

2736 - Town of Kilmarnock Resilience Plan

Application Details

Funding Opportunity:	2335-Virginia Community Flood Preparedness Fund - Capacity Building/Planning Grants - CY24 Round 5
Funding Opportunity Due Date:	Mar 28, 2025 11:59 PM
Program Area:	Virginia Community Flood Preparedness Fund
Status:	Under Review
Stage:	Final Application
Initial Submit Date:	Jan 23, 2025 3:17 PM
Initially Submitted By:	Marshall Sebra
Last Submit Date:	
Last Submitted By:	

Contact Information

Primary Contact Information

Active User*:	Yes
Type:	External User
Name*:	Mr. Marshall Alan Sebra Salutation First Name Middle Name Last Name
Title:	Deputy Town Manager
Email*:	msebra@kilmarnockva.com
Address*:	1 N. Main ST PO Box 1357 Kilmarnock Virginia 22482 City State/Province Postal Code/Zip
Phone*:	804-435-1552 2 Phone Ext. ###-###-####
Fax:	804-435-1587 ###-###-####
Comments:	

Organization Information

Status*:	Approved
Name*:	Town of Kilmarnock
Organization Type*:	Local Government
Tax ID*:	546004021
Unique Entity Identifier (UEI)*:	782116420
Organization Website:	https://www.kilmarnockva.com/

Address*: 1 N. Main ST
PO Box 1357

Kilmamock Virginia 22482-
City State/Province Postal Code/Zip

Phone*: 804-435-1552 2
Ext.

Fax: 804-435-1587
#####

Benefactor:

Vendor ID:

Comments:

VCFPF Applicant Information

Project Description

Name of Local Government*: Town of Kilmamock
Your locality's CID number can be found at the following link: [Community Status Book Report](#)

NFIP/DCR Community Identification Number (CID)*: 510280

If a state or federally recognized Indian tribe,

Name of Tribe:

Authorized Individual*: Marshall Sebra
First Name Last Name

Mailing Address*: 1 N. Main ST
Address Line 1
PO Box 1357
Address Line 2
Kilmamock Virginia 22482
City State Zip Code

Telephone Number*: 804-435-1552

Cell Phone Number*: 804-426-1215

Email*: msebra@kilmamockva.com

Is the contact person different than the authorized individual?

Contact Person*: No

Enter a description of the project for which you are applying to this funding opportunity

Project Description*:

The Town of Kilmarnock is seeking funding to create a town-wide resilience plan. This plan will serve as the guiding document to implement flood resilience strategies by: conducting a thorough a risk assessment to produce asset- level results, collecting input from stakeholders with emphasis on underserved communities, and using the risk assessment results to inform resilience projects. The Resilience Plan will be flood-focused while also considering additional hazards.

Low-income geographic area means any locality, or community within a locality, that has a median household income that is not greater than 80 percent of the local median household income, or any area in the Commonwealth designated as a qualified opportunity zone by the U.S. Secretary of the Treasury via his delegation of authority to the Internal Revenue Service. A project of any size within a low-income geographic area will be considered.

Is the proposal in this application intended to benefit a low-income geographic area as defined above?

Benefit a low-income geographic area*: Yes

Information regarding your census block(s) can be found at [census.gov](https://www.census.gov)

Census Block(s) Where Project will Occur*: Blocks 2005 - 3055 (Entire Town)

Is Project Located in an NFIP Participating Community?* :	Yes
Is Project Located in a Special Flood Hazard Area?* :	Yes
Flood Zone(s) (if applicable):	Zone A, Zone AE
Flood Insurance Rate Map Number(s) (if applicable):	51103C0135E, 51103C0155D, 51103C0132E, 51103C0153E

Eligibility - Round 4

Eligibility

Is the applicant a local government (including counties, cities, towns, municipal corporations, authorities, districts, commissions, or political subdivisions created by the General Assembly or pursuant to the Constitution or laws of the Commonwealth, or any combination of these)?

Local Government*: Yes
Yes - Eligible for consideration
No - Not eligible for consideration

If the applicant is not a town, city, or county, are letters of support from all affected local governments included in this application?

Letters of Support*: N/A
Yes - Eligible for consideration
No - Not eligible for consideration

Has this or any portion of this project been included in any application or program previously funded by the Department?

Previously Funded*: No
Yes - Not eligible for consideration
No - Eligible for consideration

Has the applicant provided evidence of an ability to provide the required matching funds?

Evidence of Match Funds*: N/A
Yes - Eligible for consideration
No - Not eligible for consideration
N/A - Match not required

Scoring Criteria for Capacity Building & Planning - Round 4

Scoring

Eligible Capacity Building and Planning Activities (Select all that apply) ? Maximum 100 points. To make multiple selections, Hold CTRL and click the desired items.

Capacity Building and Planning*: Resilience Plan Development

Is the project area socially vulnerable? (based on [ADAPT Virginia's Social Vulnerability Index Score](#))

Social Vulnerability Scoring:
Very High Social Vulnerability (More than 1.5)
High Social Vulnerability (1.0 to 1.5)
Moderate Social Vulnerability (0.0 to 1.0)
Low Social Vulnerability (-1.0 to 0.0)
Very Low Social Vulnerability (Less than -1.0)

Socially Vulnerable*: Very High Social Vulnerability (More than 1.5)

Is the proposed project part of an effort to join or remedy the community's probation or suspension from the NFIP?

NFIP*: No

Is the proposed project in a low-income geographic area as defined below?

"Low-income geographic area" means any locality, or community within a locality, that has a median household income that is not greater than 80 percent of the local median household income, or any area in the Commonwealth designated as a qualified opportunity zone by the U.S. Secretary of the Treasury via his delegation of authority to the Internal Revenue Service. A project of any size within a low-income geographic area will be considered.

Low-Income Geographic Area*: Yes

Does this project provide ?community scale? benefits?

Community Scale Benefits*: More than one census block

Comments:

See the scope of work narrative for more discussion on the social vulnerability of each block group. Most recent reported median household income is \$36,875 (in 2022 dollars), 2018-2022 (U.S. Census Bureau, ACS 5-Year Estimates).

Scope of Work and Budget Narrative - Capacity Building and Planning - Round 4

Scope of Work - General Information

Upload your Scope of Work

Please refer to Part IV, Section B. of the grant manual for guidance on how to create your scope of work

Scope of Work Attachment*: [CFPF Scope of Work Attachment_Kilmamock.docx](#)

Comments:

Budget Narrative

Budget Narrative Attachment*: [CFPF Budget Narrative Attachment_Kilmamock.docx](#)

Comments:

Scope of Work Supporting Information - Capacity Building and Planning

Scope of Work Supporting Information

Describe identified resource needs including financial, human, technical assistance, and training needs

Resource need identification*:

Financial assistance required from DCR includes waiving the match requirement for this grant. The Town will need to include a consultant to lead community engagement and the risk assessment due to gaps in technical abilities and staffing through the Town Administration. No training will be needed beyond the education of plan elements and those listed in the implementation process task.

Describe the plan for developing, increasing, or strengthening knowledge, skills and abilities of existing or new staff. This may include training of existing staff, hiring personnel, contracting consultants or advisors

Development of Existing or New Staff*:

To improve the capabilities and resourcefulness of this plan, the Town plans on contracting consultants to lead the process and develop the plan document. Existing staff in the Town Council will be included in this process and those located in specific roles and/or departments will be informed on their roles in implementing strategies.

Where capacity is limited by funding, what strategies will be developed to increase resources in the local government? (This may include work with non-governmental organization, or applying for grants, loans, or other funding sources)

Resource Development Strategies*:

Other funding opportunities, such as available State grant programs, will be explored by the Town.

Describe policy management and/or development plans

Policy management and/or development*:

Plan alignment is essential to building and amplifying resilience efforts across the Town, County, Region, and Commonwealth. The Resilience Plan development is expected to support coordination across existing activities, plans, and policies while leading to resilience project recommendations. These recommendations, developed through the planning process, may include structural and nonstructural solutions, including local policies to support resilience. To promote alignment with the Resilience Plan and existing policies, plans, and activities the Town will provide opportunities to engage with the Northern Neck PDC, engage with relevant regional and state agencies, and review existing efforts in the planning effort.

Describe plans for stakeholder identification, outreach, and education strategies

Stakeholder identification, outreach, and education strategies*:

Stakeholder identification and outreach is a vital part of this approach. The team will host a guided workshop with stakeholders to identify key inputs for plan development. The process for this content development includes following the Community Resilience Building (CRB) process, which is a comprehensive, community-driven approach to enhancing resilience against various hazards and challenges. This process facilitates rich dialogue and information sharing among participants, enabling them to collaboratively develop strategies that address both immediate and long-term resilience needs. By engaging community members from the outset, the CRB process ensures that resilience goals and priorities are feasible, realistic, and tailored to the specific context of each community. The resulting plan will be publicly available in an accessible format to share with stakeholders.

Budget

Budget Summary

Grant Matching Requirement*:

LOW INCOME - Planning and Capacity Building - Fund 90%/Match 10%

*Match requirements for Planning and Capacity Building in low-income geographic areas will not require match for applications requesting less than \$3,000.

Is a match waiver being requested?

Match Waiver Request

Yes

Note: only low-income communities are eligible for a match waiver.

*:

I certify that my project is in a low-income geographic area:

Yes

Total Project Amount (Request + Match)*:

\$50,000.00

**This amount should equal the sum of your request and match figures

REQUIRED Match Percentage Amount:

\$5,000.00

BUDGET TOTALS

Before submitting your application be sure that you meet the match requirements for your project type.

Match Percentage:

10.00%

Verify that your match percentage matches your required match percentage amount above.

Total Requested Fund Amount:

\$45,000.00

Total Match Amount:

\$5,000.00

TOTAL:

\$50,000.00

Personnel

Description	Requested Fund Amount	Match Amount	Match Source
Labor - Volunteer & Salary	\$0.00	\$4,220.00	
	\$0.00	\$4,220.00	

Fringe Benefits

Description	Requested Fund Amount	Match Amount	Match Source
No Data for Table			

Travel

Description	Requested Fund Amount	Match Amount	Match Source
No Data for Table			

Equipment

Description	Requested Fund Amount	Match Amount	Match Source
Space and Equipment	\$0.00	\$780.00	
	\$0.00	\$780.00	

Supplies

Description	Requested Fund Amount	Match Amount	Match Source
No Data for Table			

Construction

Description	Requested Fund Amount	Match Amount	Match Source
No Data for Table			

Contracts

Description	Requested Fund Amount	Match Amount	Match Source
Contract for Consultant	\$45,000.00	\$0.00	
	\$45,000.00	\$0.00	

Pre-Award and Startup Costs

Description	Requested Fund Amount	Match Amount	Match Source
No Data for Table			

Other Direct Costs

Description	Requested Fun Amount	Match Amount	Match Source
No Data for Table			

Supporting Documentation - General

Supporting Documentation

Named Attachment	Required	Description	File Name	Type	Size	Upload Date
Detailed map of the project area(s) (Projects/Studies)		Flood Hazard Map	KILMARNOCK_MAP_FEMA_FLOOD_HAZARD.pdf	pdf	3 MB	01/23/2025 12:01 PM
FIRMette of the project area(s) (Projects/Studies)						
Historic flood damage data and/or images (Projects/Studies)						
A link to or a copy of the current floodplain ordinance		Floodplain Ordinance	Ord-2022-004-Kilmarnock-Floodplain.pdf	pdf	375 KB	01/23/2025 12:00 PM
Maintenance and management plan for project						
A link to or a copy of the current hazard mitigation plan		Hazard Mtigation Plan	Northern Neck Regional Hazard Mtigation Plan_Final 2023.pdf	pdf	6 MB	01/23/2025 12:00 PM
A link to or a copy of the current comprehensive plan		Comprehensive Plan	Comprehensive Plan_2014_Kilmarnock.pdf	pdf	1 MB	01/23/2025 11:57 AM
Social vulnerability index score(s) for the project area		Social Vulnerability	KILMARNOCK_MAP_SOCIAL_VULNERABILITY.pdf	pdf	3 MB	01/23/2025 12:02 PM
Authorization to request funding from the Fund from governing body or chief executive of the local government		authorization letter from Town Manager	authorization.letter.pdf	pdf	23 KB	01/23/2025 03:17 PM
Signed pledge agreement from each contributing organization						
Maintenance Plan						
Benefit-cost analysis must be submitted with project applications over \$2,000,000. in lieu of using the FEMA benefit-cost analysis tool, applicants may submit a narrative to describe in detail the cost benefits and value. The narrative must explicitly indicate the risk reduction benefits of a flood mitigation project and compares those benefits to its cost-effectiveness.						
Benefit Cost Analysis						

Other Relevant Attachments

Watershed Assessment Report

[Kilmamock Watershed Assessment Report.pdf](#) pdf 4 MB 01/23/2025 11:58 AM

Letters of Support

Description	File Name	Type	Size	Upload Date

No files attached.

Town of Kilmarnock

VICE MAYOR - DR. CURTIS H. SMITH
COUNCIL MEMBER - ALICE COOPER
COUNCIL MEMBER - MICHAEL BEDELL
COUNCIL MEMBER - REBECCA TEBBS NUNN
COUNCIL MEMBER - MATT CUNNINGHAM
COUNCIL MEMBER - MAE P. UMPHLETT

MAYOR - SHAWN E. DONAHUE



TOWN MANAGER - SUSAN COCKRELL
TOWN ATTORNEY - NANCY ELLEN KEANE
TOWN PLANNER - MARSHALL SEBRA
TOWN CLERK - CINDY BALDERSON
TOWN TREASURER - DAVIDA WILLIAMS
POLICE CHIEF - CLIFF DAWSON

January 23, 2025

VA Department of Conservation and Recreation
VA Community Flood Preparedness Fund
Capacity Building/Planning Grants CY24 Round 5

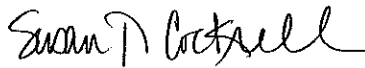
Dear Dept. of Conservation & Recreation,

On behalf of the Town of Kilmarnock and Town Council, I hereby authorize the submission of this application of funding through the VA Community Preparedness Fund to support a "Town of Kilmarnock Resilience Plan".

Deputy Town Manager, Marshall Sebra, also has authorization to submit this application and be point of contact.

We thank you and look forward to hearing from you.

Sincerely,



Susan T. Cockrell

Town Manager

COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

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COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

PREFACE

WHAT IS A COMPREHENSIVE PLAN?

Every locality in Virginia is required to have a comprehensive plan (Va. Code Sections 15.2-2223 to 15.2-2232). The goal of the plan is to guide and coordinate different local planning and land use actions. Most importantly, the plan is to serve as a guide for implementing the zoning ordinance, controlling the location, intensity, and design of residential, commercial, and industrial development. It also serves to guide decisions about the placement of public facilities such as schools, roads, sidewalks, and sewer lines.

Although required by law, the plan is only a guide. Virginia does not require that land use and zoning decisions be consistent with the plan. By itself, the plan cannot control the use of a given parcel or the location of public facilities. Implementation of the plan occurs through zoning decisions and decisions about the location of public facilities. When consistently followed, the plan can provide an important legal foundation for land use decisions. When not consistently followed, courts will be unlikely to allow a locality to rely on the plan as a defense for its actions.

The plan is a projection of land use needs and trends projected forward for twenty years. State law requires review, but not necessarily revision, of the plan every five years. The plan typically takes into consideration natural resources (both as assets and limitations), economics, population characteristics, growth trends, development patterns, and community wishes.

Comprehensive plans have the general purpose of guiding development to best promote the health, safety and general welfare of the community. Because the plan is a long-term tool intended to shape land use in a locality over time, it should be left in place for a number of years for it to be effective. Constant amendment of the plan undermines and limits its effectiveness. Some localities constantly amend their plans to accommodate requested rezonings that would otherwise be inconsistent with the plan. Such frequent amendments mean that the plan, rather than guiding land use, simply follows the fluctuations of the land market and the speculations of individual landowners. Other localities seem to be constantly in the process of undertaking major overhauls of their plan. In these localities the plan seems never to be settled; here again, the plan fails to establish patterns that provide long-term, reliable guidance for land use.

WHAT ARE THE COMPONENTS OF A COMPREHENSIVE PLAN?

The plan consists of a text, which usually describes the resources of the community and its history, population, and economy. The text typically has a section that describes the designation of areas for various types of public and private development and use. In addition to the text there is usually a plan map that shows the generalized boundaries of the different land use areas within the locality and the location of existing and planned public utilities and facilities. Comprehensive plans may also include an analysis of transportation facilities, cultural and natural resources, physical factors (natural and man-made), and resource protection.

WHAT IS THE PROCESS FOR PREPARING & ADOPTING A COMPREHENSIVE PLAN?

Virginia law requires that the local Planning Commission develop the plan and any amendments to it. The Planning Commission must hold at least one public hearing (after public notice) before taking final action to recommend adoption of a plan. The Planning Commission's action of adoption or amendment constitutes a formal recommendation to the local governing body.

COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

Final action to approve the plan or amendments is the responsibility of the Town Council. Town Council must hold a public hearing, after providing public notice, before taking final action on the Planning Commission's formal recommendation regarding the plan.

The Planning Commission and the local governing body may hold “work sessions” as they review the proposed plan update. Public comment at these work sessions is encouraged. The Kilmarnock Planning Commission has conducted public meetings or work sessions virtually every month during the Comprehensive Plan update process beginning in the fall of 2012.

(Source: The above information is from “A Citizen’s Guide to Planning and Zoning in Virginia” by the Chesapeake Bay Foundation’s BaySavers™ Institute, February 2003).

WHAT IS INCLUDED IN THE TOWN OF KILMARNOCK’S COMPREHENSIVE PLAN?

The Town of Kilmarnock’s plan is comprehensive because it: 1) provides a framework for all existing and future development, both private and public; 2) covers all of the physical area within the jurisdiction of the Town of Kilmarnock; 3) addresses the need for different types of land use and development in relation to the infrastructure necessary to support the community; and 5) reflects the Town’s vision based on input by Kilmarnock’s residents, various responsible agencies (such as the Virginia Department of Transportation), as well as Lancaster and Northumberland counties.

Chapters 1 and 2 establish the framework for Kilmarnock’s Comprehensive Plan. Chapter 1 includes a demographic and economic profile for the Town and surrounding area with, among other things, population and build-out projections and key economic development issues associated with the Kilmarnock’s economy. Chapter 2 addresses physical factors, both natural and man-made, that help to determine land that may be developed, its limitations and opportunities.

The heart of the Comprehensive Plan is the Land Use Plan in Chapter 3. The Land Use Plan establishes the framework around which public and private development may occur. By establishing development constraints and opportunities and the Town’s potential for future growth in Chapters 1 and 2, the Land Use Plan then projects the future land use arrangement within Kilmarnock by designating areas for different types of resource protection, residential, commercial, and public uses. Along with maps showing the areas that appear most favorable for development in Chapter 2, the Land Use Plan includes a set of development policies for each type of land use area.

The link between the Land Use Plan (Chapter 3) and the public service element (this Chapter) is what enables the document to rise to the level of its name, “Comprehensive Plan.” Public services and facilities discussed in Chapter 4 include water, sewer and transportation issues, as well as local government, recreation, and community services. The information in Chapter 4 identifies opportunities and potential resources for developing additional community services and ties potential future development to the capacity of the town’s infrastructure.

The final chapter addresses the need to protect certain resources in Kilmarnock, such as the quality and quantity of the Town’s water supply, to ensure the ongoing protection of the public’s health, safety, and welfare.

COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

VISION STATEMENT

The Town of Kilmarnock, located in both Lancaster and Northumberland counties, is in Virginia's Northern Neck, a strategic area that shares shorelines of the Chesapeake Bay and two of Virginia's great rivers, the Potomac and Rappahannock. Kilmarnock, incorporated in 1930, claims a rich heritage linking it to Scotland, Native Americans and early European settlers.

The Town is named for Kilmarnock, Scotland, although in earlier times it was also known as the "Crossroads." and "Steptoe's Ordinary." Road patterns today resemble paths used by Native Americans prior to European settlement. A town of approximately 1,500 citizens and 3.36 square miles in size, Kilmarnock is firmly established as the trade and service center of the eastern part of the Northern Neck. Kilmarnock is positioned for continued growth not only as the region's commercial and community service center, but also as an excellent place for living, working, retiring, tourism, public services and leisure activities.

Kilmarnock's residents, the Town Council and Planning Commission hereby articulate our vision for the future in the following goals:

Economy	Enhance and maintain a strong sustainable economic base by assuring the dominance of the Town as a major business, community service, and visitor serving center for its residents and the region. Provide a wide-range of full-time employment opportunities in commercial, technological, public service, and visitor serving enterprises.
Commerce	Maintain the historic small town identity of the Steptoe's District/downtown area as the central business and visitor zones, to provide economic incentives for new and existing businesses.
Growth, Land Use & Infrastructure	Plan and manage growth consistent with the need to accommodate future population in sync with the Town's ability to provide public facilities and services. Protect the delicate balance and land use compatibility between existing/future land use development and the natural environment.
Preservation	Incorporate the preservation of natural environmental, historical and cultural features of the community into planning and implementation of all public and private activities.
Housing	Provide a range of affordable housing styles that incorporate open space and other recreational amenities in pedestrian-oriented settings. Utilize available land planning and architectural techniques such as planned unit development and mixed-use development.
Transportation	Provide a network of streets accommodating a compatible relationship among various forms of traffic including vehicular, pedestrian and bicycle. Supplement traffic routes with adequate parking facilities in order to establish a workable circulation pattern throughout the community.
Public Uses & Community Services	Enhance and maintain Kilmarnock's strong community service base by assuring the dominance of the Town as a major center for public services for its residents and the region.

