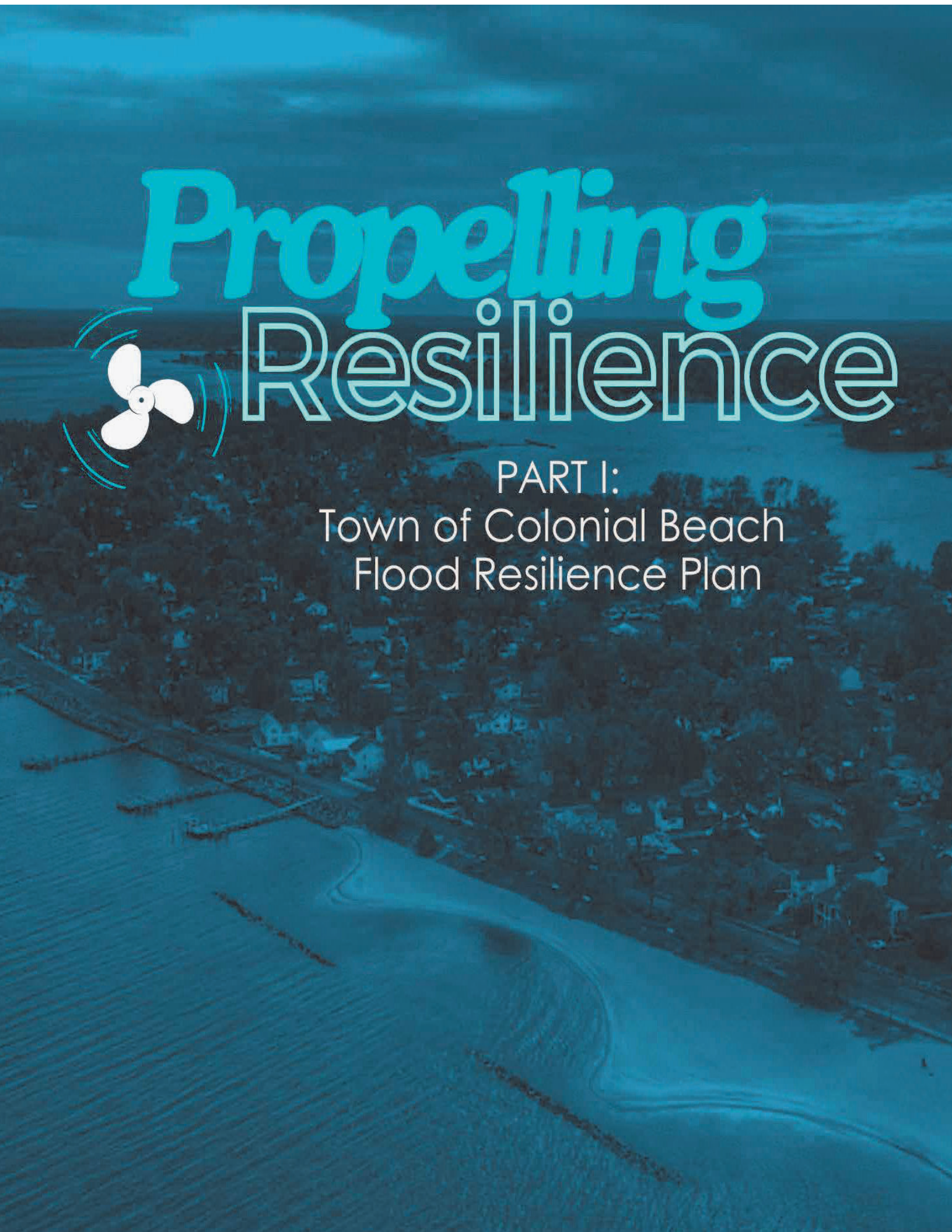


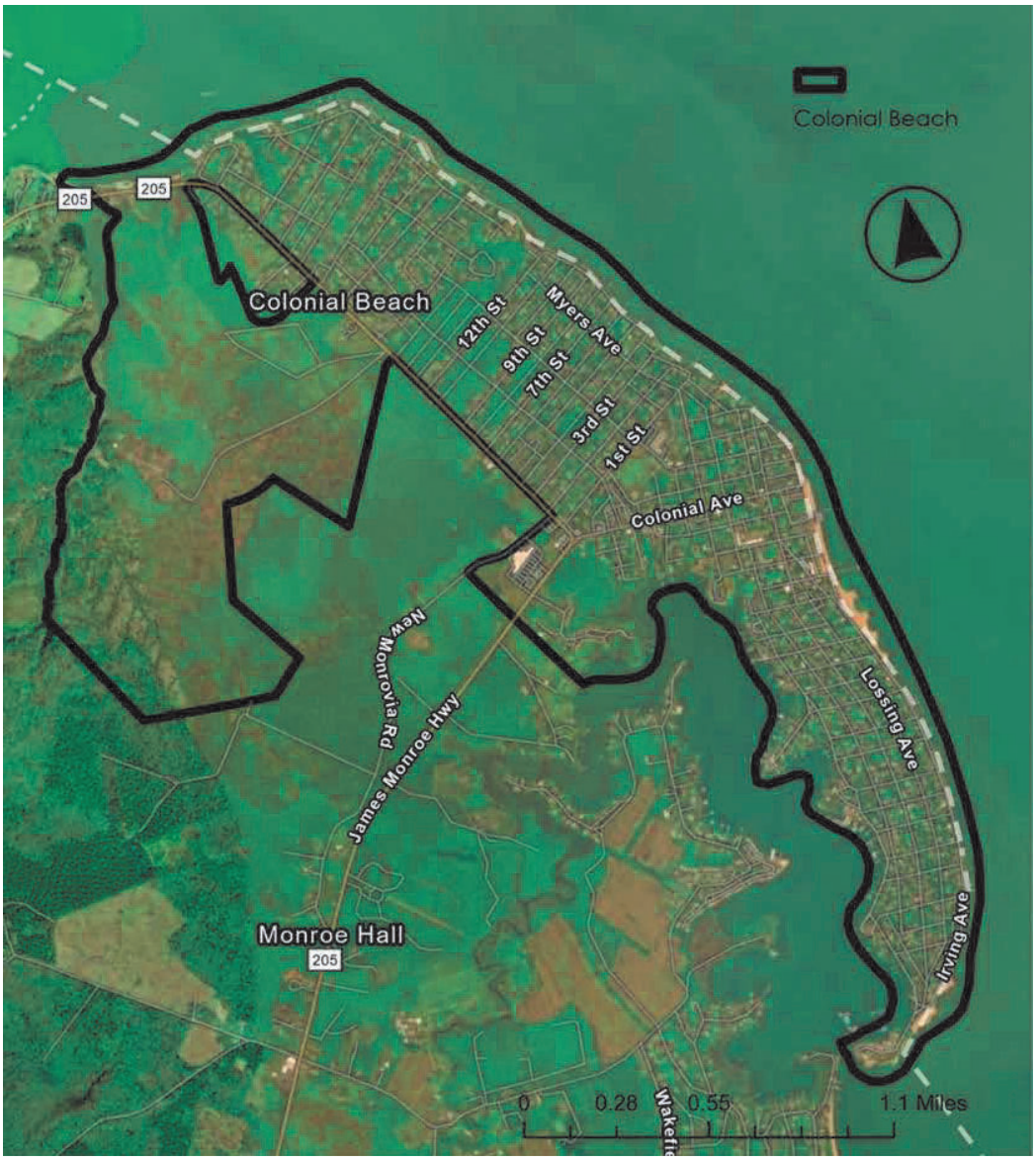
Propeling Resilience

PART I:
Town of Colonial Beach
Flood Resilience Plan

PART 1 – FLOOD RESILIENCE PLAN

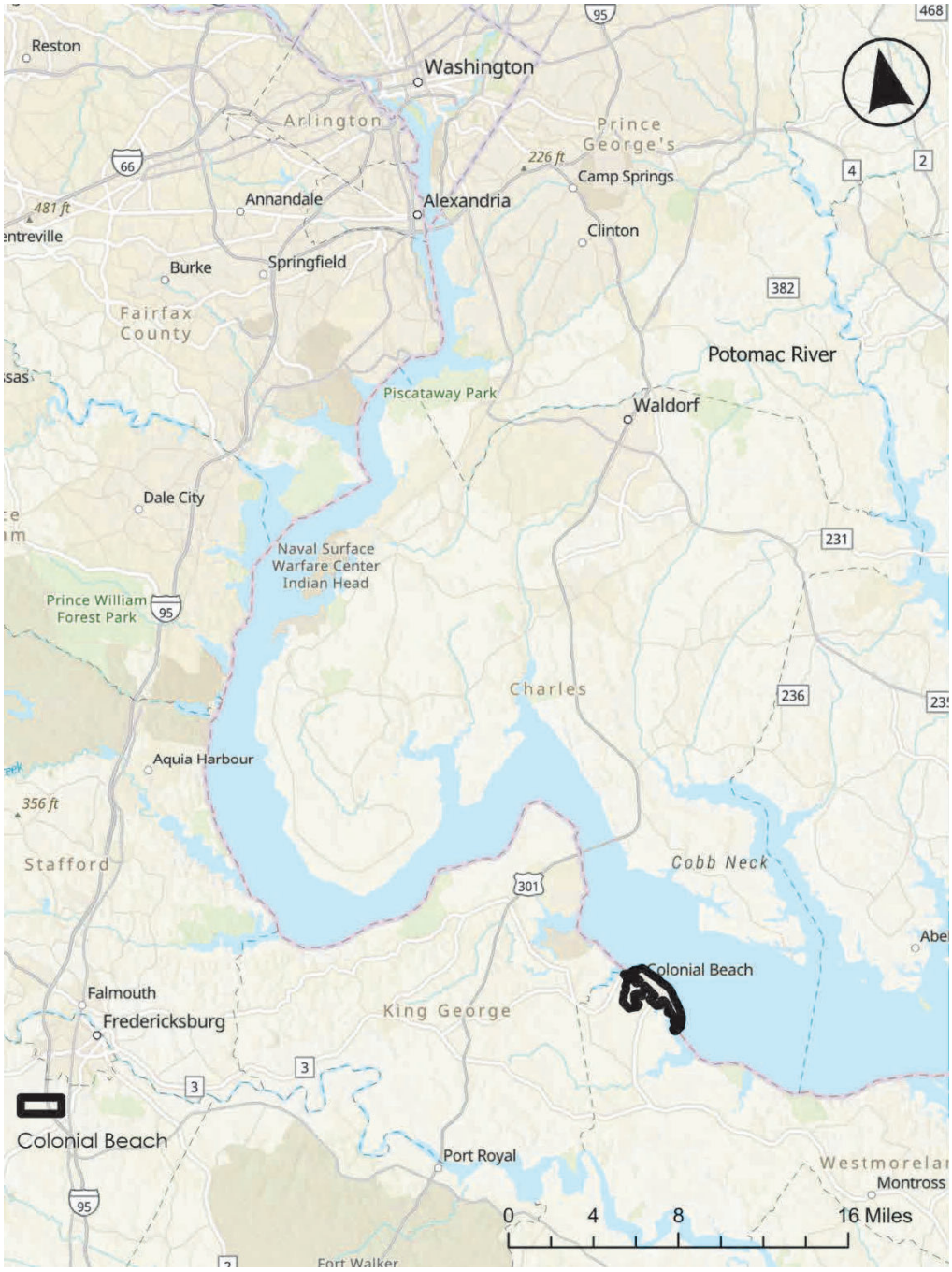
Part I of the Plan, the Flood Resilience Plan component, addresses the increasing threats posed by flooding, which are exacerbated by rising sea levels, climate change, and the town's low-lying geography. This section focuses on high level flooding issues as heard through public engagement and analyzed through public data sources, and proposes a range of mitigation strategies, including infrastructure improvements, land use planning, and nature-based solutions, to enhance the town's ability to withstand and recover from flood events. The plan emphasizes adaptability to future conditions, promoting policies and practices that respond to the evolving challenges of climate change and rising water levels. The Flood Resilience Plan component aims to create a safer and more sustainable future for Colonial Beach, reducing the impact of future flooding while supporting long-term community resilience.

Figure 1-1: Town of Colonial Beach Boundary and Aerial Imagery



Colonial Beach is located in Westmoreland County, Virginia, and is bordered by Maryland across the Potomac River, King George County, and open rural areas, contributing to its serene environment. The economy of Colonial Beach is driven by its tourism, local businesses, and seasonal activities that cater to both residents and tourists alike. The main route into town is via James Monroe Hwy (SR 205) which is accessed from Kings Hwy (SR 3) from the South and U.S. Route from the North. These routes offer access to Maryland and Fredericksburg, VA, and I-95.

Figure 1-2: Town of Colonial Beach Regional Context



DEMOGRAPHICS

As of the most recent census data, the Town of Colonial Beach has a population of around 3,500 residents. The town has a predominantly White population, but there is also a mix of African American, Hispanic, and other racial and ethnic groups. The community is largely residential, with a significant proportion of retirees and vacation homeowners, due to its waterfront appeal. Colonial Beach's demographics also include a diverse age range, with both families and older adults, and the town has a slower-paced, small-town feel with a focus on tourism and local culture. The following demographic information is taken from the US Census Bureau.

