understanding, SOOC for Superseding Order of Conditions, DEP for Dept. of Environmental Protection, ConCom for the Nantucket Conservation Commission, and SBPF for the Siasconset Beach Preservation Fund

SLR projections, which project 4.1 ft MSL by 2100.[15] This is important to note because more recent SLR projections are significantly higher.

Based on these projections, there are 70 residential buildings and several miles of road and infrastructure (water, sewer, drainage, electric, phone, internet, and cable utilities) at risk from erosion. The FEMA methodology specifically did not account for geotubes or any other coastal engineering structures. Any existing structures were removed from the input data and hazard areas were interpolated across the surrounding predicted area. The analysis was performed by classifying different shoreline types (Sandy Dunes/Beaches, Coastal Bluff), obtaining shoreline and bluff edge data spanning 1846 to 2010, to develop a linear regression rate for erosion. Projected erosion rates were modified by a SLR increase factor. The results indicate that erosion rates are not uniform across the study area, and generally decrease moving to the south. It should be noted that these projections do not include shoreline protection measures such as toe protection or nourishment activities.

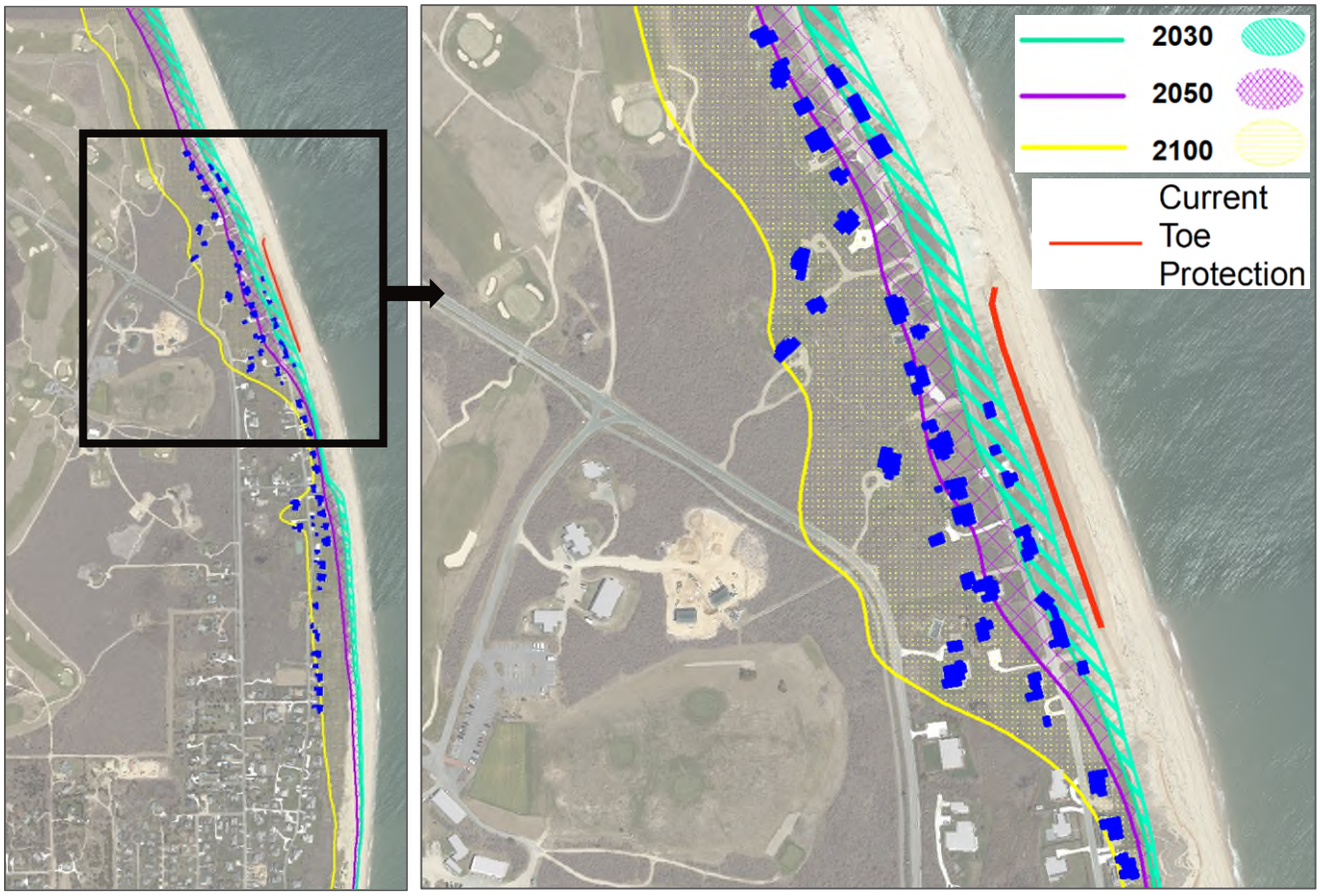


Figure 3: The 70 buildings which are projected to be at risk by 2100 are shown in blue based on FEMA Coastal Erosion Hazard Maps from July of 2019 (Source: https://arcg.is/1fuXXD0)

[15] Relative to Local Mean Sea Level (MSL), starting from 2010, based on the USACE SLR Calculator https://cwbi-app.sec.usace.army.mil/rccslc/slcc_calc.html

2.2 Review of Existing Information

The Town has maintained a record of documents related to Baxter Road as a publicly available archive on the Town's website, most of which are dated after 2010.[16] These documents contain, but are not limited to, the following:

1. Previous analyses and planning studies
    a. Coastal, financial, and permit-related
2. Memos and updates
3. Homeowner submitted documents
4. Public meeting documentation
5. Permit applications

In addition, stakeholders engaged for this project were asked to fill out a registry form and to provide any additional documents which would be important for the Project Team to review.

A registry containing over 450 documents related to Baxter Road was compiled for this project. The project team completed a review of these documents and referred to them, as relevant, to understand the history of the Baxter Road project, review prior work, and in the process of developing adaptation alternatives.

The engineers leading the alternatives analysis focused on technical reports and monitoring data from private firms and public agencies, including the Woods Hole Group and USGS. These resources were reviewed with the goal of developing a clear understanding of the research to date. Many reports summarized the findings of field data analysis and various interpretations of the raw data representing the performance of the current shore protection system. When appropriate, team members reached out to the authors for additional clarification on survey methods and analysis techniques. Several conclusions and recommendations were considered and integrated, as were parameters and information on sediment characterization and shoreline analysis island-wide. For example, recommendations regarding continuing the field monitoring campaign were incorporated into the considerations for all the alternatives.

3. Stakeholder Engagement

The stakeholder engagement process was intended to keep the community involved throughout the project and to ensure that their ideas and concerns were addressed where possible. The project team mapped out how each alternative would be selected by integrating performance-based design criteria vetted by stakeholders. A unified set of criteria were used to outline the selection process in a fact-based way. The team wanted local context to aid in identifying appropriate criteria related to coastal processes, economic factors, and ecological considerations.

Based on the initial discussions, the team focused on:

- Acknowledging all groups for how hard they have worked up to this point and validate concerns.
- Identifying common interests and goals.
- Identifying what solutions are working around Sconset.
- Identifying what stakeholders need from the process to support the outcomes.
- Seeking input on potential compromises.

For the first meeting, it was important for stakeholders to review and understand the project scope, provide feedback, and provide their perspectives.

A survey was sent out before the first meeting to collect initial information on perspectives and concerns. With the open-ended questions, respondents were referencing the tensions between opposing views. Many respondents

[16] https://www.nantucket-ma.gov/DocumentCenter

were worried about their home and access to utilities, access for emergency services, and economic impacts from loss of property taxes. Others saw a need to address sediment contributions and prevent property owners from seeking structural solutions to hold the shoreline. They felt that the owners were putting the interests of themselves ahead of the island's interests and worried about impacts to other parts of the island. It was clear that for each resident, their passion stemmed from love for their community and a desire to preserve their vision for the future.

It was concluded that initially, the participants for each meeting should be grouped based on perspectives and background. The Town identified groups of interested individuals and groups for participation, and they were placed into Focus Groups as described in Table 1.

Table 1. Stakeholder Focus Groups

Magenta Group	Orange Group	Town Group
Nantucket Land Council	The 'Sconset Trust	Town of Nantucket department representatives
Nantucket Coastal Conservancy	'Sconset Beach Preservation Fund	Coastal Resiliency Advisory Committee (CRAC)
Quidnet Squam Association	Sankaty Head Golf Club	Nantucket Select Board
Mass Audubon	Sconset Civic Association	
Greenhills		

The Magenta group included interested conservation organizations, and expressed concerns related to potential environmental impacts, beach access, and sand sources. They were concerned about environmental impacts and aesthetics including the cobble bottom habitat for fish, sand quality, sand source/migration impacts, and the bluff walk. This group took a hard stance that fighting Mother Nature is a losing strategy and that the bluff erosion should be the beach nourishment. They had been advocating for the removal of the existing system (the geotubes).

The Orange group was made up of many homeowners who would directly benefit from bluff protection. 'Sconset Beach Preservation Fund (SBPF) has spent over $12M on the current system and is eager to expand it to afford greater protection. Much of these funds have been provided by homeowners who have been anticipating the expansion to provide protection to their homes. This group felt frustrated with all the obstacles to protecting their homes. They understood and embraced the eventual retreat that would be necessary but were most interested in further protection to buy them some more time.

The Town group was interested in learning more and supporting the process. Concerns from all stakeholder groups were considered throughout the process to refine the alternatives and evaluation criteria. For example, due to the Magenta group's desire for softer installations, the viability of expanding jute coir was explored. All groups seemed to have an interest in understanding the feasibility of near shore breakwaters, so this alternative was a focus.

On March 23rd and April 13, 2021, the project team held three stakeholder focus group meetings with the following goals:

1. To share the proposed approach in terms of what the project team has done so far and the roadmap ahead
2. To define the technically feasible alternatives being considered and the consequences of each
3. To listen and understand the various perspectives, gathering feedback, data suggestions, and recommendations

4. To begin to understand what it will take to reach a consensus among opposing views, if possible. What is the acceptable risk in terms of economic, cultural, environmental, public safety, and other aspects?

The first meetings clarified the importance of exploring more deeply the key tensions and trade-offs between the various technical alternatives. The team held another round of meetings on June 22, 23 and 29 with each of the three groups to provide an opportunity to explore the draft alternatives analysis, evaluation criteria, decision points, and actionable solutions. The intent was to vet the alternatives analysis through the three groups, gain input, and use the feedback to further refine the alternatives analysis.

Live polling was conducted at all the meetings, and questions were centered around what should be done leading up to a range of future planning horizons (2050, 2070, 2100). Polling results and meeting discussions further showed that the opposing views were too strong to reach consensus. Many participants repeated that there was no hope for consensus.

The project team also held individual interviews with **facilitators** who were selected from each group. The project team and facilitators worked together to further **articulate key tensions and challenges and attempted to identify mutually acceptable solutions**. The team investigated ways to foster a technical / problem solving space for these meetings. Taking a deep dive into the key technical and environmental considerations, the teams developed potential alternative approaches to address challenges **together**, discussing questions such as:

- What is an environmentally responsible and economically sustainable way to protecting our community?
- What are the key tensions?
- What is the spectrum of concerns / trade-offs being raised?
- How will we consider concerns such as maintenance logistics/costs and trade-offs between the consequences of various alternatives?

As a framework for determining key tensions and challenges, the team pinpointed the primary points of disagreement around the potential set of short- and long-term solutions. Based on stakeholder input, the team identified categories of key technical tensions / problems to be resolved in relation to the alternatives. These categories, as outlined in Table 2, pay particular attention to the range of root needs among the stakeholders.

For each tension/challenge, the concerns, consequences, and root needs, are crucial in identifying which questions need to be asked. The answers to these questions could help ease the tensions and lead to mutually acceptable solutions. This information enabled the team to support the discussion.

Table 2. Context for Key Tensions

Key Tension/Challenge	Related Concerns	Associated Consequences and Root Needs	Critical Questions and Information to be Developed to Resolve the Tension
Opposition to using structural coastal erosion protection measures due to their potential related issues of sand and environmental impacts.	Cobble bottom, erosion rates and sand budget Nourishment volumes, sand quality, and potential ecological implications	There are different estimates for sand volume based on variations in the variables used to calculate volume. Information on factors that impact erosion/wave action: past sediment pathways, littoral budget, nourishment sand budget/source	What is the appropriate sand budget?
Maintaining the road and infrastructure	Erosion is bringing the bluff edge closer to the road.	The Town is legally responsible to provide utilities (water, sewer, and access)	How can we address the need to keep the road in its current location for access? Is the road in the right location?
Tax/economic assessment and implications	Who pays for what?	The relocation of infrastructure is expensive	What are the public and private costs?
Designation of Pre-1978 Structures	Policies in the Wetlands Protection Act (WPA) and Nantucket By-laws about coastal protection	Related to “substantial improvement” renovations defined in the Bylaw regulations as cumulative expansion of habitable space greater than 20%.	How can we determine which improvements are substantial?

It is challenging to find common desires within the diverse vision for a pathway forward. An “Adaptation Pathways’[17] exercise with polling was completed during the second road of meetings. It was centered around short-, mid-, and long-term desired outcomes. The Magenta group preferred geotube removal and planning for retreat as soon as possible. They were open to nearshore breakwaters as a potential solution to reduce beach erosion. The Orange group wanted to shift to adaptive dune nourishment and to expand the existing system. By 2050, they wanted to see nearshore breakwaters installed and to start planning a removal, retreat and road relocation which would occur in 2070.

Figure 4 shows the preferred pathway of each group.

[17] Werners, Saskia E., et al. "Adaptation pathways: A review of approaches and a learning framework." Environmental Science & Policy 116 (2021): 266-275. View HERE

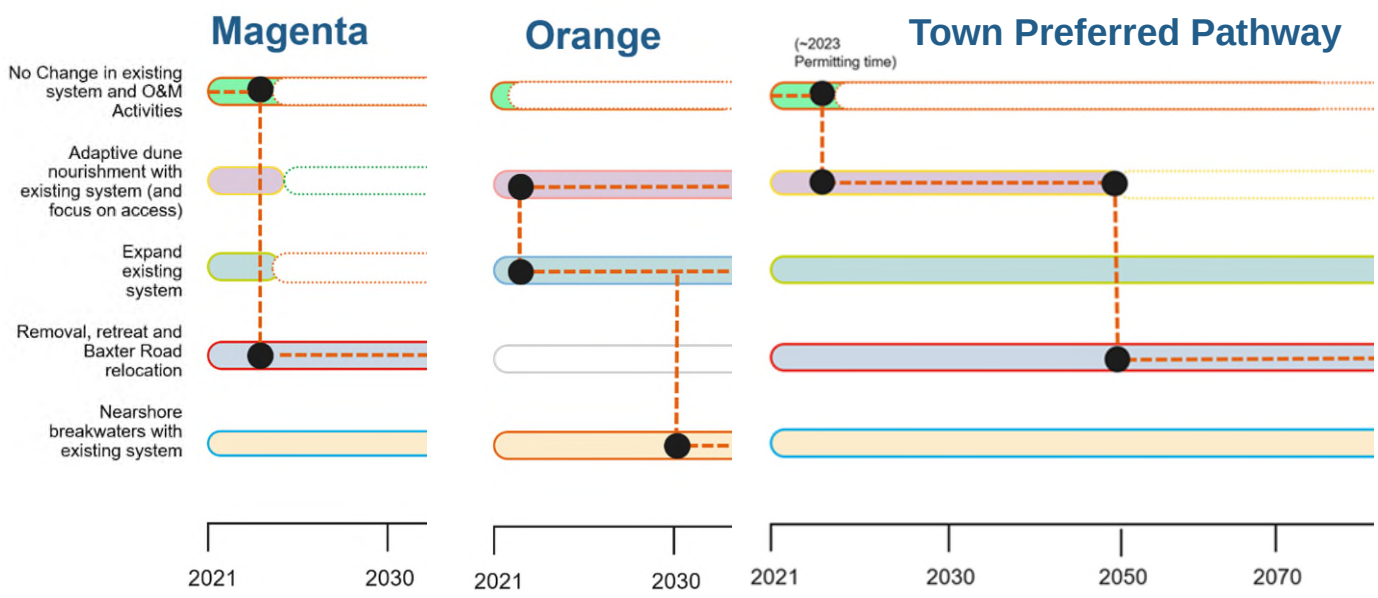


Figure 4 Adaptation Pathways exercise results for each group, with the Magenta and Orange group's preference from 2030 continuing out to 2100.

On September 14, there was a final meeting with all stakeholder groups. The Arcadis team proposed which tipping points are key for assessing potential scenarios and presented recommendations, and these are outlined in Section 5.1. It was stressed that the immediate removal of the current geotube system would likely lead to road failure in the near term. Even replacement with a softer form of toe stabilization would not provide sufficient protection to ensure sufficient time to plan for retreat. It will take time for the system to establish a new dynamic equilibrium. In the meantime, the Town and community are exposed to a range of risks including damage to roadways and utilities, emergency and public access limitations, and environmental impacts from damage to residential properties. It was recommended that the existing system remain in place and that it continues to be maintained and monitored. Stakeholders were encouraged to understand that the key concern is with the stronger storms eroding the bluff toe and causing rapid, catastrophic bluff failure.

Ideally, recommendations for toe stabilization measures would be intended to address storms with higher water levels and larger waves. The Arcadis team explained that if effectiveness were the only criterion, expanding toe protection along more of the bluff would have been recommended. However, the team was charged with identifying potentially feasible solutions based on a technical review, including the ability of the alternative to be issued permits under existing regulations, and taking stakeholder feedback into consideration. For these reasons, the recommendations focus on long-term removal and retreat, with exploration of interim measures to buy some time for the retreat process. A recommended plan with short-, mid-, and long-term actions was proposed and discussed. This memo provides more on the recommendations in Section 5.

Despite the strong caution against immediate removal of the geotubes, there was still the same feedback from the magenta group about their negative impacts and concerns about downdrift erosion. Stakeholders felt that they were perpetually stuck discussing the same issues. However, there was still a resistance to come together and plan for a workable relocation strategy.

4. Alternatives Analysis

4.1 Coastal Zone Background

The shoreline fronting Baxter Road on Nantucket Island is a unique coastal environment; it can be described as a drowned glacial erosional coast and is a product of glacial movement (USACE, 2006). The bluffs are consolidated material from glacial overburden and differ from dune back beaches by not having a mechanism for replenishment or rebuild. In a typical dune backed beach (Figure 5), sediments may migrate from the backshore and foreshore seaward to nearshore and offshore areas from storms and more energetic wave conditions. During more quiescent and lower wave energy conditions such as the summer, sediment migrate back onshore. The bluffs do not have the same regeneration abilities since they were formed from glacial movement and once eroded, cannot rebuild. Figure 5 schematizes coastal definitions on different types of coasts including typical dune backed beach, typical bluff beach and a typical overwash profile. All three types of coasts may be present at different areas of Nantucket however for the purposes of Sconset/Baxter Road area, this document will focus on bluff beaches.

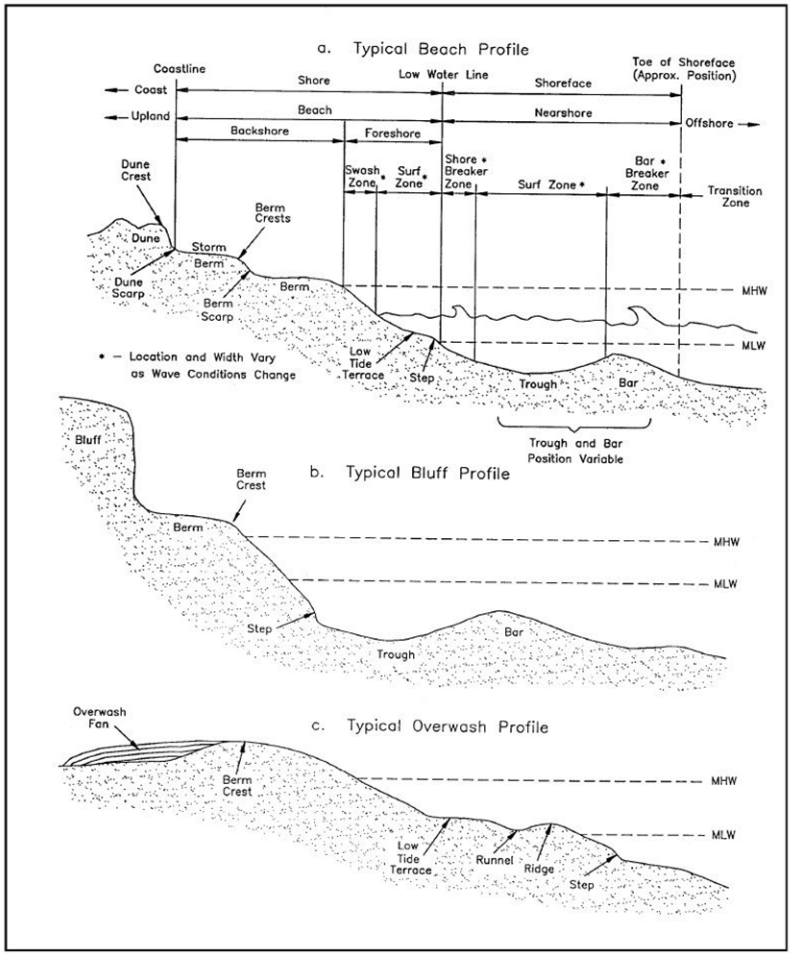


Figure 5. Definition of coastal terms and features in the coastal zone (USACE, 2006).

4.1.1 Coastal Sedimentary Processes

Sediment is in constant motion at the shore and beyond. This movement is generally evaluated as longshore and cross shore movements. Longshore or alongshore refers to sediment moving parallel to and near the shoreline

(USACE, 2003). Cross shore refers to sediment moving perpendicular to the shoreline. Wind driven transport is generally referred to as aeolian transport. Bluffs are an important feature for the Baxter Road location. “Slope instability produced by cliff-base wave erosion gives rise to mass movement…” (Komar, 1983). The following sections further describe coastal structures and coastal processes pertinent to this work.

4.1.2 Types and Functions of Coastal Structures

Several coastal structures and approaches are discussed in this section. They are described here for readers’ convenience and are detailed further in USACE, 2006.

4.1.2.1 Groins

Groins are shore parallel structures intended to increase sediment on the beach from the longshore drift. These structures are generally built of rubble mound but historically have been constructed of timber. Groins are typically constructed as a series along an eroded shoreline. Sediment will typically deposit on the updrift side and erosion occurs on the downdrift side. Erosion and accretion impacts will be observable at a distance from the structure. Figure 6 Figure 6 presents a schematic of a typical beach configuration with groins including the erosion and accretion areas adjacent to the structure in response to the net longshore transport direction. The figure also provides two typical cross sections of the structure looking both onshore (B-B) and alongshore (A-A). There are several groin fields on north shore of Nantucket where these effects of groin fields are evident. Groins would not provide direct toe protection for a coastal bluff, but could provide additional beach width, indirectly reducing the potential for bluff erosion. However, given the potential to impact longshore sediment transport, and limited ability to reduce bluff erosion, groins were not included as a feasible solution.

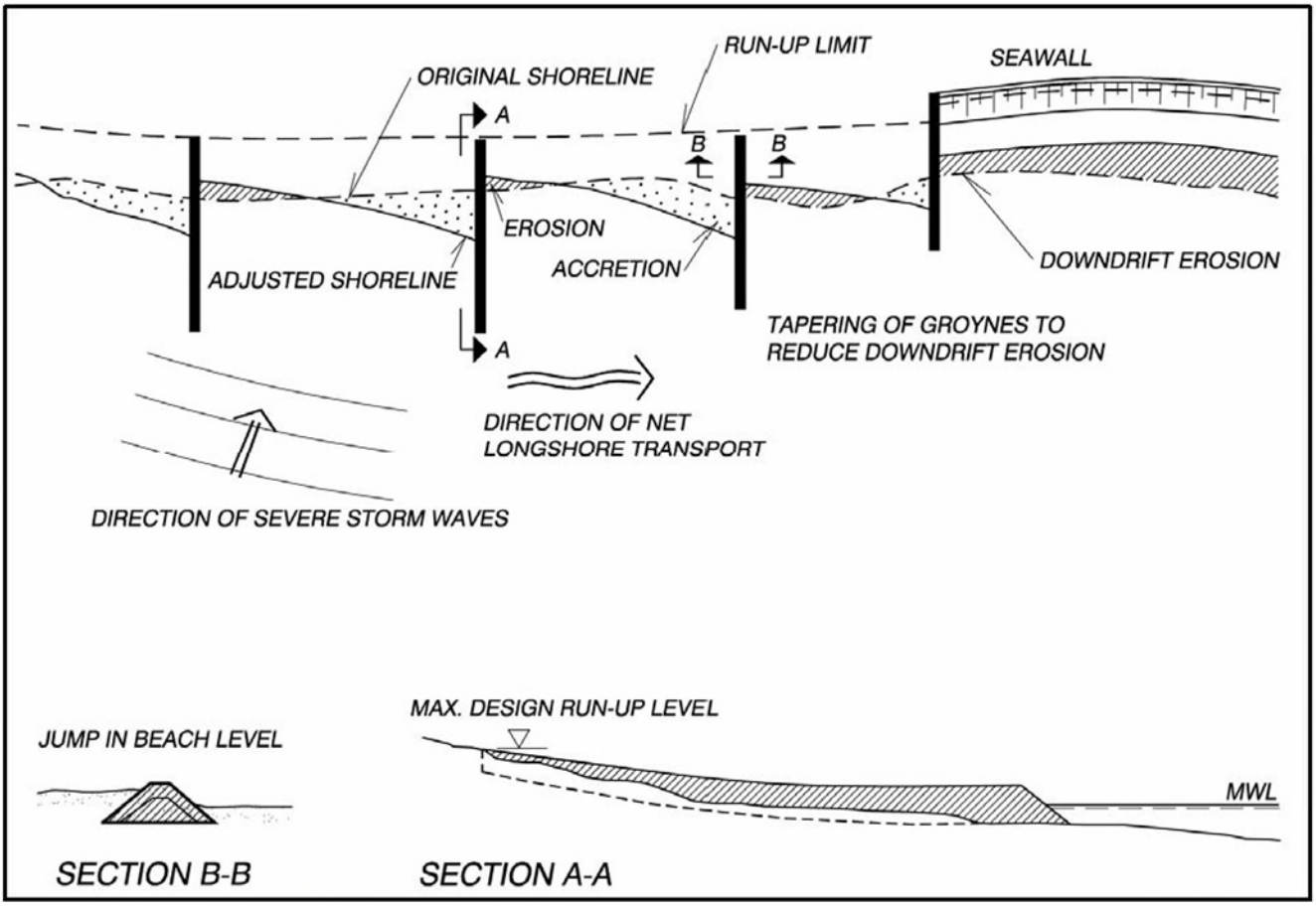


Figure VI-2-8. Typical beach configuration with groins

Figure 6. Typical beach configuration with groins (USACE, 2006).

4.1.2.2 Nearshore Breakwaters

Nearshore breakwaters or detached breakwaters are shore parallel structures with the principal function of reducing the wave energy impacting the shoreline behind the structure and encouraging sediment deposition from the longshore drift. Key components of their design and siting include wave height and length, breaker location, and gap distance. Specific configuration of these types of structures would be determined in a formal design process to determine these parameters iteratively for the desired shoreline response. One of the benefits of this approach is the ability to maintain longshore drift in the lee or land side of the structures. However, a potential limitation of this approach is the nearshore bottom topography immediately offshore of Baxter Road has a steep slope. As water depth increases, the structure cost will increase. The structures will also need to be built to survive a storm to minimize failure in this energetic wave climate. While offshore breakwaters are effective in helping to reduce beach erosion and build the beach, they have limited ability to prevent bluff erosion. In order to reduce waves during storm surge conditions, they would need to extend above the normal high-water line, increasing costs and potentially increasing aesthetic impacts. Figure 7 is a schematic of potential nearshore breakwater configurations and the likely shoreline response.

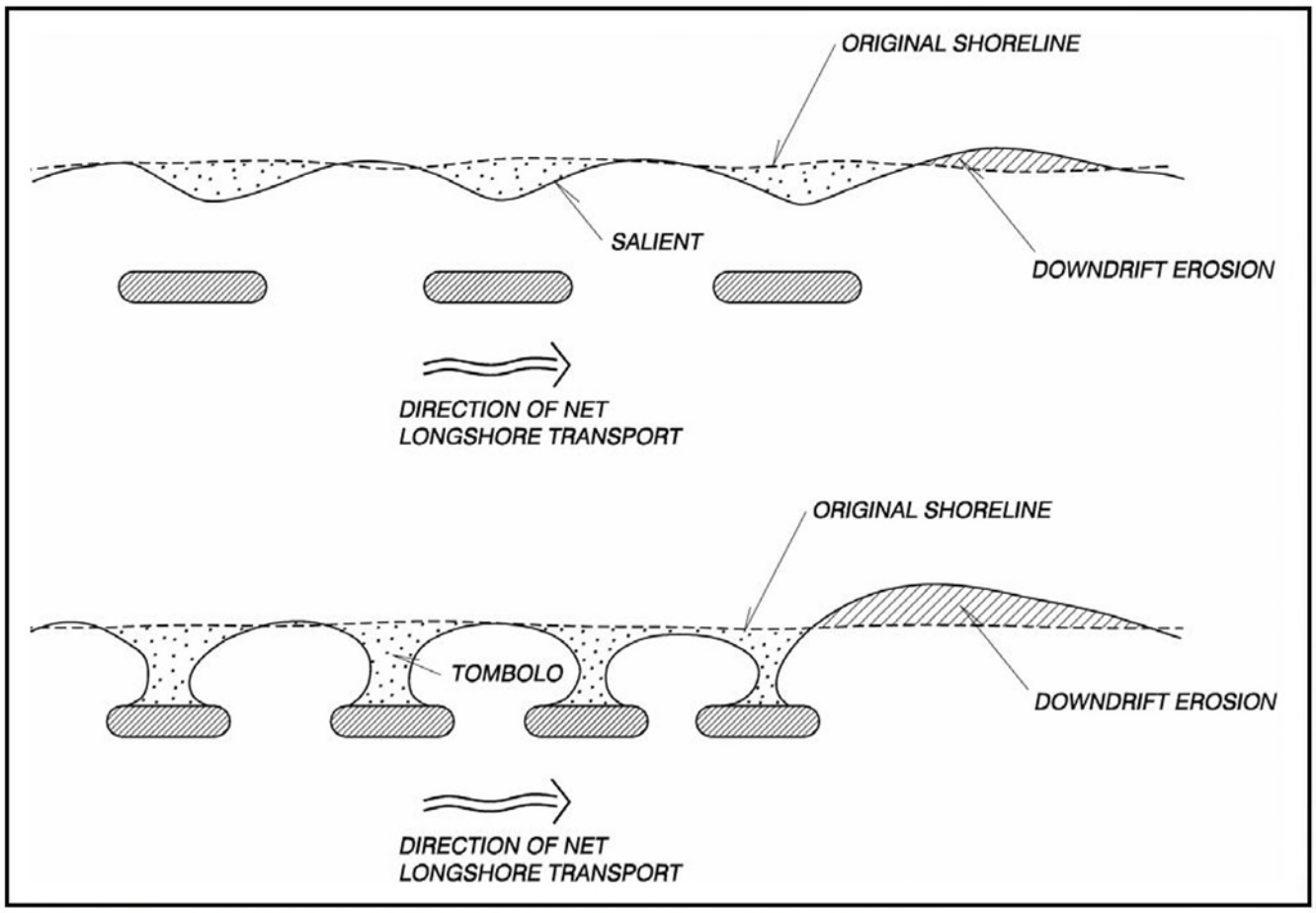


Figure VI-2-10. Typical beach configurations with detached nearshore breakwaters

Figure 7. Typical beach configurations with detached nearshore breakwaters (USACE, 2006).

4.1.2.3 Beach nourishment and dune construction

This approach is intended to reduce beach erosion and protect again flooding through an "…artificial infill of beach and dune material to be eroded by waves and currents in lieu of natural supply" (USACE, 2006). Beach nourishment is considered a soft structure solution to address shoreline erosion. Material is brought in from an outside source either from an upland mine or an offshore source such as a borrow pit or other coastal dredging project. Sediment compatibility to existing material is assessed for color, grain size and minerology. Dune construction can be described as "…piling up of beach quality sand to form protective dune fields to replace…" (USACE,2006) dunes that have washed away or damaged from intense storms. Constructed dunes can act as sacrificial dunes to add material to the littoral system during storms. "Maintenance of coastal dune systems is an important component of coastal protection and management" (Masselink, 2003). Dune construction is typically combined with planting of dune vegetation, netting or snow fencing to assist in retaining material moved by wind. Mature vegetation is effective at trapping wind-blown sand and should be incorporated. Figure 8 shows an example of mature vegetation trapping wind-blown sand on Indialantic, FL beach. Predominant wind direction during this time is from north (right) to south (left). The vegetation is trapping wind-blown sand creating an elevated feature compared to the surrounding beach surface. Beach nourishment has some limitations to preventing bluff erosion; during larger storm surge events, the storm surge may be higher than the beach elevation, allowing waves to reach and erode the bluff. Dunes can be used to protect a bluff toe, but the protection is provided by allowing the dune to erode sacrificially during storm

conditions. As such, the volume of sand above the storm surge elevation needs to be sufficient for a specified design storm condition.

Figure 8. Vegetation trapping wind-blown sand (Indialantic, FL., I. Watts).

