



Corn Neck Road

Transportation Resiliency Planning Study | DECEMBER 2017

Prepared For
Town of New Shoreham
Planning Board



Acknowledgments

The Town of New Shoreham, would like to thank the following individuals who played a significant role in preparing this Plan. They contributed in many ways and attended numerous meetings which helped shape the vision, recommendations, and actions that are included in the study. Thank you!

New Shoreham Planning Board

- ❑ Margaret Comings, Chair
 - ❑ Sven Risom, Vice Chair
 - ❑ Sam Bird
 - ❑ John Spier
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 - ❑ RIDOT for review
 - ❑ Project Funding by CDBG-DR

This Transportation Resiliency Planning Study of Corn Neck Road was prepared for the Town of New Shoreham by:



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Executive Summary

Superstorm Sandy exposes vulnerability of Corn Neck Road

Superstorm Sandy inflicted substantial damage to Block Island along its eastern shore where prevailing winds and sustained wave runup undermined roadway segments and washed away existing dunes, which formerly provided protection to vulnerable infrastructure and improvements. The damage witnessed and inconvenience experienced by island residents underscored what many have known for years—Corn Neck Road is particularly exposed and susceptible to repeated storm damage due to the low elevations and orientation relative to principle wave direction. The temporary elimination of vehicle traffic along this segment of the roadway revealed the community’s vulnerability as normal evacuation routes were cut off, access to provisions and emergency services was restricted.

Coastal storms have had damaging effects on low-lying areas of Block Island. The section of Corn Neck Road from Bridgegate Square north to Scotch Beach is particularly vulnerable to erosion and roadway flooding. This section of roadway forms the only connection between the island’s north end and its commercial center. Portions of the roadway were severely damaged during Superstorm Sandy in 2012, and were reconstructed with emergency funding and engineering design services provided by the Rhode Island Department of Transportation (RIDOT).

The Town of New Shoreham received Community Development Block Grant–Disaster Recovery (CDBG-DR) Hurricane Sandy Resiliency funding through the Department of Housing and Urban Development to undertake a Planning Study to develop, analyze, and recommend transportation alternatives for Corn Neck Road. Threats identified in the Town’s grant application included erosion, storm surge inundation and sea level rise. The grant application stated that the analysis should address the cost of each alternative relative to its effectiveness in reducing risks.

This Transportation Resiliency Planning Study evaluates existing roadway data and hydrographic data including storm surge and sea level rise data, incorporates public input, identifies a range of alternatives, and distills those potential alternatives into four alternatives for further analysis. This Planning Study identifies a range of protection and



mitigation alternatives to maintain access for residents and visitors along Corn Neck Road south of Scotch Beach. Three of the alternatives are “transportation alternatives” aimed at protecting the road from higher stillwater elevations and storm-related flooding. The most feasible alternatives include elevating the roadway, creating a raised bridge structure along portions of the road, and relocating and elevating the roadway.

A fourth alternative is presented as a suite of “non-transportation mitigation measures” that may be implemented individually or grouped together for additional benefits.

This Planning Study provides the Town with information to further evaluate potential actions to improve the resiliency of the Corn Neck Road corridor. Future environmental conditions, available funding, and local priorities will inform the selection process.



Corn Neck Road in the aftermath of Superstorm Sandy in 2012



Reconstructed roadway and dunes along Corn Neck Road



Superstorm Sandy Damage — 2012



1 Introduction

Plan Purpose

Corn Neck Road is approximately 3.78 miles long and runs north-south along the eastern side of Block Island from Old Harbor to the historic North Light. In addition to being the only route to access the northern part of the island, the road is heavily used during the summer months by visitors traveling by car, moped, bicycle, and on foot.

In late October 2012, Superstorm Sandy significantly flooded Bridgegate Square, an 1,800 foot stretch of the south end of Corn Neck Road, and the portion of Corn Neck Road across from Scotch Beach. The road was damaged, flooded, and overwashed with sand and cobble, effectively bisecting the island during the storm.

The purpose of this Planning Study is to identify a range of potential alternatives for post-disaster repairs of Corn Neck Road to better mitigate future impacts from storm surge and sea level rise.

Funding Mechanism for the Plan

Recognizing the importance of pre-disaster planning, the Town of New Shoreham applied for and was awarded federal Superstorm Sandy funds to conduct this planning effort. In October 2016, the Town was awarded CDBG-DR funds to explore alternatives for Corn Neck Road.

With these funds, the Town hired VHB to evaluate available data, engage with the public and develop the Planning Study.

Planning Study Working Group

The following individuals participated as members of the Planning Study Working Group.

- ❑ Margie Comings, New Shoreham Planning Board, Chair
- ❑ Sven Risom, New Shoreham Planning Board, Vice Chair
- ❑ Alison Ring, New Shoreham Town Planner
- ❑ Mike Shea, New Shoreham Highway Supervisor
- ❑ Jennifer Brady, New Shoreham Land Use Administrative Officer
- ❑ Susan Moberg, VHB
- ❑ James Pisano, VHB
- ❑ Carissa Lord, VHB

Deliverables

This Planning Study provides the following:

- ❑ Documents the study process.
- ❑ Identifies a range of transportation and non-transportation alternatives that could be implemented in lieu of “in-kind” post-disaster repairs within the Study Area.
- ❑ Provides an in-depth analysis of four of the alternatives including conceptual design and order of magnitude cost estimate for the transportation alternatives.
- ❑ Evaluates the cost reasonableness of alternatives relative to anticipated benefits.
- ❑ Suggests methods of preserving natural and scenic resources.

- ❑ Suggests methods of protecting citizens and property from risks associated with the identified natural hazards.
- ❑ Provides guidance for the Town to choose a preferred alternative.
- ❑ Identifies funding opportunities to implement the preferred alternative(s).

Definitions

The following terms are important contextual factors for the Planning Study.

Resiliency

The term “resilience” was first used to describe ecosystems. It was invented to define the capacity of the ecosystem to persist in the original state while being subject to disturbances¹.

Rising sea levels and increased storminess are some of the current impacts of climate change. The rate at which these impacts will intensify is the subject of much debate. Based on input from the Town of New Shoreham and some residents of Block Island it is clear that the island’s natural and man-made resources are at risk to damage from rising tides and storm surge. By adapting their ability to cope with the effects of climate change, the Town and residents can improve their climate change resiliency.

1-1 Folke, C., S. R. Carpenter, B. Walker, M. Scheffer, T. Chapin, and J. Rockström. 2010. Resilience thinking: integrating resilience, adaptability and transformability. *Ecology and Society* 15(4): 20. [online] <http://www.ecologyandsociety.org/vol15/iss4/art20/>

Planning for Mitigation

Mitigation actions seek to reduce the magnitude of a hazard before it hits (i.e. widening drainage channels so that water can be drained away before it begins to flood roadways).

Planning for Adaptation

Adaptation actions take into account future projections and seek to reduce the vulnerability of a community to the effects of a hazard (i.e. elevating or relocating a road so that it is out of the flood zone).

Adaptation strategies include:

- ❑ Retreat: relocate a structure out of harms way
- ❑ Abandonment: leave the physical structure but discontinue its use
- ❑ Elevate: move the structure above the projected inundation levels

The alternatives presented herein are adaptation measures to improve the resiliency of Corn Neck Road.

1 Introduction

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2 Existing Conditions

Town Profile

According to the Block Island Hazard Mitigation Plan, “the Town of New Shoreham, also known as Block Island, is located 12 miles off the coast of mainland Rhode Island. The island is approximately 8 miles from the northern sandy tip to the high southern bluff wall, and 3.5 miles at its widest point east to west. The island narrows to less than a 1/10th of a mile at a north-south midpoint, referred to as the “neck” with the Atlantic Ocean to the east, and the Great Salt Pond to the west. Inland, 21 miles of paved roads and 39 miles of dirt roads provide vehicular access to over 1,600 residences.”¹

There are approximately 1,000 year-round residents of Block Island². During the popular summer season, the local population may be upwards of 15,000. Many of these visitors own or rent homes on the island, and others are day trippers. Tourism is the main economic driver for the island with activities concentrated during the summer months. Features such as dramatic coastal bluffs, sand beaches, freshwater ponds, woodland and wetland habitats, meadows, scenic vistas, recreation, dining and night life bring people to all parts of the island.

2-1 Town of New Shoreham, Block Island Hazard Mitigation Plan, 2017. Adopted July 5, 2017

2-2 U.S. Census Bureau, 2011-2015 American Community Survey 5-Year Estimates



Study Area

Study Area and Roadway Description

Considering the history of damage along Corn Neck Road, the New Shoreham Planning Board decided to confine the Study Area to a section of Corn Neck Road from the entrance of Scotch Beach, south to the intersection with Dodge Street, also known as Bridgegate Square. The total length of the area is about 1.16 miles along the eastern shore of the Island.

Corn Neck Road is a two-lane major collector road, owned by the State of Rhode Island and maintained by the Town of New Shoreham, oriented north-south with one lane in either direction. The road is the sole transportation connector between the southern part of the island which includes the commercial district and the more residential northern section. Residents and visitors use this road to access major tourist destinations on the north end of the island such as beaches and North Light, as well as Town services such as the Transfer Station. Corn Neck Road also serves as an evacuation route for occupants of the northern part of the island.

The roadway provides two 10-11 foot travel lanes and shoulders of varying widths with the east side shoulder generally the wider of the two. The roadway side slopes are mostly overgrown vegetation and dunes or rip rap slopes along the east side. Utility poles line the western side of Corn Neck Road. Corn Neck Road provides access to multiple houses, beaches and businesses. The roadway drains overland or directly to Harbor Pond, Trims Pond, Great Salt Pond and the Atlantic Ocean. Additional utility research is outside the scope of this planning study, but will be an important part of future design efforts.

Generally, the roadway elevation is highest in the southern portion of the Study Area and decreases as the roadway continues north from Beach Avenue toward Scotch Beach.



2 Existing Conditions

Bridgegate Square to Beach Avenue

Between Bridgegate Square and Beach Avenue (approximately 1,900 feet) Corn Neck Road is generally 29-30 feet wide and provides two 10-foot travel lanes, a 4-foot shoulder on the west side and a 5-foot shoulder on the east side. This section of Corn Neck Road was re-striped in 2017 following the recommendation of a Road Safety Assessment performed by the Rhode Island Department of Transportation (RIDOT)³.

For approximately 350 feet north from Bridgegate Square to the first bend in the roadway, sidewalks, multiple businesses and patios or decks line both sides of Corn Neck Road. At this roadway bend the sidewalks end and pedestrians walk along the roadway shoulders to points north. As Corn Neck Road continues north from this roadway bend to Beach Avenue (approximately 1,550 feet), dunes and/or rip rap slopes line the east side of the road while open land, utility poles/overhead wires, the Beachhead restaurant, and nine residential homes with driveway access to Corn Neck Road line the west side of the road. The Beachhead Restaurant includes a front patio, parking lot and entrance abutting Corn Neck Road.

Several walking entrances allow pedestrians to access the beach on the east side of the road. This portion of Corn Neck Road was recently rebuilt in 2012 after being damaged during Superstorm Sandy.

Beach Avenue to Town Beach

From Beach Avenue north to the Town Beach (approximately 1,400 feet), Corn Neck Road is approximately 28 feet wide with two 11-foot travel lanes and 3 foot shoulders on both sides. Open space, one

residential property with driveway access, and utility poles with overhead wires line the west side of the road. The open space and vegetated land slopes down towards Trims Pond to the west. Dunes and vegetated areas line the east side of the road until the entrance to the Town Beach which has four separate driveways leading into the parking lot.

Town Beach to Scotch Beach Entrance

Between the Town Beach parking lot north to the northern project limits north of Scotch Beach (approximately 2,700 feet), Corn Neck Road is approximately 26 feet wide with two 11-foot travel lanes and 2 foot shoulders on both sides. Open space and vegetated areas, residential homes with four driveways including the Sullivan House driveway and a walking access point to Great Salt Pond line the west side of road. Dunes and vegetated areas line the east side of the road along with roadside parking with several walkways down to Scotch Beach. Also, just north of the Scotch Beach main entrance, two residential properties with driveway access abut Corn Neck Road.

Pedestrians can access Scotch beach laterally along the shore or through a cut in the dunes along Corn Neck Road. This cross-dune path discourages people from walking over the sensitive dunes. However, it also acts as a funnel when storm surge pushes sand and water onto Corn Neck Road. During Superstorm Sandy, this low-lying area of Corn Neck Road, bordered by the ocean on the east and tidal wetlands associated with Great Salt Pond on the west, was covered in sand. According to future storm surge predictions and sea level rise scenarios⁴, this area will continue to be vulnerable to inundation and erosion.

2-3 Rhode Island Department of Transportation, Block Island/New Shoreham, Rhode Island Road Safety Assessment. December 2016.

2-4 University of Rhode Island, Extra/Tropical Storms. Advanced STORMTOOLS. Accessed May 2017. <http://uri.maps.arcgis.com/home/webmap/viewer.html?webmap=62f9e99490b9431d935134aa752e3134>

Environmental Setting

Block Island was formed by the deposition of sand and gravel material in an end moraine formation that was subsequently reworked during each glacial advance and retreat. The complex surficial geology also includes very fine grained glacial-lacustrine deposits and as well sorted glacio-fluvial deposits. The Study Area consists of a barrier spit or isthmus connecting larger landmasses to the north and south. The Study Area is locally known as “the Neck.” East of the Neck is the Atlantic Ocean. On the west are several ponds including Great Salt Pond, Harbor Pond and Trims Pond. These ponds are tidally influenced salt water bodies that drain westerly through a breach on the west shore of the island.

Vegetation within the Study Area is generally low growing and includes a mixture of salt tolerant, droughty species including beach grass (*Ammophila breviligulata*), switchgrass (*Panicum virgatum*), beach rose (*Rosa rugosa*), high tide bush (*Iva frutescens*), juniper (*Juniperus sp.*), sumac (*Rhus sp.*), and bayberry (*Myrica gale*). These coastal habitats provide excellent habitat for migrant song birds and resident small mammals and herpetofauna. Tidal ponds to the west of the Study Area provide exceptional habitat for finfish and shell fish.

The Federal Emergency Management Agency (FEMA) flood insurance rate map for the area (Community Panel 44009C0362J, effective date 10/16/2013) indicates that nearly all of Corn Neck Road within the Study Area is in an AE flood zone which is a coastal flood zone. The area is subject to flood inundation during a 1% annual chance storm with wave heights of less than 1.5 feet. The Base Flood Elevation ranges from 10 to 11 feet in the affected areas. Flood zone VE with elevations of 12 feet are associated with Great Salt Pond and the ocean frontage on the east. Portions of the Study Area are also mapped as Coastal Barrier Resource System (CBRS) areas and/or Otherwise Protected Areas (OPAs).



Corn Neck Road in the aftermath of Superstorm Sandy

History of Corn Neck Road

In 1873 the federal government completed construction of the Old Harbor breakwater on the island’s southeast side⁵. This long rock jetty that extends northward into the ocean provided much needed improved harbor facilities for the island.

It is estimated that Corn Neck Road was paved in the 1930s⁶. The previous dirt road likely became rutted as more people moved about the island during times of increased commercial and residential development.

After Hurricane Carol hit the area in 1954, Corn Neck Road underwent storm damage repairs⁷.

2-5 Block Island Tourism Council website. Accessed June 2017. <http://www.blockisland-info.com/island-information/history>

2-6 As per personal communication between Mike Shea and former Highway Surveyor on June 15, 2017.

2-7 Ibid

2 Existing Conditions

In 1972 Corn Neck Road was elevated to protect it from being inundated by ocean waves during Nor'easters. Of particular concern were the areas behind the Town Beach Pavilion and at the entrance to Scotch Beach.

Superstorm Sandy in 2012 caused significant damage to the southern portion of Corn Neck Road near the Beahead restaurant. The following summarizes the repairs done by RIDOT, the Town of New Shoreham, and volunteers:

- ❑ Repaired 1,800 linear feet. Cost: \$1,749,000 (including initial dune plantings and rip rap). Paid for with FEMA emergency disaster funds.
- ❑ Road was not improved, just rebuilt to its previous elevation/ location.
- ❑ \$36,000 spent in dune grass plugs along the 1,800-foot area after initial planting washed away.
- ❑ Although repairs were managed at the State level, approximately 100 local Department of Public Works (DPW) man hours were spent hauling sand, raking, planting, and watering along the newly built revetment.
- ❑ Many school kids and residents volunteered their time to stabilize the dunes with dune grass plantings.

In the spring of 2017, the traffic lanes on Corn Neck Road were narrowed and re-stripped, allowing for a more substantial bike/



pedestrian lane on the east side of the road.

Along this exposed stretch of Corn Neck Road, regular road and dune maintenance is required. The dunes on the eastern side of the island naturally migrate west, sometimes depositing sand onto the eastern shoulder of Corn Neck Road. The larger the coastal storm, the more sand gets washed onto the road. During the summer when the dry sand is windborne and more easily spread by foot traffic, the Town DPW clears the roads once or twice a week. The sand that is collected from the roads and beach parking lots is deposited across from the Beahead restaurant for dune stabilization.



Dune migration onto eastern side of Corn Neck Road

History of Hazards

Data for this section was derived from the Block Island Hazard Mitigation Plan, 2017. Please refer to the full Hazard Mitigation Plan document on the Town website or at Town Hall for additional hazard details. The following natural hazards are of highest concern for the Study Area.

HAZARD	IMPACT TO STUDY AREA	PROBABILITY OF FUTURE EVENTS*	HISTORY
Storm Surge	Breaking waves being pushed onshore; wave run-up above still water level over the road Beach erosion, flooding and deposition of sand and debris on the roads	Highly Likely	During any coastal storm event, especially if it hits during high tide
High Winds	High winds contribute to storm surge and increased wave action which contribute to coastal erosion and cause roads to be overwashed by water	Highly Likely	<ul style="list-style-type: none"> • 03/05/08: 85 mph winds • 12/26/10: 90 mph gusts • 01/12/11: 63 mph winds • 11/02/14: 59 mph winds • 12/09/14: 60 mph winds
Hurricane	Combined impacts of storm surge and high winds Hurricane force winds drive water and sand up onto the road	Likely	<ul style="list-style-type: none"> • 08/19/91: Hurricane Bob (103 mph winds) • 08/26-27/11: Hurricane Irene (76 mph winds) • 10/22-27/12: Superstorm Sandy (80 mph winds)
Heavy Rains and Flooding	Road washout, infrastructure damage, standing water restricting vehicular access	Highly Likely	<ul style="list-style-type: none"> • 10/13-15/05: over 13 inches of rain • 02/13/06: 6 inches of rain • 03/28-31/10: 8 inches of rain
Nor'easter	Similar impacts as a hurricane, but generally a slower moving storm—high storm surge may last up to 3 days.	Highly Likely	<ul style="list-style-type: none"> • 12/26/10: Nor'easter
Coastal Erosion	Increased exposure to waterfront homes, businesses, and public infrastructure such as roads, bridges, and stormwater drainage systems	Highly Likely	Ongoing
Sea Level Rise	Compounding impacts from the hazards listed above	Highly Likely	Currently being observed locally

* Highly likely=near 100% probability within the next year; Likely=between 10% and 100% probability within the next year or at least one chance in next 10 years; Possible=between 1% and 10% probability within the next year or at least one chance in next 100 years; Unlikely=less than 1% probability in next 100 years.

2 Existing Conditions

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3 Planning Process and Study Methodology

3 Planning Process and Study Methodology

This Planning Study was conducted by a team of design professionals with input from New Shoreham residents and stakeholders. The Planning Study Working Group explored a range of mitigation options to improve the future resiliency of Corn Neck Road within the Study Area.

Planning process

The usefulness of this document relied upon a planning process that involved multiple opportunities for public input. From the start of the project through the draft presentation of findings, the Working Group considered various project ideas, concerns, and other suggestions that were offered by Block Island residents and Town staff. The initial stages of data collection and project understanding yielded a wide range of potential design alternatives. As the project evolved, the Working Group was able to narrow down the options to a few potential design alternatives that meet the project goals. The following table summarizes project milestones.

DATE	ACTION
3-31-17	Project Kick-off Meeting. VHB Team met with members of the New Shoreham Planning Board, the Town Planner, and Town Building Official to discuss project scope and deliverables
4-14-17	Article about the project ran in the Block Island Times. Public survey promoted online—27 people participated
4-19-17	Public Open House Meeting at Town Hall. Invited residents to learn about the planning project, offer suggestions, and ask questions—over 35 people attended
4-28-17	Project Alternative Brainstorming. VHB Team collected all the suggested project alternatives and organized them by type—transportation and non-transportation
5-19-17	Project Alternatives Discussion. VHB Team discussed project alternatives to narrow down 3 transportation ideas and 1 non-transportation idea
6-30-17	Draft plan sent to Planning Board Chair, Vice Chair, and Town Planner for review
7-12-17	Present Draft Plan at New Shoreham Planning Board meeting
9-13-17	Present Revised Draft Plan at New Shoreham Planning Board meeting
11-17	Consult with CRMC and RIDOT regarding the Planning Study Findings
12-17	Present Final Plan at New Shoreham Planning Board meeting

Data Gathering

In order to thoroughly understand existing and anticipated conditions within the community and to collect data and information to inform the Planning Study, VHB reviewed numerous planning documents and studies about relevant resiliency projects in the Northeast.

The following sections provide a summary of the planning documents reviewed. Additional less relevant studies consulted are listed in Appendix A.

Block Island Hazard Mitigation Plan

The Block Island Hazard Mitigation Plan, 2017 (adopted in July 2017) identifies local policies and actions that can be implemented to reduce risk and loss from hazards. Corn Neck Road is repeatedly damaged by storm surge from wind-driven waves, heavy rains and resulting flooding or washouts, and erosion. Sea level rise is expected to increase the vulnerability of the road. “While the actual loss of the road to the rising sea appears to be many years away, it will be subject to storm erosion in the meantime.” The hazard mitigation plan includes the following actions to mitigate impacts to Corn Neck Road and residents:

- ❑ **Action #3.** Planning, design and construction of relocation or raising of roadway for segment of Corn Neck Road subject to storm inundation and damage.
- ❑ **Action #6.** Back-up power for the northern end of the island.
- ❑ **Action #10.** Acquire undeveloped land having a high potential for adapting to salt marsh migration.
- ❑ **Action #13.** Bury powerlines on the east side of the island along Water Street, Corn Neck Road, and Spring Street.

New Shoreham Comprehensive Plan

The New Shoreham Comprehensive Plan (adopted in 2016) is a roadmap of goals, policies, and actions to guide sustainable community growth.

- ❑ **Goal T1.** “Provide a sustainable transportation system that meets that diverse needs of residents, visitors, and commerce.
 - ✔ *Policy T1.H. Consider natural hazards including flooding and sea-level rise when making transportation investment decisions.*
 - ✔ *Action T1.H1. Evaluate each road currently or potentially impacted by sea-level rise or flooding to determine appropriate actions to limit impacts to the community.*
 - ✔ *Action T1.H2. Conduct a planning study of Corn Neck Road to identify alternatives to mitigate future impacts from storms and climate change.*

Town of New Shoreham Traffic Safety Assessment

The Town of New Shoreham Traffic Safety Assessment (2015) developed by Crash Solution Team, “identifies the number and ratio of pedestrians, mopeds, and bicycles traveling in and out of compliance with local laws and common knowledge”.

Block Island Harbors Sea Level Rise Adaptation Study

The Block Island Harbors Sea Level Rise Adaptation Study (2013) was prepared by the Town of New Shoreham, Fairbanks Engineering, and St. Jean Engineering with funding from Association of US Delegates to the Gulf of Maine Council on the Marine Environment (US Gulf of Maine Association) in coordination with the Gulf of Maine Council

3 Planning Process and Study Methodology

(GOMC) and Northeast Regional Ocean Council (NROC), with funding provided by the NOAA Climate Program Office. The study documents New Shoreham’s vulnerabilities for various sea level rise scenarios.

- ❖ **Near term impacts to Corn Neck Road:** potential damage by storms from tropical or semi-tropical storms.
- ❖ **Long term impacts:** rising sea levels will require raising the impacted areas of the road, or possible dredging of the salt ponds to increase their storm surge capacity.

New Shoreham, RI. Coastal Sea level Rise and Storm Surge: Transportation Fact Sheet

The RI Statewide Planning Program developed the New Shoreham, RI Coastal Sea level Rise and Storm Surge: Transportation Fact Sheet (2016) regarding transportation infrastructure elements that may be affected by sea level rise and storm surge. It includes vulnerable roads and bridges. Maps show that under current sea level conditions, a 100-year storm event would affect the entire Study Area. There is no specific evacuation route indicated on the map.

Rhode Island Hurricane Evacuation Study, Hurricane Evacuation Mapping, New Shoreham

The Rhode Island Emergency Management Agency developed the Rhode Island Hurricane Evacuation Study, Hurricane Evacuation Mapping, New Shoreham (2013) this map shows that the project Study Area is in Evacuation Zone A. This zone is recommended to be evacuated prior to an expected category 1 or 2 hurricane.

Advanced STORMTOOLS

An online mapping program developed by the University of Rhode Island Shoreline Change SAMP Team is based on simplified methods to

estimate coastal inundation in Rhode Island. Available overlays include sea level rise scenarios, and storm surge from various storm magnitudes.

Rhode Island Coastal Resources Management Program

Section 145: Climate Change and Sea Level Rise

In line with other state agencies, the RI Coastal Resource Management Council (CRMC) is incorporating sea level rise and climate change impacts into their planning decisions. Their revised policy states the following:

- ❖ “The Council recognizes that sea level rise is ongoing and its foremost concern is the accelerated rate of rise and the associated risks to Rhode Island coastal areas today and in the future. The Council recognizes that the lower the sea level rise estimate used, the greater the risk that policies and efforts to adapt sea level rise and climate change will prove to be inadequate. Therefore, the policies of the Council may take into account different risk tolerances for differing types of public and private coastal activities. In addition, the Council will regularly review new scientific evidence regarding sea level change.”
- ❖ “The Council relies upon the most recent NOAA sea level rise data to address both short- and long-term planning horizons and the design life considerations for public and private infrastructure. The Council’s policy is to adopt and use the sea level change scenarios published by NOAA in Technical Report OAR CPO-1 (Parris et al., 2012), and the sea level rise change curves for Newport and Providence as provided in the United States Army Corps of Engineers (USACE) sea level rise calculator. As of 2015 the range in

sea level rise change is projected by NOAA to be a maximum of approximately 1.0 foot in 2035, 2.0 feet in 2050 and 7.0 feet in 2100. In addition, the Council adopts and recommends the use of the STORMTOOLS online mapping tool developed on behalf of the CRMC by the University of Rhode Island Ocean Engineering program to evaluate the flood extent and inundation from sea level rise and storm surge.”

RI Shoreline Change Special Area Management Plan

This ongoing effort of the RI CRMC, facilitated by the URI Coastal Resources Center and Rhode Island Sea Grant has been collecting data about coastal erosion and sea level rise to help communities adapt to changing conditions. The draft plan is still under development but the fact sheet Protecting Rhode Island’s Shorelines from Flooding and Erosion is applicable to Corn Neck Road erosion. The following helped guide the selection of design alternatives for Corn Neck Road.