Table 1-1: Colonial Beach Demographics and Change Over Time[1]

Population	
Population, Census, April 1, 2020	3908
Population, Census, April 1, 2010	3542
Age and Sex	
Persons under 5 years, percent	5.57
Persons under 18 years, percent	18.48
Persons 65 years and over, percent	26.8
Female persons, percent	52.5
Race and Hispanic Origin	
White alone, percent	74.2
Black or African American alone, percent(a)	14.09
American Indian and Alaska Native alone, percent(a)	0.54
Asian alone, percent(a)	1.85
Native Hawaiian and Other Pacific Islander alone, percent(a)	.28
Two or More Races, percent	7.93
Hispanic or Latino, percent(b)	1.1
White alone, not Hispanic or Latino, percent	65.26

[1] Source: U.S. Census Quick-Facts: https://www.census.gov/quickfacts/fact/table/kinggeorgecountyvirginia/PST045223

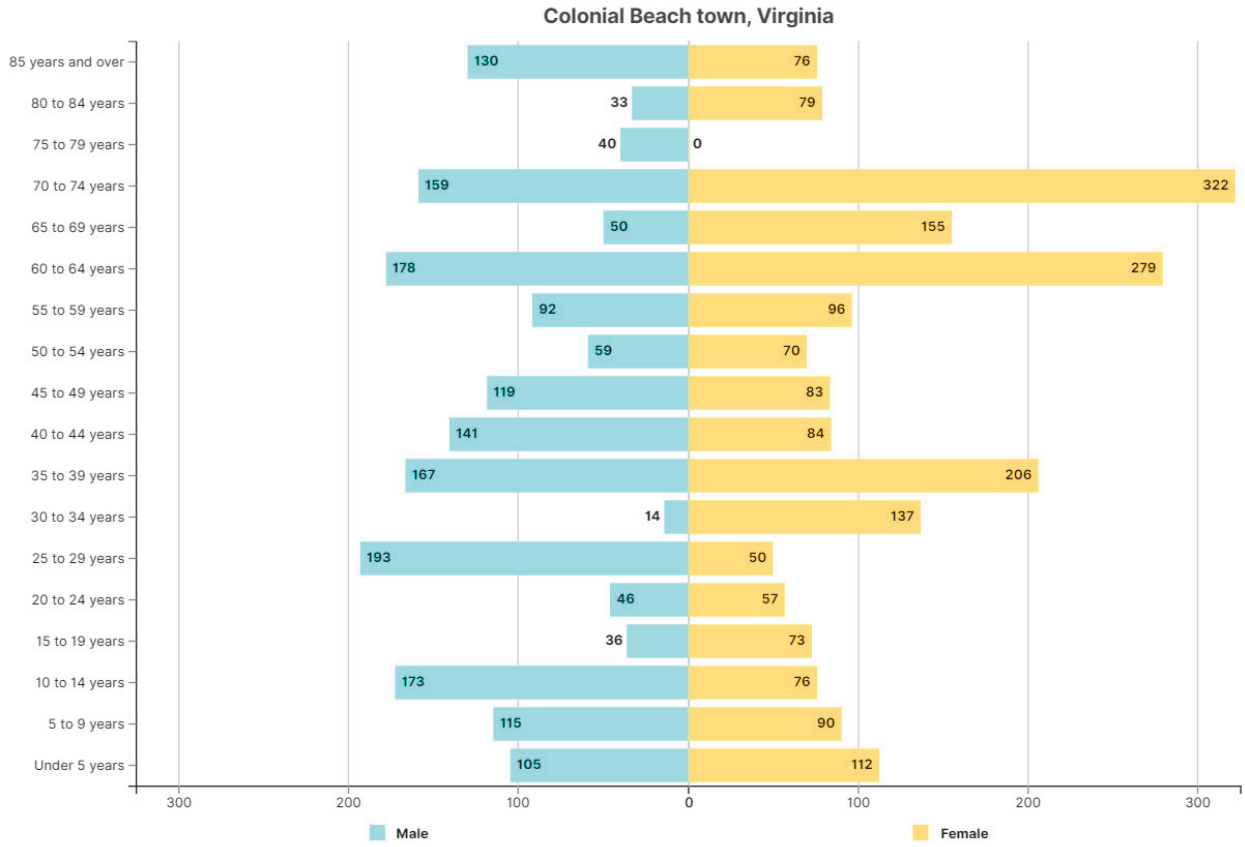
Population Characteristics (2018-2022)	
Veterans	11.12
Foreign born persons, percent	2.08
Families & Living Arrangements (2018-2022)	
Households	1865
Persons per household	2.05
Living in same house 1 year ago, percent of persons age 1 year+	3738
Language other than English spoken at home, percent of persons age 5 years+	3.9
Education (2018-2022)	
High school graduate or higher, percent of persons age 25 years+	32.4
Bachelor's degree or higher, percent of persons age 25 years+	15.6
Health (2018-2022)	
With a disability, under age 65 years, percent	69
Persons without health insurance, under age 65 years, percent	10.73
Economy (2018-2022)	
In civilian labor force, total, percent of population age 16 years+	32.58
In civilian labor force, female, percent of population age 16 years+	54.5
Income & Poverty (2018-2022)	
Median household income (in 2022 dollars)	$55,731
Per capita income in past 12 months (in 2022 dollars)	$36,187
Persons in poverty, percent	27.7
Geography	
Population per square mile, 2020	1,447
Population per square mile, 2010	1,311

(a) Includes people only reporting one race; (b) Hispanics may be of any race, included in applicable categories.

Table 1-2: Population Growth Change from 2010 to 2020

	2000 Census	2010 Census	2000–2010 % Change	2020 Census	2010–2020 % Change
Population	3219	3542	10.03%	3908	10.33

Figure 1-3: Colonial Beach Estimated Population Pyramid[2]



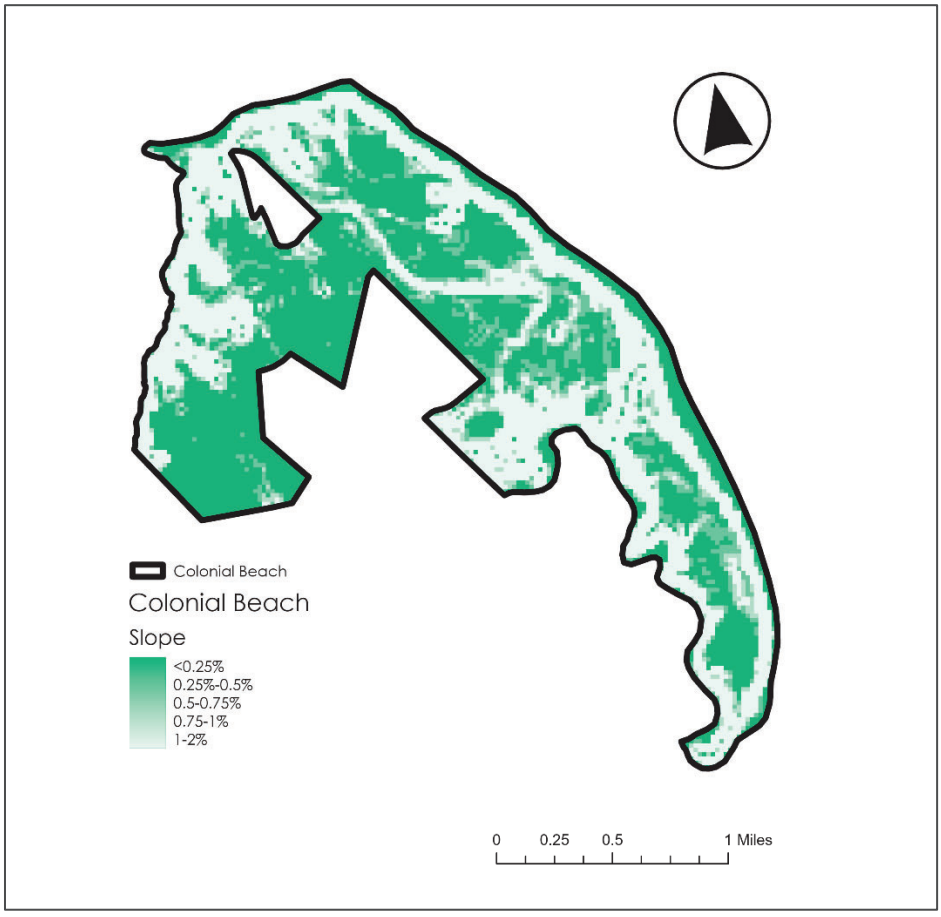
PHYSICAL PROFILE

Flood-related datasets are often used to help communities understand what kind of threats are potentially present in their area. While other threats may exist, for the purposes of this plan only those threats relevant to flooding were included. The data shown in this plan range from periodic threats such as inundation from storm surge to more permanent characteristics such as the presence of low-lying areas. The plan also incorporates regionally specific threats, such as geologic stressors, which may impact a community's ability to survive or recover from flood events in the short and long term.

[2] Source: US Census (https://data.census.gov/vizwidget?g=160XX00US5118400&infoSection=Age%20and%20Sex)

The Town's topography is characterized by flat, low-lying land with gentle elevations, the surrounding area features rolling hills and forested landscapes typical of the Northern Neck region of Virginia. The areas of low slope in the Town of Colonial Beach play an important role in the impact of storm surge from hurricanes or similar events. The following map identifies where water is more likely to collect on the landscape.

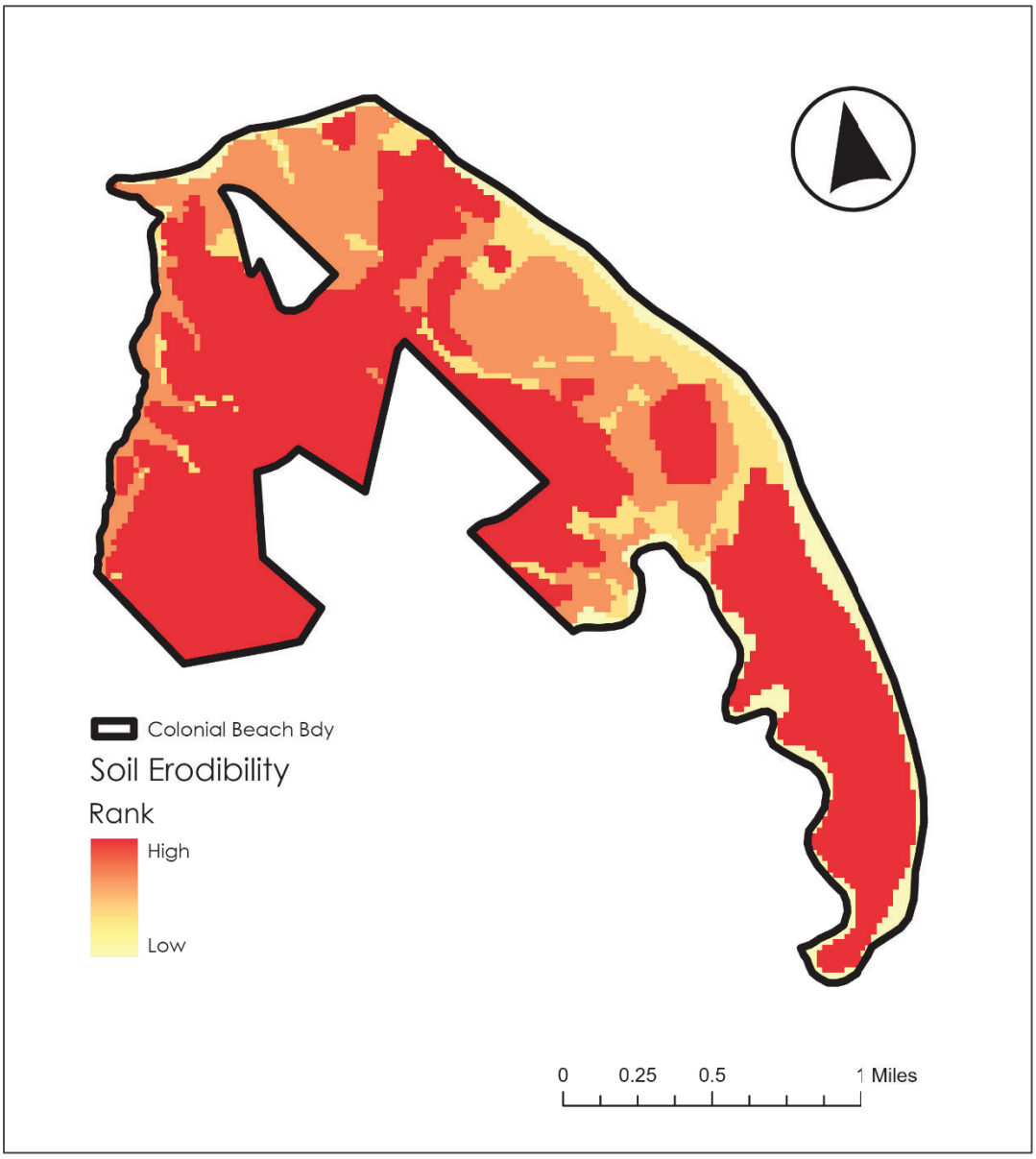
Figure 1-4: Percent Slope of Colonial Beach (and Immediate Shoreline)[3]



The geology of Colonial Beach is influenced by its location along the Potomac River and Monroe Bay, with sedimentary deposits playing a significant role in shaping the area's landscape. The underlying geology includes Quaternary sediments such as sand, silt, and clay, which have been deposited over time by river and coastal processes. The region also features some areas of fine-grained sedimentary rocks, including sandstone and shale, which are common in the broader Northern Neck region. The following map shows where, due to these soil conditions, land may be more likely to erode during floods.

[3] Source: USGS National Elevation Dataset (NED) tiles, 30m resolution

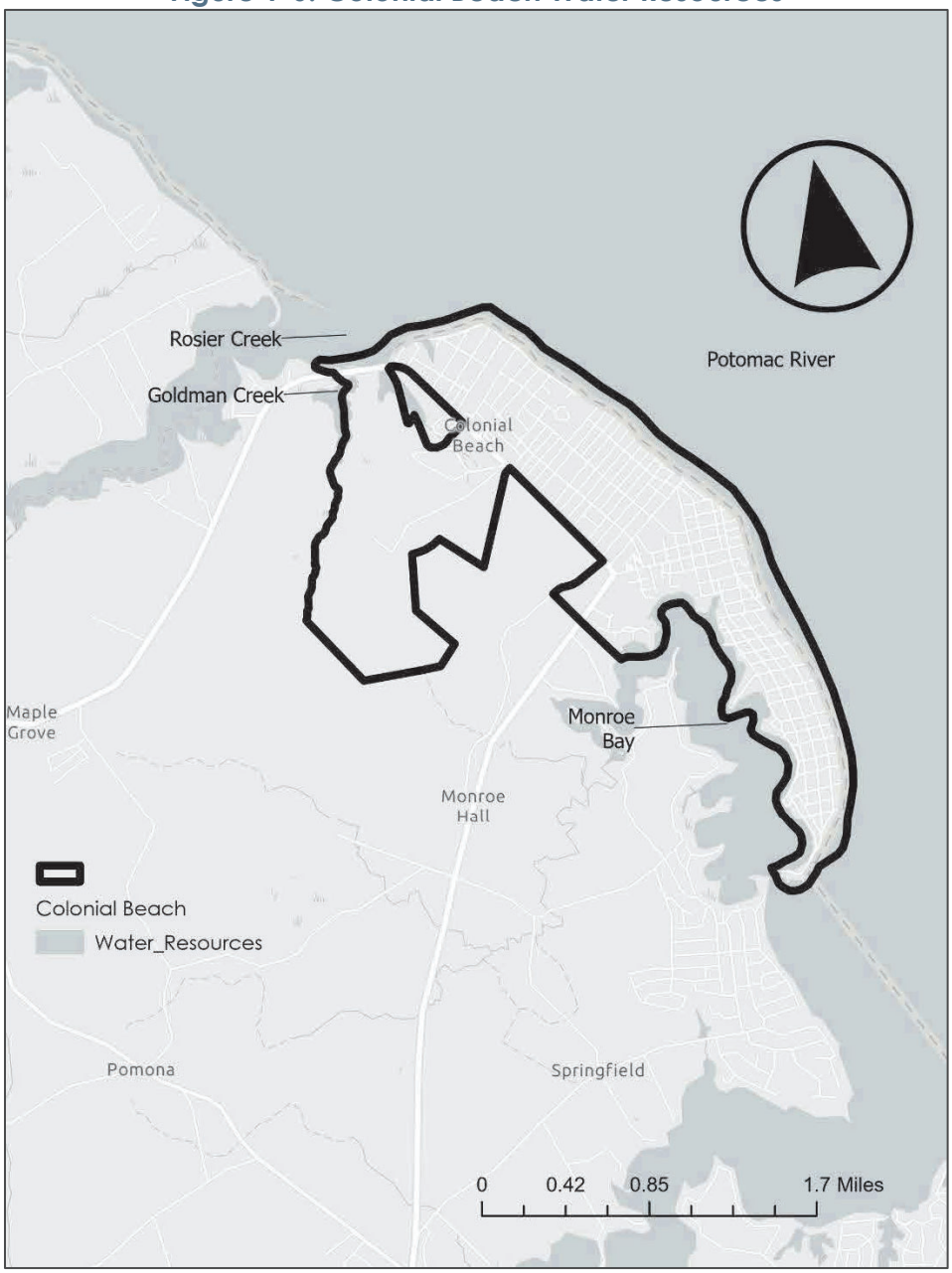
Figure 1-5: Soil Erodibility Map[4]



Colonial Beach's primary water resource is its location along the Potomac River, a major Chesapeake Bay tributary. The Town's waterfront provides access to the river, which supports recreational activities such as boating, fishing, and swimming. The Potomac River is a significant ecological and economic asset for the Town. Additionally, there are smaller local water features, including Monroe Creek and Goldman Creek, which contribute to the area's water resources and support local wildlife habitats. The region relies on both surface water from the Potomac River and groundwater from local aquifers for its water supply.