CHAPTER 1

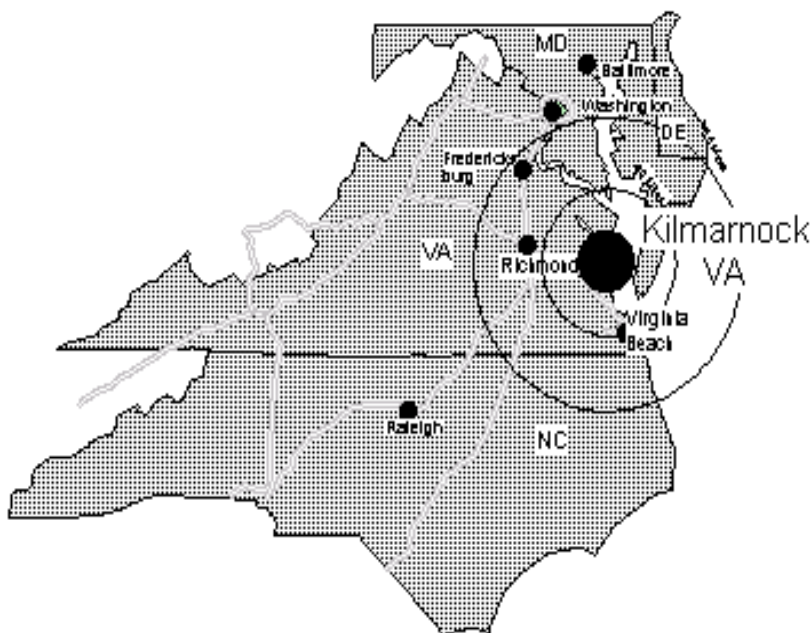
HISTORIC SETTING, DEMOGRAPHICS, GROWTH SCENARIOS & ECONOMIC PROFILE

A. HISTORIC SETTING AND LOCATION

First settled in the mid-1600s, Kilmarnock was originally known as “The Crossroads” based on a brief history provided in the 1989 Comprehensive Plan. That document suggests that Kilmarnock probably had its beginnings at the intersection of Native American paths which later became the locations of Routes 3 and 200. In the early 1700s William Steptoe operated a storehouse and ordinary at “The Crossroads” and the area came to be called “Steptoe’s Ordinary.” In 1764, Robert Gilmour, an agent for a mercantile firm based in Glasgow, Scotland, is thought to have been involved in giving the name of “Kilmarnock” to the crossroads location using the name of Kilmarnock, Scotland, where he apparently also owned land. The earliest known record referenced to “Kilmarnock, Virginia,” is in a deed recorded in 1778. Although Kilmarnock was ravaged by two fires in the early and mid 1900s, the town continues to grow and is firmly established as the trade and service center of the eastern part of the Northern Neck region.

Kilmarnock was incorporated as the “Town of Kilmarnock” by an act of the Virginia General Assembly in 1930. At the time of incorporation Kilmarnock was 761.5 acres in size. Currently the town occupies 3.36 square miles or 2,193 acres.

Figure 1.1 - LOCATION MAP



Kilmarnock is primarily located in Lancaster County near the southeastern tip of the Northern Neck. A small portion of Kilmarnock, located along the southeastern side of Church Street, is in Northumberland County. Lancaster and Northumberland counties were officially established in 1651 and 1648, respectively. While the town does not have major transportation corridors, such as interstate highways, railroads or carrier-based airports, it is within 100 miles of the metropolitan areas

COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

of Richmond, Hampton Roads, and Washington D.C. This places major urban services via Virginia's primary highways within less than two hours drive of Kilmarnock.

B. DEMOGRAPHICS

1. Population and Growth: Northern Neck Region

The population of the Northern Neck (the four-county area comprising the Northern Neck Planning District includes Lancaster, Northumberland, Richmond and Westmoreland counties) started the 20th Century at 35,126 people. By 1950 the population was roughly the same at 35,079. From 1950 until 2000 the population of the Northern Neck increased by 14,276 people to 49,355, which is a 41 percent increase. Between 2000 and 2010 the area's population reached 50,429 or an 8.6 percent increase.

Table 1.1
NORTHERN NECK POPULATION: 2000-2010

County	2000	2010	% Change
Lancaster	11,567	11,391	-1.5
Northumberland	12,268	12,330	.6
Richmond	8,802	9,254	5.1
Westmoreland	16,718	17,454	4.4
<i>TOTAL</i>	<i>49,355</i>	<i>50,429</i>	<i>8.6</i>

(Source: U.S. Census Bureau: 2000 - 2010)

Since 2000 the major increase in population occurred in two adjoining counties: Richmond (5.1 percent) and Westmoreland (4.4 percent). The population of Lancaster County, in which most of Kilmarnock is located, actually decreased by 176 people; Northumberland County grew by a modest 0.6 percent.

Recent estimates provided by the Northern Neck Planning District Commission based on data by State agencies, specifically the Virginia Employment Commission, project the population for the Northern Neck area as follows:

2020 = 52,444 2030 = 54,512 2040 = 56,446

2. Population and Growth: Town of Kilmarnock

Kilmarnock's population has also grown. The town's population has gradually increased from 627 people in 1960 to 1,487 in 2010. Between 2000 and 2010, however, Kilmarnock's population grew by 19.5 percent which is the highest increase since the 1960s. One explanation for this population growth since 2000 may be the result of the adjustment to the town's corporate limits in 2007 which increased the size of the town to 3.36 square miles. The area annexed to the town consists primarily of established residences, resulting in a population increase.

Table 1.2 shows population growth in Kilmarnock based on census data from 1960 – 2010. The table also provides projections of the town's population to year 2020. The population projection for this table is based on a "linear regression" model. This process takes known values (i.e., census data for

COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

the population from 1960-2010) that show Kilmarnock's growth during the past 50 years to project the town's population into the future based on historic trends.

Table 1.2
POPULATION GROWTH & PROJECTIONS, KILMARNOCK: 1960-2020

Year	1960-2010 Population with Projections through 2020*	Amount of Increase	% Increase
1960	627		
1970	841	214	34.1
1980	944	103	12.3
1990	1,109	165	17.5
2000	1,244	135	10.8
2010	1,487	243	19.5
2020	1,659*	172	11.5

Source: U. S. Census Bureau: 1960 – 2010

*Projections based on 1960-2010 census data using the "linear regression" model described in preceding paragraph.

Note: Of the current population (1,487 residents), 871 are female (59 percent) and 616 (41 percent) are male. (Source: U.S. Census Bureau, 2007-2011 American Community Survey)

3. Growth Scenarios: Town of Kilmarnock

Population growth will be the factor that drives the need for residential development, public facilities, commercial, visitor serving and community services of all types. Expectations of growth must be examined from several different scenarios.

Growth based on census data and population trend growth: Table 1.2 above sets forth a projection of Kilmarnock's population based on historic patterns. Trend growth assumes that future growth would be consistent with past trends. Based on this approach, Kilmarnock would continue to grow at about the same relatively moderate rate as in past years reaching a population of approximately 1,600 – 1,700 people by 2020.

Growth based on existing residentially developed acreage, population density and vacant undeveloped land: New development in areas of Kilmarnock, currently undeveloped and designated for residential use, presents another growth scenario, particularly in light of the large amount of undeveloped residential acreage.

Kilmarnock presently encompasses 3.36 square miles or 2,193 acres. Of this amount, roughly 47 percent of the town is developed with various types of land use and approximately 13 percent of the community is considered undevelopable due to designated Resource Protection Areas (RPA) and two large conservation easements. The areas designated as RPA essentially include steep slopes and stream basins. This leaves roughly 40 percent of the land in Kilmarnock as vacant and developable.

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Of the developed acreage in Kilmarnock, approximately 635 acres consist of existing single family and multi-family residences, as well as public/semi public uses typically part of a residential area. This results in an existing density of approximately 2 people (2.3 people precisely) per acre (current population is 1,487).

The developable vacant land in Kilmarnock totals approximately 880 acres, much of which could be constructed with housing. Using this acreage, coupled with the existing population density of roughly 2 people per acre, results in a potential increase of roughly 1,754 residents for a total population of 3,214 people. This scenario may not be as accurate since a portion of the developable 880 acres is designated for commercial use which would reduce the overall residential population.

Growth based on existing housing units, number of people per household and vacant undeveloped land: There are 795 existing residential units in Kilmarnock, of which approximately 687 are occupied and roughly 108 units are vacant. (**Source: U.S. Census Bureau, 2007-2011 American Community Survey**). With a population of 1,487 this equates to roughly 2 people (1.88 persons precisely) per household.

The overall residential density in Kilmarnock is 1.3 units per acre. (Explanation: 635 acres are currently developed with 795 single and multi-family residences resulting in 1.3 residential units per acre.) Assuming roughly 40 percent (i.e., 880 acres) of Kilmarnock is undeveloped, coupled with the current density of 1.3 units per acre, would potentially result in development of an additional 1,140 residential units at build-out with an increase of 2,143 people for a total population of approximately 3,630 residents. Again, this scenario may not be as accurate since a portion of the 880 acres deemed to be developable is designated for a commercial use which would reduce the overall residential housing density in Kilmarnock.

Growth based on approved but undeveloped residential units and vacant lots of record (i.e., infill development): Another scenario to determine population growth and the number of potentially new residential units is to evaluate the total number of units that have been approved but, to date, not constructed. Currently there are approximately 642 residential units that fall into this category. (See Chapter 2 - Section A - for a list of these projects).

The units described above are in addition to potential development of vacant lots of record (i.e., infill) interspersed throughout the established residential areas of Kilmarnock. Waste Water Management, Inc., (WWM) prepared a "Water and Sewer Master Plan" (Master Plan) for the Town of Kilmarnock (dated February 4, 2010) to determine build-out potential. To accomplish this, WWM used the approved development density identified in the Comprehensive Plan for areas where no development is proposed and subtracted resource protection areas and open space requirements to estimate the number of future units classified as infill. Table 3 of the Master Plan estimates that a total of 314 infill units (roughly 229 residences and 85 commercial buildings) could be constructed in Kilmarnock in the future.

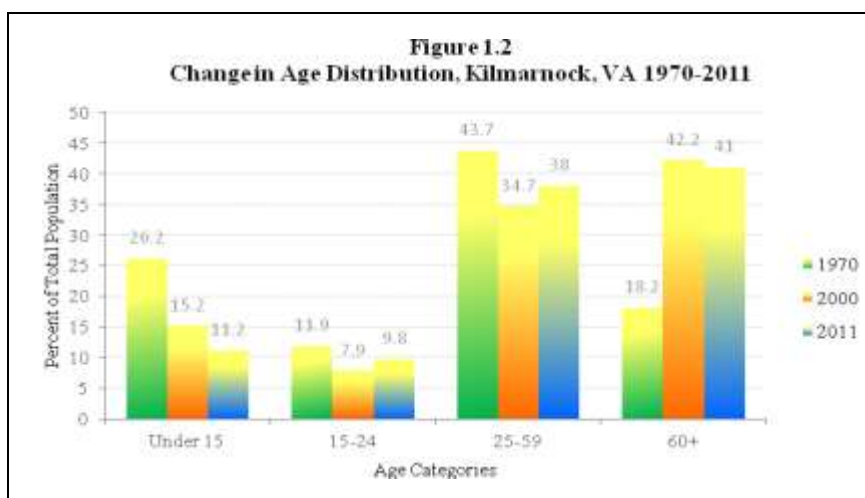
To summarize, the combined total of approved, but not constructed, units along with the potential infill development may result in an increase of 941 new residences for a total of 1,666 housing units. Again, assuming roughly 2 people (1.88 persons precisely) per household would result in a population increase of roughly 1,742 people for a total of 3,229 Kilmarnock residents. In addition, infill development on commercially designated vacant lots could add up to 85 new buildings and/or commercial uses.

COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

Factors affecting population growth and build-out projections: There are many factors affecting population and build-out projections in Kilmarnock. As a result, the projections above are estimates at best. Factors affecting population growth and future development include, but are not limited to, annexations that expand the size of the town, resource and infrastructure constraints, economic development, and land use designated for residential use but developed for public or semi-public use, (i.e., streets and sidewalks) which are typically located in residential areas. In addition, public policies and zoning regulations play a large part in determining the ultimate density of development within Kilmarnock. These issues and constraints are analyzed in subsequent chapters of this document.

C. Age Distribution

The average median age of Kilmarnock's population is 54 with the highest percentage of residents between 60 to 64 years of age. Census data show that 30.6 percent of the population is under the age of 40 with the remaining 69.4 percent over 40.



(Source: U.S. Census Bureau, 2007-2011 American Community Survey)

The above figure shows the following changes in Kilmarnock's age distribution since 2000:

- Age: Under 15 = 11.2 percent (down 4 percent)
- Age: 15 - 24 = 9.8 percent (up 1.9 percent)
- Age: 25-59 = 38 percent (up 3.3. percent). Of this amount 28.4 percent are between the ages of 40 and 59.
- Age 60+ = 41 percent (down 1.2 percent)

Figure 1.2 reflects the long-term shift, most notably between 1970 and 2000, in the composition of Kilmarnock's population from a younger to an older population, 60 years of age and over. The population trend in Lancaster County in terms of age is similar. For example, demographic data provided by the U.S. Census Bureau states that as of the 2010 estimate, 31.5 percent of the population in Lancaster County is over 65 years old. This is roughly 3 times the Virginia and national average.

There are several issues related to the increase in the older population, most notably an emphasis on services and facilities oriented to that age group, including, but not limited to, community and public services. An older population may also have fewer children, thus reducing the number of students in

COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

local schools. Elderly residents may also rely on a service-based economy with increased access to community services, health care, transportation, and local businesses to meet day-to-day needs. A retired population is also less likely to seek employment in the community which may explain why less than half the town's population is in the work force (see Section "D" below). As the "baby boomers" continue to retire, the share of retirement-age population is likely to grow even larger thus increasing the need for these types of services.

D. ECONOMIC PROFILE

(NOTE: Unless otherwise noted, the source for all of the following information is the "U.S. Census Bureau, 2007 – 2011," American Community Survey (date refreshed: 2/10/2013) and town records. It is also important to note that the last Comprehensive Plan adopted in 2006 contained very little, if any, economic data pertaining specifically to the Town of Kilmarnock. Therefore it is difficult to ascertain certain economic changes in the community since baseline information pertaining specifically to Kilmarnock is not available).

Kilmarnock is the business, commercial and community / public service center for Lancaster County and parts of the neighboring counties of Northumberland and Middlesex. The town's population makes-up approximately 11 percent of Lancaster County's population, yet roughly 47 percent of the county's business and service establishments are located in Kilmarnock.

1. Employment

Kilmarnock's residents, 16 years of age and over, total 1,249 people. Of this amount 673 people are in the labor force. 26 people in Kilmarnock are classified as unemployed, which is roughly 3.8 percent of the town's labor force. This percentage is well below the unemployment rate for the Northern Neck Region at 6.7 percent and the State of Virginia, 6.2 percent unemployment (source: DRAFT Northern Neck Comprehensive Economic Development Strategy, November 2012, p. 12). As of August 2013 the national unemployment rate was 7.4 percent.

The remaining 576 people residing in Kilmarnock, or 46 percent of the town's population 16 years of age or older, are not in the labor force presumably due primarily to retirement.

Table 1.3 below shows employment in Kilmarnock by industry group. The health care, social assistance and educational services category employs the most people, totaling 23 percent of Kilmarnock's labor force. This is primarily due to the work force at Rappahannock General Hospital, which is a major employer in Kilmarnock, and other related health care and medical office facilities. This trend shows that Kilmarnock is largely a service based economy with a primary emphasis on health care. Construction, retail and visitor serving/commercial employment categories follow, respectively.

Table 1.3
EMPLOYER CATEGORIES IN KILMARNOCK
Employed population = 647

Industry:	Kilmarnock's Employed Population
Health Care, Social Assistance & Educational Services	151
Construction	97
Retail Trade	93
Entertainment, Recreation, Accommodations & Food Services	73
Professional, Scientific, Management/Administrative	72
Transportation, Warehousing & Utilities	40
Public Administration	27

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Finance, Insurance & Real Estate	22
Manufacturing	15
Information	8
Wholesale Trade	7
Other / Unclassified	42

2. Occupations

The occupational categories for Kilmarnock's work force, as shown in Table 1.4 below, reflects the town's employment categories in the above table. This table also shows that the highest numbers of people in Kilmarnock have jobs in the service industry category, with the least number of occupations in construction, maintenance and manufacturing.

Table 1.4
OCCUPATION CATEGORIES IN KILMARNOCK
Employed population = 647

Occupation:	Kilmarnock's Employed Population
Management, Business, Science & Arts	177
Service	173
Sales & Office	163
Natural Resources, Construction & Maintenance	86
Production, Transportation & Material Moving	48

Class of Worker in Kilmarnock: Of the 647 people in Kilmarnock's labor force, 443 are private wage/salary workers; 133 are government workers and 71 are self-employed.

3. Businesses and Service Establishments

Another measure of how Kilmarnock functions as the business, commercial and service center for the region can be seen in the concentration of establishments within the Town proper. Figure 1.3 below lists the businesses and services operating within Kilmarnock in March 2013 as reported by Town records.

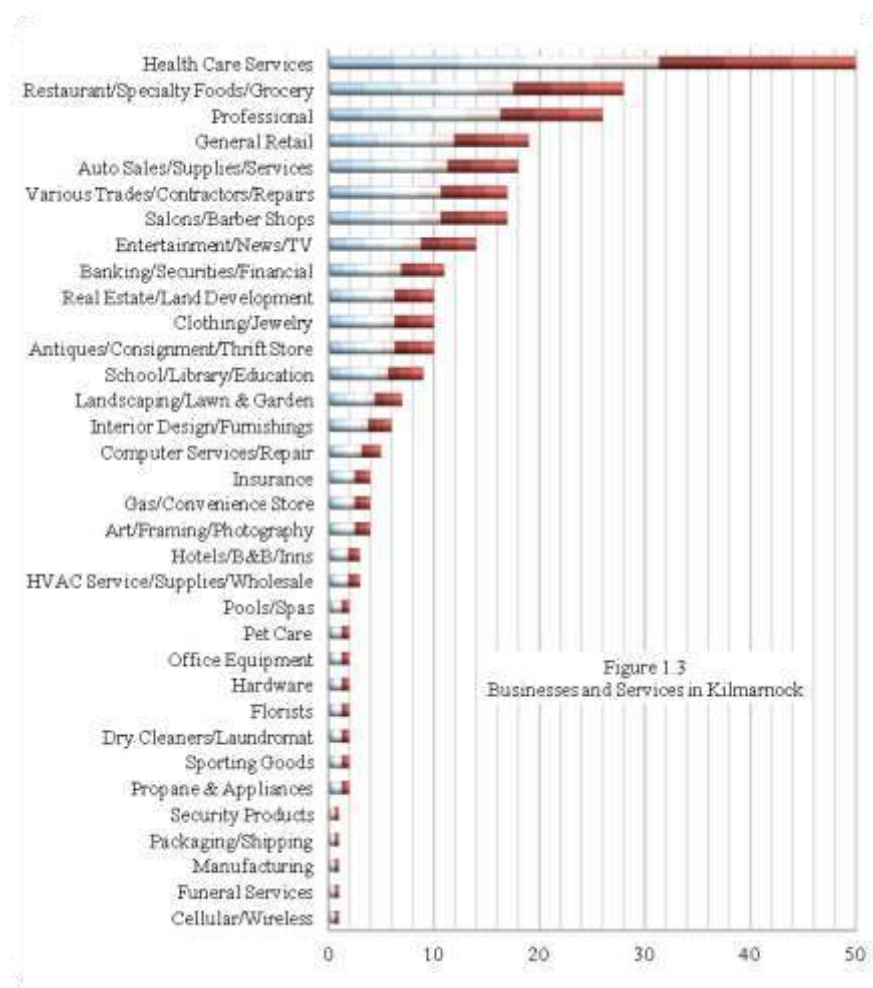
The 2006 Comprehensive Plan identifies 259 business and service establishments in Kilmarnock at that time. Since then the number increased to roughly 292 which is a total of 33, or nearly a 13 percent increase, new businesses in town. Since the data for this table is based in part on the number of business licenses issued it is important to clarify that some new businesses, for which licenses were issued, include small un-manned kiosks for movie rentals such as those located outside of CVS, Walgreens and Wal-Mart and home occupations. Regardless, Figure 1.3 shows that, despite the nationwide economic downturn, business activity in Kilmarnock continued to grow during the past 7 years. The increase in the number of businesses in the town may be explained in large part due to the development of large commercial projects between 2006 and 2007 such as the Wal-Mart shopping complex, Walgreens and the Bowling Alley. Similar to national trends, this surge in Kilmarnock's commercial development occurred shortly before the nationwide economic recession which began roughly at the onset of 2008.

Perhaps the most revealing information in Figure 1.3, is the *type* of business and service establishments in Kilmarnock and the *increase* in each category since 2006 (increase in number of

COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

services since 2006 is shown in red in Figure 1.3). The top category, almost double in size when compared to other establishments in Town, is health care services. The number of health care facilities in Kilmarnock also increased substantially when compared to growth in other sectors of the Town's economy. Following health care services are: 2) restaurants/grocery stores; 3) professional offices; 4) general retail stores; and 5) auto sales, supplies and services, respectively. These top 5 sectors of Kilmarnock's economy are also where the most growth, in terms of new businesses and service establishments, occurred since 2006. This trend further corroborates information in the preceding tables indicating that Kilmarnock's economy is service based, especially relative to health care, and this sector of the Town's economy is expanding.

Figure 1.3
BUSINESS & SERVICE ESTABLISHMENTS IN KILMARNOCK, MARCH 2013



4. Income

Employment, unemployment, occupations and the number and types of businesses in Kilmarnock only describe part of the town's economy. Another part is conveyed by residents' income, some of whom may not actually work in the town. Table 1.5 below shows the various income levels for Kilmarnock's residents based on the total number of occupied households.

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Table 1.5
INCOME PER YEAR FOR ALL HOUSEHOLDS IN KILMARNOCK
(Total number of households – not employed population)
Households = 687 (including family & single-resident households)

Income:	Total Number of Households:
Less than \$10,000	52
\$10,000 - \$14,999	69
\$15,000 - \$24,999	141
\$25,000 - \$34,999	67
\$35,000 - \$49,999	108
\$50,000 - \$74,999	121
\$75,000 - \$99,999	21
\$100,000 - \$149,999	72
\$150,000 - \$199,999	30
\$200,000 or More	6

This table shows that roughly 48 percent of the households in Kilmarnock earn less than \$34,999 per year while 229 or 33 percent of households earn between \$35,000 and \$74,999. The remaining 129 households (roughly 19 percent) earn \$75,000 or more per year.

Of the total number of occupied households (i.e., 687) in the community, 405 are classified as a “family” household (i.e., more than one individual residing in a residence). Table 1.5 above can be broken down further to show the annual income for family households in the town, as follows:

Table 1.6
INCOME PER YEAR FOR FAMILY HOUSEHOLDS IN KILMARNOCK
Family Households = 405

Income:	Total Number of FAMILY Households:
Less than \$10,000	0
\$10,000 - \$14,999	25
\$15,000 - \$24,999	53
\$25,000 - \$34,999	43
\$35,000 - \$49,999	66
\$50,000 - \$74,999	109
\$75,000 - \$99,999	18
\$100,000 - \$149,999	62
\$150,000 - \$199,999	23
\$200,000 or More	6

Based on the above table, the median family household income is \$52,813. The income bracket with the most family households (i.e., roughly 27 percent of the town’s families) is between \$50,000 and \$74,999 per year.

Single Individuals: Non-family households, or single individuals residing in a residence, total 282 people in Kilmarnock. In contrast, the median non-family income for a single individual is \$19,063.