4.1.2.4 Nearshore Berm or Nearshore Placement

A nearshore berm is a sand berm that is constructed parallel to the shore and can act as either a feeder berm or a stable berm. A feeder berm is intended to provide a source of sand to a beach and migrates onshore through wave action. One of the advantages of this approach to beach nourishment is avoiding constructing directly on the beach which in some environments may have a negative impact on sensitive bird species and turtle nesting. In this sense, nearshore berms have the potential to expand the construction window. Research is ongoing to update and further refine design guidance for this method of shore protection. Aerial imagery and nearshore berm bathymetry of a field example at Ft. Meyers, FL are shown in Figure 9. Aerial imagery of the nearshore berm is shown in the left panel where the berm can be observed by shallower areas offshore from the beach. The right panel included the original constructed berm area (red) and nearshore bathymetry. Warmer colors indicate shallower water depths and cooler colors indicate deeper water depths. Gaps in the berm were included to examine the effect of water quality on the lee (land) side of the berm. Research and monitoring is ongoing for this pilot project including its morphology and sediment partitioning. Stable berms help build the beach by slowing longshore transport and reducing normal (non-storm) waves, performing a similar function to offshore breakwaters.

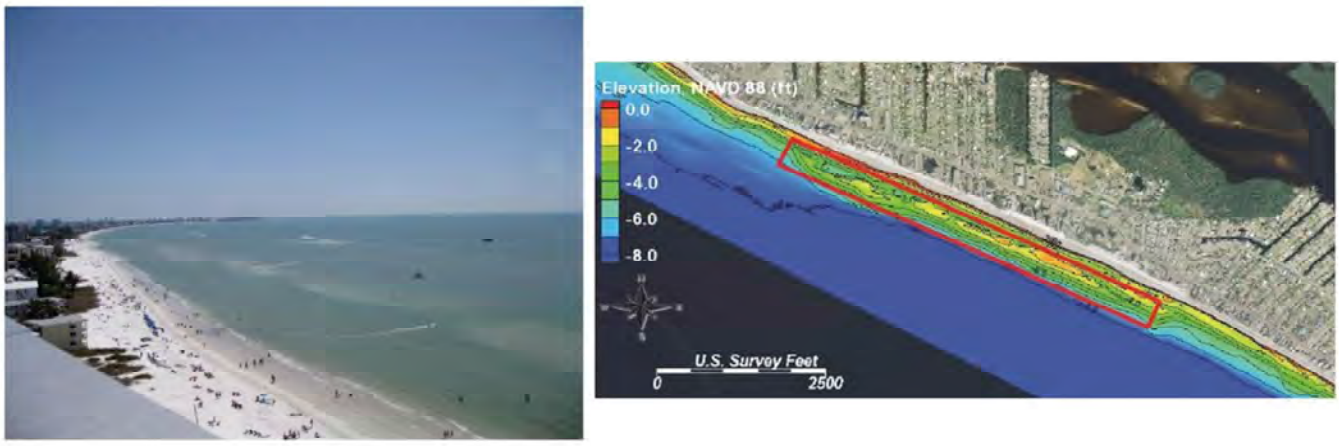


Figure 9. Nearshore berm field example, Ft. Meyers (a, left; aerial image, Brutsche, 2019; b, right; bottom topography contours, Wang, 2013).

4.1.3 Additional Coastal Tools and Techniques

4.1.3.1 Sand Fencing

Sand fencing is "…frequently used to enhance sand accumulation but recommendations for the most effective sand fence configurations vary among sites" (Miller, 2001). A conceptual model of how sand fencing works on a beach is shown in Figure 10. In this instance, the sand fence is placed seaward of the natural dune and results in a foredune building behind the fence in the sheltered area between the fence and the natural dune. Sand fence is effective in areas above high tide levels where aeolian transport (blowing sand) is prevalent.

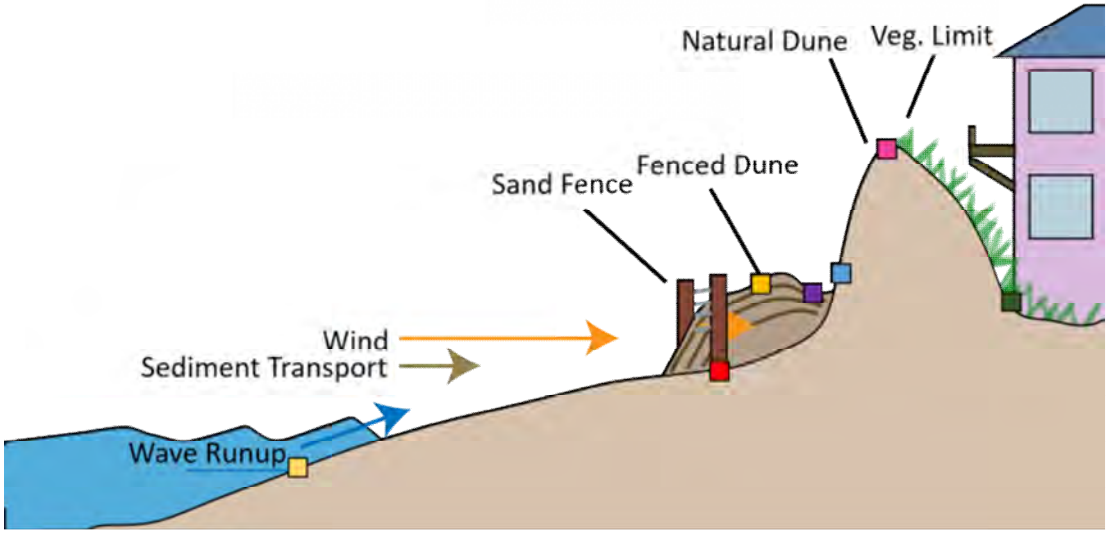


Figure 10. Conceptual model of sand fencing (NOAA, 2020).

Recent studies indicate that while sand fencing can trap sand and increase the dune width at the base, sand fencing can also "…prevent sand deposition to the natural dune behind the fence reducing vertical growth" (NOAA, 2020). Sand fencing should be considered as part of a series of management actions and their performance in the field monitored.

4.1.3.2 Natural Fiber Materials for Toe Protection

There is an interest by the stakeholders to consider natural fibers for toe and dune protection. Presently, design guidance for use of these type of materials in a coastal (wave) environment is very limited. It is anticipated that these materials are not as resilient as geotextile materials and are more appropriate in lower energy environments such as stream banks, marshes and embayments rather than shorelines with direct exposure to the open ocean. These materials are not anticipated to provide significant wave protection; however, they can serve a beneficial role in certain types of shorelines and environments. These materials have been placed in shoreline areas adjacent to the Baxter Road coastal protection system however their performance has not been quantified.

4.2 Alternative Development

Alternative analysis was performed from both an engineering and coastal process perspective. Bluff protection cannot be achieved without toe stabilization. Bluff erosion and collapse is a primary risk factor for Baxter Road structures, roadway and utilities. Therefore, all alternatives that provide bluff protection include toe stabilization. It should also be noted that alternative development assumes the existing system will be brought back into compliance.

Other forms of innovative protection methods that are common on other coasts were investigated as part of this effort. However, most of these protection methods do not provide toe protection to a bluff and some methods are not appropriate for this energetic wave climate. This speaks to the unique challenge of Nantucket bluff shoreline.

Removal of the present system and replacement with another form of toe protection would also have environmental and cost impacts. Any change to the shoreline area will require the system to establish a new dynamic equilibrium. Dynamic equilibrium of beaches can be described as "…the tendency for beach geometry to fluctuate about an equilibrium that also changes with time but much more slowly" (Dean, 2005). This analysis assumes that the present system and alternative scenarios would be fully functional and matching the project design.

With these considerations, analysis was completed with the existing system in place for most alternatives with a single variable changing each time. High level evaluation criteria included identifying the functional coastal processes, defining the environmental, ecological and habitat considerations, and identifying cost and structural considerations. Cost considerations are limited to an anticipated relative cost rather than cost estimates that would be a product of more advanced design stages.

This approach helps to identify which tools or methods can be adapted to the Baxter Road site and which options may not be applicable. All shore protection tools and approaches were evaluated based on a synthesis of the findings from the document review and stakeholder engagement sessions. The methodology of the application of these coastal tools and approaches are diagrammed as mind maps. These mind maps are diagrams that document the reasoning behind the alternative analysis and are meant to be read from left to right and top to bottom.

4.2.1 Longshore Transport

Longshore transport refers to sediment migrating parallel to the shoreline. This sediment transport mechanism is driven primarily by waves approaching the shoreline at an angle creating currents. The selection process for shore protection tools that address longshore transport is diagrammed in Figure 11. The diagram identifies three shore protection approaches that are intended to address longshore transport. Groins, nearshore breakwaters, and nearshore berms were evaluated in a qualitative manner as to whether or not they were feasible options given the discussion with stakeholders and review of documents. Groins were not identified as feasible alternative since they provide limited bluff toe protection and can have significant downdrift impacts. Nearshore berms were also considered not feasible in this location due to concerns regarding covering cobble habitat.

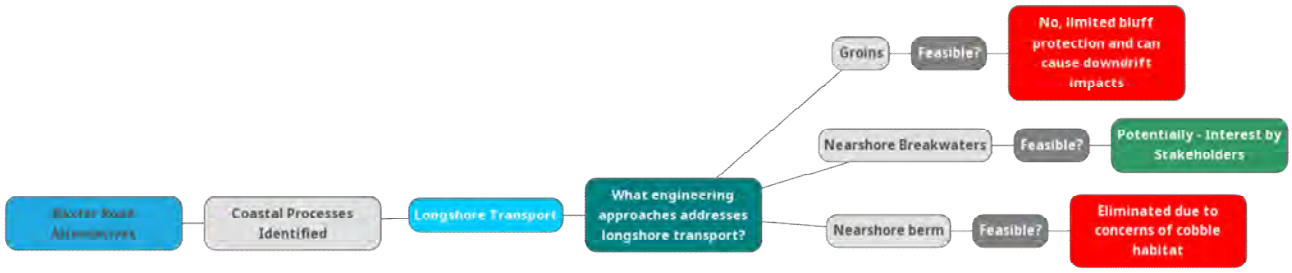


Figure 11. Longshore Transport Mind Map.

4.2.2 Cross Shore Transport

Sediments moving perpendicular to shore can be described as cross shore transport (Figure 12). This method is driven by "…the combined action of tides, wind and waves and the shore-perpendicular currents produced by them" (Seymour, 2005). Cross shore beach morphology has a seasonal fluctuation due to changes in energy levels of incoming waves. In response to storms and high wave energy, sediment moves offshore and is deposited in bars or other deposition features. This material is still in the active zone and during lower energy periods (summer) sediment migrates back onshore to form a summer beach profile. The intent of the cross shore transport alternative analysis is to explore methods or structures that may address cross shore transport of material. Structures such as nearshore breakwaters address cross shore processes by attenuating wave energy that alters the waves and currents behind them. Beach and dune nourishment projects also address cross shore processes by adding material into the system.

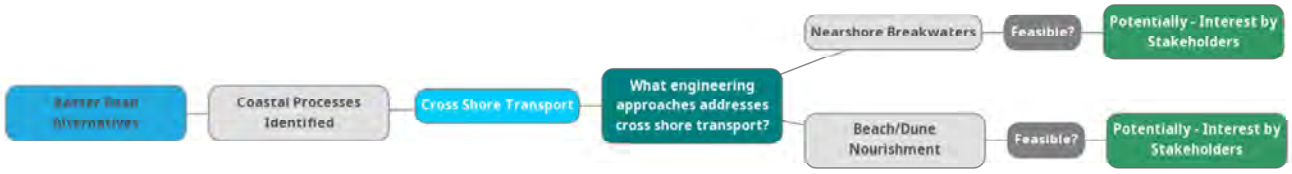


Figure 12. Cross Shore Transport Mind Map.

4.2.3 Aeolian Transport

Aeolian or wind transport refers to material that is transported primarily by winds. Bluff stabilization through native vegetation and geotextiles attempts to address the movement of sand by winds. Sand fencing can help trap sands to build a fronting dune but should be applied with the complex coastal system in mind to avoid preventing sand deposition on the natural dunes (NOAA, 2020). All three coastal sediment transport processes were discussed by the stakeholder groups and incorporated into the alternatives analysis.

4.2.4 Bluff Erosion

A wide spectrum of coastal tools and structures were evaluated related to bluff erosion. The approaches were separated by toe and slope protection. Toe protection addresses bluff erosion by preventing wave action from eroding the base of the bluff contributing to collapse. Bluff faces can erode from wind, precipitation, stormwater

runoff and potentially groundwater runoff. Erosion can be greater with a steeper slope and potential solutions could include flattening the slope, vegetation, and stormwater management at the top.

Toe protection alternatives included the entire available spectrum including seawalls, engineered dune, armoring and geotubes. Hardened structures such as seawall, engineered dune and armoring were eliminated due to hardened structures not desired by the stakeholder community and have significant regulatory restrictions. Geotubes were identified as a potential an option since there is an existing installation and an interest by the stakeholders. Slope protection options such as geotextiles and vegetation were identified as potential alternatives by the stakeholders. The methodology of bluff erosion alternatives is diagrammed in Figure 13.

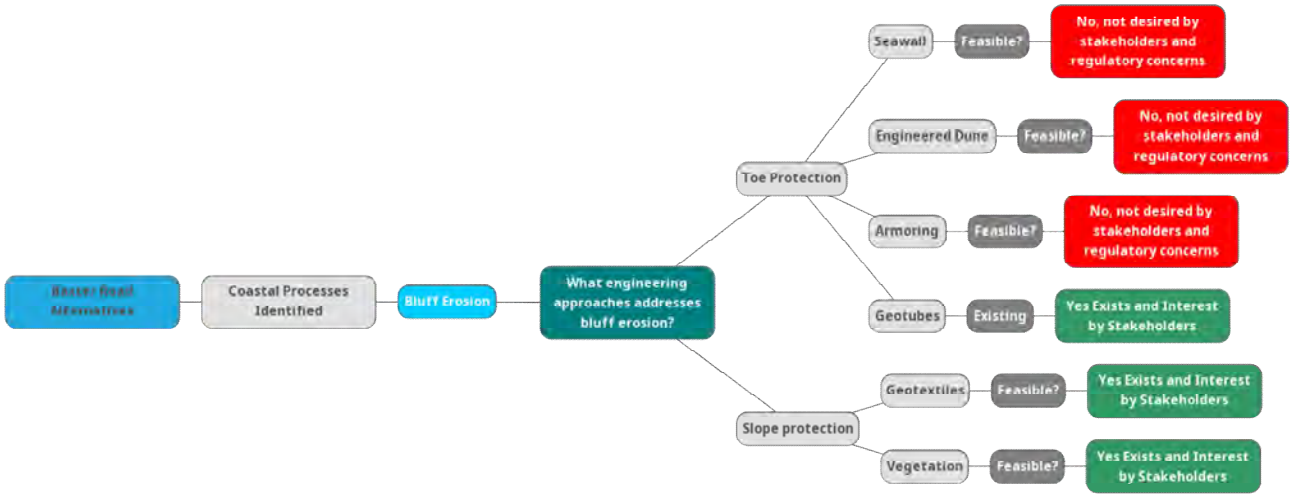


Figure 13. Bluff Erosion Mind Map.

4.2.5 Storm Return Period

A storm return period is an expression of storm intensity and its probability for recurrence. Storms with greater intensity that happen less frequently have larger storm return periods in years (50, 100). While more frequent lower intensity storms have a lower return period in years (1, 5). It should be noted that return period does not necessarily mean that a 100-year storm might not happen each year. The 100-year storm is the same as a 1% annual change of occurrence storm. There have been recent advances in the coastal community of practice in response base modeling and moving towards a more probabilistic approach to quantify risk from coastal storms. It should also be acknowledged that storm intensity and occurrence are expected to increase in response to climate change (IPCC, 2014). For the purposes of this work, we will simply express that higher intensity storms occur less frequently while lower intensity storms occur more frequently. Figure 14 diagrams the relationship between storm intensity and the suite of toe protection.

Figure 14. Design Storm Return Period Mind Map.

4.3 Environmental, Ecological and Habitat Considerations

A broad range of environmental, ecological and habitat considerations were evaluated as part of this alternatives analysis. Each element was discussed during stakeholder engagement sessions and the teams' analysis. This section details the methodology applied to these considerations across the selected alternatives.

4.3.1 Nearshore Cobble Habitat

During stakeholder engagement, an interest in nearshore cobble habitat was identified and incorporated into the alternatives analysis. Nearshore cobble habitat is important in the New England coastal waters for supporting a variety of communities including lobster. Each alternative was evaluated for the potential interaction to the nearshore cobble habitat and diagrammed in Figure 15. The existing system with toe protection and nourishment is not presently impacting nearshore cobble habitat as indicated by ongoing monitoring. Therefore, an adaptive approach to nourishment with the existing system is not anticipated to negatively impact nearshore cobble by burial. Expanding the existing system alongshore would add additional sediment to the system and monitoring of the cobble habitat should continue to ensure the nearshore cobble would not be buried. Removal, retreat, and Baxter Road relocation would not be expected negatively impact the nearshore cobble habitat since additional sediment is not being added and any erosion of the bluff is assumed to be less than what is currently being added by the nourishment program. Nearshore breakwaters would need to be evaluated for any potential impacts to the nearshore cobble habitat. It may be possible to locate the breakwaters so the footprint of the breakwaters does not overlap with the habitat. Modeling and monitoring would be required to determine if the breakwaters would cause for sedimentation over the cobble habitat by lowering the existing wave climate. It should be noted that rubble mound breakwaters, may provide similar habitat functions to nearshore cobble habitat and as such, could potentially increase the amount of available habitat.

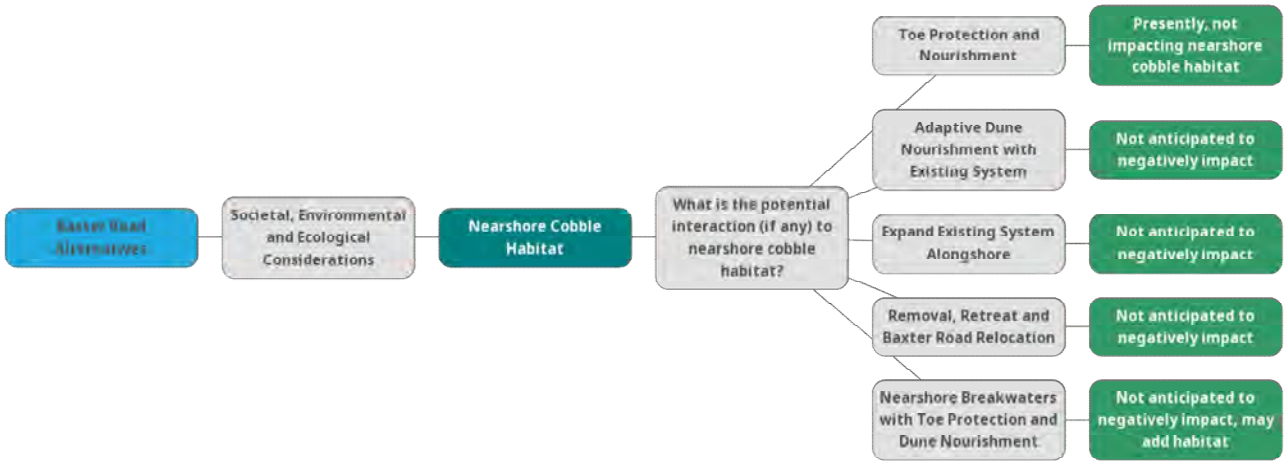


Figure 15. Nearshore Cobble Habitat Mind Map.

4.3.2 Promote Native Vegetation

Native vegetation is an important component in supporting a robust habitat. Each alternative was evaluated for their ability to promote or support the incorporation of native vegetation and is diagrammed in Figure 16 .

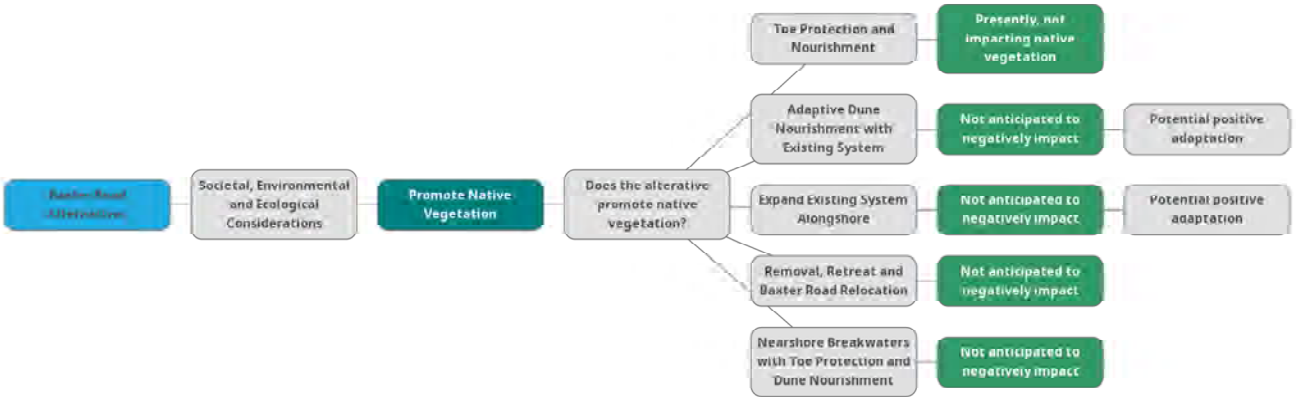


Figure 16. Promote Native Vegetation Mind Map.

No adverse impacts to native vegetation were anticipated for the suite of alternatives. All alternatives can support the incorporation of native vegetation and in the case of expanding the geotube system and adaptive dune nourishment or dune toe protection, there can be a potential for expansion of native vegetation. Adaptive dune nourishment may support native vegetation by optimizing placement volumes and preventing existing vegetation from being buried.

4.3.3 Nesting Birds

The team has assumed that alternatives that extend the beach and/or the dunes would have a positive impact on birds. Habitat requirements are very species specific so the assessment may not be directly applicable for all species that might use the beach habitat. It is also assumed that any project would have permit conditions

intended to protect nesting bird populations with appropriate seasonal restrictions on construction activities. The methodology of this analysis is diagrammed in Figure 17.

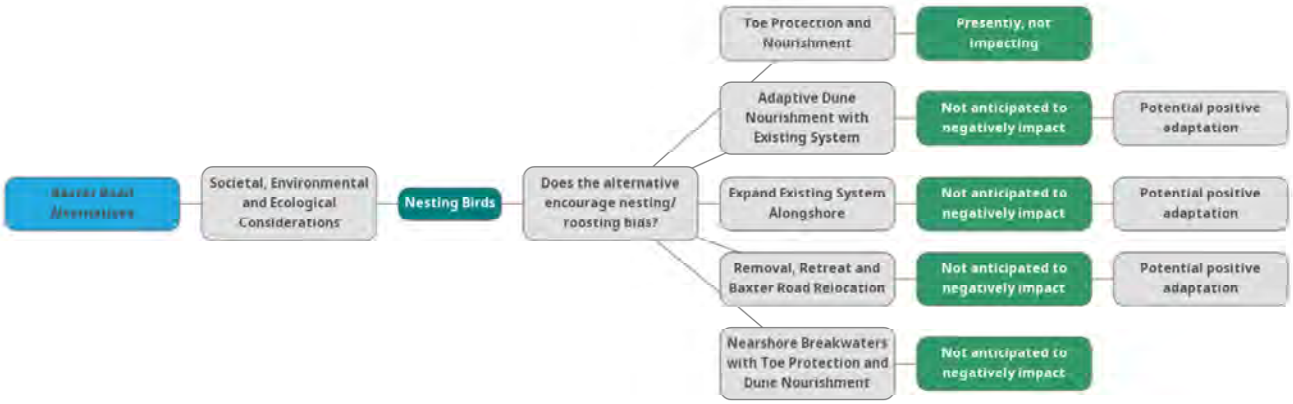


Figure 17. Nesting Birds Mind Map.

4.3.4 Beach Access

Concern regarding beach access was expressed during the stakeholder engagement sessions and was incorporated into the alternatives analysis. Beaches are considered a public resource in the Commonwealth of Massachusetts and access must be maintained. Figure 18 provides a diagram of the evaluation of the potential impact of each alternative may have on beach access.

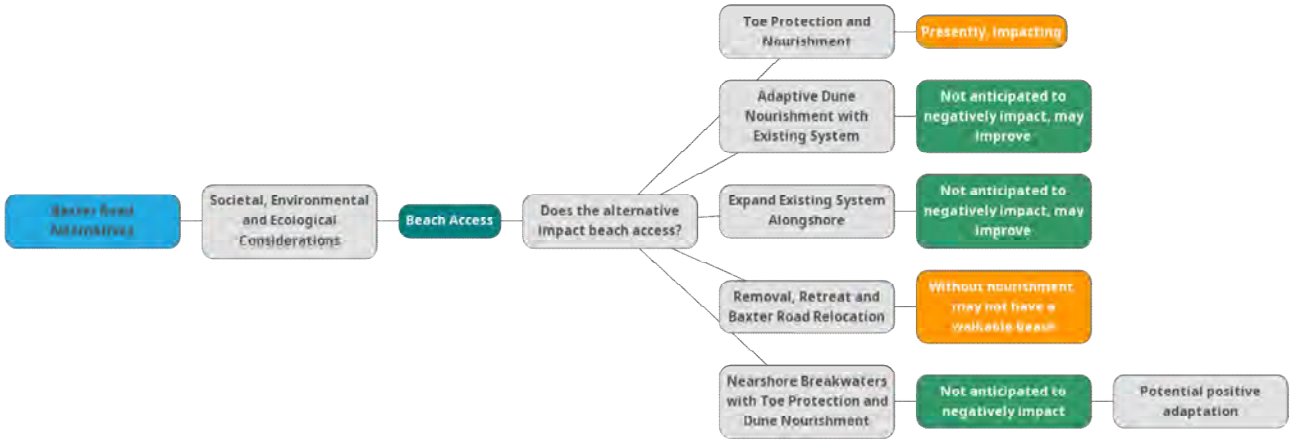


Figure 18. Beach Access Mind Map.

From stakeholder engagement sessions, the present system of toe protection and nourishment is thought to be presently impacting the beach access. It is possible that if the dune nourishment ends with the removal of the geotube system, the beach may narrow. While the unprotected bluff would provide some material to the beach, it is uncertain if this volume would maintain the beach at the same level as dune nourishment.

The other alternatives are not anticipated to negatively impact beach access.

4.3.5 Tourism and Aesthetics

Tourism is an important component in the Nantucket economy. Aesthetics and interpretation by both the local community and visitors is also an important consideration for any proposed solution. The mind map for the tourism and aesthetics category is shown in Figure 19.

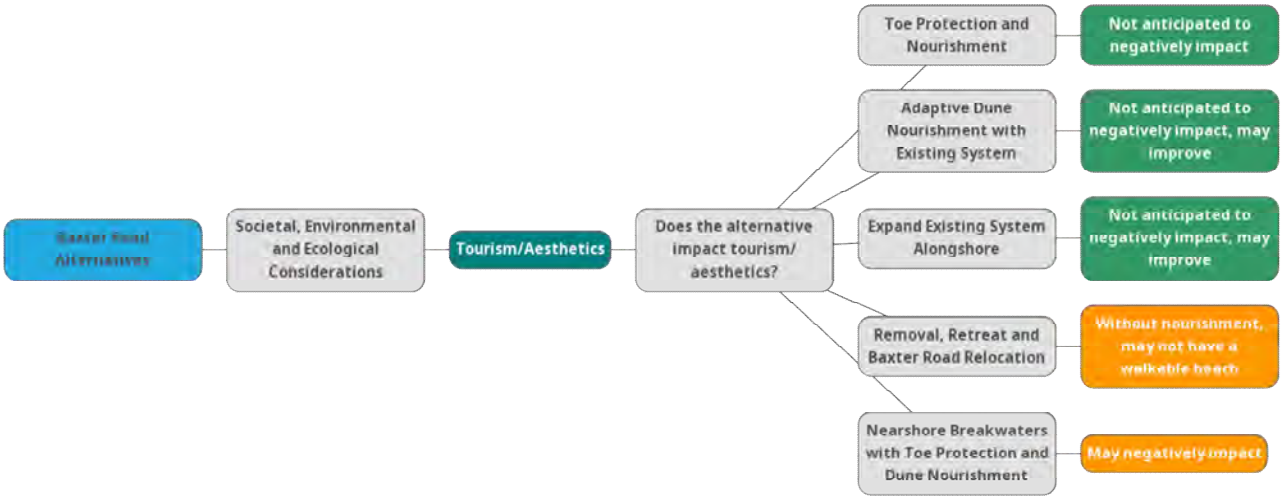


Figure 19. Tourism and Aesthetics Mind Map.

Both nearshore breakwaters and removal were identified as potentially having negative consequences to tourism and aesthetics. It is anticipated with the removal of the present system and ending of dune nourishment, the beach may narrow and not be as accessible which in turn, could negatively impact tourism and aesthetics. It is also anticipated that due to high wave energy environment and steep nearshore slope that the nearshore breakwaters may need to be situated close to shore, extend above the high tide level, and have large armor stones. That may have a negative impact on both tourism and aesthetics dependent upon the interpretation of the structure and community outreach. The other alternatives are not anticipated that have a negative impact on tourism or aesthetics because they have a comparatively more subtle change in the coastal environment and may improve tourism and aesthetics of the area.

4.3.6 Emergency Access

Maintaining or improving emergency access to the beach is an important consideration to support safe recreation on the beach. Figure 20 diagrams the approach for evaluating if the suite of alternatives impacts emergency access.

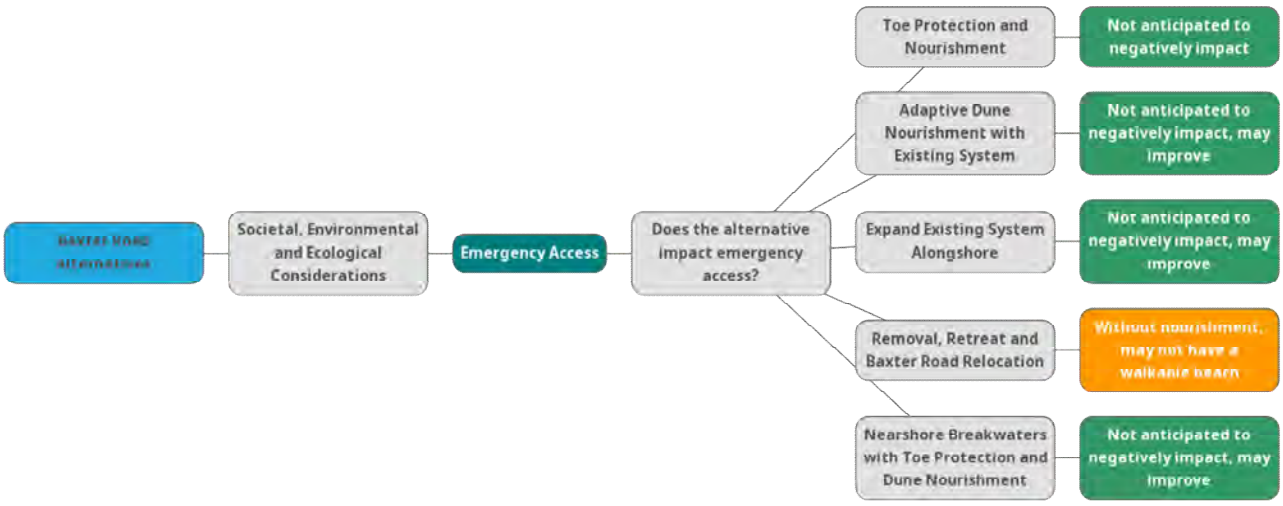


Figure 20. Emergency Access Mind Map.

If the geotube system is removed prior to the road relocation, emergency access from the existing road could be jeopardized. The removal, retreat and relocation alternative may have negative impact to emergency access due to the potential narrowing of the beach with the end of the dune nourishment. The other alternatives are anticipated to either not negatively impact emergency access or may improve beach access by widening the beach. Reliable emergency access should be incorporated into any implemented alternative as part of design.

4.4 Cost and Structural Considerations

This section documents the analysis of alternatives for cost and structural considerations. This category includes both installation and operational costs, design life, funding considerations, utilities, tax implications, maintenance responsibilities and legal agreements. Each subcategory will be discussed in the following sections.

4.4.1 Installation Cost

Relative installation costs at a feasibility level were evaluated for all alternatives and are described in Section 4.8. The existing system of toe protection and nourishment as well as the adaptive dune nourishment is assumed to not have an installation cost since the system is presently in place and the adaptive option simply refines the volume of material placed rather than add a new component. The adaptive dune nourishment alternative has the potential for cost savings by optimizing the dune nourishment volumes. The installation cost for the expanded system is considered to be comparatively moderate to the adaptive dune nourishment. The expanded system will require additional length of geotubes, additional volume of sediment as well as plantings. Construction of nearshore breakwaters will be comparatively high from a mobilization, demobilization, and materials cost.

4.4.2 Operational Cost

Operational costs refer to costs required to maintain and monitor the implemented alternative. The process to evaluate the relative operational costs at a feasibility level are diagrammed in Figure 21.