[4] Source: USDA-NRCS SSURGO database (https://www.nrcs.usda.gov/resources/data-and-reports/ssurgo-portal)

Figure 1-6: Colonial Beach Water Resources



Colonial Beach experiences a humid subtropical climate, characterized by hot, humid summers and mild to cool winters. The average annual temperature is around 57°F (14°C), with summer temperatures frequently reaching into the mid-80s to low 90s Fahrenheit (around 29-35°C). Winters are relatively mild, with average temperatures ranging from the upper 30s to mid-40s Fahrenheit (3-8°C). The town receives approximately 40-45 inches (1,000-1,200 mm) of precipitation annually, distributed fairly evenly throughout the year, with slightly wetter periods in the spring and summer. The climate supports a diverse range of vegetation and contributes to the town's appeal as a year-round destination.

The largest groundwater demands, according to the Virginia State Water Resources Plan 2022 published by DEQ, include several municipal facilities including the Town of Colonial Beach water treatment plant.

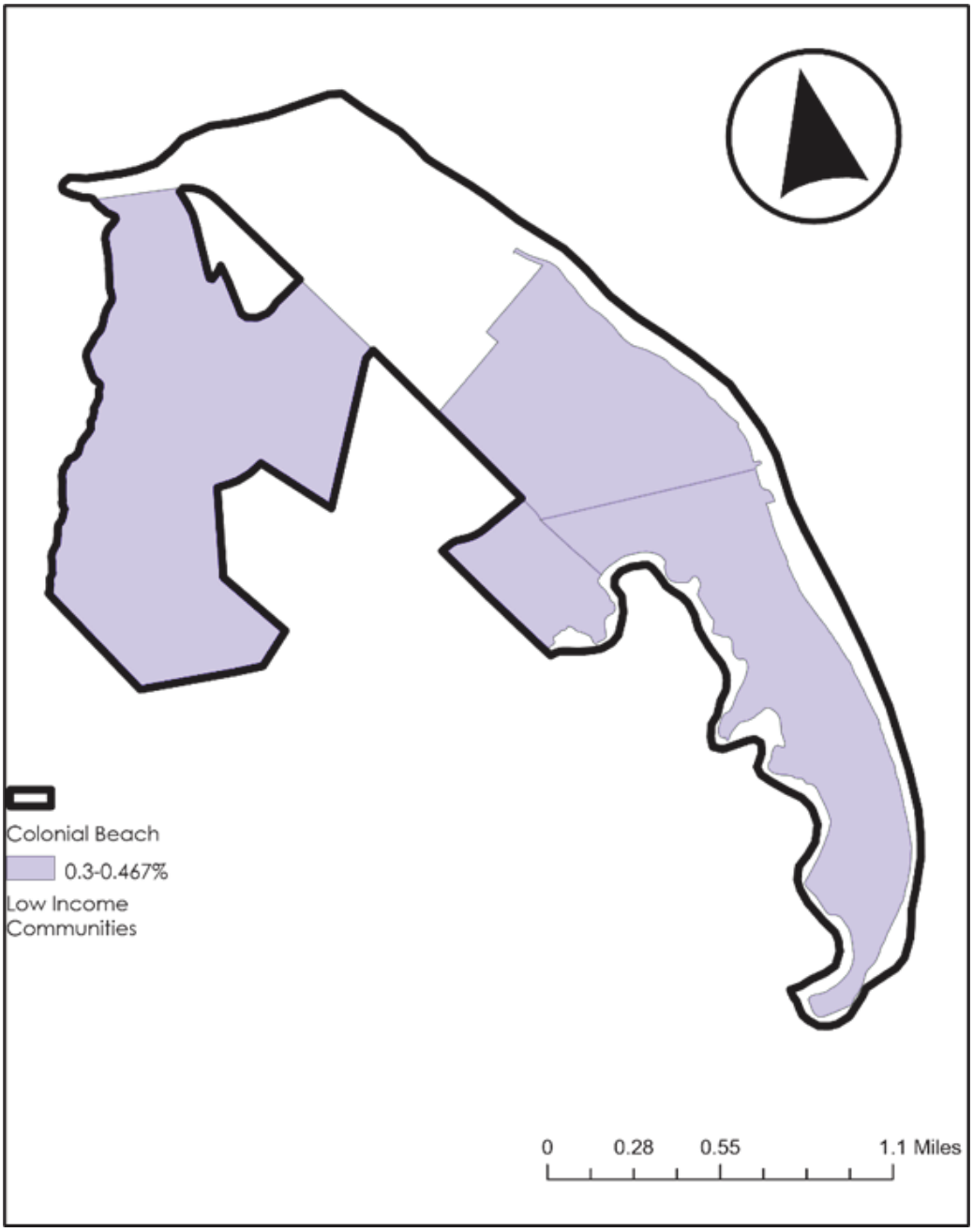
SOCIAL ASSETS AND VULNERABLE POPULATIONS

Colonial Beach's profile, although not especially vulnerable according to most characteristics, does have unique challenges given limited access points, low-lying topography, and areas of historic flooding that are low income. There are two relevant demographic indicators (as defined by the EPA's Environmental Justice Policies) including:

- Percent Low-Income: The percentage of a block group's population in households where the household income is less than or equal to twice the federal "poverty level."

- Linguistic isolation: Percent of people in a block group live in linguistically isolated households. A household in which all members aged 14 years and over speak a non-English language and also speak English less than "very well" (have difficulty with English) is linguistically isolated.

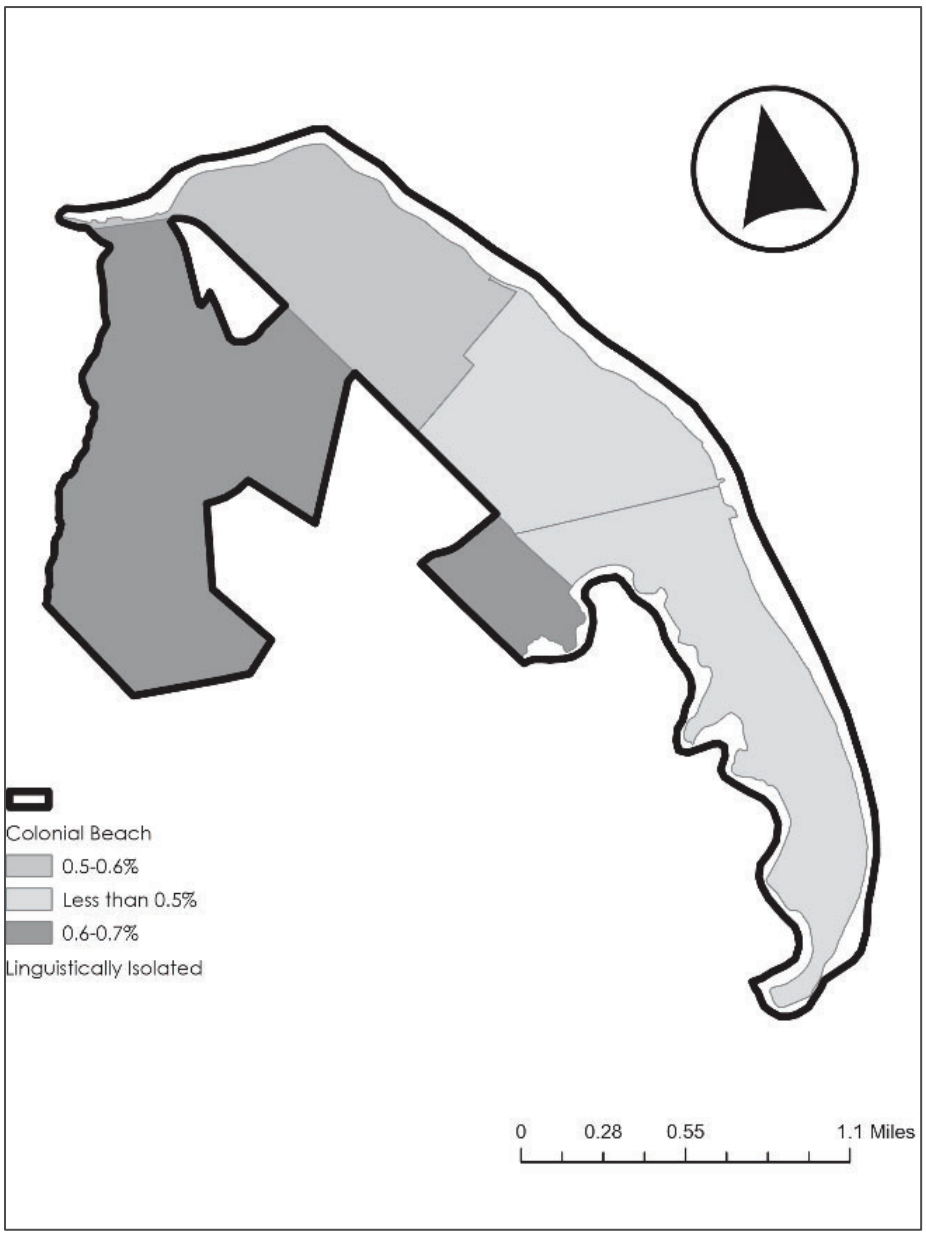
Figure 1-7: Low-Income Census Blocks (30% of Population Under HUD 80% AMI and Under Twice the Federal Poverty Level)[5]



[5] Source: DEQ EJScreen+; 2011-2018 American Community Survey (https://geohub-vadeq.hub.arcgis.com/pages/v-a-e-j-screen)

One potentially unique challenge prevalent in the town is the number of linguistically isolated individuals, who may have trouble navigating emergency information or other flood protection resources. The map below shows the census block groups, representing those 2% to 7% of households who do not speak English at home, and does not capture the significant non-English speaking tourists who regularly visit Colonial Beach.

Figure 1-8: Linguistically Isolated Populations[6]



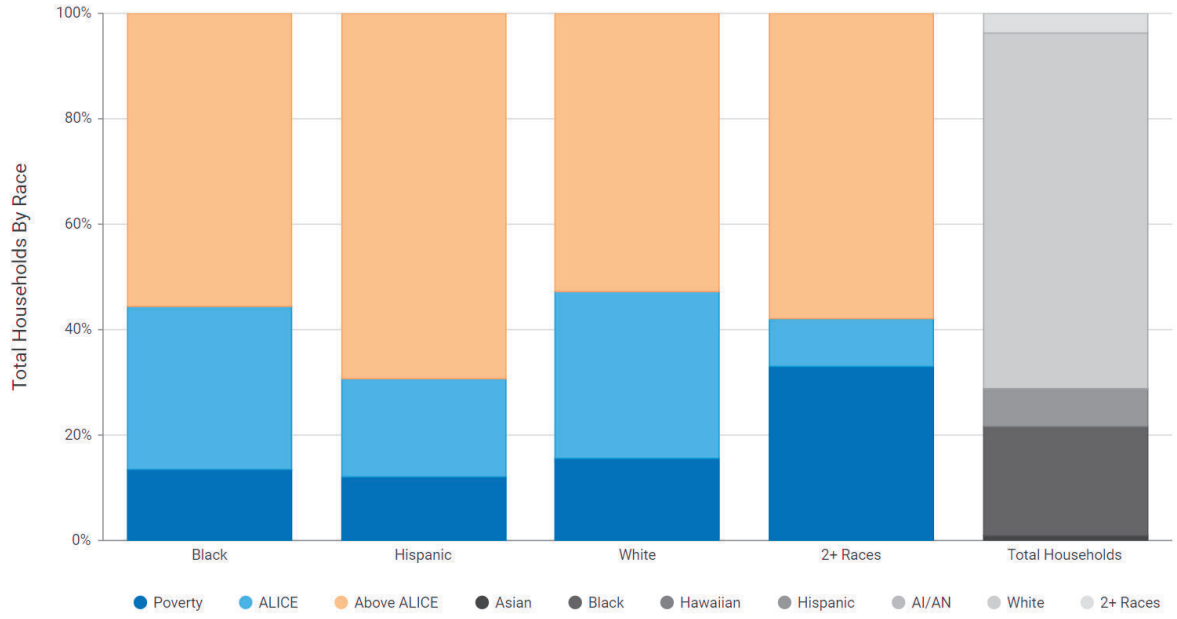
[6] Source: DEQ EJScreen+; 2011-2018 American Community Survey (https://geohub-vadeq.hub.arcgis.com/pages/v-a-e-j-screen)

ALICE is an acronym for 'Asset Limited, Income Constrained, Employed,' households that earn more than the Federal Poverty Level, but less than the basic cost of living for the county. While conditions have improved for some households, many continue to struggle, especially as wages fail to keep pace with the rising cost of household essentials (housing, childcare, food, transportation, health care, and a basic smartphone plan). Households below the ALICE Threshold — ALICE households plus those in poverty — cannot afford the essentials.[7]

Table 1-3: Westmoreland County ALICE Parameters vs. Virginia Average

Parameter (2022 Data)	Westmoreland County	State Average
Population	18,480	-
# Households	7,832	-
Median Household Income	$56,647	$85,873
Labor Force Participation	51%	65%
ALICE Households	29%	29%
Households in Poverty	17%	11%

Figure 1-9: Households by Race/Ethnicity, Westmoreland County, VA



[7] AdaptVA takes several factors into account, including income, minority status, elderly, single female head of households, educational attainment, and employment. For a complete breakdown of the methodology see: https://cmap2.vims.edu/SocialVulnerability/Documents/Metadata_descriptions_for_the_SV_viewer.pdf