- ❏ “Even properly designed and sited shoreline protection structures are expensive to build: a revetment or wall that meets U.S. Army Corps of Engineers’ standards for the high energy wave environment of Rhode Island’s south shore costs up to \$5,000 per linear foot. Additionally, the size—height and width—required to protect upland infrastructure from a significant storm or hurricane is generally much greater—and more expensive—than is typically built.”
- ❏ Large structures visually and physically block access to the ocean and beach. Property owners behind shoreline protection features have found their property values decline when access to the beach is obstructed.

Adaptation to Natural Hazards & Climate Change in North Kingstown, RI

The first of its kind in the State, the Rhode Island Sea Grant & University of Rhode Island Coastal Resource Center worked with the Town of North Kingstown to address climate change issues as it relates to transportation, land use, and other elements. Funded by the U.S. Department of Transportation Federal Highway Administration, this study created a bridge between the local hazard mitigation plan, local Comprehensive Plan, and various State studies on climate adaptation. By using spatial information, exposure and vulnerability data was used to guide and prioritize projects in North Kingstown’s Capital Improvement Program (CIP), and the State Transportation Program (TIP).

Future Threats—Sea Level Rise and Storm Surge

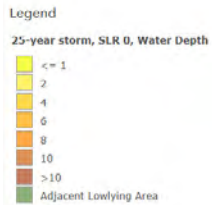
Sea level rise rates differ throughout the United States. According to the 2017 National Oceanic and Atmospheric Administration (NOAA) report entitled “*Global and Regional Sea Level Rise Scenarios for the United States*”, sea levels in the Northeast are projected to rise significantly faster than the global average¹. The CRMC has adopted NOAA’s worst-case scenario of 8 feet of sea level rise by 2100². In New England, we can expect an additional 3 feet by 2100, bringing the high-end totals to over

3-1 NOAA Technical Report NOS CO-OPS 083, Global and Regional Sea Level Rise Scenarios for the United States, January 2017 https://tidesandcurrents.noaa.gov/publications/techrpt83_Global_and_Regional_SLR_Scenarios_for_the_US_final.pdf

3-2 RI Coastal Resources Management Council, New NOAA sea level rise projections dramatically increase by 2100. February 22, 2017. http://www.crmc.ri.gov/news/2017_0222_sealevel.html

3 Planning Process and Study Methodology

STORMTOOLS 25-Year Storm Event



25-year storm event (4% chance of occurring in any given year) with no Sea Level Rise. Add about a foot of water depth for each foot of Sea Level Rise.



25-year storm event (4% chance of occurring in any given year) with 1 foot of Sea Level Rise.

11 feet³. This projection was an increase from prior State estimate as recently as 2016 when CRMC’s Coastal Resources Management Program, Section 145 estimated that by 2100 sea level rise in Rhode Island could rise approximately 2 to 5 feet⁴.

While the timing of various sea level rise scenarios is debatable, the impacts to transportation infrastructure can be predicted now. In September 2016, the Rhode Island Statewide Planning Program released the technical paper 164, “Vulnerability of Transportation Assets to Sea Level Rise.” The analysis presented in that paper included various scenarios using 1, 3, and 5 feet of sea level rise⁵. The emphasis of the report was less focused on the timing of sea level rise and more on the vulnerability of State owned transportation infrastructure such as roads, bridges, ports and harbors. In addition to report on State-owned infrastructure, Statewide Planning also authored Technical Paper 167 Vulnerability of Municipal Transportation Assets to Sea Level Rise and Storm Surge created data packets for 21 cities and towns. The New Shoreham document identifies the roads and bridges vulnerable to 1, 3, 5, and 7 feet of sea level rise, as well as scenarios coupled with storm surge from a 100-year event⁶. The data supports the Town’s concern about the vulnerability of Corn Neck Road between Scotch Beach and Bridgegate Square. Under the future 5-foot sea level rise condition, portions of Corn Neck Road would be inundated. The flooded portions

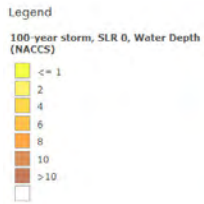
3-3 RI Coastal Resources Management Council, New NOAA sea level rise projections dramatically increase by 2100. February 22, 2017. http://www.crmc.ri.gov/news/2017_0222_sealevel.html

3-4 RI Coastal Resources Management Council, Rhode Island Coastal Resources Management Program, Adopted January 26, 2016. <http://www.crmc.ri.gov/regulations/RICRMP.pdf>

3-5 RI Department of Administration, Division of Planning, RI Statewide Planning Program, Vulnerability of Transportation Assets to Sea Level Rise. Technical Paper 164. January 2015. http://www.planning.ri.gov/documents/sea_level/2016/TP167.pdf

3-6 RI Department of Administration, Division of Planning, RI Statewide Planning Program Coastal Sea Level Rise and Storm Surge: Transportation Fact Sheet. Accessed June 2017. http://www.planning.ri.gov/documents/sea_level/fact/NewShoreham.pdf

STORMTOOLS 100-Year Storm Event



100-year storm event (1% chance of occurring in any given year) with no Sea Level Rise. Add about a foot of water depth for each foot of Sea Level Rise.

would be from Beach Avenue to the northerly project limits approximately 4,100 feet). However, from Bridgeway Square to Beach Avenue (approximately 2,300 feet), Corn Neck road is above the 5-foot sea level rise inundation elevation and is not expected to be underwater.

The Study Area is uniquely positioned with water on both sides of Corn Neck Road. When sea levels rise, seawater come in from the ocean, and also from the tidally connected harbors and ponds to the west. The future predicted combination of higher sea levels, high tides, and the greater frequency of more storm surges will result in increased damage to infrastructure⁷.

Although sea level rise is a slower, long-term threat, Block Island is already experiencing storm damage to its infrastructure. According to the 2017 Hazard Mitigation Plan, this trend is expected to continue.

3-7 Block Island Harbors; Sea Level Rise Adaptation Study (2013)

Within the next five years, Block Island is highly likely to be impacted by high winds, heavy rains and flooding, severe winter weather, and coastal flooding. The town is also likely to be impacted by a hurricane and associated storm surge in the next five years⁸.

A 25-year storm event (a 4% chance of occurring in any given year; similar to Sandy) without any increase in sea level will affect nearly the entire Study Area roadway, and could temporarily flood the section of road at Scotch Beach with approximately 4 feet of water. Further south, the land elevation rises slightly; the area in front of the Beachhead restaurant could experience almost 1.5 feet of water from storm surge during that 4% annual chance storm. A stronger event like a 100-year storm (1% chance of occurring in any given year; similar to 1938 hurricane) even without sea level rise, will have even greater impacts. The northern end of the Study Area near Scotch Beach could have temporary flood depths of approximately 6 feet above the ground elevation. For reference, Hurricane Sandy was a 260-year storm (0.38% chance of occurring in any given year).

3-8 Town of New Shoreham, Block Island Hazard Mitigation Plan, 2017. Adopted July 5, 2017.

Public Input

The Planning Study Working Group solicited Corn Neck Road resiliency ideas from local residents. On April 19, 2016, the public was invited to participate in an information gathering session at Town Hall. For those that were unable to attend the meeting or wanted to provide additional information, an online public survey was created to capture ideas.

After a brief introduction to the project scope and purpose, the group of about 35 participants openly discussed various ways to mitigate future storm impacts to Corn Neck Road. There was a general consensus around the room that Corn Neck Road will be breached in the future. The magnitude of the damages and the timing are unknown.

All suggested alternatives from the public meeting, on-line survey, case studies, and stakeholders were documented in a spreadsheet (see Appendix B).

Potential Alternatives

The ideas recorded at the public meeting and during interviews with stakeholders were generally aligned with the following two broad idea categories, transportation projects and non-transportation projects.

- ❑ **Transportation Alternatives** are defined as mitigation actions that deal specifically with the Corn Neck Road infrastructure, such as roadway elevation, bridges, or relocation.
- ❑ **Non-transportation Alternatives** are defined as actions that protect the Study Area by reducing or mitigating wave energy before it gets to Corn Neck Road. Examples of these include building up the dune system or dune restoration, offshore energy dissipating installations, such as artificial reefs, and beach nourishment.

Within the list of transportation alternatives, the ideas generally fit into

three sub-categories: elevate/armor the roadway, elevated spans or culverts, and road relocation.

Elevate/armor roadway ideas included raising the roadway, installing rip rap along the seaward side of the road, and building a seawall. The elevated spans concept included projects that would be implemented should a breach create a northern island and southern island. Mitigation ideas included a ferry from one side to the other, a small bridge connecting the two islands on the eastern side, an elevated causeway, and bridges across Great Salt Pond. Relocation ideas included moving a section of Corn Neck Road to the west and abandoning or repurposing sections of Corn Neck Road where it currently is.

The non-transportation ideas were extensive and creative. These mitigation projects do not include work on the transportation infrastructure, but rather alternatives that slow the wave energy before it damages the road. Many ideas included enhancing the dune structure between the road and the ocean. Other ideas involved installing an artificial reef or breakwater offshore to lessen the wave energy, and sand replenishment projects.

Another grouping included drainage improvement ideas related to the inland flooding of Bridgegate Square. Since the drainage in Bridgegate Square was just improved in 2015, flooding conditions are reported as resolved by the DPW. Bridgegate Square flooding is included in this study in Chapter 6 for Additional Vulnerable Areas.

Numerous ideas were outside of the scope of this project. As noted by the responses from the public, it is evident that residents see a safety issue concerning the mixed use by beachgoers, vehicles, and bicycles along Corn Neck Road during the tourist season. Ideas that were outside the nature of this resiliency study were captured and included in Chapter 6.

Narrowing Down the Options

The public meeting and additional discussions yielded over 70 suggestions to address various issues along Corn Neck Road. Those that were not transportation resiliency related were captured later in this plan. The Working Group used the following conditions to narrow down the range of options into three structural transportation alternatives:

1. Maintain a transportation connection between the northern and southern parts of the island.
2. Maintain access to public and private property along Corn Neck Road.
3. Must be scalable to accommodate 6 feet above current Mean Higher High Water.

For the non-transportation alternative, the Working Group analyzed the range of possibilities to identify commonalities. It was determined that the non-transportation ideas fit into one of the four categories: dune restoration, beach nourishment, coastal armoring, and offshore projects. These are discussed later in Chapter 4.

The benefits of numerous structural transportation alternatives were discussed at length. The following were briefly considered, but did not advance to the conceptual phase in their original form.

Concrete Seawall Along Corn Neck Road

Rhode Island, like many other coastal states has historically built seawalls to protect inland resources from the ocean. However, the State now encourages non-structural methods that mitigate erosion or coastal flooding. Aspects of this shoreline protection idea were utilized in Alternative 1 and 3. This alternative was not explored further due to the following reasons:

- ❖ Permitting may be difficult. CRMC encourages rip rap revetments rather than vertical steel, timber, or concrete seawalls.
- ❖ A seawall along Corn Neck Road may exacerbate flooding to the west when the salt ponds and harbor are flooded.
- ❖ May accelerate beach erosion by reflecting wave energy off the wall.
- ❖ May limit beach access.

Ferry Connection

When Corn Neck Road is destroyed, it may be so severe as to divide the island in two. A ferry connection was considered both across Harbor Pond as well as across Great Salt Pond at Dead Eye Dick's restaurant. Although not fully conceptualized as a ferry, the idea of maintaining the connection between the northern and southern part of the island was utilized in all proposed alternatives. This alternative was not explored further due to the following reasons:

- ❖ Difficult to predict where Corn Neck Road will be bisected and where ferry terminals should be located.
- ❖ Ferry terminals are water-dependent, and consequently would be at a low elevation which makes them vulnerable to flooding and storm surge.
- ❖ Although the land at Indian Head Neck is elevated, extending the road through there would require private property acquisition.
- ❖ Would require additional navigational studies and possibly dredging.

Bridge(s) Across Great Salt Pond

Instead of a ferry, another suggestion was to construct a long bridge across Great Salt Pond or smaller bridges across the cut at Dead Eye Dick's on Ocean Avenue or across the cut at the end of Champlin Road at Harbor Neck Coast Guard Station. The purpose of this would be to connect traffic from the southern end of the island to the northern area, avoiding the more vulnerable lower elevations of Corn Neck Road. Although not proposed in this form, the idea of maintaining the connection between the northern and southern part of the island was utilized in all proposed alternatives. This alternative was not explored further due to the following reasons:

- ❑ Bridge supports in an ecologically sensitive area would impact the Type 1 Waters (Conservation Areas).
- ❑ May adversely impact shellfish resources.
- ❑ Difficult to permit a large bridge across Great Salt Pond.
- ❑ May require property acquisition at both ends of the bridges.
- ❑ Would require new roads to be built.
- ❑ Wetland, floodplain, conservation area, and natural heritage areas on Gunners Hill across from Coast Guard Station.

Continuous Elevated Viaduct Above Corn Neck Road

Another alternative before or even after damage to Corn Neck Road would be to construct one long elevated viaduct above Corn Neck Road. The remains of the existing road would be abandoned and storm surge would flow under the viaduct. This alternative was not explored further due to the following reasons:

- ❑ Loss of access to beaches and private property.
- ❑ May impact the water quality of the inland harbor and ponds if Corn Neck Road is not maintained and conditions allowed for more mixing between the ocean and inland ponds.
- ❑ Difficult to permit such a large structure along the coast.

Although none of the above designs were fully developed, components of each were used to develop three proposed conceptual designs generally including roadway elevation and shoreline protection, a series of raised structures, and road relocation paired with roadway elevation.

4 Conceptual Design Alternatives

Applied Design Elements

Project Base Mapping

VHB used topographic elevation data available from the Rhode Island Geographic Information System (RIGIS) as the basis for existing conditions. The existing road elevations were created from 2-foot contour lines derived from 2011 Statewide LiDAR. The Project Datum is the North American Vertical Datum of 1988. This datum is consistent with FEMA flood mapping and the STORMTOOLS data layers. The current Mean Higher High Water (MHHW) elevation is 1.81 feet. MHHW is the average of the highest tide events, and is used as the regulatory datum for CRMC and the US Army Corps of Engineers.

Please note that portions of Corn Neck Road have been rebuilt since 2011 and although the repairs should have maintained the same elevation, VHB did not verify elevations in these areas.

Sea Level Rise, Storm Surge, and Mean Higher High Water

To model future sea level rise scenarios along Corn Neck Road, VHB utilized the 2014 Sea Level Rise: RIDOP shapefile available on the RIGIS website. This data represents “results of ‘modified bathtub’ coastal inundation analyses conducted by NOAA Coastal Services Center and the RI Division of Planning” (RIGIS layer description). This available mapping layer includes 1, 3, or 5-foot potential sea level rise scenarios, which was the current State standard in January 2016.

Under the 5-foot sea level rise condition, portions of Corn Neck Road would be inundated. These portions would be from Beach Avenue to the northerly project limits (approximately 4,100 feet). From Bridgegate

Square to Beach Avenue (approximately 2,300 feet), Corn Neck Road is above the 5-foot sea level rise elevation.

Using the STORMTOOLS mapping tool¹, VHB looked at storm surge scenarios. Storm surge elevations were measured online at regular intervals along Corn Neck Road and then interpolated in a continuous line along the road using the engineering mapping tool AutoCAD®. These storm surge elevations are included as reference only in the design cross-sections. The effects of road modifications on storm surge flows were not studied as part of this effort and therefore were not included in the aerial figures.

A 25-year storm event (a 4% chance of occurring in any given year; similar to Sandy) without any increase in sea level will affect nearly the entire Study Area roadway, and could flood the section of road at Scotch Beach with approximately 4 feet of water. A stronger event like a 100-year storm (1% chance of occurring in any given year; similar to 1938 hurricane) without sea level rise will have even greater impacts. The northern end of the Study Area near Scotch Beach could have flood depths of approximately 6 feet above the ground elevation.

During discussions with the working group on June 6, 2017, participants reviewed various future scenarios. Based upon the sea level rise and STORMTOOLS data, the Planning Board selected 5 feet above MHHW plus an additional 1 foot of freeboard as the design elevation for the conceptual designs.

The transportation alternatives have a design elevation of 6 feet above MHHW. Based on current sea level rise trends, this design elevation

4-1 University of Rhode Island, Extra/Tropical Storms. Advanced STORMTOOLS. Accessed May 2017. <http://uri.maps.arcgis.com/home/webmap/viewer.html?web-map=62f9e99490b9431d935134aa752e3134>

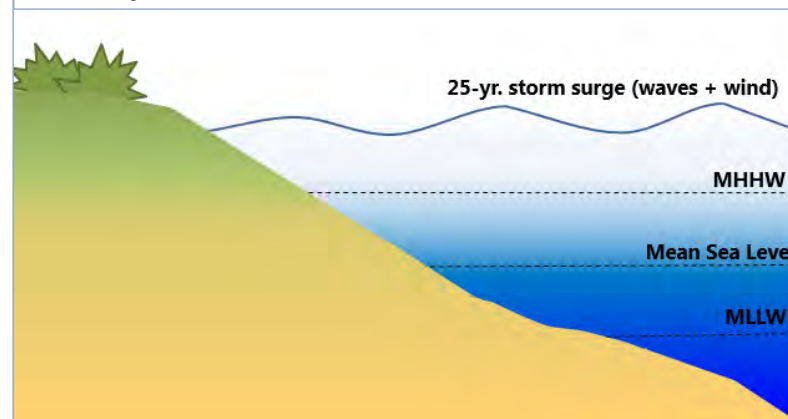
would set the road surface of each of the transportation conceptual alternatives through the standard life expectancy of the infrastructure, about 55 years.

The design elevations of the alternatives could be increased if a greater level of sea level rise or storm surge is desired.

At the start of this project in March 2017, there was a possibility that if Corn Neck Road was built with federal funds in the future, that it would have to be rebuilt above the Base Flood Elevation of 11 feet. Executive Order 13699 Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input required that all federally funded projects must be built above the Base Flood Elevation. In August 2017, President Trump signed the Executive Order titled Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects. This signing rescinds Executive Order 13699. The purpose of the new Executive Order is to make Federal review of infrastructure projects more efficient², however, the order effectively removes federal requirements for additional freeboard for federally funded projects located in FEMA-mapped floodplains.

4-2 The White House, Office of the Press Secretary. Presidential Executive Order on Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure. Released August 15, 2017. <https://www.whitehouse.gov/the-press-office/2017/08/15/presidential-executive-order-establishing-discipline-and-accountability>

Mean Higher High Water: The average of all daily highest tide measurements is commonly referenced as Mean Higher High Water (MHHW). When predicting sea level rise, this is the baseline from which models measure tide heights.



Source: RI Statewide Planning, New Shoreham, RI Coastal Sea Level Rise and Storm Surge: Transportation Fact Sheet.

Applied Roadway Design Criteria

The following design standards are applied under all Conceptual Design Alternatives:

- ❖ The roadway will be widened as necessary to provide a consistent 30 foot wide asphalt paved width including two 10-foot travel lanes, a 2-foot shoulder on the west side of the road, and an 8-foot shoulder on the east side of the road. The wider eastern shoulder will provide a shared use path for pedestrians and bicycles. This is consistent with public requests and recommendations from the 2017 RIDOT Road Safety Assessment on Corn Neck Road. The RIDOT Highway Design Manual Section 450.02 requires a minimum of 11-foot travel lanes and consequently a Design Exception will need to be filed with RIDOT for the 10-foot lanes.

4 Conceptual Design Alternatives

- ❑ The disturbed roadway side slopes will be restored to match adjacent areas of vegetation, dunes/rip rap or driveway composition (i.e. gravel or asphalt).
- ❑ Utility poles/overhead wires will be maintained in their present location.
- ❑ The roadway cross section will be sloped to maintain the existing drainage patterns.
- ❑ Access to businesses, private properties and the beaches will be maintained.
- ❑ Existing rip rap south of Beach Avenue will be replaced with rip rap armoring to address erosion along this roadway segment.
- ❑ Raising the road the first 300 feet north from Bridgegate Square would eliminate access to the abutting businesses, and consequently, this roadway segment is not included in the alternatives. Raising this road segment is discussed in Section 6.

The roadway designs were developed using specific design criteria specified by the State of Rhode Island for a rural major collector road. Elements include the width of lanes, profile gradients, curb offsets, and driveway openings (see Appendix H).

Pedestrian Safety

While the scope of this Planning Study did not include pedestrian safety and egress, the Town identified pedestrian safety as a concern that should be considered in the conceptual design alternatives. The section of Corn Neck Road included in the Study Area is heavily used by people to get to popular tourist destinations along the shore. Corn Neck Road is the main artery to the Town Beach Pavilion, and town beaches, as well as a corridor for recreational bikers, hikers, joggers, and tourists on

their way to the North Lighthouse. Upon leaving the ferry terminal, people walking, driving, biking, pushing strollers and carts, all travel north along both sides of the road.

Since there is no continuous sidewalk, many people walk in the street. This becomes a safety hazard for vehicles traveling along both sides of the road. At one section along Corn Neck Road, normal high tide prohibits safe, dry passage along the beach. One participant at the public meeting on April 19, 2017, indicated that walkers are forced to exit the beach over the dunes, and walk along Corn Neck Road for at least 450 feet until they can access the exposed sand beach.

Although the scope of the study did not include improving multi-modal safety, wider paved shoulders are included in all transportation design alternatives.



Transportation Alternatives

The following pages summarize the three conceptual transportation alternatives for Corn Neck Road. Estimates of Probable Costs are provided in Appendix G. Each transportation alternative includes typical sections of improvement for illustrative purposes.

No Build (Do Nothing) Alternative

As described in Section 2 regarding the history of Corn Neck Road, the roadway is assumed to have been established in the early 1800s and has been the subject of various improvements and repairs over the years including elevating the roadway as recently as 1972. Review comments received from RIDOT suggested that it was appropriate to evaluate a scenario that involved “doing nothing”, essentially leaving the roadway as is from a design perspective, and repairing it as needed when subjected to damage. In developing this Study, historic cost data was not available beyond that spent following Hurricane Sandy, so the ability to establish an average annual cost for this alternative is limited. Post-Sandy repairs to the roadway cost \$1.75M.

An evaluation of this alternative reveals that there are no significant environmental impacts or permitting challenges, no right of way acquisition costs or utility relocations, and the alternative would maintain access to all adjacent properties. However, the No Build Alternative doesn't address sea level rise. Consequently, the alternative does not improve the resiliency of the roadway or render it less vulnerable to environmental conditions.



Alternative 1—Elevated Road

Under the Elevated Road alternative, Corn Neck Road would be reconstructed and portions of the roadway would be raised so that the entire length (approximately 6,000 feet) would be at least 6 feet above the current MHHW.

This alternative would generally be accomplished by demolishing the existing roadway, placing earthen fill along the road alignment and compacting the fill until the design elevation for the roadway subgrade is reached. The roadway pavement section would be constructed on top of the base. The conceptual design utilizes RIDOT standard specification and details for the road base and pavement section.

Design Considerations

For this alternative, a conceptual alignment, profile, and corridor were created using Civil3D for approximately 6,000 feet of Corn Neck Road. The alignment was selected to avoid interfering with the utility poles on the west and keep the new wider roadway within the public right of way. The profile was then created using a minimum elevation of 6 feet above existing MHHW. If the existing roadway was already at an elevation of 6 feet above MHHW, the roadway profile was not elevated in this area. A corridor was then built using this alignment and profile to obtain estimated slope limit impacts to abutting properties.

Additional considerations for this alternative:

- ❑ Approximately 1,200 square yards of rip rap armoring would replace the existing rip rap slope to bring the slope up to the new roadway elevation.
- ❑ Approximately 1,700 square yards of driveways would need to be reconstructed using some combination of gravel and common fill in order to connect to the elevated road.

- ❑ Approximately 12,000 square yards of vegetated slope work would be needed to tie the new slopes back to existing grade.
- ❑ There would be no property acquisitions needed for this alternative.

For the purpose of a cost estimation, VHB assumed a complete roadway reconstruction project with a pavement structure of 2 inches hot mix asphalt surface course, 4 inches hot mix asphalt base course and 1 foot gravel borrow subbase course.