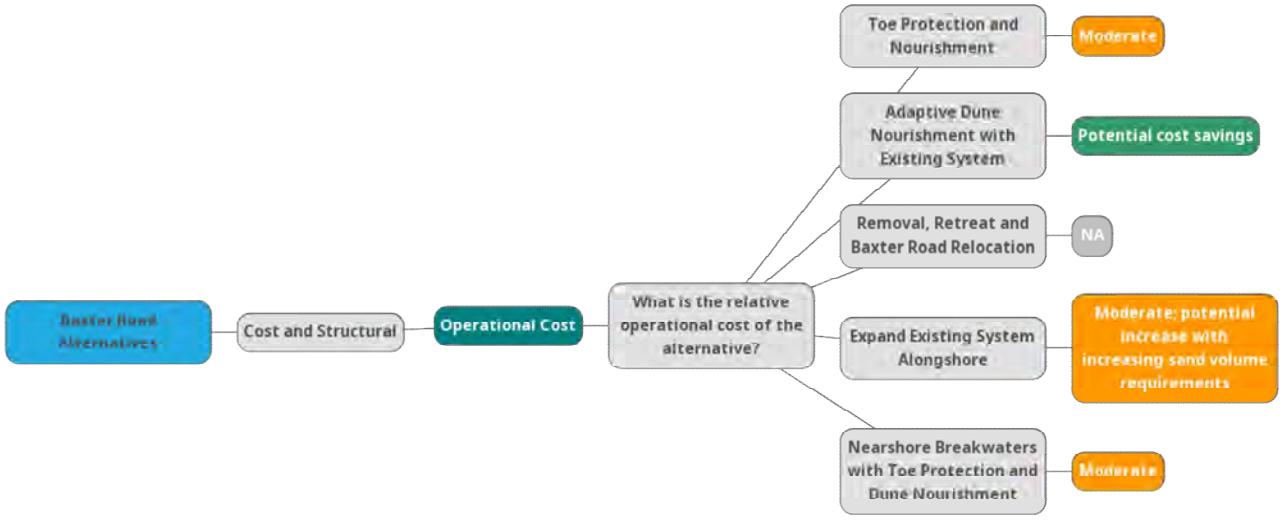


Figure 21. Operational Cost Mind Map.

The adaptive dune nourishment alternative has the potential to provide an operational cost savings by optimizing the material placed. The existing system has a comparatively larger operational cost due to the increased sand requirements. Expanding the toe protection and dune nourishment system along will increase maintenance and monitoring costs by both increasing the volume needed and increasing the area that is monitored. The nearshore breakwaters option is also anticipated to have a moderate operational cost. These structures are designed generally with a 50-year design life and resistance to a return period storm. Nearshore breakwaters do not require maintenance but require monitoring. Repair to the breakwaters is not anticipated during this design life but may be required if they are damaged and need repair. Monitoring costs are likely to increase but can easily be incorporated into the existing field monitoring plan. There is no associated operational cost with the removal, retreat, and relocation alternative.

4.4.3 Design Life

Design life can be described as the intended operational life span of a structure. Probable design life was evaluated as part of this alternative analysis and the methodology is diagrammed in Figure 22.

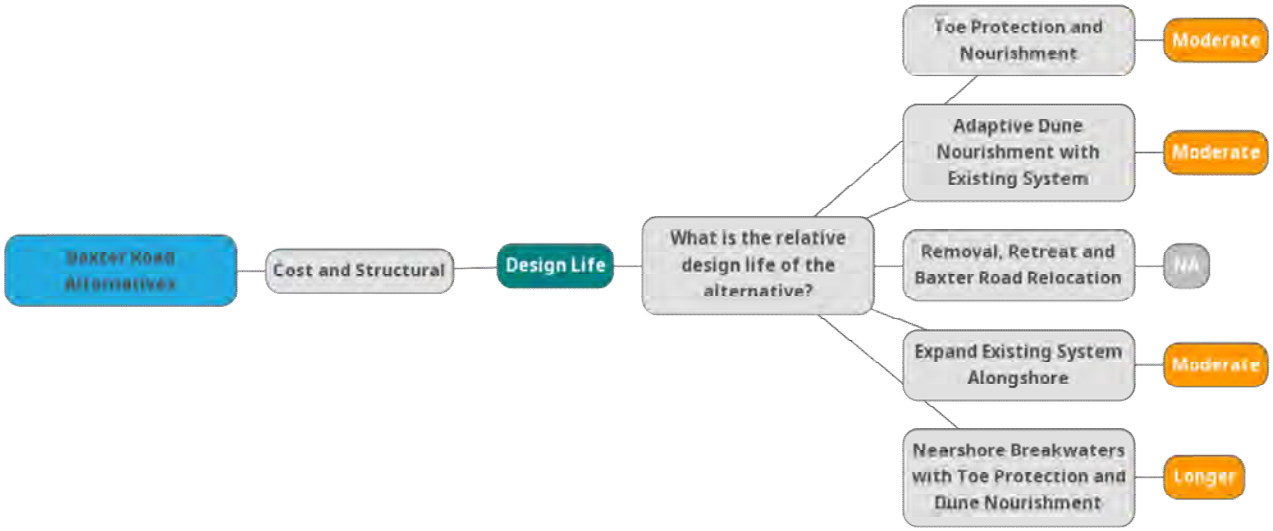


Figure 22. Design Life Mind Map.

It is anticipated that engineered solutions such as the existing toe protection and nourishment system, adaptive dune nourishment, and any expansion of toe protection alongshore would have a comparable moderate design life from a feasibility level assessment. The nearshore breakwaters would have a longer design life as part of its design process. The removal, retreat and relocation alternative would not have a design life.

4.4.4 Funding Considerations

For this feasibility level assessment, funding considerations were evaluated across the suite of alternatives. The assessment of funding considerations per alternative is diagrammed in Figure 23.

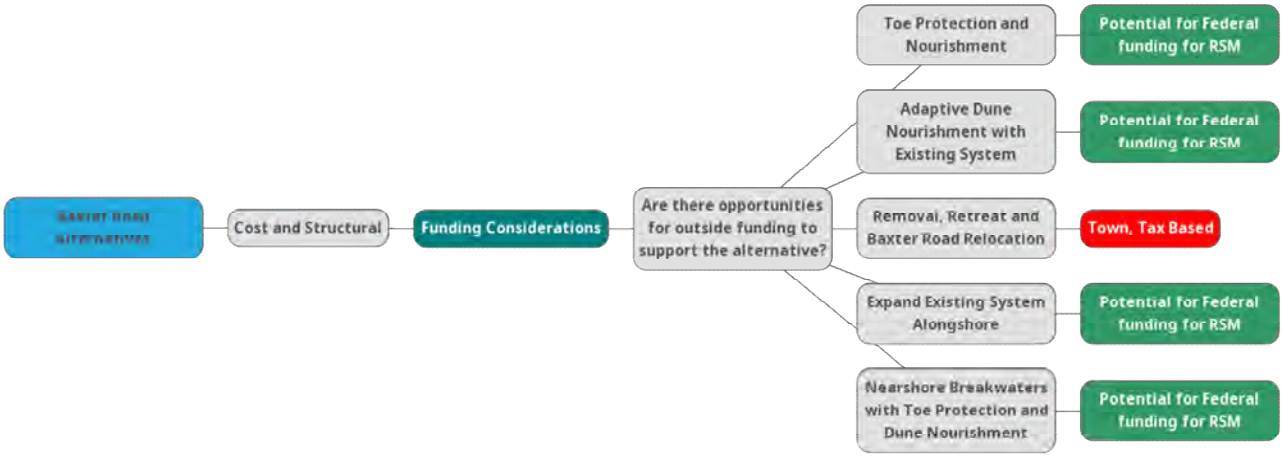


Figure 23. Funding Considerations Mind Map.

The Regional Sediment Management (RSM) program is a federally funded program that promotes a systems approach for management of sediments across coastal, estuarine and inland environments (USACE, 2021). This program would require coordination with local stakeholders as well as the U.S. Army Corps of Engineers New

England District. These funds may be used to reuse sediment from the navigation channel for beach and dune nourishment at Baxter Road and other projects around Nantucket Island. Figure 24 provides a graphic of national RSM program participation across the USACE Districts and Divisions and other federal and non-federal partners. Many funding programs require a positive cost benefit ratio (BCR) in order for a project to be funded. Due to the single-family residential nature of the area, potential benefit costs are likely to be relatively low compared to most structural solutions, and possibly even a substantial dune or beach nourishment program.

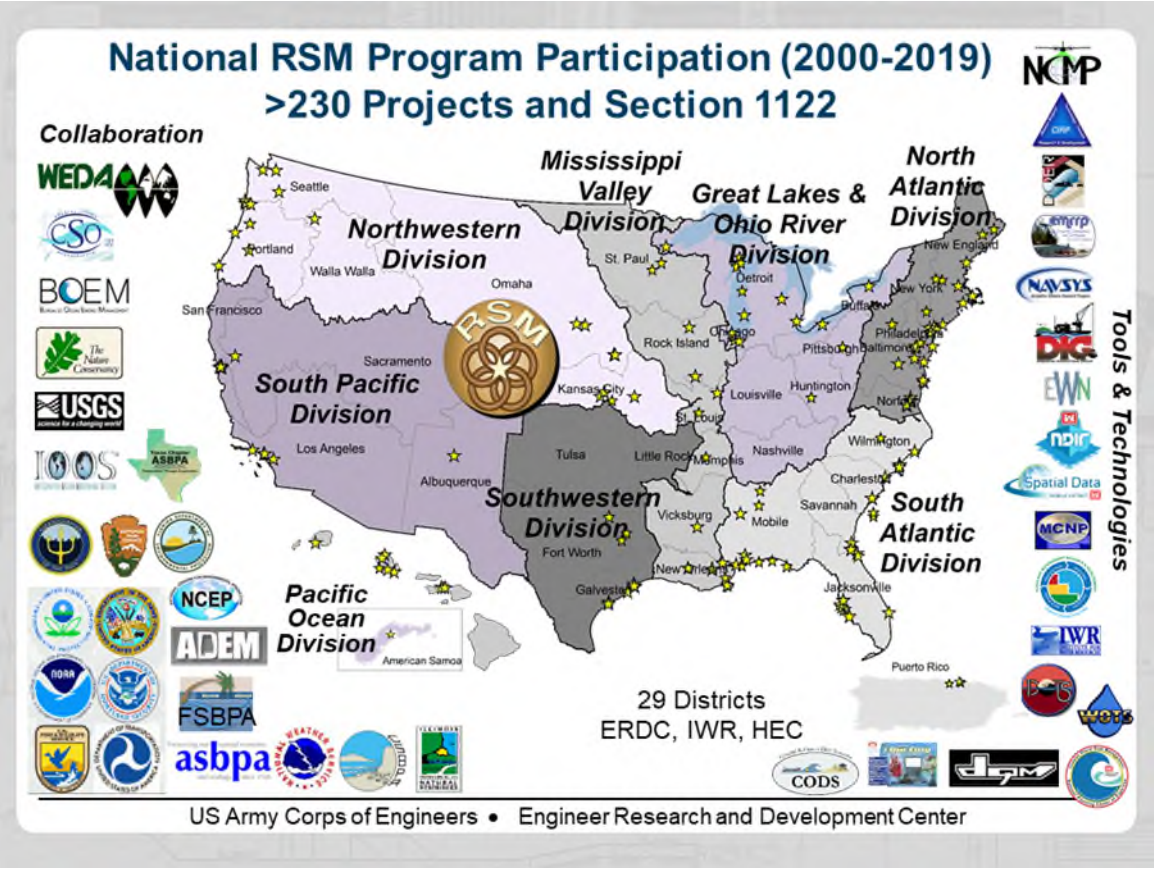


Figure 24. National RSM Program Participation (USACE, 2021).

Yellow stars indicate RSM projects across the USACE mission areas from 2000 to 2019. All alternatives except removal, retreat and relocation of Baxter Road have the potential for RSM or other federal funding programs.

Erosion reduction projects at Baxter Road will likely be eligible for FEMA funding, including Building Resilient Infrastructure and Communities (BRIC) grant and Hazard Mitigation Grant Program (HMGP). For FY2021, $1B will be available through BRIC and in FY2022, $3.46B will be available through HMGP. For these programs, eligibility is for projects which mitigates the risk of natural hazards to infrastructure. There is ample data on erosion rates that will provide documentation for historic losses and the need to increase the level of protection. With a 25% local match, each project can be up to $50M federal share. These FEMA opportunities also provide funding (up to $300k) and technical assistance for planning, project scoping, and studies. Local and private funding can be used for match or to fund an entire project that is scoped. Expansion of the system would likely be funded by private homeowners as well as retreat of private homes.

4.4.5 Utilities

There are both town-owned and private utilities located within Baxter Road. Among the town-owned utilities are the physical roadway as well as the water and sewer service. Privately owned and maintained utilities include the overhead electric lines as well as buried internet & communication lines. This portion of the alternative analysis included examining if the alternative would support utility resiliency. This process is diagrammed in Figure 25 as a mind map.

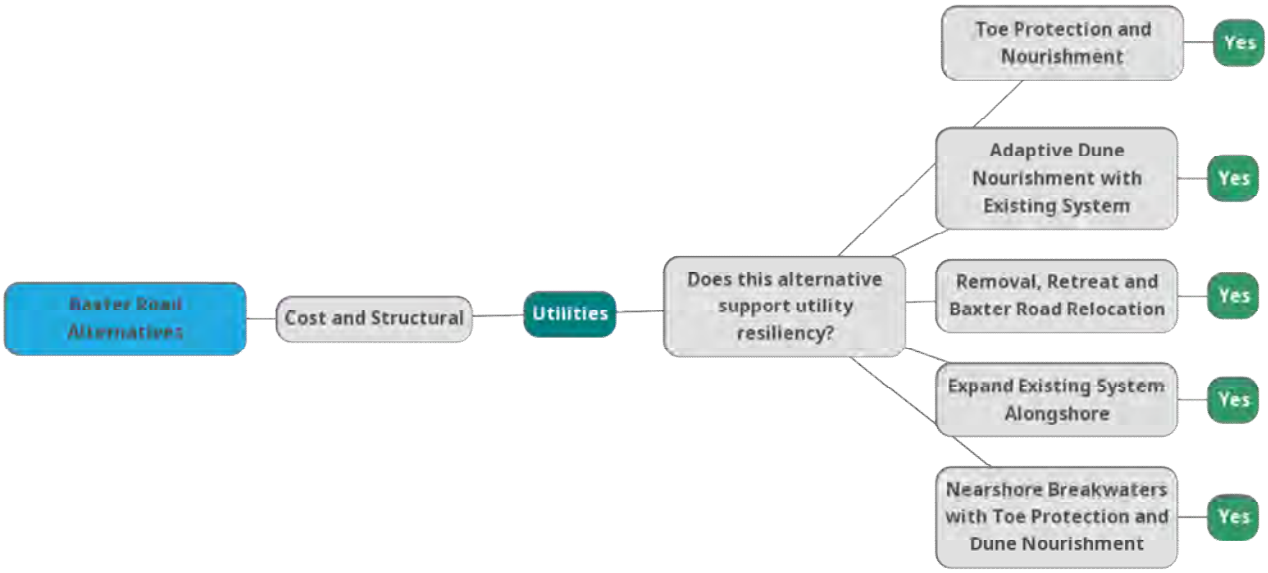


Figure 25. Utilities Mind Map.

4.4.6 Tax Implications

Town revenue from property taxes may be affected by the loss of privately owned property through erosion. Therefore, any alternative which has a positive (mitigating) effect on erosion may be considered to positively maintain the town's revenue from property taxes along Baxter Road. However, analyses of Nantucket's property tax loss for anticipated property loss for years 2030, 2050, 2100 was reviewed and is included in Appendix C. The analysis utilized the assessor's data for the current assessed land/and property values from 2021 and shows that any loss in revenue due to loss of property on Baxter Road would result in only modestly higher property taxes across the whole island. By 2100 it is anticipated that a total of $531,000 in tax revenue will be lost this represents less than 1% of the tax base for the island. Thus, many suggest any loss in property tax would be absorbed by the remaining property owners within Nantucket.

4.4.7 Maintenance Responsibilities

Any implemented system will need to be maintained by an entity. Toe protection is presently maintained by the SBPF including periodic dune nourishment. Any existing or new roadway as well as utility infrastructure would be maintained by the Town, private utility companies, and private property owners, as applicable based on maintenance agreements set forth during the planning and construction of the roadway. Maintenance of other components would need to be determined as part of the implementation process.

4.5 Description of Alternatives

The purpose of this work is to present a suite of options for the stakeholder community to consider. The decision of which pathway to choose is the responsibility of the local community.

4.5.1 No Change in Project and Operation and Maintenance Activities

This alternative serves as baseline for analysis. It is also an opportunity to define the individual components of the system and the linkage to the coastal processes. The existing system provides toe protection, artificial or sacrificial dune nourishment and bluff stabilization over a portion of the study area (approximately 950 feet). Toe protection is achieved by geotubes placed at the toe or base of the bluff protecting it from erosion due to wave action. Erosion at the base of the bluff can lead to episodic collapse. Dune nourishment is compatible sand that is placed on top of the geotubes to provide a buffer to the geotubes and add material to the littoral system. Presently, compatible sand is added to the template by heavy machinery. Bluff stabilization includes vegetation and promoting best management practices to manage surface drainage. Surface drainage can exacerbate erosion of material from the bluff face. This alternative assumes that the system is brought back into compliance with the existing permit.

Feedback received during stakeholder outreach and documents in the background information files have conflicting information on the geotubes and current nourishment program with regard to downdrift beach erosion. While a detailed analysis of the substantial available beach and bluff monitoring data was beyond the scope of this study, a preliminary review of several reports suggesting downdrift impacts indicated that the analysis was based on selective data analysis as opposed to a more comprehensive analysis. Changes in beach position occur on multiple time scales, from hours to decades with significant variability over those time frames, and as such, a more comprehensive review is more likely to accurately capture long-term trends. One of the more comprehensive analyses reviewed for this study noted:

> Long term shoreline change plots are presented for continued insight into beach response. Although there is substantial variability, no post-geotube changes have yet been observed that deviate substantially from past observations. The present shoreline is at a similar location as more than ~10 years ago at many profiles and no significant accelerated erosion has been noted.(Woods Hole Group, 2021)

4.5.2 Adaptive Dune Nourishment with Existing System

Adaptive dune nourishment refers to incorporating an adaptive or optimized nourishment strategy. A potential method of implementation is to determine the sacrificial sand volume necessary to refill the template to design specifications after the springtime survey. A topographic and bathymetric survey should be done twice annually to capture both the quiescent (summer) configuration and the resulting profile after the energetic (winter). This survey approach is used at other locations with active adaptive management approaches to beach nourishment (Zarillo, et al., 2016). The motivation behind this alternative is efficient use of sand resources and prevent overfilling the template documented by Epsilon, 2020. This adaptive technique minimizes potential to impact nearshore cobble habitat and fishing industry. Adaptive mitigation optimizes sediment requirements by only placing the material needed on the beach. This approach may reduce the volumes of sand necessary for maintenance, however greater volumes of sand may be needed if more erosion is observed. Optimizing sand resources may become more necessary in the future with sand becoming a more in-demand commodity around the island. It should be noted that throughout the monitoring efforts, nearshore cobble habitats were not found to be impacted by sediment burial. This optimization technique for sediment management addresses annual variations in erosion and accretion which is more in line with natural variability in coastal processes.

4.5.3 Expand Existing System Alongshore

This alternative leverages previous work investigating expanding toe protection and dune nourishment alongshore to approximately 2,800 feet. This proposed alternative includes four tiers of geotubes (similar to the existing system) to provide resiliency to the 100 to 200-year storm. This alternative also includes vegetation of the bluff face with American beachgrass or other native vegetation. The dune nourishment to cover the geotubes for the longer length of the system is also included in this analysis. With the expanded system, the monitoring program would also need to be expanded. A variation on this alternative would be to design expanded toe protection to a lower level of return-period storm, such as 25- or 50-year storm, to be more aligned with providing protection over a time-period appropriate to allow for a retreat strategy to be implemented. Figure 26 depicts the alongshore extent of the proposed system.

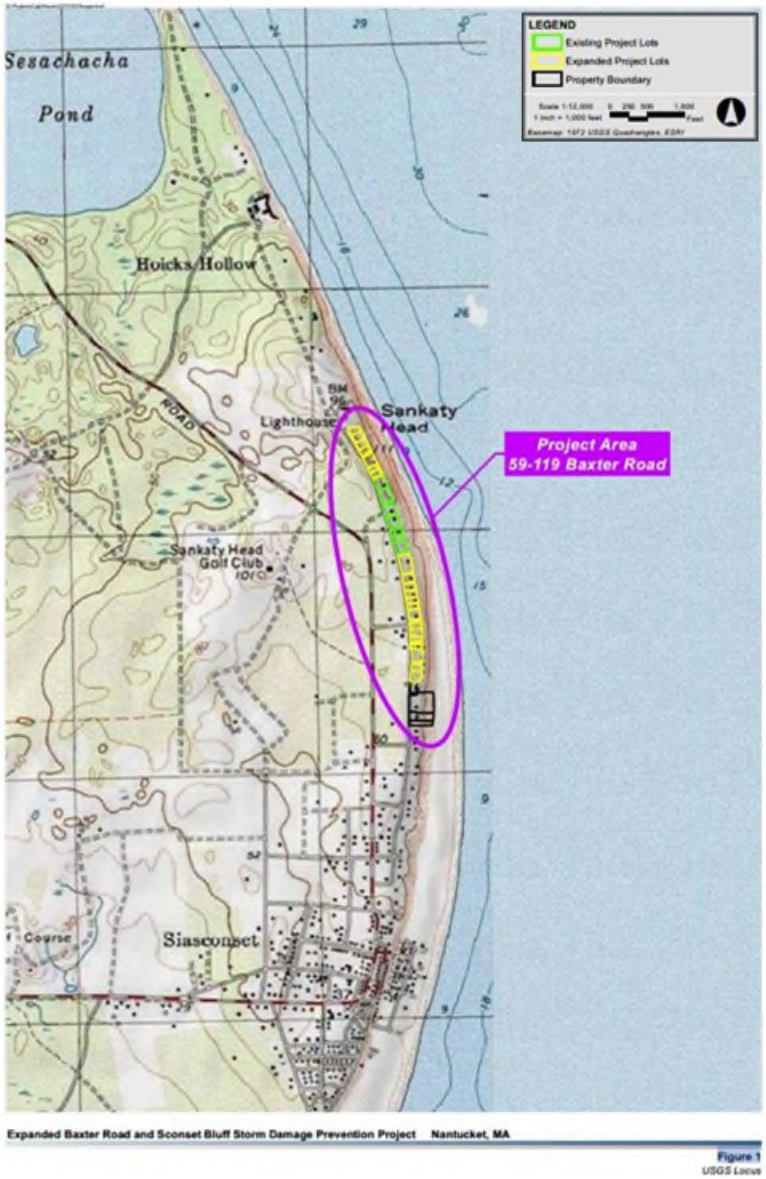


Figure 26. Approximate Alongshore Coverage of Expanded Toe Protection and Dune Nourishment System (Epsilon, 2018).

4.5.4 Removal, Retreat and Baxter Road relocation

The removal, retreat and Baxter Road relocation includes the removal of the existing structures including geotubes and associated components. This alternative would also include ceasing artificial dune nourishment activities including truck traffic on roadways and heavy machinery on the beach. and begin the retreat process to remove homes and relocate utilities. No additional bluff stabilization measures would be implemented. Removal of the geotubes would occur after relocation activities is complete.

4.5.5 Nearshore Breakwaters with Existing System

This alternative explores the feasibility of adding nearshore breakwaters directly seaward of the existing system to provide wave attenuation. Nearshore breakwaters can assist in maintaining dune nourishment and encourage sediment deposition on the lee (shore) side of the structures. A conceptual sketch is shown in Figure 27 with potential nearshore breakwaters locations indicated as wire frame rectangles.

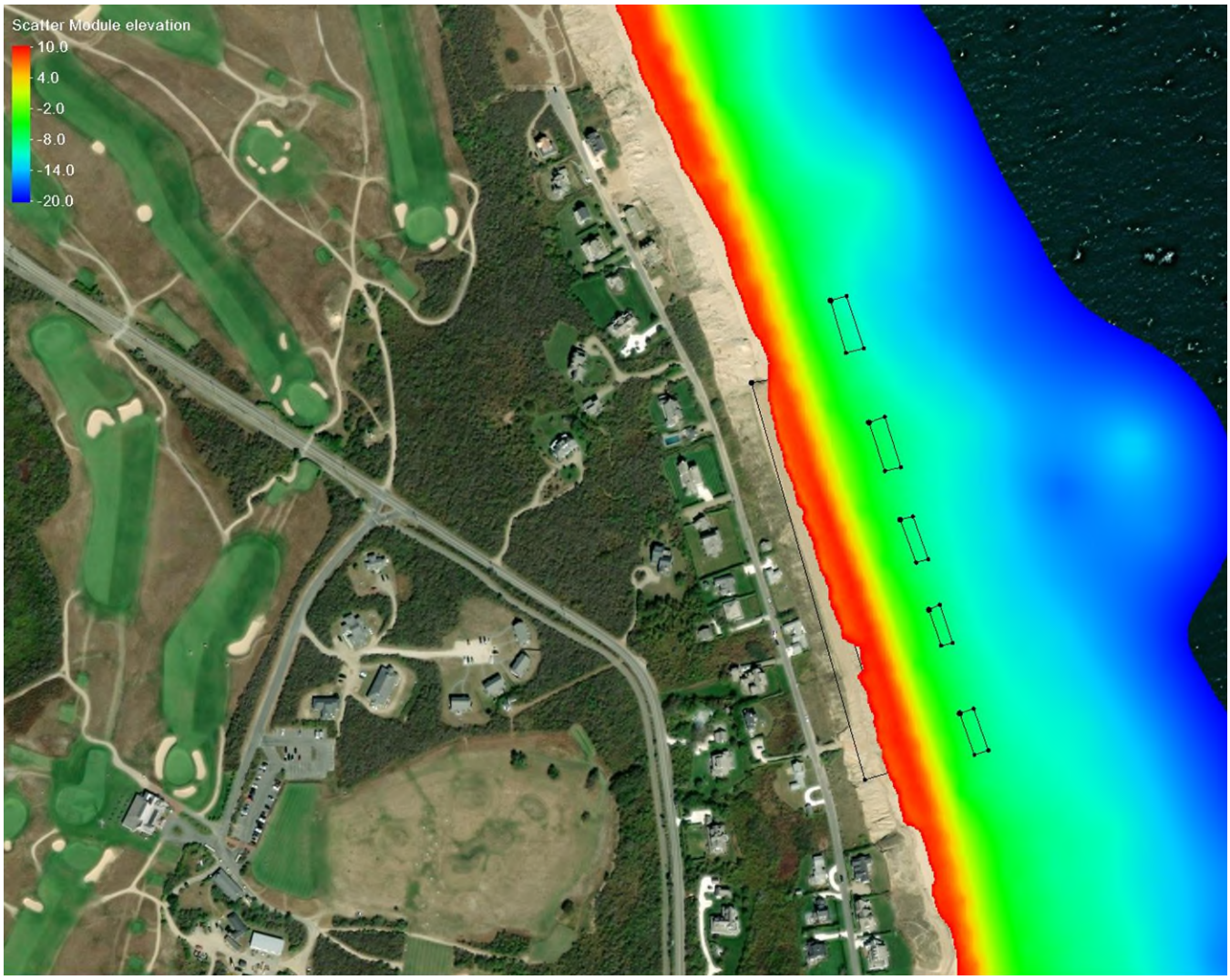


Figure 27. Nearshore breakwaters conceptual configuration.

The lateral extent of the existing project is represented by a wire frame on the shoreline. Bottom topography is included and deeper depths are indicated by cooler colors and shallower water depths are represented by warmer

colors. Design specifications such as distance from shore, gap width and number of breakwaters would be defined during later design phases.

4.6 Evaluation of Alternatives

4.6.1 Definition of Purpose

The purpose of the existing project includes the following: provide toe protection to the bluff, add sediment to the littoral system via dune nourishment, and bluff stabilization through vegetation and best management practices for managing surface drainage. Toe protection in the form of a geotube protects the base or toe of the bluff from wave action which can erode the bluff leading to episodic collapse. The dune nourishment covers the geotubes and provides a buffer to the toe protection against storms in addition to adding sediment to littoral system. Bluff stabilization through vegetative cover seeks to address aeolian or sediment transport from wind. The alternative selection process was designed around augmenting one element of the system or one specific coastal process to evaluate the response of the system. Responses by changing a single parameter between each alternative are observed.

4.6.2 Service Life

Coastal erosion mitigation measures have certain service life based on their ability to resist storm events and/or when materials begin to lose strength. A typical design / service life for harder coastal protection structures is 50-years, but softer solutions typically have a lower design life or require more frequent maintenance to maintain a specified level of protection. While many coastal protection projects in the US utilize a typical 100-year return period design storm, it is often better to match the design storm to the desired service life. For instance, if an alternative is designed for a service life of 25 years, the cumulative probability of exceedance is 34% if the design storm is a 100-year event. Figure 28 diagrams toe protection alternatives and the appropriate storm and wave intensity for that approach.

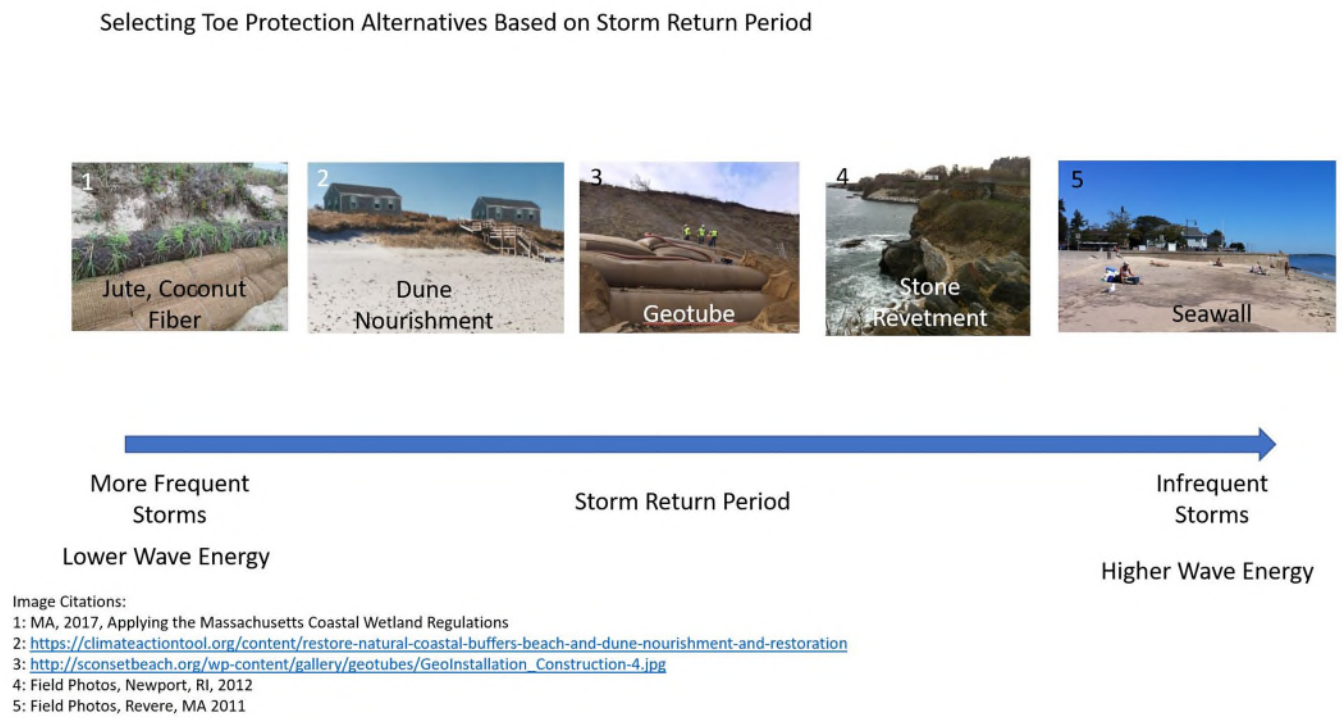


Figure 28. Toe Protection Alternatives and Storm Return Period.

4.6.3 Initial Construction Cost

To facilitate a relative comparison of initial construction costs between the alternatives, the following assumptions are made.

It should be noted that sand costs are highly variable and are likely to change in the future.

The nearshore breakwaters with existing system alternative have the largest initial construction cost. The value listed in Table 3 is derived from previous experience with these structures in similar environments. The next alternative with the largest cost is the removal, retreat and Baxter Road relocation as discussed in 4.7 Removal, Relocation of Baxter Road and Utilities, Retreat section. The expand the system alongshore is estimated at $6M from previous documentation. Adaptive nourishment and existing alternatives are not included because they do not have an initial construction component.

Table 3. Estimated Initial Construction Costs.

Parameter	Cost ($)
Expand System Alongshore	$6M (Includes initial sand template)
Removal, Retreat and Baxter Road Relocation	$30M
Nearshore Breakwaters with Existing System	$100M

4.6.4 Operations and Maintenance

Potential downdrift impacts of any proposed solution are possible and the recommended method to address these impacts is through sand mitigation. If expanded dune nourishment is implemented, a similar adaptive management monitoring and maintenance approach should be taken. In addition to annual filling to a design template, emergency replenishment may be needed after significant storm events.

It should be noted that Nantucket has identified the need for a comprehensive island-wide approach to sediment management. The CRP recommends a comprehensive approach to sediment management across the island as well as priority data collection and analysis steps including performing a Sediment Transport Study and developing an operational sand budget, or Sediment Budget. These projects will be beneficial to implementation (or continued implementation) of the alternatives discussed in this Summary of Findings.

Other maintenance activities associated with bluff best management practices include installation, monitoring and repair of sand fencing, vegetation, or other slope erosion reduction measures. Diversion of storm water runoff away from the bluff face should continue and irrigation of lawn areas should be avoided. Homeowner Best Management Practices are discussed in more detail in Section 4.9 and in Appendix B.