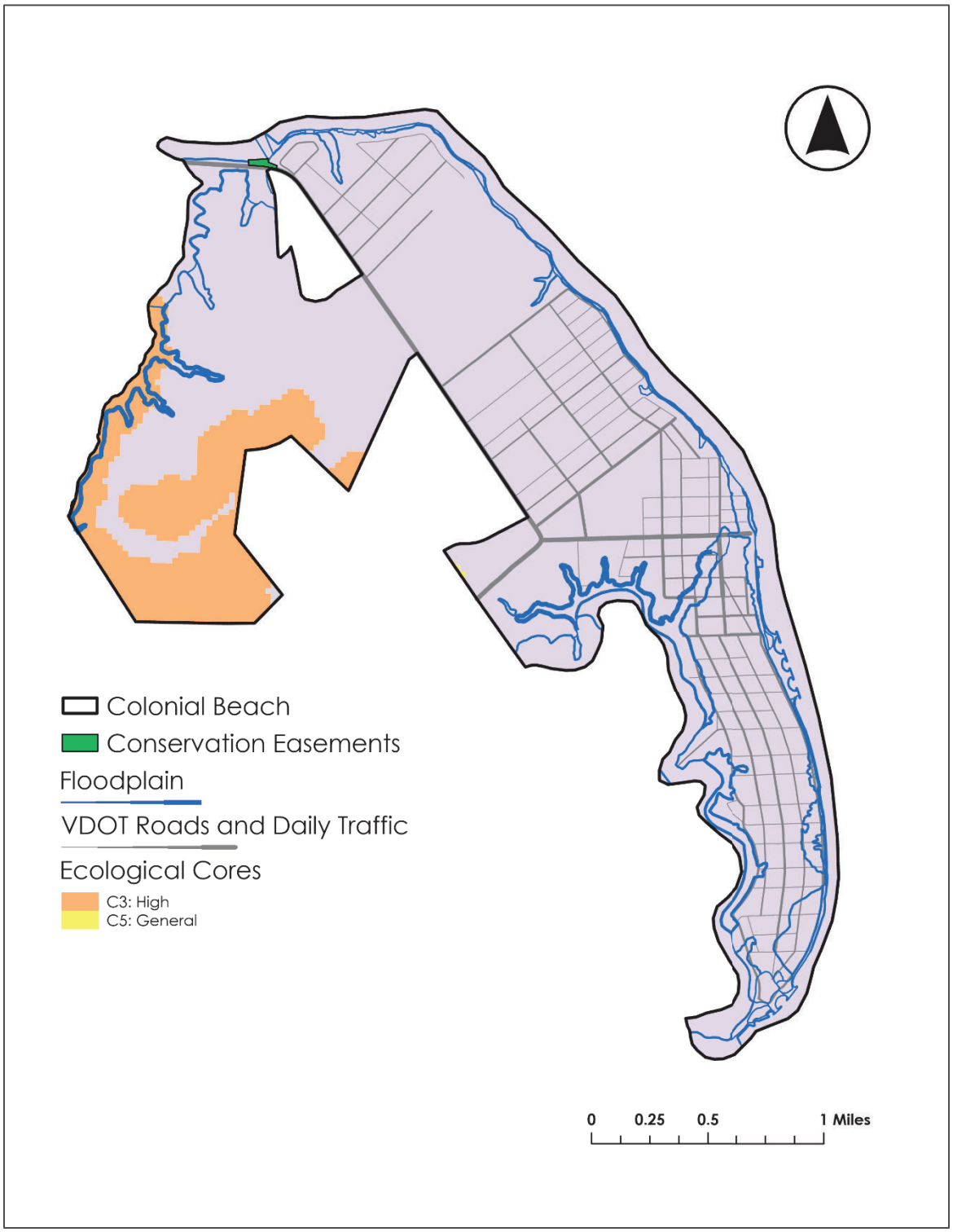
ENVIRONMENTAL AND CULTURAL ASSETS

The Potomac River and Monroe Bay are central environmental assets for Colonial Beach. Its scenic waterfront provides recreational opportunities such as boating, fishing, and swimming. Colonial Beach boasts a sandy shoreline that is a key attraction for residents and visitors alike. The town has several parks that enhance its green space and recreational options including playgrounds, sports facilities, and walking trails. There are local initiatives that aim to preserve the health of the Potomac River, manage stormwater runoff, and protect the town's coastal and riparian environments. Colonial Beach has a rich historical heritage, with several preserved sites and landmarks. The Colonial Beach Historical Society plays a role in maintaining and interpreting the town's history. Key historical sites include old inns, Victorian-style homes, and structures from the town's early days as a resort destination. The Colonial Beach Commercial Historic District offers a wide variety of shops and restaurants while being a national historic landmark.

Ecological Cores

The Virginia Natural Landscape Assessment (VaNLA) is a landscape-scale GIS analysis that has identified, prioritized, and linked important lands to form natural land networks throughout Virginia. The cores layer shown in Figure 1-10, represents cores as polygons that are symbolized by Ecological Integrity scores, calculated from an Ecological Composite Model (ECM). Maintaining vital natural landscapes is essential for basic ecosystem services such as cleaning our air and filtering our water. Natural lands also harbor thousands of species of animals and plants and contain libraries of genetic information from which we derive new foods, materials, and medicinal compounds. These parts of the landscape also provide us with recreational opportunities and open space resources. To assess their unique values, each core and habitat fragment has been assigned an Ecological Integrity score that rates the relative contribution of that area to ecosystem services such as wildlife and plant habitat, biodiversity conservation, open space, recreation, water resources protection, erosion control, sediment retention, protection from storm and flood damage, crop pollination, and carbon sequestration. In general, larger, more biologically diverse areas are given higher scores. Scores are enhanced if the core or habitat fragment is part of a larger complex of natural lands. Scores also are increased for those cores and habitat fragments that contribute to water quality enhancement. For more information, go to: http://www.dcr.virginia.gov/natural-heritage/vaconvisvnla.

Figure 1-10: Ecological Cores Overlaid on the Regulatory Floodplain[8]



[8] Source: DCR Natural Landscape Assessment (https://www.dcr.virginia.gov/natural-heritage/vaconvisvnla)

FLOODING

Flooding in The Town of Colonial Beach, like many coastal communities, can occur due to a variety of causative factors, including, frequent and intense tropical storms, hurricanes, accelerated sea level rise (SLR)[9], and related nuisance flooding. All types of flooding can have serious risks to human health and infrastructure.

The Floodplain

One of the most immediate sources of information in the United States for identifying areas at risk of flooding are FEMA's flood maps, officially known as Flood Insurance Rate Maps (FIRMs). The maps provide critical information for homeowners, businesses, and local governments to understand flood hazards and make informed decisions about building, insurance, and land use planning. These maps help determine flood insurance requirements and guide development in flood-prone areas, ultimately aiming to reduce the impact of flooding on lives and property. For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of an engineering analyses or Flood Insurance Study (FIS).

The zones are as follows:

> ***Zone A*** is the flood insurance rate zone that corresponds to the 1- percent annual chance floodplains that are determined in the FIS by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.
>
> ***Zone AE*** is the flood insurance rate zone that corresponds to the 1- percent annual chance floodplains that are determined in the FIS by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone. Z
>
> ***Zone AO*** is the flood insurance rate zone that corresponds to the areas of one percent annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are shown within this zone.
>
> ***VE Zone*** the flood insurance rate zone that corresponds to the 1- percent annual chance coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

[9] Science Direct, 2024, Sea Level Rise, https://www.sciencedirect.com/topics/earth-and-planetary-sciences/sea-level-rise

Zone X is the flood insurance rate zone that corresponds to areas outside the 0.2-percent annual chance floodplain, areas within the 0.2- percent annual chance floodplain, and to areas of 1- percent annual chance flooding where average depths are less than 1 foot, areas of 1- percent annual chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1- percent annual chance flood by levees.

Most portions of the town are currently not located in a FEMA flood zone, with small portions located in the "X" zone and other areas in the "AE" Zone. It is important to remember that structures located outside of a designated flood zone may still flood due to factors such as low natural topography, high groundwater levels, and increases in impervious surfaces due to development. See Figure X below for the Town's NFIP effective floodplain areas.

Figure 1-11: FEMA NFIP Effective Flood Hazard Areas. 2024

In addition to regulating the floodplain, the National Flood Insurance Program (NFIP) provides flood insurance for properties that are vulnerable to flooding. This flood resilience plan builds on the flood risk assessment performed in the 2023 Northern Neck HMP update. Repetitive loss properties and severe repetitive loss properties as stated in the HMP, *"The Hazard Mitigation Assistance program defines Repetitive Loss as having incurred flood-related damage on two occasions, in which the cost of the repair, on the average, equaled or exceeded 25 percent of the market value of the structure at the time of each such flood event; and, at the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage."*[10] As of 2023 publication of the HMP update, there were 40 structures in Westmoreland County considered Repetitive Loss, with repetitive losses amounting to $3,622,592 in damage payments for $52,827,400 in property value in the Town of Colonial Beach. [11]

Hurricanes and Tropical Storms

Hurricanes, tropical storms, and typhoons are all cyclonic storms. In the northern hemisphere, these are characterized by counterclockwise rotational air movement around and into a low-pressure center. On average, about six storms per year reach hurricane intensity in this region. As recorded, about 69 tropical cyclones have been tracked directly across Virginia. Virginia averages about one storm per year. While some years are storm-free, others may witness multiple storms just days or weeks apart.

While the official hurricane season runs June 1 through November 30, the peak of the Atlantic hurricane season is typically from mid-August to late October, with September 10th being the climatological peak.

The Town of Colonial Beach is vulnerable to the impacts of hurricanes and tropical storms. The extent and magnitude of hurricane and tropical storm impacts can vary widely depending on the storm's characteristics, path, and speed of movement. Key factors include:

> ***Wind:*** High winds can cause widespread damage to structures, down trees and power lines, and create dangerous debris. While the region typically experiences reduced wind speeds compared to coastal areas, tropical storm-force winds (39-73 mph) and occasionally hurricane-force winds (74+ mph) can still occur.
>
> ***Storm Surge:*** A rise in seawater level during a storm, caused primarily by the strong winds pushing water toward the shore; storm surges can result in significant coastal flooding, particularly when they coincide with high tides, and are a major cause of damage and loss of life during hurricanes, cyclones, and other severe storms. The height of a storm surge can vary depending on the storm's intensity, speed, and direction, as well as the shape of the coastline and the underwater topography.

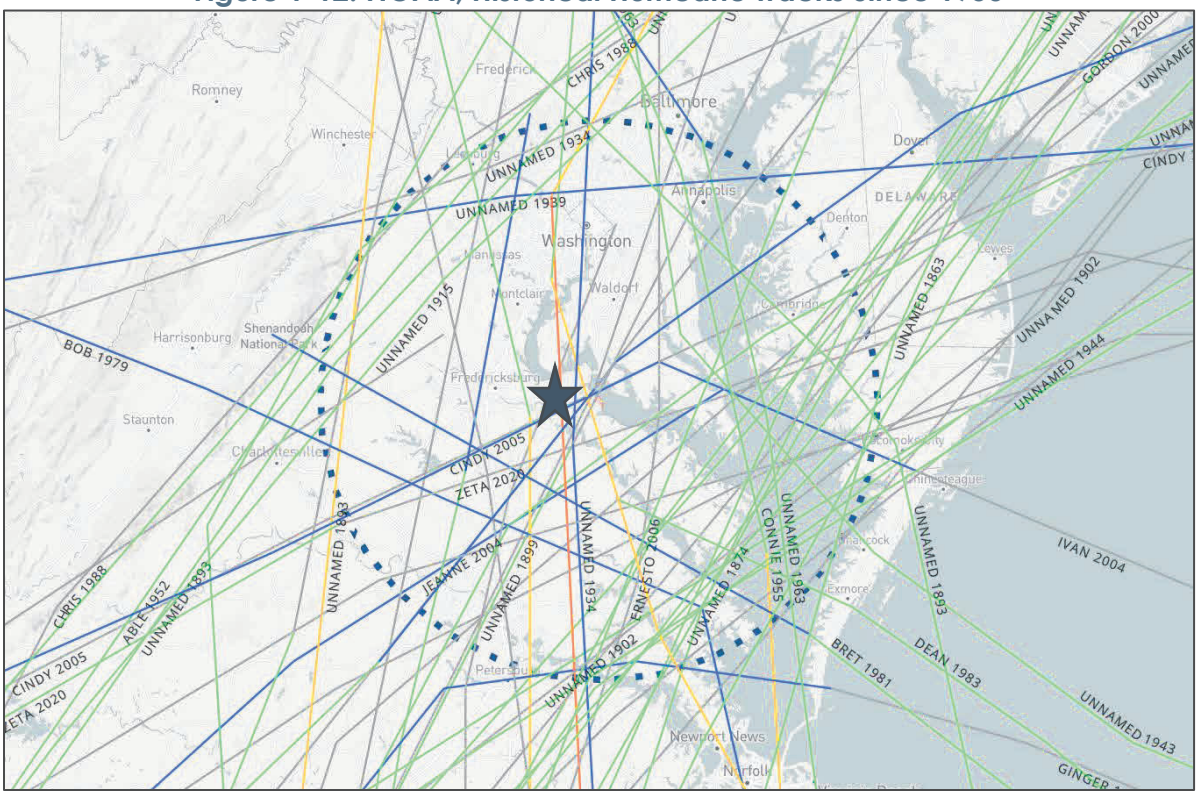
[10] The 2023 Northern Neck HMP Update
[11] Framework for Coastal Flooding, UVA School of Architecture, 2021

Rainfall: Tropical systems can produce extreme rainfall, leading to flash flooding and river flooding. The region's varied topography, including the eastern slopes of the Blue Ridge Mountains, can enhance rainfall in some areas.

Tornadoes: Hurricanes and tropical storms can spawn tornadoes, which may affect the region even when the storm center is hundreds of miles away.

Historical data provides insight into the region's hurricane risk. According to NOAA's Historical Hurricane Tracks tool, between 1851 and 2023, 57 tropical systems have passed within 50 nautical miles of the Town's center (approximate coordinates 38.25° N, 76.96° W):

Figure 1-12: NOAA, Historical Hurricane Tracks Since 1950



Notable storms that have impacted the region include:

Hurricane Isabel (2003): Made landfall in North Carolina as a Category 2 hurricane, causing significant wind damage and flooding in the region. Storm surge caused significant damage. Strong winds, heavy rainfall, and storm surge created considerable destruction in this small waterfront town.

Tropical Storm Lee (2011): Brought heavy rainfall and flooding to the area.

Hurricane Sandy (2012): Although it made landfall in New Jersey, its large size affected the region with high winds and heavy rainfall.

Hurricane Florence (2019): While the main impact of Florence was farther south, the storm's remnants caused minor flooding and high tides in the Colonial Beach area.

Tropical Storm Elsa (2021): Some wind impacts (due to gusts of 40-50 mph, with a couple gusts as high as 60 mph) were felt across eastern VA. Localized power outages occurred, and there were some significant flood/flash flood impacts (generally along and just to the left of the track).