Estimated Cost: \$9.8 million

❑ Pros:

- ❑ *Elevates roadway 6 feet above existing MHHW*
- ❑ *Accommodates pedestrians and bicycles*
- ❑ *Reduces erosion potential along eastern roadway shoulder*
- ❑ *Maintains access to all abutting properties*
- ❑ *Fits within existing right of way*
- ❑ *No utility relocations required*
- ❑ *Least expensive alternative*

❑ Cons:

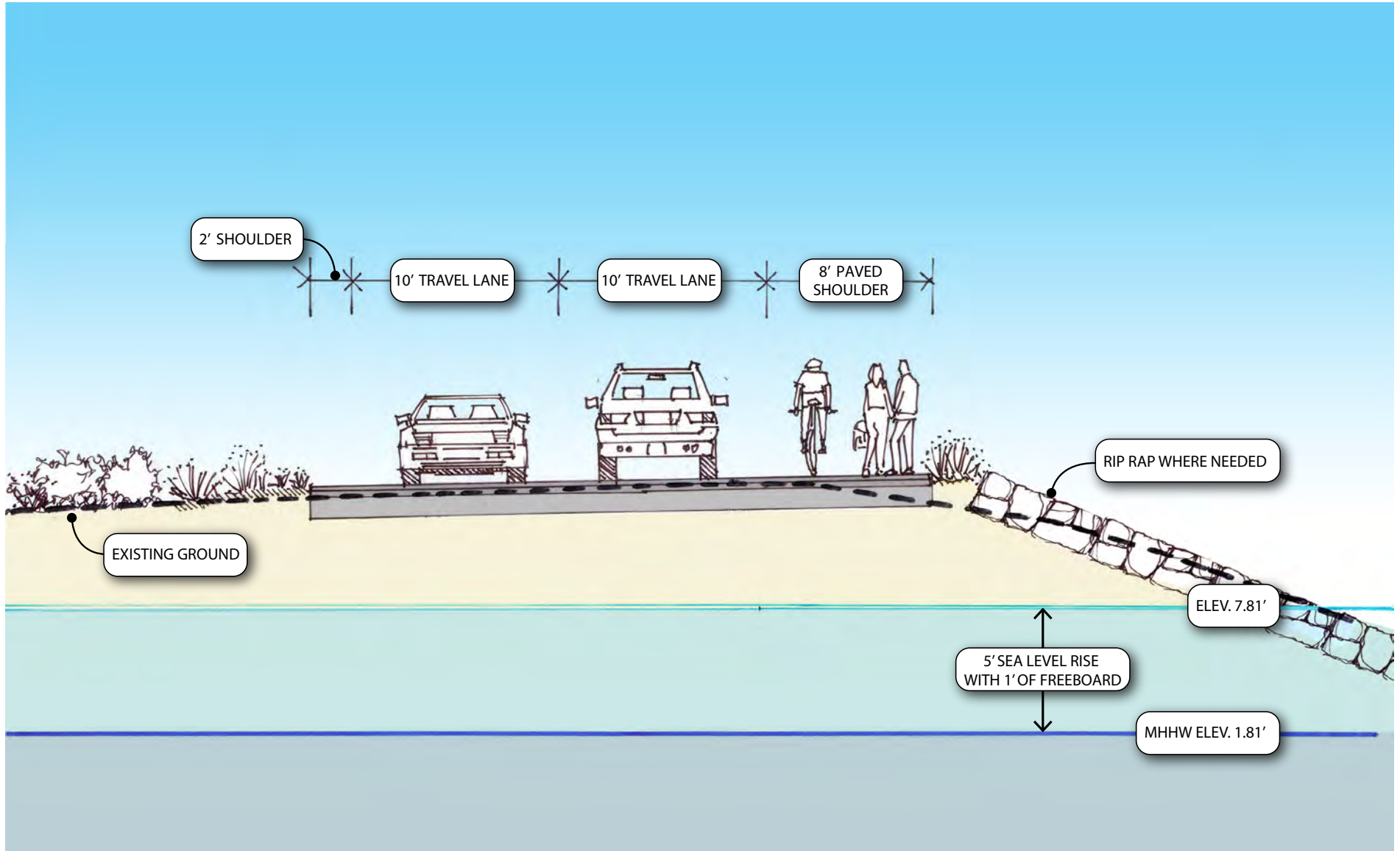
- ❑ *Roadway grading and earthwork may alter adjacent resources*
- ❑ *Rip rap armoring may impact coastal areas*
- ❑ *Increased pavement width will generate increased runoff*
- ❑ *Roadway subject to storm surges*

Alternative 1—Elevate Roadway



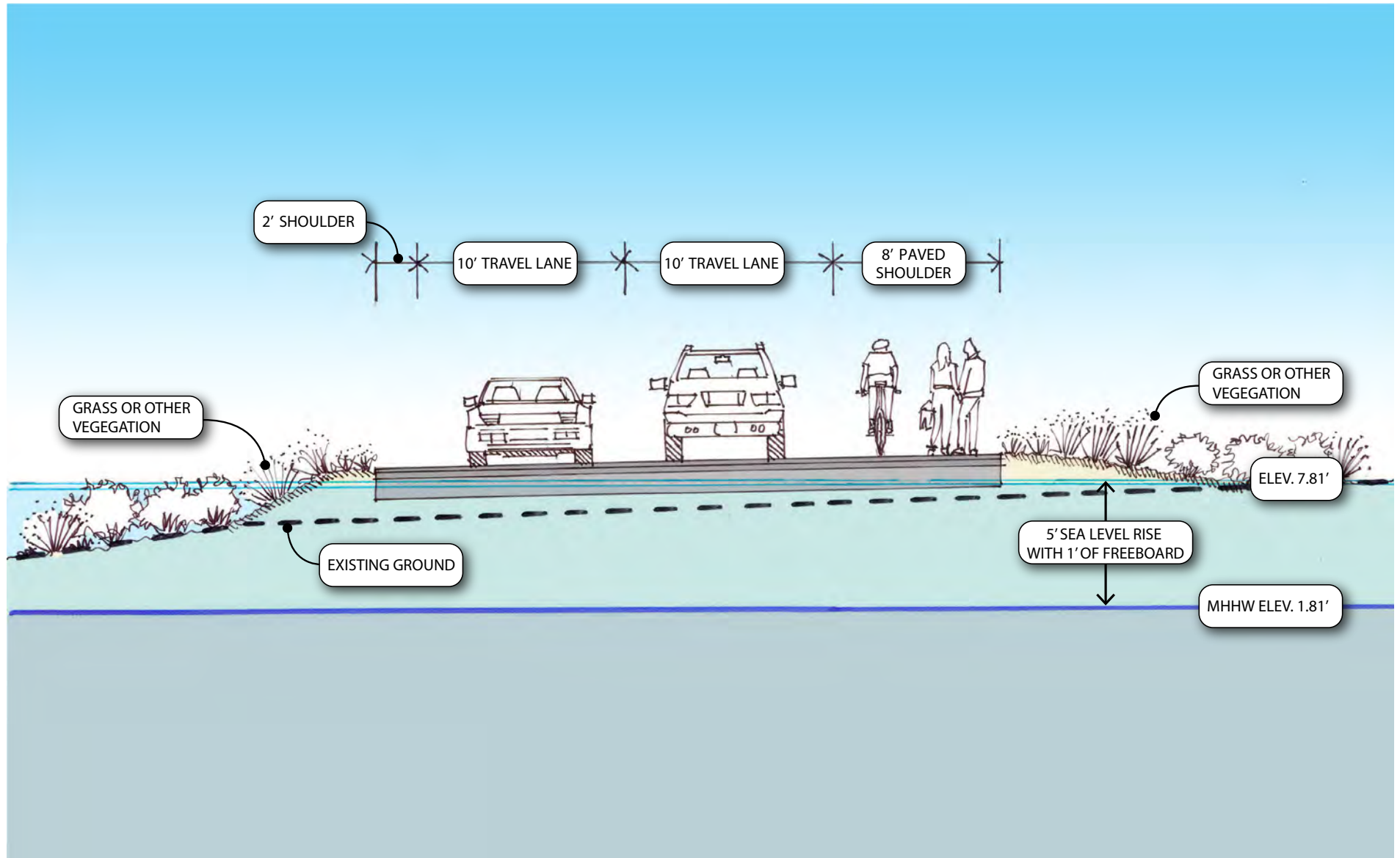
4 Conceptual Design Alternatives

Alternative 1—Elevate Roadway Typical Cross Section (Section A-A)



Not to Scale

Alternative 1—Elevate Roadway Typical Cross Section (Section B-B)



Not to Scale

Alternative 2—Partial Bridge Structure

Under the Partial Bridge Structure alternative, portions of the roadway would be replaced with bridge structures and portions of Corn Neck Road would be reconstructed at a higher elevation similar to Alternative 1. Under Alternative 2, three bridge structures would be constructed along the following roadway segments:

- ❑ Beach Avenue and Town Beach (approximately 1,000 feet)
- ❑ Town Beach and the private property (approximately 600 feet)
- ❑ Private property and the northerly project limits (approximately 925 feet)

These locations are at some of the lowest existing elevations within the Study Area. Elevating the roadway on structures enables storm surges or increased sea level to flow beneath the roadway while the road remains passable above. In between the bridge structures, the remaining roadway segments would need to be reconstructed in order to transition from the existing grade where the roadway meets existing driveways and parking lots and the proposed elevation of the structures. The reconstructed roadway portions would be the southerly portion of Corn Neck Road from 300 feet north of Bridgegate Square to just north of Beach Avenue (approximately 2,050 feet), in front of Town Beach (approximately 800 feet), at the private property driveway access (approximately 225 feet), and the northerly project limits (approximately 400 feet). Similar to Alternative 1, Corn Neck Road will be raised such that the roadway is at least 6 feet above MHHW.

Though this alternative could be designed as one continuous structure throughout the Study Area, such a structure would eliminate access to private properties, vehicle and pedestrian access to Town Beach, and

reduce access to Scotch Beach. Along the same vein, a continuous bridge concept could be designed at a higher elevation to achieve a greater resiliency target or longer useful life.

Existing utilities are avoided under the conceptual design layout. However, existing overhead utilities could be relocated underground through the bridge segments in either the partial or full bridge concept.

Engineering Considerations

A prestressed voided slab superstructure has been selected for the elevated bridge portion of Corn Neck Road. These slabs are precast and can span up to approximately 60ft (RI BDM Article 2.3.4). This superstructure type was selected for the following reasons:

- ❑ Concrete has been chosen over steel since it is more resistant to the exposure of a salt environment. ACI 318-14 Table 19.3.1.1 and Table 19.3.2.1 provide methods to make a concrete structure more resistant to a harsh salt environment. In addition, the steel reinforcing and prestressing strands will receive their own protective coating (galvanizing/grouted sleeve) that a traditional steel bridge beam wouldn't be able to receive due to their size. AASHTO LRFD Article 5.4.2 also provides guidance for concretes in salt environments.
- ❑ Precast slabs are easy to store (stackable), transport, and erect (requires small crane).
- ❑ Slabs are butted together creating a riding surface once installed, only requiring a bituminous wearing surface to be placed afterwards.
- ❑ Due to the proposed profile, there is a low freeboard (distance from bottom of superstructure to top of water) under the bridge. The voided slabs will provide a shallower superstructure over other

concrete beams, maximizing the freeboard. This reduces the chance that any part of the superstructure will become submerged during a normal tide event.

- ❑ The shallow superstructure reduces the side surface area for a wave load to act on.

Estimated Cost: \$77.5 million

❑ **Pros:**

- ❑ *Elevates roadway 6 feet above existing MHHW*
- ❑ *Allows water/storm surges to flow below the road*
- ❑ *Accommodates pedestrians and bicycles*
- ❑ *Reduces erosion potential along eastern roadway shoulder*
- ❑ *Maintains access to all abutting properties*
- ❑ *Fits within existing right of way*
- ❑ *No utility relocations required*

❑ **Cons:**

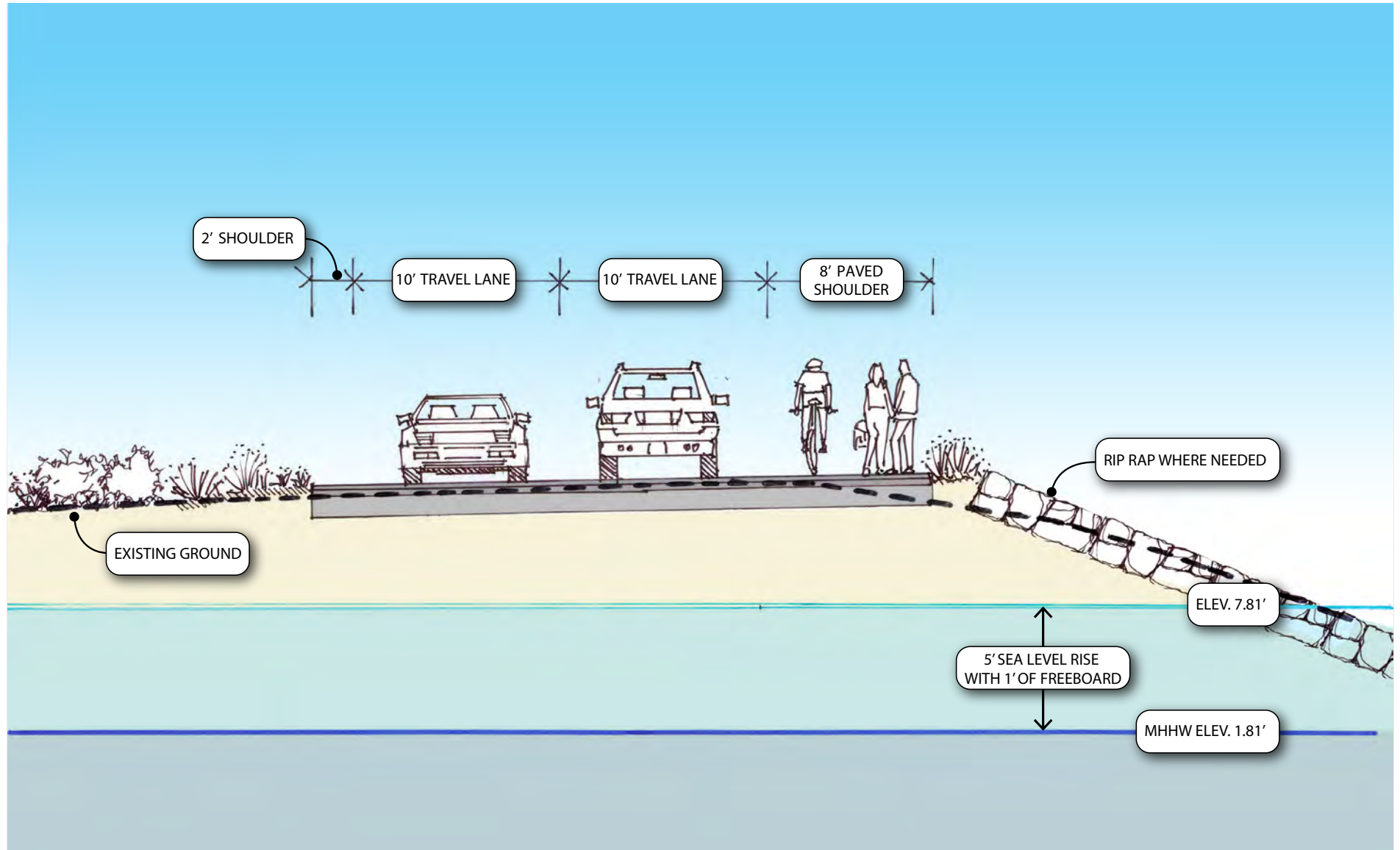
- ❑ *Roadway grading and earthwork may alter adjacent resources*
- ❑ *Rip rap armoring may impact coastal areas*
- ❑ *Increased pavement width will generate increased runoff*
- ❑ *Most expensive alternative*
- ❑ *Reduces available roadside parking*

4 Conceptual Design Alternatives

Alternative 2—Partial Bridge Structure



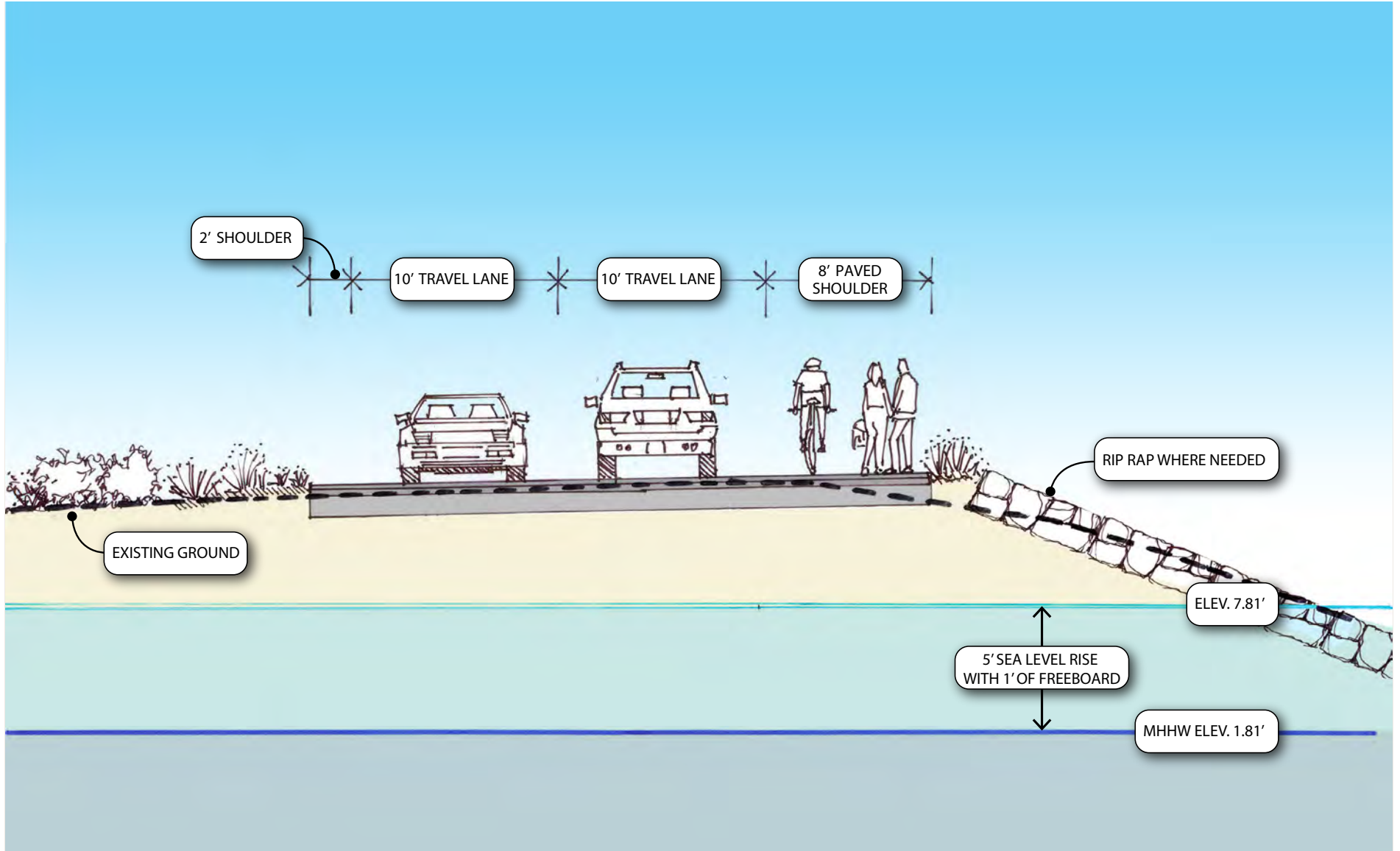
Alternative 2—Partial Bridge Structure (A-A)



Not to Scale

4 Conceptual Design Alternatives

Alternative 2—Partial Bridge Structure (B-B)



Not to Scale

Alternative 3—Combined Roadway Relocation and Elevation

Under the Relocated Road and Elevated Road Combination alternative, Corn Neck Road will be shifted to the west between the Yellow Kittens restaurant and Beach Avenue (approximately 1,900 feet) and raised between Beach Avenue and the northerly project limits (approximately 4,100 feet).

The roadway would be shifted westerly (varies from 0 to 45 feet) away from the beach. This segment of roadway was reconstructed following Superstorm Sandy when storm surge and wave action undermined the road and widespread pavement failure occurred. Other areas to the north and south where the road is setback further from tidal waters and protected by existing dunes was less damaged. The relocation would create the increased separation desired, and allow for the construction of dunes or enhancement of existing dunes along this section.

Right of way acquisition would be required from abutting property owners along the relocated segment. Approximately 33,300 square feet (0.75 acres) of property will need to be acquired to implement the roadway relocation. When laying out the revised roadway alignment, VHB avoided impact to structures or other features that would be likely to interfere with the current use of the property or result in a significant impact.

VHB assessed the possibility of raising the roadway along the relocated segment. Elevating the shifted segment would result in significant impacts on access to the abutting properties.

The remainder of Corn Neck Road would be elevated consistent with Alternative 1. Also consistent with Alternative 1, rip rap armoring would be added to the road shoulder, replacing the existing rip rap.

Engineering Considerations

For this alternative, a conceptual alignment, profile, and corridor were created using Civil3D for approximately 6,000 feet of Corn Neck Road. The alignment was shifted approximately 20-45 feet to the west at the low-lying area from the Yellow Kittens Restaurant, approximately 400 feet north of Ocean Avenue, to Beach Avenue. Once at the intersection of Beach Avenue, the alignment is back on the existing roadway until it reaches the northern project limits. The profile was created to follow the existing elevation for the shifted portion of the roadway (Yellow Kittens Restaurant to Beach Avenue) to reduce impacts to the abutting properties. North of Beach Avenue, a minimum elevation of 6 feet above existing MHHW was used to create the roadway profile. If the existing roadway was already at an elevation of 6 feet above MHHW, the roadway profile was not elevated in this area. A corridor was then built using this alignment and profile to obtain estimated slope limit impacts to abutting properties.

Additional considerations for this alternative:

- ❑ Approximately 1,100 square yards of driveways would need to be reconstructed using some combination of gravel and common fill to connect to the elevated road sections.
- ❑ Approximately 16,000 square yards of vegetated slope work to tie the new slopes back to existing grade and replace the existing roadway.
- ❑ Approximately 3,700 square yards of property acquisition would be needed for the shifted roadway.

4 Conceptual Design Alternatives

Estimated Cost: \$11.5 million

▼ Pros:

- ▼ *Incorporates adaptation strategies by shifting the road west*
- ▼ *Elevates portions of roadway 6 feet above existing MHHW*
- ▼ *Incorporates natural dune features to improve resiliency along most vulnerable road segment*
- ▼ *Accommodates pedestrians and bicycles*
- ▼ *Reduces erosion potential along eastern roadway shoulder*
- ▼ *Maintains access to all abutting properties*

▼ Cons:

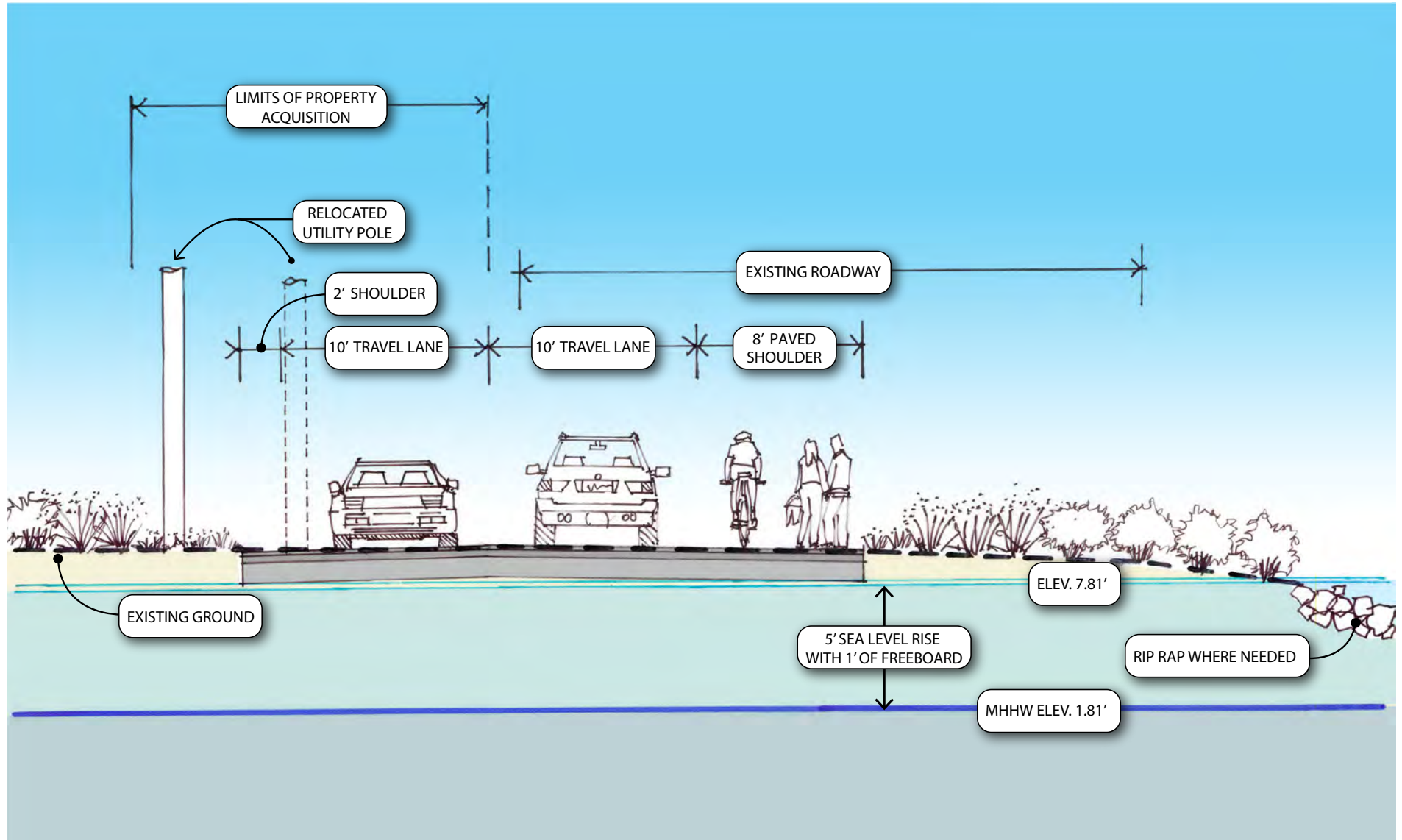
- ▼ *Roadway grading and earthwork may alter adjacent resources*
- ▼ *Rip rap armoring may impact coastal areas*
- ▼ *Increased pavement width will generate increased runoff*
- ▼ *Property acquisition required*
- ▼ *Utility relocations required*
- ▼ *Roadway subject to storm surges*

Alternative 3—Combined Roadway Relocation and Elevation



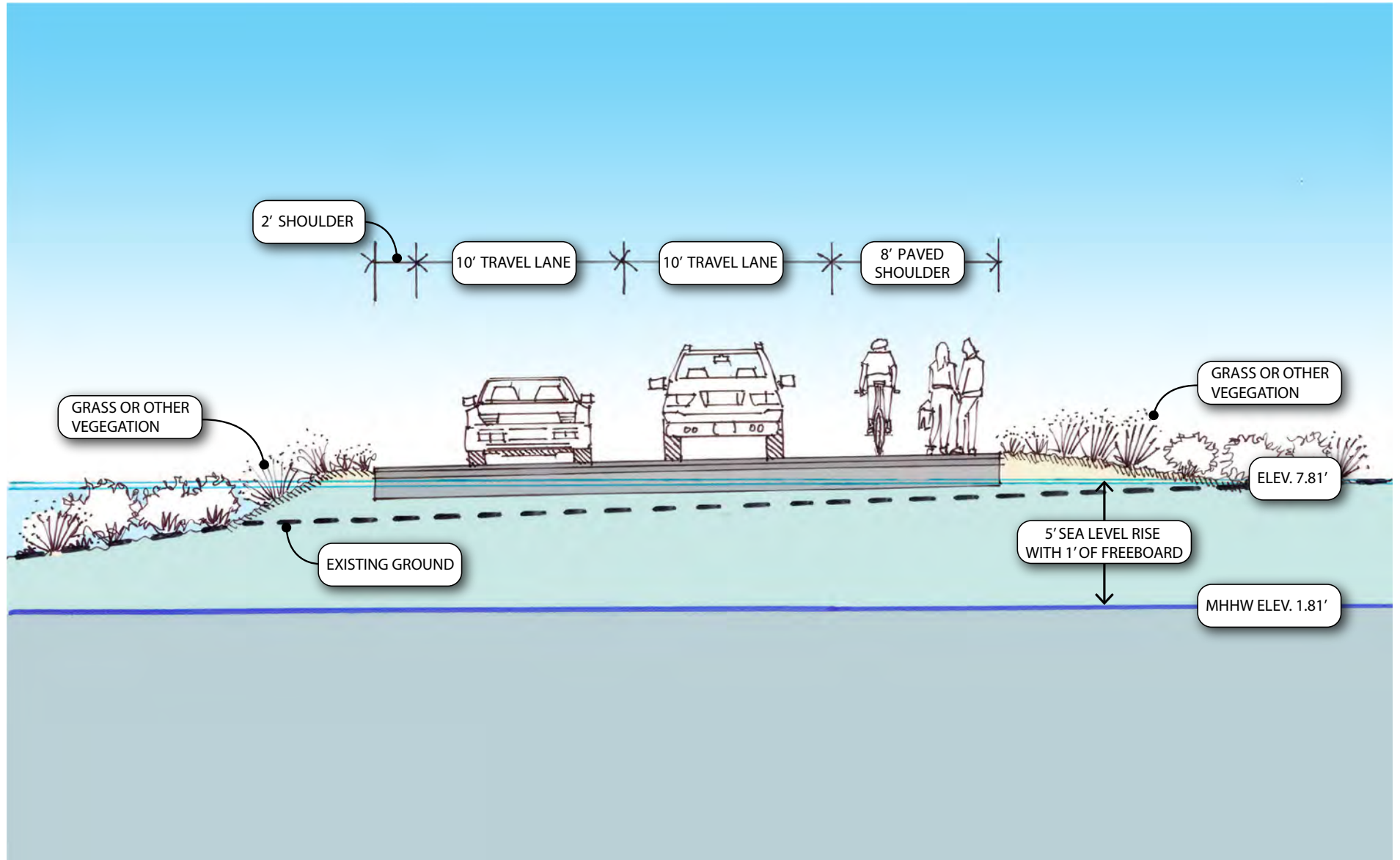
4 Conceptual Design Alternatives

Alternative 3—Combined Roadway Relocation and Elevation (A-A)



Not to Scale

Alternative 3—Combined Roadway Relocation and Elevation (B-B)



Not to Scale

Life Expectancy

Since the same design elevation is applied to each of the alternatives, they generally accommodate the same amount of sea level rise over the same approximate life span, or approximately the year 2100 using current sea level rise projections³. Alternatives 2 and 3 incorporate added resiliency elements. Under Alternative 2, the roadway can better accommodate storm surges by allowing water to flow under the structures. If modified to provide a continuous elevated structure, Alternative 2 essentially equates to the “two island” concept discussed at the project kick-off meeting and the public meeting. Alternative 3 incorporates “retreat” elements by shifting the roadway further away from the tidal waters, and includes natural best management practices by reconstructing a dune between the relocated road and the beach.