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Employed Population: As stated above, 647 of Kilmarnock's residents are actively employed. The median income for all people residing in Kilmarnock in the labor force is \$25,903. Census data estimate that of the employed **MALE** population, the median income for full-time year-round worker is \$43,947 whereas median earnings for **FEMALES** (full-time year-round workers) total \$29,107.

Poverty Level: Percentage of **ALL People** in Kilmarnock with Income below the Poverty Level (in the past 12 months) = 17.3 percent

Percentage of **ALL Families** in Kilmarnock with Income below the Poverty Level (in the past 12 months) = 11.1 percent

Average (not median) Wage per Job, by Job Count (2011)

U.S. =	\$48,301
Virginia =	\$52,072
Westmoreland =	\$28,209
Richmond =	\$35,332
Northumberland =	\$32,987
Lancaster =	\$32,287

(Source: DRAFT Northern Neck Comprehensive Economic Development Strategy (update Feb., 2013, p. 11)

Per Capita Income: Still another dimension of the economy is revealed by examining income for the Town of Kilmarnock on a per capita basis which is \$24,883. This is an indicator of the personal income of the town's residents from sources other than what is reported through the payroll taxing system. The average per capita income in 2011 is lower than all others reported for the region, state and nation as shown below:

Per Capita Income (2011)

U.S. =	\$41,560
Virginia =	\$46,107
Westmoreland =	\$36,557
Richmond =	\$26,941
Northumberland =	\$41,936
Lancaster =	\$48,607
Kilmarnock =	\$24,883

(Source for above: DRAFT Northern Neck Comprehensive Economic Development Strategy (update Feb., 2013, p. 10)

5. Construction Activity

Another indicator of the strength of Kilmarnock's economy is reflected in construction activity. In the 1990s and continuing through 2007 construction activity in Kilmarnock was strong. Figure 1.4, however, shows a significant drop in commercial construction after 2007, similar to national, state and local trends occurring at roughly the same time. In 2006 construction of new commercial and office buildings is significant with a building value of roughly \$15,000,000. This is due in part to development of the new Wal-Mart shopping complex, Walgreens and the Bowling Alley. By 2007 commercial development in Kilmarnock begins to decline precipitously until it reaches virtually the bottom of the scale in 2009 with negligible flocculation at best from that time through 2012.

In contrast, residential development has remained roughly the same since 2006, despite the downward economy, although these building values are slightly higher between 2006 and 2008. By 2008, however, residential construction and building values dip slightly and hover at or below the

COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

\$1,000,000 mark and remain at that level for the ensuing years. During this time, the relationship between commercial and residential development also remains fairly constant.

Figure 1.4
CONSTRUCTION ACTIVITY & BUILDING VALUE: 2006 - 2012

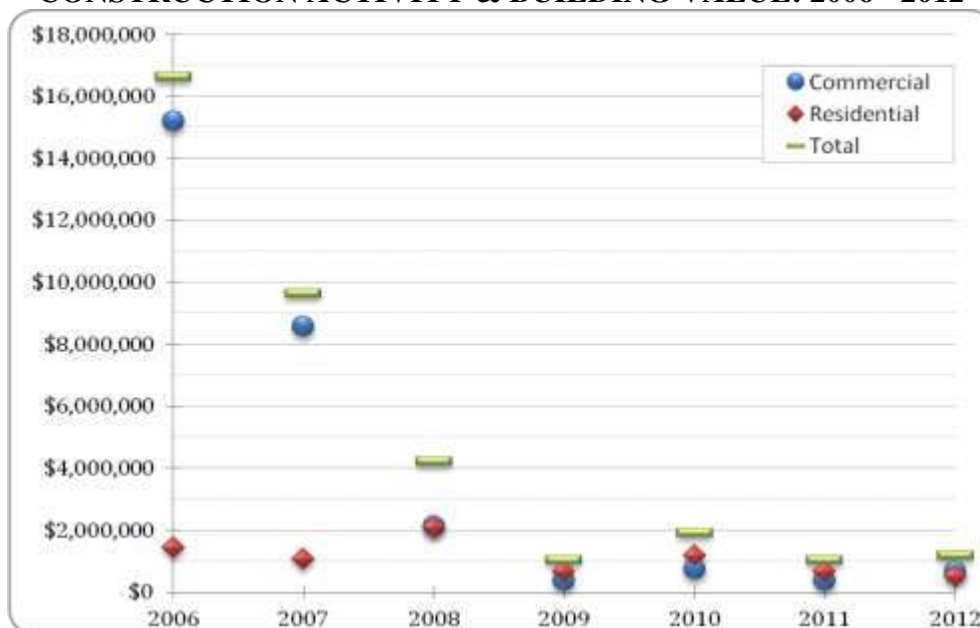


Figure 1.4 is consistent with the trends identified above pertaining to occupational and employer categories, as well as the figure showing new business establishments in Kilmarnock. When combined, all the data clearly show Kilmarnock's ongoing growth in and shift to a service based economy.

6. Housing

In addition to construction activity and value, the type of housing and housing values in the town also help to establish the baseline for Kilmarnock's economy. Currently, there are a total number of 795 housing units in the Town of Kilmarnock. Of these approximately 687 are occupied and 108, or 14 percent, of the town's housing units are vacant. Homes that are owner occupied total 408; the remaining 279 are rental units. Housing issues, specifically the type of residential development and affordability, are discussed in greater detail in Chapter 3 (Land Use).

Table 1.7 shows the value of owner occupied housing units in Kilmarnock.

Table 1.7
HOUSING VALUE – OWNER OCCUPIED HOMES IN KILMARNOCK
Owner Occupied Homes = 408

Value:	Total Number of Owner Occupied Units:
Less than \$50,000	8
\$50,000 - \$99,999	18
\$100,000 - \$149,999	39
\$150,000 - \$199,999	139

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\$200,000 - \$299,999	127
\$300,000 - \$499,999	69
\$500,000 - \$999,999	6
\$1,000,000 or more	2

The above table shows that the value of most homes in Kilmarnock ranges between \$150,000 and \$299,999; approximately 65 percent of the owner occupied homes in town fall into this category. Roughly 19 percent of the homes are valued at \$300,000 or more with 16 percent valued at less than \$150,000. The median home value in Kilmarnock is \$200,000 and the median cost for rent is \$706 per month (median).

The type of housing in Kilmarnock shows that detached single family residences are the predominant type of residence in the town with 585 homes. The next highest category is multi-family residential homes with an attached unit. Often these are classified as a senior citizen or caretaker unit for a family member.

Table 1.8
HOUSING TYPE IN KILMARNOCK

Housing Type:	Number of Units:
Single Family Residential (detached)	585
Multi Family Residential	
1 unit attached	51
2 units (duplexes)	17
3 to 4 units	29
5 to 9 units	47
10 to 19 units	32
20 or more units	39
Mobile Homes	15

7. Kilmarnock Tax Revenue

Another way to evaluate changes to Kilmarnock's economic base is to analyze tax revenue generated by a variety of sources. This information, for fiscal year 2012 and changes since 2011, is presented in Table 1.9 below. Specifically, the restaurant, retail sales and hotel taxes generated during fiscal year 2012 provide a mechanism to gauge changes to the town's economic profile since 2011.

Restaurant and fast-food sales are up indicating more people are eating in Kilmarnock's restaurants. Retail sales tax remains essentially unchanged since fiscal year 2011. This may be in part due to the fact that, as shown in Figure 1.4 above, there has been minimal, if any, new commercial development in Kilmarnock during the same period.

There are three visitor serving commercial establishments that provide overnight accommodations in Kilmarnock. These include the "Holiday Inn Express" and two Bed and Breakfast Inns known as the "Kilmarnock Inn" and "Back Inn Time." Revenue generated by the hotel/motel room tax is down by \$7,625 when compared to the previous fiscal year in 2011.

It should be noted that the significant drop by over \$48,000 in revenue generated by the Town's business license tax is somewhat misleading and irrelevant to this analysis. This drop is primarily due to Town Council's decision in June 2010 to decrease this tax by as much as 40 percent in some categories in order to provide an economic incentive for the establishment of new businesses in

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Kilmarnock. The drop in this revenue does not necessarily reflect a substantial decline in the number of business licenses issued.

Table 1.9
KILMARNOCK REVENUE FOR FY 2012 & CHANGES SINCE 2011

Tax Type	Change since FY 2011	
Restaurant/Meals Tax	UP	\$9,086
Business License Tax	DOWN	\$48,199
Local Sales Tax	DOWN	\$353
Hotel/Motel Room Tax	DOWN	\$7,625

8. Economy - Summary

Three major activities drive the economy of Kilmarnock. The first and principal economic strength comes from the town's service economy. Kilmarnock is the regional trade and service center for the eastern part of the Northern Neck. As shown in the above tables, the service sector of Kilmarnock's economy dominates employment, occupation and business categories. This is, in part, the result of health care services provided by Rappahannock General Hospital, related medical services, as well as assisted living residential and health care facilities. In addition, since adoption of the Comprehensive Plan in 2006 several large scale commercial projects were developed in 2007 including the Wal-Mart Shopping complex, Walgreens and the Bowling Alley. Because Kilmarnock is the dominant trade and service center in the region, an employment base in the service and retail economy will likely continue to produce the most jobs.

Retirement comprises another part of Kilmarnock's economic base although its impact is not directly seen in economic statistics. The Northern Neck region, and specifically Kilmarnock, has seen a steady increase in the number of people 60 years of age and over. Currently, roughly 41 percent of the town's population is over the age of 60. An elderly population is more likely to rely on a service economy for access to community services, health care, transportation, and local businesses to meet day-to-day retail needs. A retired population is also less likely to seek employment in the community which may explain why less than half the town's population is in the work force.

The third factor in the local economy is tourism. While Kilmarnock does not have direct waterfront access to the Chesapeake Bay or any of its major estuarine rivers, its proximity to one of the finest shorelines for recreation along the Atlantic Coast, coupled with the Town's business and commercial venues, places the town in a good position to continue to increase revenue from visitors to the Northern Neck, particularly during the summer season. Ongoing improvements to the downtown commercial district to maintain and enhance Kilmarnock's small-town appeal also enhance the town's ability to capture a larger share of tourist dollars.

Manufacturing and industrial activity is not likely to be a strong force in the local economy because lack of major transportation corridors is a constraint. The distance from Kilmarnock to railroads, interstate highways and carrier airports is a barrier to developing products that require timely distribution to outside markets. On the other hand, in today's computer-driven economy and "next day" delivery service available almost anywhere, numerous economic opportunities present themselves to individuals and corporations alike located in rural areas.

CHAPTER 2

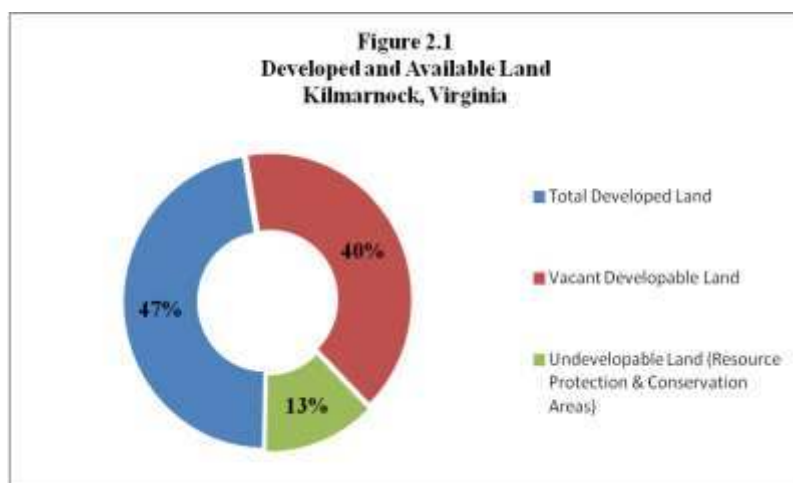
PHYSICAL FACTORS AFFECTING GROWTH AND DEVELOPMENT

Factors affecting Kilmarnock's potential for future development may be broadly analyzed based on four topics: (1) the amount of land within the town's corporate boundaries; (2) the extent to which that land is already developed; (3) land that is protected from development by regulation, conservation or other means; and (4) physical characteristics likely to limit development. Of course, future adjustments to the town's corporate limits would also affect development potential.

In this Chapter, these conditions are analyzed and illustrated based on available data and maps that show various physical issues. Development policies are also included that relate to the physical factors affecting growth and development in Kilmarnock. This Chapter also identifies natural resource constraints for future land use in the Town of Kilmarnock, which is the topic of Chapter 3.

A. AMOUNT OF LAND

The land in Kilmarnock may be broadly divided into three categories shown in Figure 2.1: 1) developed land; 2) vacant developable land; and 3) undevelopable land based on resource constraints including, but not limited to, conservation easements and designated Resource Protection Areas (RPA). Figure 2.1 shows roughly 40 percent of the land in Kilmarnock has the potential for development.



There are essentially three changes that have affected the developable area

of Kilmarnock since adoption of the last Comprehensive Plan in 2006. First, the town's corporate limits were expanded in 2007 as a result of a boundary adjustment to include an additional 432 acres (or .67 of a square mile). This area, largely an established residential land use at the time of the adjustment, was annexed by the Town of Kilmarnock from Lancaster County, and extends the town boundary to the south. Since the Town's boundary adjustment in 2007 Grace Hill Subdivision, consisting of 66 units, was recorded in this area. This single-family residential subdivision remains largely undeveloped with the exception of just a few residences.

The second factor is the dedication of two conservation easements over two large areas comprising roughly 10 percent of the land within the town of Kilmarnock. One easement primarily allows for the continued agricultural use of the property, while the other area is forested and precludes development in its entirety (including agriculture), although timber harvesting is permitted. In both cases, future, if any, structural development is restricted. These areas are shown in Figure 2.11 and are discussed further in Section G (Available Land for Development) of this Chapter.

Approved development, some of which may not be constructed or is partially built, is the last change affecting the developable area in Kilmarnock since 2006. Some new relatively large or significant projects, in addition to the Grace Hill subdivision mentioned above, include:

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- Springwood Planned Unit Development (PUD), located on Yorkshire Road, consists of approximately 40 residential units, of which roughly half are constructed.
- Crossroads at the Chesapeake is a medium density residential development with approval for 128 dwelling units located adjacent to James B. Jones Memorial Highway. This project is undeveloped.
- Kilmarnock Glen is a PUD approved for 423 units with various amenities such as a park and community center. The site, located behind School Street and north of Irvington Road, remains undeveloped.
- Tartan Village is a 38-unit affordable housing government subsidized apartment complex. This project is fully constructed.
- Mercer Place provides much-needed housing for Kilmarnock's work force, such as teachers. The apartment complex has approval for 24 rental units, of which 16 are constructed. This development is located on the east side of Town north of Route 200.

Commercial development along both sides of upper North Main Street dominated recent growth within the town limits between 2006 and 2007. Large commercial projects developed during this time include Walgreens, the Bowling Alley and Grill, and the Wal-Mart shopping complex.

Table 2.1 below summarizes the amount of land in each category described above. This table shows that of the 1,034 acres developed in Kilmarnock the primary land use is residential. Roughly 47 percent of the Town consists of single-family and multi-family residences. Offices, commercial and industrial land uses total approximately 28 percent of the developed area, with the remaining 25 percent developed with public/semi-public uses (e.g., parks) and streets.

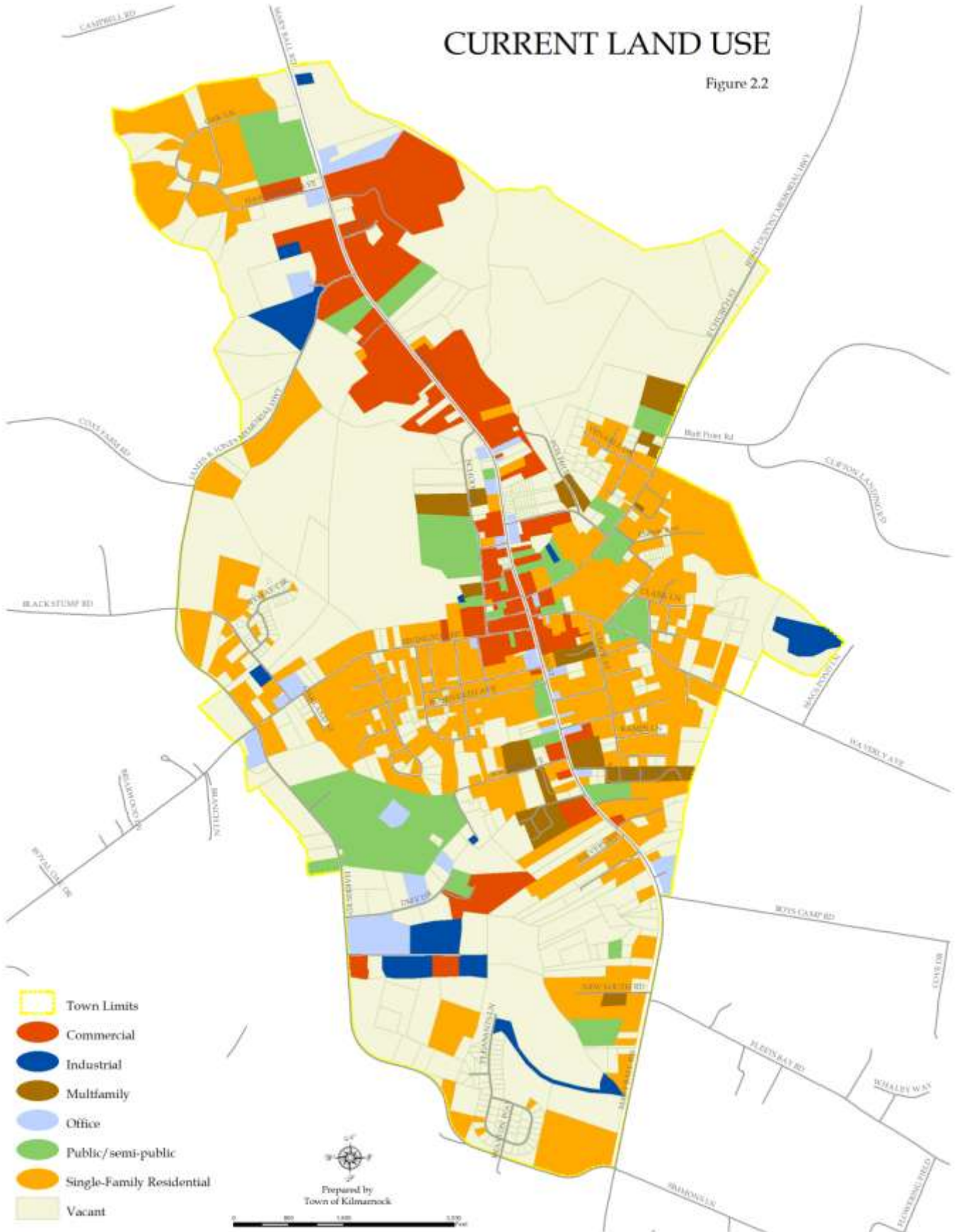
Table 2.1
Existing Land Use, 2013
Kilmarnock, Virginia

Type of Land Use	Acres
Single-family Residential	436
Multi-family Residential	48
Offices	53
Commercial	220
Industrial	17
Public/Semi-public	151
Streets	109
-----	-----
Total Developed Area	1,034
Undevelopable Land	279
Vacant Developable Land	880
-----	-----
Total Town Area	2,193

Details showing the vacant and developed land in Kilmarnock are delineated in Figure 2.2.

CURRENT LAND USE

Figure 2.2



COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

This map shows the existing land use in Kilmarnock initially prepared based on a field survey and updated using the latest technology (e.g., Geographical Information System or GIS). Existing land use is shown in seven color-coded categories juxtaposed over a Town parcel map.

Figure 2.2 shows an overall existing pattern of development with various land uses. This pattern essentially establishes the framework around which future development may occur. The core downtown, anchored by several major highways, defines the central commercial area of Kilmarnock. A typical residential development pattern exists around the core business center. This area is predominantly single-family residential, with intermittent higher density residential projects. Forest Hills subdivision, located at the northern end of town, is largely developed and consists of 44 single family residential lots, each of which is larger than lots in other established residential areas of Kilmarnock. At the southern corporate line, development of the Technology and Business Park is underway south of the Rappahannock General Hospital. The east side of Kilmarnock consists of farmland, an apartment complex known as Mercer Place which provides housing for the local workforce, existing residences, and several protected areas consisting of stream basins, steep slopes and conservation easements. Medical and other office related uses, as well as residences, border the town to the west. The west side of Kilmarnock includes the most land with potential for future development.

B. TOPOGRAPHY AND DRAINAGE

Topography: The topography of Kilmarnock ranges from approximately 10 to 90 feet above sea level. The steep slope areas are typically designated as a Resource Protection Area or RPA (see discussion below in Section “C” pertaining to the RPA). The RPAs include stream basins and steep banks. These areas are typically no more than 50 feet above sea level.