Using publicly available data from the National Weather Service's SLOSH (Sea, Lake, and Overland Surges from Hurricanes) model[12], it is possible to visualize the estimated impacts to the Town from hurricanes categories. Figure 1-13 below is a modelled visualization of a Category 3 hurricane, and storm surge heights within the Town of Colonial Beach.

Figure 1-13: Storm Surge Heights from Category 3 Hurricane

Precipitation Events

According to the National Weather Service, on average, the United States sees 100,000 thunderstorms each year. Although thunderstorms generally affect only a small area,

[12] National Hurricane Center, National Storm Surge Risk Maps,

the extent of their impact is often enhanced by their ability to generate tornadoes, hailstorms, strong winds, damaging lightning, and flash floods. Thunderstorms occur in all regions of the United States and are very common in the region where topographic and atmospheric conditions combine to create ideal circumstances for generating these powerful storms.

Thunderstorms can produce excessive amounts of rainfall which can produce riverine, coastal, and flash flooding. Riverine flooding results from excessive precipitation and high runoff volumes over a large area. In Virginia, riverine flooding often begins with widespread flash flooding of small streams. This may result from a series of small storms or the impact of larger systems including tropical storms, hurricanes, and northeasters. Snowmelt may also contribute to excessive runoff.

Flash floods, as the name suggests, strike quickly. Resulting from intense rainfall rates that quickly exceed surface absorption capacity, flash floods are often associated with slow-moving thunderstorms, hurricanes, and tropical storms. Streams, creeks, and drainage-ways quickly become raging torrents. Occurring more frequently along mountain streams, flash floods also affect highly urbanized areas where impervious surfaces offer no opportunity for infiltration. Rapidly moving walls of water and associated debris can uproot trees, roll boulders, destroy buildings, and obliterate bridges and roads. Flash floods also may result from the sudden release of water blocked by a shifting ice jam or the spontaneous failure of a dam or levee. The region's topography, with its mix of steep mountain slopes and broad river valleys, makes it particularly susceptible to these types of flooding events.

Coastal Flooding

Coastal flooding in the area refers to the inundation of normally dry, low-lying coastal areas with seawater. This type of flooding is often caused by a combination of factors, including storm surges from hurricanes or nor'easters, high tides, and rising sea levels. In the Mid-Atlantic region, which includes Virginia, coastal flooding is a significant concern due to the region's extensive coastline, dense population, and numerous estuaries and bays.

The impacts of coastal flooding in this region can be severe, leading to property damage, erosion, loss of habitat, and disruptions to transportation and infrastructure. The risk is exacerbated by climate change, which is causing sea levels to rise and storms to become more intense. The combination of these factors makes coastal flooding a persistent and growing threat.

Coastal flooding is most often associated with storm events that bring large amounts of rainfall to the area, swelling rivers and tributaries beyond their banks which in turn flood downstream areas. Topographical features, soils, and development patterns also play a part in flooding; and the interaction between these geophysical elements can affect how water moves through the landscape.

Flooding due to stormwater runoff is being evaluated for potential measures through Part 2 of this Plan, the Stormwater Management Plan, whereas flooding due to tidal influences is being evaluated for potential measures through the Town-wide Resilience Plan, being developed by The Berkely Group.

Known Flooding Issues

As previously mentioned, the Town of Colonial Beach has floodplain areas, where development is more at risk due to the proximity to coastlines and wetlands. Additionally, Colonial Beach contains topographical features that may contribute to standing water in certain areas during intense or prolonged storm events. Combining information received during community interviews, discussions with staff and elected officials, and the public survey has produced a list of the most common areas of known flooding in the Town:

Virginia State Road 205 near Wilkerson's Seafood: The road has a low spot that has ongoing flooding.

9th Street: The numbered streets between 7th Street and 12th Street have ongoing flooding problems.

Virginia Avenue: The portion between Lincoln Avenue and Maryland Avenue and Washington Avenue and the beach has flooding that affects the homes along the road.

Dennison Street: Near Monroe Bay, the road has a low point that floods from storm and tidal events.

Santa Maria Avenue: The drainage network in this area has undersized pipes and ditches leading to flooding.

Irving Avenue: The road experiences beach erosion and flooding issues, especially during high tides.

Potomac River Beach Outfalls: Severe beach erosion is occurring at each of the outfalls located at the municipal pier, Wilder Avenue at the Riverboat, Colonial Avenue near the pump house, and Madison Street.

Undeveloped Area: The area to the west of the numbered streets is currently undeveloped but future development will add to stormwater management issues in this area and the numbered streets.

The known areas of flooding (shown as points) from the public survey were placed by individuals to identify the location and source of known flooding. These points have been overlaid on layers depicting the average volume of daily traffic (according to VDOT) and outlines of the regulatory floodplain.

Figure 1-14: Flooding Locations Identified from Survey

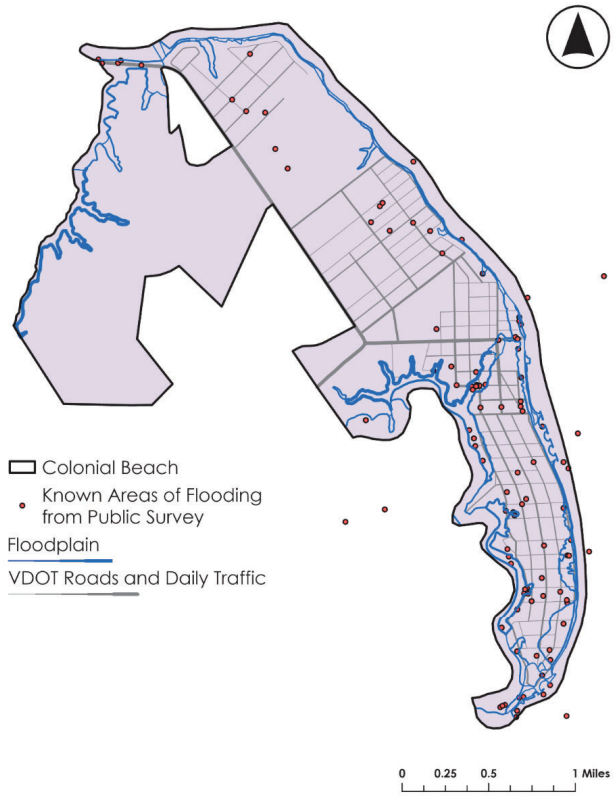
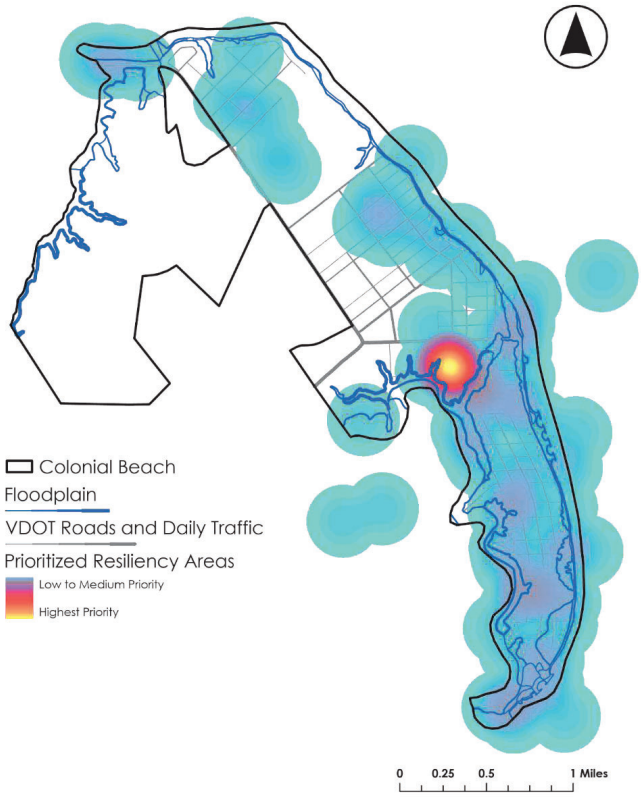


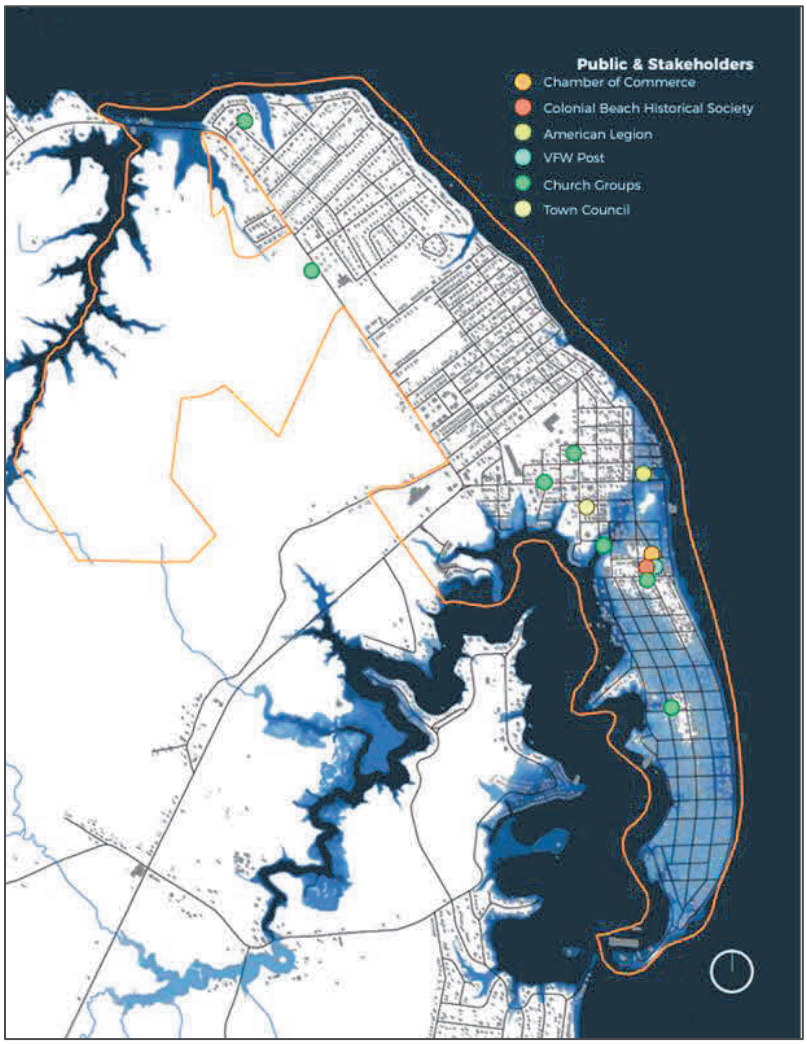
Figure 1-15: Heat Map of Flooding Locations Identified in Survey



Critical Facilities Threatened by Flooding

Different conclusions as to what constitutes "critical facilities" can be reached, which affects this analysis, but it is important to consider what infrastructure, government function buildings, major bridges and roadways, and social assets could be impacted by flooding and lead to compounding negative effects – for instance, a flooded road preventing fire and rescue from reaching imperiled portions of the County, or flooded and backed up sewage causing public health and humanitarian issues. The University of Virginia's Framework for Coastal Flooding Report[13] completed an analysis of assets throughout the town and their relative vulnerability to flood events. See Figure 1-16 below for mapped assets.

Figure 1-16: Mapped Assets and Vulnerability to Flooding with 10' of Sea Level Rise[14]



[13] A Framework for Coastal Flood Planning, Colonial Beach, VA, UVA School of Architecture, https://raft.ien.virginia.edu/system/files/Framework%20for%20Coastal%20Flooding_Colonial%20Beach%20VA.pdf

[14] Source: UVA School of Architecture

STORMWATER MANAGEMENT

Stormwater management is critically important in the Town of Colonial Beach given its low-lying geography and proximity to water. The town is particularly susceptible to flooding from heavy rains, storm surges, and rising sea levels. Effective stormwater management is essential to reduce flooding risks, protect property, maintain water quality, and safeguard natural habitats. As identified in previous reports and studies, as the town continues to experience growth and development, implementing robust stormwater management practices will help mitigate the adverse impacts of urban runoff, prevent erosion, and enhance the resilience of this scenic coastal community to climate change and extreme weather events.

Stormwater management was identified as a priority and therefore an initial assessment was completed, in advance of a more detailed stormwater management plan. This assessment included Interviews with Town staff, Town Council, Planning Commission, and the public to identify areas of flooding. These areas were then prioritized to determine which should be a part of the Stormwater Management Plan, which is Part II to this report. Three priority areas were identified and will be discussed in more detail in Part II.

The prioritized areas to be further studied in Part II of this report are: (1) Virginia Avenue, (2) Potomac River Beach Outfalls, and (3) Monroe Bay at Dennison Street.

As stated in Tetra Tech's memorandum dated March 17, 2024 which can be found in the Appendix. There are potential options to address flooding in the three priority areas, there are several town wide strategies that could be implemented across the Town to help improve current stormwater management and reduce stormwater impacts from future development.

These measures include:

- Increasing maintenance to clean out ditches and inlets, repair broken pipes, and sweep the streets to maintain the capacity of the existing system.
- Adopting ordinances to guide future development to ensure that additional infrastructure is added to address the stormwater runoff from new development.
- Implementing an outreach and education campaign about what community members can do to help manage stormwater, such as reducing the impervious area on their properties, adding rain gardens, and using rain barrels.

Stormwater Infrastructure Funding

Currently, funding for dedicated stormwater initiatives in Colonial Beach comes only from the general fund allotted to the public utilities department, with additional grant funding added. The Town does have a dedicated utilities fund, a flat annual fee of $366 for all residences, but this is used for upgrades to sewer and water delivery services. One

common way to address funding for stormwater infrastructure is a stormwater fee applied to residents and businesses.

Stormwater Fees

A stormwater fee is a charge assessed on property owners to fund stormwater management programs. Unlike taxes, these fees are typically based on the amount of impervious surface on a property, which directly correlates to the amount of stormwater runoff generated. The fee structure encourages property owners to reduce impervious surfaces and implement stormwater management practices on their property.

There are several ways a stormwater fee can be structured:

Flat Fee: All properties pay the same fixed amount, regardless of size or land use.

Tiered Residential Rates: Single-family residential properties are grouped into tiers based on impervious surface area (e.g., small, medium, large), with a flat fee for each tier.

Proportional: directly proportional to the impervious surface area, or impervious surface area divided by a common unit (such as the average impervious area of a single-family residence, called an Equivalent Residential Unit).

Discounts for LID: low-impact development or green infrastructure that reduces stormwater can bring fees or tax rates down.

Combination: Any combination of these, including flat fees with variable rates.

Examples of Stormwater Fees in Virginia:

City of Richmond: Richmond implemented a stormwater utility fee in 2009. As of 2023, the fee is $2.92 per month per 1,000 square feet of impervious area. Single-family residential properties are charged a flat rate based on five tiers of impervious surface area, with discounts for installed stormwater control measures.