The performance of any alternative needs comprehensive monitoring to support informed management. Monitoring activities should have a comprehensive system wide approach and resolve coastal processes acting on the system and the response of the system to coastal forcing. Specifically, monitoring should capture sediment changes in the constructed system, beach, and adjacent areas. Other components that should be included in a monitoring effort is any plantings or habitat elements. Conditions of any other system components such as sand fencing should also be included in the monitoring efforts. Presently, the ongoing monitoring program provides a basis for analysis however can be improved by expanding the surveys and leveraging new survey techniques and technologies.

Previously, changes in the shore and shoreface were observed with a combination of land based cross shore transects via GPS RTK to wading depth and single beam survey via boat. The most recent survey performed by Woods Hole Group on June 16th, 2021, included drone based Light Detection And Ranging (LIDAR) that captures the beach, dunes and bluff. This approach enables the development of a 3D topographic map and move towards a surface based evaluation of sediment movement rather than cross shore profiles. It should be recognized that cross shore profiles have been industry standard approach for quantifying changes in beaches however, the Baxter Road site poses some unique challenges to traditional survey techniques with the bluff and geotube project. The incorporation of drone based LIDAR represents a significant step forward in evaluating sediment movement in a comprehensive manner by capturing the majority of the system in a single survey. Depending on laser penetration depth, these surveys will likely need to be combined with traditional boat based surveys to capture deeper water depths. Costs associated with surveys include mobilization, demobilization, survey time and post processing time. Incorporating remote sensing techniques such as LIDAR may save survey time. However, post processing of LIDAR data may increase as compared to traditional survey methods however it is dependent upon software, scripting and computational capabilities.

Other monitoring that may be included and can be performed concurrently with drone based survey is aerial imagery. Aerial imagery of conditions can assist in communicating with the public and monitoring habitat such as vegetative cover that might not be reflected in the LIDAR. Another type of aerial imagery is hyperspectral imagery which can assist in delineation of vegetation types to quantitatively measure cover and density. Vegetation has been shown to be an important component in the performance of rehabilitated coastal dunes. Aerial imagery can also best capture other system components such as the condition of sand fencing, presence of debris or location of wrack line.

Additional monitoring components such as nearshore wave and current monitoring would be advantageous to closely link response of the system to coastal forcing however likely beyond the scope of this effort. If offshore

breakwaters are proposed, then collecting this information would be needed to establish baseline conditions and monitor changes due to the breakwaters. Oceanographic instrumentation such as acoustic doppler current profilers (ADCP) and directional wave buoys requires substantial capital cost, regular servicing and rapid response should a surface buoy move outside its defined watch circle. Nearshore waves and currents can be observed remotely through the use of high frequency (HF) radar and could provide the added benefit of providing near real time surface currents, waves and tidal current predictions.

Comprehensive monitoring will support the development of an operational sand budget. “Budgets allow estimates to be made of the volume of volume rate of sediment entering and existing a defined region of the coast and the surplus or deficit remaining in that region” (Rosati, 2005). A sediment budget is an engineering tool that accounts for the sediments sources and sinks in a local or regional area with specified boundaries and time interval. This approach can be used to examine short-term conditions (seasonal) or longer term such as a previous or existing conditions. “Sediment budgets are a fundamental tool for project management and they often serve as a common framework for discussions with colleagues and sponsors…” (Rosati, 2005). A previous effort to develop a sediment budget could serve as a starting point and updated with recent field data. An operational sediment budget would be one of the primary products of an island wide sediment study. “Understanding the boundaries of littoral cells, rates, and direction of net sediment transport should be the basis for science-based coastal management” (UMASS Boston, 2021).

Monitoring activities will also provide field data necessary to support an adaptive nourishment approach. Presently, the annual nourishment volume is set at a single, non-adaptive value. This approach does not allow for natural variability in sediment movement. Sediment transport can vary from season to season as well as longer time scales. An adaptive approach to refill the constructed template once a year rather than a single value may present a cost savings by optimizing sand needs. Previous reporting by Epsilon indicates that the design template is being overfilled beyond its design due to the requirements of the single renourishment value.

Maintenance of nearshore breakwaters may include resetting the armor stone layer or concrete units after an intense storm. In some instances, these stones may need to be replaced. These structures are typically designed to withstand a storm with a larger return interval. Costs associated with maintenance of nearshore breakwaters include materials, mobilization, demobilization and constructions costs.

Relative operations and maintenance costs are detailed below to compare the array of alternatives and listed in Table 4. The price of sand needed for nourishment varies based on current sand availability. Costs assume that 22 cubic yards per linear foot would be required for nourishment. Costs assume sand at $50 per cubic yard (CY) which includes transport and placement onsite with procurement by a private entity. This approximate unit cost of sand was provided by the Sconset Beach Preservation Fund based on existing system costs and is considered a scalable unit cost that may be adjusted as sand prices change.

Table 4. Estimated Annual Operations and Maintenance Costs (Sand Only).

Alternative	O&M Cost
Existing System (947 LF)	$1M per year
Expanded System (2680 LF)	$3M per year
Nearshore Breakwaters	Monitoring + Stone Repair costs

While the expanded system has a higher operation and maintenance cost from a sand nourishment perspective, the additional costs should be contrasted by increased longshore distance of protection and additional infrastructure. A comprehensive benefit cost comparison is beyond the scope of this work.

For the Removal, Retreat and Baxter Road Relocation alterative, operation and maintenance costs for the relocated road and utilities (for example plowing, repaving, drainage maintenance) are expected to be similar to the existing roadway and utilities. Since no appreciable change in costs are anticipated, these costs are not included in the assessment.

4.6.5 Constructability

An important consideration in any project is the constructability of the project and its potential impact to the surrounding community. Any construction project will impact the surrounding community albeit temporarily. Access to the beach may be temporarily limited or eliminated for safety requirements during construction for any of the alternatives. For land-based construction, repeated heavy truck traffic on residential roadways can damage roadways, increase congestion, and pose a noise concern. A traffic survey during maintenance could be considered to understand the present number of trucks during maintenance and its overall contribution to traffic conditions. Sand is typically trucked to the site from offsite, upland sources, and then moved to the beach and placed using beach-based heavy equipment. For both new construction and maintenance activities involving sand placement (geotube construction, dune construction, dune maintenance, beach nourishment), local truck traffic will increase, and beach access will be somewhat restricted for safety. Sand is a commodity, and prices may fluctuate, and availability vary over time. While current trends show a significant increase in sand costs, and the need for sand is expanding island-wide, at this time we do not believe sand availability restricts the constructability or viability of any alternatives. Water based construction has a limited season and operable weather windows with additional cost. Timing of construction activities may also be restricted due to environmental requirements. Nesting birds may limit when certain onshore construction activities take place and fish species spawning may limit times of the year when in-water work can be completed. While some of the alternatives are more challenging to construct than others, none of the solutions were deemed not feasible to move to construction. All alternatives presented have been implemented previously either onsite, or in similar conditions elsewhere.

4.6.6 Other Issues and Considerations

Regulatory Considerations

Solutions that would be implanted on the beach or further offshore require Conservation Commission review and approval under the Wetlands Protection Act. Additionally, USACE, CZM, and other Federal agencies also play a regulatory role for alternatives that are constructed below the high water line.

4.7 Removal, Relocation of Baxter Road and Utilities, Retreat

Allowing the natural process of erosion to continue unchanged is of interest to certain stakeholders. This alternative will involve the loss of private homes as well as existing easements that the town possesses and will require the Town to obtain new easements for the building of new utilities for the remaining homes on Baxter Road.

Removal

The removal of the existing toe protection involves unearthing the geotubes, emptying of the sand contents, and disposal of the fabric. Similar heavy machinery used during the installation of the geotubes would be utilized for the removal. The excess sand from the geotubes' contents would be graded into a dune adjacent to the toe of the bluff. This excess sand would erode as coastal processes continue and expose the toe of the bluff, leaving it vulnerable to the same coastal erosion over time. Our understanding is that there are funds in escrow devoted for the removal of the geotubes. It needs to be determined if the funds are sufficient for system removal.

Retreat

Following the removal of the geotubes, the unprotected shoreline would begin to retreat landward as the coastal processes continue unmitigated. It is difficult to predict how the shoreline would adjust to this change, as it depends on the intensity of the following storm seasons, as well as several other factors. The best prediction of how the shoreline might realign itself comes from the FEMA hazard areas for 2030, 2050, and the 2100 years, as shown in Figure 3: The 70 buildings which are projected to be at risk by 2100 are shown in blue based on FEMA Coastal Erosion Hazard Maps from July of 2019 (Source: https://arcg.is/1fuXXD0).

There is the potential for the shoreline realignment to be rapid and dramatic, so it is important that homeowners, the Town, and all residents of Nantucket have a strategic plan before removal of the geotubes. The Arcadis team will be recommending a plan below.

Relocation

The relocation of Baxter Road involves the relocating of utilities, roadways, and private property inland away from the 2030, 2050, and 2100 erosion hazard areas.

Maintaining both access and water/sewer service to residents will require advanced planning and implementation. As previously studied and recommended by Milone & MacBroom, the integrity of the roadway is likely to become compromised when the top of the bluff is within 25ft of the roadway. It is important that Town has a shovel-ready plan in place to address continued access and utility service well before the 25ft threshold is reached. Table 5 shows the most recent measurements taken by the town during August 2021 and Figure 29 provides an aerial image of the monitoring locations.

Table 5. Baxter Road Bluff Monitoring

Baxter Road Top of Bank to Edge of Pavement Measurements (In feet)							
Location	**Street Address**	**6/2/2018**	**10/4/2018**	**1/30/2019**	**8/24/2020**	**3/3/2021**	***8/9/2021**
A	109		67	67	67	67	67
1	105	39	39	39	38	38	37
2	101	35	35	35	35	35	35
3	91	56	56	56	56	56	56
4	87/Way	66	66	66	66	65	65
5	85	63	63	63	63	57	57
6	71/Way		144	144	144	144	144
7	67		192	192	191	191	191
8	61/Way		163	163	163	163	163

August 2021 Measurements in ft[1]

[1] Measuring tape was used, these numbers are subject to variations in measuring methods.

* Not associated with any storm event.

Figure 29. Locations of Baxter Road Bluff Monitoring.

Considerations

The team considered several factors in the design of the relocation. Included in these considerations are the following:

1. Location of existing town owned parcels and easements
2. Proximity of FEMA Hazard areas
3. Continued Access to Sankaty Head Lighthouse
4. Maintaining utilities (both public and private utilities) and access to homes
5. Minimizing impact to sensitive environmental areas
6. Dimensional requirements for roadway (e.g. width requirements for Fire Department)

The relocation of Baxter Road is considered for affected areas up to the year 2100 according to the FEMA erosion lines. Because of the breadth of the affected area as well as the imminence of the years 2030 and 2050, the relocation is broken up into two phases.

Phase 1 (through year 2050)

Phase 1 includes the previously executed Alternative access MOU[18] and utility relocation route with an extension to provide additional at risk properties access and utilities through year 2050. The extension is planned to be a one-way gravel access route while the original MOU pathway will be a two-way gravel access route. Gravel will allow the absence of required roadway drainage for impervious asphalt, while the one-way extension will limit the width of required easement acquisition. Figure 30 below shows the locations of easements involved in the Phase 1 plan in blue. Also, note the red highlighted parcel within this area which shows the shortest bluff edge to pavement edge measurement (35') within the Baxter Road area.

Phase 2

Phase 2 considers the impact of the 2100 FEMA erosion area on all assets, access, and private property. As such, it is not as imperative to begin further design of this concept plan when compared to the Phase 1 area. Included in Phase 2 is a short Sankaty Road re-routing where the road bends northwesterly. This will require the associated water utility within the roadway to be rerouted within the new roadway alignment. Within Baxter Road, several more private homes and utilities are affected and therefore easements for utilities (water and sewer) and maintenance of the road will need to be acquired behind the landward houses of Baxter Road. As with Phase 1, costs associated with Phase 2 sewer incorporate pricing to reflect a low-pressure HDPE sewer system with grinder pumps located at each residence. Both water and sewer utilities will continue to travel south within this easement, until the 2100 FEMA line moves seaward away from the Baxter Road properties, at which point the proposed water and sewer utilities will reconnect with existing Baxter Road infrastructure. This occurs just south of 55 Baxter Road. The areas in Phase 2 with proposed easement acquisition and new utility routes are shown below in yellow in Figure 31.

[18] This is the 2015 Memorandum Of Understanding (MOU) detailing Alternative Access plans for Baxter Road.

Figure 30 Phase 1 Relocation

Figure 31 Phase 2 Relocation

4.8 Cost Estimate

4.8.1 Capital Cost of Retreat

Costs for the various items involved in both Phase 1 and Phase 2 are shown in Table 6. Arcadis utilized unit rates for prior contracts for estimating the different items. For easements, assessed land value from the fiscal year of 2021 were averaged and used in the estimate. Easement widths of 40 feet were assumed to be large enough to cover the temporary construction requirements. Permanent easements were assumed to be 20 ft. Currently prices in the table are based on the payment for permanent easements only. Costs do not include the relocation of the electrical or communication utilities as it is assumed these costs would be part of the utility company ownership requirements and spread over a different base of users. All costs are in 2021 dollars.

In addition, the cost of hardened drainage infrastructure was not included as it assumed property owners will mitigate any needed drainage on site. The new roads are mostly gravel and assumed to not need drainage infrastructure.

Both the subtotal and total costs for each phase of work are included, as well as a grand total representing the cost for both phases of work. This grand total should be considered a ballpark estimate to relocate the roadway and infrastructure away from the FEMA erosion area projections through the year 2100.

Table 6. Road Relocation Costs

Item	Unit Prices	Unit	Phase 1 Quantity	Phase 2 Quantity	Phase 1 Cost	Phase 2 Cost
Sewer pipe (4" HDPE Force Main)	$150	/LF	3,200	5,100	$480,000	$765,000
Low Pressure Grinder Pumps	$25,000	EA	19	30	$475,000	$750,000
Water Main (8" DIP)	$175	/LF	3,200	2,600	$560,000	$455,000
Fire Hydrants	$7,260	EA	8	22	$58,000	$159,000
Service Connections	$3,000	EA	8	22	$24,000	$66,000
Paved Road	$60	/Sq. Ft	0	22,200	-	$1,332,000
Gravel Road	$40	/Sq. Ft	63,400	0	$2,536,000	-
Police Details	$2,200	/week	8	12	$17,600	$26,400
Easements					$1,540,000	$2,475,000
Temporary Facilities (Travel Expenses)	$3,000	/week	10	14	$30,000	$72,000
Environmental Controls					$50,000	$75,000
SUBTOTAL					**$5,800,000**	**$6,200,000**
Contractor's General Conditions	10%				$580,000	$620,000
Engineering % Construction Management	20%				$1,160,000	$1,240,000
Mobilization & Demobilization	30%				$1,740,000	$1,860,000
Permits & Survey	15%				$870,000	$930,000
Legal Fees & Documentation	15%				$870,000	$930,000
Contingency	40%				$2,320,000	$2,480,000
TOTAL					**$13,340,000**	**$14,260,000**
GRAND TOTAL					**$27,600,000**	

Immediate Next Steps for Retreat Planning

The following immediate next steps should begin for planning for retreat:

- Continue public education and outreach throughout Nantucket to gain consensus on the funding needed for utility and road relocation.
- Appropriate dedicated funding ($2-4 million) to begin the work to solidify utility and road relocation route.
- Proceed to field surveys (including sensitive receptor surveys) and discussion with homeowners on possible routing.

Project Cost Recovery

Arcadis reviewed several potential options for recovering the cost of the Phase 1 and Phase 2 improvements. The following provides a brief overview of the options; however, it is noted that some of the options have specific requirements per Massachusetts statutes and the Town should consult its legal counsel to determine the best course of action.

- User Fees – In Arcadis' experience, it is common for sewer and water utilities to include utility relocation and sewer main replacement work as part of ongoing capital budgets. In this instance, the Town is planning for the eventual relocation of utilities to maintain service that is threatened by the onset of natural circumstances beyond the control of the existing customers. The cost of the improvements could be paid via borrowing, with the annual debt service principal and interest recovered from all customers via the Town's existing sewer user fee (for the sewer portion of the relocation cost). The respective cost of relocating the water and other utilities such as electricity or cable would likewise be recovered from the corresponding utility's customers.
- One advantage of using this option for cost recovery includes the establishment of a relatively easy to understand method for recovering utility costs related to future natural disasters or pre-disaster mitigation projects. As future projects are required to restore or enhance the resilience of existing service connections, the cost would be recovered across the customers of the service area. From a financial standpoint, using the user fee for recovery of costs provides greater economies of scale resulting in less overall impact to existing customers.
- It is also noted that the Massachusetts Division of Local Services (DLS) provides a guide for betterments and special assessments. The guide notes that local communities could also potentially recover capital costs via user fees, or a user fee surcharge. In this instance a surcharge would be applied to specific customers that benefit from a project in addition to the general user fees charged to all customers. In this instance, the user fee surcharge would shield all other customers from contributing to a specific project.
- Betterments – Betterments would recover all or a portion of the project costs from parcels impacted by the project based on a formal vote of the Town. A betterment is a special property tax "that is permitted by general or special law where real property within a limited and determinable area receives a special benefit or advantage, other than the general advantage to the community, from the construction of a public improvement." In general, betterments must show special benefit, i.e., an enhancement of the use or value of the property due to the construction of the improvement. A special benefit is measured by how much the particular improvement has increased the fair market value of the property considering all present and future uses to which the property is or may be reasonably adapted in the hands of any owner.[19]
- Within the realm of sewer or water utilities, betterments can occur when a utility is looking to initiate service or extend a water or sewer line to provide service to new customers. In these instances, the receipt of quality will let you save as public water or sewer service compared to reliance on a well or septic system can be seen as adding value to a customer's property. The enhanced value provides the basis for establishing a betterment

[19] From Informational Guideline Release for Betterments and Special Assessments Assessment and Collection Procedures published by the Massachusetts Department of Revenue Division of Local Services, February 2021.

assessment that recovers the cost of the project from benefiting customers over time. The existing customers of the system are thus shielded from paying for the capital costs of extending service to new customers. The relocation of utilities provided in this report essentially leave the customers with the same or similar service, thus, it may be difficult to reflect that the proposed project provides an enhancement of value to the existing properties as they have service or access to the utilities currently located in Baxter Road.

- Special Assessments – These are similar to betterments but focused primarily on sewer or water improvements. Like betterments, the assessment is a special property tax, and is backed by a lien on the property that benefits. The project must provide a special benefit, which includes enhancement of value or use of the property. As noted above, it is difficult to discern the special benefit or use those customers would derive from the project, as relocating the utilities would essentially restore the same or existing service to the customers that they currently have. In addition to special assessments, the Massachusetts statutes also note the ability of Towns to charge customers for "permanent privilege" of connecting to a system. This is a one-time charge usually collected when a customer has connected to the main that abuts the property. They recover capital costs that have not been previously recovered via a special assessment. Thus, they typically recover, additional or incremental costs above and beyond what existing or new customers have already been charged via special assessments or other means.

As seen, utilities have several options for recovering certain capital improvements to sewer or water systems. There are certain requirements that are necessary for a Town to use a betterment or special assessment as a means for recovering capital project costs. This includes determining the special benefit that properties receive from the project. Arcadis recommends that the Town consult with its legal counsel to ensure what is possible from a legal standpoint. From a ratemaking standpoint, Arcadis recommends that the Town consider the project in light of similar existing, or potential future capital projects across its service area. If the proposed project is of a one-time nature, other similar projects are not expected, and it is determined to be legally feasible, then the special assessment option should be considered more fully. If the proposed project is similar to potential future projects that may deal with rising sea levels or recovery from natural disasters, then recovery of capital costs through user fees should be considered more fully.

4.9 Best Management Practices (BMPS)

Poorly controlled rainwater drainage can affect bluff erosion negatively. Rainwater that drains over the bluff edge can cause sediment erosion at the top of the bluff, further exacerbating the toe erosion occurring from wave action. In addition, lack of appropriate vegetation or the presence of partially impervious vegetation such as manicured lawns may create a suboptimal top-of-bluff interface. Planting the appropriate types of vegetation with stabilizing roots near the edge of the bluff may delay erosion further. Irrigation of lawn areas should be avoided.

There are several Best Management Practices (BMPs) like vegetation selection and planting and runoff control which homeowners can implement to mitigate bluff erosion.

Best Management Practices (BMPs) are simple protocols that can be implemented to reduce factors which contribute to erosion on an individual property owner basis. Homeowners can implement these practices to mitigate stormwater runoff to prevent erosion of the bluff. These BMPs do not typically require additional permitting and represent the "low-hanging fruit" of reducing the acceleration of erosion along the Baxter Road bluff.

Appendix B includes the full PDF of homeowner BMPs. These were adapted from Massachusetts Coastal Zone Management (CZM) documentation and adapted to only include pertinent BMPs for the Baxter Road area.

5. Recommendations

5.1 Adaptation Pathways

Adaptation Pathways are sequences of actions, which can be implemented progressively, depending on future dynamics. They can be oriented around performance-thresholds, considering the input of multiple-stakeholders. The pathways should indicate flexible options for changes in actions based on appropriate tipping points, which can be planning horizons, increases in sea level, severity or impacts of storm events, changes in policy, maintenance costs, distance to the bluff, or other tipping points. For the pathway exercise described in Section 3, the initial tipping points including planning horizons of 2030, 2050, 2070, and 2100. Based on stakeholder input, Figure 32 shows a refined adaptation pathways graphic which centers around erosion rates and the distance of the bluff to homes, buried infrastructure, and the road.

Identified Tipping Points include:

1. **Baxter Road is determined to be within 25 feet from the bluff.**
2. **Maintenance of an installed system is no longer cost-effective.**
3. **Removal of the Existing System. It is not advisable that the existing toe protection be removed before a comprehensive retreat plan is in place.**
4. **Construction of the Relocated Road and Utilities**

All of the adaptation pathways eventually lead to strategic retreat from the shoreline. However, the retreat must be carefully planned, and the planning must begin now. For example, it is not prudent to remove the geotubes without a plan to prevent the erosion and other impacts that will come with their removal. Time needs to be given to plan for minimizing these potential impacts.

Based on a number of factors, including climate change, increasing construction and maintenance costs, and regulatory policy, indefinitely protecting the bluff from erosion is no longer a practicable solution. However, we do not recommend a policy of retreat without a plan to manage anticipated impacts, and adequate time to implement the retreat plan.

As seen in Figure 34, the *Adaptation Pathways* are split into Adaptation Alternatives shown in orange which include the alternatives evaluated to slow bluff erosion and maintain the beach and *Recommended Short-Term Actions* shown in blue which center around planning for eventual Retreat (shown in pink). Provisions for monitoring and maintenance are shown in gold, tipping points indicated with a scale symbol, and cautionary steps with a caution symbol.

Monitoring and maintenance should continue during this process to support informed management of the system until retreat is complete. Continuing routine surveys of the system provides valuable information to support continued sand placement and can inform adaptive management approaches if incorporated. In turn, this information may also inform other sediment management activities at other locations with similar shoreline characteristics and wave energy.

If effectiveness were the only evaluation criterion, Expansion of the Existing System would be the recommended Adaptation Alternative for the short term. This would provide the greatest level of risk reduction to Baxter Road, the utilities, and private properties and human safety. A variation on this alternative would be to design toe protection to a lower level of return-period storm, such as 25- or 50-year storm, to be more aligned with providing protection over a time-period appropriate to allow for a retreat strategy to be implemented. The work of this project was to

identify potentially feasible solutions based on a technical review, including the ability of the alternative to be issued permits under existing regulations, and taking stakeholder feedback into consideration. Based on stakeholder engagement and the current regulatory landscape, it is understood that expansion of the system may not be possible. **At a minimum, it is recommended that the existing system remain in place and that it continues to be maintained and monitored.** This provides time for comprehensive retreat planning as discussed in Section 5.2. Such a system could remain in place while retreat planning occurs and the new road and utilities are built, and until such time as maintenance is no longer cost effective, the bluff erodes to within 25 feet of the road, or the existing toe protection fails. If any of these tipping points occur, the Town and private property owners must be ready to move, and the new road must be already built. Therefore, design of the new road and comprehensive retreat planning must be undertaken in the short term.

As previously discussed, the addition of Nearshore Breakwaters to the existing system may reduce wave energy from smaller storms but to be effective for larger storms, they would need to extend above storm tide elevations and, as such, would need to be several feet above normal high tides. This may have visual impacts and would also contribute to higher construction costs. As an added benefit, they would encourage sand deposition on the beach. The cost of such a solution is likely prohibitive given the benefits provided at this location and would face significant regulatory hurdles and evaluation of a range of potential environmental impacts. Nearshore breakwaters in combination with a softer form of toe protection (sand dune or jute fiber) may provide a way to optimize wave reduction from the breakwaters with storm protection for the bluff toe. However, offshore breakwaters, even ones with lower crest elevations, will have cost and regulatory challenges as noted above.

It is not recommended that the existing toe protection be removed until after new infrastructure is in place, and an orderly retreat can be implemented, as there is not anything currently permittable to provide the same level of toe protection and risk reduction to the infrastructure and homes on the bluff. If the toe protection is significantly damaged by a storm and must be removed, other interim measures should be immediately implemented to allow the retreat process to continue; these measures may include sand dunes (with ongoing maintenance) or another temporary toe protection system.

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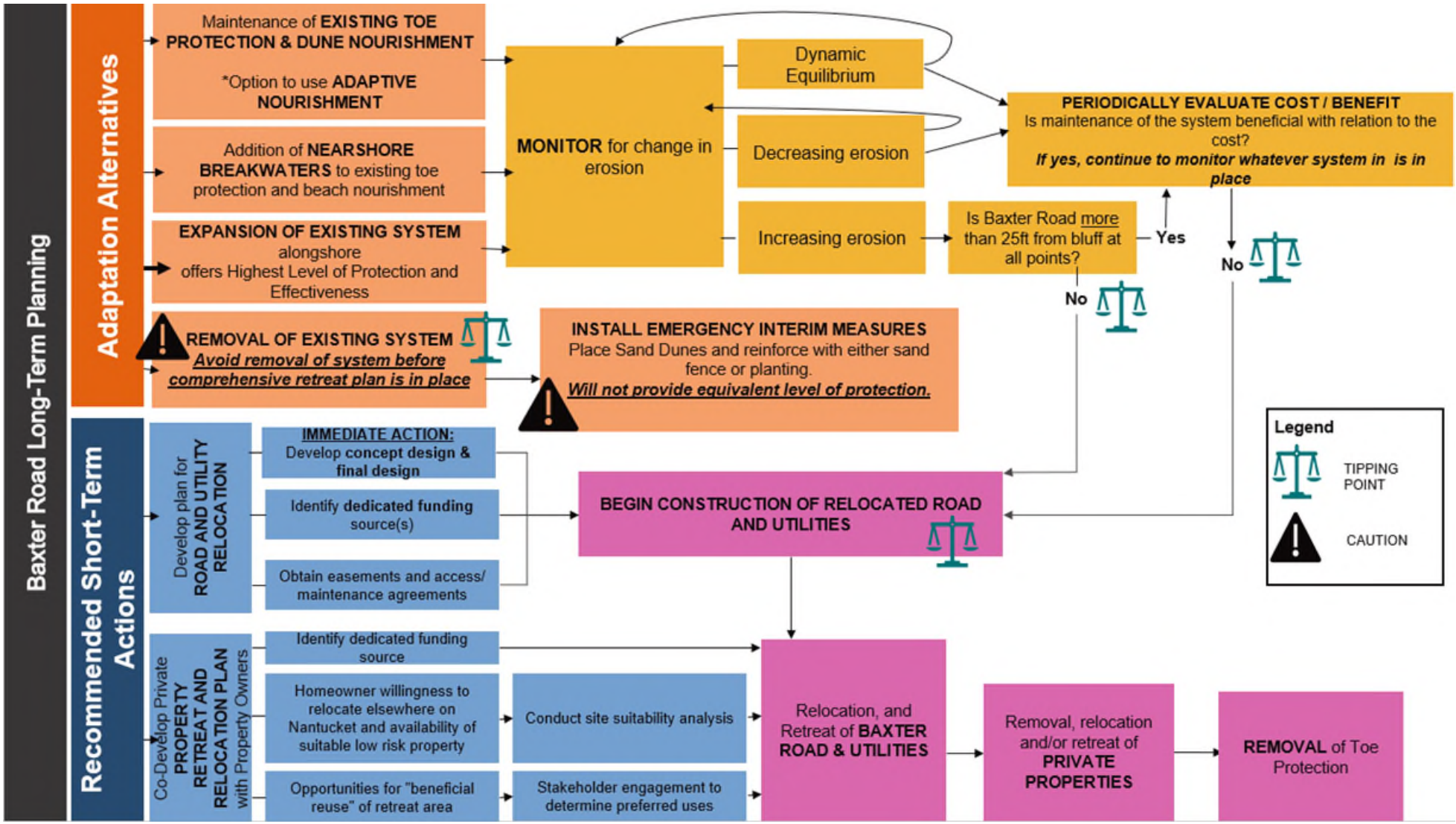


Figure 32 Adaptation Pathways

5.2 Comprehensive Retreat Planning

Given the historic erosion rates in the Baxter Road area and likely increase in erosion due to SLR and increased storm frequency, maintaining the bluff in its current position is not a practical long-term option. There is a need for an alternative approach rather than protecting the bluff, due to:

- Limitations on hard structures,
- Desire to maintain beach access, and
- Likelihood that sand mitigation costs will continue to increase further.

Given these constraints and the input received during this analysis, Arcadis recommends relocation and a return to a more natural bluff system as the most practical long-term solution.

For the short term, it is imperative to maintain and enhance existing measures that can keep the area safe during the retreat process. The appropriate length of time for these protection measures to stay in place depends on the timing for the selected retreat process, on how much erosion increases, and on other tipping points as previously discussed.

The Recommended Short-Term Actions on the Adaptation Pathways figure (Figure 34) have been split into two categories: Road and Utility Relocation, and Private Property Retreat and Relocation. Comprehensive retreat planning for the road relocation includes work to further develop the concept design and final design for road relocation, identification of a dedicated funding source(s), and obtaining easement, access, and maintenance agreements for the road relocation plan. The order of magnitude costs associated with this effort were previously presented.

Comprehensive retreat planning for Private Property retreat and relocation involves co-development of a plan by the Town and property owners including identification of a funding source(s), assessment of homeowner willingness to relocate and availability of suitable low-risk property, as well as identification of acceptable beneficial reuse of the retreat area.

This area will not be the only location on the island facing eventual retreat from the shoreline. This planning effort presents an opportunity for the community to set precedent for retreat island-wide consistent with the CRP, and then apply lessons-learned at Baxter Road in other likely retreat areas.

5.3 Recommended Action Plan

The following summary is intended to serve as the short- and long-term adaptation roadmap for the Baxter Road Long-Term Planning project, including actions that need to be taken by the Town and private property owners.

5.3.1 Short-Term Actions

- Start to apply for funding through FEMA and other applicable programs
- Continue to monitor erosion rates and other indicators
- Plan out the road relocation now. Continue public education and outreach throughout Nantucket to gain consensus on the funding needed for utility and road relocation.
- Appropriate dedicated funding ($2-4 million) to begin the work to solidify utility and road relocation route.
- Hold discussions with homeowners on possible routing. Obtain easements, access and maintenance agreements, locate all sensitive receptors to finalize road alignment, conduct field investigations and survey, get a concept and final design in place (bid-ready documents).
- Removal of the existing toe protection is not recommended until comprehensive retreat planning is complete and use of the new road and utility infrastructure is imminent. Keep existing toe protection in place and perform required maintenance until an agreed upon tipping point. Consider adaptive nourishment.
- The pending enforcement action for removal will likely be appealed. If removal or failure occurs, switch to emergency interim measures.
- Planned private property retreat – begin planning now for the inevitability of strategic removal and relocation. Develop comprehensive retreat plan.
- Plant and stabilize the bluff face and maintain the existing and new planting areas.
- Implement homeowner BMPs to reduce runoff contributing to bluff erosion.
- Develop a feasibility and cost/benefit assessment for nearshore breakwaters.
- Develop a Sediment Budget.
- Work collaboratively with all stakeholders to set a timeline for retreat.

5.3.2 Mid-Term Actions

- Continue to monitor erosion rates and other indicators.
- Install nearshore breakwaters if shown to be feasible.
- Begin Construction of the new road as soon as planning is complete, and funding is in place.
- Continued development of retreat plan
- Relocate homes.

5.3.3 Long-Term Actions

- Continue to monitor erosion rates and other indicators.
- Implement the Retreat Plan fully, support the eventual removal of existing toe protection and relocation of homes.
- Manage the beach/bluff for public access and habitat. This may still involve some nourishment and breakwaters could be beneficial for this purpose.

6. References

Brutsche, K. E., McFall, B. C., Bryant, D. B., & Wang, P. (2019). Literature review of nearshore berms. ERDC/CHL SR-19-2.

Dean R.G. (2005) Dynamic Equilibrium of Beaches. In: Schwartz M.L. (eds) Encyclopedia of Coastal Science. Encyclopedia of Earth Science Series. Springer, Dordrecht. https://doi.org/10.1007/1-4020-3880-1_129

Epsilon, (2020) 2020 Annual Review: Sconset Geotextile Tube Project (SE48-2824)

Epsilon, (2018) Expanded Baxter Road and Sconset Bluff Storm Damage Prevention Project. Notice of Intent.