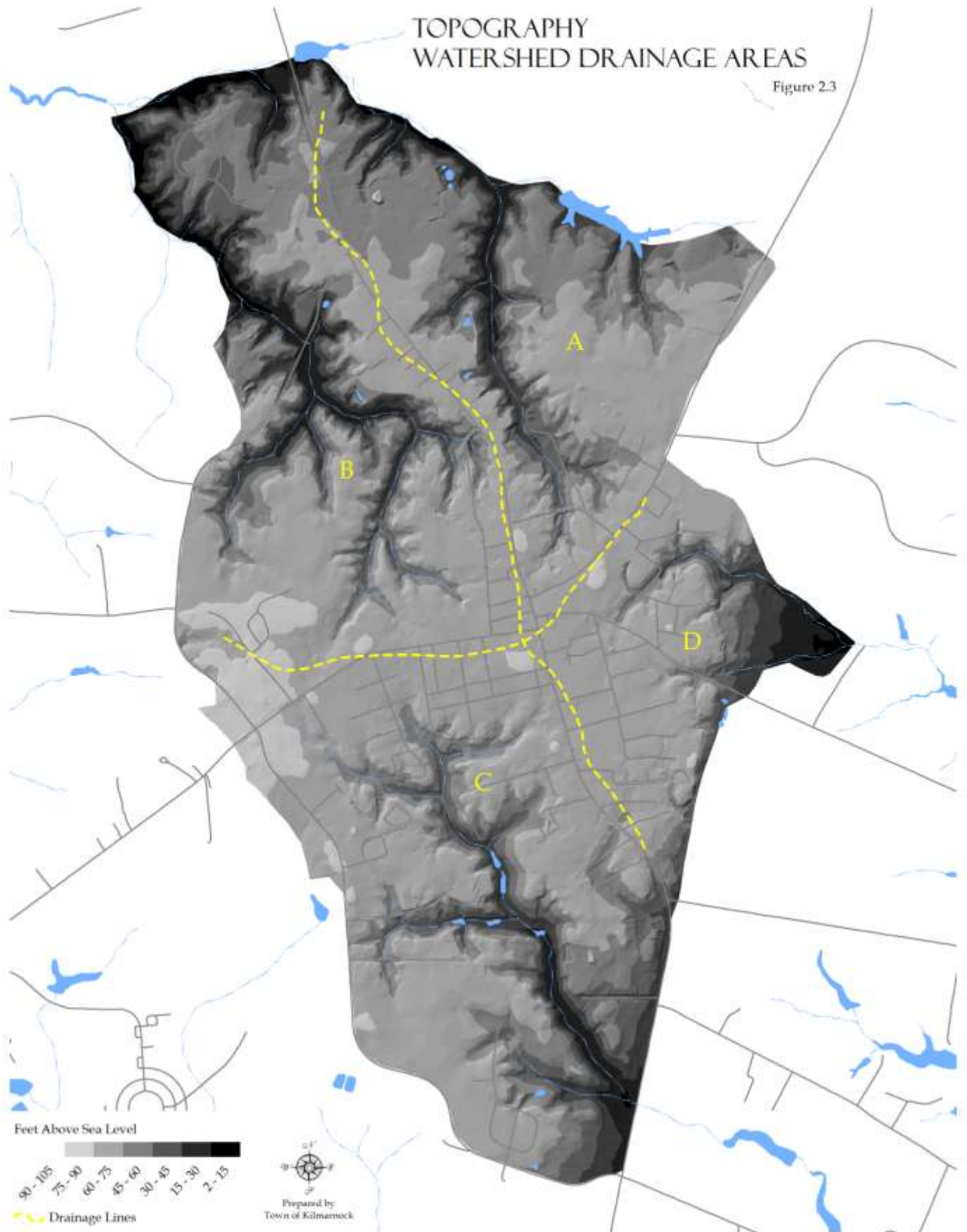
Within the town limits of Kilmarnock, there are two named streams (Dymer Creek and Norris Prong) as well as several unnamed tributaries. Most of the streams appear to be stable with active floodplains and fully vegetated buffers.

The streambeds vary in elevation. For example, the Norris Prong streambed is about 10-feet above sea level where it leaves the Town of Kilmarnock. However, most of the steep slopes in Kilmarnock lie along the stream basins. These areas have limited, if any, development potential and are best suited for protection and preservation to preclude runoff and siltation of the stream basins, as well as excessive erosion along the banks.

Drainage: The Town is drained by four basins, none of which is tidal. The four drainage basins are part of three larger watersheds. Each drainage basin is divided roughly along a major highway, which indicates that the major road system was initially built on highlands formed by ridge lines between each basin. An updated Watershed Assessment report was prepared for the Town of Kilmarnock in April 2013 by the Center for Watershed Protection and is incorporated by reference in this document. This report identifies each watershed as follows: 1) Drainage Basins A and B shown on Figure 2.3 below drain into the Corrotoman River (a.k.a. Norris Prong) watershed. 2) Drainage basin C is referred to as the Dymer Creek watershed; and 3) Basin D is part of the Indian Creek watershed.

The Watershed Assessment concludes that that “no runoff from other jurisdictions enters the town. [As a result,] the health of streams in Kilmarnock is almost entirely dependent on activities and land uses within its boundaries.” (Source: **Kilmarnock Watershed Assessment Report, Section 1 – Introduction, 1.1 Executive Summary, p. 5, April 2013**).

Figure 2.3 illustrates the topography and delineates the approximate location of each of the four drainage basins.



COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

Significant characteristics of each drainage basin are described as follows:

Drainage Basin A is part of the Corrotoman River (a.k.a. Norris Prong) watershed and contains approximately 500 acres. This area drains into Norris Prong, a tributary to the Eastern Branch of the Corrotoman River. This area generally includes the northeastern part of Kilmarnock and is developed with a mix of land uses. Potentially adverse impacts as a result of new development may result from increased storm water runoff and sedimentation. Implementation of development policies during the planning process and construction phase of new development would minimize any impacts.

Drainage Basin B is also a part of the Corrotoman River watershed and includes the land west of Route 3 and north of Irvington Road. Existing development includes housing on the north side of Irvington Road and development west of School Street. A public school, fire station, public library and a nursing home are located in this area as is the commercial development along the west side of North Main Street. The primary potential for development in this basin is the Kilmarnock Glen PUD approved for 423 units. The site, located behind School Street and north of Irvington Road, remains undeveloped.

Drainage Basin C is part of the larger Dyer Creek watershed and contains most of the developed area in the Town south of Irvington Road and west of Main Street. The area is substantially built except for part of the Town between Dyer Creek and Kilmarnock's southern boundary. The Rappahannock General Hospital is the most predominant existing use in this area. Immediately south of the hospital is the developing Technology & Business Park and Grace Hill residential subdivision. This area is fully served by public water and sewer.

Drainage Basin D is part of the Indian Creek watershed and encompasses the southeast part of Kilmarnock, specifically that area located south of Church Street and east of Main Street. This area is substantially developed with residences. The Town's Wastewater Treatment Plant is also located in this drainage basin.

Planning issues for these drainage basins relate to potential impacts due to flood damage, as well as storm water runoff and sediment that drain into the three watersheds, eventually reaching Chesapeake Bay. Also pollutants resulting from the use of land may adversely impact the underground water supply. Implementation of policies in the plan should minimize pollutants in runoff as well as reduce the volume of runoff and sedimentation that reach the tributaries to Chesapeake Bay. These issues and policies in the Comprehensive Plan are consistent with the "Chesapeake Bay Preservation Overlay District" zoning regulations (Chapter 54 "Zoning" Article V of the Town Code) as well as those in the Best Management Practices Handbook, Planning Bulletin 522 published by the Virginia Department of Environmental Quality.

Even though runoff and sedimentation may enter drainage basins in Kilmarnock and eventually reach Chesapeake Bay, it should be noted that that no runoff from other jurisdictions enters the town. This finding is included in the Kilmarnock Watershed Assessment report (April 2013) referenced above and, as such, means that "Kilmarnock's decision-makers and citizens are in a unique position to influence their own destiny with regard to water resources, as well as have an influence on downstream waterways and communities." (Source: **Kilmarnock Watershed Assessment Report, Section 1 – Introduction, 1.1- Executive Summary, p. 5, April 2013**).

Flood Hazards. To protect the public's health and safety relative to flood hazards, Chapter 54 "Zoning", Article VI of the Town Code, sets forth regulations for the Town's "Floodplain Overlay

COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

Districts.” These regulations apply to all development and/or activity within the Town of Kilmarnock in the 100-year floodplain. The purpose of these regulations is to “prevent the loss of life and property, the creation of health and safety hazards, the disruption of commerce and governmental services, [and] the extraordinary and unnecessary expenditure of public funds for flood protection and relief.” (Section 54-500 (a)). Regulations require, among other things, flood proofing and elevating structures.

C. RESOURCE PROTECTION AREAS, POTENTIAL STREAM EROSION & HIGHLY ERODIBLE SOILS

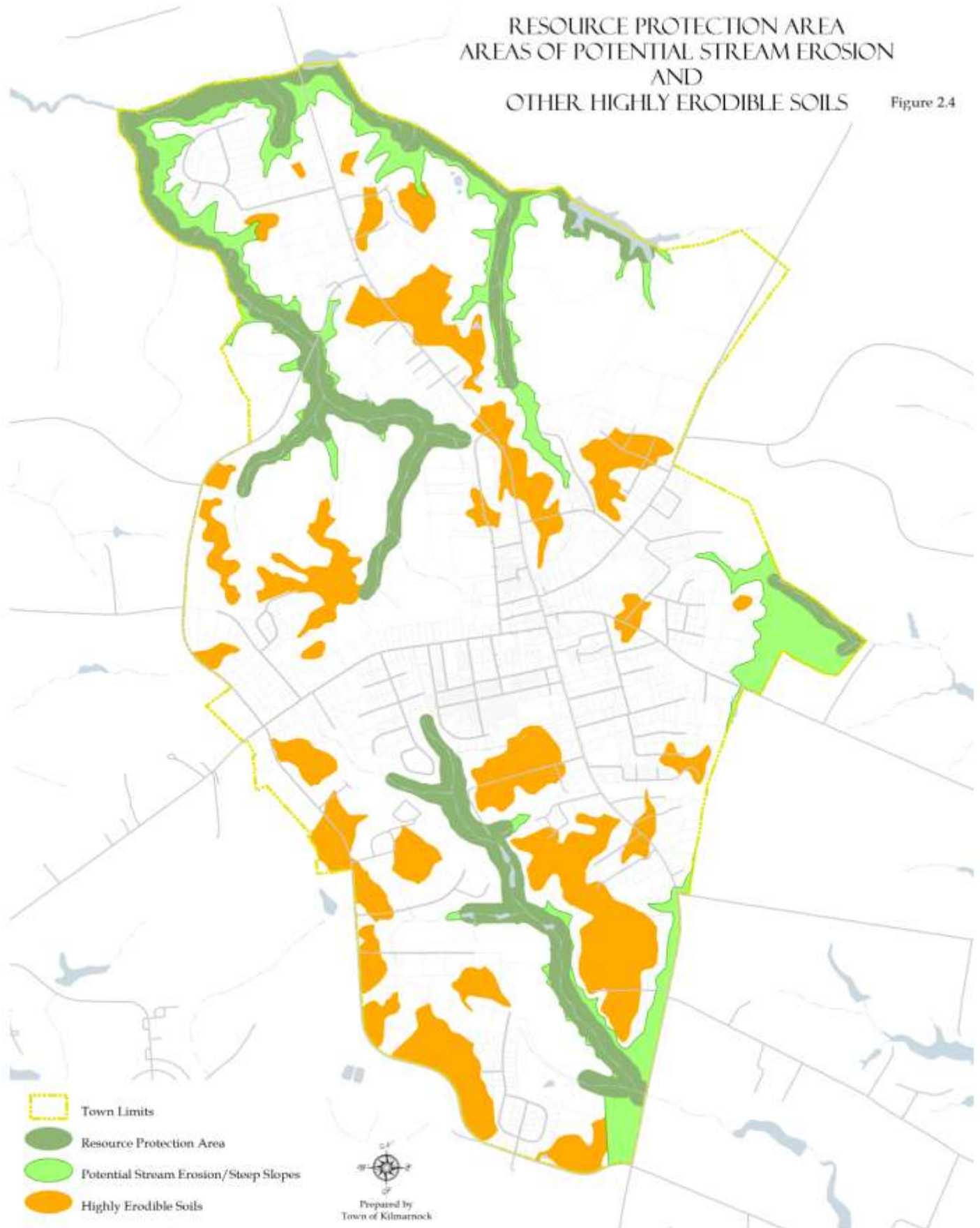
Resource Protection Areas. Figure 2.4 delineates the Resource Protection Areas (RPAs) in the Town of Kilmarnock. The RPAs are also delineated on the land use map and are regulated by the zoning ordinance consistent with requirements of the Chesapeake Bay Preservation Act. The RPAs shall remain largely undeveloped according to the regulations in the Town’s zoning ordinance and the policies set forth in this Comprehensive Plan.

RPA’s include tidal wetlands, non-tidal wetlands that are connected by surface flow and contiguous to tidal wetlands or water bodies with perennial flow, tidal shores, and a 100ft vegetated buffer area that is located adjacent to and landward of water bodies with perennial flow as well as all the aforesaid components. The total undevelopable area designated as a RPA is roughly 4 percent (or 84 acres) of the Town of Kilmarnock. In addition to the RPAs, this map identifies areas with the potential for stream erosion which are defined as steep slopes below the 50-foot contour. Based on USGS topographic maps, most of the land below this contour level has slopes that range from 12 to 15 percent or more. Such slopes are difficult to develop by most planning standards. In addition, steep slopes are sensitive to erosion when the land is disturbed.

COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

RESOURCE PROTECTION AREA
AREAS OF POTENTIAL STREAM EROSION
AND
OTHER HIGHLY ERODIBLE SOILS

Figure 2.4



COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

Several other maps in this document show that there are other qualities that make the land along the steep stream banks difficult for development. These qualities include poor soils, especially for septic systems, such as rapid permeability and high groundwater tables.

Highly Erodible Soils. Figure 2.4 also includes the County's soil survey and identifies areas with "highly erodible soils." Most of the highly erodible soils are not located on the steep slopes of the stream basins as one might expect, but on higher ground. In highly erodible locations, erosion and sediment control measures, common today for most construction activity, may be required as part of the planning and construction process.

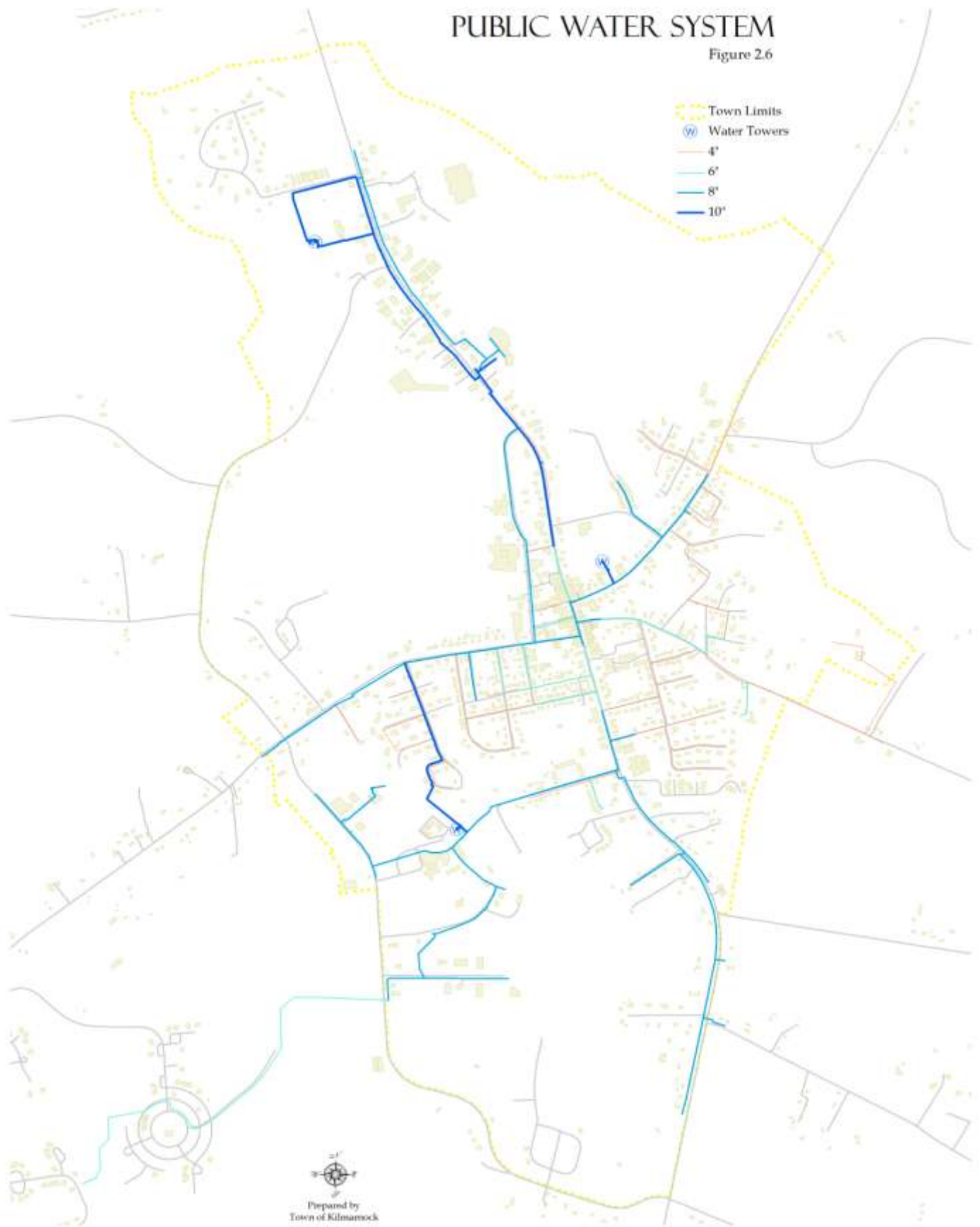
Stream bank erosion also occurs naturally as part of the hydrologic cycle, but the rate of erosion may be accelerated if pre-existing hydrologic conditions are not properly mitigated during the development planning process and adequately enforced during construction. Most development results in an increase in impervious surface coverage which in turn increases the volume and rate of storm water runoff. An increase in runoff may scour stream banks and introduce a significant amount of sedimentation into the stream. For this reason, measures to minimize sedimentation, erosion and runoff must be considered as part of any development proposal.

To mitigate these potential impacts and to comply with federal and state requirements, the Town of Kilmarnock has adopted the "Chesapeake Bay Preservation Overlay District" (Town Code, §54-481). Areas covered by the overlay zoning district include "floodplains, highly erodible soils, steep slopes, highly permeable soils and non-tidal wetlands." Regulations set forth in the ordinance are intended to protect the stream basins and steep banks. In addition to the zoning regulations, policies for the protection of these natural resources are included in Chapter 5 (Preservation of Resources).

D. SOIL SUITABILITY FOR SEPTIC SYSTEMS & SEWER/WATER INFRASTRUCTURE

Most of the developed area in Kilmarnock is served by a public water and sewer system. Policies (see Chapter 4) and regulations (Chapter 50 "Utilities" of the Town Code) require new development to be served by public sewer and water. This applies specifically to new subdivisions and other major projects. Development of a single vacant lot is also required to connect to the public infrastructure if the property is within 250-feet of a water and sewer line. The infrastructure for the Town's public sewer system and public water system is shown on Figures 2.5 and 2.6, respectively. Public services and facilities related to sewer and water are discussed and analyzed in more detail in Chapter 4.



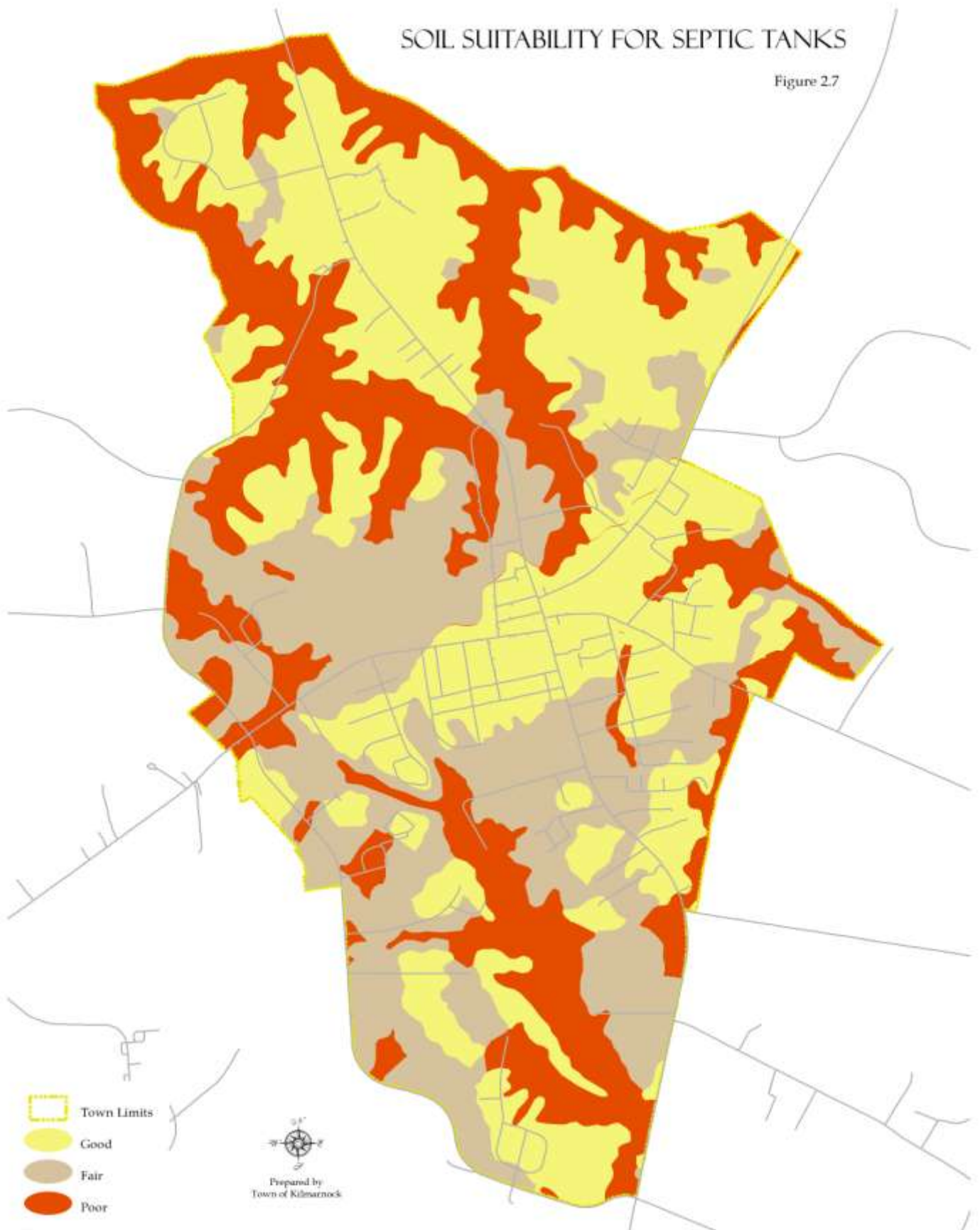


COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

There are roughly 45 developed properties that are currently not connected to the sewer system, but are served by the Town's public water supply. The primary areas in the Town of Kilmarnock which are developed with septic systems include the 44-lot Forest Hills residential subdivision (these lots are larger in size than most of the other residential parcels in Kilmarnock so there is ample area for a septic leach field) at the north end of town, as well as a few commercial properties along North Main Street. For this reason, soil suitability is an issue to address to ensure the soil's ability to digest wastewater if development is to occur in areas not served by public sewers, such as the Forest Hills subdivision. Figure 2.7 identifies those areas within Kilmarnock's corporate limits where soil conditions are considered good, fair or poor for septic systems and related development. Poor soils are typically found where other environmentally sensitive soil conditions (e.g., RPAs) exist. The poor soils more or less follow stream basins and steep slopes. These sensitive areas are discussed throughout this Chapter.