City of Norfolk: Norfolk's stormwater fee is currently $14.07 per month for a typical single-family residence (2,000 square feet of impervious area). Commercial properties pay based on their actual impervious area.

City of Charlottesville: As of 2023, Charlottesville's fee is $1.20 per 500 square feet of impervious area per month.

City of Virginia Beach: Virginia Beach adopted a stormwater fee in 1992 used mostly for operations and maintenance of pump stations, ditches, lakes, dams, and pipes.

For Colonial Beach, a flat fee plus additional per-unit amounts for impervious cover over a certain amount could signal both that everyone in the Town has a responsibility for stormwater while bigger contributors to the issue pay more.

Other Potential Funding Sources

General Fund: this is the current method used by the Town and is dependent on tax revenues to fund stormwater projects, which can create a negative feedback loop if stormwater issues cause less tax revenue.

Special Assessment Districts: similar to a fee, create special districts where property owners within flood-prone areas pay an additional tax or assessment to fund specific stormwater projects benefiting that area. This would likely cover nearly all of Colonial Beach.

Bond Issuance: although debt should usually only be considered for emergencies or large necessary expenditures, it can spread the cost over many years.

State and Federal Grants: various grant programs are available for stormwater and flood mitigation projects; examples include:

- Virginia Community Flood Preparedness Fund (CFPF);
- FEMA's Building Resilient Infrastructure and Communities (BRIC) program; and
- EPA's Clean Water State Revolving Fund (CWSRF)

Development Impact Fees: Charge one-time fees to new developments to offset their impact on the stormwater system.

In-Lieu Fees: Allow developers to pay a fee instead of implementing on-site stormwater management practices, with the funds used for larger, regional stormwater projects that can serve the same purpose for an area.

CLIMATE CHANGE AND FUTURE FLOODING CONDITIONS

While future climate trends are variable in some areas of the United States, annual precipitation is expected to increase, presumably due to increased energy in the atmosphere. Simultaneously, other areas are expected to see less rainfall and prolonged droughts. Historical trends are variable and difficult to ascertain and extrapolate.

However, one shift in environmental conditions that can reasonably be determined is sea level rise. Sea level rise refers to the increase in average sea level over time, primarily caused by the expansion of ocean waters due to the warming of the Earth's

atmosphere and the melting of land-based ice.[15] This analysis, in keeping with Commonwealth's Coastal Resilience Master Plan[16], relies on the publicly available science and datasets for sea level rise projections.

Localized sea level rise rates in Colonial Beach have been recorded at 4.89 mm/year, which is the 11th highest rate of sea level rise in the entire U.S., and exceeds rates recorded both at other Virginia gauges at Sewell's Point and Gloucester[17].

In the future, The US Army Corps of Engineers has estimated that water levels at the Colonial Beach Potomac River Gauge will rise up to 6 feet by 2100 in its highest rate scenario.[18] The map on the next page illustrates the impacts to the town with a more moderate, Intermediate-High SLR scenario of 4.8 feet of sea level rise in 2100.[19] The Town can expect dramatic impacts to infrastructure both private and public.

[15] Climate Change (Third Edition), 2021
[16] Virginia Coastal Resilience Master Plan, VADCR. 2021
[17] NOAA, Tides and Currents, Colonial Beach, VA Station 8635150
[18] US Army Corp of Engineers
[19] NOAA, Intermediate High Sea Level Scenario, 2017

Figure 1-17: Water Depth for Intermediate-High Sea Level Rise Scenario, NOAA

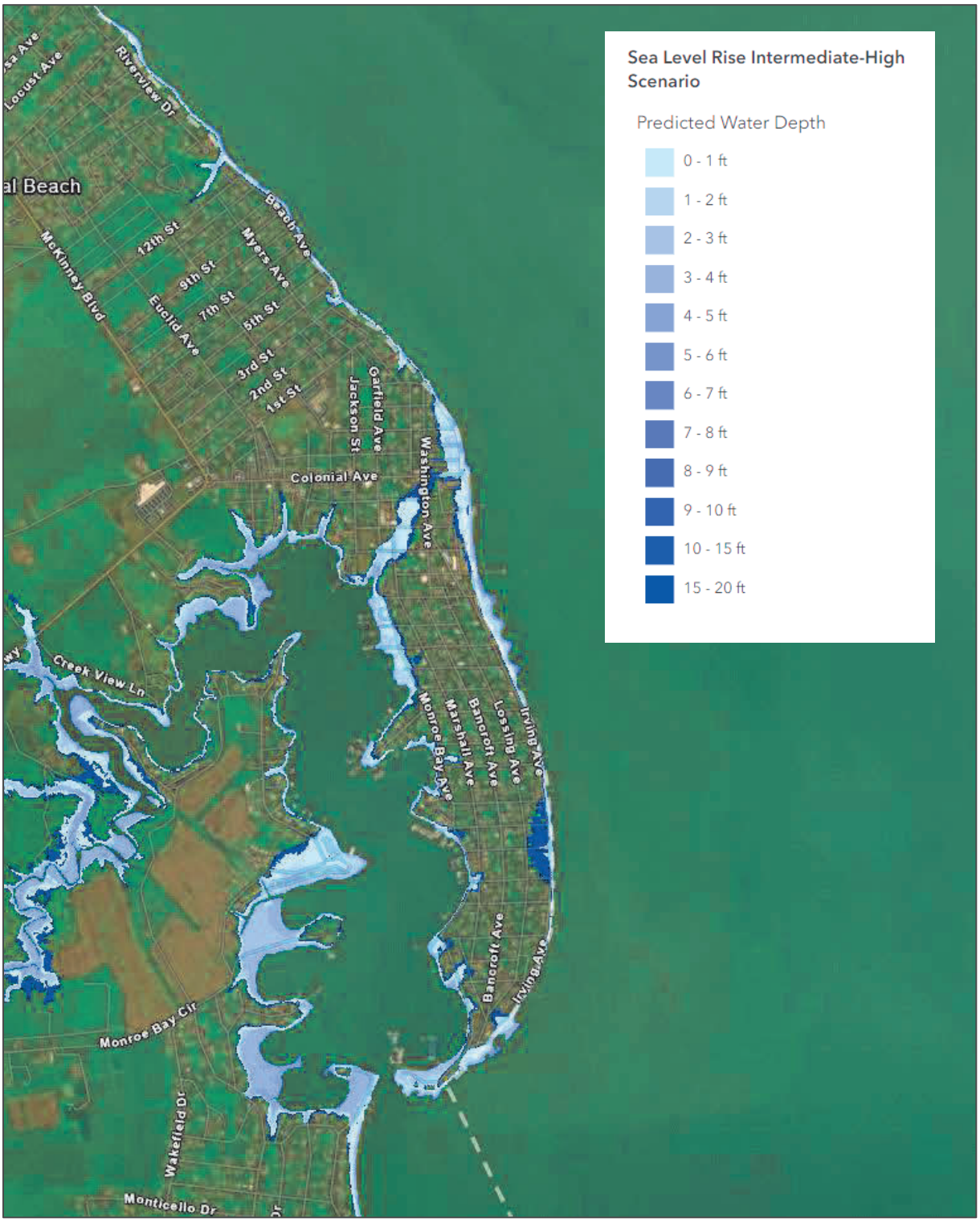


Figure 1-18: Structures at Risk of Sea Level Rise

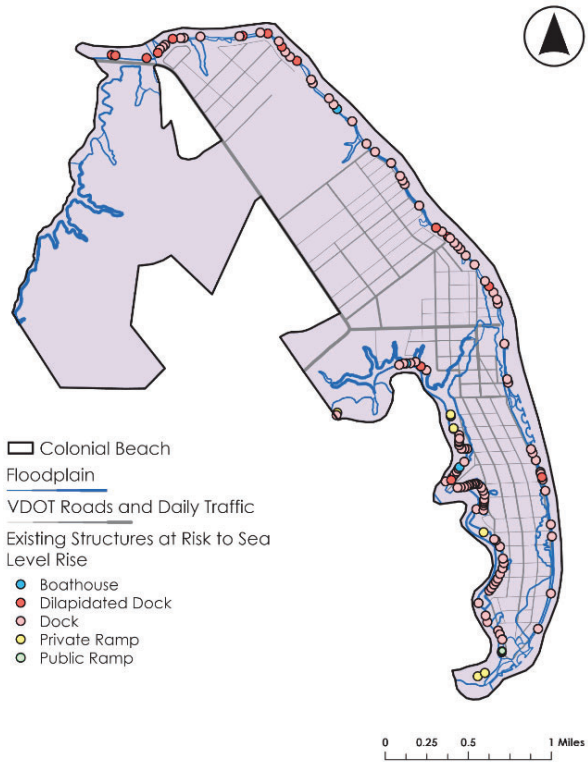
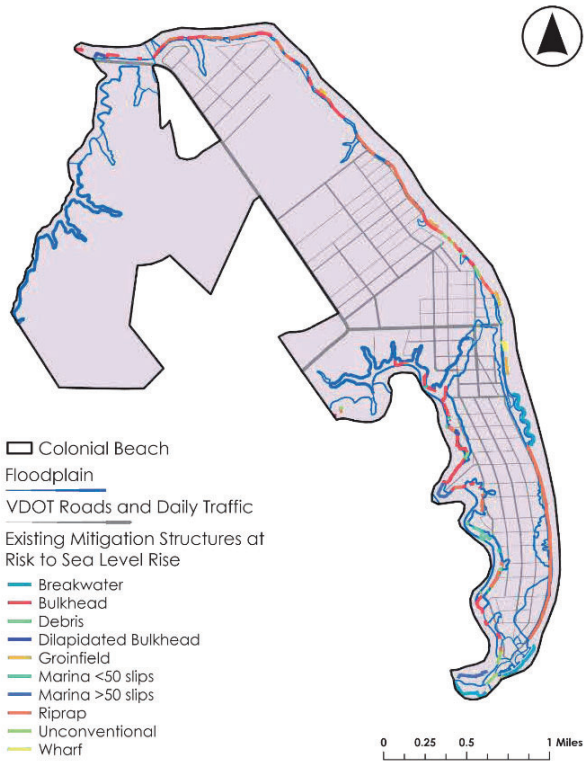


Figure 1-19: Existing Sea Level Rise Mitigation Structures



DEVELOPMENT TRENDS

Development in a coastal community can significantly exacerbate flooding by altering natural landscapes and increasing vulnerability to water-related hazards. One of the primary impacts is the reduction of natural buffers, such as wetlands, beaches, and dunes, which serve as critical barriers against floodwaters and storm surges. When these areas are cleared or filled for development, the ability of the environment to absorb and slow down water is greatly diminished, resulting in faster and more voluminous flooding. Furthermore, development typically involves the creation of impermeable surfaces like roads, parking lots, and buildings, which prevent water from soaking into the ground and lead to increased surface runoff during rainfall. This often overwhelms drainage systems, contributing to more severe flooding.

Additionally, construction in coastal areas frequently alters natural drainage patterns. Stormwater management systems, like culverts and ditches, may be poorly designed or inadequate for handling extreme weather events, leading to new flood-prone areas. In some regions, excessive groundwater extraction for development can cause land subsidence, further increasing vulnerability to flooding. The removal of vegetation for development also reduces the land's ability to absorb rainfall, leading to greater runoff and soil erosion. This erosion can cause sediment to build up in waterways, reducing their capacity to handle floodwater.

Moreover, the pressure on existing infrastructure grows with development, often overwhelming the capacity of drainage and stormwater management systems, especially during extreme weather. Raised structures and land elevation changes designed to protect individual properties can inadvertently direct water to lower-lying areas, exacerbating flooding for neighboring properties. Coastal development also places more buildings and infrastructure in areas vulnerable to storm surges, making it easier for surges to flood developed areas.

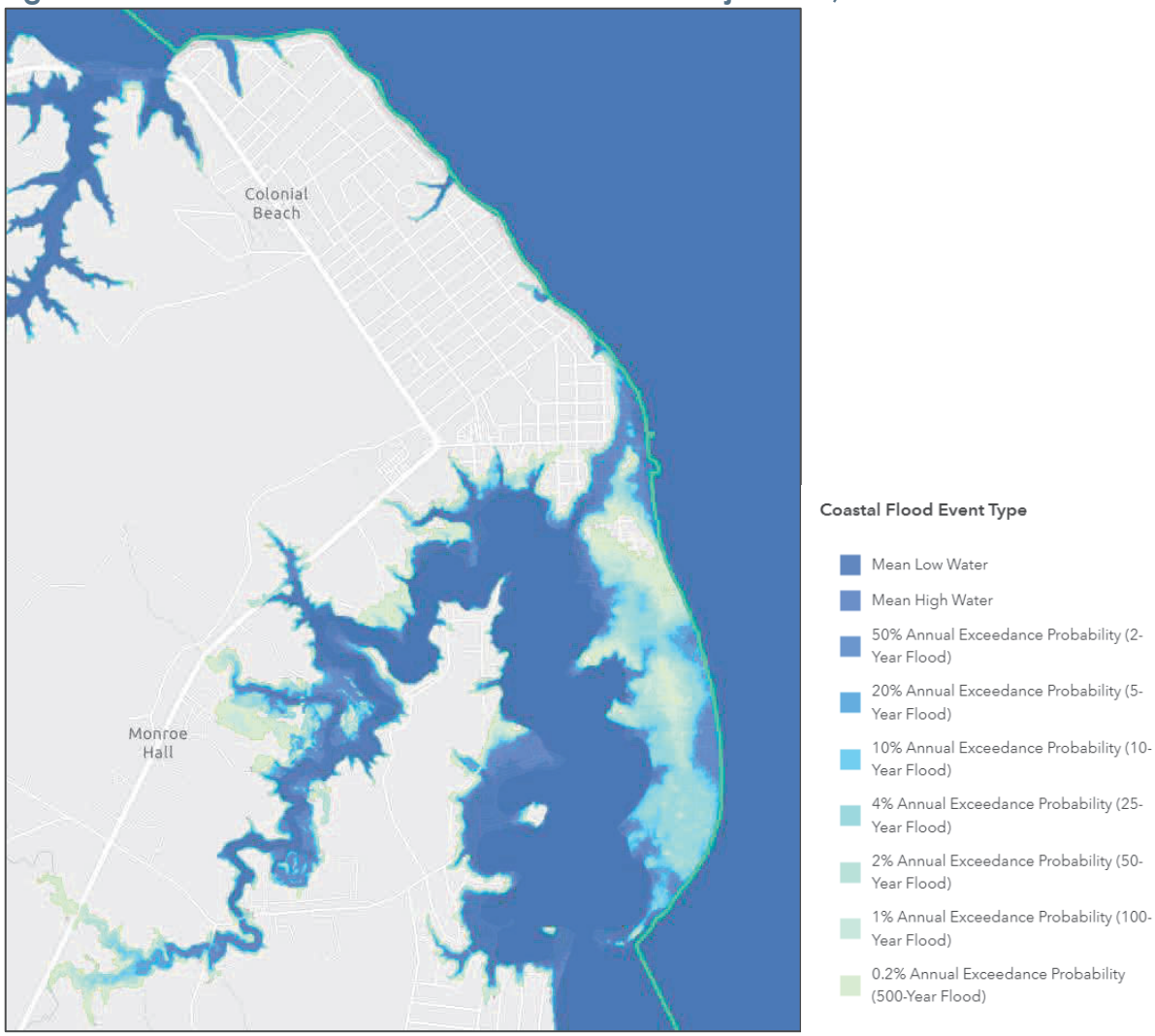
While there are fewer large areas of the Town of Colonial Beach that are undeveloped and most of the current development is in-fill development, there are opportunities to consider flood resilience in policies and regulations that will influence development patterns for redevelopment, retrofitting, and new development in yet undeveloped areas. Strategies to address future growth and development will be necessary in order to mitigate future flooding.