4-3 <http://www.corpsclimate.us/ccaceslcurves.cfm>

Transportation Alternatives for Corn Neck Road

ACTION	DESCRIPTION	RELATIVE RESILIENCE	COST	OBSTACLES TO CONSIDER
Elevate Road	Raise entire length of roadway (where necessary) so that the road surface is at least 6 feet above MHHW Add rip rap material on the eastern side near the Beachhead to reduce wave related erosion	Medium term	\$9.8M	<ul style="list-style-type: none"> • Access to private properties • Drainage of flood waters • End points may be subject to flooding at Bridgegate Square
Partial Bridge Structure	Construction of elevated bridge structures along the lower portions of the road Other areas will be elevated to meet the elevated structures	Long term	\$77.5M	<ul style="list-style-type: none"> • A higher structure along the entire length of Corn Neck Road may hinder access to private properties; access to beaches; and storm drainage
Relocate and Elevate Roadway	Relocate 1,900 feet of the road to the west between the Yellow Kittens and Beach Avenue Westward relocation distance varies throughout the segment Elevate the area north of Beach Avenue so the road surface is at least 6 feet above MHHW	Medium term	\$11.5M	<ul style="list-style-type: none"> • Property acquisition—the RIDOT right-of-way is not wide enough • Drainage of floodwaters • End points may be subject to flooding at Bridgegate Square

Non-Transportation Alternatives

In addition to the structural alternatives to Corn Neck Road, there are numerous mitigation measures that can be employed to improve the area's resiliency from flooding and storm surge. Through the information gathering process, the non-transportation ideas fell within the following categories:

Dune Restoration

Enhance or restore the existing dunes on the eastern side of Corn Neck Road to better protect the road from storm surge. There are many instances along the Atlantic seaboard where properly engineered dunes have protected the property behind them from wave action during a storm event. These enhancements can be done through sand replenishment from nearby dredging projects, sand fencing to capture sand, closing gaps in dunes, and providing additional room on the backside of the dune, allowing it to migrate westward.

The Town has already been working on limiting foot traffic over the sensitive dunes in undesignated places. The removable stairs that go over the dune allow for multiple safe access points to the beach. Another option may be a temporary eco-friendly slatted beach access ramp that rolls over the dune. This may be utilized up at Scotch Beach if the current access path is replaced by dunes. A combination of these options maintains dune height and access to the beach.

Additional potential dune modifications include a serpentine access through the dune at Scotch Beach instead of maintaining a straight access path. A winding path will slow incoming storm surge as it flows inland.



Developed dunes between Corn Neck Road and the ocean



Removable stairs along Corn Neck Road providing safe access to the beach and protecting sensitive dunes from foot traffic

4 Conceptual Design Alternatives

Beach Nourishment

Widening the beach can reduce wave impact and flooding effects on Corn Neck Road. Suggested options include using dredge sand on the beaches, eliminate jetties to restore the sand budget, and fill geotextile tubes with sand to put at the base of the dunes to capture sand.

Coastal Armoring

A mix of coastal armoring techniques may be explored further by the Town. Examples would include a seawall on the east side of Corn Neck Road (similar to Ocean Road in Narragansett), installing more and replace fallen rip rap along the coast, or installing marine mattresses filled with cobble rock along the shore. Each of the transportation alternatives includes a revetment component.

Offshore

Offshore structures can reduce the wave energy before it gets to shore, thereby lessening the potential damages. Offshore installations require additional studies on bathymetry, wave action, and marine habitat to develop specific designs. Project examples include rock jetties, breakwaters, a boulder reef, an oyster shell reef, or another type of manmade reef. A reef element is an alternative solution to the concrete and steel bulkheads that provides additional functions including cleaning water—a single oyster can filter as much as 50 gallons per day; and providing food and habitat for a diversity of plants and animals, including fish, crabs and birds. These are relatively low cost easy to install solutions that may be suitable for lower energy environments.

Burying Overhead Utilities

Burying power lines can improve the resilience and reliability of the electric system as well as other communication and cable wires. The

improvement is a direct result of sheltering the utility lines from physical hazards like wind and water that undermine the stability of the utility poles that support them. Costs for the design and construction of underground utilities can be prohibitive, and time needed to make repairs may dramatically increase because the lines are rendered largely inaccessible. Additionally, some utility companies report that storm-related flooding—particularly salt-water flooding—can cause and prolong outages in underground systems, and can shorten the life and increase the ongoing maintenance of the underground system⁴. Recent examples of burying utility lines include Sachuest Point in Middletown, Rhode Island. Lines were buried along a 1.5 mile roadway corridor between Purgatory Road and the Sachuest National Wildlife Refuge (<http://www.providencejournal.com/news/20170511/buried-power-lines-now-reality-along-middletowns-sachuest-point-road>). The cost of the project is reported to be \$2.15 million and funding for the project was obtained from private donations and Hurricane Sandy Disaster Repair funding. An added benefit is an improved viewshed.

Scotch Beach Access

During the project meetings, the Working Group identified the Scotch Beach Access Road as a location of concern. During Superstorm Sandy, this road funneled water and sand up from the ocean west across Corn Neck Road, effectively flooding the road and leaving behind sand and debris that obstructed the road. It was suggested that realigning the access road from a more or less straight shot to an alignment that is more sinuous would mitigate the funnel effect. VHB developed a relocation concept for the roadway which would effectively shift the road south slightly, and fill in from the north. The existing roadway is

⁴ http://www.entergy.com/2008_hurricanes/Underground-lines.pdf

Scotch Beach Roadway Relocation Concept



Not to Scale



Example walkover mat



Straight access path to Scotch Beach is at risk of incoming storm surge

4 Conceptual Design Alternatives

more than 20 feet wide in many places. The concept allows for a 15 foot wide road which is more than adequate for recreational and emergency vehicles. Existing parking along the south side of the access-way could be maintained. A more refined design could be developed, but site specific wind and wave data and geotechnical data would be required to develop that concept.

Enhancement of Beach and Revetment System

During the public information meeting, members of the public shared information regarding the Study Area that suggests the nearshore area east of the Beachhead was formerly land not subject to tidal inundation, and that over the years, this area has eroded and subsided, becoming smaller each year. Others speculated that the construction of the breakwater around Old Harbor interrupted the natural depositional processes feeding this segment of the shoreline which caused the continuous decrease in land elevation in this area. In response to this suggestion, VHB coastal geologists evaluated a beach enhancement scenario where aggregate material could be deposited on the beach segment to enhance the beach elevations and stabilize the beach profile. It was concluded that adding sand alone would not substantially protect the roadway because the elevation and volume of material needed to accomplish this goal is not practicable from a permitting or construction standpoint. VHB concluded that some system of revetment would still be needed to protect the roadway.

Consequently, VHB developed a beach enhancement and revetment alternative which includes the construction of a rip rap revetment similar to that proposed under Transportation Alternatives 1 and 3, combined with a “beach fill” which would substantially broaden and stabilize the beach profile.

Estimated Cost: \$3.9 million

Non-Transportation Alternative

Pros:

- ✔ *Protects the roadway from storm surge*
- ✔ *Least expensive alternative*
- ✔ *Appropriate location for future harbor dredge spoil disposal*

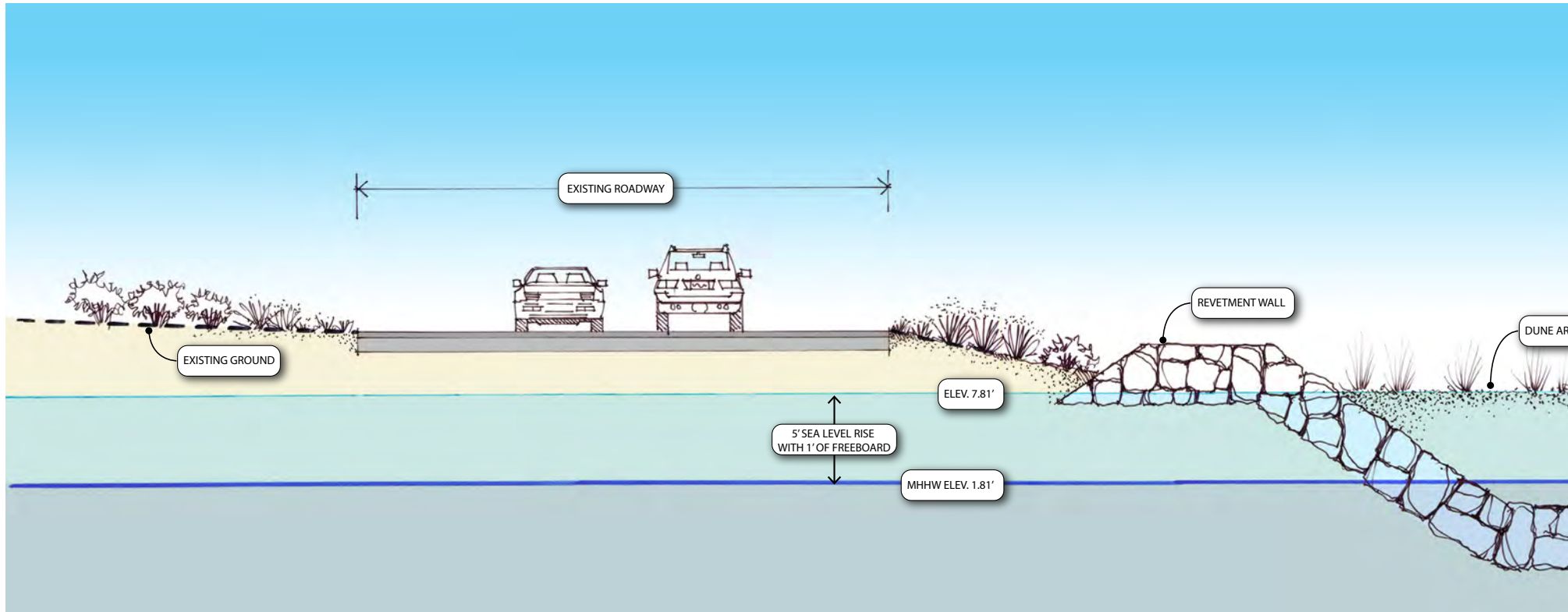
Cons:

- ✔ *Doesn't address sea level rise*
- ✔ *Storm surges would still overtop the road*
- ✔ *Requires periodic re-nourishment of the beach*
- ✔ *Greater impacts to natural resources than other alternatives*

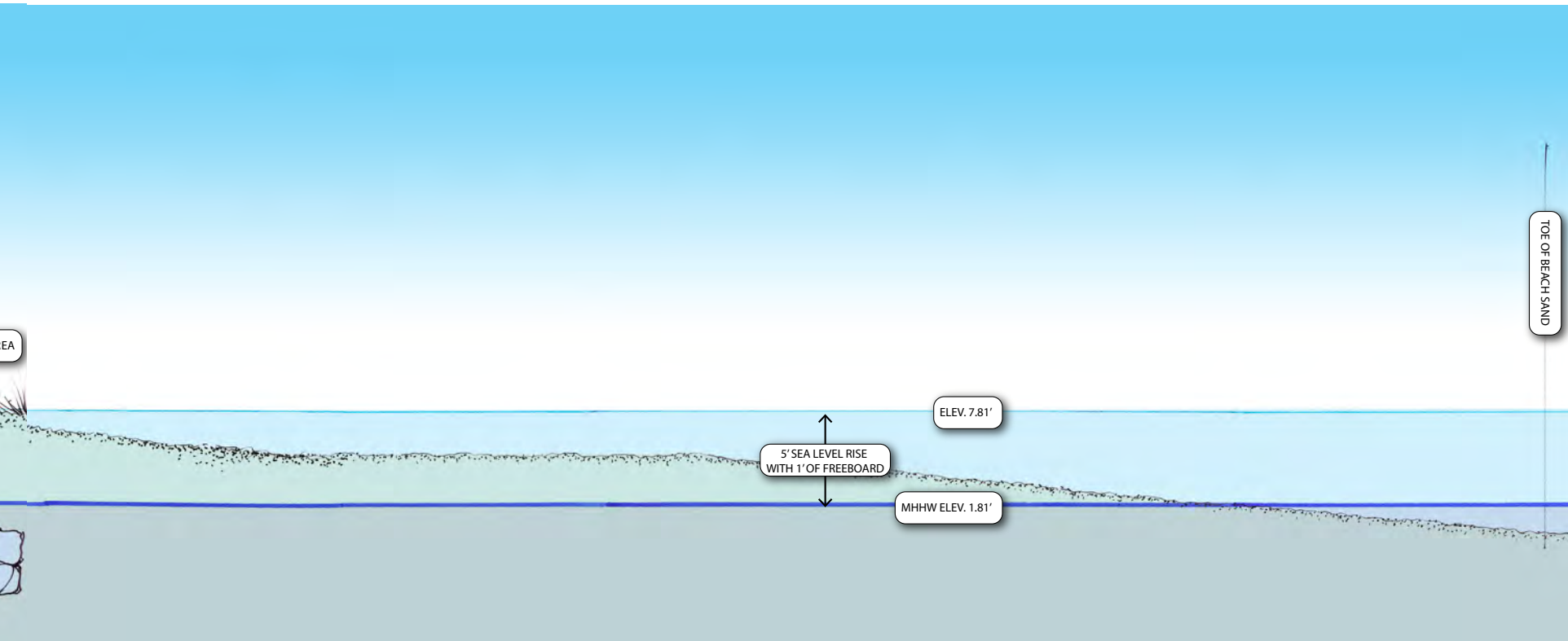
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4 Conceptual Design Alternatives

Non-Transportation Alternative



Not to Scale



Additional Studies Needed

Depending on what type of mitigation project the Town chooses to make Corn Neck Road more resilient to the effects of climate change, additional studies are likely to be required. Below are some examples:

ADDITIONAL STUDY	ALTERNATIVE 1 ELEVATION	ALTERNATIVE 2 PARTIAL BRIDGE STRUCTURE	ALTERNATIVE 3 ROADWAY SHIFT AND ELEVATION COMBINATION	NON-TRANSPORTATION
Hydrodynamic and sediment transport model				✓ Coastal armoring Offshore reef
Water quality modeling for tidal areas of Great Salt Pond		✓		
SWAN (Simulating Waves Nearshore) to model the energy contained in incoming waves	✓	✓	✓	✓ Dune Restoration Beach Nourishment Coastal armoring Offshore reef
Stormwater runoff analysis	✓	✓	✓	✓
Cost benefit analysis	✓	✓	✓	✓
Historic and archaeological resources survey	✓	✓	✓	✓
Wetland and natural resource survey	✓	✓	✓	✓
Topographic and bathymetric survey	✓	✓	✓	✓

Summary of Alternatives

ALTERNATIVE DESCRIPTION	PROS	CONS	COST
01 – Elevated Road	<ul style="list-style-type: none"> • Elevates road 6’ above MHHW • Accommodates pedestrians • Reduces erosion • Maintains access to abutting properties • No utility relocations 	<ul style="list-style-type: none"> • Grading may impact adjacent natural resources • Rip rap armoring may impact coastal resources • Increased runoff • Roadway subject to storm surges 	\$9.8M
02 – Partial Bridge Structure	<ul style="list-style-type: none"> • Elevates road 6’ above MHHW • Storm surges pass below structure • Accommodates pedestrians • Reduces erosion • Maintains access to abutting properties • No utility relocations 	<ul style="list-style-type: none"> • Grading may impact adjacent natural resources • Rip rap armoring may impact coastal resources • Increased runoff • Roadway subject to storm surges • Reduces available roadside parking 	\$77.5M
03 – Combined Roadway Relocation & Elevation	<ul style="list-style-type: none"> • Incorporates adaptation by shifting roadway west • Includes dune restoration/enhancement • Elevates road 6’ above MHHW • Accommodates pedestrians • Reduces erosion • Maintains access to abutting properties 	<ul style="list-style-type: none"> • Grading may impact adjacent natural resources • Rip rap armoring may impact coastal resources • Increased runoff • Roadway subject to storm surges • Property acquisition required • Utility relocation required 	\$11.5M
04 – Beach Enhancement & Revetment System	<ul style="list-style-type: none"> • Reduces erosion during storm surges 	<ul style="list-style-type: none"> • Doesn’t address sea level rise • Storm surges still overtop the road • Requires periodic beach re-nourishment • Greater impacts to natural resources than other alternatives 	\$3.9M

4 Conceptual Design Alternatives

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5 Environmental Permitting for Conceptual Alternatives

National Environmental Policy Act

The National Environmental Policy Act (NEPA) was established in 1970 to promote the evaluation of impacts to the natural and human environment resulting from projects that are classified as a “federal action”. Federal actions include activities or projects undertaken or funded by a federal agency, and issuance of a permit by a federal agency for a particular activity. NEPA established the Council on Environmental Quality (CEQ) which promulgated guidance for federal agencies to establish their own guidance and standards for the implementation of NEPA. Transportation projects are often executed with funding from the Federal Highway Administration (FHWA).

It is FHWA’s policy that:

- ❑ To the fullest extent possible, all environmental investigations, reviews, and consultations be coordinated as a single process, and compliance with all applicable environmental requirements be reflected in the environmental document required by this regulation.
- ❑ Alternative courses of action be evaluated and decisions be made in the best overall public interest based upon a balanced consideration of the need for safe and efficient transportation; of the social, economic, and environmental impacts of the proposed transportation improvement; and of national, state, and local environmental protection goals.
- ❑ Public involvement and a systematic interdisciplinary approach be essential parts of the development process for proposed actions.
- ❑ Measures necessary to mitigate adverse impacts be incorporated into the action.

If the project is funded by FHWA, a Class of Action determination must be made by FHWA regarding the preferred Transportation Alternative which will define the level of review appropriate under NEPA.

Regulatory Jurisdiction

The Project Area is bounded by tidal waters on both sides. Tidal waters are regulated by the USACE and the CRMC. The USACE has authority over waters of the United States, which extends from the limit of international waters 12 miles offshore to the landward limit of the inter-tidal zone, and freshwaters including rivers, lakes and ponds and any tributary wetlands. CRMC has regulatory authority over state waters from the 3-mile limit offshore extending landward to include the inter-tidal zone, the coastal feature and the upland area contiguous to the coastal feature.

Tidal waters adjacent to the Project Area are mapped by CRMC as Type 1 Waters designated for conservation. Type 1 waters include water areas that are within or adjacent to the boundaries of designated wildlife refuges and conservation areas, water areas that have retained natural habitat or maintain scenic values of unique or unusual significance, and water areas that are particularly unsuitable for structures due to their exposure to severe wave action, flooding, and erosion. Type 1 waters receive the highest level of protection and CRMC regulations for these areas are the most restrictive. Many activities are prohibited on shorelines abutting type 1 waters.

CRMC further maps the section of Corn Neck Road within the Study Area as barrier beach: moderately developed and developed. Moderately developed barriers generally lack developed structures but may contain surfaced roads, recreational structures and structural shoreline facilities. Developed barrier beaches contain developed structures and associated infrastructure. The Coastal features within the study area include beach backed by dune, manmade shoreline and barrier beach on the east, and coastal wetlands backed by barrier beach on the west. The entire Project Area is within the upland area contiguous to these features, and consequently the entire Project Area is subject to CRMC regulatory authority.

CRMC Water Type Classification

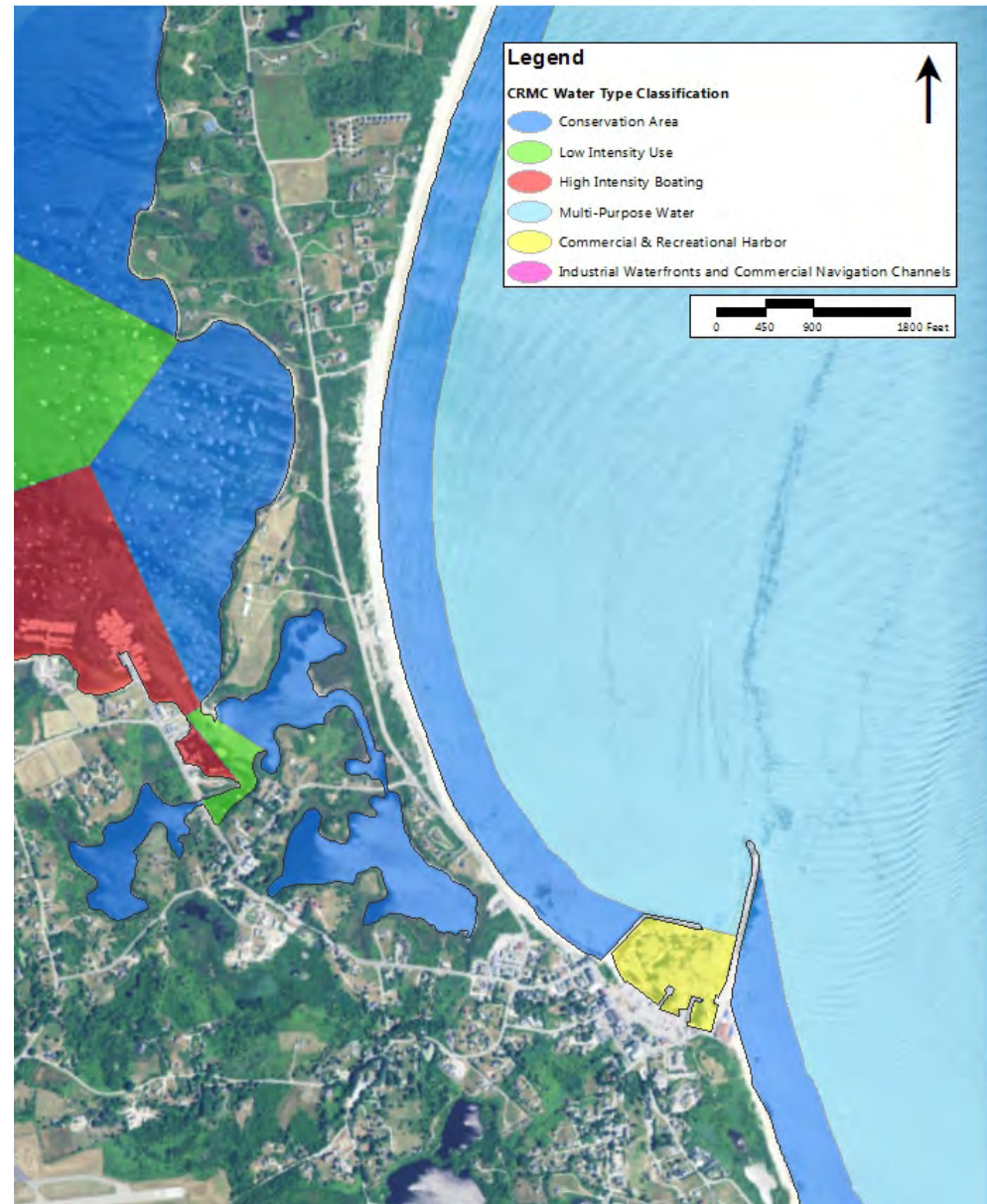
CRMC Consultation

In the development of this Planning Study, VHB consulted with the CRMC staff. CRMC recommended that the Town file a Preliminary Determination Application for the conceptual alternatives. This type of application is helpful in determining regulatory and permitting requirements for a proposed design. It can be used to help an applicant understand what information will be needed for a review should an applicant decide to move forward on the activity. The Preliminary Determination results of a Report of Findings which is not a permit. CRMC issued a Report of Findings dated 11/15/17 (refer to Appendix I).

Generally, because the Project Area abuts Type 1 waters, CRMC favors stabilization with vegetation and beach nourishment. CRMC also prohibits new structural shoreline protection methods on barriers classified as undeveloped, moderately developed, and developed and in Type 1 waters.

CRMC has an experimental coastal erosion policy currently only applied along the headlands of Misquamicut (Westerly) and Matunuck (South Kingstown). Erosion control methods such as marine mattresses filled with cobble rock or geo-textile bags filled with sand may be permitted for temporary experimental use in the designated area. Project monitoring for effectiveness and adverse impacts are required. Some experimental technologies may be approved for use on Block Island. Further consultation is recommended with CRMC.

It is anticipated that a Special Exception will likely be required for all of the Conceptual Alternatives. Special Exceptions may be granted by the CRMC for otherwise prohibited activities to permit alterations and activities that do not conform with a CRMC goal for the area affected or which would otherwise be prohibited by the requirements of the program. Applicants must demonstrate that the alteration serves a compelling public purpose which provides benefits to the public as a



5 Environmental Permitting for Conceptual Alternatives

whole; all reasonable steps are taken to minimize environmental impacts; and no reasonable alternatives to the proposed activity exist. Special Exceptions are requested through the application process for the project.

Anticipated Permits

Based on the Project Area's location entirely within CRMC jurisdiction, it is anticipated that every conceptual alternative will require some type of authorization from CRMC.

Transportation Alternatives

Alternative 1—Elevated Roadway

- ❑ NEPA Class of Action Determination and other permitting as determined by the lead federal agency
- ❑ CRMC Category B Assent – triggered due to structural shoreline stabilization and or probable fill in tidal waters, also filling, removing and grading of shoreline features
- ❑ USACE Pre-construction Notification – triggered due to structural shoreline stabilization and or probable fill in tidal waters

Alternative 2—Bridge Structure Option

- ❑ NEPA Class of Action Determination and other permitting as determined by the lead federal agency
- ❑ CRMC Category B Assent – triggered due to construction of new bridge on barrier beach and potential shoreline stabilization
- ❑ USACE Pre-construction Notification – triggered due to structural shoreline stabilization and or probable fill in tidal waters associated with structural shoreline stabilization

Alternative 3—Relocation and Elevate Roadway

- ❑ NEPA Class of Action Determination and other permitting as determined by the lead federal agency
- ❑ CRMC Category B Assent – triggered due to construction on barrier beach
- ❑ USACE – not anticipated

Non-Transportation Alternatives

Dune Restoration

- ❑ CRMC Category A Assent – triggered due to construction on barrier beach
- ❑ USACE – Self-verification Notification

Beach Nourishment

- ❑ CRMC Category B Assent – Category B adjacent to all coastal features in Type 1 waters
- ❑ USACE – Self-verification Notification

Offshore Technologies

- ❑ CRMC Category B Assent – triggered due to fill in tidal waters
- ❑ USACE Pre-construction Notification – triggered due to fill in tidal waters

Enhancement of Beach and Revetment System

- ❑ CRMC Category B Assent – triggered due to fill in tidal waters, structural shoreline protection in Type 1 waters
- ❑ USACE Individual Permit – fill in tidal waters exceeding 10,000 cubic yards

6 Additional Vulnerable Areas

6 Additional Vulnerable Areas

Throughout this planning process, there were additional flooding and resiliency issues that were identified, but were outside the scope of the Project Study Area along Corn Neck Road. As resources allow, the Town may want to consider further studies to explore ways to address the flooding concerns summarized below.