SOIL SUITABILITY FOR SEPTIC TANKS

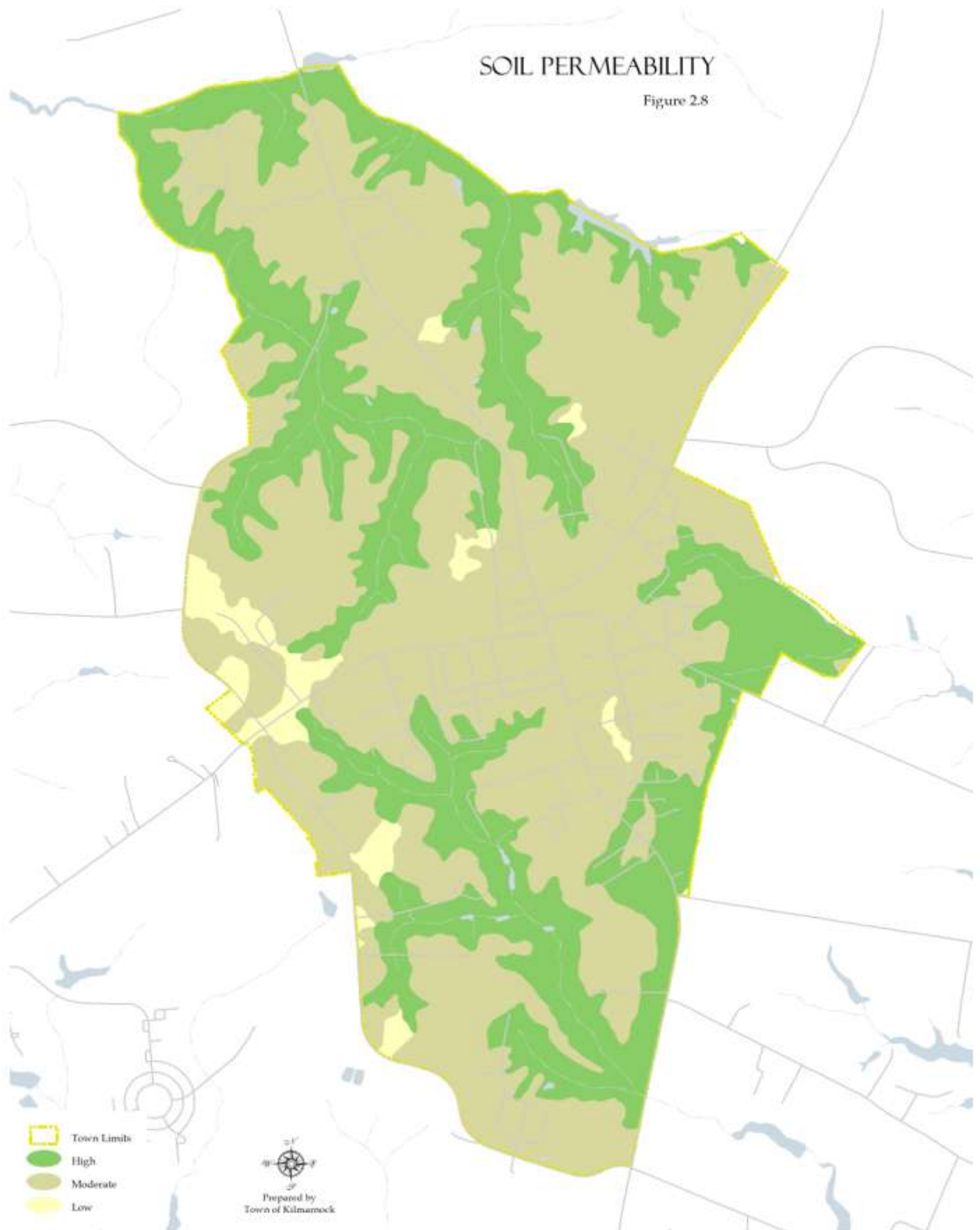
Figure 2.7



COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

A major factor in the soil's ability to accommodate septic systems is its permeability. Permeability indicates the speed at which water passes through a particular soil which is also referred to as a "percolation" rate. Soils with extremely slow percolation may result in wastewater standing or slightly below the surface which would ultimately runoff to streams in storm water. On the other hand soils with an extremely fast percolation rate may result in wastewater filtering, undigested, to the water table below, with the possibility that it would mix with and contaminate a potable water source. The acceptable standard established by the Virginia Department of Health is that percolation rates should be no greater than five minutes per inch and no less than 120 minutes per inch. **(Source: Email from Don Alexander of the Virginia Department of Health dated June 7, 2005, quoting from regulations that have been in effect since 1982.)**

The soil permeability map (Figure 2.8) is similar to other maps in this Chapter which show poor soil qualities. Most of the highly permeable soils (those labeled "high" on the map) are located along streambeds and banks. This is, in part, the result of years of erosion from higher ground settling into the lower stream and drainage basins. The map shows most of the soil in Kilmarnock is classified as "moderate" which is acceptable for septic system disposal fields.



COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

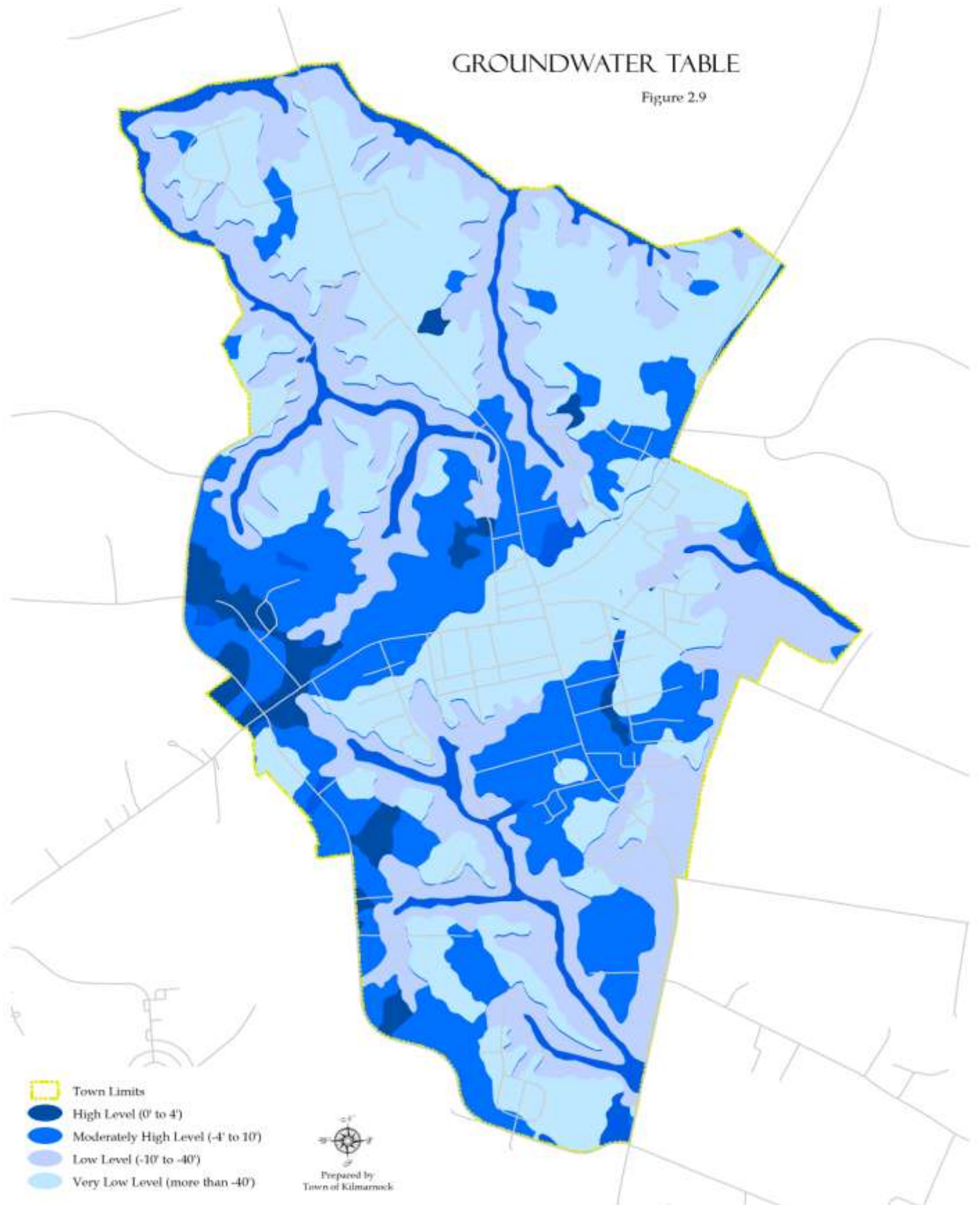
E. GROUNDWATER TABLE

Figure 2.9 shows the various depths of groundwater in Kilmarnock. The designations on the map are from the Lancaster County Soils Survey map. Areas with the highest groundwater are located in and near stream bottoms and basins. These are the same areas that have consistently been identified as having unsuitable soils for development for other reasons. The various water table levels, as a percentage of the Town, are as follows:

Water Table Class	Percent of Town's Area
High water table - less than 4 feet below the surface	11
Moderately high water table - between 4 and 10 feet below the surface	24
Low water table - between 10 and 40 feet below the surface	30
Very low water table - more than 40 feet below the surface	35

GROUNDWATER TABLE

Figure 2.9



COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

Most of the developed land in Kilmarnock is in areas where the groundwater table is 10 to 40 feet below the surface. In fact, roughly two-thirds of the Town of Kilmarnock has a low to very low groundwater table. The remaining third of the Town, with a high to moderately high groundwater table, is located almost exclusively along stream basins where other unfavorable development conditions exist. The higher ground, which also has the lowest groundwater table, is the best quality land for development. A large part of the vacant land that is most likely to be developed has water tables of more than 40 feet although there are some areas with higher water tables. The history of land use in Kilmarnock reflects a preference for the higher elevations.

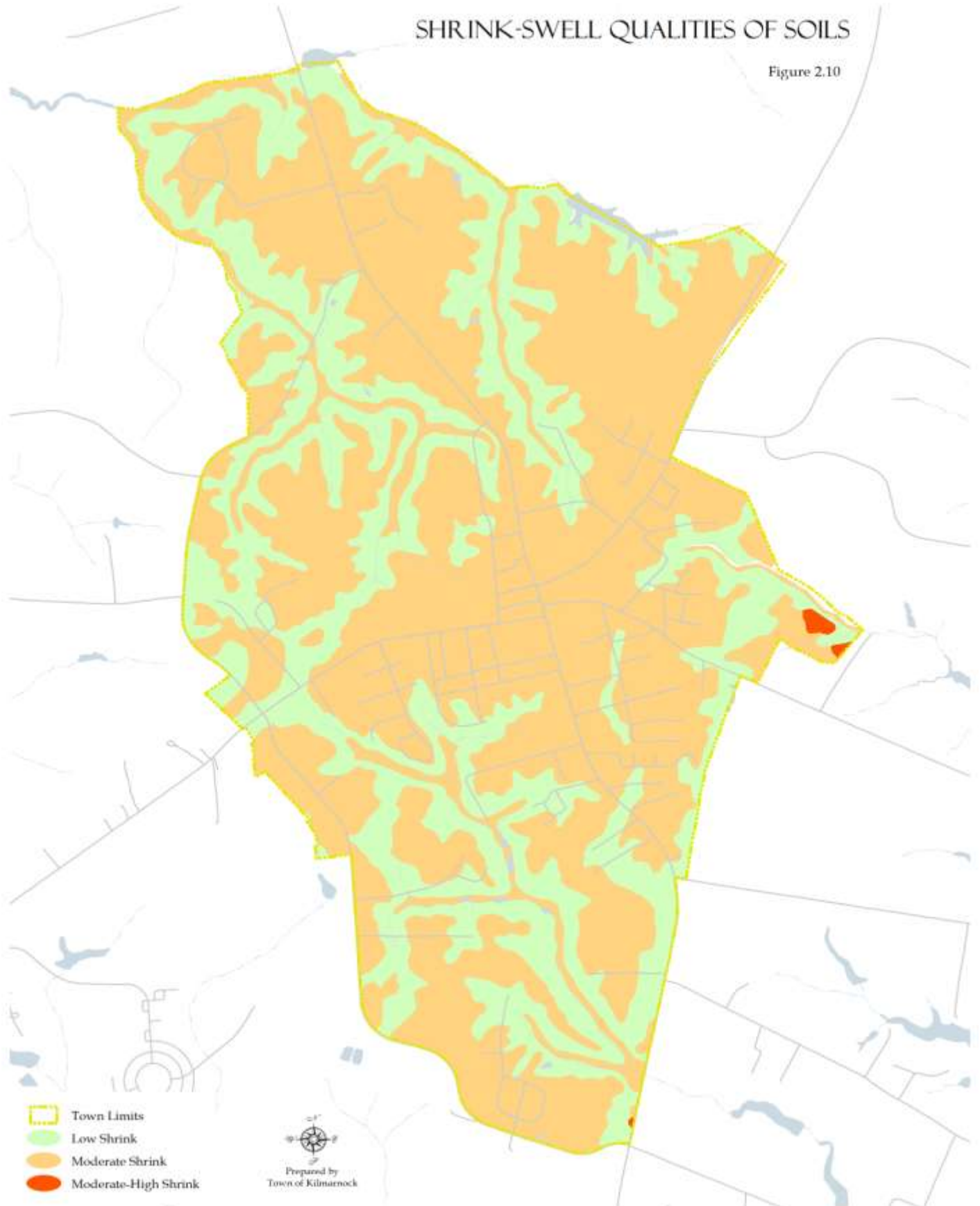
There are at least two implications for land use planning relative to the groundwater level. The first is the requirement for future development to connect to public sewer and water service, particularly given the depth of the groundwater table on a particular site. This subject is discussed in detail in Chapter 4 (Public Services and Facilities). The second issue, which is discussed in Chapter 5 (Preservation of Resources), is to protect areas with high water tables from construction and land uses that may contaminate the underground water table. Policies pertaining to the protection of water quality are also included in Chapter 5.

F. SHRINK-SWELL QUALITIES OF THE SOIL

Shrink-swell refers to the changing volume of soil as moisture is gained or lost. The interaction between minerals in clay with water is the primary reason for volume changes to the soil. Accordingly, the amount of shrink-swell in a particular soil is related to the type and amount of clay minerals found in the soil. Figure 2.10 maps the shrink-swell qualities of soils in Kilmarnock and classifies them as low, moderate or high. Low shrink-swell soils are found mostly in the low-lying streambeds within Kilmarnock and are classified as the most stable of the three classes of soil. Moderate shrink-swell soils are located, for the most part on higher ground, and are virtually in the same area shown as favorable for development by other criteria described in this Chapter.

SHRINK-SWELL QUALITIES OF SOILS

Figure 2.10



COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

The implications of shrink-swell soils for planning and building relate to the design of building foundations. The goal is to ensure that new buildings in areas with shrink-swell soil constraints are constructed with sufficient foundations. Within those areas where construction is proposed on soils with high shrink-swell qualities and/or if multi-storied or large buildings are proposed, a special foundation investigation and design, such as an engineering analysis, may be required. These requirements are also part of the State's building code regulations. To ensure that new construction is properly designed to protect the public's safety, the following policy applies:

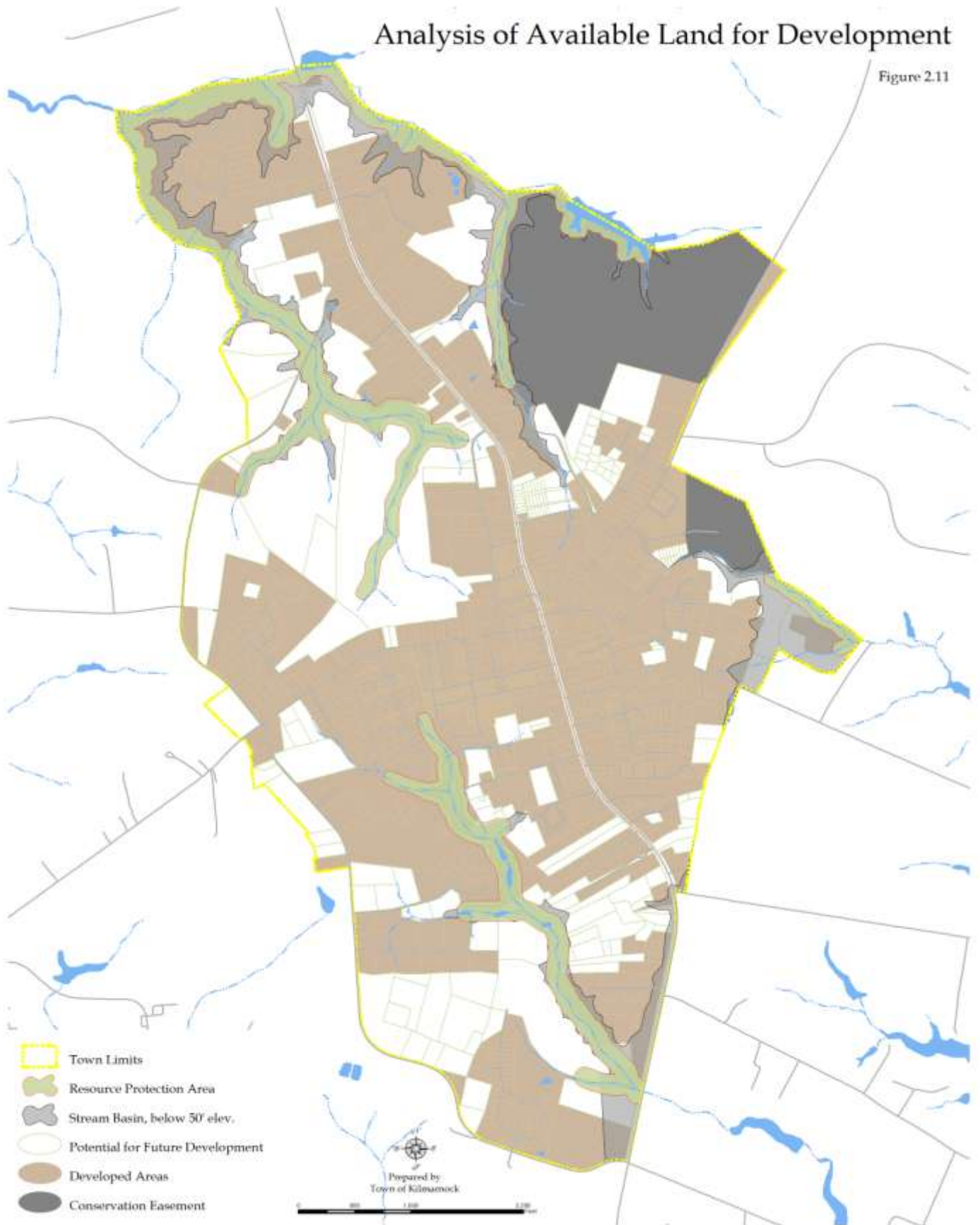
1. During the building permit application phase of development, Town officials should advise builders of the need to consider shrink-swell qualities of the soil when designing building foundations.

G. ANALYSIS OF AVAILABLE LAND FOR DEVELOPMENT

Figure 2.11 illustrates land potentially available for future development within the Town of Kilmarnock. The map shows five different classifications within the Town: 1) designated RPAs; 2) stream basins with steep slopes, below a fifty-foot elevation; 3) areas with the potential for development; 4) developed areas; and 5) conservation easements. These areas are not mutually exclusive, as each classification may overlap another to some extent. The areas on Figure 2.11 that are not shaded are undeveloped but may be so in the future. The area shown as developed on Figure 2.11 totals about 60 percent of the Town and encompasses all the land use classifications portrayed on the existing land use map.

Analysis of Available Land for Development

Figure 2.11



COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

A few of the major issues related to future development of Kilmarnock are described below:

A. Infill Development: Vacant land within the developed area is comprised of numerous undeveloped lots of record. Development of these lots is commonly called “infill”. A reasonable amount of infill development within the existing developed area in Kilmarnock should be expected. Waste Water Management, Inc., (WWM) prepared a “Water and Sewer Master Plan” (Master Plan) for the Town of Kilmarnock (dated February 4, 2010) to determine build-out potential as it relates to the capacity of the public water and sewer systems. (This specific issue is discussed in Chapter 4.) To accomplish this, WWM used the approved development density identified in the Comprehensive Plan for areas where no development is proposed and subtracted resource protection areas and open space requirements to estimate the number of future units. Table 3 of the Master Plan estimates that a total of 314 infill units (roughly 229 residences and 85 commercial buildings) could be constructed in the future in Kilmarnock. This number does not include the major projects approved but not built. These projects are listed above in Section “A” of this Chapter.

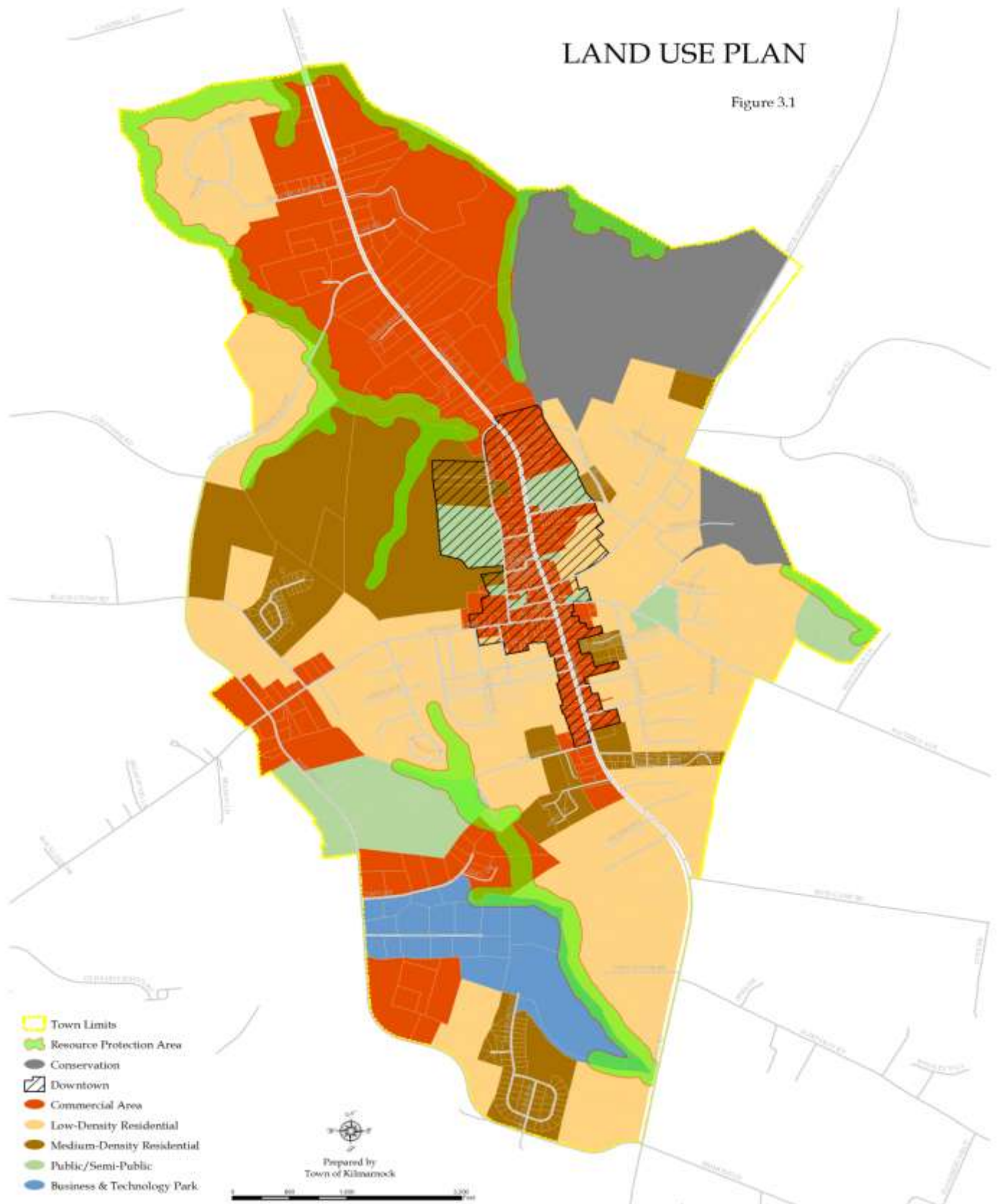
Zoning regulations are the primary tool to guide infill development to ensure the protection of the public’s health, safety and welfare. Implementation of the zoning ordinance also ensures the compatibility of new development with the surrounding established land uses, and establishes an appropriate balance between development and community services.