IPCC, 2014: *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

Komar, P. D (1983) Handbook of Coastal Processes and Erosion, CRC Press, Boca Raton, FL.

Masselink, G., Hughes, M. G. (2003) Introduction to Coastal Processes and Geomorphology, Oxford University Press, New York.

Miller, D., Mack Thetford, & Lisa Yager. (2001). Evaluation of Sand Fence and Vegetation for Dune Building following Overwash by Hurricane Opal on Santa Rosa Island, Florida. *Journal of Coastal Research*, *17* (4), 936-948. Retrieved August 18, 2021, from http://www.jstor.org/stable/4300253

NOAA, (2020) The Effect of Sand Fencing on the Structure of Natural Dune Systems, National Centers of Coastal Ocean Science, Available Online: https://coastalscience.noaa.gov/news/the-effect-of-sand-fencing-on-the-structure-of-natural-dune-systems/

Rosati, J.D. (2005) Concepts in sediment budgets. *Journal of Coastal Research*, 21(2), 307 – 322. West Palm Beach (Florida), ISSN 0749 – 0208.

Seymour R.J. (2005) Cross-Shore Sediment Transport. In: Schwartz M.L. (eds) Encyclopedia of Coastal Science. Encyclopedia of Earth Science Series. Springer, Dordrecht. https://doi.org/10.1007/1-4020-3880-1_104

University of Massachusetts Boston (2021) The CaPE Lab, Sediment Budget. Available Online: https://www.umb.edu/capelab/research/sediment.

U.S. Army Corps of Engineers. (2021) Regional Sediment Management. Available Online: https://rsm.usace.army.mil/index.php

U.S. Army Corps of Engineers. (2006). *Coastal Engineering Manual*. EM 1110-2-1100, Washington, D.C.

U.S. Army Corps of Engineers. (2003). *Coastal Engineering Manual, Appendix A. Glossary of Coastal Terminology.* EM 1110-2-1100 Change 1.

Wang, P., Brutsche, K. E., LaGrone, J. W., Beck, T. M., Rosati, J. D., & Lillycrop, L. S. (2013). Performance Monitoring of a Nearshore Berm at Ft. Myers Beach, Florida. ERDC/CHL TR-13-11.

Zarillo, G. A., Watts, I. M., Erickson, L., Hall, K., & Enfinger, J. (2016). State of Sebastian Inlet Report 2016. *Florida Institute of Technology, Melbourne, FL*.

APPENDIX A

Abbreviations and Glossary

Acronyms and Abbreviations

AEP – Annual Exceedance Probability. The probability of a flood event occurring in any year. The probability is expressed as a percentage. For example, a large flood which may be calculated to have a 1% chance to occur in any one year, is described as 1% annual chance or commonly the 100-year flood event.

Aeolian transport – The transportation of sediment by wind.

BMPs – Best Management Practices

ASCE – American Society of Civil Engineers

Beach Profile – A cross-section taken perpendicular to a given beach contour; the profile may include the face of a dune or sea wall, extend over the backshore, across the foreshore and seaward underwater into the nearshore zone (USACE, 2003).

Bluff Stabilization – Includes vegetation and promoting best management practices to manage surface drainage.

ConCom – Nantucket Conservation Commission

CRAC – Nantucket Coastal Resiliency Advisory Committee

CRP – Nantucket Coastal Resilience Plan

Cross Shore Transport – The movement of sediment perpendicular to shore.

CZM – Massachusetts Office of Coastal Zone Management

DEP – Massachusetts Department of Environmental Protection

Depth of Closure – The water depth beyond which repetitive or topographic surveys (collected over several years) do not detect vertical sea bed changes, generally considered the seaward limit of littoral transport. The depth can be determined from repeated cross-shore profile surveys or estimated using formulas based on wave statistics. Note that this does NOT imply the lack of sediment motion beyond this depth (USACE, 2003).

Design Life – The length of time during which a capital investment or mitigation strategy is expected to function within its specified parameters. For example, short-term solutions may have a 10-year design life. Long-term solutions may have a 50- or 100-year design life.

Dynamic Equilibrium – Short term morphological changes that do not affect the morphology over a long period (USACE, 2003).

Dune Nourishment – Sand that is placed on top of the geotubes to provide a buffer to the geotubes and add material to the littoral system.

FEMA – Federal Emergency Management Agency, primarily responsible for disaster response and recovery following Federal declared state of emergency.

GIS – Geographic Information System

Longshore – Parallel to and near the shoreline; alongshore (USACE, 2003).

Longshore Drift – Movement of (beach) sediments approximately parallel to the coastline(USACE, 2003).

Morphology – River, estuary, lake, beach, seabed form and its change with time (USACE, 2003).

MOU – Memorandum of Understanding

MSL – Mean Sea Level, The average height of the surface of the sea for all stages of the tide over a 19-year period, usually determined from hourly height readings (USACE, 2003).

Nearshore – (1) In beach terminology an indefinite zone extending seaward from the shoreline well beyond the breaker zone. (2) The zone which extends from the swash zone to the position marking the start of the offshore zone, typically at water depths of the order of 20 m (USACE, 2003).

Nourishment – The process of replenishing a beach. It may occur naturally by longshore transport or be brought about artificially by the deposition of dredged materials or of materials trucked in from upland sites (USACE, 2003).

NHESP – Natural Heritage & Endangered Species Program

MORIS – Massachusetts Ocean Resource Information System
http://maps.massgis.state.ma.us/map_ol/moris.php

NOAA – National Oceanic and Atmospheric Administration

NOI – Notice of Intent

RSM – Regional Sediment Management. This program is a federally funded program that promotes a systems approach for management of sediments across coastal, estuarine and inland environments (USACE, 2021).

Sediment Transport – The main agencies by which sedimentary materials are moved are: gravity (gravity transport); running water (rivers and streams); ice (glaciers); wind; the sea (currents and longshore drift). Running water and wind are the most widespread transporting agents. In both cases, three mechanisms operate, although the particle size of the transported material involved is very different, owing to the differences in density and viscosity of air and water. The three processes are; rolling or traction, in which the particle moves along the bed but is too heavy to be lifted from it; saltation; and suspension, in which particles remain permanently above the bed, sustained there by the turbulent flow of the air or water (USACE, 2003).

SBPF – Siasconset Beach Preservation Fund

SLR – Sea Level Rise, the long-term trend in mean sea level (USACE, 2003)

SOOC – Superseding Order of Conditions

Subsidence – Gradual settling or sudden sinking of vertical land surface elevation, exacerbating the effects of sea level rise.

Toe Protection –Protection that is placed at the toe or base of a bluff or cliff to prevent wave erosion during storms. .

USACE – United States Army Corps of Engineers

USGS – United States Geological Survey

Sources:

USACE, 2021 Regional Sediment Management Program Available Online: https://rsm.usace.army.mil/index.php

USACE, 2003 Coastal Engineering Manual, EM 1110-2-1100

APPENDIX B

Homeowner Best Management Practices

Controlling Overland Runoff Specific to Coastal Bluffs

The following was adapted from the Massachusetts Coastal Zone Management Storm Smart Coasts initiative. Arcadis gives full credit of this document to Massachusetts CZM.

What Is Runoff and How Does It Cause Coastal Erosion?

Runoff is rainwater, snowmelt, and water from irrigation systems and other sources that does not soak into the ground or evaporate, but instead flows over the ground surface. Runoff causes erosion when water falling on and/or running across bare or sparsely vegetated areas dislodges soil and other sediments. When runoff flows over a coastal bank, dune, or beach, it can erode these landforms from above and exacerbate other coastal erosion problems.

Channels or gullies on the face of a bank or dune are a sign of a runoff problem. As shown in the photograph on the right, sediment carried by runoff is often deposited in a fan-shaped pile at the base of the slope. The channels and fan-shaped deposits are both indicators that runoff is eroding the bank. Similarly, runoff can erode soil from behind concrete seawalls and under rock revetments (i.e., shoreline stabilization structures constructed of sloping rock), causing them to slump or collapse. Indicators that runoff may be contributing to the failure of seawalls and revetments include channels in the bank above the structure or sinkholes behind the structure. If overland sources of runoff are not successfully managed, the effectiveness of other shoreline stabilization techniques can be compromised.

Runoff has eroded a channel in this bank face, exacerbating the coastal erosion problem. Some of the eroded material has been deposited in a fan-shaped mound at the base of the bank. **(Photo: CZM)**

General Approaches to Runoff Control

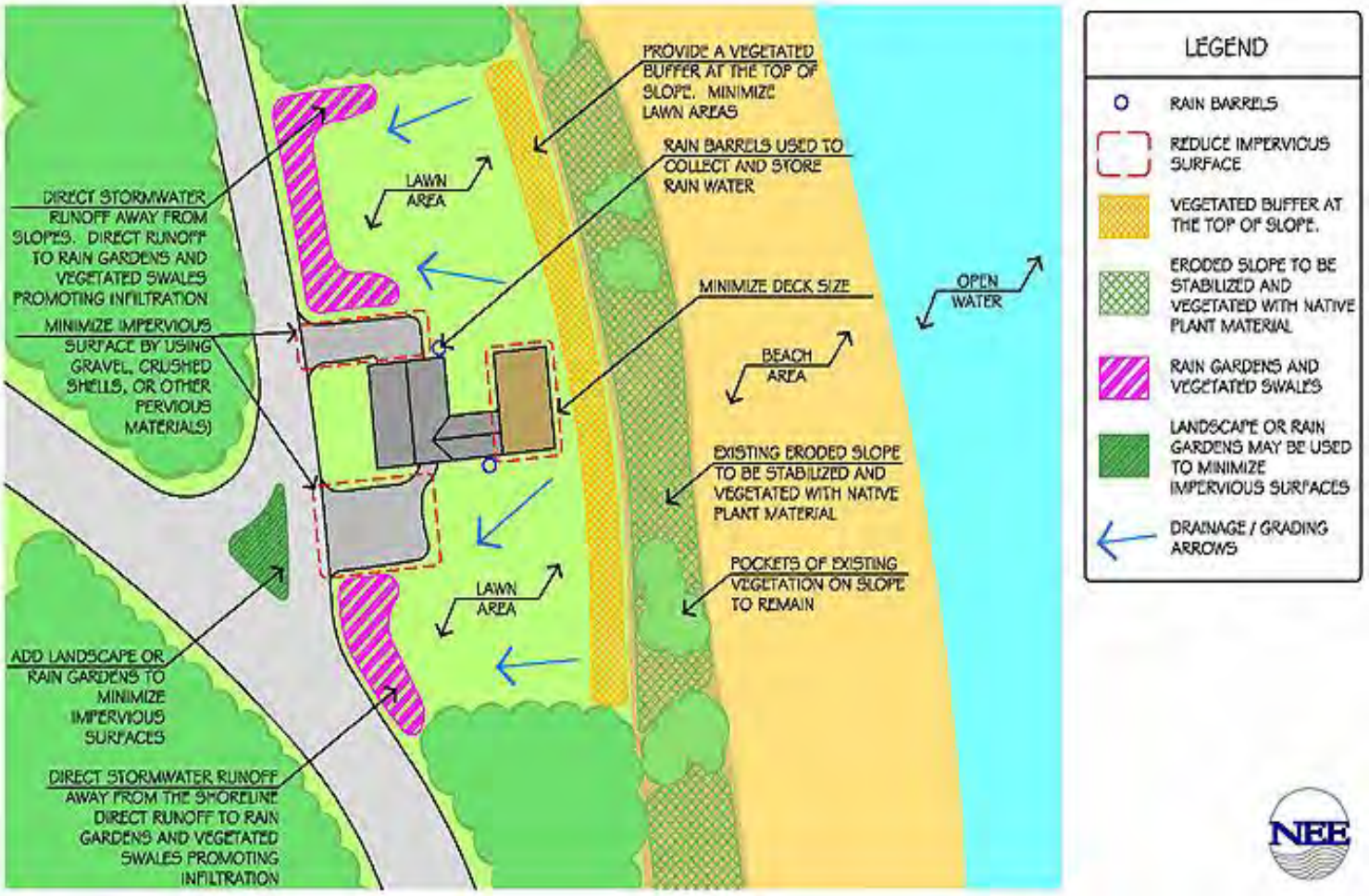
Controlling runoff from upland sources helps reduce a significant cause of erosion on many beaches, dunes, and banks. Efforts to control runoff focus on reducing the quantity and velocity of water flowing across the land surface and changing the direction of flow as necessary to address specific erosion problems. Runoff control approaches include:

- Removing and reducing impervious surfaces (i.e., pavement, concrete, and other impermeable materials) and planting natural vegetation to help slow the flow of runoff and allow the water to naturally seep into the ground. For example, converting asphalt or concrete driveways to grass, crushed-shell, or other surfaces that allow water to soak into the ground is an excellent way to reduce impervious surfaces.
- Capturing runoff so that it can be infiltrated into the ground over a broad area or reused for irrigation.
- Redirecting the flow of water away from erosion-prone areas by regrading the ground surface, constructing a barrier of soil or other sediment (known as a berm), and removing landscaping elements that channel runoff.
- Maintaining the soil's natural capacity to absorb water by preventing saturation from lawn watering and other irrigation.

Runoff control techniques should address the specific patterns and sources of runoff on the site based on a comprehensive evaluation of site conditions. These conditions include the location and extent of impervious and vegetated surfaces, soil types, slope and elevations on the property, and sources and amounts of water coming from both on- and off-site. An experienced professional may need to be consulted for additional guidance regarding project design, and the local Conservation Commission should be contacted about permitting.

Several options are available for installing grass driveways, including this grass and paver system. As with all runoff control options, site conditions and potential impacts should be fully evaluated in project design. **(Photo: CZM)**

This lawn was regraded to slope inland, and a buffer of native shrubs was planted along the top of the bank to stabilize the area and direct runoff away from the bank. These measures reduced runoff flowing over the bank so that a bioengineering project with natural fiber blankets, coir rolls, and vegetation could be successfully installed. **(Photo: CZM)**



This figure demonstrates how a typical coastal property could be modified to reduce runoff and where appropriate runoff control techniques could be sited. **(Graphic: New England Environmental, Inc.)**

The following factors should be addressed to ensure that the runoff control options selected do not create **unintended negative impacts:**

- **Channelization of Runoff** - Improperly managing runoff can have negative impacts, particularly if the runoff is channelized or redirected onto adjacent properties where it inadvertently increases erosion and flooding issues or where it would impact sensitive environmental resources, such as salt marsh. To avoid these impacts, runoff control options should include components that redirect and spread the flow of water across a broad vegetated area or into a rain garden or vegetated swale (i.e., specially constructed depressions in the ground that are planted with vegetation).
- **Impermeable Soil Layers on Banks** - When there is an impermeable layer of soil (like clay) underlying permeable sediments in a coastal bank, water that infiltrates into the ground may flow along this impermeable layer toward the bank face. This concentration of water flow may exacerbate erosion where the water breaks out onto the bank face. The runoff control techniques described below may address this issue. However, it is not

always obvious that this situation exists and is exacerbating erosion on a bank. Therefore, professional assistance may be needed to identify the problem and determine the most appropriate techniques to address it.

Design Considerations for Common Runoff Control Techniques

The following section describes a variety of techniques that can be used to help control runoff erosion problems. Specific suggestions for proper design, construction, and implementation are listed for each technique.

Reduce Impervious Surfaces

Reducing the area covered by impervious surfaces slows overland flow and allows water to naturally seep into the ground. To reduce impervious cover:

- Construct driveways or patios with pea stone, gravel, crushed shells, or other pervious materials, rather than using impermeable pavement or concrete.
- Avoid the use of dense-graded aggregate, stone dust materials, and other products that prevent water from permeating into the ground on driveways, patios, or walkways. These products are designed to eliminate voids in the compacted surface, which causes these areas to become impervious.
- Minimize the footprints of proposed buildings and impervious surfaces as much as possible.

Additional Benefit - Improved Coastal Water Quality
Contaminants carried in runoff can significantly harm coastal water quality. Oils and greases washed from roadways and driveways and pesticides from lawns can introduce toxins to coastal waters. Bacteria in runoff can lead to closed shellfish beds and swimming areas. Nutrients from fertilizers, pet waste, or septic systems can lead to nuisance plant or algae growth, which can reduce oxygen supplies (leading to fish kills and odors) and shade out eelgrass beds. Runoff control techniques allow the runoff to seep into the ground where some contaminants may be filtered out by the soil or absorbed by plant roots, minimizing contamination of coastal waters.

Replace Lawns with Natural Plantings

Lawns exacerbate runoff issues because water readily runs over mowed grass and the soils under lawns tend to compact to create an impervious surface. Replacing lawn with longer grass, shrubs, and other vegetation can therefore significantly improve runoff problems. Where possible:

- Restrict the use of mowed lawns to areas needed for pathways and recreation.
- Avoid mowing the lawn right up to the edge of the dune, bank, beach, or marsh (which has the added advantage of keeping people back from the edge—foot traffic may exacerbate erosion).

Extensive irrigated lawns that slope seaward have exacerbated the erosion of this coastal bank. **(Photo: CZM)**

Plant Vegetated Buffers

Vegetated buffers are strips of high grasses, shrubs, and other plants (other than lawn). These buffers absorb runoff, slow its overland flow, and break the impact of raindrops or wave splash. The plant roots also bind the soils and help improve the stability of the area. See *StormSmart Properties Fact Sheet 3: Planting Vegetation to Reduce Erosion and Storm Damage* for additional information on using plants for coastal erosion control. To improve the success of runoff control projects:

- Plant vegetated buffers 5-10 feet in width landward of the top of the bank, dune, or beach to be protected.
- Plant salt-tolerant grasses with extensive root systems to provide more immediate erosion control. Though trees and shrubs may look more stable, grasses can grow more quickly and effectively stabilize large areas and require less maintenance to thrive.
- Plant native and salt-tolerant species that are adapted to local conditions and require less maintenance, watering, and pest control.
- Select appropriate species for site conditions, plant at the appropriate time of year (generally spring or fall), and follow the specific instructions for watering, fertilizing, and general care and maintenance.
- Plant trees far enough back from the top of coastal banks to ensure that their weight does not contribute to bank instability.
- If trees on or near the bank are leaning, they may increase instability of the bank and may need to be pruned or removed.
- Do not place dead plant material, such as lawn clipping, brush, and discarded Christmas trees, on a bank or other coastal area. These dead plant materials limit the natural growth and establishment of plants and do not have roots that help bind soils together. Many municipal landfills accept yard waste for composting.
- **Some of the most effective plants for vegetated buffers in coastal areas include beach plum, bayberry, Virginia or Carolina rose, arrowwood viburnum, sweet fern, and bearberry.**

Fertilizer can cause nuisance plant or algae growth that can degrade water quality. The nitrogen in fertilizer is a particular problem in coastal waters. Consequently, the use of fertilizer on vegetated buffers, as in all coastal areas, should be limited as much as possible. When designed and maintained correctly, vegetated buffers actually filter out nitrogen and other contaminants from inland sources, helping to reduce coastal water contamination.

Install Vegetated Swales and Rain Gardens

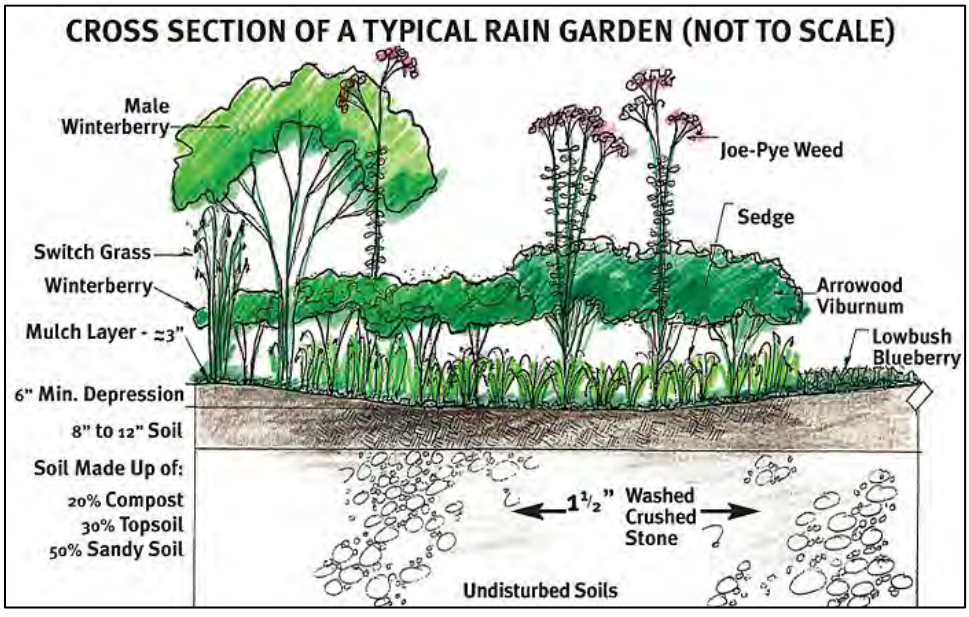
Vegetated swales are channel-like depressions in the ground used to slow, filter, and direct water to another location. Rain gardens are wider and flatter depressions that allow for the maximum collection and infiltration of water. Swales and rain gardens both use plants that tolerate both wet and dry conditions to ensure plant survival (swales often use grasses, while rain gardens are planted with a mix of grasses, perennials, shrubs, and trees).

A large rain garden. **(Photo: Massachusetts Bays National Estuary Program)**

To maximize effectiveness and prevent problems:

- Place swales/rain gardens downslope from a downspout, driveway, or other impervious surface in a relatively flat area (with less than a 5% slope), at least 50 feet away from septic systems, 100 feet away from wells, and 10 feet away from a dwelling foundation. Regrade the area if necessary to create an appropriate location for the swale/rain garden. Consult with your municipal board of health before installing a rain garden or swale near a septic system or well to make sure the proposed setback is sufficient.
- Locate vegetated swales/rain gardens as far away from the top of a bank as possible to reduce the amount of groundwater that may flow toward the bank face and potentially cause erosion.
- Determine the appropriate size of the swale/rain garden needed to effectively capture the runoff based on average yearly rainfall, soil infiltration rates, the size of the area that runoff is draining from, and impervious surface cover. Swales and rain gardens constructed in wetland resource areas will need to meet specifications contained in the *Massachusetts Stormwater Handbook* if a permit is required by the Conservation Commission.
- Plant a series of interconnected swales/rain gardens if one is too small to hold and infiltrate the amount of water flowing into it.
- If necessary, add amendments to clay or poorly drained soils to increase the infiltration capacity of the swale/rain garden. Some of the existing soil may need to be removed and replaced with a layer of gravel, planting soil mix, and mulch.
- To help prevent runoff from washing out the mulch or soil in large storm events, consider installing a temporary erosion-control blanket made of natural fibers over the swale/rain garden to stabilize the soil until the plants become established. (See *StormSmart Properties Fact Sheet 5: Bioengineering - Natural Fiber Blankets on Coastal Banks* for further information.) In addition, if concentrated flow is being introduced from a driveway, downspout, or other source, spread a layer of crushed stone across the entrance point where the water comes into the swale/rain garden to slow the speed of the flow.

As with vegetated buffers, select appropriate plants for site conditions, plant at the appropriate time of year (generally spring or fall), and follow the specific planting and care instructions.



Adapted illustration courtesy of Comprehensive Environmental, Inc.

Regrade Site to Direct Water Away from the Shoreline

Regrading the area landward of a bank, dune, or beach can ensure that runoff flows away from the shoreline. With this technique:

- Grade the site to slope toward vegetated swales or rain gardens. As mentioned above, swales/rain gardens should be placed well away from the top of a bank.
- To prevent basement flooding, do not direct the water toward a dwelling.
- To prevent erosion of the regraded area, consider covering exposed soils with a temporary erosion-control blanket and successfully plant the area as soon as possible.
- Avoid regrading work during heavy rains when exposed soils are more vulnerable to erosion.
- Avoid making slopes too steep, which will accelerate the flow of runoff and may cause additional erosion problems. Consult a professional for site-specific assistance in determining the appropriate slope.

Construct a Vegetated Berm

A berm (i.e., a mound of soil or other sediment built as a barrier) can be used as a "speed bump" to slow the flow of runoff. It is important to:

- Strategically construct vegetated berms to address specific runoff problems. For example, place a berm landward of the top of a coastal bank to redirect runoff away from the shoreline, or use a berm as a barrier to block or redirect runoff from roads, other properties, and other offsite sources.
- Determine the height and overall shape of the berm based on site conditions, such as soil characteristics, existing vegetation, site slope, and volume of water flowing toward the berm. The steeper the slope of the site, the faster the water will be flowing, requiring a higher berm to redirect the flow. As for shape, a berm is generally more stable when its base is twice the width of its height.
- Select sediments to construct the berm based on the amount of runoff. For average water flow, a mix of sediments (such as well-drained soil and sand) provides an effective physical barrier while also allowing for infiltration. For higher water flow, coarser materials (such as sand and gravel) provide greater flow-through and infiltration (to avoid the pooling of water behind the berm).
- Cover the berm with a layer of topsoil and plant/seed the area to stabilize the soil
- Consider using a short-term natural fiber blanket to stabilize the berm while the plants get established

Capture Roof Runoff

Significant quantities of rainwater and snowmelt run into roof downspouts. This water can be directed into a rain barrel, where it can be stored for reuse as irrigation water, or into a system designed to immediately infiltrate the water into the ground, such as a drywell or a French drain. When using these techniques:

- Place rain barrels below downspouts (55 gallon drums are the most common size for rain barrels). Cut the downspout to fit directly into the rain barrel. Special adaptations can be used, such as a spigot to attach hoses to reuse the water or an overflow hose to direct any overflow away from the foundation. Rain barrels should have a screen and cover to keep out mosquitoes, leaves, and debris.

- Design the drywells/French drains to channel water away from foundations. For sites directly adjacent to banks, French drains are generally preferred over drywells because they disperse the water infiltration, which helps ensure that the water successfully seeps into the ground and does not flow toward the bank face.
- Base the storage capacity of the drywell/French drain on the quantity of roof runoff, as well as on the depth of the water table. The bottom of the drywell/French drain should be at least two feet (but preferably four feet) above the seasonal high groundwater level.
- Drywells need to be at least 10 feet from building foundations, 50 feet from vegetated wetlands or tops of coastal banks, 50 feet from any component of a septic system, and 100 feet from wells.

Avoid or Reduce Watering of Lawns and Plants

Watering less keeps soils from becoming saturated, allowing them to more effectively soak up rainwater and other runoff. To water less:

- For the first year, if necessary, use a temporary irrigation system (such as drip tubing on a timer) while newly planted vegetation becomes established (see the planting instructions for specific watering requirements). Once the plants are established, watering is only required during extreme drought.
- When nature does not provide enough water to keep a lawn green and growing, allow it to go dormant. Though it may appear dead, this dormant state allows grass to preserve the vital parts of the plant during times of heat and low moisture and revive with the first saturation.
- Avoid cutting grass too short (generally no shorter than 2 inches). Taller grass has a deeper and more extensive root system, which enables the lawn to better withstand heat and drought.
- Plant less lawn grass and more drought-tolerant grasses and vegetation.

Slow the Flow of Water

By allowing water to spread out and flow over a wider vegetated surface, infiltration will increase, erosive forces will decrease, and runoff will be reduced. Specifically:

- Reduce the use of walls, solid fencing, curbs, etc., that concentrate runoff and create channels and gullies.
- Design discharge points for downspouts or other conduits of water to avoid causing scour, gullies, erosion, or alteration to vegetation. Place splash blocks or level spreaders (structures designed to uniformly distribute concentrated flow over a large area), or small amounts of gravel, at these discharge points to minimize erosion.
- Eliminate curbs or small retaining walls for defining the boundaries (such as between a driveway and lawn), which can channelize runoff and concentrate erosive forces. Replace curbs or walls with vegetated swales or rain gardens that promote infiltration and avoid channelization.
- If road runoff is an issue on your property, contact your town or city to determine if there is a drainage easement (an attachment to a property deed which states that access to part of the property is given to a third party, usually a community, for the purpose of maintaining drainage). If there is no easement, consider rain gardens parallel to the roadside to promote infiltration of road runoff. If there is an easement, work with your local officials to address the issue.

Heavy Equipment Use

If heavy equipment is needed for a project to address runoff, equipment access must be carefully planned to avoid destruction of existing vegetation; creation of ruts; destabilization of banks, beaches, or other landforms; impacts to wildlife and protected species habitat; and related impacts. When mechanical equipment is being

used, contractors should keep hazardous material spill containment kits on-site at all times in case there is a release of oil, gasoline, or other toxic substance.

Additional Information

- CZM's Coastal Landscaping website includes information on landscaping coastal areas with salt-tolerant vegetation to reduce storm damage and erosion.
- CZM's *Landscaping to Protect Your Coastal Property from Storm Damage and Flooding fact sheet* (PDF, 962 KB) gives specific information for homeowners on appropriate plants for erosion control in coastal areas.
- CZM's CZ-Tip - Keep Waterways Clean by Filtering Pollutants with Plants discusses reducing runoff impacts by planting vegetated buffers.
- The Massachusetts Department of Environmental Protection's (MassDEP) Vegetated Buffer Strips: Slow the Flow to Protect Water Quality explains how vegetated buffer strips function and how to create them.
- The U.S. Environmental Protection Agency's (EPA) National Menu of Stormwater Best Management Practices has searchable fact sheets on berms, regrading, swales, and other stormwater control practices.
- EPA's GreenScaping: The Easy Way to a Greener, Healthier Yard provides information on yard maintenance to reduce water usage.
- *Rain Gardens Across Maryland* (PDF, 14 MB) discusses locating, siting, and designing rain gardens and calculating impervious surfaces (rainfall depths and plant species are specific to Maryland).
- CZM's Environmental Permitting in Massachusetts briefly describes major environmental permits required for projects proposed in Massachusetts.
- Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00) cover work in wetland resource areas and buffer zones.
- MassDEP's *Erosion & Sedimentation Control Guidelines* (PDF, 4 MB) give best management practices for managing sediment and runoff.
- MassDEP's *Massachusetts Stormwater Handbook* provides design specifications for rain gardens, drywells, and swales.
- The Natural Heritage and Endangered Species Program website provides information on protected species in Massachusetts, habitat maps, and regulatory review for projects in or adjacent to these habitats.
- The Massachusetts Division of Marine Fisheries can provide information on horseshoe crab protection and other fisheries resources.
- The Massachusetts Ocean Resource Information System, or MORIS, is a web-based mapping tool for interactively viewing coastal data. MORIS data layers, such as endangered species habitat and shellfish, can help identify sensitive resource areas within or near the project site.

StormSmart Properties Fact Sheet 3: Planting Vegetation to Reduce Erosion and Storm Damage

The following was adapted from the Massachusetts Coastal Zone Management Storm Smart Coasts initiative. Arcadis gives full credit of this document to Massachusetts CZM.

How Vegetation Reduces Erosion and Storm Damage

Dunes, banks (also known as bluffs), and other coastal landforms are susceptible to erosion from tides, currents, wind, and coastal storms. Overland runoff, which is the water from rain, snowmelt, sprinklers, and other sources that does not readily soak into the ground or evaporate but instead flows over the ground surface, can also cause erosion by dislodging vegetation, sand, gravel, and other sediments. Salt-tolerant plants with extensive root systems can help address both kinds of coastal erosion problems. First, plant roots hold sediment in place, helping to stabilize the areas where they are planted. Second, by absorbing water, breaking the impact of raindrops or wave-splash, and physically slowing the speed and diffusing the flow of overland runoff, plants reduce runoff erosion. Vegetation also helps trap windblown sand, which is particularly important for building dune volume, increasing the dune's ability to buffer inland areas from storm waves, erosion, and flooding. Finally, high grasses, shrubs, and other vegetation can be planted to limit foot traffic in erosion-prone areas.

Vegetation can be used in conjunction with many other techniques for erosion management. Considering the specific characteristics of Baxter Road, reducing Overland runoff over the Bluff is an important practice.

Beachgrass was planted to stabilize an eroded dune and trap windblown sand to build dune volume. **(Photo: CZM)**

A variety of salt-tolerant vegetation was planted on the face of this bank to stabilize fill added to address bank erosion. **(Photo: CZM)**

Shrubs were planted at the top of this bank to slow runoff. On the bank face, natural fiber blankets were installed to hold soils in place until the erosion-control vegetation could get established. **(Photo: CZM)**

Relative Benefits and Impacts Compared to Other Options

The major benefit of vegetation projects is that vegetated areas absorb and dissipate wave energy, rather than reflecting or redirecting waves elsewhere. The design of a hard structure affects how much wave energy is reflected, for example vertical walls reflect more wave energy than sloping rock revetments. These reflected waves erode beaches in front of and next to a hard structure, eventually undermining and reducing the effectiveness of the structure and leading to costly repairs. This erosion also results in a loss of dry beach at high tide, reducing the beach's value for storm damage protection, recreation, and wildlife habitat. Other benefits of vegetation projects are that they preserve the natural character of the coastal environment and provide wildlife habitat.

In general, the impacts of vegetation projects are relatively minor when compared to other options. Vegetation projects in habitat for protected species (i.e., species that are considered endangered, threatened, or of special concern in Massachusetts), however, do have the potential to cause significant impacts, such as removing open sand areas needed for successful nesting of piping plovers and diamond-backed terrapins. Even the planting of native plant species can cause impacts in these areas. See Design Considerations below for information on addressing this issue.

Design Considerations for Vegetation Projects

This section covers a variety of factors that should be considered to minimize adverse impacts and ensure successful design, permitting, construction, and maintenance of vegetation projects.