Bridgewater Square

According to the Block Island Hazard Mitigation Plan and public discussions, Bridgewater Square is susceptible to sea level rise impacts. Bridgewater Square is the area of town where Ocean Avenue, Dodge Street, Corn Neck Road, and Old Town Road meet in a 4-way intersection. This is a low-lying area about 500 feet southwest of the town beach. During heavy rain events and coastal storms, this intersection acts as a basin and has been flooded with stormwater from the upland areas and seawater from the ocean. The drainage system was replaced in 2015 and functions as it was designed. However, during high tides, it takes longer for the area to drain large volumes of water because the tidal waters surcharge the drainage outlets. Currently this is an occasional inconvenience, but if sea levels and climate conditions change, the area may not drain properly on a routine basis. Improvements at Bridgewater Square that would target the flooding may include:

- ❑ Installation of tidal flapgates or check valves at drainage outfalls to the pond. These check valves would prohibit tidal waters from surging into the drainage system under high tide or moderate surge events.
- ❑ Raising the roadway elevation above sea level rise and storm surge projections to maintain through access. This alternative would need to consider all or at least proximate segments of Ocean Avenue and Corn Neck Road. Elevating these roadway segments would impact access to adjacent properties, which will need to be considered in any such scenario.



Four-way intersection of Bridgewater Square, looking towards Corn Neck Road

In order to design any solution to this problem, the Town would need to conduct an analysis that considers stormwater runoff and storm surges in a combined model that evaluates the functioning of the drainage system under a variety of rainfall intensity and tidal scenarios. Typically engineers would utilize a modeling program such as the Natural Resource Conservation Service TR-20 Hydrologic Model with a tailwater condition. The TR-20 model generates the volume of runoff that can be anticipated from a given rainfall event based upon the size of the watershed, the runoff curve number based upon the surface condition (i.e. pavement versus grass) and the intensity of the rainfall event. The tailwater condition would mimic the tidal elevation in the pond that is

surcharging the drainage system. Through this analysis, the Town would be able to identify what combination of storm event/tidal conditions cause flooding within the intersection and adopt a mitigation strategy. The TR-20 model would require topographic data for the watershed and a survey of the drainage system to map system components and inverts.

Ocean Avenue and Beach Avenue

The length of Ocean Avenue between Bridgegate Square and Corn Neck Road via Ocean Avenue and Beach Avenue may be considered for future traffic routing if the southern portion of Corn Neck Road is washed out. However, future studies would have to be done before improving elevation and drainage along Ocean Avenue. See Appendix E for the current elevation profile. The following areas are low areas where flooding occurs:

- ❑ Southeast of the entrance to the Block Island Power Company.
- ❑ Approximately at 450 Ocean Avenue—west of Connecticut Avenue near the culvert to Harbor Pond.
- ❑ West of Poor People’s Pub and Kimberly’s near the culvert for Harbor Pond.

Additional Vulnerable Locations

Additional areas of New Shoreham are also vulnerable to flooding and sea level rise but are outside the geographic scope and intent of this Planning Study. The following areas were noted during discussions with the Working Group, the public, and Project Stakeholders.

- ❑ Beach Avenue Bridge at Harbor Pond (also has freeboard concern as per RI Statewide Planning SLR Transportation Assets report).
- ❑ Beach Avenue to be used as an alternative to Corn Neck Road if there are funds available to elevate the roadbed.



View of Harbor Pond



Ponding at intersection of Beach Road and Corn Neck Road

6 Additional Vulnerable Areas

- ❑ Ocean Avenue Bridge at Trims Pond (also has freeboard concern as per RI Statewide Planning SLR Transportation Assets report).
- ❑ Ocean Avenue to be used as an alternative to Corn Neck Road if there are funds available to elevate the roadbed.
- ❑ Spring Street is threatened by erosion.
- ❑ Chapel Street has a history of flooding.

7 Recommendations

7 Recommendations

In order to be prepared for future conditions as identified in the project purpose, the Town must select a preferred alternative from the major alternatives evaluated: No Build, Elevated Road, Partial Bridge Structure, Relocated and Elevated Roadway, and Beach Enhancement and Revetment System. These alternatives cover a range from costs and improved resilience. Advancing a design for any of the alternatives except the No Build alternative would require one or more analyses or studies (see page 50), and field studies and data collection to support the design, permitting and construction of that alternative. If able to secure funding for such a project, the Town could initiate these studies and data collection and advance the development of the selected alternative from conceptual or preliminary design.

For the Non-Transportation Alternatives, somewhat lesser data and funding requirements may make these projects easier to implement. Additionally, some of these projects appeared to be favored by CRMC in their review of the Draft Resiliency Plan. Specifically, the CRMC Report of Findings appeared to favor the Realignment of Scotch Beach Access to reduce the surge channel effect, as well as the Beach Nourishment

and Dune Restoration concepts. Permitting of these projects would be complicated by the designation of the area as an undeveloped barrier under the Coastal Barrier Resource Act. With CRMC as a project advocate, the federal permitting process may be somewhat more streamlined.

Additional actions that could produce immediate results include more beachgrass plantings, creating more walkover structures for the public to access the beach without walking on the dunes, and desisting the annual dune breaching opposite the Beachhead Restaurant. Walking on dunes is harmful to the existing vegetation, leading to destabilization and erosion of the dune. Excavating the breach through the dune creates a weak point in the dune, which is likely to be more susceptible to wave erosion during storm events. Preserving the dune system in a relatively undisturbed state will increase its stability over time as the area becomes vegetated and cohesive soil structure is developed. These “low tech” solutions may be able to be implemented with minimal cost by volunteer and student groups.



8 Potential Project Funding Sources

8 Potential Project Funding Sources

After a Presidentially declared disaster, FEMA disaster funds such as 406 or 404 funding may be used by the State to repair Corn Neck Road. However, if the Town is interested in rebuilding the damaged road to be more resilient, they may have to seek additional funds to cover the difference in costs. Similarly, if the Town is interested in resiliency improvements now, they should actively seek out appropriate funds. VHB researched potential sources of funding to assist with roadway improvement. The chart below summaries federal, state, and local entities that may be able to help pay for the proposed project alternatives.



FEMA 406 Public Assistance (following a Presidentially declared disaster)

- Repairs to the disaster-damaged facilities
- Applied only to the parts of the structure that were damaged by the disaster

FEMA 404 HMGP (following a Presidentially declared disaster)

- Provide protection to undamaged parts of a structure to prevent or reduce future damages
- May be used with 406 to bring the entire facility to a higher level of disaster resistance
- In order for FEMA mitigation funds to be used, the cost-benefit ratio must exceed 1.0 when using the FEMA Benefit Cost Analysis Tool (this would require high traffic counts and long detour times)

FEMA Flood Mitigation Assistance

- Annual appropriation for projects and plans that reduce or eliminates long-term risk of flood damage to structures insured under the National Flood Insurance Program



US Department of Housing and Urban Development (HUD) CDBG-DR Grant (following a Presidentially declared disaster)

Appropriate disaster recovery grants to rebuild the affected area and aid in the recovery process



US Economic Development Administration (EDA)

Disaster Recovery/Post-Disaster Economic Recovery grants to support recovery in disaster-impacted communities



US Environmental Protection Agency (EPA)

Various green infrastructure funding opportunities for nonpoint source pollution, stormwater management, protection and management of wetlands, oceans, and watersheds



National Oceanic and Atmospheric Administration

- Climate Program Office funds high-priority climate science, assessments, decision support research, outreach, education, and capacity-building activities



Rhode Island Department of Transportation

- State Transportation Improvement Program (U.S. Department of Transportation funds)
- Pavement Capital Program



Town Bonds**Capital Improvement Funds****Taxes**

- Provide the town with a consistent stream of income to fund both the implementation cost and the operation and maintenance costs for the nature-based project
- An example might be a Dune Preservation Fund, a small percentage tax on real estate transactions

Fees

- Such as fees tied directly to use of Town Beach



Private Funds

- Donations, gifts

Private Grants

- Rhode Island Foundation Strategy Grants
- See Foundation Director Online available at local libraries to see a list of grantmakers in the area.

Partnerships

- The Nature Conservancy
- U.S. Fish and Wildlife
- Volunteer organizations

- How to Pay for Green Infrastructure (Georgetown Climate Center): <http://www.georgetownclimate.org/adaptation/toolkits/green-infrastructure-toolkit/how-to-pay-for-green-infrastructure-funding-and-financing.html>

Additional Resources

8 Potential Project Funding Sources

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Appendix

A Other Hazard Resiliency Projects Reviewed

Examples of Other Hazard Resiliency Projects

Highway Resilience Projects

- ❑ **Port Fourchon, LA.** 9 miles of Louisiana's LA-1 (used for gas and supply distribution) was elevated onto 17-foot pillars to combat the effects of rising seas and sinking land. Benefit-cost analysis estimated that a 3-week loss in services at the Port would lead to \$10 million in lost sales for U.S. firms. <https://www.climate.gov/news-features/climate-case-studies/built-last-climate-data-ensure-oil-supply-route-gulf-mexico>
- ❑ **Colorado.** Moved the flood-damaged road away from the river. <https://www.climate.gov/news-features/climate-case-studies/colorado-rebuilding-riverside-roads-withstand-future-floods>
- ❑ **Miami Beach, FL.** Raised roads and build the seawall 4-5 feet higher in Sunset Harbor. <http://www.npr.org/2016/05/10/476071206/as-waters-rise-miami-beach-builds-higher-streets-and-political-willpower>
- ❑ **Chilmark, MA.** Elevated causeway construction to begin in the fall of 2017 to bypass an eroding road and maintain access to Squibnocket Farm residents. <http://www.mvtimes.com/2017/01/25/chilmark-planners-want-voters-decide-squibnocket-causeway-question/>

Shoreline Resiliency Projects

- ❑ **Cape May Point State Park, NJ.** Ecological restoration project including both natural infrastructure (reconstructing dunes for bird nesting, restoring freshwater channel and foraging ponds, and creating islands in the wetlands) and engineered aspects (levees and water control structures). During Hurricanes Sandy and Irene waves did not breach dunes and wetlands remained intact. <https://toolkit.climate.gov/case-studies/restoring-natural-dunes-enhance-coastal-protection>
- ❑ **Cape Cod, MA.** Dune planting included sand fencing and dune vegetation. <http://www.whoi.edu/fileserver.do?id=87224&pt=2&p=88900>
- ❑ **Prime Hook Refuge, DE.** Filled dune gaps from Superstorm Sandy with offshore sand. Re-slope the dunes and stabilize with native vegetation. <https://www.fws.gov/hurricane/sandy/projects/PrimeHook.html>
- ❑ **Fire Island, NY.** Emergency repairs at Robbins Rest to build a 15-foot high dune and a 90-foot wide berm in response to destruction from Superstorm Sandy. Used stockpiled sand. <http://www.newsday.com/long-island/suffolk/cuomo-dune-project-on-robbins-rest-on-fire-island-complete-1.11808279>

- ❑ **Fire Island, NY.** Various interim and one-time renourishment projects. Includes an ongoing Reformulation Study to identify storm damage risk reduction and evaluate erosion and hurricane protection measures. <http://www.nan.usace.army.mil/Media/Fact-Sheets/Fact-Sheet-Article-View/Article/487483/fact-sheet-fire-island-to-montauk-point/> <http://fireisland-news.com/projects-update-fire-island-beach-rebuilding-to-restart-next-fall/>
- ❑ **Long Beach, NY.** Rebuilding dunes, new groin jetties and groin rehabs. Urban, engineered area. <http://www.newsday.com/long-island/nassau/long-beach-dunes-to-be-rebuilt-under-37-5m-army-corps-project-1.11640199>
- ❑ **Southeast, MA.** Examples of rock mattresses, sand burritos and a dune tram in Plymouth, Massachusetts <http://www.capecodtoday.com/blogs/Bourne/2014/09/03/26819-Beach-Management-Plymouth-Style>
- ❑ **Barnstable, MA.** Bio-engineered soft solutions <http://www.cleengineering.com/projects/blish-point-stabilization-using-bio-engineering-techniques/>
- ❑ **Pensacola, FL.** Breakwater reefs constructed of oyster shells for protecting eroding coastlines and re-establishing lost marsh. <http://nrCsolutions.org/pensacola-florida/>
- ❑ **Brunswick Town, NC.** Testing a new design of artificial oyster reef in high-energy wave action areas to combat coastal erosion. <https://www.coastalreview.org/2017/06/can-new-reef-design-save-historic-shoreline/>

Online Resiliency Tools

- ❑ **Naturally Resilient Communities** <http://nrCsolutions.org>
 - ❑ *Case studies, funding resources, and ways to implement nature-based solutions.*
- ❑ **U.S. Climate Resilience Toolkit** <https://toolkit.climate.gov>
 - ❑ *Case studies, tools, and climate-relevant reports and experts*
- ❑ **Resilience and Adaptation in New England (RAINE)** <https://www.epa.gov/raine>
 - ❑ *A database with vulnerability, resilience and adaptation reports, plans, and webpages throughout the region.*

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Appendix

B Public Input

Public Input: Corn Neck Road Alternatives

Idea	General Location	Improvement Type	Elevate Roadway	Structural Concept	Relocate Roadway	Non-transportation	Non-Scope Related	Bridgegate Flooding	Timing
Elevate Corn Neck Road from Scotch Beach to Beachead	Project Area	Elevation	X						Post-disaster
Elevate Corn Neck at Scotch Beach Road.	Scotch Beach	Elevation	X						Either
Elevate a portion of Corn Neck Road where Sandy hit.	Beachead	Elevation	X						Either
Elevate all of Corn Neck Road, cement revetment, boardwalk.	Project Area	Elevation	X						Post-disaster
Drainage under CNR	Beachead	Drainage		X					Post-disaster
Ferry to connect North and South.	Beachead	Infrastructure		X					Post-disaster
Small bridge to connect North and South	Beachead	Infrastructure		X					Post-disaster
Small raised roads or bridges across Great Salt Pond	West side	Infrastructure		X					Either
Raised causeway/viaduct along CNR	Beachead	Infrastructure		X					Post-disaster
One or more WIDE bridges so stormwater is channelled underneath.	Project Area	Infrastructure		X					Either
Causeway with dedicated bike lane	Project Area	Road use		X					Post-disaster
CNR bridge from Beachead to Beach Ave.	Project Area	Infrastructure		X					Post-disaster
Abandon Bridgegate.	Bridgegate	Relocate			X				Post-disaster
Eliminate road from gas station to Beach Ave.	Beachead	Infrastructure			X				Post-disaster
Move road 6' west between gas station and Beach Road.	Beachead	Infrastructure			X				Post-disaster
Make CNR a walking path	Beachead	Road use			X				Either
One-way on CNR, use extra lane to build up dune.	Project Area	Dune Design				X	X		Post-disaster
Madmade reef at Beachead	Beachead	Offshore				X			Post-disaster
Put rocks behind a seawall where dunes are gone.	Beachead	Seawall				X			Post-disaster
Serpentine access to Scotch Beach Road (not straight).	Scotch Beach	Dune Design				X			Pre-disaster
Let energy flow through at choke points.	Scotch Beach	Dune Design				X			Pre-disaster
Building dune and installing wooden slatted beach access ramp at Scotch Beach	Scotch Beach	Dune Design				X			Pre-disaster
Offshore riprap to reduce wave energy.	Offshore	Offshore				X			Post-disaster
Dike with removable floodgates in the channel behind BI Maritime Institute to control surge	West side	Infrastructure				X	X		Either
Enhance natural systems.	Project Area	Dune Design				X			Pre-disaster
Maintain <u>current</u> dune structure.	Project Area	Dune Design				X			Pre-disaster
Close gaps in the dunes	Project Area	Dune Design				X			Post-disaster

Public Input: Corn Neck Road Alternatives

Idea	General Location	Improvement Type	Elevate Roadway	Structural Concept	Relocate Roadway	Non-transportation	Non-Scope Related	Bridgegate Flooding	Timing
Wooden dune fencing	Project Area	Dune Design				X			Pre-disaster
Develop a sand budget for the beach (transport).	Project Area	Sand				X			Pre-disaster
Eliminate jetties and restore sand budget, use west side.	Project Area	Sand				X			Post-disaster
Sand replenishment (offshore to inshore).	Project Area	Sand				X			Pre-disaster
Dredge old harbor every year for sand	Project Area	Sand				X			Pre-disaster
Sand in geotextile tubes at waterline	Project Area	Sand				X			Pre-disaster
Raise berm on ocean side	Project Area	Sand				X			Pre-disaster
Marine mattresses (filled w cobble rock)	Project Area	Seawall				X			Pre-disaster
Sink a surplus ship to provide offshore wave barrier	Project Area	Offshore				X			Either
Oyster reef installed with eel grass	Project Area	Offshore				X			
Rocks and seawall 60 ft. high, some below ground	Project Area	Seawall				X			Post-disaster
Seawall and riprap	Project Area	Seawall				X			Post-disaster
Hurricane barrier walkway (New Bedford)	Project Area	Infrastructure				X			Post-disaster
Widening the existing riprap w. big rock	Beachhead	Seawall				X			Either
Low tide maintenance program of digging out fallen riprap	Beachhead	Seawall				X			Pre-disaster
Allow dunes in front of Beachhead to develop.	Beachhead	Dune Design				X			Pre-disaster
The road is fine as is. Do nothing.	Project Area	None				X			-
Keep people off dunes	Project Area	Dune Design				X			Pre-disaster
Rock jetties to lessen wave impact	Project Area	Offshore				X			Pre-disaster
Install breakwater to assist with the building of the beach	Project Area	Offshore				X			Pre-disaster
Boulder reef off crescent beach to reduce wave energy	Project Area	Offshore				X			Pre-disaster
Allow dunes to rebuild and become continuous at Beach Pavillion and Scotch Beach entrances- move pavillion	Project Area	Dune Design				X			Pre-disaster
Short term- allow/encourage dunes to fill in.	Project Area	Dune Design				X			Pre-disaster
Maze of snow fencing in front of pavilion.	Town Beach	Dune Design				X			Pre-disaster
Dredge salt ponds to increase flood storage	Project Area	Sand				X			Either
Bridge at Dead Eye Dick's	West side	Infrastructure					X		Post-disaster
Elevate Ocean Ave and Beach Ave and abandon southern portion of CNR	West side	Infrastructure					X		Post-disaster
Modular buildings at Town Beach – remove in winter/storm.	Town Beach	Infrastructure					X		Pre-disaster

Public Input: Corn Neck Road Alternatives

Idea	General Location	Improvement Type	Elevate Roadway	Structural Concept	Relocate Roadway	Non-transportation	Non-Scope Related	Bridgegate Flooding	Timing
Culvert <u>under</u> Corn Neck Road at Town Beach parking lot.	Town Beach	Drainage					X		Post-disaster
Move Town Pavillion Back	Town Beach	Infrastructure					X		Pre-disaster
Better signage for bicycles and mopeds	Project Area	Road use					X		Either
Bike lane	Project Area	Road use					X		Either
Moving pedcrossing to non-ocean side with crosswalks at crossovers	Project Area	Road use					X		Post-disaster
Local zoning – not lateral setback but height/elevation.	Project Area	Zoning					X		Either
Seasonal stop signs to slow traffic	Project Area	Road use					X		Pre-disaster
Seasonal shuttle bus	Project Area	Road use					X		Pre-disaster
Wider walking path separated from road	Project Area	Road use					X		Pre-disaster
Reroute northern traffic around	Beachhead	Road use					X		Post-disaster
Widen shoulders for bikers and walkers	Project Area	Infrastructure					X		Either
Voluntary relocation for southern Corn Neck Road owners	Project Area	Relocate					X		Post-disaster
Dike around Bridgegate	Bridgegate	Infrastructure						X	Post-disaster
Manage flood waters due to heavy rain (rain gardens)	Bridgegate	Infrastructure						X	Either
Drainage improvements/allow water to flow south at Beachhead.	Beachhead	Drainage						X	Post-disaster

Appendix

C Public Meeting Documentation



www.vhb.com
Engineers | Scientists | Planners | Designers

Public Open Meeting Corn Neck Road

April 19, 2017

Bridgewater Square becomes flooded as the storm runoff overwhelms the drainage system, and the Scotch Beach access point funnels the storm surge from the beach across Corn Neck Road. The Town has hired VHB to conduct a planning study which will focus on long-term alternatives for this vulnerable stretch of Corn Neck Road between Scotch Beach and Bridgewater Square to mitigate the impacts from storm surge and sea level rise.

Proposed Timeline for Corn Neck Road Study

- » **April:** Public Open Meeting
- » **May:** Team review of project alternatives, and compile plan
- » **June:** Planning Board to review preliminary findings
- » **July 12:** Draft plan and design alternatives presented at a Planning Board meeting
- » **August 9:** Final plan and design alternatives presented at a Planning Board meeting



What do you think is the best long-term solution for Corn Neck Road?

Please participate in the following online survey which has been created to share your thoughts and ideas.

<https://www.surveymonkey.com/r/CornNeckRoad>



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Corn Neck Road planning session

For sea level rise and flood prevention

By Carissa Lord | Sat, 04/15/2017 - 10:45am

Category: [News](#)

The following was sent in by Carissa Lord, a Hazard Mitigation specialist for VHB, a firm engaged by the town to assist in looking at ways to mitigate areas on Block Island subject to damage and flooding during storms.

Anyone who has been on-island during a major coastal storm or a particularly high tide event knows that sections of Corn Neck Road cannot escape destructive wave action, migrating dunes, or overland flooding. Conditions are only expected to get worse. Because of that, the town has kicked off a new planning study that will focus on long-term alternatives for a vulnerable stretch of Corn Neck Road between Scotch Beach and Bridgegate Square, in order to mitigate the impacts from storm surge and sea level rise. This planning study was identified as a need in the town's recently adopted Comprehensive Plan and in the Hazard Mitigation Plan. Analyses included in the Comprehensive Plan indicate that portions of Corn Neck Road are projected to be inundated as a result of three to five feet of sea level rise.

The timing of when that much change may occur could be sooner than later. A 2017 National Oceanic and Atmospheric Administration report estimates a worst-case scenario for New England might be more than nine feet of relative sea level rise by 2100. Even now, in bad storms, Bridgegate Square becomes flooded as the storm runoff overwhelms the drainage system, and the Scotch Beach access point funnels the storm surge from the beach across Corn Neck Road.

As sea level rises, the geography of the areas connecting the harbors will also be dramatically impacted, requiring that alternatives to the present roadway configuration be developed.

In an effort to be proactive, the Planning Board, with the assistance of partners and residents, would like to identify a creative long-term solution for Corn Neck Road that will better serve the community, mitigate storm impacts and avoid costly future road repairs.

On Wednesday, April 19, from 11:30 a.m. to 1:30 p.m., there will be a public event at Town Hall to discuss opportunities to reduce erosion, storm surge inundation, and sea-level rise effects along Corn Neck Road. The public is invited to share thoughts, ideas, and concerns with the team from VHB, the firm hired by the town to assist with this planning effort. An overview of the Corn Neck Road issues will be followed by a public discussion. (On October 27, 2016, the town was awarded Community Development Block Grant Disaster Recovery funds to explore alternatives for Corn Neck Road and the preservation of a long-term connection to the northern end of the island if Corn Neck Road were to remain inundated as a result of sea level rise.)

Low-lying portions of Corn Neck Road are a constant concern when storms hit Block Island. In 2010, storm-driven sands were deposited on Corn Neck Road at Scotch Beach, creating treacherous conditions for vehicular traffic. During Hurricane Sandy, in late October 2012, the eastern side of the island was pummeled by hurricane-force wind and waves. Corn Neck Road was damaged in three areas: Bridgegate Square; an 1,800 foot section of Corn Neck Road north of Bridgegate Square; and Scotch Beach. The road was rebuilt to pre-existing standards without any local input.

Emergency repairs and post-storm recovery projects such as rip-rap and dune replanting have only met the minimum requirements to stabilize Corn Neck Road. The southern portion of Corn Neck Road still remains extremely vulnerable and will likely suffer significant damage as a result of the next major storm.

Sea level rise can seem like a slow process, but one strong coastal storm can change the landscape significantly in a matter of hours. With public input we can find the best solution for the future of Block Island.

The town has hired the firm VHB who has put together a cross disciplinary team to assist with this critical planning effort. During the initial phase of this project, VHB will be collecting information from residents and other stakeholders to capture their concerns and thoughts about the future of Corn Neck Road. From this first list of suggestions, VHB will identify and evaluate a range of alternatives, and develop preliminary design sketches for the four most practicable alternatives.

A draft report of project findings will be presented at a future Planning Board meeting before being finalized. The current timeline is to have the Planning Board accept the final study at the August 2017 meeting.

Public engagement throughout this planning process is not only encouraged but is vital in order to produce the best possible solution.

For additional project information, periodically check the Town's website www.new-shoreham.com (www.new-shoreham.com) . Those who can't make it on Wednesday can share their perspectives with the planning team anonymously (or not so anonymously). Please email Carissa Lord at clord@vhb.com (<mailto:clord@vhb.com>) or take part in a short survey <https://www.surveymonkey.com/r/CornNeckRoad> (<https://www.surveymonkey.com/r/CornNeckRoad>) .