B. Undeveloped Areas / Future Land Use: The second issue concerns how future development should occur in the large undeveloped areas of Kilmarnock. Much of how the community is developed in the future depends on the following 1) physical factors discussed in this Chapter; 2) the availability of public utilities and services including adequate road capacity, public water and sewer; and 3) the amount and location of vacant land that may be potentially developed.

Future land use of the undeveloped area in Kilmarnock is the focus of the next chapter in this Comprehensive Plan. Chapter 3 identifies strategies for the use and/or development of these areas. The following issues and priorities are analyzed in the next two Chapters:

- Identification of predominant allowable land uses in large undeveloped areas is the highest priority in terms of land use policies and future development.
- The intensity of a given land use is the next priority. For example in residentially designated areas the appropriate density should be identified as “low, medium or high” to ensure compatibility with the surrounding land use, while balancing physical factors and the infrastructure capacity. A Planned Unit Development (PUD) and/or cluster development may reduce costs and consolidate infrastructure improvements.
- Last, but certainly not least, is the capacity of Kilmarnock’s infrastructure to accommodate future development. The primary issues include, but aren’t limited to, roads, and the ability to provide public water and sewer service.

CHAPTER 3
LAND USE PLAN



A. THE ROLE OF THE LAND USE PLAN (LUP)

This chapter focuses on existing and future land use in the Town of Kilmarnock. The LUP establishes the framework for managing future growth and development and contains two major components: 1) the "land use plan map" (*referred to as the LUP Map in this chapter – See Figure 3.1*) which identifies various land use designations based on existing development patterns, and serves as a guide for potential development and land use in the future -- at least for the next decade or more; and 2) a set of general land use and development policies for each classification of land use shown on the LUP Map. These policies are “broad-brush” in nature rather than specific regulations - the latter function reserved for regulations, such as those in the zoning and subdivision ordinances. Together the land use map and policies reflect the town’s vision for the future use and/or development of the community.

The LUP has the following functions:

1. Represents the vision of the community and its leaders for future use and development of land within the Town of Kilmarnock. It is important to have consensus within the community so that the vision set forth in the LUP is supported by the public, as well as officially sanctioned by Town Council when it is adopted.
2. Serves as a guide to any change in character of individual properties as they change from one use to another over time.
3. Provides a rational basis for establishing and modifying zoning and other land use and development regulations.
4. Establishes a broad set of land use policies which are used to guide public and private decisions on proposals that come before the local government.
5. Is a valuable tool of communication between Kilmarnock’s citizens, applicants/developers and the local government on matters concerning land use and development.

Description of Kilmarnock’s LUP: Consistent with State law, preparation of Kilmarnock’s LUP involves several steps. First, there is a need to project potential development and identify where it may occur. Chapter 1 examines various build-out scenarios, overall population density, and baseline socioeconomic factors in the community. Chapter 2 identifies a wide range of physical constraints that may affect future development, especially the location. In Chapter 4, development potential is tied to the town’s infrastructure and its ability to serve the community. Chapter 5 addresses the protection of resources, in particular the quantity and quality of the Town’s long-term water supply to ensure its sustainability for current and future residents. After analyzing all of the above issues, constraints, and resources, the last step is to convert these factors into development policies and appropriate land use designations. Based on the analysis outlined above, general land use designations and related development policies are discussed in this Chapter, consistent with the accompanying LUP Map. These areas and designations are listed below:

1. General Development Policies and Goals
2. Resource Protection Areas, Chesapeake Bay Preservation Act and Conservation Easements
3. Future Land use and Development
4. Commercial Areas
 - a. Downtown
 - b. North Main Street

COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

- c. Partially Undeveloped Commercial Area (generally located at the intersection of Route 200 or Irvington Road, James B. Jones Memorial Highway, and Harris Road extending south of the Business and Technology Park)
- 5. Residential Areas
 - a. Established Residential Neighborhoods
 - b. Low Density Residential
 - c. Medium Density Residential
- 6. Public / Semi-Public Uses
- 7. Business and Technology Park

Sections C, D, E and F: The last four sections of Chapter 3 address: C) development proposed in the unincorporated area adjacent to Kilmarnock; D) housing for Kilmarnock's work force and affordable housing for low-income residents; E) economic development; and F) implementation of the LUP.

B. LAND USE PLAN - DEVELOPMENT POLICIES

1. **Development Policies in General:** Policies in this section reflect the town's vision for development and land use in Kilmarnock, as well as legal mandates for land use in the State of Virginia. The Town's primary policies pertaining to future land use activity in Kilmarnock are to ensure that all development, including redevelopment:
 2. Occurs in an orderly manner and is harmonious with the existing community and surrounding area in which it is located
 3. Protects, enhances or otherwise improves the health, safety and welfare of Kilmarnock's residents and visitors alike
 4. Is consistent with the Town's ability to accommodate the future population in sync with public facilities and services. Future water and sewer demands requiring system upgrades should be coordinated with the town's long-term capital improvement plan to respond to growth and change in land use
 5. Maintains the delicate balance and land use compatibility with the natural environment and that state waters, other sensitive environmental resources, and historical features of the community be protected
 6. Enhances and maintains a strong sustainable economic base by assuring appropriate development policies and designation of sites for the growth and/or expansion of existing businesses, development of new commercial uses and technical industries which also provide an expanding base of quality jobs that pay a living wage for residents of the area.

Specific policies for each area designated on the LUP Map are presented in the sections that follow below:

2. **Resource Protection Areas (RPA), Chesapeake Bay Preservation Act (CBPA) and Conservation Easements:**

Figure 2.1 in Chapter 2 shows that roughly 13 percent of the total acreage (i.e., 2,193 acres) within the Town of Kilmarnock is essentially undevelopable, consisting of RPAs and conservation easements. It is doubtful that this acreage will change or be developed unless or until the existing conservation easements are modified, new easements are dedicated, and/or additional land containing environmentally sensitive areas is annexed to Kilmarnock. In this section three topics are discussed which address land use in environmentally sensitive areas. These are:

COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

- a. Resource Protection Areas (RPAs);
- b. Chesapeake Bay Preservation Act (CBPA) and related Chesapeake Bay Preservation Overlay District (CPBOD) which covers the entire Town of Kilmarnock, and areas within the 100-year floodplain; and
- c. Conservation easements.

Chapter 2 (Physical Conditions Affecting Development) of this document describes the features of the RPAs and the physical factors that limit development. Chapter 5 (Preservation of Resources) addresses protection of these natural resources and the quality of the water/runoff that drains into Kilmarnock's stream basins, ultimately ending up in Chesapeake Bay. Additional policies for preservation of these natural resources are included in Chapter 5.

a. RPA: The RPA shown on the LUP Map is officially defined as “that component of the Chesapeake Bay Preservation Area comprised of lands adjacent to water bodies with perennial flow that have an intrinsic water quality value due to the ecological and biological processes they perform or are sensitive to impacts which may result in significant degradation to the quality of state waters” (§54-481, Town Code). Based on §54-482 of the Town Code, “the RPA includes: a) Tidal wetlands; b) Non-tidal wetlands connected by surface flow and contiguous to tidal wetlands or water bodies with perennial flow; c) Tidal shores; and d) a 100-foot vegetated buffer area located adjacent to and landward of . . . both sides of any . . . water bodies with perennial flow. . . . The full buffer area shall be designated as the landward component of the RPA.” In the case of Kilmarnock, the above definition of an RPA primarily applies to the various unnamed stream basins, the two streams known as Dyrer Creek and Norris Prong Creek, and that area adjacent to the Indian Creek tributary where the Wastewater Treatment Plant is located. RPAs also include highly erodible soils, particularly on the steep slopes, which are part of the 100-foot vegetated buffer.

Several maps in Chapter 2 show that the RPAs and soil conditions, in all practicality, render these areas unbuildable. Nearly 13 percent (roughly 279 acres) of Kilmarnock is within an area that is essentially undevelopable. Practically no development has occurred within these areas in the past (see Figure 2.1 – Existing Land Use), which is a factor that protects the stream banks and basins from erosion. Soil erosion control measures and the CBPA regulations are intended to prevent further damage to the stream environment as a result of construction and land use activity.

While erosion and runoff occurs naturally, development and land use activities may exacerbate the process, as well as introduce contaminants to protected areas. These issues must be properly addressed and implemented during the planning and construction phase of any new development proposal, especially those located in proximity to a designated RPA. Most development results in an increase in impervious surface coverage which, in turn, typically increases the volume and rate of storm water runoff and pollutants. The increased rate and volume of runoff, in turn, may scour stream banks and introduce a significant amount of sediment and contaminants into the stream. In addition, construction activity and development in proximity to an environmentally sensitive area may result in an adverse impact to these sensitive resources, especially stream banks, if not adequately mitigated.

With these issues in mind, the following policies apply to the RPAs in Kilmarnock in order to protect steep slopes, minimize surface runoff, soil erosion and the amount of pollutants entering the surface water as a result of development or other land use activities. These policies apply to a specific project if a portion of the property contains an area designated for resource protection as shown on the LUP Map and/or based on staff's on-site inspection.

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7. Protect steep slopes along creek banks and other sensitive areas designated for resource protection from soil erosion and construction activity by implementing water quality Best Management Practices (BMP) during the planning and construction phase of all new development. These practices include, but aren't limited to, provision for an adequate setback for new development located in proximity or adjacent to a stream bank, and other protected areas. In addition to the permanent setback, designation of an adequate buffer using natural (e.g., hay bales) or man-made (e.g., fencing) materials to protect the sensitive area and stream basin during grading activity, construction and staging of heavy equipment is appropriate.
8. As part of the planning process, encourage developers to utilize innovative land use designs and techniques, such as clustering development, designation of conservation easements, etc., to provide a natural buffer from steep slopes and environmentally sensitive areas.
9. Discourage development on highly erodible soils and/or slopes greater than 15%. Generally, development on steep slopes 25% or more is not allowed. Exceptions to this policy may be appropriate under certain circumstances.
10. Encourage residents to establish adequately vegetated buffers (as opposed to grass lawns) with native, drought tolerant, low maintenance, and/or riparian plant species adjacent to streams, stream banks, and other environmentally sensitive areas, in order to reduce the potential for erosion and runoff. The use of environmentally safe products for maintenance of the landscaped buffer, until established, can decrease contaminants in runoff that may impact streams, rivers and the Chesapeake Bay. (Please refer to policies in Chapter 5 and the discussion related to groundwater protection and the use of herbicides, etc.)
11. Encourage developers and residents to minimize impervious surface coverage by reducing paved surfaces or using an alternative method. One example is to use gravel or some other pervious surface for driveways as opposed to asphalt or concrete. The size of a structural footprint adjacent to a sensitive area may also be reduced. Reduction in impervious surfaces should be encouraged throughout the Town of Kilmarnock but is especially important adjacent to protected and/or sensitive areas. (Please refer to Town Code §54-481, "Chesapeake Bay Preservation Overlay District," for specific requirements pertaining to impervious surface coverage.)
12. Continue to work with the Virginia Department of Transportation (VDOT) to rectify any existing drainage, storm water management and/or erosion problems arising from existing roads, new road construction and storm drain maintenance.

There is no underlying zoning classification for the RPAs as shown on the LUP Map. This is primarily due to two factors: 1) almost all of the parcels with an RPA designation are privately owned with, for the most part, an underlying zoning classification of either residential or commercial; and 2) the RPAs shown on the LUP Map are not considered precise delineations of the environmentally sensitive areas and, as such, do not follow property lines. The RPA boundaries meander and change over time due to natural causes. As a result, development on parcels in proximity to an RPA must be evaluated on a case-by-case basis as part of the planning and site review process.

b. CBPA and Kilmarnock's "Chesapeake Bay Preservation Overlay District" (CBPOD): The Town of Kilmarnock is subject to the Chesapeake Bay Preservation Act (CBPA) primarily because it is located within the Chesapeake Bay Watershed. A description of the regional watershed is included in Chapter 5. To ensure compliance with the CBPA, Kilmarnock adopted the "Chesapeake Bay Preservation Overlay District" or CBPOD (Town Code, §54-481). The entire Town is located within this "Overlay District." In addition to the RPAs, defined in the above section, all the remaining land within the town is designated as a Resource Management Area or RMA pursuant to the CBPOD. The RMA includes all lands within the town that are not designated as RPA. Regulations for the RMA

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address “land types that, if improperly used or developed, have the potential for causing significant water quality degradation or for diminishing the functional value of the resource protection area” (§54-482, Town Code).

Based on the above, all development in Kilmarnock is subject to the zoning regulations contained in the Town’s CBPOD. These regulations address, among other things, new construction, redevelopment, land disturbance, and land use activity. Requirements include, but aren’t limited to, an overall reduction in impervious surface coverage; an overall decrease in non-point source pollution; and installation of landscaped buffers, especially adjacent to environmentally sensitive areas. No additional land use policy is required for the RMA in this chapter since existing zoning regulations for the “Overlay District,” adopted in compliance with the CBPA, adequately address new development.

100-Year Floodplain: There are also areas within the Town of Kilmarnock located within the 100-year floodplain. These are, for the most part, in proximity to stream basins and RPAs. Flooding and runoff in these locations may also have the potential to cause water quality degradation if development is not properly planned and constructed. To protect these sensitive resources as well as the public’s health and safety during a flood event, the Town adopted a “Floodplain Overlay District.” Chapter 54 “Zoning”, Article VI of the Town Code, sets forth regulations for development within the 100-year floodplain in Kilmarnock. Regulations require, among other things, flood proofing and elevating structures. No additional policy is required for development located within the 100-year floodplain, as defined in the “Floodplain Overlay District,” since existing zoning regulations, adopted in compliance with the Federal Emergency Management Agency or FEMA standards, adequately address new development.

Rare or Endangered Animal and Plant Species: Since this section addresses environmentally sensitive areas, it is important to note that there are no documented rare, threatened or endangered animal or plant species within the town’s limits based on a review provided by the Virginia Department of Conservation and Recreation Natural Heritage Program.

c. Conservation Easements: There are two areas on the LUP Map designated for “Conservation.” These areas consist of two conservation easements: a 195-acre easement dedicated to the Virginia Outdoors Foundation and a 27-acre easement held by the Northern Neck Land Conservancy. In exchange for dedication of the easement, the landowner may receive certain income, or estate and property tax benefits while still maintaining ownership of the property. In one case the property is currently farmed and the agricultural use on that site may continue. The other property is forested; the only allowable use, pursuant to the language in the deed restriction for the easement on that parcel, is timber harvesting.

In each case language in the deed restriction for the conservation easement specifies what the property owner(s) may or may not do on the property in terms of development and land use activity. As such, regulation of the “type” of land use and/or development is beyond the purview of the Town of Kilmarnock. However, when and if development is proposed on either parcel or in the event the easement(s) is revoked or removed, regulations for the underlying zoning district would apply. In both cases the parcels are zoned for an “Agricultural” use. There are no other areas in the Town of Kilmarnock designated for “Agriculture.”

3. Future Land Use and Development:

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How much of Kilmarnock is undeveloped but buildable? Where should development be located? What types of land use are likely to be developed? The following sections of this Chapter address these questions and include policies for new development in areas that are currently vacant but potentially buildable. Roughly 40 percent (880 acres) of the land in Kilmarnock falls into this category, with the potential to be developed in the future. The types of land use that may be developed in Kilmarnock, as shown on the LUP Map, include commercial, residential, public /semi-public and business / technology. Areas currently undeveloped in Kilmarnock are shown on Figure 2.2 “Existing Land Use” in Chapter 2. This map, when reviewed in conjunction with the LUP Map in this chapter, shows that most of the undeveloped acreage is designated for a residential use (the largest amount of undeveloped land falls into this category), followed by commercial, and with a smaller clearly defined undeveloped area for the Town’s “Business and Technology Park.” Figure 2.2 also shows that the bulk of developable land is located on the west side and south end of Kilmarnock.

4. Commercial Areas

Table 2.1 in Chapter 2 shows that, of the 1,034 acres developed in Kilmarnock, offices and commercial land uses total approximately 28 percent of the developed area. Table 3 of the Town’s “Water and Sewer Master Plan” dated February 2010 estimates there are roughly 75 commercially designated vacant lots, some of which are much larger in size when compared to a residential parcel. Many of these are interspersed throughout the various developed commercial areas in the community. The area with the greatest potential for commercial development in the future is described in item “c” below.

There are three primary commercial areas in Kilmarnock discussed in this section. These are:

- a. Downtown Commercial Area/Steptoe’s District;
- b. North Main Street Commercial Area; and the
- c. partially undeveloped commercial area generally located at the intersection of Route 200 (Irvington Road), James B. Jones Memorial Highway, and Harris Road extending south of the Business and Technology Park. Perhaps the most undeveloped commercial acreage is located in this area along with the “Business and Technology Park.” As a result, a major concentration of businesses may be developed in this area in the future.

It is important to clarify that section “E” of this document addresses economic development in the Town of Kilmarnock. This section and the “Economic Development” piece are closely related. This section addresses commercial (i.e., structural) development and land use whereas the “Economic Development” section focuses on incentives that encourage property investment, business expansion, increased revenue and job creation.

a. Downtown Commercial Land Use - Steptoe’s District: The downtown commercial area is Kilmarnock’s original business and commercial center. This area is largely built-out with the exception of a few vacant lots interspersed throughout downtown. As a result, new commercial projects are likely to consist of changes in use within existing structures and redevelopment.

The downtown commercial district includes a mixture of retail shops, offices, restaurants, banks, an Inn and Town Hall, as well as a few detached single family homes. The buildings in the core of the downtown are typically one and two-story constructed without side yards and abutting alleys on the back side. They comprise a mixture of original structures constructed around the turn of the 20th century and replacement or “infill” buildings built in recent decades. More information about

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potentially historic structures in downtown Kilmarnock is included in Chapter 5 (Preservation of Resources). Parking space is at a premium consisting predominantly of on-street parking and four off-street public parking lots.

The core downtown area is a classic “mixed-use” (i.e., commercial and residential) development since many of the business establishments have residential apartments on the second-story. This aspect of the downtown area is important and should be encouraged since this residential use provides housing adjacent to places of employment and business establishments. This is particularly important for those who may be employed in an establishment located downtown. There are many additional benefits to having residential units in the downtown area including, but not limited to: 1) a reduction in traffic impacts since those who live downtown may be more likely to work and shop there; and 2) a residential presence downtown helps to establish a sense of community, particularly when shops and businesses are closed.

A lot has occurred downtown since adoption of the last Comprehensive Plan in February 2006. Some of the major public projects that have been implemented under the auspices of Town Council and the Town’s local government include:

- Implementation of the “Downtown Revitalization Plan;”
- Designation and adoption of the “Steptoe’s Overlay District” which covers most of the downtown commercial area;
- Zoning Ordinance update (Chapter 54, Town Code) to include, among other things, design and architectural guidelines for development and redevelopment of structures in commercially designated areas;
- Relocation of Town Hall to the center of the downtown commercial “Steptoe’s” district;
- Acquisition and use of the “Town Lot” for public use including community events, farmers’ market, and a dog park, etc. Plans are currently underway for development of the “Town Lot” to expand opportunities for recreational use by the public.

Downtown Revitalization Plan: Implementation of the Downtown Revitalization Plan has upgraded both the appearance and function of downtown Kilmarnock. This in turn has made downtown Kilmarnock more attractive as a place to shop as well as to invest in new business opportunities. Some of the major improvements that have occurred include: 1) placement of overhead utility lines underground; 2) new sidewalks with benches, landscaping and street lights; 3) designation of pedestrian crosswalks; 4) new directional signs for public parking areas and local attractions; 5) landscaped median strips; 6) various other landscaping projects including a program for hanging flower baskets; and 7) seasonal/holiday decorations.

Steptoe’s Overlay District: The Steptoe’s Overlay (Zoning) District, or SOD, was adopted by Town Council in March 2006, roughly one month after adoption of the last Comprehensive Plan. The stated purpose of this overlay designation is to recognize and promote the unique character of the town's downtown area. The SOD is intended to preserve the character and fabric of Kilmarnock’s original trade center, as well as allow for flexibility of the underlying commercial zoning regulations by relaxing standards for parking, setbacks, and other development requirements. This flexibility makes it easier for new businesses to obtain appropriate permits while maintaining the charm and appeal of downtown Kilmarnock. The Steptoe's Overlay District covers the portion of the downtown intended for the conduct of mixed use commerce. Upper floor residential uses are also encouraged. (See § 54-601, Town Code).

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General Commercial Land Use Designation & Design Guidelines: The underlying commercial designation for downtown Kilmarnock is intended for general business activity which requires direct and frequent access by the public, but which is not characterized either by constant heavy trucking, other than stocking and delivery of retail goods, or by any nuisance other than the incidental congregation of people and passenger vehicles.