Appropriate Locations

Vegetation projects are appropriate for virtually any dune or bank along the coast where sand and other sediments are exposed to wind and waves. Because it is relatively difficult to get vegetation established in areas that are regularly inundated or overwashed by tides and waves, however, the longevity and effectiveness of these projects can be limited in certain locations. The techniques discussed in Protecting Plants below can help address this issue.

Protecting Plants

Plants are most vulnerable before their root systems become established. Techniques that can help stabilize dunes and banks while plants get established include:

1) **installing natural fiber blankets** on the ground surface before planting to hold soils in place while roots get established

2) **using temporary baffles** of natural-fiber material to shelter plants from wind

3) **installing sand fencing** to help slow wind, trap sand, and reduce erosion

Combining these techniques is more effective than using only one method. On banks, another method to protect the soil around newly planted live vegetation is to plant a salt-tolerant seed mix on the exposed soil. The plants that grow from seed can quickly stabilize the soil so it is not washed away while the live plants are becoming established.

Another important factor for successful plant establishment and survival is water availability. Since new plants with their smaller root systems have a limited capacity to find water in the surrounding soil, a consistent supplementary source of water should be provided directly to these plants while their root systems and foliage are developing. For large planting projects, the use of a temporary, automated irrigation system may be warranted for up to three summers following planting. See the Watering section below for additional details and cautions on using automated irrigation systems.

To further ensure the success of planting projects, sources of erosion, including upland runoff and waves, should be identified and addressed as part of the site evaluation and design process. Runoff should be reduced or redirected to give the vegetation the best chance of survival. In areas subject to regular erosion from waves, tides, currents, wind, and coastal storms, additional techniques should be considered to improve site protection. For example, beach nourishment can protect vegetation projects by widening beaches in areas with relatively narrow beaches at high tide. For bank projects, dense rolls of natural fiber called coir rolls can protect newly planted areas, hay bales can be staked at the base of the bank to provide a short-term buffer from tide and waves, and artificial dunes can be constructed with

sediment from an off-site source to buffer the base of the bank.

In addition, to protect dune and bank vegetation, pedestrian access to the shoreline should be restricted to designated access paths or walkways and the number of access points should be limited as much as possible. Often, multiple properties can use a common access point. The size of access structures should be minimized as much as possible to limit shading impacts to vegetation.

Lightweight, natural-fiber, erosion-control fabric was installed on this bank to protect the plants from wind until the roots could get established. Boards were placed on top of wooden stakes to provide access during construction, which minimized impacts to the bank from foot traffic. The photo on the right was taken one year after planting. **(Photos: New England Environmental, Inc.)**

An Added Consideration on Banks - Establishing a Stable Slope

On banks, a stable slope is essential for project success. If the bottom of the bank has eroded and its slope is steeper than the upper portion of the bank, the bank is likely unstable. Even when heavily planted with erosion-control vegetation, banks with unstable slopes are extremely vulnerable to slumping or collapse that can endanger property landward of the bank. Before planting vegetation, therefore, the bank slope should be stabilized.

Ideally, soil of a similar type to that on the bank or beach is brought in as fill and added to the lower part of the bank to create a slope that matches or is less steep than the upper slope. However, if adding fill brings the toe of the bank within the reach of high tides, the fill will erode quickly and undermine the rest of the bank. In these cases, regrading the bank slope by removing sediment from the top of the bank may be a better option. While removing part of the upper portion of the bank does reduce the land area between the top of the bank and the property, it can be done in a controlled fashion that improves the overall stability and storm-damage prevention capacity of the bank. And if the slope is not stabilized, bank collapse during a storm could cause substantially more loss of land area to the sea. In addition, any investment in vegetation and other methods to prevent erosion on an unstable bank will be lost if the bank collapses. On sites where the top of the bank is well vegetated with mature, salt-tolerant species with extensive roots, the appropriate approach to stabilize the bank should be carefully developed by a professional with extensive experience successfully stabilizing similar sites.

Sediment was added to this eroding bank to create a shallower and more stable slope before the vegetation was planted. The lower bank was planted with grasses and the upper section with mixed grasses and shrubs. **(Photo: CZM)**

Plant Selection

Specific site conditions—including wind, salt, soil type and quality, moisture, shifting sands, frequency of coastal storms, and exposure to waves and overwash—dictate the plant species that can grow successfully. Native, salt-tolerant species are recommended for coastal use because they are well adapted to the harsh conditions, require less maintenance to grow and thrive, and provide more diverse food and shelter for wildlife. In addition, only plants with extensive root systems should be selected for erosion-control projects.

On dunes or the toe of coastal bluffs (particularly those closest to the beach where wind and wave action are strongest), American beachgrass is the best species to use for initial plantings. Beachgrass quickly establishes a dense root system, rapidly accumulates sand, and is very resilient to being overwashed by waves. For beachgrass to thrive, it should be planted in a location where wind-blown sand will reach the plants. Other plants recommended for use in combination with beachgrass include little bluestem, purple lovegrass, and seaside goldenrod. Further landward in dunes and beyond the reach of regular wave action, shrubs such as beach heather, lowbush blueberry, bayberry, and beach plum can be planted with grasses to add diversity and improve erosion control.

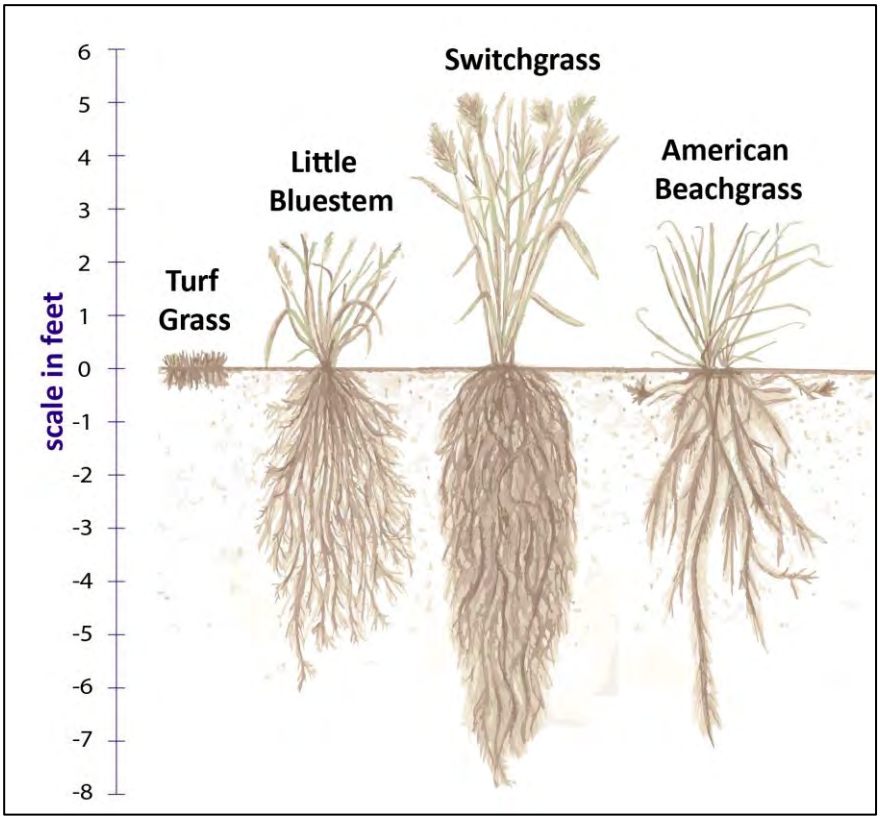
On banks, saltmeadow cordgrass, little bluestem, and other grasses can stabilize exposed areas quickly with their fast-growing, fibrous root systems. While American beachgrass is helpful for initial bank stabilization, it will not thrive on banks that receive little blowing sand. In these areas, it should be planted with other recommended species that will take over as the beachgrass fades. Shrubs, low groundcovers, and perennials that have extensive surface areas and root systems can be used to intercept heavy rainfall and help shelter and stabilize the underlying soils.

Northern bayberry is an excellent shrubs for protecting underlying soil in coastal areas. Shrubs are best used higher up on the bank where they are not exposed to waves, and planting a mix of grasses around newly planted shrubs can help stabilize the area while the shrubs become established. Trees and large shrubs should not be planted on the face of a bank because their height and weight can destabilize the bank and

make them vulnerable to toppling by erosion or high winds. Existing trees on banks can be pruned back to help address this problem.

It is important to plant a diversity of native species because a stand of only one plant is more susceptible to complete die-out from drought, disease, or pests.

CZM's Coastal Landscaping website provides additional detailed information on appropriate plants for storm damage prevention and flood control on dunes and banks.



Turf grass has a very shallow root system compared to these other plants recommended for erosion control. **(Figure redrawn from illustration by Dede Christopher of the Tennessee Valley Authority, Benefits of Riparian Zones)**

Use Only Live Plants for Erosion Control

Only live plants should be used since brush, lawn clippings, and other dead plant materials prevent live plants from getting established and have no roots to bind soils. Discarded Christmas trees are a particular problem because they leave large, destabilizing holes when they are ripped out by waves. Sand fencing is a much more effective option and does not impede the natural growth of live plants.

Never Plant Invasive Plants

Invasive species (i.e., introduced species that thrive at the expense of native plants) should never be planted in coastal areas. Oriental bittersweet, bush honeysuckle, vine honeysuckle, autumn olive, and porcelain berry vine are particularly problematic coastal invasives because they have shallow roots, spread rapidly, and can secrete toxic compounds that prevent the growth of other plants. Japanese knotweed is another common invasive that is a problem on coastal sites. Although knotweed has deep roots, it can easily be torn out of the ground, taking large chunks of the soil with it. Because of these growth characteristics, even dense stands of these six species do little to reduce erosion by storm waves, runoff, and wind.

Removing/Replacing Invasive Plants

Invasive plants should be removed and replaced with appropriate native plants if they are preventing establishment of erosion-control vegetation. Because of their tenacity, successful control of invasive plants can take years to accomplish and may require perpetual monitoring and management. This effort is particularly warranted when bank stability is severely compromised by the invasive plant or when unruly and overgrown invasives can be replaced with lower-growing native species to stabilize the bank and improve coastal views.

INVASIVE PLANTS THAT HINDER EROSION CONTROL

Bush Honeysuckle

(Photo: Leslie J. Mehrhoff, University of Connecticut)

Vine Honeysuckle

(Photo: Chuck Bargeron, University of Georgia)

Oriental Bittersweet

(Photo: James R. Allison, Georgia Department of Natural Resources)

Autumn Olive

(Photo: Leslie J. Mehrhoff, University of Connecticut)

Porcelain Berry Vine

(Photo: Nancy Loewenstein, Auburn University)

Japanese Knotweed

(Photo: Jan Samanek, State Phytosanitary Administration)

All photos courtesy of Bugwood.org with specific acknowledgements given.

The photo on the left shows a densely vegetated bank that looks stable, but isn't. The invasive black locust, Asiatic bittersweet, and autumn olive growing on the bank do not have deep, dense roots that help hold soils in place. The photo on the right shows a close up of the exposed soils and erosion at the site. In addition, the roots of these invasive plants secrete toxic compounds and the thick branches shade the area, both of which inhibit the growth of native plants that could stabilize the soil. **(Photos: Wilkinson Ecological Design)**

Removing invasive plants to replace them with native species, however, can temporarily destabilize the bank. For sites where bank regrading is not needed, invasive plants should be cut off at ground level, keeping the roots in place to minimize site disturbance. Many invasive plants can be effectively eliminated by applying limited amounts of herbicide to the cut stems, which kills the remaining root material. Herbicides can only be used in areas where they are allowed by local regulations. A direct and targeted application of herbicides, as opposed to spraying, helps

to minimize adverse impacts to existing native vegetation, soils, groundwater, and coastal waters. Invasive plants should also be removed by hand when possible, rather than with heavy equipment. For sites where regrading is needed, the roots of invasive plants can be pulled out to minimize resprouting.

Regardless of the method used, when vegetation is cut or removed, the exposed soils will become more vulnerable to erosion from wind, rain, and waves. Proper scheduling and sequencing of invasive species removal and replanting with native species will minimize this problem, as will the use of other soil stabilization techniques. Consultation with a professional experienced in replacing invasives with native plants in erosion-prone areas is recommended, as the techniques and timing vary between plants.

Time of Planting

Although specific timing varies based on the plant species selected, most vegetation should be planted in early-to-mid spring (when the growing season has started and moisture levels are relatively high) to promote root growth and successful plant establishment. Beachgrass, however, typically does best when planted in unfrozen ground from mid-November through early April, except in areas exposed to strong wind or waves, where it should be planted in early spring to reduce the likelihood it will be washed or blown away in winter storms.

Watering

Established native plants typically do not require watering. When planted at the appropriate time of year, some newly planted species, such as American beachgrass planted on dunes, also do not require watering.

In both dune and bank areas, some supplemental irrigation may be necessary to ensure success in certain circumstances. For most newly planted vegetation, it is generally recommended that a temporary, automated irrigation system be used from April through October during the first two to three growing seasons until the roots can effectively find and absorb water from the surrounding soils. These irrigation rates can typically be reduced each year, with only minimal water needed in the third year, if at all. For American beachgrass and other plants that do not typically require initial watering, temporary irrigation (i.e., for 4-6 months) is needed when these species are planted in the hot, dry summer months.

Permanent irrigation systems and heavy watering are unnecessary and are not recommended, not only because established plants do not require watering (with the exception of times of drought), but also because excess water from permanent irrigation systems generally exacerbates dune and bank erosion and can even lead to bank failure. Excess water on dunes can also reduce soil salinity levels and allow plants that will not survive in the long-term to out-compete appropriate erosion-control plants.

Temporary irrigation systems, such as aerial heads, are good for providing water to large areas of plugs and seeds, while soaker hoses and drip tubing are effective for supporting container plantings, such as shrubs. A timer may be appropriate to deliver a sufficient amount of water (enough to infiltrate well into the soil to help plants develop deep roots) at desired times (often early morning when less water is lost to the heat of the day). The temporary irrigation lines should be left at the surface (so soils will not be disturbed when the lines are removed) and the system should be removed at a determined time (such as when a local Conservation Commission issues a Certificate of Compliance for the project around year 3).

Various methods to improve water retention and nutrient content in the plants and soils can also help significantly boost the survival rates of plants, such as the application of wetting agents (e.g., Yucca extract), beneficial microbes, and organic compost. A professional may need to be contacted to help determine the most appropriate watering methods and applications that will ensure plant establishment while avoiding impacts to coastal resource areas.

Fertilizer

Because sandy soils are typically dry and lack nutrients, it may be necessary to add some organic matter such as compost before planting. For coastal settings, it is appropriate to select plants that require little fertilizer. If the plant label indicates that fertilizer is needed the first year, use only the minimum amount necessary and use slow-release fertilizers composed of water-soluble materials to prevent coastal water pollution. On artificial or nourished dunes where sand has been brought in from off-site, a limited application of time-release fertilizer 30 days after planting is often needed.

Wildlife Protection

Because vegetation can alter habitat, care must be taken with vegetation projects in protected species habitat. Selecting appropriate types of vegetation (e.g., grass vs. shrubs) and increasing the spacing between plantings can reduce impacts to nesting habitat for protected shorebirds and turtles. Detailed guidance is available from the Natural Heritage and Endangered Species Program of the Massachusetts Division of Fisheries and Wildlife.

Heavy Equipment Use

If heavy equipment is needed for a vegetation project, equipment access must be carefully planned to avoid destruction of existing vegetation; creation of ruts; destabilization of banks, beaches, or other landforms; impacts to wildlife, particularly nesting habitat for protected shorebirds and turtles; and related impacts. When mechanical equipment is being used, contractors should keep hazardous material spill containment kits on-site at all times in case there is a release of oil, gasoline, or other toxic substances.

APPENDIX C

Property Tax Analysis

Baxter Road Long Term Planning
Appendix C - Tax Analysis
Property Tax Revenue for Homes Expected to be Lost in 2030

Map / Parcel	Address	Owner	Area (Acres)	FY 2021 Assessed Value	FY 2021 Assessed Land Value	Taxes Collected (at FY2020 Rate of 0.345%)
49 35	85 Baxter Road	SIASCONSET BEACH PRESV FUND	0.52	$18,700	$18,700	$64.52
49 8	87 Baxter Road	SIASCONSET BEACH PRESERVATI	0.46	$16,600	$16,600	$57.27
48 22	91 Baxter Road	KORENGOLD DANIEL L TRST	0.3	$10,800	$10,800	$37.26
48 19	97 Baxter Road	MCQUADE LAWRENCE C & MARG	0.59	$207,100	$181,100	$714.50
48 18	99 Baxter Road	SIASCONSET BEACH PRESERVATI	0.57	$37,800	$30,800	$130.41
48 17	101 Baxter Road	SEA FOREVER LLC	0.6	$21,600	$21,600	$74.52
48 15	105 Baxter Road	MATTESON MARILEE B TRST	0.58	$20,900	$20,900	$72.11
48 14.1	107 Baxter Road	GIFFORD WHITNEY A TRST	0.18	$6,500	$6,500	$22.43
48 14	107A Baxter Road	GIFFORD WHITNEY A TRST	0.27	$9,700	$9,700	$33.47
48 9	117 Baxter Road	KELLEY SCOTT	0.33	$400,400	$11,900	$1,381.38
48 7	119 Baxter Road	SCONSET TRUST INC	0.32	$17,000	$17,000	$58.65
48 10	115 Baxter Road	KELLEY SCOTT	0.34	$170,900	$170,900	$589.61
48 11	113 Baxter Road	LATSHAW KYLE L & YODER LORE	0.22	$304,000	$161,000	$1,048.80
48 12	109 Baxter Road	KENNEY JUSTINE M TR	0.54	$1,020,000	$186,000	$3,519.00
48 21	93 Baxter Road	FREEMAN STEVEN T & ERIN P	0.3	$376,200	$169,200	$1,297.89
48 5	122 Baxter Road	SCONSET TRUST INC	9.2	$5,589,000	$5,589,000	$19,282.05
49 34	83 Baxter Road	DOSTALIER MARIE ETAL	0.35	$390,700	$171,400	$1,347.92
49 33	81 Baxter Road	COHAN WILLIAM D & DEBORAH F	0.44	$767,700	$175,800	$2,648.57
49 32	79 Baxter Road	WEYMAR F HELMUT & CAROLINE	0.35	$779,800	$171,400	$2,690.31
49 31	77 Baxter Road	POSNER JOSHUA & RUDDEN EILEI	0.25	$357,000	$166,600	$1,231.65
49 30	75 Baxter Road	SANKATY BLUFF GROUP LLC	0.27	$481,100	$167,600	$1,659.80
49 27	73 Baxter Road	THOMPSON BRUCE & MARY	0.52	$779,900	$183,600	$2,690.66
49 26.1	71 Baxter Road	HONEY WILLIAM F & MICHELLE D	0.29	$1,100,200	$168,300	$3,795.69
					Total Tax Revenue	**$44,448.42**

Total Assessed Value Lost $12,883,600

ARCADIS

Property Tax Revenue for Additional Homes Expected to be Lost by 2050

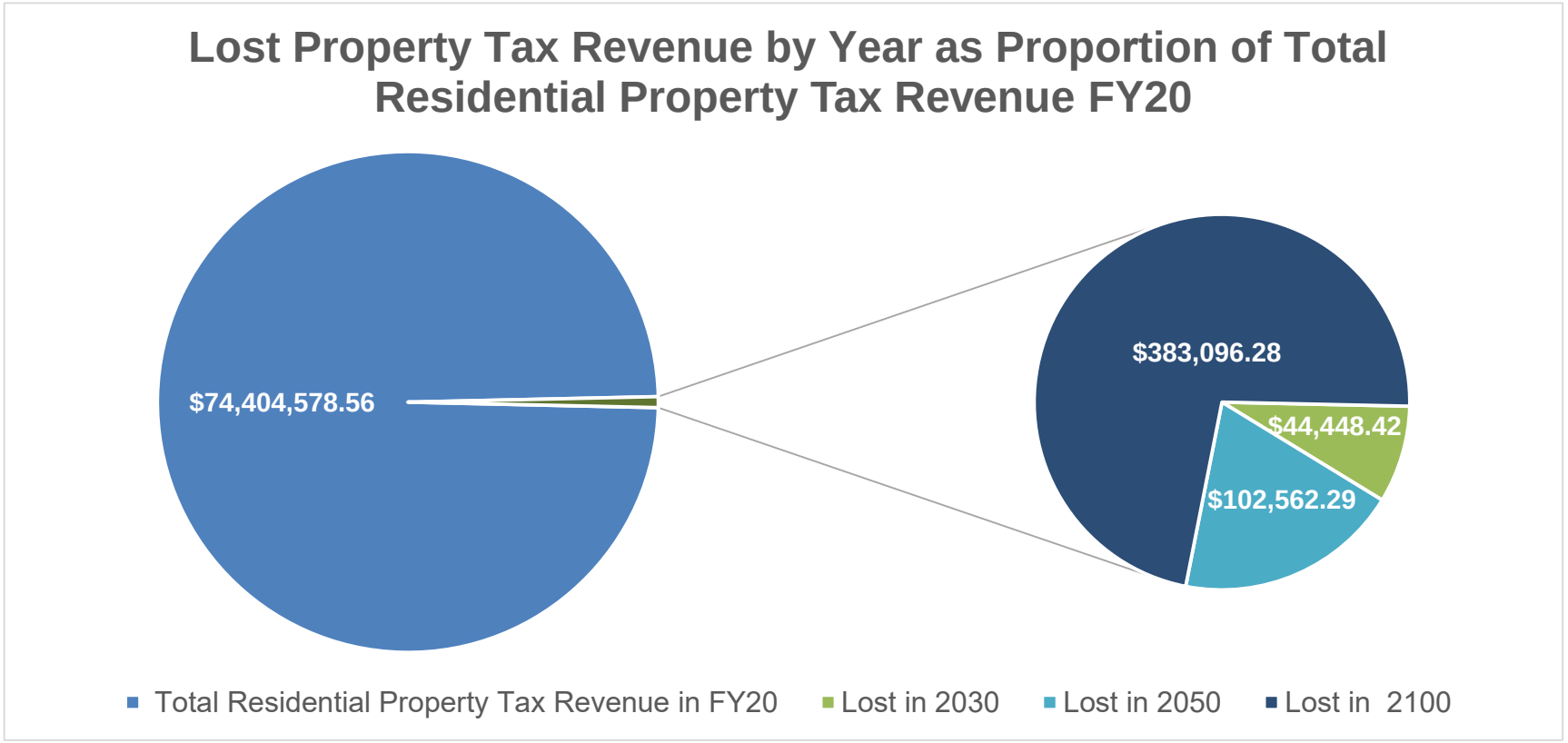
Map / Parcel	Address	Owner	Area (Acres)	FY 2021 Assessed Value	FY 2021 Assessed Land Value	Taxes Collected (at FY2020 Rate of 0.345%)
49 36	86 Baxter Road	86 BAXTER RO/	0.74	$1,002,700	$621,600	$3,459.32
49 5	90 Baxter Road	NIELSEN CARL	0.46	$1,311,200	$588,100	$4,523.64
48 23	92 Baxter Road	KORENGOLD D	0.58	$2,799,100	$749,400	$9,656.90
48 44	96 Baxter Road	WEBB ALEXAN	0.24	$1,285,900	$553,600	$4,436.36
48 43	98 Baxter Road	PISCHDOTCHIA	0.22	$999,400	$672,600	$3,447.93
48 42	100 Baxter Road	BAILEY DAVID	0.48	$1,898,000	$737,000	$6,548.10
48 40	104 Baxter Road	SEA FOREVER I	0.44	$1,773,500	$730,700	$6,118.58
48 39	106 Baxter Road	MATTESON MA	0.47	$1,752,900	$736,100	$6,047.51
48 38.1	108 Baxter Road	GIFFORD WHIT	1.82	$2,832,000	$644,600	$9,770.40
48 37	110 Baxter Road	RYAN PATRICK	0.82	$2,723,800	$778,200	$9,397.11
48 36	112 Baxter Road	Furrow Ann	0.25	$2,745,900	$554,800	$9,473.36
48 35	114 Baxter Road	HINCHEY RICK	0.3	$1,236,300	$563,100	$4,265.24
48 34	116 Baxter Road	DELPIDIO LOUI	0.28	$1,178,700	$560,000	$4,066.52
48 33	120 Baxter Road	MACKAY RICH	0.53	$943,100	$596,400	$3,253.70
49 25	69 Baxter Road	MOSCICKI RICH	0.36	$2,020,100	$172,300	$6,969.35
49 24	67 Baxter Road	MORNING LIGH	0.29	$1,726,800	$168,300	$5,957.46
49 23	65 Baxter Road	TUTTLE THOM/	0.21	$1,498,800	$351,700	$5,170.86
					Total Additional Tax Revenue	**$102,562.29**
					Cumulative Total (Including 2030)	**$147,010.71**
					Cumulative Total Assessed Value Lost	$42,611,800

Map / Parcel	Address	Owner	Area (Acres)	FY 2021 Assessed Value	FY 2021 Assessed Land Value	Taxes Collected (at FY2020 Rate of 0.345%)
48 47.1	111 Sankaty Road	GIFFORD WHITNEY	1.51	$3,227,400	$2,537,200	$11,134.53
48 26	115 Sankaty Road	GIFFORD WHITNEY	2.75	$2,214,000	$2,214,000	$7,638.30
49.2.3 14	19 Baxter Road	SIMON MCDUFF LL(	1.24	$9,809,500	$3,808,800	$33,842.78
49.2.3 12	23 Baxter Road	THE BRAES LLC	0.89	$5,777,200	$3,682,800	$19,931.34
49.2.3 9	29 Baxter Road	LAUGHLIN CONAN .	1.01	$5,447,300	$3,373,200	$18,793.19
49.2.3 8	31 Baxter Road	BURKE ROBERT P &	0.51	$4,823,200	$3,193,200	$16,640.04
49.2.3 7	33 Baxter Road	GORSUCH LLC	0.5	$4,393,200	$3,189,600	$15,156.54
49.2.3 6	35 Baxter Road	PRICE MICHAEL F &	0.34	$6,677,000	$3,102,300	$23,035.65
49 10	39 Baxter Road	SAUL ANDREW M &	0.35	$4,535,200	$2,570,000	$15,646.44
49 11	41 Baxter Road	SOROS PAUL TRST	0.37	$4,228,100	$2,586,500	$14,586.95
49 13	45 Baxter Road	SOROS JEFFREY P &	0.21	$4,505,000	$2,377,700	$15,542.25
49 14	47 Baxter Road	SOROS JEFFREY P &	0.3	$4,496,500	$2,537,400	$15,512.93
49 15	49 Baxter Road	JEANNE RICHMOND	0.84	$3,483,000	$2,782,800	$12,016.35
49 16	51 Baxter Road	FIFTY ONE BAXTER	1.19	$5,483,200	$2,908,800	$18,917.04
49 17	53 Baxter Road	KIDDER STEPHEN W	2	$5,679,400	$3,200,400	$19,593.93
49 18	55 Baxter Road	KIDDER STEPHEN W	0.31	$3,702,500	$2,540,700	$12,773.63
49 54	58 Baxter Road	ABCET LLC	1.9	$2,198,900	$1,649,600	$7,586.21
49 20	59 Baxter Road	DALE KEVIN F TRUS	0.46	$2,729,900	$1,764,000	$9,418.16
49 21	61 Baxter Road	HEALEY ANN R TRS	0.25	$2,541,600	$1,668,000	$8,768.52
49 52	62 Baxter Road	HEALEY ANN R TRS	0.18	$875,700	$875,700	$3,021.17
49 22	63 Baxter Road	SINGER ELIZABETH	0.57	$4,345,000	$1,803,600	$14,990.25
49 51	64 Baxter Road	SINGER ELIZABETH	0.51	$1,207,300	$1,182,000	$4,165.19
49 47	68 Baxter Road	ROSEMOOR LLC	0.15	$2,537,400	$1,080,800	$8,754.03
49 45	70 Baxter Road	WILNER SUSAN & G	0.36	$3,639,800	$1,432,500	$12,557.31
49 91.1	83 Sankaty Road	BAILEY DOROTHY (	0.9	$1,228,800	$1,228,800	$4,239.36
49 35	85 Baxter Road	SIASCONSET BEACH	0.52	$18,700	$18,700	$64.52
49 95	101 Sankaty Road	ROOSEVELT KERMI	0.83	$3,669,700	$1,220,900	$12,660.47
49 4	103 Sankaty Road	MASSEY CRAIG & P	1.29	$2,650,600	$1,566,300	$9,144.57
48 46	107 Sankaty Road	DIPPELL MARTHA L	0.7	$1,266,300	$1,213,800	$4,368.74
48 27	117 Sankaty Road	GIFFORD WHITNEY	3.14	$3,651,000	$2,260,800	$12,595.95
					Total Additional Tax Revenue	**$383,096.28**
					Cumulative Total (Incl. 2030 and 2050)	**$530,106.99**

Cumulative Total Assessed Value Lost $153,654,200

Baxter Road Long Term Planning
Appendix C - Tax Analysis
Property Tax Revenue for Homes Expected to be Lost through 2100

Year	Property Tax Revenue	As Percent of Total Residential Property Tax Revenue FY20
Total Residential Property Tax Revenue in FY20	$74,404,578.56	
Lost in 2030	$44,448.42	0.060%
Lost in 2050	$102,562.29	0.138%
Lost in 2100	$383,096.28	0.515%
Sum Lost	$530,106.99	0.712%



ARCADIS

CONSENT AGENDA ITEMS FOR 10/6/2021 SELECT BOARD MEETING

1. Gift Acceptances

Recommend the acceptance of the following gifts to Town agencies:

- Fire Department:
  - Gift of $365 from the Carl and Nancy Gewirz Fund. The finds will be earmarked for the Department's Safe Grant account for initiatives led by the Fire Prevention Office

- Our Island Home:
  - Gift Certificate valued at $300 from Paul and Lora Stewart for musical performance by Susan Berman and Ray Saunders

Recommended Motion: To accept all gifts for their designated purposes, with thanks to the donors.

Town Administration will ensure that letters of thanks are sent.

Nantucket Fire
Department
4 Fairgrounds Road
Nantucket, MA 02554
Tel: (508) 228-2324
Fax: (508) 325-7500

September 8, 2021

SELECT BOARD
16 BROAD ST
NANTUCKET, MA 02554

Re: THE CARL AND NANCY GEWIRZ FUND, INC
Fire Department Training & Equipment

Dear Chair Hill-Holdgate:

The Carl and Nancy Gewirz Fund, Inc. have made a generous donation of $365.00 to fund the safe grant initiatives lead by the Fire Prevention Office. We are requesting that the select board authorize the transfer of this donation to the Safe Grant Account.

Please let us know if you have any questions or need anything further.

Please let us know if you have any questions or need anything further.

Sincerely,

Stephen Murphy, Chief

SM/
Enclosures

OUR ISLAND HOME
9 East Creek Road
Nantucket, Massachusetts 02554
(508) 228-0462
FAX (508) 228-6875

September 22, 2021

Nantucket Select Board
Nantucket, MA. 02554

Dear Chairman Bridges,

I am writing to request that the Board accept the following gift certificate for Our Island Home:

- Gift Certificate for Music performance by Susan and Ray, valued at $300.00. Donated by Paul and Lora Stewart.

Please be advised the donation will be utilized to provide Musical Entertain for the residents of Our Island Home.

Thank you in advance for your acceptance.

Sincerely,

MJmunroe

Michelle L Munroe
Assistant Administrator
Our Island Home

Music with Susan & Ray

Susan & Ray will provide 2 sets of music for your gathering event.

Susan and Ray play an eclectic mix of musical styles, but will tailor songs to suit your event and musical tastes.

Donated by Susan J. Berman & Ray K. Saunders

Value: $300

9.21.2021

Olivia –

Susan and Ray love playing at Our Island Home and volunteer regularly. They donated the enclosed gift certificate to the Unitarian Church auction.

Paul and Lora Stewart bid on it and wanted to donate the music to the residents. Please contact them, or the next time they play, can you share with them and the residents that the Stewarts support their music?

Thanks - Jeven Sorensen

UU Auction Chair

Agenda Item Summary

Agenda Item #	XI. 1.
Date	10/6/2021

Staff

Brian E. Turbitt, Finance Director

Subject

Sale of General Obligation Bonds $20,312,200

Executive Summary

The Town through its financial advisors recently completed a competitive sale of $15,977,500 in General Obligation Bonds and a refunding of previously issued General Obligation Bonds in the Amount of $4,334,700. These bonds were for the following municipal purposes: Sewer projects $1,745,000; General Fund $4,258,100; Affordable Housing Trust (Neighborhood First) $7,612,500; along with a refunding of Water and Airport Debt in the amount of $4,334,700.

Staff Recommendation

Recommend approval of the sale of the General Obligation Bonds for Municipal Purposes.

Background/Discussion

The sale of the notes took place on Thursday September 30, 2020; the Town received 13 bids for the bonds. The winning bidder was Raymond James and Associates with True Interest Cost (TIC) of 1.0626%

Impact: Environmental ☐ Fiscal ☒ Community☐ Other☐

Budgetary Cost associated with the principal and interest for the life of the bonds.

Board/Commission Recommendation

N/A

Public Outreach

None

Connection to Existing Applicable Plan (i.e. Strategic Plan, Master Plan, etc.)

None

Attachments

Vote of the Select Board.

Agenda Item Summary

Agenda Item #	XI. 2.
Date	10/6/2021

Staff

Brian E. Turbitt, Finance Director

Subject

Sale of $35,818,400 in General Obligation Bond Anticipation Notes (BAN), Series A ($26,818,400) and Series B ($9,000,000).