Most Popular

- Uncertain times for island's... (940)
- Seafloor disturbance monitored (838)
- The unseen benefit of the wind... (829)
- A tale of two new establishments (735)
- Rite of Passage (687)
- Historic moment may be quiet event (617)
- Block Island receives wind power for... (597)
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Corn Neck Road
Public Open Meeting 4/19/17

<u>Name</u>	<u>Ad</u>
Doug Gilpin	
Margie Comings	
Fran Benedit	F
Chickwick	I
Becky Clark	
Mary Jane Peterson	
Jon A. Peterson	
Dan & Lynda Le	
Amy Macdougall	
MARC TILLSON	
Sven Risom	
Socha Cohen	
Marth Bell	
Paul Morte	
Nigel Grindley	E
Cathy Joyce	S
Jim Hinshaw	F
Elizabeth Crawford	
Kim Cufflett	
Christie Greene	
Mary E. Anderson ^{Hanning B}	
Judith Gray	
Dee Verbeyst	
Andrew Tunney	
CR McGinnis	
Frances Migliaccio	

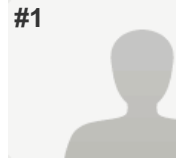
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Appendix

D On-line Survey Results

New Shoreham- Corn Neck Rd

#1



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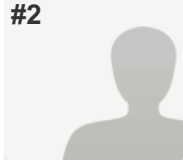
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Q1: Tell us a bit about yourself (click all that apply).	I'm a property owner on the Island , I am a seasonal resident, I vacation on Block Island , Other (please specify) We spend some shoulder season time on the Island
Q2: Why do you currently use Corn Neck Road? (click all that apply)	Access home, Access to recreation , Other (please specify) For access to town services -- both public and private
Q3: I travel along Corn Neck Road by... (click all that apply)	Car, Bike, Walking
Q4: During an average week in the off-season, how often do you drive on Corn Neck Road?	once
Q5: During an average week in the summer, how often do you drive Corn Neck Road?	more than 5 times
Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road?	Very concerned
Q7: What improvements would you like to see on Corn Neck Road?	<i>Respondent skipped this question</i>
Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?	Better dune protection useful for storm surges, probably not that useful for sea level rise. Not sure what can be done to mitigate the effects of sea level rise.
Q9: What do you envision as being the best long-term solution for Corn Neck Road?	Probably a bridge or causeway.
Q10: Optional: Please provide your name and contact info.	

New Shoreham- Corn Neck Rd

#2



COMPLETE

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Last Modified: Monday, April 17, 2017 6:26:30 PM

Time Spent: 00:02:27

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PAGE 1

Q1: Tell us a bit about yourself (click all that apply).

Other (please specify)
former year round resident that lived and worked on island

Q2: Why do you currently use Corn Neck Road? (click all that apply)

Access to family/friends

Q3: I travel along Corn Neck Road by... (click all that apply)

Car

Q4: During an average week in the off-season, how often do you drive on Corn Neck Road?

twice

Q5: During an average week in the summer, how often do you drive Corn Neck Road?

twice

Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road?

Somewhat concerned

Q7: What improvements would you like to see on Corn Neck Road?

better shoulders for bikers and walkers.

Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?

focus on beach ave to the north and forgo actions in front of the beachhead.

Q9: What do you envision as being the best long-term solution for Corn Neck Road?

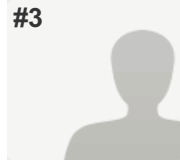
reroute the road.

Q10: Optional: Please provide your name and contact info.

Respondent skipped this question

New Shoreham- Corn Neck Rd

#3



COMPLETE

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PAGE 1

Q1: Tell us a bit about yourself (click all that apply). I'm a property owner on the Island ,
I vacation on Block Island

Q2: Why do you currently use Corn Neck Road? (click all that apply) Access home, Access to recreation

Q3: I travel along Corn Neck Road by... (click all that apply) Car, Walking

Q4: During an average week in the off-season, how often do you drive on Corn Neck Road? 3 to 5 times

Q5: During an average week in the summer, how often do you drive Corn Neck Road? 3 to 5 times

Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road? Very concerned

Q7: What improvements would you like to see on Corn Neck Road? Respondent skipped this question

Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise? Respondent skipped this question

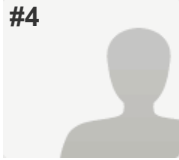
Q9: What do you envision as being the best long-term solution for Corn Neck Road?

Raise the roadway and build drainage underneath to permit storm water to flow away...

Q10: Optional: Please provide your name and contact info. Respondent skipped this question

New Shoreham- Corn Neck Rd

#4



COMPLETE

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Q1: Tell us a bit about yourself (click all that apply). Other (please specify) Working on a Planning Study

Q2: Why do you currently use Corn Neck Road? (click all that apply) Other (please specify) Study it

Q3: I travel along Corn Neck Road by... (click all that apply) Walking

Q4: During an average week in the off-season, how often do you drive on Corn Neck Road? Respondent skipped this question

Q5: During an average week in the summer, how often do you drive Corn Neck Road? never

Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road? Very concerned

Q7: What improvements would you like to see on Corn Neck Road?

Pedestrian

Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?

Build a bridge

Q9: What do you envision as being the best long-term solution for Corn Neck Road?

Build a bridge

Q10: Optional: Please provide your name and contact info.



#5

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Q1: Tell us a bit about yourself (click all that apply).	I'm a property owner on the Island , I'm an island business owner, I'm a year round resident
Q2: Why do you currently use Corn Neck Road? (click all that apply)	Access home, Access work, Access to recreation , Access to family/friends
Q3: I travel along Corn Neck Road by... (click all that apply)	Car
Q4: During an average week in the off-season, how often do you drive on Corn Neck Road?	more than 5 times
Q5: During an average week in the summer, how often do you drive Corn Neck Road?	more than 5 times
Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road?	Very concerned
Q7: What improvements would you like to see on Corn Neck Road?	Better signage for bicycles and mopeds. Bike lane, but not sure that can happen. Flooding mitigation near Town beach and Bridgegate Sq.
Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?	Create a "barrier" near the Beachhead. Like the idea of a man made reef suggested at the public meeting. Close the gaps in the protective dunes. Keep tourists off the dunes except at designate crossing spots.
Q9: What do you envision as being the best long-term solution for Corn Neck Road?	A bridge to the north end \$\$\$\$\$\$\$
Q10: Optional: Please provide your name and contact info.	<i>Respondent skipped this question</i>

#6



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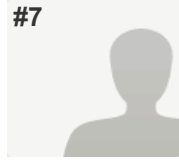
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IP Address:

PAGE 1

-
- Q1: Tell us a bit about yourself (click all that apply).** I'm a property owner on the Island ,
I'm an island business owner,
I am a seasonal resident
-
- Q2: Why do you currently use Corn Neck Road? (click all that apply)** Access home, Access work, Access to recreation,
Access to family/friends
-
- Q3: I travel along Corn Neck Road by... (click all that apply)** Car, Bike
-
- Q4: During an average week in the off-season, how often do you drive on Corn Neck Road?** 3 to 5 times
-
- Q5: During an average week in the summer, how often do you drive Corn Neck Road?** more than 5 times
-
- Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road?** Very concerned
-
- Q7: What improvements would you like to see on Corn Neck Road?**
What time period? 5-10 years? 10-30 years? 30-83 years?
Short-term: Consider raising the berm on the ocean side, and providing a different location or positioning for the emergency access point opposite The Beachhead.
Maybe consider a dike with insertable/removable floodgates in the channel behind BIM1 to control surgewater into the 'back bay' areas.
-
- Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?**
See 7 above.
-
- Q9: What do you envision as being the best long-term solution for Corn Neck Road?**
Elevated causeway in 30 years.
-
- Q10: Optional: Please provide your name and contact info.**

New Shoreham- Corn Neck Rd

#7



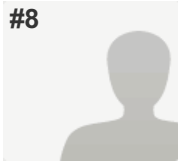
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Q1: Tell us a bit about yourself (click all that apply).	I'm a property owner on the Island , I am a seasonal resident
Q2: Why do you currently use Corn Neck Road? (click all that apply)	Access to recreation , Access to family/friends
Q3: I travel along Corn Neck Road by... (click all that apply)	Car, Bike, Walking
Q4: During an average week in the off-season, how often do you drive on Corn Neck Road?	twice
Q5: During an average week in the summer, how often do you drive Corn Neck Road?	more than 5 times
Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road?	Very concerned
Q7: What improvements would you like to see on Corn Neck Road?	The road is bucolic and charming. Would love to see it stabilized with lowest impact on aesthetics.
Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?	Let nature take its course. You can't fight it. The road should be made into an independent structure at its most vulnerable parts and/or raised, but erosion will continue as it has for thousands of years.
Q9: What do you envision as being the best long-term solution for Corn Neck Road?	Likely need a slightly raised concrete structure that allows water to flow underneath during storms. Would need this to run from bridge gate square to just past scotch beach. Key question is what happens to pedestrian access and bikes with this sort of solution.
Q10: Optional: Please provide your name and contact info.	<i>Respondent skipped this question</i>

#8



COMPLETE

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Last Modified: Thursday, April 20, 2017 12:28:15 PM

Time Spent: 00:13:20

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PAGE 1

Q1: Tell us a bit about yourself (click all that apply). I'm a property owner on the Island

Q2: Why do you currently use Corn Neck Road? (click all that apply) Access home, Access to recreation

Q3: I travel along Corn Neck Road by... (click all that apply) Car, Bike, Walking

Q4: During an average week in the off-season, how often do you drive on Corn Neck Road? once

Q5: During an average week in the summer, how often do you drive Corn Neck Road? more than 5 times

Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road? Very concerned

Q7: What improvements would you like to see on Corn Neck Road?

The rip rap along the stretch from Kittens to just shy of beach ave has not been maintained at all and many of the large rocks have shifted down towards the water, leaving bare spots of black "tapping" with the small rocks vulnerable to erosion. CRMC has given the town approval to maintain the ripe rap by using two machines to replace the slipped rocks back on the hillside and/or adding more rock. The walkovers are a great first step and stop people from walking all over the dunes and more importantly walking on the rocks. Due to the nature of people, I have personally, seen and tried to stop, numerous numbers of teen boy groups on the rocks pushing the rocks down the embankment enjoying the tumbling boulders. So a low tide maintenance program of digging the fallen rock out of the sand and putting back on the rip rap would be helpful in general erosion control.

Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?

The most obvious would be a sea wall on that stretch of road, or as the CMC people have said, bringing in very large rock and creating a natural sea wall would be viable in all but the worst of potential storms. Also, moving all the foot traffic to the "non ocean" side of the road with crossovers to the beach stairs would further reduce people walking on the dunes and thus the rip rap wall. This would also create a safer summertime situation on Cornneck.

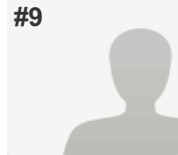
Q9: What do you envision as being the best long-term solution for Corn Neck Road?

A seawall built along the Corn Neck stretch would be the best long term solution. The seawall fronted by a rip rap wall that was properly maintained would be a definitive long term solution and the one that most towns historically and in the planning for the future all along the eastern side of the US are leaning toward and planning to construct. This is a vital stretch of road for all concerned using the island and needs to be preserved.

Q10: Optional: Please provide your name and contact info.

New Shoreham- Corn Neck Rd

#9



COMPLETE

Collector: Web Link 1 (Web Link)
 Started: Sunday, April 23, 2017 8:09:58 PM
 Last Modified: Sunday, April 23, 2017 8:17:37 PM
 Time Spent: 00:07:38
 IP Address:

PAGE 1

Q1: Tell us a bit about yourself (click all that apply).	I'm an island business owner, I'm a year round resident
Q2: Why do you currently use Corn Neck Road? (click all that apply)	Access to recreation, Access to family/friends, Other (please specify) access to the transfer station
Q3: I travel along Corn Neck Road by... (click all that apply)	Car, Bike
Q4: During an average week in the off-season, how often do you drive on Corn Neck Road?	3 to 5 times
Q5: During an average week in the summer, how often do you drive Corn Neck Road?	3 to 5 times
Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road?	Somewhat concerned
Q7: What improvements would you like to see on Corn Neck Road?	I think we should NOT improve Corn Neck road. Rather, we need to re-route traffic to avoid the section of road that may be damaged in storm surges
Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?	As above, it is a waste of recourses to keep repairing the road. It is much better to re-route traffic.
Q9: What do you envision as being the best long-term solution for Corn Neck Road?	Small raised roads or bridges between the high points inside Great Salt Pond.
Q10: Optional: Please provide your name and contact info.	You cannot create a plan for Corn Neck Road without considering the entire area around the pond. It would be a big mistake to invest in a Corn Neck Road causeway when damage to other areas in actually more important. A real solution would divert traffic away from the flood prone areas and save lower Corn Neck Road for a preserve and recreation with limited access.

New Shoreham- Corn Neck Rd

#10



COMPLETE

Collector: Web Link 1 (Web Link)
Started: Monday, April 24, 2017 7:11:59 PM
Last Modified: Monday, April 24, 2017 8:10:59 PM
Time Spent: 00:59:00
IP Address:

PAGE 1

Q1: Tell us a bit about yourself (click all that apply). I'm a property owner on the Island ,
I am a seasonal resident , I vacation on Block Island

Q2: Why do you currently use Corn Neck Road? (click all that apply) Access to recreation , Access to family/friends,
Other (please specify) trips to the dump

Q3: I travel along Corn Neck Road by... (click all that apply) Car, Bike

Q4: During an average week in the off-season, how often do you drive on Corn Neck Road? never

Q5: During an average week in the summer, how often do you drive Corn Neck Road? twice

Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road? Very concerned

Q7: What improvements would you like to see on Corn Neck Road?

1. Seasonal stop signs to slow traffic and provide crosswalks near beach access points
2. Seasonal shuttle bus to decrease car and moped traffic
3. Wider walking/biking path possibly separated from road
4. Better care and protection of the dunes and grasses

Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?

1. Rebuild any beach access points, such as Scotch Beach access, that are susceptible to storm surge. Consider redesigning the Scotch Beach parking to allow for a natural high dune that will help resist high storm waters. Build boardwalks over the dunes at all beach accesses and encourage visitors to stay off dunes to prevent damage to natural systems.
2. To manage flood waters due to high rains, consider rain gardens: low-lying vegetated areas where runoff storm water can collect and percolate into the ground. These systems lessen the flow of water into the storm drain system and service the local water table.

New Shoreham- Corn Neck Rd

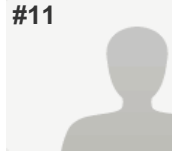
Q9: What do you envision as being the best long-term solution for Corn Neck Road?

1. Ideas: I believe that Corn Neck Road will need to be envisioned as a causeway or bridge over the most vulnerable and low-lying areas near the beaches. Raising the elevation of the road would provide an opportunity to redesign the natural surrounding to better manage the storm waters, provide for the potential flow of water under the roadway, and build an adequate storm management system. Foot and bike paths could be separated from the road and integrated into a more natural low-lying landscape that might be designed to permit occasional flooding.
 2. Learn by example: There are many other communities in the United States and the world that are managing similar problems. It would be valuable to study strategies implemented elsewhere in order to learn from their experiences and plans. A valuable website put together by NOAA for case studies is: <https://www.climate.gov/news-features/department/climate-case-studies>
-

Q10: Optional: Please provide your name and contact info.

New Shoreham- Corn Neck Rd

#11



COMPLETE

Collector: Web Link 1 (Web Link)

Started: Wednesday, April 26, 2017 11:18:15 PM

Last Modified: Wednesday, April 26, 2017 11:21:24 PM

Time Spent: 00:03:08

IP Address:

PAGE 1

Q1: Tell us a bit about yourself (click all that apply).	I'm a property owner on the Island , I'm an island business owner , I'm a year round resident
Q2: Why do you currently use Corn Neck Road? (click all that apply)	Access work, Other (please specify) Access to my property and business
Q3: I travel along Corn Neck Road by... (click all that apply)	Car, Bike, Walking
Q4: During an average week in the off-season, how often do you drive on Corn Neck Road?	more than 5 times
Q5: During an average week in the summer, how often do you drive Corn Neck Road?	more than 5 times
Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road?	Very concerned
Q7: What improvements would you like to see on Corn Neck Road?	Respondent skipped this question
Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?	Respondent skipped this question
Q9: What do you envision as being the best long-term solution for Corn Neck Road?	Respondent skipped this question
Q10: Optional: Please provide your name and contact info.	



#12

COMPLETE

Collector: Web Link 1 (Web Link)
 Started: Saturday, April 29, 2017 10:06:31 AM
 Last Modified: Saturday, April 29, 2017 10:16:54 AM
 Time Spent: 00:10:23
 IP Address:

PAGE 1

Q1: Tell us a bit about yourself (click all that apply).	I'm a property owner on the Island , I am a seasonal resident , Other (please specify) I am an owner with no say pay taxes but no input as not year round resident
Q2: Why do you currently use Corn Neck Road? (click all that apply)	Access to recreation , Access to family/friends, Other (please specify) Transfer station
Q3: I travel along Corn Neck Road by... (click all that apply)	Car, Bike
Q4: During an average week in the off-season, how often do you drive on Corn Neck Road?	once
Q5: During an average week in the summer, how often do you drive Corn Neck Road?	more than 5 times
Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road?	Somewhat concerned
Q7: What improvements would you like to see on Corn Neck Road?	Rip rap
Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?	Rip rap for surge No solution for sea rise
Q9: What do you envision as being the best long-term solution for Corn Neck Road?	Causeway not a long term solution unless from beacon hill to clayhead
Q10: Optional: Please provide your name and contact info.	<i>Respondent skipped this question</i>

New Shoreham- Corn Neck Rd

#13



COMPLETE

Collector: Web Link 1 (Web Link)

Started: Saturday, April 29, 2017 9:43:57 PM

Last Modified: Saturday, April 29, 2017 9:49:37 PM

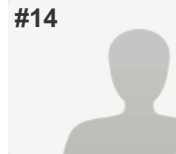
Time Spent: 00:05:39

IP Address:

PAGE 1

-
- Q1: Tell us a bit about yourself (click all that apply).** I vacation on Block Island
-
- Q2: Why do you currently use Corn Neck Road? (click all that apply)** Access to recreation , Access to family/friends
-
- Q3: I travel along Corn Neck Road by... (click all that apply)** Car, Bike, Walking
-
- Q4: During an average week in the off-season, how often do you drive on Corn Neck Road?** once
-
- Q5: During an average week in the summer, how often do you drive Corn Neck Road?** 3 to 5 times
-
- Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road?** Very concerned
-
- Q7: What improvements would you like to see on Corn Neck Road?**
block island is too small for a two island option. One or more WIDE bridges such that storm water is channeled underneath is likely the best solution.
-
- Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?**
I would imagine more than one bridge will be needed. Starting with one bridge with federal and/or state assistance would make a lot of sense. BI - just like with wind energy - can be at the forefront of this global concern and seek financial assistance as a trail blazer.
-
- Q9: What do you envision as being the best long-term solution for Corn Neck Road?**
Bridges so storm water can be channeled underneath.
-
- Q10: Optional: Please provide your name and contact info.** *Respondent skipped this question*
-

New Shoreham- Corn Neck Rd



#14

COMPLETE

Collector: Web Link 1 (Web Link)
 Started: Sunday, April 30, 2017 6:48:32 AM
 Last Modified: Sunday, April 30, 2017 7:08:43 AM
 Time Spent: 00:20:10
 IP Address:

PAGE 1

Q1: Tell us a bit about yourself (click all that apply). I vacation on Block Island

Q2: Why do you currently use Corn Neck Road? (click all that apply) Access to recreation

Q3: I travel along Corn Neck Road by... (click all that apply) Car, Bike

Q4: During an average week in the off-season, how often do you drive on Corn Neck Road? never

Q5: During an average week in the summer, how often do you drive Corn Neck Road? 3 to 5 times

Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road? Somewhat concerned

Q7: What improvements would you like to see on Corn Neck Road?

Work to strengthen, lengthen and widen the natural system of sand dunes using native sea grasses. Restricted parking on the road side. Controlled restrictions on public access ways across the dunes, if any.

Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?

See 7. Educate visitors about the importance of sand dunes as natural surge protectors. Have regular grass planting sessions.

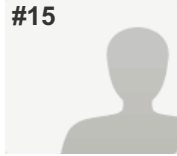
Q9: What do you envision as being the best long-term solution for Corn Neck Road?

Culverts to channel water between the Great Salt Pond system and the ocean sounds like a good idea to dissipate rising waters but probably wouldn't make much difference in a storm. Breakwaters and 'groynes' simply move sand elsewhere and can weaken rather than strengthen the coast under threat - see UK studies on coastal erosion along the east coasts of Yorkshire and Lincolnshire. Gabion basket walls filled with rocks can trap sand and enable plants to grow but a big storm might simply rip them out. Trees/shrubs could help stabilise some areas. Or you could simply let nature take its course and make provisions for a causeway to link the two sides of the island - crossing only possible at low tide or by a push-pull roll-on roll-off flat-bed ferry-on-a-wire type of arrangement at high tide. It would be another unique reason to visit the Island!

Q10: Optional: Please provide your name and contact info.

New Shoreham- Corn Neck Rd

#15



COMPLETE

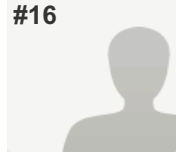
Collector: Web Link 1 (Web Link)
Started: Sunday, April 30, 2017 10:03:31 PM
Last Modified: Sunday, April 30, 2017 10:05:13 PM
Time Spent: 00:01:41
IP Address:

PAGE 1

Q1: Tell us a bit about yourself (click all that apply).	I'm a property owner on the Island
Q2: Why do you currently use Corn Neck Road? (click all that apply)	Access home
Q3: I travel along Corn Neck Road by... (click all that apply)	Car
Q4: During an average week in the off-season, how often do you drive on Corn Neck Road?	once
Q5: During an average week in the summer, how often do you drive Corn Neck Road?	more than 5 times
Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road?	Very concerned
Q7: What improvements would you like to see on Corn Neck Road?	<i>Respondent skipped this question</i>
Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?	<i>Respondent skipped this question</i>
Q9: What do you envision as being the best long-term solution for Corn Neck Road?	<i>Respondent skipped this question</i>
Q10: Optional: Please provide your name and contact info.	<i>Respondent skipped this question</i>

New Shoreham- Corn Neck Rd

#16



COMPLETE

Collector: Web Link 1 (Web Link)
 Started: Monday, May 01, 2017 5:38:03 AM
 Last Modified: Monday, May 01, 2017 5:43:11 AM
 Time Spent: 00:05:07
 IP Address:

PAGE 1

Q1: Tell us a bit about yourself (click all that apply). I'm a property owner on the Island ,
 I vacation on Block Island

Q2: Why do you currently use Corn Neck Road? (click all that apply) Access to recreation

Q3: I travel along Corn Neck Road by... (click all that apply) Car, Bike

Q4: During an average week in the off-season, how often do you drive on Corn Neck Road? 3 to 5 times

Q5: During an average week in the summer, how often do you drive Corn Neck Road? 3 to 5 times

Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road? Very concerned

Q7: What improvements would you like to see on Corn Neck Road?
 It works fine for me as is.

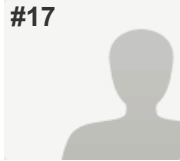
Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?
 Build dunes to fight erosion.

Q9: What do you envision as being the best long-term solution for Corn Neck Road?
 Causeway supported by bridges as needed or close one or both lanes to make room for dunes.

Q10: Optional: Please provide your name and contact info. *Respondent skipped this question*

New Shoreham- Corn Neck Rd

#17



COMPLETE

Collector: Web Link 1 (Web Link)

Started: Monday, May 01, 2017 10:37:32 AM

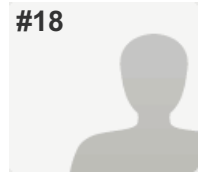
Last Modified: Monday, May 01, 2017 10:39:45 AM

Time Spent: 00:02:13

IP Address:

PAGE 1

Q1: Tell us a bit about yourself (click all that apply).	I take day trips to Block Island
Q2: Why do you currently use Corn Neck Road? (click all that apply)	Access to recreation
Q3: I travel along Corn Neck Road by... (click all that apply)	Bike
Q4: During an average week in the off-season, how often do you drive on Corn Neck Road?	once
Q5: During an average week in the summer, how often do you drive Corn Neck Road?	once
Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road?	Very concerned
Q7: What improvements would you like to see on Corn Neck Road?	Move the road back away from the water enough that it can be navigated by bike and car.
Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?	natural landscaping, dunes & vegetation
Q9: What do you envision as being the best long-term solution for Corn Neck Road?	natural barriers to sea, not sea wall
Q10: Optional: Please provide your name and contact info.	<i>Respondent skipped this question</i>



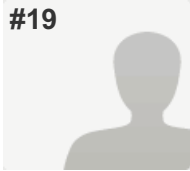
COMPLETE

Collector: Web Link 1 (Web Link)
Started: Monday, May 01, 2017 12:15:21 PM
Last Modified: Monday, May 01, 2017 12:18:17 PM
Time Spent: 00:02:55
IP Address:

PAGE 1

Q1: Tell us a bit about yourself (click all that apply).	I'm a property owner on the Island , I am a seasonal resident , I work but do not reside on Block Island
Q2: Why do you currently use Corn Neck Road? (click all that apply)	Access to recreation , Access to family/friends
Q3: I travel along Corn Neck Road by... (click all that apply)	Car, Bike
Q4: During an average week in the off-season, how often do you drive on Corn Neck Road?	once
Q5: During an average week in the summer, how often do you drive Corn Neck Road?	3 to 5 times
Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road?	Very concerned
Q7: What improvements would you like to see on Corn Neck Road?	A causeway that includes a dedicate bike lane.
Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?	rickrack in the ocean to mitigate wave damage and construction of a causeway
Q9: What do you envision as being the best long-term solution for Corn Neck Road?	causeway
Q10: Optional: Please provide your name and contact info.	<i>Respondent skipped this question</i>

#19



COMPLETE

Collector: Web Link 1 (Web Link)

Started: Tuesday, May 02, 2017 9:59:03 AM

Last Modified: Tuesday, May 02, 2017 10:31:58 AM

Time Spent: 00:32:55

IP Address:

PAGE 1

Q1: Tell us a bit about yourself (click all that apply).

I am a seasonal resident,
I work but do not reside on Block Island

Q2: Why do you currently use Corn Neck Road? (click all that apply)

Access work, Access to recreation

Q3: I travel along Corn Neck Road by... (click all that apply)

Car, Bike

Q4: During an average week in the off-season, how often do you drive on Corn Neck Road?

once

Q5: During an average week in the summer, how often do you drive Corn Neck Road?

more than 5 times

Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road?

Very concerned

Q7: What improvements would you like to see on Corn Neck Road?

Bike lane. paint a white line 2 feet inside of the fog line all the way down corn neck road. this would give bikers and walkers a guide to stay inside so drivers have an easier time passing them, also much safer for everyone since theres no space for a side walk and visitors typically walk/ride wherever they want in the road, this gives them their own lane. Also, change the double yellow line in the center of the road to a single yellow line to make more space for the bike/walk line.

More walkers and bikes, less cars! Make it safe and inviting for visitors to walk from old harbor to the beach pavillion. A boardwalk from old harbor to the beach pavillion would be ideal. Widen and reinforce the road, seperate the walking path from the vehicle travel lane with a wall, fench, cones, temp barrier, jersey style barrier ect..

Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?

Build a seawall like narragansett has.

Man made dunes.

Strategically placed rock jettys to lessen wave impact in the area between the beachhead and beach ave.

Build a corn neck road bridge from the beachhead to beach ave.

Q9: What do you envision as being the best long-term solution for Corn Neck Road?

A bridge that blends in with the island scenery, along with wave force diversion.

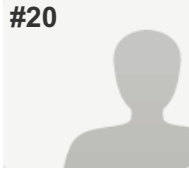
New Shoreham- Corn Neck Rd

Q10: Optional: Please provide your name and contact info.