While commercial establishments are critical to the continued economic vitality of the downtown area and to the well-being of Kilmarnock's citizens, they can also have significant aesthetic, traffic-related and other adverse impacts upon the community. The viability of commercial establishments located downtown depends in large part upon high visibility from public streets in busy areas of the town. As a result, the building and site design may have a significant impact upon the character and attractiveness of the town in general and its streetscapes. The protection and enhancement of the positive aesthetic qualities of the town, specifically the commercially developed areas, have a direct and substantial bearing upon the Town's continued economic vitality. This is especially important in Kilmarnock in light of the town's reliance upon economic benefits provided by tourism. (See § 54-338, Town Code).

In light of the above, the Town's goal is to promote commercial development which utilizes high-quality design and building features in such a manner as to enhance the function and aesthetic attributes of downtown Kilmarnock in order to maintain its small town rural charm and appeal. To accomplish this, the Town adopted design guidelines, several months following adoption of the last Comprehensive Plan in 2006, for development in commercial land use designations. One key provision in the guidelines that relates specifically to the "Steptoe's Overlay District" encourages reduction of the footprint of a commercial establishment through the use of multiple levels. A sample of a few other architectural features and design elements addressed in the guidelines, which apply to certain development proposals located within all general commercial areas, include: 1) roof design; 2) screening of rooftop mechanical equipment from street level view; 3) building materials and colors including facades, trim and accent areas; 4) entryway design; 5) display windows; 6) integration of architectural details such as, tile work or moldings into building design; 8) incorporation of landscaped areas and/or public places for sitting, etc.; 9) outdoor display areas and exterior lighting fixtures. (See § 54-340, Town Code)

Based on the existing conditions outlined above, land use and development policies applicable to the downtown commercial "Steptoe's" area are as follows:

Establishment of a variety of visitor-serving, general commercial, service related, and office uses, integrated with public spaces and amenities, are encouraged within the downtown area. Upper floor residential uses above business establishments are also encouraged.

13. Establishment of a variety of visitor-serving, general commercial, service related, and office uses, integrated with public spaces and amenities, are encouraged within the downtown area. Upper floor residential uses above business establishments are also encouraged.
14. Maintain and expand improvements in the downtown area in order to continue to revitalize and upgrade the appearance and function of downtown Kilmarnock to include, but not be limited to, landscaping, installation of public amenities such as bicycle racks, park benches, picnic tables, public spaces, etc.
15. Continue to identify appropriate areas for off-street public parking.
16. Ensure that the downtown area retains its unique small town appeal and charm in order to enhance and maintain the economic vitality of the area for residents of Kilmarnock and the

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region, tourists, and businesses. One way to do this is to continue to implement and enforce the building design guidelines, outlined above, as set forth in § 54-340, “Building Design,” of the Town Code.

b. North Main Street “General” Commercial Land Use: The North Main Street commercial corridor is also classified as a “general” commercial area because of the range of existing uses requiring direct and frequent access by the public. The underlying zoning designation for North Main Street is the same as that for the downtown area. This commercial area includes shopping centers and a variety of businesses and offices ranging from banks, car dealerships, to fast food restaurants.

The North Main Street commercial designation extends from the downtown commercial district along both sides of North Main Street (Route 3) to the northern end of town. Overall this commercial area is about 1.5 miles in length and ranges in width from roughly 200 to 1,500 feet on each side of North Main Street. Shopping complexes are established in the wider sections of this commercial corridor while the frontage in the narrow part is developed with a mixture of smaller shops and original residences. Two major streambeds, located on the east and west side of the North Main Street commercial corridor, are identified on the LUP Map as Resource Protection Areas.

While much of the frontage has been developed, there is more vacant land, as well as unoccupied commercial establishments, when compared to the downtown commercial district. This is primarily due to the fact that the North Main Street commercial area is larger in size. Many of these undeveloped commercial lots are individually owned and/or developed with single family residences, making it more difficult to develop a master plan for build-out of the area. Most of the lots have direct access to North Main Street along the front, as well as additional acreage to the rear that would potentially serve as a buffer between commercial development and protected resources areas. In addition to commercial facilities, these parcels might also be developed with a mixed-use residential project such as multi-family residential units provided a project is properly planned to address “site-specific” conditions.

Similar to the downtown commercial area, a lot has occurred in the North Main Street commercial corridor since adoption of the last Comprehensive Plan in February 2006. However, in this case most of the changes involve new commercial development as opposed to public / government projects, with the exception of the new Rappahannock Community College / Kilmarnock campus (a non-profit, educational facility), established at the beginning of 2012 in the “Chesapeake Commons” complex.

Private commercial development in the North Main Street commercial area since 2006 includes the development of the Wal-Mart shopping complex and Walgreens. There are also several existing vacant buildings where new commercial uses have been established. Most of the recent commercial development occurred between 2006 and the beginning of 2008. After that time new commercial development in Kilmarnock dropped precipitously in sync with the nationwide economic downturn. Currently there are no plans proposed for new large-scale commercial projects.

In light of the above, land use development policies for the North Main Street commercial corridor are as follows:

17. Establishment of a variety of visitor-serving, general commercial, service related, and office uses, integrated with public spaces and amenities (e.g., bicycle racks and picnic tables) are encouraged within the North Main Street commercial area with emphasis on retail trade, restaurants, offices, and other compatible establishments.

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18. The development strategy within the North Main Street area should focus on the following issues:
 - a) identify the most appropriate mix of land uses (e.g., commercial and residential) for the area to meet the needs of Kilmarnock's residents and the region's population, consistent with the Town's economic goals;
 - b) ensure that the capacity of the Town's water and sewer services is consistent with commercial growth demand;
 - c) extend applicable improvements, completed as part of the Downtown Revitalization Plan, to North Main Street; and
 - d) in conjunction with the Virginia Department of Transportation (VDOT), improve both vehicular traffic circulation and pedestrian access along the North Main Street commercial corridor.
19. Access to commercial establishments should be coordinated to reduce the number of vehicular access points along both sides of the entire North Main Street frontage. This may be accomplished by requiring adjacent businesses to share one access point to interconnected parking areas with the potential use of turning lanes from the main thoroughfare.
20. Lots with excess depth beyond that needed for commercial frontage development and/or are adjacent to a Resource Protection Area should include an adequate vegetated buffer between the commercial development and the protected area.
21. Continue to implement and enforce the town's building design guidelines, outlined above, as set forth in § 54-340, "Building Design," of the Town Code. These regulations apply to the North Main Street Commercial district and help to ensure an aesthetically appealing area when new development and/or redevelopment occur.
22. Encourage construction of "mixed use" commercial and residential consistent with the Town's Zoning Ordinance (Chapter 54) regulations for the "General Commercial" district. With careful planning and oversight, some sites along North Main Street may be appropriate for development of townhouses or multi-family housing facilities.

c. Partially Undeveloped Commercial Area: This area is generally located at the intersection of Route 200 (Irvington Road), James B. Jones Memorial Highway, and Harris Road extending south of the Business and Technology Park. Perhaps the most undeveloped commercial acreage is located in this area along with the "Business and Technology Park." A major concentration of business uses may be developed in this area in the future. In addition the Rappahannock General Hospital (RGH), Northern Neck Free Health Clinic and the YMCA are located in this area. These facilities, especially RGH, are major employers and are accessed on a regular basis by the general public. Because of this any development in this area should incorporate bicycle paths and sidewalks to encourage pedestrian and bicycle access.

Unightly commercial "strip" development in this area should not be allowed. This is particularly important since the area generally located at the intersection of Route 200 (Irvington Road), James B. Jones Memorial Highway and Harris Road is considered a "Gateway" to Kilmarnock and, as such, development of this area should be in keeping with the goal to preserve and enhance Kilmarnock's rural small town charm.

Unlike the downtown and North Main Street commercial areas, which are designated for a "general" commercial use, this area is, for the most part, classified for "limited" commercial development. The "limited" commercial designation is intended to provide a business area that is compatible with the transition between the more densely developed commercial areas in downtown Kilmarnock and along North Main Street, as well as nearby residential neighborhoods. In contrast to the regulations for downtown Kilmarnock and the North Main Street corridor, there are no building design guidelines in the "limited" commercial zone. Therefore, it is important that new commercial development in this area is reviewed carefully during the planning process to ensure proper design and architectural styles

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in keeping with the Town's goals for the "Gateway" approach to Kilmarnock, as well as to enhance and retain Kilmarnock's charm.

In light of the above issues, the following policies apply:

23. Consider installation of sidewalks, designated bicycle lanes and other related pedestrian/bicycle improvements in this area to encourage bicycle and pedestrian access to major employment centers and areas with a high concentration of development offering community and public services. These improvements could be required as a condition of permit approval when development is proposed, as part of the Town's Capital Improvement Plan, and/or in conjunction with the Virginia Department of Transportation when road improvements are proposed.
24. When new development is proposed, ensure proper design review, using compatible architectural styles and innovative design techniques, to allow for responsible and aesthetically compatible commercial growth in keeping with the "Gateway" approach to town, adjacent residential areas, and the rural small town charm of Kilmarnock.

5. Residential Areas

This Section addresses residential land use. Table 2.1 in Chapter 2 shows that, of the 1,034 acres developed in Kilmarnock, the primary land use is residential with roughly 47 percent of the Town developed with single-family and multi-family residences. As noted above (see Section "3") approximately 40 percent of Kilmarnock consists of vacant but developable land, the majority of which is designated for a residential use.

Chapter 1 identifies various scenarios for the full residential build-out of Kilmarnock. One such scenario includes approved but not developed or partially constructed projects, coupled with vacant residential lots of record interspersed throughout the established community (i.e., infill), as well as larger tracts of land designated for a residential use for which no development is proposed at this time. All of these projects and vacant lots could be developed in the future. Development projects approved but not constructed -- or partially constructed -- are listed in Chapter 2, Section "A." Currently there are approximately 642 residential units that fall into this category. These units are in addition to potential development of vacant lots of record (i.e., infill) interspersed throughout the established residential areas of Kilmarnock, as well as the larger undeveloped tracts of land. Based on the approved development density for the undeveloped residential acreage, minus the resource protection areas and open space requirements, roughly 229 residences (in addition to those approved but not constructed) could be built in Kilmarnock in the future. This amounts to a combined total of potentially 941 new residences.

There are three residential areas in Kilmarnock discussed in this section, two of which are shown on the LUP Map. These are:

- a. established residential neighborhoods which, for the most part, are designated as "low density residential;"
- b. undeveloped Low Density Residential areas; and
- c. undeveloped Medium Density Residential designations.

a. Established Residential Neighborhoods: The established residential areas in Kilmarnock for the most part surround the downtown commercial area on the east, south and west. Currently there are roughly 795 existing single family and multi-family residential units in Kilmarnock. Most of the established residential community is built-out with the exception of random vacant lots located

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throughout the residential community. Many of these vacant lots are likely to be developed in the future with single-family dwellings, similar to those located in the surrounding neighborhood.

The existing residential neighborhoods are typically designated for a “low density residential” use and are developed with single-family homes on separate lots. Most of the lot sizes in the established residential community average roughly one-half acre in size or less, which translates into an average density of 2 units per acre. Higher-density residential projects ranging from assisted living facilities to apartment projects and townhomes (e.g., Heatherfield Court Townhomes) are interspersed throughout the residential community. The area annexed to the Town of Kilmarnock in 2007, which extended the town limits in a southerly direction beyond the downtown commercial area, is also largely developed with single family homes. Some public and semi-public uses are located in the established residential community. This is discussed further in the following section. These uses, such as churches, schools and playgrounds, are considered ancillary to and support residential neighborhoods.

Of course there are residential developments that are exceptions to the above existing conditions. There are two relatively new residential subdivisions which are separated from the downtown commercial area and consist of lots that are either larger or smaller than those in Kilmarnock’s established residential neighborhoods. The Forest Hills subdivision, located in the northwest corner of Kilmarnock, is one residentially developed area that is set apart from the downtown commercial district and has lots in size of one acre or more. This 44-lot subdivision is primarily the only residential area in Kilmarnock developed with septic systems so the lots must be larger to accommodate the drain field for each septic system. The other project is the Grace Hill 66-lot Planned Unit Development, which is also set apart from the downtown commercial area and is located at the southern end of town west of Route 3. This development consists of smaller lots and, as such, is designated as “medium density residential.” To date, 3 of the 66 approved lots are developed with single family units.

One final issue applicable to the established residential community is that some existing residences located along Kilmarnock’s major thoroughfares (i.e., Routes 3 and 200) are being converted to non-residential uses, such as professional offices, service related businesses, and visitor serving accommodations (e.g., a Bed and Breakfast). This trend is likely to continue in the future since the location of these homes along major roads provides maximum exposure to potential clients and customers. To address this issue, there are “Gateways” along the main roads (i.e., Routes 3 and 200) that provide access to Kilmarnock. The purpose of the “Gateway” is to provide an aesthetically pleasing entrance to the community that “sets the stage” for Kilmarnock’s small town charm and appeal.

Land use and development policies applicable to the established residential area are as follows:

25. Continue to ensure that new residential development within the established residential community (i.e., infill and/or redevelopment) is compatible with the residential characteristics of the surrounding neighborhood.
26. When it can be determined that an existing residence can better serve the community and adjacent neighborhood as some other use because of its age, size, location or other factor, a limited conversion of the dwelling may be allowed. In general when such conversions are proposed, the project shall be reviewed for compatibility with existing uses in the immediate vicinity and the neighborhood in general to ensure that no adverse impacts to the residential neighborhood would occur and that the proposal is consistent with the intent of the zoning classification for the site. A

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converted residence is limited to activities that would not require modifications to the external appearance of the original single family dwelling. Examples of appropriate conversions include, but aren't limited to, a professional office, a service related establishment, and visitor serving accommodations such as a Bed and Breakfast.

27. "Gateways" to the Town of Kilmarnock along major roads should be attractive entrances. The "Gateways" that are predominantly residential in character should remain, although limited conversion of existing residences may be allowed provided the resulting use does not adversely affect the existing character of the area and is consistent with the intent of the zoning classification for the site. Redevelopment of a few areas within the "Gateways" may be appropriate to improve and enhance the appearance of the entrances to Kilmarnock.

b. Low Density Residential Areas: As noted above, many of the areas shown on the LUP Map designated for a low density residential are built-out with the exception of vacant lots of record interspersed throughout existing residential neighborhoods. Currently there are approximately 585 existing single family detached homes in Kilmarnock. There are a few large essentially undeveloped tracts of land designated for low density residential use that may be subdivided in the future. These areas are generally located on the east side and southern end of Kilmarnock, specifically north of Waverly Avenue and Church Street, and in the south end of town, west of Route 3. (Please refer to Figure 2.2 "Current Land Use" in Chapter 2 and Figure 3.1 "Land Use Plan" in this Chapter.)

It is likely that the undeveloped areas designated for a low density residential use would be developed with detached single family residences, each on a separate parcel. Residential density in these areas would be similar to the established residential community and consistent with neighboring development patterns. Connection to the Town's public water and sewer systems would likely be required.

Based on the above, the following development policies apply to areas designated for a "Low Density Residential" use:

28. The low density residential designation is composed of quiet undeveloped areas where similar residential construction may occur. The purpose is to stabilize and protect the essential character of the area, as well as to promote and encourage a suitable living environment for all of Kilmarnock's residents. Development in this residential designation is limited to relatively low concentration single-unit dwellings, plus selected additional uses such as schools, parks, churches and certain public facilities that serve the residents of the neighborhood. Mobile homes, rooming houses, and commercial activities are not allowed pursuant to the zoning regulations but could be approved subject to a Variance.
29. New residential development in Kilmarnock should be served by the town's public water and sewer systems. Infrastructure for public water and sewer services shall be extended to each development by the developer. Development may take place only if there is adequate capacity to serve the development by Kilmarnock's public water and sewer systems.
30. Identify the general locations of "feeder" streets which connect to major thoroughfares for larger residential subdivisions and encourage the incorporation of pedestrian-friendly amenities (i.e., sidewalks and bicycle paths) open space, preservation of natural resources and creative design techniques as part of the subdivision.
31. An owner may submit a plan for an alternative residential dwelling use of a parcel in cases where a tract of land is: a) vacant; b) contains more than five acres; c) has not previously been subdivided into residential lots; and d) because of its location, frontage, shape, adjoining uses, or

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other relevant physical features, it can be demonstrated by the applicant that the parcel is better suited for a use other than a single-family residential lot subdivision. The plan for an alternative residential use shall be evaluated on a case-by-case basis to determine the proposal's compatibility with the community at large and existing development located in proximity to the site. This policy may be appropriate in a case where a site abuts an environmentally sensitive or protected area and clustered development, as opposed to individual single family residential lots, may be more appropriate in order to provide an adequate buffer from the protected area.

c. Medium Density Residential Areas: The largest undeveloped area in Kilmarnock, with the potential for residential development, is designated for a medium density residential use. These sites are primarily located on the west side of town. (Please refer to Figure 2.2 "Current Land Use" in Chapter 2 and Figure 3.1 "Land Use Plan" in this Chapter.)

Planned Unit Development (PUD) Overlay: The PUD zoning regulations were adopted by Town Council in 2005. A "PUD" classification has been placed on three of the larger tracts, two of which are partially developed and the third remains undeveloped. The two partially developed projects include the 66-unit (3 of which are developed) Grace Hills PUD and Springwood PUD, located on Yorkshire Road, consisting of approximately 40 residential units half of which are constructed. Both projects are developed with infrastructure improvements (e.g., public water, sewer and roads). The third medium density residential site classified as a "PUD" is called "Kilmarnock Glen" which was approved for 423 units. This site, located behind School Street and north of Irvington Road, remains undeveloped but could be constructed in the future.

Other undeveloped areas designated for a "Medium Density Residential" use could be reclassified as a "PUD" in the future when and if development of this type is proposed. In the case of a PUD residential density, the type of dwelling units, and support facilities may be customized based on the special circumstances of each area. The previous Comprehensive Plan adopted by Town Council in 2006 includes several policies stressing the Town's preference for Planned Unit Development. That document states that a PUD with its own open space and recreational facilities operated and maintained by a homeowner's association is the Town's preference and such developments are strongly encouraged.

Developed Areas: There are several other developed areas within the Town of Kilmarnock designated as medium density residential but not classified as a "PUD." A few of these include, the townhomes located on Heatherfield Court and Fox Hill Drive; the recently developed multi-family housing complex known as Mercer Place; Lancashire Nursing Home; the assisted living facility on South Main Street along with the adjacent senior community located on Bay Walk Drive, as well as the apartment complexes west of South Main Street known as Indian Creek and Tartan Village, just to name a few.

Undeveloped Areas: The largest undeveloped area designated for medium density residential is generally located north of Irvington Road, east of James B. Jones Memorial Highway, abutting the public school, library and nursing home to the west and bordered on the north by a Resource Protection Area. Like the other medium density residential designations, the density for this area is roughly 4 units per acre.

A portion of this site is combined with a "PUD" classification which was adopted as part of the 423-unit "Kilmarnock Glen" project. This project remains undeveloped. "Crossroads at the Chesapeake" is the other medium density residential development (not classified as a PUD) with approval for 128

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dwelling units located adjacent to James B. Jones Memorial Highway. This project is also undeveloped. These specific proposals may or may not move forward. If not, other developments could be proposed on these sites in the future. The area in between both of these projects is essentially undeveloped; there are no proposals pending for development of this particular area.

Based on the development potential outlined above, the following development policies apply to areas designated for a “Medium Density Residential” use:

32. The medium density residential designation is intended to allow residential development at a higher density as well as certain compatible public, semi-public and limited commercial land uses. This designation is intended to provide a suitable environment for those who desire the amenities of townhomes, condominiums, multifamily dwellings and/ or apartment living along with the convenience of being closest to shopping and employment centers and other community facilities. Examples of the limited commercial uses allowed in this land use designation, subject to appropriate permit approvals, include: tourist homes; boardinghouses; professional offices; office buildings; nursing homes; and bed and breakfasts.
33. Planned Unit Development located within a medium density residential land use designation is encouraged. This type of development typically includes a cluster of residential dwelling units based on an innovative design to provide for a neighborhood with a variety of housing types and densities. A PUD may also include neighborhood shopping facilities, parks, open space and recreational amenities such as bicycle paths and playgrounds for residents. This policy is intended to allow for greater flexibility in terms of design to ensure quality development while preserving areas designated for resource protection. A clustered development would help to avoid encroachment into these sensitive areas. Mixed-use residential land uses are appropriate consistent with the overall density limitation of the entire site’s acreage.
34. New residential development in Kilmarnock should be served by the town’s public water and sewer systems with infrastructure extended by the developer. Please refer to policy #29 above which also applies in its entirety to new development in Medium Density Residential land use designation.
35. Identify the general locations of “feeder” streets which connect to major thoroughfares and encourage the incorporation of pedestrian-friendly amenities (i.e., sidewalks and bicycle paths). Please refer to policy #30 above which also applies in its entirety to new development in Medium Density Residential land use designation.

6. Public / Semi-Public Uses

The Town of Kilmarnock is a major center for the region providing many public services for both its residents and the region’s population. The LUP Map designates several developed sites for public / semi public use. These include, but aren’t limited to, the: wastewater treatment plant; fairgrounds; Town Lot; four public parking lots in the downtown commercial area; Waverly Avenue playground; public school and library; fire station; Rappahannock General Hospital (RGH) and the adjacent medical office complex. There are also other uses of a public / semi public nature in Kilmarnock such as churches; the U.S. Post Office; YMCA; Northern Neck Free Health Clinic; Boys and Girls Club; Town Hall; the State Division of Motor Vehicles; the Volunteer Rescue Squad; and Baylor Park Nature Trail, just to name a few.

Land use in the area around RGH is under the jurisdiction of the hospital, subject to applicable permit approval by the Town of Kilmarnock if necessary. New uses in this area are selected based on the

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hospital's criteria, the bulk of which are likely to provide medical services, such as offices for physicians.

Public /semi public uses are allowed, subject to applicable permit approval, within all land use designations, as well as the underlying zoning district regulations. This is the case for most jurisdictions. These uses are generally defined as those that provide a public service such as a non-profit and/or volunteer organization, as well as facilities owned and/or operated by local, state and the federal government. Section 54-1 (4) of the Town Code stresses the importance of public land use, stating that the Town shall "expedite the provision of adequate police and fire protection, disaster evacuation, civil defense, transportation, water, sewerage, schools, parks, forests, playgrounds, recreational facilities, airports, and other public requirements" in order to promote the health, safety and general welfare of the public.