Executive Summary

The Town through its financial advisors recently completed a competitive sale of $35,818,400 in General Obligation Bond Anticipation Notes. Series A was made up of: Town Projects $5,756,000; Sewer Projects $12,765,400; Affordable Housing Projects $8,297,000. Series B was made up of Airport Projects in the amount of $9,000,000.

Staff Recommendation

Recommend approval of the sale of the General Obligation Bond Anticipation Notes in Series A and B, and the signing of the notes.

Background/Discussion

The sale of the notes took place on Thursday September 30, 2021. The Town received 3 bids for the Series A offering and 7 bids for the Series B offering. The winning bid was received from Bank of America Securities for both Series. The Series A bid was a coupon rate of 1.50, with a Net Interest Cost (NIC) of .1461 and for the Series B a coupon rate of 1.50% with a Net Interest Cost (NIC) of .1163%

Impact: Environmental ☐ Fiscal ☒ Community☐ Other☐

Budgetary Cost of $93,244.36 to be paid when the notes mature.

Board/Commission Recommendation

N/A

Public Outreach

None

Connection to Existing Applicable Plan (i.e. Strategic Plan, Master Plan, etc.)

None

Attachments

Vote of the Select Board.

VOTE OF THE SELECT BOARD

I, the Clerk of the Select Board of the Town of Nantucket, Massachusetts (the "Town"), certify that at a meeting of the board held October 6, 2021 of which meeting all members of the board were duly notified and at which a quorum was present, the following votes were unanimously passed, all of which appear upon the official record of the board in my custody:

Voted: That in order to reduce interest costs, the Treasurer is authorized to issue refunding bonds, at one time or from time to time, pursuant to Chapter 44, Section 21A of the General Laws, or pursuant to any other enabling authority, to refund all of the Town's $16,015,000 General Obligation Municipal Purpose Loan of 2012 Bonds dated June 7, 2012 maturing on December 1 in the years 2022 through 2029 (inclusive), and 2031 (collectively, the "Refunded Bonds") and that the proceeds of any refunding bonds issued pursuant to this vote shall be used to pay the principal, redemption premium and interest on the Refunded Bonds and costs of issuance of the refunding bonds.

Further Voted: that the sale of the $17,955,000 General Obligation Municipal Purpose Loan of 2021 Bonds of the Town dated October 14, 2021 (the "Bonds"), to Raymond James & Associates, Inc. at the price of $21,222,956.55 and accrued interest, if any, is hereby approved and confirmed. The Bonds shall be payable on October 1 of the years and in the principal amounts and bear interest at the respective rates, as follows:

Year	Amount	Interest Rate	Year	Amount	Interest Rate
2022	$1,695,000	5.00%	2030	$1,410,000	5.00%
2023	1,775,000	5.00	2031	1,405,000	4.00
2024	1,630,000	5.00	2032	875,000	3.00
2025	1,625,000	5.00	2033	875,000	2.00
2026	1,625,000	5.00	2034	245,000	2.00
2027	1,450,000	5.00	2035	245,000	2.00
2028	1,450,000	5.00	2036	240,000	2.00
2029	1,410,000	5.00			

Voted: to approve the sale of $26,818,400 1.50 percent General Obligation Bond Anticipation Notes, Series A (the "Series A Notes") of the Town dated October 15, 2021, and payable October 14, 2022, to BofA Securities, Inc. at par and accrued interest, if any, plus a premium of $362,075.30.

Further Voted: to approve the sale of $9,000,000 1.50 percent General Obligation Bond Anticipation Notes, Series B (the "Series B Notes" and together with the Series A Notes, the "Notes") of the Town dated October 15, 2021 and payable June 30, 2022, to BofA Securities, Inc. at par and accrued interest, if any, plus a premium of $88,209.

Further Voted: that in connection with the marketing and sale of the Bonds, the preparation and distribution of a Notice of Sale and Preliminary Official Statement dated September 23, 2021, and a final Official Statement dated September 30, 2021 (the "Official Statement"), each in such form as may be approved by the Town Treasurer, be and hereby are ratified, confirmed, approved and adopted.

Further Voted: that the Bonds shall be subject to redemption, at the option of the Town, upon such terms and conditions as are set forth in the Official Statement.

Further Voted: that in connection with the marketing and sale of the Notes, the preparation and distribution of a Notice of Sale and Preliminary Official Statement dated September 23, 2021, and a final Official Statement dated September 30, 2021, each in such form as may be approved by the Town Treasurer, be and hereby are ratified, confirmed, approved and adopted.

Further Voted: to authorize the execution and delivery of a Refunding Escrow Agreement to be dated October 14, 2021, between the Town and U.S. Bank National Association as Refunding Escrow Agent.

Further Voted: that the Town Treasurer and the Select Board be, and hereby are, authorized to execute and deliver continuing and significant events disclosure undertakings in compliance with SEC Rule 15c2-12 in such forms as may be approved by bond counsel to the Town, which undertakings shall be incorporated by reference in the Bonds and Notes, as applicable, for the benefit of the holders of the Bonds and Notes from time to time.

Further Voted: that we authorize and direct the Treasurer to establish post issuance federal tax compliance procedures and continuing disclosure procedures in such forms as the Treasurer and bond counsel deem sufficient, or if such procedures are currently in place, to review and update said procedures, in order to monitor and maintain the tax-exempt status of the Bonds and Notes and to comply with relevant securities laws.

Further Voted: that any certificates or documents relating to the Bonds and Notes (collectively, the "Documents"), may be executed in several counterparts, each of which shall be regarded as an original and all of which shall constitute one and the same document; delivery of an executed counterpart of a signature page to a Document by electronic mail in a ".pdf" file or by other electronic transmission shall be as effective as delivery of a manually executed counterpart signature page to such Document; and electronic signatures on any of the Documents shall be deemed original signatures for the purposes of the Documents and all matters relating thereto, having the same legal effect as original signatures.

Further Voted: that each member of the Select Board, the Town Clerk and the Town Treasurer be and hereby are, authorized to take any and all such actions, and execute and deliver such certificates, receipts or other documents as may be determined

by them, or any of them, to be necessary or convenient to carry into effect the provisions of the foregoing votes.

I further certify that the votes were taken at a meeting open to the public, that no vote was taken by secret ballot, that a notice stating the place, date, time and agenda for the meeting (which agenda included the adoption of the above votes) was filed with the Town Clerk and a copy thereof posted in a manner conspicuously visible to the public at all hours in or on the municipal building that the office of the Town Clerk is located or, if applicable, in accordance with an alternative method of notice prescribed or approved by the Attorney General as set forth in 940 CMR 29.03(2)(b), at least 48 hours, not including Saturdays, Sundays and legal holidays, prior to the time of the meeting and remained so posted at the time of the meeting, that no deliberations or decision in connection with the sale of the Notes were taken in executive session, all in accordance with G.L. c.30A, §§18-25 as amended.

Dated: October 6, 2021

_____
Clerk of the Select Board

98313245v.2

Chapter 278

HARBORS AND WATERWAYS

[HISTORY: Adopted by the Town of Nantucket as indicated in article histories. Amendments noted where applicable.]

TOWN CODE REFERENCES

Noncriminal disposition of penalties — See Ch. 1, Art. II.

Town wharves and waterways — See Ch. 137.

TOWN REGULATIONS REFERENCES

Administration of Board of Health regulations; definitions — See Ch. 223.

Fishing and shellfishing — See Ch. 260.

Boats used as residences — See Ch. 283, Art. I.

ARTICLE I

Dumping of ~~Sewage~~ waste in Island Waterways

~~[Adopted by the Board of Health 8-14-1985]~~

§ 278-1. Disposal of ~~refuse~~ waste prohibited.

No person shall dispose of, or if in control of any vehicle, boat or other conveyance, allow to be disposed of, in or on any way to which the public has access, or in or on any stream, pond, creek, waterway, estuary, harbor, beach or foreshore in the Town of Nantucket, any garbage, refuse, bottles, cans, containers, gray water, treated or untreated sewage or other refuse material of any kind or nature.

§ 278-2. Violations and penalties.

Any person violating this regulation shall be punished by a fine of not more than $300 for each offense.

ARTICLE II

Harbors and Town Pier

§ 278-3. DEFINITIONS

"BERTH" means any space wherein a vessel is confined by wet slip, dry stack, float, mooring, or other type of docking facility.

"COMMERCIAL USE", a vessel engaged in commercial trade or that carries passengers for hire.

"COMMERCIAL FISHING BOAT", a vessel which is used to engage in the industry or occupation devoted to the catching, processing, or selling of fish, shellfish, or other aquatic animals.

"DINGHY", a small self-propelled vessel used for transportation to and from a dock or wharf, and/or between vessels moored in the harbor.

"DINGHY PERMIT", an annual permit issued by the Town of Nantucket for a Dinghy.

"DIVER", includes swimmers using fins and/or masks and/or snorkel tubes or self-contained underwater breathing devices and may include those diving without aids, where the circumstances are appropriate.

"GRAY WATER", in Nantucket waters as defined above, gray water is a vessel's water/soap discharge, which is derived from galley, bath, showers, dishwashing and laundry equipment.

"IMMEDIATE FAMILY", parents, grandparents, children, sister, brother, and spouse.

"HARBOR MASTER", officer appointed by the Town to perform the duties of Harbor Master.

"LIVEABOARD", a liveaboard is a person who sleeps aboard a vessel and the vessel is considered as a residence for any period of time as determined by the Harbor Master.

"MOORING", A means of temporarily berthing a vessel utilizing a dead weight, mushroom or pyramid type bottom anchor affixed to a chain or other method approved by the Harbor Master, which is affixed to a buoy.

"MOORING PERMIT", annual permit issued by the Town of Nantucket for the placement and use of a Mooring in Nantucket Waterways pursuant to M.G.L. c.91, s.10A. Mooring Permit does not include the Mooring License Agreement permitting the installation of Rental Moorings.

"NANTUCKET WATERWAYS or WATERWAYS", includes all of the navigable waters within the boundaries of Nantucket County, which shall include all harbors, rivers, bays or ponds, including waterways which, from time to time, may be temporarily non-navigable by reason of low tides, drought or seasonal weather and water conditions.

"PERSONS", includes an individual, corporations, societies, associations, partnerships, trusts or other business or corporate entity recognized by law as having the standing of a person.

"RAFT" or "FLOAT", a non-propelled floating craft, not intended for transportation purposes.

"RENTAL MOORING". Mooring installed and maintained by the Mooring Licensee pursuant to a Mooring License Agreement between the Mooring Licensee and the Town.

"RECREATIONAL VESSEL ", a vessel manufactured or operated primarily for pleasure.

"TOWN", Town of Nantucket, Massachusetts.

"TOWN PIER", municipal pier located at 34 Washington Street, to include timber pier and floating dock.

"TRANSIENT", a vessel visiting Nantucket Waterways for a short period of time not exceeding forty-eight (48) hours.

"VESSEL", ships and boats of all kinds, including barges, sailing vessels, watercraft and powerboats of any type or kind by whatever means propelled; every structure, designed, adapted, or capable of being navigated, towed or operated on water from place to place for the transportation of merchandise, people or for any other purpose.

"WAITING LIST", the official list of names of mooring permit applicants managed by the Town.

"WATER-DEPENDENT USES", those uses and facilities which require direct access to, or location in, marine or tidal waters and which therefore cannot be located inland, including but not limited to: marinas, recreational uses, navigational and commercial fishing and boating facilities, water-based recreational uses, navigation aids, basins, and channels, industrial uses dependent upon waterborne transportation or requiring large volumes of cooling or process water which cannot reasonably be located or operated at an inland site.

§ 278-4. General prohibitions and restrictions.

A. Except in an emergency, no vessels shall be made fast to any of the Town's wharves, floats or piers without the permission of the Harbor Master.

B. No person shall leave any vessel, fishing equipment, fish or any other personal property upon Town landing places, floats, wharves or pier for longer than is necessary in the act of loading or unloading the same to and from vessels or vehicles.

C. The Town shall not be responsible for any loss or damage to vessels at the Town wharves, floats, pier or moorings. Owners will be held responsible for damage caused by them or their vessels to structures and pilings and related facilities owned by the Town.

D. No warp or line shall be passed across the channels or any dock so as to obstruct or interfere with vessels navigating in the area.

E. Except in an emergency, no vessel shall fuel at any of the Town's wharves, floats or piers without the permission of the Harbor Master.

F. Vessels shall not be permitted to tie up or otherwise made fast at the Nantucket Town pier or wharves in Madaket, except as authorized by the Harbor Master.

G. All vessels using the Town wharves and Waterways shall observe all police, fire, health and sanitary regulations of the Town, and the owners or operators of such vessels shall not permit acts contrary to good order, public safety or public health, including public profanity or obscene language or indecent exposure. Unnecessary noise, loud talking or playing of musical instruments between the hours of 11:00 p.m. and 8:00 a.m. is not permitted. No person upon such vessel shall throw garbage, paper, refuse or debris of any kind into the harbor.

H. Commercial or business use of any vessel or watercraft docked at any Town-owned dock, pier or wharf is prohibited, except that Charter or commercial fishing boats or other uses defined as "water dependent" as herein defined and provided that such uses and the vessels employed in such uses are first allocated dock space in accordance with these regulations.

I. No vessel or watercraft of any kind whatsoever which is painted with paints containing butyltin compounds shall be permitted to moor in Town waters or tie up at the Town wharves, whether private or public.

J. Between October 15 and April 15, all Dinghies not servicing vessels presently moored in the harbor shall be removed from any ~~Town~~ property where dinghy storage has been permitted.

K. The Town may remove after October 30, any Dinghy left on Town any property where storage has been permitted. Following such removal, the Harbor Master shall give notice of the removal as follows:

(1) if the owner is known, then by mail, email, or hand-delivery;

(2) if the owner is unknown, then by publication in a newspaper of general circulation within the Town;

(3) if, after thirty (30) days following the publication or written notice, the owner has failed to claim the Dinghy and reimburse the Town for removal costs, the Dinghy may then, at the discretion of the Harbor Master, be sold at public auction to cover the costs of removal. If said auction produces surplus proceeds after payment of the costs of removal, said surplus shall be held in a separate account and be paid over to the owner upon proof of ownership.

L. There shall be no Liveaboards at any Town Pier or Wharf. Liveaboards shall only be allowed within the Nantucket Boat Basin, or in Nantucket Waterways if the vessel is tied to a Mooring that is authorized by the Town pursuant to these regulations. Vessels used as Liveaboards that are anchored are prohibited.

M. Vessels using Nantucket Waterways for more than forty-eight (48) hours, which are not berthed or trailered, must utilize a Mooring which has been permitted under these regulations or a Rental Mooring. The Harbor Master may, in the event of no suitable berthing space being available, allow transient vessels to anchor in an approved area until such time as a berthing space becomes available.

§ 278-5. Moorings

A. Mooring Equipment

(1) All Moorings must be registered and a permit for the Mooring must be approved prior to the placement of the Mooring. No Mooring shall be placed by any person or Mooring Handler unless a Mooring Permit has been issued. The Harbor Master may authorize a temporary Mooring placement on a case by case basis pending issuance of a Mooring permit.

(2) The location of all Moorings shall be determined from time to time by the Harbor Master. No Mooring shall be located in the main stream, channel or turning basin of any of the harbors of the Town, unless, in the opinion of the Harbor Master, the particular circumstances require it. Moorings shall be located so that vessels lying on them shall not block any channel or approach to wharves or other Moorings in the vicinity or create any other hazard to navigation.

(3) No vessel shall use a Mooring in Nantucket Waterways unless the Mooring is in good condition and meets the following minimum standards unless otherwise determined by the Harbor Master:

Length of Boat	Mushroom Mooring	Concrete Block Mooring
Under 14’	75 lbs.	Subject to individual approval by the Harbor Master
15’ to 18’	150 lbs.	
19’ to 22’	200 lbs.	
23’ to 26’	300 lbs.	
27’ to 32’	500 lbs.	
Over 32’	Subject to individual approval by the Harbor Master	

(4) No vessel shall use a Mooring unless the chain is in good condition and that the length is at least the vertical height above the sea bottom to four feet above mean high water. Maximum length of chain shall be no more than 2.5 times the maximum depth of the water, except where the Harbor Master determines otherwise. All Mooring chains shall be of a grade suitable for Moorings and meet the following minimum size standards:

Length of Boat	Chain Minimum Size
10’ to 23’	1/2”
24’ to 32’	5/8
Over 33’	3/4" - 1” as determined by the Harbormaster

(5) No vessel shall use a Mooring pennant unless it is in good condition and of a type suitable for Moorings. The length shall be no longer than half the length of the vessel. Pennant line size shall be:

Length of Boat	Line Minimum Size
Up to 10’	7/16”
11’ to 23’	1/2”
24’ to 32’	5/8”
Over 33’	3/4"

NOTE: The use of synthetic lightweight high-strength pennant lines such as Dyneema and Spectra may be used in lesser dimensional sizes provided that such use provides equal or greater tensile strength than the standard line sizes listed above.

(6) Moorings shall be inspected by the Harbor Master, or by a designated representative at least once every two (2) years to determine their compliance with the regulations herein. Proof that the Mooring has been inspected is a requirement for a Mooring permit to be issued. If a permit is not issued pending an inspection, and a period of thirty (30) days elapses from the date that the permit is requested to be issued, the Harbor Master shall notify the permit holder by certified mail at the address appearing on the permit application that if the permit holder fails to provide proof of inspection within thirty (30) days, the Mooring permit will be forfeited.

(7) The Harbor Master may remove, relocate or order the removal of any Mooring not in compliance with these regulations. The expense of such removal or relocation shall be the responsibility of the owner.

(8) The Harbor Master may order the removal or relocation of any Mooring whenever, in the judgment of the Harbor Master, the safety of other vessels or the optimum use of the area requires such action. The expense of such removal or relocation shall be the responsibility of the owner. Except when immediate removal is deemed necessary by the Harbor Master, an owner shall have at least fourteen (14) days to relocate or remove a Mooring when so ordered by the Harbor Master.

(9) All Moorings shall be removed from areas designated by the Harbor Master as shell fishing areas prior to October 15.

(10) All Mooring buoys shall be white and have a minimum one-inch blue band visible above the water. Buoys shall be marked with the permit number assigned by the Harbor Master. The numbers shall be a minimum of three inches in height and be clearly visible. Mooring buoys shall be of customary shape and materials as determined by the Harbor Master.

(11) Spar buoys shall be upright at all times and not less than 40° at any period of tide and not less than 18 inches exposed.

(12) The Harbor Master may order the removal of any buoy deemed to be inappropriate in form, appearance or construction.

(13) Helix type or any other permanent Mooring that has not been permitted pursuant to Chapter 91 of the General Laws or received a permit from the U.S. Army Corps of Engineers is prohibited.

(14) Any existing Helix Mooring not permitted under Subsection A (13) shall be removed.

B. Mooring Permits

(1) To be eligible for a Mooring Permit, any vessel habitually moored in Nantucket Waterways shall have paid any excise tax due pursuant to Chapter 60B of the General Laws. Furthermore, only Massachusetts registered vessels, non-motorized vessels, or vessels with a valid Federal documentation certificate showing the vessels hailing port of Nantucket shall be eligible for a mooring permit.

(2) All applications for a Mooring space in any Nantucket harbor or waterway shall be submitted to the Town on the Mooring Permit Application form. All information requested on the form must be supplied or the application may be rejected.

(3) The Mooring Permit decal issued by the Town shall be firmly affixed to boat on the port side of the bow, or in the case of classic-design wooden sail boats, the port side of the mast.

(4) Only the registered boat, displaying a current and valid mooring permit decal, which is owned by the person to whom the Mooring Permit was issued, shall fasten to the Mooring.

(5) At the time of the Mooring Permit issuance, if the Mooring Permit holder does not currently own a vessel or is not a person lawfully entitled to possession and use of a vessel for the season for which a Mooring Permit is granted, no Mooring Permit will be issued. The mooring permit holder will have twelve (12) months to acquire a vessel of the same type and size as stated on their Mooring Permit Application. If, at the end of twelve (12) months, the vessel has not been obtained, the Mooring Permit shall be forfeited and the person will be placed at the bottom of the wait list.

(6) If an individual holds a valid Mooring Permit and sells his/her rights to the boat with the intention of replacing it with a vessel of the same type and length, he/she will have twelve (12) months to replace the vessel. If, at the end of twelve (12) months, the vessel has not been replaced with a vessel of the same type and length, the Mooring Permit shall be forfeited and the individual will go to the top of the waiting list for an appropriate mooring location.

(7) No Mooring Permit shall be transferable to another person, except to a person within the immediate family of the permit holder upon approval of the Harbor Master.

(8) The sale, rental or subletting of a Mooring Permit issued pursuant to these regulations is prohibited. However, the Harbor Master may permit the time sharing of Moorings in order to maximize the usage of the Mooring fields provided that payment of the Permit fee has been paid by the Mooring Permit holder and the time share vessel is of the same type and approximate length of the vessel shown on the Mooring Permit. Time sharing of a Mooring shall be limited only to registered Mooring Handlers for vessels less than twenty-six feet (26') in length. Vessels engaged in a time share situation shall comply with marking and reporting requirements as determined by the Harbor Master.

(9) Mooring Permits shall be for a period of one year, or any fraction thereof, terminating on December 31 of each year, unless earlier revoked by the Harbor Master, and shall be

renewable annually for one year. All Mooring Permit holders shall ensure annually that their vessel information, contact information, Mooring Handler and other information as required by the Town is current and up to date. Failure to update and/or review the information annually may result in the non-renewal of the Mooring Permit until such information is verified.

(10) Payment for the annual Mooring Permit shall be paid in full by January first of each year.

(a) If payment is not received by this date, the Town shall:

[1] Assess a late fee ~~of $25.00~~;

[2] Send notice of non-payment by first class mail to the address that the permit holder currently has on file advising them that the permit will be forfeited if payment is not received by February 15.

[3] If payment is not received by March 15, the Town shall send notice by certified mail advising the Permit holder that their Mooring Permit has been revoked.

[4] If the Permit holder responds to the certified mail notice by April 15, the Permit shall be reinstated for a $100 fee and also upon payment of the applicable Mooring Permit fee.

(b) If no response is received, or full payment of late fees and all Permit fees is not made by April 15, the Permit is forfeited and the Mooring location will be offered to the next person on the waiting list.

(11) In areas where no additional Mooring spaces are available, applicants shall be placed on a waiting list maintained by the Town.

(a) The waiting list shall include the names of applicants waiting for Moorings in chronological order of application, regardless of the applicant's preference for a particular Mooring location. The person at the top of the official waiting list shall have priority to obtain the next available location, but may waive the right to the next available location if it is not in a place convenient for him without losing his place at the top of the waiting list. In the event of a waiver, the next person on the list shall be offered the location, and if that person waives the right to the location, the next successive person shall be offered the location until someone in succession on the list elects to take the Mooring location. Notice to the person entitled to the next available Mooring shall be in writing or by any reasonable method.

(b) It shall be the responsibility of wait list applicants to notify the Town of any address or information change. Notification of mooring availability to wait list applicants shall be only to the information supplied to the Town on the Mooring Permit application. The Town is under no obligation to seek out wait list applicants who fail to respond to notice of mooring space availability.

(12) Dinghies of less than ten feet (10') attached to permitted Moorings shall be required to have a Dinghy Permit. Dinghies less than ten feet (10') are otherwise exempt from the Mooring Permit requirements herein provided that the Mooring is properly permitted and there is a primary vessel regularly attached to the Mooring which bears a valid Mooring Permit decal.

Vessels that are greater than ten feet (10') in length are subject to all Mooring Permit requirements and shall not be fastened to a mooring unless it is properly permitted.

C. Dinghy Permits

(1) In waterfront areas where the Harbormaster has constructed racks or designated an area for the storage of dinghies, any dinghy in these areas shall have a dinghy permit issued by the Town.

(2) Dinghy permits shall be issued by the Town only to those persons who have a valid Mooring Permit upon payment of a fee. Only one dinghy permit shall be issued to each mooring.

(3) Dinghy permits shall be affixed the left (port) side of the dinghy where it is clearly visible.

(4) Only permitted dinghys shall be stored in dinghy storage racks. If rack space is not available, then dinghies shall be stored neatly in an area designated by the Harbormaster.

(5) Dinghy storage is prohibited if there is insufficient storage space in the racks or insufficient space in areas so designated as dinghy storage areas. Dinghys shall be removed from the area by the owner immediately after use. The determination of dinghy storage spaces shall be in the sole determination of the Harbormaster.

(6) The Harbormaster may remove any permitted dinghy improperly stored or any dinghy not properly displaying a dinghy permit. Disposition of dinghies so removed shall be pursuant to section §278-4 K of these regulations.

D. Liveaboards

(1) There shall be no Liveaboards at any Town Pier or Wharf. Liveaboards shall only be allowed within the Nantucket Boat Basin, or in Nantucket Waterways if the vessel is tied to a Mooring that is authorized by the Town pursuant to these regulations. Vessels used as Liveaboards that are anchored are prohibited.

(2) No vessel shall be moored in Nantucket waterways and used as a liveaboard for a period exceeding forty-eight (48) hours unless the owner of the vessel is present during that period of time or there is a person who is licensed as a U.S. Coast Guard Captain with a minimum rating as an Operator of Uninspected Passenger Vessels on board.

(3) Vessels used as a liveaboard shall be required to complete a registration form listing information as required by the Harbormaster to include at a minimum the vessel owners name, address, vessel type, and identifying information of persons using the vessel as a liveaboard.

(4) Vessels used as a liveaboard shall have a current boaters insurance policy.

(5) Vessels used as a liveaboard shall be capable of traveling under its own motorized propulsion to a sewer pumpout station located at the Town Pier or Nantucket Boat Basin.

§ 278-6. Town Pier

A. Capacity and Slip Assignments

(1) The Standing or Fixed Pier has fifty-five (55) slips which can accommodate recreational vessels up to and including thirty feet (30') in length. Three (3) slips are designated for the Town for the pump-out and patrol boats. The Harbor Master may designate additional spaces for Town purposes as needed.

B. Slip Assignments Revocable License

(1) Slips assignments to vessels will be subject to a revocable license agreement between the Town and the vessel owner. The revocable license agreement shall contain the terms of the agreement for the slip assignment. Failure to comply with the terms of the license agreement shall result in the termination of the license and forfeiture of the slip without refund.

(2) Only persons who are at least eighteen (18) years of age are eligible to enter the slip lottery and execute a slip license.

(3) Only vessels with mechanical power, thirty-five (35) feet in length or smaller, and either have a current and valid Massachusetts vessel registration or valid Federal documentation certificate showing the vessels hailing port of Nantucket are eligible for entry into the slip lottery and subsequent awarding of a slip assignment.

(4) The term of any revocable slip assignment license will be from May 1st through September 30th whether or not the revocable license is automatically renewable from year to year.

(5) No vessel may be placed in a slip prior to May 1st, and no vessel may remain in a slip after September 30th without permission of the Harbor Master. The permission of the Harbor Master notwithstanding, no additional rights or term of occupancy is to be implied as a result of the Harbor Master allowing early arrival or late departure from a licensed slip.

C. Recreational Vessels

(1) Recreational Vessel slips are divided into two categories, 'A' and 'B'. Thirty-five (35) ~~Fifty (50) percent of the available~~ slips will be designated as category 'A', and thirty-five (35) slips will be designated as category 'B' ~~for Vessels less than 30'. The Harbormaster shall determine the percentage of eligible slips available for a class 'A' or 'B' based on Vessel length. The intent is to evenly distribute the percentage available 'A' or 'B' classes based upon Vessel length recognizing that most slip locations are determined by Vessel size.~~

(2) Category 'A' recreational slip assignments shall be awarded by lottery and be allowed a ~~renewable~~ ~~two (2) year slip license. The category 'A'~~ revocable slip license. The revocable slip license will be renewable for subsequent years ~~the second year~~ without participation in the lottery as long as the slip holder remains current with payments and is in compliance with all applicable rules, regulations and by-laws of the Town or unless otherwise cancelled by the Town of Nantucket or the license holder. When a category 'A' slip becomes available, its initial assignment shall be by lottery pursuant to Section §278-6 H ~~250.4.3.8~~

(3) Category 'B' recreational slip assignments shall annually be awarded by lottery. The category 'B' revocable slip license will expire each year. They will not be renewable and any previous category 'B' holder must participate in the annual slip lottery.

~~(4) The annual lottery will be held in October of each year. The date of the lottery shall be advertised for at least two (2) weeks to the lottery date. Names of applicants shall be entered based upon information provided to the Town on the slip assignment application form. Slip~~

~~applications shall be accepted up to twenty-four (24) hours prior to the lottery provided that the new slip application fee has been paid.~~

NOTE: THIS TEXT MOVED TO NEW Section §278-6 H

(4) Persons who are awarded a recreational 'A' or 'B' slip assignment shall have thirty (30) days after the lottery to make payment and execute a revocable slip assignment license. If no payment is made end/or the revocable slip license is not returned within the thirty (30) days, then the slip assignment shall be forfeited and offered to the next eligible vessel on the lottery waiting list.

(5) Notwithstanding any other provision herein, the Harbormaster may remove any vessel from eligibility for a revocable slip license if the available slip spaces are insufficient to safely accommodate the size of the vessel.

D. Commercial Use/Commercial Fishing Vessels

(1) Commercial Use/Fishing Vessels slips are located ~~divided into two categories, 'A' and 'B'. Six (6) slips~~ on the floating dock ~~will be designated for each category~~ for vessels less than forty feet (40'). Commercial fishing vessels forty feet (40') and greater and transient fishing vessels will ~~Moor~~ tie-up at the end of the fixed pier and will not participate in the lottery. There is no guarantee of space on the fixed pier for commercial fishing vessels forty (40') and greater or transient fishing vessels. Accommodation of space for these vessels will be made upon the determination of availability by the Harbormaster.

~~(2) Category "A"~~

(a) ~~Six (6) Available spaces:~~ Initial Commercial Use/Fishing vessels slip space is drawn at lottery. Once awarded, the revocable slip license will be renewable each year without participation in the lottery as long as the slip holder remains current with payments and is in compliance with all applicable rules, regulations and by-laws or unless otherwise cancelled by the Town of Nantucket or the license holder. When a category 'A' slip becomes available, its initial assignment shall be by lottery pursuant to paragraph 278.4.8.

(b) Eligibility: Any person wishing to apply for a ~~Category 'A' Commercial~~ Commercial Use/Fishing vessel ~~Use~~ slip and entry into the Commercial Use/Fishing vessel slip lottery must provide sufficient information which proves beyond a reasonable doubt that the applicant spends a major portion of their annual work time in water-based commercial industry and that greater than 60% of their annual income is derived from the commercial business. Proof of eligibility may include, but not necessarily be limited to:

[1] Coast Guard Licenses and Inspection

[2] Federal Tax Identification number and tax returns

[3] State and Federal Commercial Fishing Licenses

[4] Vessel size and equipment

[5] Catch reports or fish sale reports

[6] Other information that the Harbor Master may require

~~(3) Category B~~

~~(a) Six (6) Available spaces: Category 'B' Vessel is drawn in the lottery annually pursuant to the procedures in paragraph 250.4.3.3 and 250.4.3.4. The revocable license is for one year.~~

~~(b) Eligibility: Any person wishing to apply for a Commercial Use/Fishing Vessel slip must provide sufficient information which proves beyond a reasonable doubt that the applicant spends a major portion of their annual work time in water-based commercial industry and that greater than sixty percent (60%) of their annual income is derived from the commercial business. Proof of eligibility may include, but not necessarily be limited to:~~

- ~~Coast Guard Licenses and Inspection~~
- ~~Federal Tax Identification number and tax returns~~
- ~~State and Federal Commercial Fishing Licenses~~
- ~~Vessel size and equipment~~
- ~~Catch reports or fish sale reports~~
- ~~Other information that the Harbor Master may require~~

~~(4) Eligibility for a handicap accessible slip requires the applicant be eligible for a State issued handicap parking sticker.~~

NOTE- Moved to Section §278-6 E

(4) The Town may assess a commercial use user fee for vessels utilizing the Town Pier, Children's Beach ramp and Barrett Pier in Madaket as a primary loading and off-loading point for customers and/or wares. The Town will require that any Commercial users subject to this fee be required to obtain an insurance liability policy naming the Town as an additional insured.

E. Handicap Accessible Slips

(1) Two (2) slips on the floating pier shall be made available for handicapped persons. Initial handicap slip space is drawn at lottery. Once awarded, the revocable slip license will be renewable each year without participation in the lottery as long as the slip holder remains current with payments and is in compliance with all applicable rules, regulations and by-laws or unless otherwise cancelled by the Town of Nantucket or the license holder. When a handicap slip becomes available, its initial assignment shall be by lottery pursuant to Section §278-6 H.

(2) For eligibility for a handicap accessible slip requires the applicant be eligible for a State issued handicap parking sticker.

F. Slip Assignment Wait list

(1) For Recreational vessels, a wait list of twenty (20) will be drawn at the annual lottery. For ~~Category B~~ Commercial Use/Fishing vessels, a waitlist of three (3) will be drawn at the

annual slip lottery. For Handicap slips, a waitlist of one (1) will be drawn at the annual slip lottery.

G. Floats and Rafts

(1) No Raft or Float shall be moored in Nantucket Waterways unless the location of said Float or Raft has been approved by the Harbormaster and a Mooring Permit issued by the Town.

(2) Any vessel which is tied to a Raft or Float as a moored vessel shall have a Mooring Permit for each individual vessel so tied.

(3) The Harbormaster shall make the determination of the maximum allowable vessels which may be tied to a Raft or Float. The Harbormaster may fine either the vessels so tied and/or the Raft or Float owner in violation if the number of vessels so approved is exceeded.

H. Slip Lottery

(1) The annual lottery will be held in October of each year. The date of the lottery shall be advertised for at least two (2) weeks prior to the lottery date.