Respondent skipped this question

New Shoreham- Corn Neck Rd

#20



COMPLETE

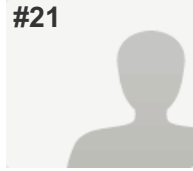
Collector: Web Link 1 (Web Link)
Started: Tuesday, May 02, 2017 2:41:44 PM
Last Modified: Tuesday, May 02, 2017 2:43:43 PM
Time Spent: 00:01:58
IP Address:

PAGE 1

Q1: Tell us a bit about yourself (click all that apply).	I vacation on Block Island
Q2: Why do you currently use Corn Neck Road? (click all that apply)	Access home
Q3: I travel along Corn Neck Road by... (click all that apply)	Car, Bike, Walking
Q4: During an average week in the off-season, how often do you drive on Corn Neck Road?	once
Q5: During an average week in the summer, how often do you drive Corn Neck Road?	more than 5 times
Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road?	Somewhat concerned
Q7: What improvements would you like to see on Corn Neck Road?	<i>Respondent skipped this question</i>
Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?	Bring in sand
Q9: What do you envision as being the best long-term solution for Corn Neck Road?	retaining break wall
Q10: Optional: Please provide your name and contact info.	<i>Respondent skipped this question</i>

New Shoreham- Corn Neck Rd

#21



COMPLETE

Collector: Web Link 1 (Web Link)
Started: Tuesday, May 02, 2017 3:21:43 PM
Last Modified: Tuesday, May 02, 2017 3:23:54 PM
Time Spent: 00:02:10
IP Address:

PAGE 1

Q1: Tell us a bit about yourself (click all that apply).	I vacation on Block Island
Q2: Why do you currently use Corn Neck Road? (click all that apply)	Access to recreation , Access to family/friends
Q3: I travel along Corn Neck Road by... (click all that apply)	Car, Bike, Walking, Other (please specify) Run
Q4: During an average week in the off-season, how often do you drive on Corn Neck Road?	never
Q5: During an average week in the summer, how often do you drive Corn Neck Road?	once
Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road?	Somewhat concerned
Q7: What improvements would you like to see on Corn Neck Road?	Bigger shoulder for bikes and less cars parking on the sides.
Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?	Install a breakwater to assist in the building of beach and dunes in the impacted area
Q9: What do you envision as being the best long-term solution for Corn Neck Road?	<i>Respondent skipped this question</i>
Q10: Optional: Please provide your name and contact info.	<i>Respondent skipped this question</i>

New Shoreham- Corn Neck Rd

#22



COMPLETE

Collector: Web Link 1 (Web Link)
Started: Tuesday, May 02, 2017 4:44:35 PM
Last Modified: Tuesday, May 02, 2017 4:51:15 PM
Time Spent: 00:06:40
IP Address:

PAGE 1

Q1: Tell us a bit about yourself (click all that apply). I vacation on Block Island

Q2: Why do you currently use Corn Neck Road? (click all that apply) Access to recreation

Q3: I travel along Corn Neck Road by... (click all that apply) Bike, Walking

Q4: During an average week in the off-season, how often do you drive on Corn Neck Road? never

Q5: During an average week in the summer, how often do you drive Corn Neck Road? more than 5 times

Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road? Very concerned

Q7: What improvements would you like to see on Corn Neck Road?

Additional room for pedestrians.

Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?

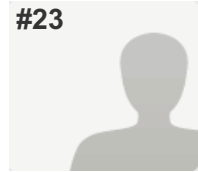
Encourage natural growth of dunes.

Q9: What do you envision as being the best long-term solution for Corn Neck Road?

Relocate the road westward or narrow the roadway if necessary to accommodate dune growth / sea-level rise. If that's not possible, the area near the beachhead could become a bridge/causeway though that would mean splitting the island in half.

Q10: Optional: Please provide your name and contact info.

New Shoreham- Corn Neck Rd



#23

COMPLETE

Collector: Web Link 1 (Web Link)
 Started: Thursday, May 04, 2017 10:19:41 AM
 Last Modified: Thursday, May 04, 2017 10:22:38 AM
 Time Spent: 00:02:56
 IP Address: 65.211.13.2

PAGE 1

Q1: Tell us a bit about yourself (click all that apply).	I vacation on Block Island
Q2: Why do you currently use Corn Neck Road? (click all that apply)	Access to recreation
Q3: I travel along Corn Neck Road by... (click all that apply)	Car
Q4: During an average week in the off-season, how often do you drive on Corn Neck Road?	more than 5 times
Q5: During an average week in the summer, how often do you drive Corn Neck Road?	more than 5 times
Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road?	Somewhat concerned
Q7: What improvements would you like to see on Corn Neck Road?	<i>Respondent skipped this question</i>
Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?	Boulder reef off crescent beach could reduce energy from storm waves, taking the impact off the dunes.
Q9: What do you envision as being the best long-term solution for Corn Neck Road?	<i>Respondent skipped this question</i>
Q10: Optional: Please provide your name and contact info.	<i>Respondent skipped this question</i>

New Shoreham- Corn Neck Rd

#24



COMPLETE

Collector: Web Link 1 ([Web Link](#))
Started: Saturday, May 06, 2017 9:52:29 AM
Last Modified: Saturday, May 06, 2017 9:58:50 AM
Time Spent: 00:06:21
IP Address:

PAGE 1

Q1: Tell us a bit about yourself (click all that apply). I'm a property owner on the Island ,
I am a seasonal resident

Q2: Why do you currently use Corn Neck Road? (click all that apply) Access to recreation

Q3: I travel along Corn Neck Road by... (click all that apply) Car, Bike, Walking

Q4: During an average week in the off-season, how often do you drive on Corn Neck Road? once

Q5: During an average week in the summer, how often do you drive Corn Neck Road? 3 to 5 times

Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road? Very concerned

Q7: What improvements would you like to see on Corn Neck Road?

It would be great if people could respect the dunes and stay off of them - I've witnessed many people read the signs across from the Beachhead before walking over the dunes onto the beach.

Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?

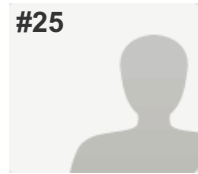
Not sure, I'm not an expert and respect the sea. I'm not sure if a breakwater of some kind could help.

Q9: What do you envision as being the best long-term solution for Corn Neck Road?

I think long-term fighting the sea will be a losing battle. Planning for a future bridge or connector makes some sense as it seems we will eventually be cut off from Corn Neck Road.

Q10: Optional: Please provide your name and contact info.

New Shoreham- Corn Neck Rd



COMPLETE

Collector: Web Link 1 (Web Link)
Started: Sunday, May 07, 2017 9:00:12 AM
Last Modified: Sunday, May 07, 2017 9:04:30 AM
Time Spent: 00:04:18
IP Address:

PAGE 1

Q1: Tell us a bit about yourself (click all that apply). I vacation on Block Island

Q2: Why do you currently use Corn Neck Road? (click all that apply) Access to recreation

Q3: I travel along Corn Neck Road by... (click all that apply) Car, Bike, Walking

Q4: During an average week in the off-season, how often do you drive on Corn Neck Road? never

Q5: During an average week in the summer, how often do you drive Corn Neck Road? more than 5 times

Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road? Somewhat concerned

Q7: What improvements would you like to see on Corn Neck Road?

establish and protect existing dunes

Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?

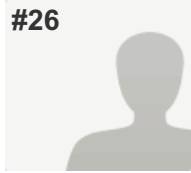
structures in the water to break the wave action

Q9: What do you envision as being the best long-term solution for Corn Neck Road?

allow the water to pass underneath the road

Q10: Optional: Please provide your name and contact info.

#26

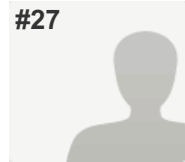


COMPLETE

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Started: Monday, May 08, 2017 9:40:18 PM
Last Modified: Monday, May 08, 2017 9:59:13 PM
Time Spent: 00:18:55
IP Address:

PAGE 1

- Q1: Tell us a bit about yourself (click all that apply).** I'm a property owner on the Island ,
I'm a year round resident
-
- Q2: Why do you currently use Corn Neck Road? (click all that apply)** Access to recreation , Access to family/friends,
Other (please specify)
Access to coastline for various "citizen-science" projects; also to take stuff to the Transfer Station
-
- Q3: I travel along Corn Neck Road by... (click all that apply)** Bike, Car
-
- Q4: During an average week in the off-season, how often do you drive on Corn Neck Road?** 3 to 5 times
-
- Q5: During an average week in the summer, how often do you drive Corn Neck Road?** more than 5 times
-
- Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road?** Very concerned
-
- Q7: What improvements would you like to see on Corn Neck Road?**
See question 8
(The road itself is fine as is.)
-
- Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?**
Allow the dunes to rebuild and become continuous at the Beach Pavilion and Scotch Beach entrances. This will mean moving the Beach Pavilion and preferably making it into a movable, less permanent structure. Protect the dunes by using wooden slatted "up-and-over" walkways, instead of pathways that cut through the dunes from the road to the beach.
-
- Q9: What do you envision as being the best long-term solution for Corn Neck Road?**
See #8, above. Eventually it may be necessary to accept that the most southerly portion of Corn Neck Road cannot be maintained against rising seas and more severe storms. If so, a detour will be needed.
-
- Q10: Optional: Please provide your name and contact info.**



COMPLETE
Collector: Web Link 1 (Web Link)
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Last Modified: Monday, May 08, 2017 10:37:06 PM
Time Spent: 00:54:11
IP Address:

PAGE 1

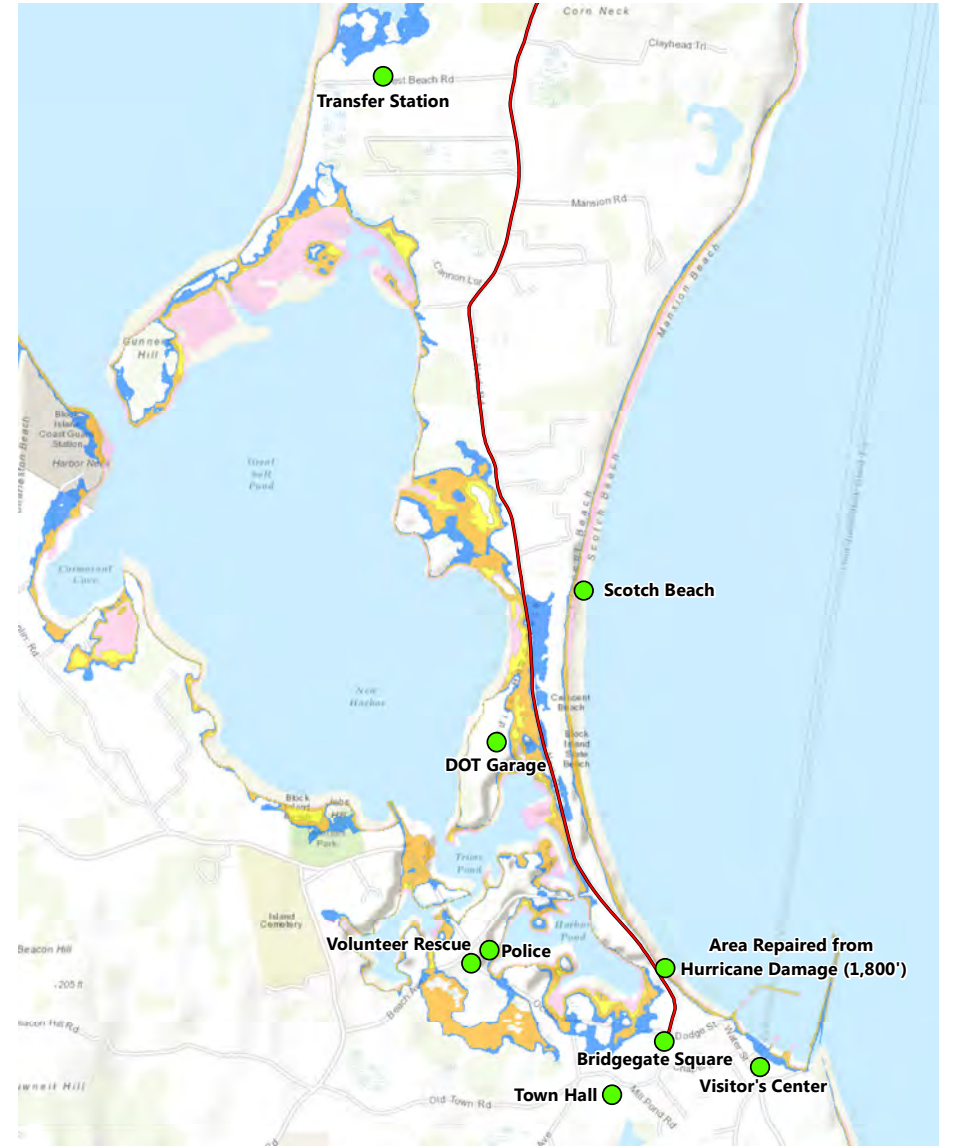
- Q1: Tell us a bit about yourself (click all that apply).** I'm a property owner on the Island ,
I'm a year round resident
-
- Q2: Why do you currently use Corn Neck Road? (click all that apply)** Access to recreation, Access to family/friends,
Other (please specify) Trash disposal
-
- Q3: I travel along Corn Neck Road by... (click all that apply)** Car, Bike
-
- Q4: During an average week in the off-season, how often do you drive on Corn Neck Road?** twice
-
- Q5: During an average week in the summer, how often do you drive Corn Neck Road?** more than 5 times
-
- Q6: How concerned are you about future storm damage, flooding, and sea level rise impacts to Corn Neck Road?** Very concerned
-
- Q7: What improvements would you like to see on Corn Neck Road?** *Respondent skipped this question*
-
- Q8: In your opinion, what steps could the Town take to reduce potential future damage to Corn Neck Road due to storm surge or sea level rise?**
 There should be an unbroken stretch of protective dunes between the beach and the road right up to the bluffs north of Scotch Beach. In the short term the Town should allow/encourage dunes to fill in the most obvious places of weakness, in particular the Scotch Beach access road and parking lot, and the Benson Town Beach House. The Beach House should be moved back towards Corn Neck Road (or replaced by seasonal buildings) behind a rebuilt dune. Further strengthening of the dunes would be achieved by additional sand deposition between the current dune crest and Corn Neck Road. All walkways to the beach should be protected from erosion by some means (e.g. slatted wooden walkways that sit on top of the sand).
-
- Q9: What do you envision as being the best long-term solution for Corn Neck Road?**
 It may become prohibitively expensive to reinforce (or rebuild) the section that was destroyed by Sandy. But the section of Corn Neck Road north of Beach Avenue appears more readily protectable. Thus, Beach Avenue may provide the necessary access to the north end of the island.
-
- Q10: Optional: Please provide your name and contact info.**

Appendix

E Maps

- ❖ Project Area
- ❖ Sea Level Rise Scenarios
- ❖ Ocean Avenue Profile

Project Area



↑ 0 550 1100 2200 Feet **Corn Neck Road** | Planning Area

Sea Level Rise Projections

- +3 Feet SLR
- +5 Feet SLR
- +1 Foot SLR
- Mean Higher High Water
- Corn Neck Road

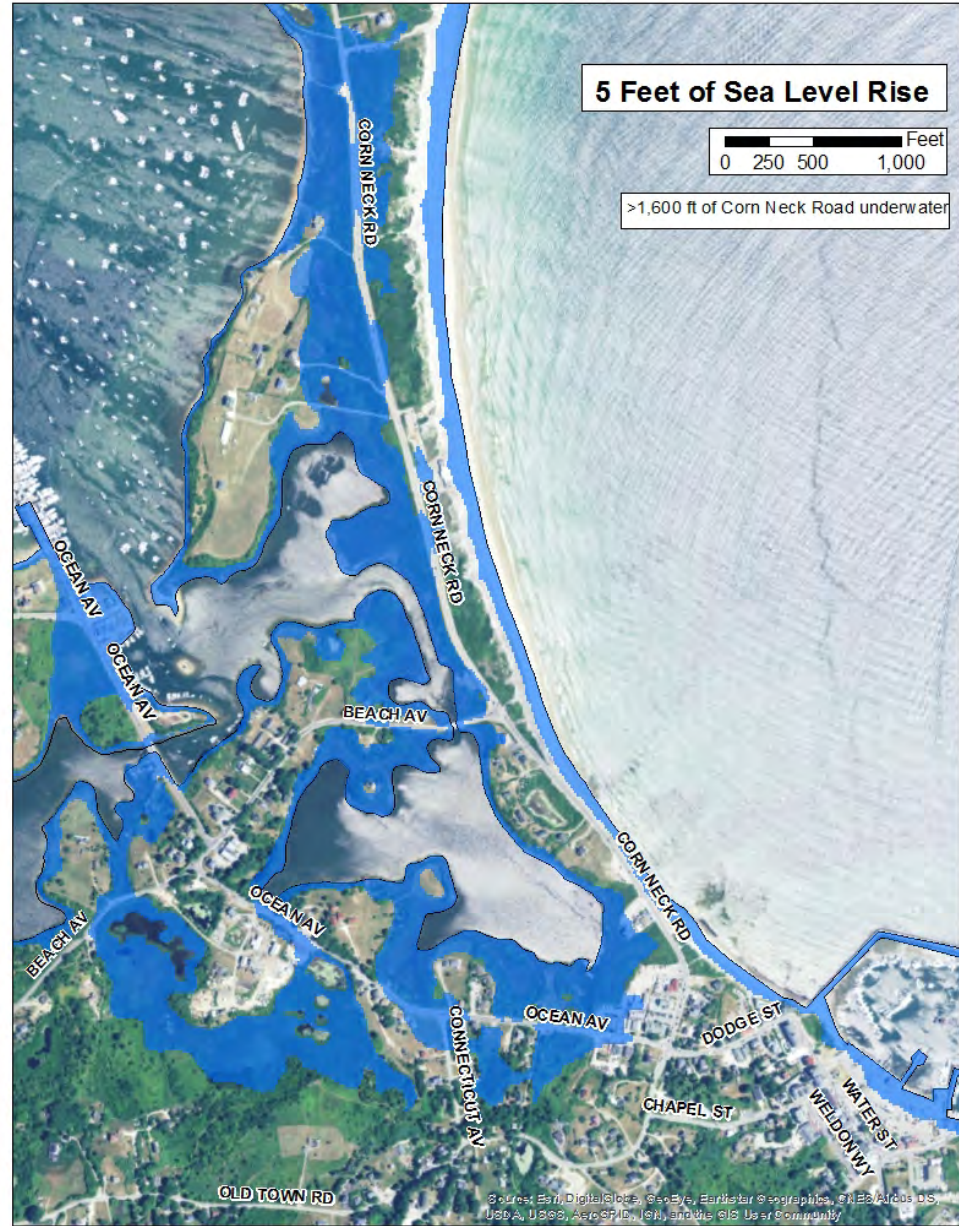
Sea Level Rise Source:
Rhode Island Division of Planning 2014 and RIGIS
*Does not include erosion due to hurricanes and storm surge

**New Shoreham
Block Island, RI**

Sea Level Rise Scenarios

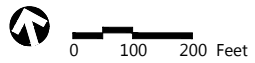
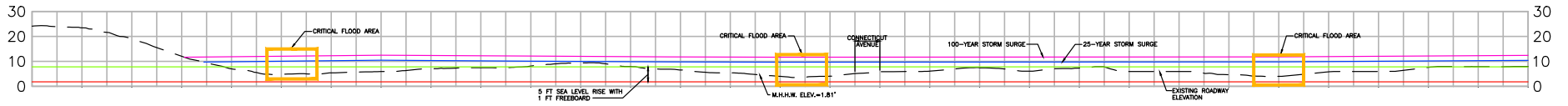



Stormtools, URI, 2017.



Stormtools, URI, 2017.

Ocean Avenue Profile



 Existing Conditions
 Ocean Avenue
 New Shoreham, Rhode Island

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Appendix

F References

F References

Block Island Tourism Council website. Accessed June 2017. <http://www.blockislandinfo.com/island-information/history>

Block Island Harbors; Sea Level Rise Adaptation Study (2013).

Federal Highway Administration, Small Town and Rural Multimodal Networks, December 2016.

Folke, C., S. R. Carpenter, B. Walker, M. Scheffer, T. Chapin, and J. Rockström. 2010. Resilience thinking: integrating resilience, adaptability and transformability. *Ecology and Society* 15(4): 20. [online] <http://www.ecologyandsociety.org/vol15/iss4/art20/>

National Oceanic and Atmospheric Administration (NOAA) Technical Report NOS CO-OPS 083, Global and Regional Sea Level Rise Scenarios for the United States, January 2017 https://tidesandcurrents.noaa.gov/publications/techrpt83_Global_and_Regional_SLR_Scenarios_for_the_US_final.pdf

RI Coastal Resources Management Council, New NOAA sea level rise projections dramatically increase by 2100. February 22, 2017. http://www.crmc.ri.gov/news/2017_0222_sealevel.html

RI Department of Administration, Division of Planning, RI Statewide Planning Program, Vulnerability of Municipal Transportation Assets to Sea Level Rise and Storm Surge. Technical Paper 167. September 28, 2016. http://www.planning.ri.gov/documents/sea_level/2016/TP167.pdf

RI Department of Administration, Division of Planning, RI Statewide Planning Program. Coastal Sea Level Rise and Storm

Surge: Transportation Fact Sheet. Accessed June 2017. http://www.planning.ri.gov/documents/sea_level/fact/NewShorehamfs.pdf

RI Department of Transportation, Road Safety Assessment, Block Island | New Shoreham, Rhode Island. Rhode Island's Highway Safety Improvement Program—Vulnerable Road User Safety Program, December 2016.

RI Department of Transportation, Rhode Island Department of Transportation Block Island Roadway Repairs Project: Construction Monitoring and Archaeological Recovery at the Crescent Beach Site (RI 2555). July 2013.

RI Department of Transportation, Highway Design Manual, 2008.

RI Department of Transportation, Bridge Design Manual, 2007.

Town of New Shoreham, Block Island Hazard Mitigation Plan, 2017, Adopted July 5, 2017.

Town of New Shoreham Traffic Safety Assessment (2015)

University of Rhode Island, Extra/Tropical Storms. Advanced STORMTOOLS. Accessed May 2017. <http://uri.maps.arcgis.com/home/webmap/viewer.html?webmap=62f9e99490b9431d935134aa752e3134>

U.S. Census Bureau, 2011-2015 American Community Survey 5-Year Estimates

Appendix

G Estimates of Probable Costs



**Corn Neck Road Study
Alternative 1: Raised Roadway
Preliminary Construction Cost Estimate**

*1 Cedar Street Suite 400
PROVIDENCE, RI 02903
PHONE: 401 272 8100
FAX: 401 277 8400*

SUMMARY

Roadway Construction **\$2,916,500.00**

Drainage	4%	\$	116,660.00
Utilities	5%	\$	145,825.00
Maintenance & Protection of Traffic	20%	\$	583,300.00
Traffic Signals	0%	\$	-
Lighting	0%	\$	-
Signing & Striping	2%	\$	58,330.00
Landscaping	5%	\$	145,825.00
Miscellaneous	35%	\$	1,020,775.00
	Subtotal		\$4,987,215.00

Roadway Construction Subtotal **\$4,987,215.00**

Mobilization & Demobilization	10%	\$	498,721.50
Maintenance and Movement of Traffic Protection	5%	\$	249,360.75
	Subtotal		\$5,735,297.25

Engineer & Construction Contingency 15% \$ 860,294.59

PRELIMINARY CONSTRUCTION TOTAL **\$6,595,591.84**

Police Detail 5% \$ 329,779.59

CONSTRUCTION COST TOTAL **\$ 6,925,371.43**



**Corn Neck Road Study
Alternative 2: Partial Bridge Structure
Preliminary Construction Cost Estimate**

1 Cedar Street Suite 400
PROVIDENCE, RI 02903
PHONE: 401 272 8100
FAX: 401 277 8400

SUMMARY

Roadway Construction \$2,162,000.00

Drainage	5%	\$	108,100.00
Utilities	5%	\$	108,100.00
Maintenance & Protection of Traffic	25%	\$	540,500.00
Traffic Signals	0%	\$	-
Lighting	0%	\$	-
Signing & Striping	3%	\$	54,050.00
Landscaping	3%	\$	64,860.00
Miscellaneous	35%	\$	756,700.00
Subtotal			\$3,794,310.00

Roadway Construction Subtotal **\$3,794,310.00**

Bridge Construction \$ 50,000,000.00

Roadway Construction and Structures Total **\$53,794,310.00**

Mobilization & Demobilization	10%	\$	5,379,431.00
Maintenance and Movement of Traffic Protection	5%	\$	2,689,715.50
Subtotal			\$61,863,456.50

Engineer & Construction Contingency 15% \$ 9,279,518.48

PRELIMINARY CONSTRUCTION TOTAL **\$71,142,974.98**

Police Detail 5% \$ 3,557,148.75

CONSTRUCTION COST TOTAL **\$ 74,700,123.72**



**Corn Neck Road Study
Alternative 3: Relocated Roadway and
Elevation Combination
Preliminary Construction Cost Estimate**

*1 Cedar Street Suite 400
PROVIDENCE, RI 02903
PHONE: 401 272 8100
FAX: 401 277 8400*

SUMMARY

Roadway Construction **\$2,705,000.00**

Drainage	5%	\$	135,250.00
Utilities	25%	\$	676,250.00
Maintenance & Protection of Traffic	25%	\$	676,250.00
Traffic Signals	0%	\$	-
Lighting	0%	\$	-
Signing & Striping	3%	\$	67,625.00
Landscaping	5%	\$	135,250.00
Miscellaneous	35%	\$	946,750.00
	Subtotal		\$5,342,375.00

Roadway Construction Subtotal **\$5,342,375.00**

Mobilization & Demobilization	10%	\$	534,237.50
Maintenance and Movement of Traffic Protection	5%	\$	267,118.75
	Subtotal		\$6,143,731.25

Engineer & Construction Contingency	15%	\$	921,559.69
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PRELIMINARY CONSTRUCTION TOTAL **\$7,065,290.94**

Police Detail	5%	\$	353,264.55
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Property Acquisition Cost **\$850,000.00**

CONSTRUCTION COST TOTAL **\$ 8,268,555.48**

Appendix

H Design Standards

DESIGN CRITERIA

Roadways – Corn Neck Road

Functional Classifications: Rural Major Collector - State of Rhode Island Highway Functional Classification 2014

Design Element	Design Criteria	Source*	Exception Required
Design Speed, V	35 mph	RIDOT HDM pg 3-1	
Levels of Service	Level C Desirable	AASHTO pg 2-67 Table 2-5	
Sight Distance			
Min Stopping SD	250 ft K (Crest – 250 ft) = 29 K (Sag – 250 ft) = 49	AASHTO pgs 6-4 AASHTO Table 6-3	
Min Intersection SD	Left Turn – 390 ft Right Turn – 335 ft	AASHTO pgs 9-38 & 9-41 Table 9-6 & 9-8	
Min Passing SD	550 ft	AASHTO pgs 6-5 Table 6-4	
Profile Gradient	7% Max 0.5% Min	AASHTO Pg 6-12 Table 6-8, RIDOT HDM pg 4-7 Table 4-2	
Superelevation			
Rural Collector	0.04 Maximum	RIDOT HDM pg 4-4	
Horizontal Alignment			
Minimum Radius	e= 4% = 371 ft e= -2% = 2490 ft	AASHTO Pg 3-55 Table 3-8	
Cross Slope	0.02ft/ft	RIDOT HDM pg 4-11	
Lane Width			
Travel Lane	12 ft Des./11 ft Min.	RIDOT HDM pg 4-10	Yes
Curb Offsets	2 ft Des./1 ft Min.	RIDOT HDM pg 4-11	
Drainage			
Inlet Spacing	N/A		
System Pipe			
Cross Culvert			
Spread			

DESIGN CRITERIA

Roadways – Corn Neck Road

Functional Classifications: Rural Major Collector - State of Rhode Island Highway Functional Classification 2014

Design Element	Design Criteria	Source*	Exception Required
Sidewalk Type Nominal Width Clear Width	N/A		
Driveway Openings Residential Commercial	10 ft Min./20 ft Max 20 ft Max (One-Way) 35 ft Max (Two-Way)	RIDOT RRCPU pg 20 Section 13.0	

- AASHTO “A Policy on Geometric Design of Highways and Streets, 2011”
- RIDOT RRCPU - RIDOT Rules and Regulations Concerning Permission for Use of State Highway Rights Of Way” February 2005
- RIDOT HDM – RIDOT Highway Design Manual, September 2008

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Appendix



Correspondence

NAME: Town of New Shoreham
CRMC FILE NUMBER: 2017-10-104

**RHODE ISLAND COASTAL RESOURCES MANAGEMENT COUNCIL
REPORT OF FINDINGS -- PRELIMINARY DETERMINATION**

STATEMENT OF LIMITATIONS

The contents of this staff determination report shall be valid only for the period on and preceding the date of this report. This report is neither an approval or denial of the subject proposal. It is an evaluation of CRMC regulations in effect as of 11/15/17 as they pertain to the below stated proposal, including preliminary staff recommendations.