Colonial Beach has adopted certain typical standards for buildings lying in the floodplain, considered their Floodplain Overlay District, designated according to FEMA's typical lettering scheme: the A Zone (including AE, AH, AO, and the Coastal A Zone) where there is a 1% annual chance of flood, and the V and VE zones for Coastal High Hazard, which extends from the shore to the boundary of the primary dunes and describes areas expected to experience higher wave energy. The standards for these areas include freeboard requirements (per FEMA, "extra height above the Base Flood Elevation (BFE) that a structure is elevated to reduce the risk of flooding"), although these are lower than many other coastal areas require. For instance, Colonial Beach

requires 3 feet of freeboard for V, VE, and Coastal A zones, and only 1 foot of freeboard above grade or above base flood elevation for other flooding districts.

Not all of the Town of Colonial Beach is in a low-lying floodplain area, but these regulations do not apply consistently across the Town, do not account for other forms of flooding, and do not account for projected sea level rise. Significant portions of the Town which are currently outside of designated flood zones may be flooded entirely or much more consistently, if projections hold, by the year 2080. Figure 1-20 below shows the Coastal Resilience Master Plan projections for Colonial Beach by 2080, illustrating new mean low water that will essentially divide the Town in two.

Figure 1-20: Coastal Resilience Master Plan Flood Projections, 2080



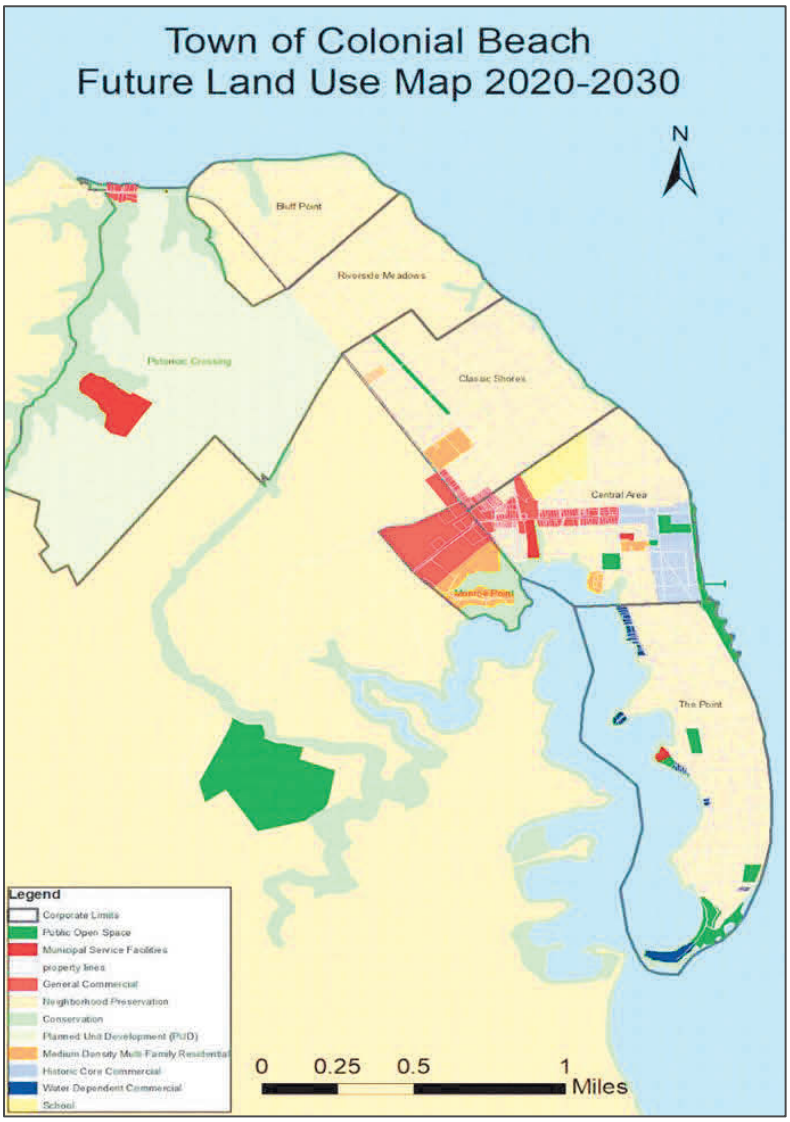
All land in Colonial Beach is also subject to the provisions of the Chesapeake Bay Preservation Act, and thus wetlands, waterways, and 100 feet inland of each are designated as Resource Protection Areas (RPAs), with special rules governing construction and land disturbance according to State Code. All other areas of the Town that are not in the RPA have been designated Resource Management Areas

(RMAs), although there are no strict state or local regulations for RMAs except to provide for tree preservation and sufficient water quality benefits.

The most common types of development in Colonial Beach are commercial and single-family residential dwellings on individual lots. A common issue cited amongst those concerned about future flood-proofing is that, unless a home exceeds 36% impervious lot coverage, or development is over 2,500 square feet, there are little to no requirements to install stormwater mitigation measures. As written, even when triggered by disturbed area or lot coverage percent, it is unclear exactly how much stormwater mitigation is necessary. While it is generally the practice of the current Town staff that once those thresholds are met, no net stormwater or nutrient pollution may be generated, it is largely up to interpretation.

Commercial and mixed-use properties are also subject to the same stormwater management regulations. Being that they almost always hit the threshold, they are required to provide for on-site mitigation or to utilize the Town's stormwater system. Several commercial and real estate stakeholders expressed that they are willing to mitigate stormwater, but that requirements should be made clearer. These same parties would also appreciate consistent maintenance and expansion of the Town-operated system, and likely regulations designating easements for that purpose.

Figure 1-21: Future Land Use Map (2030 Comprehensive Plan)



In all cases, increased development has the potential to worsen flood issues, and multi-pronged, precise, consistent resilience regulations ought to be considered both for future and current floodplain flooding risk and for expected increases in stormwater. The Colonial Beach future land-use map emphasizes residential preservation, along

with a core of commercial properties, a small number of medium-density residential developments, and one large subdivision on a large property abutting the Town's wastewater treatment plant. Clarity in flood and stormwater regulations and minimum development standards that protect existing property in a manner that does not strain Town resources will be necessary for future growth. The RAFT effort conducted further analysis of the Town's regulations surrounding stormwater, and has be referenced in the Relevant Environmental Database located in the appendix.

Also, it is imperative when looking at existing regulations is the community's ability to implement such regulations. The following Capability Assessment is a part of the Northern Neck's Regional Hazard Mitigation Plan update in 2023.

Table 1-4: Town of Colonial Beach Capability Assessment, NNPDC HMP Update 2023[20]

Capability	Colonial Beach
Comprehensive Plan	Yes
Land Use Plan	Yes
Subdivision Ordinance	Yes
Zoning Ordinance	Yes
NFIP/FPM Ordinance	Yes
- Effective FIRM Date	05/17/2022
- Substantial Damage Language	Yes
- Certified Floodplain Manager	No
- # of Flood Prone Parcels	
- # of NFIP Policies	
- Additional Freeboard Requirements	36 inches
- # of Repetitive Losses	
CRS Rating	N/A
Stormwater Program	Yes
Building Code Version	VA USBC 2018
Full-time Building Official	Yes
- Conduct "As-built" Inspections	Yes
Local Emergency Operations Plan	Yes
Hazard Mitigation Plan	Yes
Warning Systems in Place	Poor

[20] Source: Data provided from the Northern Neck Regional Hazard Mitigation Plan updated in 2023

- Storm Ready Certified	No
- Weather Radio Reception	Fair
- Outdoor Warning Sirens	No
- Emergency Notification (SMS Text)	Yes – Caroline Alert System
- Other? (e.g., cable over-ride)	No
GIS system	Yes
- Hazard Data	Yes
- Building footprints	Yes
- Tied to Assessor data	Yes
- Land Use designations	Yes
Structural Protection Projects	N/A
Property Owner Protection Projects	N/A
Critical Facilities Protected	Yes
Natural Resource Inventory	Yes
Cultural Resources Inventory	Yes
Erosion Control Procedures	Yes
Sediment Control Procedures	Yes
Public Information Program/Outlet	Yes
Environmental Education Program	Yes

POTENTIAL FLOOD RESILIENCE SOLUTIONS

While Part 2 will address specific stormwater management infrastructure improvements, solutions for flooding issues in the Town of Colonial Beach in general are addressed here. Solutions are categorized as Financial/Administrative, Organizational, Regulations and Ordinances, and Infrastructure.

These strategies were compiled and then assessed and prioritized through an action score. The prioritization matrix (detail of scoring) can be found in Appendix D, while the top actions that scored a 13 or above are incorporated into action plan sheets, found at the end of this Part of the Plan.

POTENTIAL FLOOD RESILIENCE ADMINISTRATIVE, ORGANIZATIONAL, AND REGULATORY ACTIONS

The analysis of rising sea levels trends and increased flooding risk threatens both public and private infrastructure within Colonial Beach. Development exacerbates these issues by reducing natural buffers like wetlands and increasing impermeable surfaces, leading to heightened runoff and overwhelmed drainage systems. Following the analysis,

assessment, and evaluation of the impacts of flooding, development, and overall stormwater management on the Town, it is recommended to implement the following administrative, organizational, and regulatory solutions to mitigate future flooding concerns, improve flood resilience, protect infrastructure, and safeguard residents from the impacts of flooding. These measures will create a more robust and coordinated approach to managing flood risks and ensure the town's long-term sustainability and safety.

Financial/Administrative: Financial and administrative policies significantly influence a locality's overall flood resilience by shaping how resources are allocated, decisions are made, and flood mitigation strategies are implemented. Financial policies determine budget priorities, ensuring funds are available for critical infrastructure projects such as stormwater management, and emergency preparedness initiatives. Adequate financial planning also helps localities to access state and federal grants, such as FEMA funding, for large-scale resilience efforts. Furthermore, local policies that create dedicated revenue streams, like stormwater utility fees or special tax districts, enable consistent investment in flood mitigation projects without relying solely on external sources.

Administrative policies also play a vital role by embedding long-term flood resilience into the day-to-day operations of a government entity. From decisions on Town-owned property, to regular and clear communication with the public and elected officials, sound administrative policy ensures that the town is being managed appropriately. Ultimately, well-designed financial and administrative policies strengthen a local government's capacity to mitigate flood risks and safeguard its community from future disasters.

Organizational: Organizational policies are fundamental to enhancing flood resilience, as they establish the internal frameworks, processes, and standards that guide decision-making and operational efficiency in flood management. These policies ensure that government departments work cohesively toward common flood resilience goals, streamline communication, and define clear responsibilities during flood preparedness, response, and recovery phases.

Regulations and Ordinances: Regulations and ordinances play a crucial role in local flood resilience by establishing enforceable rules that govern land use, building practices, and floodplain management. These legal frameworks ensure that development and construction within a community are done in ways that minimize flood risks and protect both public safety and property.

One of the most impactful tools is floodplain management regulations, which control development in areas prone to flooding. These regulations often require that new construction in designated flood zones adhere to specific guidelines, such as elevating structures above the base flood elevation or restricting certain types of development altogether. By enforcing these standards, local governments can reduce the number of vulnerable properties in flood-prone areas and limit potential damage from future flood events.

Zoning ordinances also play a vital role in flood resilience by guiding land use decisions. These ordinances can designate certain areas as unsuitable for development due to their flood risk or require developers to include flood mitigation features in new projects. For example, zoning laws might mandate that new developments incorporate green infrastructure, such as permeable pavements or retention ponds, to manage stormwater and reduce flooding.

Building codes are another critical aspect of flood resilience regulations. Local building codes can be updated to require flood-resistant materials, stronger foundations, or designs that prevent water intrusion in homes and commercial buildings. These ordinances are especially important for communities looking to adapt to increasing flood risks due to climate change or more intense storm events.

Finally, local stormwater management ordinances can help control how water flows through developed areas. By regulating how stormwater is collected, stored, and discharged, these ordinances prevent local flooding caused by heavy rain or inadequate drainage systems. They often require that new developments manage stormwater on-site to prevent overwhelming public drainage systems, thus reducing the risk of flash floods.

Infrastructure: Potential infrastructure improvements are further discussed in Part II of Propelling Resilience. Upgrading existing stormwater management systems may include enhancing culverts, ditches, and retention basins to prevent overwhelm during extreme weather. The use of permeable materials could be promoted to increase water infiltration, reducing surface runoff and easing pressure on existing drainage systems. Restoring and preserving natural buffers like wetlands and dunes can help absorb floodwater and protect against storm surges, while creating green spaces further aids in water absorption. Clear stormwater management regulations must be established for new developments to ensure that increases in impervious surfaces are offset by effective runoff management. Additionally, long-term community resilience planning should incorporate climate projections to guide infrastructure investments, and routine assessments of existing systems should be implemented to identify vulnerabilities and prioritize necessary upgrades.

The strategies listed below were identified and assessed through a prioritization matrix and assigned an action score. The scoring detail is outlined in the Action Plans at the end of Part 1. The comprehensive scoring matrix can be found in the appendices. The top four scoring strategies were further developed in the action plans below.

FINANCIAL/ADMINISTRATIVE

Coordination with VDOT on maintaining and improving stormwater infrastructure on State roads. Manage and enhance stormwater infrastructure along state roads to

prevent flooding, reduce erosion, and maintain water quality while ensuring that transportation systems remain operational and safe.

1. ***Coordinate with VDOT to install high water warning systems and signage along roadways informing that driving through standing water poses significant danger.*** To enhance roadway safety by installing high water warning systems and signage that alert drivers to the dangers of driving through standing water, thereby reducing the risk of accidents, and improving public awareness.

2. ***Targeted community outreach for predominately minority, low-income, or other vulnerable communities or communities that are not always included in the planning process.*** To ensure equitable participation and representation in the planning process by engaging predominantly minority, low-income, and other vulnerable communities, ensuring their voices are heard and their needs are addressed.