(2) Only a single entry into the lottery for a vessel shall be allowed. Requirements for entry into the slip lottery are:

(3) vessel is thirty (30) feet in length or less;

(4) vessel is mechanically powered, and;

(5) vessel has an active Massachusetts vessel registration or is federally documented with Nantucket as the hailing port.

(6) Vessel registration number shall be entered into the lottery based upon information provided to the Town on the slip lottery assignment application form. Slip applications shall contain such information that the Town may require and be accepted up to forty-eight (48) (24) hours prior to the lottery provided that the new slip lottery application fee has been paid.

(7) The lottery shall be conducted by placing the vessel number, (or other corresponding unique number) into a bin where they will be randomly drawn by the Harbormaster or their designee. The number drawn shall be publicly announced with the corresponding vessel and owners name. Such information shall be recorded by the Harbormaster at the time of the lottery. Separate lottery draws shall be done for assignment of each class of slip license, (A&B Recreational, Commercial and Handicap).

(8) Any current Category 'A' Recreational revocable slip license that is valid through September 30, 2022 shall remain valid through the 2022 season after which the slip will be placed into the 2022 October slip lottery for reassignment. This paragraph shall automatically be deleted on November 1, 2022.

(9) Any current Category 'B' Commercial Use/Fishing Vessel revocable slip license that is valid through September 30, 2022 shall remain valid through the 2022 season after which the slip will be placed into the 2022 October slip lottery for reassignment. This paragraph shall automatically be deleted on November 1, 2022.

§ 278-7. Fees

A. Mooring Fees. Fees for mooring permit applications, mooring permits, mooring permit wait list, rafts or floats shall be set from time to time by the Select Board.

B. Fees for Town pier slips and slip applications shall be set from time to time by the Select Board.

(1) The minimum slip per-foot charge per season is 22 feet.

C. Payment for all mooring fees, commercial and category "A" recreational slips shall be received by January 1. If payment is not received by this date, the Town shall:

(1) Assess a late fee;

(2) Send notice of non-payment by first class mail to the address that the permit holder currently has on file or by email advising them that their slip will be forfeited if payment is not received by February 1.

(3) If payment is not received by February 15, the Town shall send notice by certified mail and email advising the slip holder that their mooring permit or revocable Town Pier Slip License has been revoked.

(4) If the mooring permit or slip license holder responds to the certified mail or email notice by March 15, the mooring permit or revocable slip license shall be re-issued for a reissuance fee and also upon payment of the annual applicable fees.

(5) If no response is received, or full payment of late fees and all Permit fees is not made by April 1, the Permit is forfeited and the mooring or slip location will be offered to the next person on the waiting list.

(6) Refunds will not be provided.

D. Fees for other items, including the following, shall be set from time to time by the Select Board:

(1) Commercial use vessel fee for Town ramps and piers.

(2) Nonresident commercial off-load.

(3) Transient rates.

(4) Commercial fishing transients.

~~278.5 Fees~~

~~278.5.1 Mooring Fees~~

~~278.5.1.1 Mooring Permit Renewal Fees per Season:~~

~~Length of Boat~~	~~Annual Fee~~
~~up to 16'~~	~~$80.00~~

~~17' to 23'~~	~~$100.00~~
~~24' to 32'~~	~~$200.00~~
~~33' to 49'~~	~~$300.00~~
~~Over 50'~~	~~$500.00~~
~~Commercial Fishing~~	~~$80.00~~
~~Livery/Rental~~	~~$200.00~~
~~Boat Handler/Repair~~	~~$175.00~~

~~278.5.1.2 Fees for Rafts or Floats shall be based upon the table in 278.5.1.1~~

~~278.5.1.3 Mooring Permit Application Fee: $25.00 payable at the time of Mooring Permit application.~~

~~278.5.1.4 Mooring Permit Wait List Fee: $10.00 annually by those applicants wishing to remain on the official waiting list.~~

~~278.5.2 Town Pier Slip- Recreational and Handicap vessel slips~~

~~278.5.2.1 Category 'A' $100.00 per foot per season.~~

~~278.5.2.2 Category 'B' $80.00 per foot per season.~~

~~278.5.2.3 Minimum per foot charge per season is twenty-two (22) feet.~~

~~278.5.2.4 Payment for Recreational 'A' Slips shall be received paid in full by January 1 of each year.~~

~~278.5.2.5 Payment for Recreational 'B' slips shall be received within thirty (30) days following the date of the lottery. If payment is not received by this date, the applicant will forfeit his slip and the next person on the waiting list will be chosen.~~

~~278.5.3 Town Pier Slip- Commercial Use:~~

~~278.5.3.1 Category A: $150.00 per foot per season.~~

~~278.5.3.2 Commercial Use Category B: $125.00 per foot per season.~~

~~278.5.3.3 50% of payment for Commercial 'A' and 'B' slips shall be received by June 1; the remaining 50% payment is due by July 1.~~

~~278.5.3.4 Refunds will not be provided.~~

~~278.5.4 Other Fees:~~

~~Commercial use vessel fee for Town ramps and piers: $100.00 per year.~~

~~Non-Resident Commercial Off-Load Fee: $100.00 per year.~~

~~Transient Rate: $15.00 per hour or $75.00 per day.~~

~~Commercial fishing transient 50' or less: .75¢ cents per foot per night.~~

~~Commercial fishing transient 51' or greater: $1.50 per foot per night, to be capped at $100 per foot annually.~~

~~Slip Lottery Application Fee: $25.00~~

§ 278-8. Enforcement

A. Enforcement. The Harbor Master, Assistant Harbor Masters, Mooring Enforcement Officers and any Police Officer are authorized to enforce these regulations.

B. Non-Criminal Violation Citation. Officers authorized to enforce these Regulations may use the Standard Town Non-Criminal Violation Notice for violations.

C. Penalties. Whoever violates any of the provisions of the Regulations shall be punished by a fine amount of one hundred dollars ($100.00) each day of continual violation constituting a separate offense.

§ 278-9. Severability

The provisions of these Regulations are hereby declared to be severable; and if any provision of the Rules and Regulations is invalid, such invalidity shall not affect or impair any other provision hereof.

From: Gibson, Charles
To: Erika Mooney
Subject: CH278 schedules of fees
Date: Saturday, August 14, 2021 9:16:11 AM
Attachments: 2021 08 14 CH 278 Schedule of Fees.pdf

The schedule of fees for the Harbor regs is attached. There have been no fee increases with the exception of:

Addition of:

- $25.00 dinghy fee
- $25.00 Mooring and slip late payment fee
- $100.00 Mooring and slip reinstatement fee

Thanks

Charles Gibson
Deputy Chief of Police
Nantucket Police Department
4 Fairgrounds Road
Nantucket, MA 02554-2804
(508) 228-1212

SCHEDULE OF FEES
Chapter 278
HARBORS AND WATERWAYS

A. Mooring Fees:

a. §278-7 A. Mooring permits for vessels, rafts and floats shall be based upon the below table:

Length of Boat	Annual Fee
up to 16’	$80.00
17’ to 23’	$100.00
24’ to 32’	$200.00
33’ to 49’	$300.00
Over 50’	$500.00
Commercial Use/Fishing	$80.00
Livery/Rental	$200.00
Boat Handler/Repair	$175.00

b. §278-7 A. Mooring Permit Application Fee: $25.00
c. §278-7 A. Mooring Permit Wait List Fee: $10.00 annually to remain on list
d. §278-5 B (10)(a)[4]. Mooring Permit Payment Late Fee: $25.00
e. §278-5 B (10)(a)[5]. Mooring Permit Reinstatement Fee: $100.00

B. Town Pier Slip Fees (per foot/season rates unless otherwise noted):

a. §278-7 B. Recreational “A”- slips $100.00.
b. §278-7 B. Handicap slips- $100.00.
c. §278-7 B. Recreational “B” slips: $80.00.
d. §278-7 B. Commercial Use/Commercial fishing slip: $150.00.
e. §278-6 D (4). Commercial Off-Load Fee: $100.00.
f. §278-7 B. Transient Rate: $15.00 per hour or $75.00 per day.
g. §278-7 B. Commercial fishing transient 50’ or less: .75¢ cents per foot per night.
h. §278-7 B. Commercial fishing transient 51’ or greater: $1.50 per foot per night, to be capped at $100 per foot annually.
i. §278-6 H (6). Slip Lottery Application Fee: $25.00
j. §278-7 C (1). Slip License Payment Late Fee: $25.00
k. §278-7 C (4). Slip License Reinstatement Fee: $100.00

C. Dinghy Permits:

a. §278-5 C (2) Dinghy Permit: $25.00

D. Town Pier Parking Permits:

a. Reserved Town Pier Parking Permit for slip holders: FREE

the other food service establishments, the license only would be approved, not the location. Ms. Lewis said that they attempted to seek approval from the other food service establishments, but they have been unable to secure approvals in writing. Ms. Murphy said she would be agreeable to approving the license, but the location is a concern without the approvals of the other establishments. Ms. Ferrantella concurred with Ms. Murphy. Chair Bridges agreed. There being no further public comment, Chair Bridges closed the hearing. Ms. Murphy moved approval of the license without the location, pending final inspections by required departments; seconded by Ms. Ferrantella. So voted by roll call vote: Chair Bridges – Yes; Ms. Ferrantella – Yes; Ms. Holdgate – Yes; Ms. Murphy – Yes.

3. Public Hearing to Consider Amending Chapter 250, Harbors and Town Pier Regulations (to be Known as Chapter 278, Harbors and Waterways) (Continued from July 14, 2021). Chair Bridges reopened the public hearing and noted the hearing is proposed to be continued. Ms. Holdgate moved to continue the hearing to October 6, 2021; seconded by Ms. Murphy. So voted by roll call vote: Chair Bridges – Yes; Mr. Fee – Yes; Ms. Ferrantella – Yes; Ms. Holdgate – Yes; Ms. Murphy – Yes.

4. Public Hearing to Consider Utility Petition from National Grid/Nantucket Electric Company for Plan #303054181 to Install Underground Conduit and Service Cables from Existing Hand Hole 10-1 at Base of P10 under Fairgrounds Road Bike Path for New Service at 34 Fairgrounds Road. Chair Bridges opened the hearing. Fabio Santos of National Grid explained the petition. Some discussion followed as to the exact location. There being no public comment, Chair Bridges closed the hearing. Mr. Fee moved approval of the petition as presented and recommended by the Town departments; seconded by Ms. Murphy. So voted by roll call vote: Chair Bridges – Yes; Mr. Fee – Yes; Ms. Ferrantella – Yes; Ms. Holdgate – Yes; Ms. Murphy – Yes.

5. Public Hearing to Consider Utility Petition from National Grid/Nantucket Electric Company for Plan #30325133 to Install Hand Hole and 2-3" Concrete Encased Conduits Across Vestal Street from Existing Hand Hole 9 at Base of P9 to New Hand Hole 9-1 near 21 and 23 Vestal Street. Chair Bridges opened the hearing. Mr. Santos explained the petition. There being no public comment, Chair Bridges closed the hearing. Ms. Murphy moved approval of the petition as presented and recommended by the Town departments; seconded by Ms. Ferrantella. So voted by roll call vote: Chair Bridges – Yes; Mr. Fee – Yes; Ms. Ferrantella – Yes; Ms. Holdgate – Yes; Ms. Murphy – Yes.

6. Public Hearing to Consider Utility Petition from National Grid/Nantucket Electric Company for Plan #30389981 to Install 2-3" Concrete Encased Conduit Across Tom Nevers Road from Riser P44 and Install New Hand Hole in Front of 85 Tom Nevers Road. Chair Bridges opened the hearing. Mr. Santos explained the petition. There being no public comment, Chair Bridges closed the hearing. Ms. Ferrantella moved approval of the petition as presented and recommended by the Town departments; seconded by Mr. Fee. So voted by roll call vote: Chair Bridges – Yes; Mr. Fee – Yes; Ms. Ferrantella – Yes; Ms. Holdgate – Yes; Ms. Murphy – Yes.

7. Public Hearing to Consider Joint Utility Petition from Verizon New England, Inc and National Grid/Nantucket Electric Company for Plan #MA2021-06 to Install Approximately 186' of 2-4" Conduit from Joint-owned Pole 546/54 on Orange Street, Across Milestone Road to Joint-owned Pole 175/1 on Old South Road to Move Aerial Cables Underground. Chair Bridges opened the hearing. Tom Stanton of Verizon explained the petition, noting the reason is that due to the volume of house moves these cables are proposed to be placed underground, and the road may not have to be disturbed due to possible existing conduit under the road. Mr. Fee expressed support for placing cables underground. Mr. Stanton asked if

citizens are very sensitive to this sort of equipment and that to the extent that it can be moved away from housing, would be preferable. Mr. Weaver said as a condition of approval, specific details as to proximity to nearby houses could be provided. Mr. Atherton asked if the Town has an overall sense of where existing equipment is and if there is competition among the carriers as to where additional equipment is to be placed. Mr. Weaver said that more than one carrier cannot have equipment on the same pole. He said that regarding the allocation of space, that is through the pole owner, which is not the Town, but the utility and that each utility has its own allocation program. Ms. Ferrantella asked if the Town could charge rent for these installations on poles. Mr. Weaver said no because the Town does not own the poles. Ms. Murphy suggested that the Town look into how to track these installations. Ms. Murphy moved approval contingent upon the provision of additional information for the Dave's Street and Easton Street installations; seconded by Ms. Ferrantella. So voted by roll call vote: Chair Bridges – Yes; Mr. Fee – Yes; Ms. Ferrantella – Yes; Ms. Holdgate – Yes; Ms. Murphy – Yes.

X. PUBLIC HEARINGS

1. Public Hearing to Consider Amending Chapter 250, Harbors and Town Pier Regulations (to be Known as Chapter 278, Harbors and Waterways). Chair Bridges opened the public hearing. Ms. Gibson noted that the Board previously reviewed the proposed amendments at its meeting on June 2nd and said that no public comment has come in regarding them, other than a late concern received today from the Land Bank. She noted a summary of the amendments is in the Board's packet. Some discussion followed. Deputy Chief Charles Gibson spoke on the Land Bank concern and said the amendments could proceed as is and if the Land Bank wishes to control or not control the watercraft at its property, that is up to the Land Bank. Tom Szydlowski of the Harbor and Shellfish Advisory Board (HSAB) spoke in favor of the amendments. Elaine Russell spoke on concerns regarding the change in the Town Pier slip lottery. Deputy Chief Gibson provided some background on the initiation of the lottery system in the first place, which was a state procurement requirement. He said that the law has changed and no longer requires this. He said over the years, towns with piers have eliminated the lottery system and that Nantucket may be the only town still using it. He noted that the lottery system exacerbates the use of unnecessary moorings because of the uncertainty of whether or not someone will obtain a pier slip through the lottery. Mr. Fee asked about the mooring permit wait list. Harbor Master Sheila Lucey said it is about a five-year wait. Mr. Szydlowski asked about when the lottery is proposed to end; and, said that HSAB would like to see some part of the lottery continue. Ms. Lucey said that input was considered, and the staff recommendation was to proceed as recommended. Deputy Chief Gibson spoke about the mechanics of the lottery or a partial lottery. He said the intent is to streamline the process and free up moorings. Ms. Murphy said she would like to see the first year begin with a new lottery. Mr. Fee said he is concerned that there will be no turnover of slips with this proposal. He went on to comment about this issue being a consequence of growth on the island. Ms. Holdgate said she sees the benefit of freeing up moorings but also supports a smaller lottery. She suggested tying the lottery to a specific boat registration. Discussion followed as to which system to proceed with. Brooke Mohr suggested that if someone gets a slip, they should be required to give up their mooring. Ms. Lucey said that is part of the recommended amendment. Mr. Barada asked how the system works now. He then suggested a term limit of the pier slips and a "partial" lottery. Deputy Chief Gibson suggested continuing the hearing for one month to address some of the concerns raised.

Ms. Holdgate moved to continue the hearing to August 18, 2021; seconded by Ms. Murphy. So voted by roll call vote: Chair Bridges – Yes; Mr. Fee – Yes; Ms. Ferrantella – Yes; Ms. Holdgate – Yes; Ms. Murphy – Yes.

Natural Resources Director Jeff Carlson reviewed the department's summer programs including endangered species monitoring, water quality monitoring, shellfish enforcement, and resiliency monitoring. Mr. Fee asked about recent shellfish closures in the harbor and what measures could be taken to address these. Mr. Carlson explained a particular closure in Nantucket Harbor which relates to newly increased regulation by the federal government. He said a new rule was applied nationally and many areas are affected in Massachusetts and other states. He said NRD is working with the Harbor Master office to address the additional information that could be used to petition a reopening. Mr. Fee asked about "better enforcement". Discussion followed as to what actions have been and are being taken by the Town to address harbor water quality. Harbor Master Sheila Lucey spoke on the Town's boat sewage pump-out program which includes patrols and pump-outs. She spoke further on the shellfish closure and the new specific requirements, some of which are not going to be met by Nantucket because of unmeetable standards. Mr. Rick Atherton commented that he does not feel confident that a condition has been met that "regenerates" harbor water quality. He said he feels Town Administration should be recommending a significant reduction in the number of moorings in the harbor which would improve water quality. Ms. Gibson said that type of review and/or recommendation is typically undertaken by the Harbor and Shellfish Advisory Board.

Police Chief William Pittman reviewed the police summer beach program including All Terrain Vehicle (ATV) patrols, and beach sticker sales. He said there will be increased focus this year on loose dog enforcement. Mr. Fee said he's glad to hear of this increased attention to loose dogs.

Ms. Lucey reviewed the Marine Division programs, including lifeguards and timing of beach openings, shark sighting protocol; as well as beach clean-ups, signage and ramp installations as needed.

Licensing Administrator Amy Baxter reviewed the types of events permitted at various beaches and the associated permit conditions.

Public Works Director Robert McNeil reviewed the various DPW activities relating to beaches, including trash pick-up, porta-potty management, concession facility issues and grading of roads and parking areas as needed.

Ms. Schulte reviewed the activities and programs being offered this summer at Children's Beach.

Fire Chief Stephen Murphy spoke as to the Fire Department's beach patrols for illegal beach fires. He spoke on what is and is not allowed with respect to fires on the beach.

3. Review Proposed Amendments to Harbors and Waterways/Town Pier Regulations; Possible Scheduling of Public Hearing. Ms. Gibson introduced the agenda item, explaining that the proposed amendments were developed in response to concerns of waterfront property owners in certain areas where mooring fields are located as to the number, condition and organization of dinghies and other floatable vessels. She added that additional proposed amendments arose as a result of further review of the regulations, referring to a summary in the Board's packet. Ms. Lucey reviewed the other proposed amendments, including changes as to how Town Pier slips are secured using a methodology other than the traditional lottery; increased restriction as to liveaboards not being able to rent vessels as "Air BnB" rentals. Chair Holdgate said she supports moving ahead with a public hearing but asked a question about mooring permit and associated registration of vessels. Ms. Lucey responded. Some discussion followed as to how the lottery change would be implemented. Ms. Lucey responded. Mr. Fee asked about "transfer" of slips. Ms. Lucey said transfers

would require approval of the Harbor Master. Mr. Fee asked about prohibiting the rental of vessels as Air BnB's entirely. Ms. Lucey said that an outright prohibition as she understands it, is illegal. Ms. Ferrantella asked about whether this is an issue in other places. Ms. Lucey responded and said it is becoming a known problem in waterfront communities. The Board agreed to proceed to schedule a public hearing for these proposed amendments.

4. Monthly Town Management Activity Report. Ms. Gibson reviewed the report contained within the Board's agenda packet.

X. SELECT BOARD'S REPORTS/COMMENT

1. Discussion Regarding Options of Imposing a Community Impact Fee on Short-Term Rentals. Chair Holdgate stated this item was placed on the agenda simply as a discussion and to educate the Board as to what other towns are doing with this fairly newly authorized fee. Mr. Bridges said it will be helpful to learn more about this before Town Meeting. Town Counsel John Giorgio explained how the fee works, how it is adopted and what the limitations are, referring to a memo in the Board's packet. Mr. Turbitt reviewed some projections as to potential revenue that could be generated from an imposition of the fee. Discussion followed as to the fee, other ways to get short-term rentals licensed as businesses, what the potential revenue could be used for and what other cities and towns do. Ms. Murphy spoke in support of housing regulations, unrelated to short-term rentals specifically, but which would cover them. Discussion continued. Mr. Henry Sanford spoke on a survey the Nantucket Association of Real Estate Brokers is conducting with respect to short-term rentals and duration of stays. Ms. Hillary Rayport spoke in support of this additional fee on short-term rentals.

2. Committee Reports.

Ms. Murphy asked if there is a report as to citizen complaints regarding the use of Essex Road as a detour for the Surfside sewer project, as expressed under Public Comment last week. Ms. Gibson said she did not have one but would get one for next week's Board meeting. Ms. Murphy commented that Saturday town meetings are disenfranchising too many people in the community. Some discussion followed.

XI. ADJOURNMENT

Ms. Murphy moved to adjourn at 8:48 PM; seconded by Mr. Fee. So voted by roll call vote. Chair Holdgate – Yes; Mr. Bridges – Yes; Mr. Fee – Yes; Ms. Ferrantella – Yes; Ms. Murphy – Yes.

Approved the 9th day of June 2021.

From:	Elainebrussell
To:	Erika Mooney
Subject:	Town pier regulations public hearing, October 6, 2021
Date:	Monday, October 4, 2021 6:38:11 AM

Dear Ms. Mooney,

I will be unable to attend the public hearing this Wednesday in regards to the proposed changes to the Town Pier Slip Lottery. Would it be possible for you to read the following statement to the Select Board during the meeting or do I need to email it to each Select Board member? I am not sure of the proper procedure.

Thank you
Elaine Russell

"Dear Select Board,

I agree with the changes in making the lottery the way it used to be by boat registration, but I do not agree with making half the of the slips permanent.

At the public hearing in July, it was stated the reason for making the slips permanent was to free up moorings and because the lottery was out of control since a person could put their name in multiple times. I believe that by making the change back to submission by boat registration will solve this part of the problem.

Also, in the new regulations, there is no provision stating that a person will have to give up their mooring in return for a permanent slip, so I don't see how making slips permanent will free up moorings. Also, I believe many people rightfully should not have to give up their mooring in return for a permanent slip, because they have more than one boat for family use, or they intend to transfer their mooring to a family member.

I would like to see the lottery remain as is, with one and two year slips, with submission by boat registration.

Thank you for your consideration.

Respectfully,
Elaine Russell "

OUTDOOR DINING UPDATE

Outdoor Dining/Street and Sidewalk Closures

Report to the Select Board, October 6, 2021

Town & County of NANTUCKET, MA

OUTDOOR DINING

CURRENT STATUS

- STATE LEGISLATURE: (Section 19 of the Acts of 2021): Extends until April 1, 2022 the ability of cities and towns to approve requests for expansion of outdoor dining and alcohol service without further ABCC review or approval. The Act also authorizes a local licensing authority to extend or modify the scope of an earlier approval issued under the now-rescinded Governor's Executive Orders to address potential issues with snow removal, pedestrian traffic or similar concerns.

- NANTUCKET SELECT BOARD: Outdoor Dining Permits are valid until December 31, 2021 or as further amended by the Select Board. All 2020-21 approvals are on a single-season, non-precedent setting basis.

Town & County of NANTUCKET, MA

OUTDOOR DINING

CATEGORIES

OUTDOOR DINING CATEGORIES:

- PRIVATE PROPERTY: (this includes parking lots, lawns, patios and privately owned spaces to include downtown locations such as Straight Wharf and South Wharf)
- PUBLIC PROPERTY: Sidewalks
- PUBLIC PROPERTY: Parking Spaces (No street closure required)
- PUBLIC PROPERTY: Street Dining (Street closure required)

Town & County of NANTUCKET, MA

OUTDOOR DINING

PRIVATE PROPERTY SPACES

- All establishments wishing to keep their extended outdoor spaces must apply as they would for any addition of an outdoor service area.
- First review would be by Planning/Zoning to determine any adjustments needed for special permits, to include parking requirements.
- Once approved by PLUS, the establishment would begin the Alteration of Premises process through Licensing, Select Board and ultimately ABCC.
- All outdoor spaces serving alcohol must also comply with the ABCC Patio guidelines.
- Modification of Entertainment Licenses will be administered at the same time as Alt of Premises if required.

Town & County of NANTUCKET, MA

OUTDOOR DINING

PUBLIC PROPERTY: SIDEWALKS

- Requires Select Board Direction/Approval for Location standards to include:
  - Approval to add seasonal sidewalk permit standards and application process for Common Victualler Licensees.
  - Grant authority to carry Liquor across sidewalk to create a contiguous space.
  - Approve Fees for sidewalk permit based on sq. ft and/or #seats.
  - Approve any restricted locations as recommended by staff/public safety as needed.

- Requires the following from Town Departments:
  - Sidewalk Restaurant Patio License, Maintenance and Indemnification Agreement to include:

    Permitted structures, barriers, furniture, etc. in coordination with HDC, building, public safety, ADA, etc.

    Licensed Area specifications.

    Pedestrian access requirements.

    HDC/Signage/lighting type requirements.

Town & County of NANTUCKET, MA

OUTDOOR DINING

PUBLIC PROPERTY: PARKING SPACES

- Requires Select Board Direction/Approval for Location standards to include:
  - Approval to add seasonal parking space permit standards and application process for Common Victualler Licensees.
  - Grant authority to carry Liquor across sidewalk to create a contiguous space.
  - Approve Fees for sidewalk permit based on sq. ft and/or #seats.
  - Approve any restricted locations as recommended by staff/public safety as needed.

- Requires the following from Town Departments:
  - Sidewalk Restaurant Patio License, Maintenance and Indemnification Agreement to include:

    Permitted structures, barriers, furniture, etc. in coordination with HDC, building, public safety, ADA, etc.

    Licensed Area specifications.

    Pedestrian access requirements.

    HDC/Signage/lighting type requirements.

Town & County of NANTUCKET, MA

OUTDOOR DINING

PUBLIC PROPERTY: STREET DINING

- Requires Select Board Direction as follows:
  - Assignment of any external review committees or Task Force type of meetings in addition to current internal work group and business review. Currently scheduled with restaurants, retail, Visitor Services and Chamber.
  - Give direction to staff to present recommended location standards and application process now or determine wider review to include:
    1. Do we need to consider how to replace lost parking spaces with additional valet or perimeter parking?
    2. Should this type of street closure be allowed for special events only or longer periods during the summer/fall seasons?
    3. How can we expand this program to include more businesses (Temporary type events?)
    4. Should the conversation include adding pedestrian spaces in general downtown?

2021 OUTDOOR DINING: Private Property

2021 OUTDOOR SEATING EXPANSION PRIVATE PROPERTY *All establishments below have property owner approval for expansion to outdoor space as noted below and in attached layouts.				
LIC#	**DBA**	**LICENSED OUTDOOR SPACE**	**CHANGES FROM 2020?**	**APPLICATION: ALTERATION OF PREMISES ADDITION OF OUTDOOR DINING AREA**
#03217-RS-0762	Charlie Noble 15 South Water Street	No	No	14 tables on back patio/private parking area along Easy Street
#00011-RS-0762	Chicken Box 12-16 Daves Street	No	No	12 tables in adjacent parking area with food trailer and food permit
#00201-RS-0762	CRU 49 Straight Wharf	Patio	No	3 tables roped off adjacent to existent patio space and 12 on dock alongside building
#00082-RS-0762	Faregrounds 27 Fairgrounds Road	Deck	No	12 tables in parking area in front of building along Fairgrounds Rd.
#00120-RS-0762	Fifty-Six Union 56 Union Street	Patio	No	6 tables in lawn area adjacent to patio
#00171-RS-0762	Island Kitchen One Chins way	Deck/patio	No	Total 66 additional seats in parking area
#00154-RS-0762	Kitty Murtagh's Four West Creek Road	No	No	10 tables in lawn area adjacent to building and parking lot
#00175-RS-0762	Lola 41 15 South Beach Street	Patio	No	10 tables in adjacent parking lot
#00053-RS-0762	Muse 44 Surfside Road	No	No	10 tables in front parking area along Surfside Rd

2021 OUTDOOR DINING: Private Property

LIC#	DBA	LICENSED OUTDOOR SPACE	CHANGES FROM 2020?	APPLICATION: ALTERATION OF PREMISES ADDITION OF OUTDOOR DINING AREA
#04653-RS-0762	Or, The Whale 38 Main Street	Patio	No	3 tables in adjacent alley/easement Sidewalk Tables to be reviewed seperately with Public Property locations.
#00208-RS-0762	Proprietors 9 India Street	No	Additional Tables added on neighboring private property	3 tables on patio of adjacent property - Roberts House Inn 4 tables in adjacent courtyard 8 tables alongside and between Proprietors building and Craftmasters
#04096-RS-0762	Saltbox Tavern & Table 16 Macys Lane	Patio	No	5 tables on front lawn along Old South Road
#00091-RS-0762	Sea Grille 45 Sparks Ave	No	No	5 tables on front lawn along Sparks Ave.
#00138-RS-0762	Slip 14 14 Old South Wharf	Patio	Additional tables added along wharf.	10 tables alongside and in front of building along Old South Wharf
#00021-RS-0762	Straight Wharf Restaurant	Decks	No	12 additional tables adjacent to building and along dock area
#00049-RS-0762	Tavern 4 Harbor Square	Patio and Gazebo	No	2 additional tables adjacent to patio
#04909-RS-0762	The Beet 9 South Water Street	No	No	6 tables alongside building on private easement betweeen Easy and South Water
#00039-CL-0762	VFW 22 Bunker Road	No	Yes. Area moved to opposite side of building.	14 tables in adjacent parking area

2021 OUTDOOR DINING: Public Streets/Sidewalks

2021 OUTDOOR SEATING EXPANSION PUBLIC STREETS AND SIDEWALKS						
LIC#	DBA	EXISTING LICENSED OUTDOOR SPACE	STREET SPACE	SIDEWALK SPACE	CHANGES FROM 2020?	APPLICATION: ALTERATION OF PREMISES ADDITION OF OUTDOOR DINING AREA
#00166-RS-0762	Boarding House Federal Street	YES Patio and Deck	YES	NO	NO	Dining Area located in 3-4 One hour parking spaces directly in front of premises on Federal Street.
#00031-RS-0762	Club Car Main Street	NO	YES	YES	NO	Full Street Closure of Still Dock between Easy and S. Water. Written approval of private parking space owner and adjacent businesses required. Additional 4 tables fronting building on Main Street.
#00020-RS-0762	Ventuno Oak Street	YES Patio	YES	NO	NO	Full Street Closure of Oak between S. Water and Federal. Clear pathway for Atheneum back exit required. West half of Street only. East side used by Quequegs/Town. Spaces must be seperated from each other and public sidewalk to remain open to pedestrians.
#00173-RS-0762	Quequegs/Town Oak Street	YES Patio	YES	NO	NO	Full Street Closure of Oak between S. Water and Federal. East half of Street only. West side used by Quequegs/Town. Spaces must be seperated from each other and public sidewalk to remain open to pedestrians.
#04769-RS-0762	The Gaslight North Union Street	YES Patio	YES	NO	YES Addition of Decking over cobblestones.	Full Street Closure of N. Union between Main and Cambridge. Allow truck access to alley behind Murray's. Decking to be added to cover cobblestones directly in front of restaurant only.
#00211-RS-0762	Nautilus Cambridge Street	NO	YES	NO	YES Reduction of Space.	**Option 1**: Partial Closure of cambridge with Dining Ares in street in front of restaurant only. Parking spaces removed for traffic flow on opposite side of street. **Option 2**: Full Street of Cambridge between S. Water and Easy. Seating area must be located in front of Nautilus and PPX only.
#00005-RS-0762	Le Languedoc Broad Street	YES Patio	NO	YES	NO	Dining Tables alongside parking spaces on Broad - in front of restaurant only.
#0-RS-0762	Dune Broad Street	YES Patio	NO	YES	NO	Dining Tables alongside parking spaces on Broad - in front of restaurant only.
#03273-RS-0762	Afterhouse Broad Street	NO	NO	YES	NO	Dining Tables alongside parking spaces on Broad - in front of restaurant only.

2021 OUTDOOR DINING: Public Streets/Sidewalks

2021 OUTDOOR SEATING EXPANSION PUBLIC STREETS AND SIDEWALKS						
LIC#	DBA	EXISTING LICENSED OUTDOOR SPACE	STREET SPACE	SIDEWALK SPACE	CHANGES FROM 2020?	APPLICATION: ALTERATION OF PREMISES ADDITION OF OUTDOOR DINING AREA
#00208-RS-0762	Proprietors 9 India Street	NO	YES	NO	YES Approved street space not used last year.	Partial Street Closure. Parking removed and traffic flow shifted to South side of street. Are in front of Proprietors and along side of Roberts House to be decked for dining tables with agreement from neighboring businesses. Loading Zone to be moved across street along with 2-3 parking spaces.
#04022-RS-0762	Lemon Press Main Street	NO	NO	YES	YES Reduction of Space.	Dining Tables alongside parking spaces on Main - in front of restaurant only. Remainder of sidewalk must be kept clear of tables and host stands. One 'lane' of tables only and no blocking of adjacent businesses.
#00167-RS-0762	Rose & Crown South Water Street	NO	YES	YES	NO	Dining Tables alongside street side of sidewalk with open lane for pedestrians in front of building and in removed spaces alongside tables.
#00210-RS-0762	Backyard-BBQ Lower Main Street	NO	NO	YES	NO	Dining Tables alongside building only. Sidewalk must be kept clear alongside street side for traffic flow to/from boat and taxi stand.