Modifications to the below stated proposal may, upon the discretion of the CRMC, render this determination null and void.

APPLICANT INFORMATION

NAME: Town of New Shoreham **CRMC FILE NO.** 2017-10-104
LOCATION/POLE: Corn Neck Road
CITY/TOWN: New Shoreham **PLAT(S):** N/A **LOT(S):** N/A
CONTACT PERSON(S) & ADDRESS:
Shirlyne Gobern, Town Manager, Town of New Shoreham, P.O. Box 220, Block Island, RI 02807
Susan Moberg, VHB, Inc., 1 Cedar Street, Suite 400, Providence, RI 02903

PRELIMINARY REVIEW INFORMATION

PROPOSAL: This CRMC Staff Preliminary Determination Report is intended to provide preliminary comments with regard to the draft "Corn Neck Road, Transportation Resiliency Planning Study", dated September 2017.

PLAN(S) REVIEWED: "Corn Neck Road, Transportation Resiliency Planning Study"

<u>INVESTIGATOR</u>	<u>DATE</u>	<u>TIME</u>
Dave Reis	Office review only	
Janet Freedman	"	
Rich Lucia	"	

MEASUREMENTS & OBSERVATIONS: None – office review only.

PREVIOUS CRMC ACTIONS FOR SITE: Prior CRMC actions not specifically reviewed for purposes of this report.

NAME: Town of New Shoreham
CRMC FILE NUMBER: 2017-10-104

SUMMARY OF FINDINGS

CRMC JURISDICTION: (Y OR N) **TYPE WATER:** Type 1, Conservation Area(s), Rhode Island Sound, Harbor Pond Trims Pond, Great Salt Pond

For the purpose of this review the coastal feature(s) shall be the barrier beach (moderately and developed barrier), coastal dunes, coastal beach, coastal wetland, coastal bluffs, riprap revetment.

Applicability of CRMP and SAM Plans (as amended):

CRMP Sections: 120, 130, 140, 150, 200.1, 200.2, 200.3, 200.4, 200.5, 200.6, 210.1, 210.2, 210.3, 210.4, 210.5, 210.6, 210.7, 300.1, 300.2, 300.3, 300.4, 300.5, 300.6, 300.7, 300.8, 300.9, 300.10, 300.13, 310, 320, 325, 330, 335 other.

SAM PLAN: None

BUFFER (ref. Section 150 CRMP): To be determined based on project design.

SETBACK (ref. Section 140 CRMP): To be determined based on project design.

STAFF CONCERNS/COMMENTS/INFORMATION REQUIREMENTS:

TRANSPORTATION CONCEPTS

The following CRMC Staff comments are provided for initial guidance purposes only in accordance with the "Draft" Corn Neck Road Transportation Resiliency Study dated September 2017. The following comments are provided with regard to the 3 "transportation" conceptual design alternatives provided within chapter 4:

Alternative 1: Elevated Road: Under this alternative, the entire length of Corn Neck Road would be raised to elevation 6' MHHW. As proposed, riprap protection will only be provided in areas of existing riprap to elevate the riprap slope to the new roadway elevation. Accordingly, CRMC staff is concerned that this alternative will only help protect the roadway from flooding and sea level rise but will not protect the roadway from erosion. In the event of a large storm (hurricane or Nor'easter), the roadway side-slopes and roadway fill may be subject to the erosive effects of storm surge and/or waves. In larger storms, the roadway may be damaged or destroyed due to erosion and roadway fill used to elevate the roadway may be transported into Harbor Pond, Trims Pond and Great Salt Pond as well as the wetland areas which border these Ponds. Furthermore, if the elevated roadway were to be more fully protected with riprap armoring, it is likely that additional beach erosion will occur as daily tidal cycles and even minor storm surges more frequently encounter the riprap protected roadway side-slopes resulting in scouring and beach loss along the face of the revetment. On this basis, CRMC Staff does not believe this alternative provides significant "resiliency" when considering anticipated rates of sea level rise, increased "storminess" and associated erosion. Additionally, efforts to further protect the roadway by extending riprap protection (if proposed in the future) would likely have negative impacts on the beach and use of the beach as a recreational resource and tourist destination.

NAME: Town of New Shoreham
CRMC FILE NUMBER: 2017-10-104

Alternative 2: Under this alternative three (3) bridge segments will be constructed along Corn Neck Road with “landings” on reconstructed roadway segments at existing driveway and parking lot locations. The roadway at these locations will be elevated similar to Alternative 1. This alternative proposes to “bridge” portions of Corn Neck Road currently at some of the lowest existing roadway elevations. It is noted that this alternative may provide some protection from storm surges which will be able to pass under the elevated bridge sections. However, CRMC Staff is concerned that the remaining roadway sections which would likely include bridge abutments located at the bridge/roadway transition points (“landings”) would be subject to erosion similar to Alternative 1. This alternative also comes in at a high cost and may not result in significant resiliency over time. This alternative will likely be resilient from daily tides and minor storm surges, but significant storm surge and wave action from the 1% event could damage or displace the bridge surface and precast slabs. As sea levels rise the bridge components will be compromised by more frequent return period storms.

The pilings supporting the bridge sections will need to penetrate the subsurface to a depth that will withstand erosion during severe storm surge events. Anecdotal evidence suggests that the barrier was breached in past hurricanes, possible in multiple places. One source described that the Great Gale of 1815 “Divided the Island in twelve parts” (Block Island Land Evidence Records). This description is consistent with multiple breaches observed on the South County barriers following the 1938 and 1954 hurricanes. Future breaches will likely be through the lower lying areas on the barrier under the bridge sections. Pilings therefore will need to be anchored several feet lower than MLLW (at a minimum depending on the geotechnical limitations) to survive erosion and barrier breaching. Additionally, significant concerns in regards to the resiliency of a bridge segment are warranted in such proximity to the open waters of Block Island Sound against wave forces. Review of wave modeling research (STWAVE) at Block Island by Malcolm Spaulding et. al. 2015. (Figure 1) indicates that significant wave heights of at least 3.2 meters (10.5 feet) in a 1% event could impact this location. These wave heights are predicted to be even higher with the increase in sea level. With these wave forces substantial damage may occur to both substructure and superstructure.

Alternative 3: This alternative involves relocating Corn Neck Road 0-45 feet to the west while elevating portions of the road to elevation 6’ MHHW consistent with Alternative 1. As considered with Alternative 1, elevating the road to 6’ MHHW is intended to protect the roadway from 5 feet of sea level rise. However, the resiliency of this alternative is subject to limitations similar to Alternative 1. That is, relocating and elevating the roadway on this narrow low-lying barrier beach strand will not protect the road from storm surge, wave damage and associated erosion. As demonstrated by Figure 2 below, a 100 year storm with only 2 feet of sea level rise will inundate the existing roadway surface with 6-8’ of water thereby exposing a roadway reconstructed to elevation 6’ MHHW with storm surge and exposure to wave damage. Furthermore, as sea level rises over time the shoreline will be subject to a corresponding increase in “annual” (or “chronic”) erosion as the sea surface and associated nominal wave environment extends landward onto the beach face and dunes and further inundates wetlands on the pond(s) side of the barrier. Note that waves are not incorporated into the STORMTOOLS storm surge models. The inundation surfaces represent stillwater elevations rather than BFEs. The future BFE will be deeper than what is depicted on the map.

The historic erosion (1952-2016) for the shoreline fronting the revetment ranges from a loss of 34 to 59 feet, with the average annual erosion rate of less than one foot per year. To the north of the revetment the barrier shoreline has been relatively stable or has shown slight accretion except for the northern 1400 feet. The area immediately north of the breakwater is eroding at a very rapid rate (98 to 229 feet), suggesting that the breakwater structure is influencing the erosion rate. It is not clear if this is due to wave focusing, interruption of the longshore sediment transport, or a combination of both (Figure 3). The STWAVE modeling (Figure 1)

NAME: Town of New Shoreham
CRMC FILE NUMBER: 2017-10-104

shows a wave shadow with smaller significant wave heights directly north of the breakwater. This model is weighted for tropical storms. This suggests that extratropical storms have more influence on the erosion adjacent to the breakwater.

Erosion does not occur gradually over time but is episodic during storms when the shoreline can shift tens of feet in a single storm. Obviously there is an erosion problem for the area fronted by the revetment. Based on these erosion rates it is possible that project could last for 40-50 years. However, erosion rates are expected to increase as sea levels rise. The design life of the project should incorporate the increased erosion rates due to sea level rise.

NON-TRANSPORTATION ALTERNATIVES

The following CRMC Staff comments address “non-transportation” alternatives addressed in Chapter 4 and “other options” resulting from public input as noted in Chapter 3 of the “Draft” Corn Neck Road Transportation Resiliency Study dated September 2017:

Realignment of Scotch Beach Road: CRMC Staff agrees that realigning Scotch Beach Road in order to minimize the “surge channel” effect by making the roadway more “sinuous” is an easily implemented and beneficial opportunity. Increasing the sinuosity from that shown on the plan would increase resiliency and would be recommended.

Coastal Armoring: CRMC Staff does not believe further armoring of Corn Neck Road will provide sufficient resiliency in the long term due to sea level rise, increased erosion of the beach face fronting the armoring, and due to overtopping of the armoring during a storm. The later typically results in erosion from the “back side” of the armored slope as storm surges and waves which have overtopped the armoring surge back toward the ocean in “return flow” during a storm. Any coastal armoring should be accompanied by beach nourishment and dune restoration to increase coastal resiliency and maintain coastal habitat. Much of the barrier shoreline has been fairly stable since 1952, probably due to sufficient sediment supplied by the eroding bluffs. High erosion rates are seen directly adjacent to the breakwater and in the area fronted by the riprap. A sand bypass system around Old Harbor could improve shoreline stability on the southern end of the barrier.

Offshore Structures: Currently, there are no off-shore structures in use to help control beach erosion in Rhode Island. Such devices or structures are considered “experimental” and “unproven” in Rhode Island and on that basis; the proposed use of such structures is beyond the scope of this review.

Beach Nourishment and Dune Restoration: These activities are considered to be non-structural alternatives that provide temporary benefits in the long term but have little adverse environmental consequences if appropriately implemented. Please be informed that CRMC’s marine infrastructure coordinator indicates a source of beach nourishment material may be available from periodic dredging of the navigation channels and marine uses serving Point Judith Pond. However, a plan would need to be developed to transport and release this material within the near-shore environment as necessary to result in the onshore drift of this material to the beach face fronting Corn Neck Road. Beach Nourishment within the intertidal and subtidal areas will be reviewed by all federal stakeholders including National Marine Fisheries Services. Rocky subtidal habitat as well as seagrasses are considered very important fish habitat. The impacts of beach nourishment to these resources may be considered detrimental to the habitat. In addition, much of the area is classified as undeveloped coastal barrier within the Coastal Barrier Resources Act (CBRA). The CBRA specifically prohibits preventing erosion on a CBRA designated barrier unless it is a non-structural

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project for shoreline stabilization designed to mimic, enhance, or restore a natural stabilization system. Those challenges aside, CRMC favors non-structural methods for erosion control. Beach nourishment and dune restoration are considered non-structural. To be effective a wide beach should be backed by robust dunes.

Bridge across Great Salt Pond: While a bridge across the Great Salt Pond was discussed in the “Draft” Corn Neck Road Transportation Resiliency Study as a potential option, it was apparently discounted from further analysis as an alternative. However, based on our review, CRMC Staff believes the Great Salt Pond bridge option may be the most “resilient” long term alternative. This alternative could provide a bridge span over the entrance to Trim’s Pond from Great Salt pond thereby connecting the intersection of Ocean Ave. and West Road with the elevated landmass (“headland”) to the east which now contains low-density residential housing. A road which continues northeast across this headland could then connect to a second bridge span proceeding northeast over the coastal wetland bordering Great Salt Pond to provide a bridge connection to Corn Neck Road just south of Scotch Beach Road. An alternative of this type could bypass nearly 5,000 feet of the area of concern on Corn Neck Road. Under this option, the section of Corn Neck Road from Bridgegate Square to the aforementioned bridge connection could then be managed as a “sand trail” absent a paved roadway surface and protective armoring. Eliminating the paved roadway and armoring would also allow the beach to naturally adapt to sea level rise and when the sand trail washes out during a storm, it could be easily and inexpensively replaced with sand and gravel fill. Absent the reflective armoring to protect Corn Neck Road, it is likely the beach will adapt to sea level rise and other coastal influences thereby providing a naturally resilient recreational beach. Rerouting the majority of vehicle traffic over the pond bridge crossing will further minimize vehicle/pedestrian conflicts. Furthermore, additional access routes to the pond bridge crossing will avoid times when Bridgegate Square and low lying areas of Ocean Avenue experience storm flooding and/or future impacts from sea level rise. Although special exceptions(s) (ref. RICRMP Section 130) may be required for constructing a bridge on coastal features bordering Type I waters, all other Corn Neck Road transportation alternatives require the granting of special exception(s) as well.

Ferry Connection: The “Draft” Corn Neck Road Transportation Resiliency Study indicates this alternative was not explored further for various reasons. Unless the Town further considers this alternative as “practical”, CRMC Staff does not believe further comments are warranted in this review.

Continuous Elevated Viaduct above Corn Neck Road: The “Draft” Corn Neck Road Transportation Resiliency Study also indicates this alternative was not explored further for various reasons. CRMC Staff further believes a salt pond bridge crossing represents a superior alternative to a bridge constructed on a fragile barrier beach strand.

Other Comments: Although Sandy was considered a 260 year storm in the NY/NJ area in RI it was equivalent to a 20-25 year recurrence interval storm. Any damages that were sustained in Sandy will be far worse in the event of a 100 year storm and future lower magnitude storms.

STORMTOOLS inundation maps for Block Island depict the stillwater elevation and not the base flood elevation (BFE). Waves on top of the BFE will increase the flood depths from those depicted on the map viewer.

The Coastal Barrier Resources Act (CBRA) restricts federal funding for most new expenditures and financial assistance. Most of the proposed transportation resiliency area is located within the Coastal Barrier Resources System (CBRS). Only the very southern end of the project area (figure 2) is outside of the CBRS.

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The Town Beach is classified as an Otherwise Protected Area (OPA) where funding is available for most federal expenditures other than federal flood insurance. Funding for erosion control measures including beach nourishment is specifically prohibited. The maintenance, replacement, reconstruction or repair, but not expansion of publically owned roads may be exempted if they are part of a larger system. Widening the road or expansion of the riprap may render the project ineligible for federal funding.

Please review STORMTOOLS for NACCS Wave Heights for the 100yr, 50, 20, and 10 year events. Also for further information in this regards to predicted wave heights and STWAVE results for Block Island.

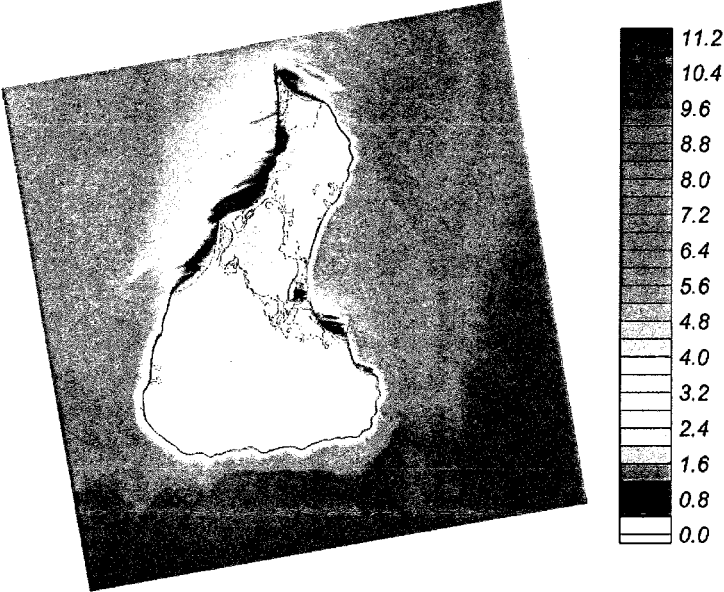


Figure 1. STWAVE modeling derived for Block Island using the NACCS wave data for 1050 synthetic tropical and 100 historical extra-tropical storms (Spaulding et.al, 2015).

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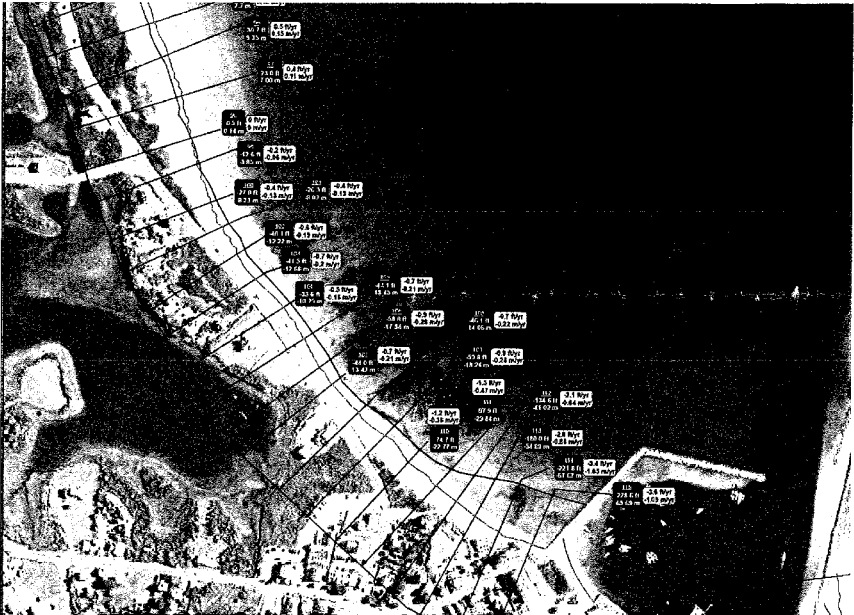


Figure 3. Draft shoreline change map for Block Island showing the 1952 shoreline (black) and the 2016 shoreline (green). The most extensive erosion is north of the breakwater, with rates of less than 1 foot per year in the area fronting the riprap revetment and accretion farther north.

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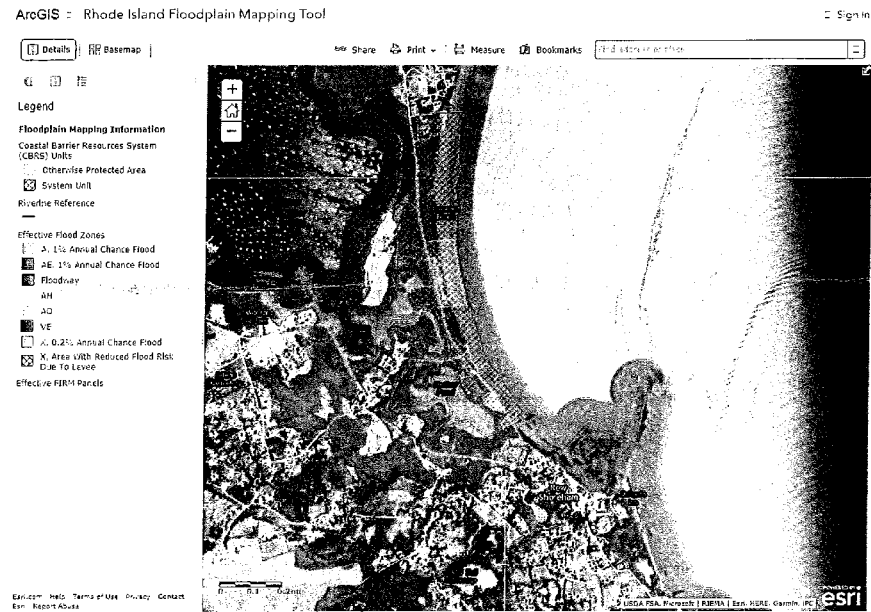


Figure 2 - RIEMA RI Floodplain Mapping Tool showing the flood zones and extent of the Coastal Resources Barrier Act System Unit D09 and OPA D09P for the area where road improvements are proposed. Federal funding is very limited for projects within the CBRA System Units.

References Cited: Spaulding, Malcolm L., Annette Grilli, Tatsu Isaji, Chris Damon, Reza Hashemi, Lauren Schumbach, and Alex Shaw. 2015. Development of flood inundation and wave maps for the Washington County, RI using high resolution, fully coupled surge and wave (ADCIRC and STWAVE) models, prepared for CRMC (Appendix D).

SIGNATURE: David S. Reis STAFF BIOLOGIST

SIGNATURE: Richard J. Jurek STAFF ENGINEER

SIGNATURE: [Signature] STAFF GEOLOGIST



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November 16, 2017

Susan Moberg
Principal
Vanasse Hangen Brustlin, Inc.
1 Cedar Street, Suite 400
Providence, RI 02903

Subject: Draft Transportation Resiliency Planning Study
Corn Neck Road - From Ocean Avenue to Scotch Beach Road, Block Island

Dear Ms. Moberg:

Thank you for the opportunity to review the Draft Transportation Resiliency Planning Study, dated September 2017, for Corn Neck Road in Block Island, that has been prepared by VHB for the Town of New Shoreham.

Following a review of the various proposed alternatives, further detailed engineering and environmental analysis is required for RIDOT to rank those alternatives.

Attached are our comments, regarding the study.

Should you have any questions regarding this correspondence, please contact Ferdinand Ihenacho, P.E., at (401) 222-2023 extension 4467.

Sincerely,

Michael Gannon
Project Manager II
Office of Coordination of Local and State Planning
Rhode Island Department of Transportation

/FCI

cc: Brady, Fisetite, Fish, Gannon, Ihenacho, Moore, Rocchio (all w/o attachment);
File (w/ attach.)

General Comments
Draft Transportation Resiliency Planning Study (TRPS)
Corn Neck Road, Block Island

November 16, 2017

The review is based on the draft TRPS prepared by VHB for the Town of New Shoreham Planning Board, dated September 2017, as follows:

General Comments:

1. For reference purposes, consider using alphabetic indexing and descriptive headings for all photographs, drawings, diagrams, charts, etc. in the report.
2. There are various typographical errors in the report; some are as follows
 - a. The word "low" is used twice in line no. 5, page ES2
 - b. The word "spit" is improperly used in line no. 5, page 9
 - c. The word "be" is improperly used in line no. 5, page 21
 - d. The word "location" is improperly used in last line, page 25
 - e. The word "Appendix C" is improperly used in line no. 3, page 27.
3. In order to fully evaluate the cost/benefit of the proposed Alternatives (1, 2 and 3), consider evaluation of "Do Nothing" scenario i.e. repair costs for storm damage during the analysis period (55-year), considering that major repair of Corn Neck Road has occurred a few times since the Great New England Hurricane of 1938.
4. The Mean Higher High Water elevation (MHHW) basis for the Study is based on average of all daily highest tide measurements. In discussion of MHHW, consider including a time period for the measurements (i.e. daily highest tide measurements taken during a 4-week, 1-year, 10-year, etc. period).
5. To assist in full evaluation of the proposed Alternatives, please show the location of the public right-of-way on the proposed cross-section for all Alternatives (1, 2, 3 and the Non-Transportation).
6. Consider using the callout "8 ft. Recreation Corridor" at the paved shoulder, on the proposed cross section sketches.

Section 2 - Existing Conditions:

7. It is not clear if there are other utilities on Corn Neck Road (i.e. electric, gas, telecommunication, sewer, drain lines, potable water, fire protection, etc.). Consider inclusion in this narrative.

Section 3 - Planning Process and Study Methodology:

8. The study states "Consult with CRMC and RIDOT ... on 9/17". What was nature of this consultation? (See Planning Process milestones.)
9. In the section "Future Threats", the first sentence of the last paragraph states Hurricane Sandy is a 25-year storm event while the last sentence states it was a 260-year storm; please review and clarify.

Section 4 - Conceptual Design Alternatives:

10. The proposed Alternatives specify 10-foot travel lanes. Be advised Section 450.02 RIDOT Highway Design Manual policy requires a minimum of 11-foot travel lanes otherwise, a Design Exception will be filed with the RIDOT.

General Comments
Draft Transportation Resiliency Planning Study (TRPS)
Corn Neck Road, Block Island

November 16, 2017

11. The study proposes not to raise the first 300 feet of Corn Neck Road northerly of Bridgegate Square, due to inconvenience to abutting businesses. Will this area withstand the projected sea level rise (5' SLR plus 1" freeboard)? If not, consider raising the road and relocating these businesses so Alternatives (1,2 and 3) remain viable.
12. It appears that storm surges, flowing through the center Partial Bridge Structure (from Town Beach to the private property, 600' long) may inundate properties/buildings on the west side of Corn Neck Road. Consider eliminating this segment, which will also result in reduce cost of Alternative 2.
13. Is "Yellow Kittens Restaurant" approximately 400' north of Ocean Avenue? Please include that description in the narrative for Alternative 3.

Section 6 - Additional Vulnerable Areas:

14. Be advised the FY2018-2027 State of Rhode Island Transportation Improvement Program indicates minor Bridge Preservation work at Beach Avenue Bridge and Ocean Avenue Bridge, beginning in year 2018. Bridge Preservation work is to extend the useful service life of the structure, which may include joint replacement, bridge washing, deck repairs, moderate superstructure repairs and other incidentals.

Appendix C - Public Meeting Documentation:

15. The flyer states "Bridgegate Square becomes flooded as storm runoff overwhelms the drainage system, and ..." Can the study address solutions to sea level rise impacts to Bridgegate Square drainage system?

Appendix E - Maps:

16. The Existing Conditions Plan is entitled "Corn Neck Road" while the plan is labelled Ocean Avenue. Please review and revise accordingly.

Appendix H - Design Criteria:

17. A Design Exception will be required for "Lane Width".

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