3. ***Coordinate with VDOT to install high water warning systems and signage along roadways informing that driving through standing water poses significant danger.***

4. ***Conduct a vulnerability assessment of the Town's wastewater treatment plant and determine adaptation options to either retrofit the building or design and implement site strategies to mitigate flooding.*** To enhance the facility's resilience, protect infrastructure, and ensure effective and sustainable wastewater management in the face of future challenges, conducting a vulnerability assessment of the Town's wastewater treatment plant involves evaluating risks related to flooding and other climate impacts, and exploring adaptation options such as building retrofits and site-specific strategies.

5. ***Identify drainage improvement opportunities along the following roadways: Ridge Rd./McKinney Blvd (SR 205) along Wilkerson Creek, Locust and Mimosa Avenues, and problems with a culvert on 4th Street. Residents also reported major flooding incidents near 1st Street and the challenges posed by sea level rise affecting Garfield and Wilder Avenues.*** By evaluating existing conditions, exploring targeted improvements, and planning for adaptation to sea level rise, the aim is to enhance drainage systems, reduce flood risks, and improve overall infrastructure resilience.

6. ***Join Community Rating System program to reduce flood insurance premiums.*** The Town should consider the CRS program; however, there can be increased administrative costs and demands associated with participation in the program, and the Town should therefore consider this as a mid-term action.

7. ***Install and maintain flood monitoring systems to provide real-time data on water levels and flood risks.*** To install and maintain flood monitoring systems that provide real-time data on water levels and flood risks, thereby enhancing emergency response, supporting informed decision-making, and improving future project planning and evaluation.

ORGANIZATIONAL

8. ***Create a Resiliency Advisory Committee, representative of the communities being served, to provide community engagement and input on current and future initiatives and projects.*** Creating a Resiliency Advisory Committee involves assembling a diverse group of community representatives to provide input and guidance on resiliency initiatives and projects. This approach enhances community engagement, ensures that projects address local needs, and fosters collaborative decision-making to build a more resilient and inclusive community.

9. ***Identification of ecosystems, wetlands, and floodplains that are suitable for permanent protection or acquisition***. This process aims to ensure that these valuable areas are safeguarded from development and degradation, thereby contributing to long-term environmental and community benefits. Explore various protection methods and partnerships including conservation easements, land trusts, and regulatory protections (e.g., zoning laws, environmental regulations) to safeguard identified areas.

10. ***Partner with other agencies to incentivize shoreline stabilization best management practices.***

    A. ***Promote the use of vegetative controls for shoreline stabilization projects where appropriate and continue to evaluate the use of structural controls based on eroding shoreline to ensure that the most appropriate shoreline management strategies will be used.*** Promoting vegetative controls for shoreline stabilization involves advocating for the use of natural methods to enhance coastal resilience and reduce erosion. Simultaneously, evaluating and adapting structural controls ensures that the most effective and appropriate shoreline management strategies are employed. This integrated approach aims to balance environmental benefits with practical needs, supporting sustainable shoreline management practices.

    B. ***Discourage the use of structures that harden the shoreline and encourage alternative shoreline protection measures such as fringe marsh establishment in shoreline areas with less wave energy and light boat traffic.*** To reduce reliance on structures that harden shorelines, such as seawalls and bulkheads, and promote the use of alternative, green shoreline protection measures like fringe marsh establishment through partnering with other agencies to incentivize shoreline stabilization- best management practices.

11. ***Assess the vulnerability of roadways and identify priority projects to improve drainage through grey and green infrastructure upgrades. Upgrades will help with continuity of access to critical facilities and to physically isolated residents.*** To evaluate the vulnerability of roadways to flooding and other drainage issues and to identify and prioritize projects that enhance drainage through both grey (traditional) and green infrastructure upgrades. These improvements aim to

ensure continuous access to critical facilities and better connectivity for physically isolated residents.

12. ***Increased education on residential and private property green infrastructure projects.*** To enhance awareness and knowledge about green infrastructure projects on residential and private properties, promoting the adoption of environmentally friendly practices that improve stormwater management, enhance property value, and contribute to community sustainability.

13. ***Offer training for residents and businesses on flood resilience practices and how to best implement resilience plan actions.*** To provide comprehensive training for residents and businesses on flood resilience practices, focusing on effective implementation of resilience plan actions to mitigate flood risks, enhance preparedness, and improve community resilience. Engage experts in flood management, emergency response, and resilience planning to develop and deliver training materials. Through a combination of workshops, online courses, and printed materials, participants gain the knowledge and tools needed to implement effective resilience actions, thereby enhancing community preparedness and reducing flood-related risks.

14. ***Inventory the Town of Colonial beach stormwater infrastructure to better understand flooding issues, stormwater system capacity, and stream conditions under future climate projections.*** Utilize the recently awarded CFPF grant to the Town to perform a stormwater asset inventory and assessment (AIA). Using the model, create a priority action plan of flood mitigation actions and review the action plan annually as part of the development of the Town's budget and CIP.

REGULATIONS AND ORDINANCES

15. ***Develop a Debris Management strategy or plan for flood scenarios.*** *In the event of a flood, specific and hazardous debris may be strewn and should be planned and accounted for in advance.*

16. ***Develop policies, incentives, and/or stormwater regulations and the use of green infrastructure in residential areas to improve Flood Mitigation.***

    A. ***Policies that require or encourage on-site water retention and treatment for residences and businesses*** can boost the Town's defense against nuisance flooding as it continues to grow and develop.

    B. ***Examine the existing Planned Unit Development incentives for open space preservation*** and address community concerns for stormwater management in large scale development proposals.

    C. ***Evaluate that submittal materials for development proposals are addressing the solutions*** within this plan and other supporting documents for the town.

17. ***Support the adoption and enforcement of flood-resistant building codes for new construction and renovations. This ensures that structures are designed to withstand future flood events.*** Work with building code authorities and experts to review and enhance existing flood-resistant building codes. This may involve incorporating updated standards and practices based on recent flood risk assessments and technological advancements. Promote the adoption of model codes and guidelines, such as those provided by the International Building Code (IBC) or Federal Emergency Management Agency (FEMA), which include provisions for flood resistance.

18. ***Develop comprehensive stormwater management minimum development standards.***

To prioritize the strategies outlined in this section, a matrix was created that used these evaluation factors and their associated criteria, metrics, and point scores summarized below in Prioritizing Resilience Projects. **See Appendix D.**

INFRASTRUCTURE

As noted, Part 2 will address specific stormwater management infrastructure improvements, general infrastructure solutions for flooding issues in Town of Colonial Beach are addressed here and will fall generally into three (3) categories: Green, Grey, and Hybrid.

19. ***Elevate critical infrastructure such as roads, bridges, and utilities to reduce vulnerability to flooding. This includes retrofitting existing structures to meet updated flood elevation standards***. Ensure that elevation and retrofitting efforts are aligned with local, state, and federal regulations and policies related to floodplain management and infrastructure resilience. Advocate for policies that support the elevation and retrofitting of critical infrastructure as part of broader state flood resilience and disaster preparedness strategies. For utilities, consider raising utility infrastructure above projected flood levels or relocating it to safer areas.

    The following projects are highlighted in Part 2 of Propelling Resilience:

    A. ***Elevation of McKinney Boulevard Bridge***
    B. ***Virginia Avenue retrofits to reduce flooding caused by tidal impacts***

20. ***Implement Flood Mitigation and Water Quality Green Infrastructure***. Especially along roadways where flooding threatens transportation. Opportunities to connect ecological cores and other environmentally important areas, especially those already owned by the town or that include substantial easements, should be capitalized on. This can include everything from expanded vegetated ditches, created wetlands or other natural water detention, and riparian buffers.

21. ***Study the Hydrology of Monroe Bay and Potomac River to Determine Flood Risk.*** Monroe Bay and Monroe Creek that lead to the Potomac River should be studied in order to manage flood risk to public and private property and infrastructure, with special attention paid to repetitive flooding areas. Additionally, preliminary studies to further the North Beach Erosion Project identified in the Virginia Coastal Resilience Master Plan should be initiated, along with renewed coordination with the U.S. Corps of Engineers.

22. ***Add Flood Mitigation BMPs to Town Parks and Historic Resources.*** Colonial Beach has important assets in its history and preserves open spaces, and should be protected from flooding, with co-benefit opportunities to turn BMPs into beautification and educational opportunities for the public.

23. ***Develop a Parks and Open Space Master Plan to identify and plan for Potential Acquisitions***. Creating an in-depth understanding of the towns' open space assets, especially in flood prone areas, will allow for opportunities to manage water volume through the development of green infrastructure on potential acquisitions.

24. ***Identification of ecosystems, wetlands, and floodplains that are suitable for permanent protection or acquisition***. This process aims to ensure that these valuable areas are safeguarded from development and degradation, thereby contributing to long-term environmental and community benefits. Explore various protection methods and partnerships including conservation easements, land trusts, and regulatory protections (e.g., zoning laws, environmental regulations) to safeguard identified areas.

    A. ***Consideration of areas like the wooded region northwest of 12th Street and the Meadows*** (approximately between Dwight and Myers to the Potomac River) presents an opportunity for a river walk project that combines habitat restoration, recreational opportunities, and addressing some stormwater concerns for the town. This strategy was voiced in the public outreach portion; as with any strategy outlined in this plan, this solution should be assessed for the equitable distribution of resources and access to this area.

25. ***Complete a shoreline management assessment and plan.***

ACTION PLAN

ORGANIZATIONAL 12

13 Action Score

Action Description

Increase education on residential and private property green infrastructure projects.

Key Steps for Implentation

- Community Outreach and Awareness Campaigns
- Provide Incentives and Financial Assistance
- Technical Support and Training
- Focus on affordable, simple projects that require little maintenance or expertise.
- Develop online resources to offer continuous

Action Lead and Supporting Partners

Town of Colonial Beach, Hazard Mitigation Plan partners, and Northern Neck Planning District Commission

Collaborate with community partners

Ease of Implementation

- [x] Locality can complete in-house
- [ ] Requires locality to hire a staff person
- [ ] Requires hiring a technical consultant

This Project Implementation Sheet is a part of a Flood Resilience Plan funded by the Virginia Community Flood Preparedness Fund (CFPF) on behalf of the town of Colonial Beach. For more detailed information please see the complete flood resilience report in the appendix.

ACTION PLAN

ORGANIZATIONAL 12

13 Action Score

Action Timeframe

Short 0-2 years
Medium 2-5 years
Long 5+ years

Resilience Considerations

Improve existing: water retention, coastal flood control, shoreline stability, erosion and sedimentation, drainage and water flow within socially vulnerable communities.

Co-Benefits and Equity Considerations

Focused communication efforts in underserved or minority communities can raise awareness and involvement, ensuring that all residents benefit from improved environmental quality and climate resilience.

Possible Funding Sources

- Community Flood Preparedness Fund (CFPF)
- Virginia Trees for Clean Water Program (VDOF)
- Virginia Conservation Assistance Program (VCAP)

Measures of Success

Participation in Educational Events, Engagement with Resources and Tools, Grant Applications, and eventual Project Implementation.

ACTION PLAN

ORGANIZATIONAL 13

13 Action Score

Action Description

Offer training for residents and businesses on flood resilience practices and how to best implement resilience plan actions.

Key Steps for Implentation

- Assess Community Needs and Develop Curriculum
- Utilize Diverse Training Methods such as online tools
- Promote and Evaluate the Training Program
- Leverage existing Community Centers and Hubs

Action Lead and Supporting Partners

Town of Colonial Beach, Hazard Mitigation Plan partners, and Northern Neck Planning District Commission

Collaborate with Local Experts and Academic Institutions

Ease of Implementation

- [x] Locality can complete in-house
- [ ] Requires locality to hire a staff person
- [ ] Requires hiring a technical consultant

This Project Implementation Sheet is a part of a Flood Resilience Plan funded by the Virginia Community Flood Preparedness Fund (CFPF) on behalf of the town of Colonial Beach. For more detailed information please see the complete flood resilience report in the appendix.

ACTION PLAN

ORGANIZATIONAL 13

13 Action Score

Action Timeframe

Short 0-2 years
Medium 2-5 years
Long 5+ years

Resilience Considerations

Improve existing: water retention, coastal flood control, shoreline stability, erosion and sedimentation, drainage and water flow within socially vulnerable businesses and communities.

Co-Benefits and Equity Considerations

Tailored outreach to landowners and businesses in underserved communities can increase awareness and implementation, promoting equitable access to environmental benefits and greater climate resilience.

Possible Funding Sources

- Community Flood Preparedness Fund (CFPF)
- Virginia Trees for Clean Water Program (VDOF)
- Virginia Conservation Assistance Program (VCAP)

Measures of Success

Participation and Engagement Rates, Knowledge Improvement Surveys, Feedback from Participants, and Implementation of Resilience Practices.

ACTION PLAN

INFRASTRUCTURE 26

13 Action Score

Action Description

Complete a shoreline management assessment and plan.

Key Steps for Implentation

- Conduct Preliminary Site Evaluations.
- Complete Preliminary Site designs with an Engineer.
- Apply for grants and implement a site solution.

Action Lead and Supporting Partners

Army Corp of Engineers

Town of Colonial Beach Community Development Dept.

Town of Colonial Beach Public Works Dept.

Ease of Implementation

- ☐ Locality can complete in-house
- ☐ Requires locality to hire a staff person
- ☑ Requires hiring a technical consultant

This Project Implementation Sheet is a part of a Flood Resilience Plan funded by the Virginia Community Flood Preparedness Fund (CFPF) on behalf of the town of Colonial Beach. For more detailed information please see the complete flood resilience report in the appendix.

ACTION PLAN

INFRASTRUCTURE 26

13 Action Score

Action Timeframe

Short 0-2 years
Medium 2-5 years
Long 5+ years

Resilience Considerations

The project will reduce shoreline erosion, reclaim beach area and mitigate adjacent property flooding during periods of high tides.

Co-Benefits and Equity Considerations

Shoreline Stabilization, Erosion Control

Education Components during assessment phase and construction

Possible Funding Sources

- WIFIA – EPA
- NFWF
- CFPF

Measures of Success

Creation of a coastal resilience project.

Approval of permitting and acceptance of a grant or funding opportunity.

ACTION PLAN

REGULATIONS AND ORDINANCES 18

12 Action Score

Action Description

Develop Comprehensive Stormwater Management Minimum Development Standards.

Key Steps for Implentation

- Create consistent impervious surface cover limitations, runoff rate calculations, and maintenance requirements for BMPs for (re)development
- Adopt design standards for stormwater infrastructure and incentivize green infrastructure
- Adopt regulations that serve residential, commercial, and large-scale developments

Action Lead and Supporting Partners

Town of Colonial Beach Community Development Dept.

Town of Colonial Beach Planning Commission

Town of Colonial Beach Town Council

Ease of Implementation

- [x] Locality can complete in-house
- [ ] Requires locality to hire a staff person
- [ ] Requires hiring a technical consultant

This Project Implementation Sheet is a part of a Flood Resilience Plan funded by the Virginia Community Flood Preparedness Fund (CFPF) on behalf of the town of Colonial Beach. For more detailed information please see the complete flood resilience report in the appendix.