Consistent with the above, the town's goal is to enhance and maintain Kilmarnock's strong community service base by assuring the Town's dominance as a major center for public services for its residents and the region's population. Since public/semi-public uses may be allowed within any land use designation, the following development policy applies to this type of land use:

36. New "public/semi public" land uses shall be reviewed for compatibility with the existing land use and development in the surrounding area. Uses that are acceptable in residential areas include some public/semi public uses and facilities that are typically located in residential neighborhoods, such as schools, churches, and playgrounds, provided such uses have access to a principal circulating street and there is sufficient area to accommodate required off street parking.

7. Business and Technology Park

The area designated as a "Business and Technology Park" (Technology Park) on the LUP Map is located in the southwestern part of Kilmarnock, adjacent to Harris Road with DMV Drive bordering the site to the north and the headwaters of Dymmer Creek to the east. The Technology Park is owned by the Town of Kilmarnock and is intended to offer sites for qualified "expanding" technology businesses pursuant to the Town's "Technology Zone" regulations. A 60-acre portion of the Technology Park remains undeveloped although the Town proposes to complete certain infrastructure improvements, such as road construction, in the future. Not all of the 60 acres is developable since portions of the site include designated Resource Protection Areas.

The primary purpose of the "Technology Zone," which is not part of the Town's zoning ordinance, but codified in Chapter 43 of the Town Code, is to improve economic conditions within the "Technology Park" by offering incentives to developers, in the form of a tax rebate, for the establishment of a variety of technologically related land uses such as information technology, telecommunications and medical research / product development. See Section "E" (Economic Development) below for discussion and related policy pertaining to the economic incentives set forth in the "Technology [Enterprise] Zone" regulations.

The underlying zoning classification for a portion of the Technology Park is "M-1" or Industrial. These regulations establish development standards (e.g., height, coverage, setbacks, parking, etc) for the area. The primary purpose of this classification is to permit certain industries that do not detract from the desirability of residential uses that may be located adjacent to the Technology Park. These regulations adequately address standards for new development. There are no other areas in Kilmarnock designated for an industrial and/or manufacturing land use.

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To ensure compliance with the Town's economic goals for the Technology Park the following policy applies:

37. Continue infrastructure improvements to allow for the development of the "Business and Technology Park." A few examples of projects include, but aren't limited to: complete a survey of the undeveloped portion of the property; identify appropriate building sites; construct a new access road with drainage improvements and install appropriate signage.

Much of how Kilmarnock is developed in the future will depend upon the availability of public services and the capacity of the town's infrastructure to accommodate growth. The next Chapter (Public Services and Facilities) addresses these issues including, but not limited to, the town's public water and sewer system, as well as Kilmarnock's major thoroughfares and their ability to accommodate additional traffic that would occur as a result of new development.

C. DEVELOPMENT PROPOSED ADJACENT TO KILMARNOCK IN THE UNINCORPORATED AREAS

Development is proposed in the unincorporated areas adjacent and/or in proximity to the Town of Kilmarnock. Even though these proposals are not located in Kilmarnock, they should be identified in the town's LUP. Consideration of development proposed directly adjacent to Kilmarnock's town limits is especially important to ensure compatibility with existing and future land use activity within the town. In addition, any development in proximity to Kilmarnock may directly impact the Town's resources and infrastructure as well as generate additional vehicular traffic in areas that are currently congested. On the flip side, development of these proposals may benefit the local economy by increasing business activity, tax revenue, and consumer spending in Kilmarnock.

A few of the more significant developments and/or conceptual proposals are as follows:

- Northumberland County – Village of North Kilmarnock: The Land Use Plan (LUP) component of Northumberland County's Comprehensive Plan includes a conceptual plan for the "Village of North Kilmarnock" PUD. The area proposed for this development abuts the Town of Kilmarnock to the east and is generally proposed north of Route 608 (Bluff Point Road) to Route 607 (Ditchley Road), and east of Route 200. In Chapter 3 (page 30) the LUP for Northumberland County describes the development concept stating that the "potential exists for the establishment of a major village in this area . . . to develop around a small commercial hub. . . . In addition to its commercial potential, the North Kilmarnock Village could also be developed as a . . . modern planned unit development mixed with residential, recreation and commercial facilities." The small commercial "hub" mentioned in the above conceptual outline is shown south of Route 200 generally across from the new Mercer Place residential complex.
- Lancaster County – "Planned Growth Area" (PGA): Lancaster County's LUP component of its Comprehensive Plan identifies one PGA in the County which is roughly a triangular shaped area located between the towns of Kilmarnock, White Stone and Irvington. The PGA is generally located south of Kilmarnock between Routes 3 and 200 and is bordered on the south by Irvington Road between the towns of White Stone and Irvington. The Lancaster County LUP explains that this PGA is proposed since it provides the highest concentration of residential, commercial, employment, and industrial activity combined with public infrastructure, including public water/sewer, and community services. The LUP states that higher density residential, such as medium density single family and multi-family housing, as well as commercial activity will be directed to the PGA. Incorporated towns may propose a contiguous expansion of their boundaries

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to areas within the PGA. (The above summary is taken from Lancaster County Comprehensive Plan, Chapter 7 – “Land Use and the Economy” Section II – “Quality Growth,” page 15.)

- Virginia Department of Transportation (VDOT): VDOT has prepared the “Southern Lancaster County: Sub-Area Planning Study” dated May 2009. This report identifies two major road/transportation projects which, if developed, would likely generate commercial and residential development in the long-term. These projects, identified as “Recommendations” in the “Executive Summary” (p. i) of the study, are as follows:
 - Widen Route 3 from two lanes to four lanes beginning 1.5 miles northwest of Kilmarnock connecting to the existing 4-lane section 4.8 miles northwest of Kilmarnock.
 - Replacement of the Norris Bridge with a 4-lane span bridge. The report states that the Norris Bridge is “functionally obsolete.”

D. HOUSING

Like most jurisdictions across the United States, Kilmarnock’s goal is to ensure that the town has an adequate housing balance to meet the needs of all of its residents. This housing mix includes market rate residences, rental units, housing for Kilmarnock’s work force, as well as affordable housing for low income residents. The goal is to allow for a range of choice in housing type, design, density, and price.

Data provided by the U.S. Census Bureau described in Chapter 1 show that the bulk of housing units in Kilmarnock are “market rate” detached single family residences with a median price of \$200,000. There are also several government subsidized (Section 8) affordable housing developments in Kilmarnock for low income residents. A few examples of this type of affordable housing include various apartment complexes such as Indian Creek, Tartan Village, New Horizons, and the townhomes located on Fox Hill Drive. In 2013 two of the three single family homes constructed in Kilmarnock were developed by “Habitat for Humanity” which provides affordable housing for low income families and individuals.

In addition to housing for low income residents, housing for the community’s work force is critical. One project intended specifically to provide housing for the community’s work force is the recently constructed “Mercer Place” complex located on the east side of Kilmarnock north of Route 200. To date, 16 of the 24 approved units have been constructed. Development of this project was funded by a non-profit foundation to provide housing for professionals such as teachers in the community. Also, in Section “B.4” of this Chapter (Commercial Areas) it is noted that “mixed-use” development, i.e., combining residential and commercial uses, is encouraged, specifically in the downtown and North Main Street commercial areas. Development of housing for the community’s work force is especially appropriate in these areas since services and places of employment are mixed with residential uses. The downtown commercial district is largely built-out with existing businesses and residential units located above. However, opportunities exist in the North Main Street commercial corridor for future development of mixed use commercial and residential projects.

To ensure an innovative well-designed diverse housing stock that meets the needs of all of Kilmarnock’s residents, the following policies apply:

38. Continue to seek opportunities and encourage developers to provide an adequate range of choices in housing type, design, density, and price in order to meet various needs of Kilmarnock’s population. The housing mix includes market rate residences, rental units, housing for Kilmarnock’s work force, as well as affordable housing for low income residents.

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39. Encourage diverse and innovative housing and subdivision design which includes a range of affordable housing styles utilizing high quality design, construction and architectural techniques to create an aesthetically appealing development. Open space and amenities for pedestrians and bicyclists should be incorporated in the project design.
40. During the planning process for a market-rate residential subdivision, encourage a developer to designate a certain number of units below market-rate to provide opportunities for home ownership to those who could not otherwise afford to purchase a home.
41. Support the efforts of private and nonprofit groups to improve and provide housing for the work force and low income residents.
42. Coordinate with neighboring jurisdictions to develop a regional approach to meet the need for adequate housing for the work force and low income residents. This approach would include an inventory of existing housing of this type and a needs assessment.

E. ECONOMIC DEVELOPMENT

The Town of Kilmarnock's goal is to enhance and maintain a strong sustainable economic base by assuring the dominance of the Town as a major business, community service, and visitor serving center for its residents, businesses, and visitors. Programs are underway to increase business activity in Kilmarnock. The opportunity for economic growth exists since the community is already established as the commercial and trade center for part of the Northern Neck region and parts of Middlesex County to the south. In addition, expansion of visitor-serving commercial uses continues to draw tourists to the area for shopping, dining and overnight accommodations.

Another key component of economic development in Kilmarnock is to provide opportunities for full-time year-round jobs that provide living wages in both the private and public sectors of the Town's economy including commercial, technological, and visitor serving enterprises. The Town continues to utilize available tools, such as regulations for the economic and technological enterprise zones, to provide incentives for new and existing businesses, as well as to encourage job expansion. Employment opportunities that pay at a higher level than the types typically offered by retail and service establishments are encouraged.

The Town has implemented several innovative economic development programs, since adoption of the Comprehensive Plan in 2006, which are beneficial to both the community and the region's economy. In addition to the programs listed below, the Town lowered business license fees and adopted the "Steptoe's Overlay District" which allows for flexibility of zoning regulations in the downtown area for commercial development and/or changes in use. This flexibility is important since it would be difficult at best for an applicant to meet certain requirements, such as parking, given the historic lay-out of downtown Kilmarnock. These incentives are intended to encourage relocation and/or establishment of new businesses in this area. Some of the more major initiatives are described below:

Branding Concept: The town is currently working on developing a branding concept for Kilmarnock as a prime location for businesses, visitors and residents. The key target audiences for this new Kilmarnock brand will include potential business start-ups, relocations, and expansions as well as existing businesses, residents and visitors. The town's Economic Development Committee and town staff are leading this effort. The Town's primary focus is creating a unique brand message for Kilmarnock that enables it to be a focal point for economic and community development in the county, Northern Neck and Commonwealth of Virginia.

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Economic Enterprise Zones: Kilmarnock has been awarded an economic “Enterprise Zone” designation by the Northern Neck Planning District from the Virginia Department of Housing and Community Development. The purpose of the economic “Enterprise Zone” is to stimulate business and industrial growth by providing state and local tax incentives. These incentives are intended to encourage property investment, business expansion and job creation. Therefore, it is the Town’s goal to continue to maintain the “Enterprise Zone” designation to provide incentives for increased investment in the Town’s economic infrastructure and labor force.

Technology (Enterprise) Zone: Town Council updated its regulations for the “Technology Zone” (see Chapter 43, Town Code) since adoption of the last Comprehensive Plan in 2006. The primary purpose of this designation is to improve economic conditions within the “Technology Park” by offering incentives to developers, in the form of a consumer utility tax rebate, for the establishment of a variety of technologically related land uses such as information technology and telecommunications. In exchange a “qualified expanding technology business” must hire a certain number of employees each of whom receives an annual wage that meets or exceeds the average annual wage of the state or county work force. In addition to providing jobs, the “qualified business establishment” must meet certain criteria set forth in the “Technology Zone” ordinance including, but not limited to, making an additional capital investment to maintain status as an “expanding” business to qualify for the tax incentive.

The following policy applies to ensure compliance with the Town’s economic goals for the “Technology Zone:”

43. Promote the “Technology Park” on a regional, national and international level, consistent with the intent of Town Council and subject to the advice and assistance of various economic development entities in the community and the region including, but not limited to, local businesses in the technology zone.

Northern Neck Region - Economic Development Strategies: Efforts are also ongoing on a regional level in terms of economic development. For example, the Northern Neck Planning District Commission adopted the Northern Neck Comprehensive Economic Development Strategy in April 2013. This document was prepared in collaboration with various municipalities and stakeholders located in the Northern Neck.

The regional economic base is changing with a decline in traditional industries and a growth in a retired populace. Similar trends are evident in the Town of Kilmarnock (see discussion in Chapter 1). Since these trends are similar, regional goals pertaining to economic development and land use are generally applicable to Kilmarnock as well. A few of these goals particularly applicable to Kilmarnock are:

- Expand and diversify the economic / tax base while maintaining the rural small town charm of the area and quality of life;
- Support and encourage tourism and the businesses serving this market;
- Develop effective job training and placement programs in collaboration with the local and county government, the public school system, vocational school, Rappahannock Community College and the local business community; and
- Support programs that contribute to the success of new entrepreneurs, as well as encourage and assist entrepreneurs to move from employment to ownership in local business.

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In order to develop and implement the above goals, it is the Town's policy to:

44. Continue to collaborate with various economic development entities; local, regional and state governmental agencies; non-profit organizations; local businesses/stakeholders; and major employers in both Kilmarnock and throughout the region. These organizations include, but aren't limited to: Lancaster County; Northumberland County; the incorporated towns of Irvington and White Stone; public school system; various non-profit organizations such as the Rappahannock Community College Educational Foundation, Inc. and the public library; Rappahannock General Hospital; Lancaster County Partnership for Economic Development; Lancaster, Northumberland and Kilmarnock Chambers of Commerce; VISIONS Economic Development Committee; Virginia's River Country; the Northern Neck Planning District Commission; Virginia Economic Development Partnership; Northern Neck Tourism Commission; local banks and businesses, just to name a few.

F. IMPLEMENTATION OF THE LAND USE PLAN

Once a land use plan is adopted as part of a Comprehensive Plan, it attains certain legal status as set forth in Section 15.2-2232 of the Virginia Code. This section states that when *a comprehensive plan has been adopted, it shall control the general or approximate location, character and extent of each feature shown on the plan*. This section of the state law, when read in its entirety, requires a "conformity review" by the Planning Commission. This process ensures that certain proposals for development, subdivision and land use activity are consistent with the comprehensive plan.

Establishing Consistency between the Comprehensive Plan and the Town Code Regulations:

After a comprehensive plan is adopted, or updated, the Town should take steps to coordinate its development regulations with the vision of the future community as defined in the plan. The primary regulatory tools are Kilmarnock's zoning and subdivision regulations contained in the Town Code. The Zoning Ordinance establishes specific requirements pertaining to how land may be used or developed and the subdivision ordinance focuses on dividing property and specifies project improvements (e.g., roads and related infrastructure) necessary to provide adequate public services. It is important that both ordinances, as well as any other sections of the Code that affect land use, reflect the policies of the comprehensive plan. Several other ordinances and/or adopted plans may also play a role in implementing the goals and policies of the comprehensive plan, such as those regulating or managing storm water, soil erosion and sediment. After the comprehensive plan has been adopted, it is appropriate to review various applicable ordinances that pertain to implementation of its policies for consistency.

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CHAPTER 4 **PUBLIC SERVICES AND FACILITIES**

Public services and facilities, discussed in this Chapter, represent a combination of Federal, State, County and Town services, as well as those provided by non-profit organizations and the private sector. Under Virginia's form of government, towns are not required to provide schools, courts, health and social services. As a result, the dominant services provided by the Town of Kilmarnock requiring physical facilities, are public water and sewer, police protection, utility maintenance, and local government administration.

In addition to water and sewer issues and local government, other topics in this Chapter address downtown improvements, traffic circulation, recreation, as well as community services and facilities. The information presented in this Chapter helps to identify opportunities and potential resources for developing additional community services and also ties potential future development to the capacity of the town's infrastructure. There are several areas in which Kilmarnock could be involved in terms of initiating, supporting or promoting the establishment of supplementary public services.

A. WASTEWATER DISPOSAL AND WATER SUPPLY

1. Wastewater

A map showing the general location of areas in Kilmarnock served by the existing public sewer system is included in Chapter 2 (see Figure 2.5). Specific information regarding Kilmarnock's sewer infrastructure including, but not limited to, areas served by the town's public sewer are identified in the Town Code and the "Water and Sewer Master Plan." Kilmarnock's "Water and Sewer Master Plan" (Master Plan) was prepared for the town by Waste Water Management, Inc., and is dated February 4, 2010. The Master Plan is incorporated by reference in this document.

The Town of Kilmarnock's sewer system was originally constructed in the middle of the last century and consists of 9 miles of gravity sewer lines, five main sewage pump stations, two small pump stations, and a wastewater treatment plant with a permit to discharge 500,000 gallons per day of treated effluent.

Wastewater and effluent (or sewage) are transported primarily through gravity fed piping, flowing downhill unaided to the treatment plant. Additionally, there are collection points, each served by a lift station, where sewage is pumped and gravity fed to the plant. At the treatment plant, the wastewater is cleaned by removing harmful bacteria, letting the solid mater settle and the chemical balance restored to allow the treated water to be released into a tributary of Indian Creek.

Based on current records, the town's sewer system serves a total of 1,106 residential and commercial customers both in-town (940 connections) and outside (166 connections) the town limits. The only area currently served by Kilmarnock's public sewer system outside of town is the Hills Quarter golf course development, located on Route 200 between Irvington and Kilmarnock, which is roughly 20 percent developed at this time according to the Master Plan. To gauge changes there were roughly 893 residential and commercial connections in 2005 at the time the last Comprehensive Plan was updated which increased to 1,010 in 2010 based on data in the Town's "Water and Sewer Master Plan."

Certified to treat 500,000 gallons of wastewater per day, the treatment plant is currently processing an average of about 200,000 gallons per day (GPD). This shows that the Town's wastewater treatment

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plant is operating at about 40 percent of its capacity. The current treatment level of 200,000 GPD is an increase of roughly 20,000 GPD of wastewater when compared to data in the 2006 Comprehensive Plan. Of course, the amount of wastewater treated fluctuates depending on dry weather flow as opposed to the volume generated during heavy periods of rain. Currently the average daily flow of wastewater per connection is approximately 190 gallons per day which takes into account both dry and wet weather conditions. It should be noted that the Town's ongoing infiltration and inflow (I/I) reduction program continues to achieve substantive results in the overall reduction of flow through the treatment plant.

Several issues determine the amount of wastewater treatment required in the future. Factors include: 1) several approved, but not constructed, plans for undeveloped properties in town; 2) several large areas in the Town of Kilmarnock without current development plans; and 3) build-out of the Hills Quarter project located outside the town's corporate limits but served by Kilmarnock's sewer system.

The type of development is another important factor to determine the amount of wastewater that will require treatment in the future. Many businesses and uses generate higher amounts of wastewater that must be taken into consideration. High-volume water users and/or those that generate significantly higher volumes of wastewater should be reviewed carefully during the planning process, particularly if most of the water consumed is discharged into the public sewage system. Rappahannock General Hospital is one example where a wastewater recycling system is in place and its implementation is successful in terms of reducing wastewater discharge into the public sewer system, as well as reducing water use. In contrast, residential uses are generally more predictable in terms of water consumption and wastewater generation rates.

The consulting firm responsible for preparation of the Master Plan analyzed these various scenarios to assess the future demand for wastewater treatment. It should be noted that unlike the water system, which was evaluated in the Master Plan for its existing capacity and ability to serve additional development, the nature of the sewer system does not lend itself to a comprehensive analysis until such time as specific development plans are submitted for detailed analysis.

Based on the above analysis, the Master Plan concludes that Kilmarnock's wastewater treatment plant has the capacity to serve existing customers plus the projected build out of the undeveloped areas in town, as well as Hills Quarter. However, the plant may not have capacity to serve additional out-of-town customers without sacrificing capacity for future customers in the Town of Kilmarnock.

It is safe to assume that the Town may expect the State to require an upgrade to the wastewater treatment plant well before full build out of Kilmarnock may occur. An assessment of the plant's capacity to serve additional development beyond that identified in the preceding paragraph, including the potential need for a plant expansion, may be appropriate at the time upgrades are required and/or during the next Comprehensive Plan update. The Master Plan does state that the treatment plant could be modified and upgraded to provide greater treatment capacity without having to construct major equipment.

As development in Kilmarnock continues, the Town should consider innovative ways of funding infrastructure improvements including expansion of the treatment plant. For example, some municipalities have agreements with developers to pay for upgraded facilities sized to serve an entire major development. Communities have come to realize it is the developers who should be paying for the upgrades and not the municipalities themselves. This is particularly true with smaller utilities that often struggle to maintain financial viability and balanced budgets.

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Associated with the wastewater issue is the town's policy pertaining to septic systems, which are discouraged. New development, such as subdivisions, buildings and other facilities intended for human occupancy, requires connection to the town's public sewer system at the owner's expense, with a few minor exceptions. Chapter 50 (Utilities), Article IV (Sanitary Sewers) of the Town Code requires that all new development within 250-feet of a sewer line connect to the public sewer system. By focusing on serving new development with public water and sewer and discontinuing the use of septic systems and private wells, the town's goals, as well as those pertaining to protection of water resources, are well served.

In addition to identifying areas served by sewer lines, Figure 2.5 in Chapter 2 shows -- by omission -- areas where sewer lines may be required in the future. Given that much of the land to be developed in the future is not near existing sewer lines, the policies listed below are intended to promote orderly development of land within the Town of Kilmarnock by ensuring connection to the public wastewater system. This will also help to minimize potential groundwater pollution, among other things.

The following policies pertain to wastewater treatment in the Town of Kilmarnock:

45. New development of buildings, structures or subdivision of land designed or intended for human occupancy/ use shall be connected to the Town's public sewage system whenever feasible.
46. For buildings and structures that currently and lawfully utilize septic systems for wastewater disposal, such septic systems shall be connected to the town's public sewage system if practical and when public sewer lines are accessible.
47. The existing wastewater treatment plant may not have capacity to serve additional out-of-town customers, beyond the undeveloped portion of Hills Quarter, without sacrificing capacity for future residents of Kilmarnock. Connection to Kilmarnock's wastewater treatment plant by new development located outside of the town's corporate limits should be discouraged unless expansion of the wastewater treatment plant allows for additional capacity.
48. The Town should consider innovative ways of funding upgrades and/or expansion of the wastewater treatment plant. One example would be for the Town to enter into an agreement with a developer of a major project to pay the cost to upgrade and/or expand the wastewater treatment plant to serve the development.
49. New development that has the potential to generate a significantly higher volume of wastewater should be reviewed carefully during the planning process, prior to construction and/or establishment of the use, particularly if most of the wastewater is discharged into the public sewage system. Various programs (e.g., an on-site recycling/reuse wastewater system) may be implemented to reduce the volume of discharge. Rappahannock General Hospital has implemented such a system and is successful in terms of reducing its wastewater and water use.

2. Water Supply

The public water system serving Kilmarnock is delineated in Figure 2.6 in Chapter 2. Specific information regarding Kilmarnock's water system including, but not limited to, areas served by the town, are identified in the Town Code and the "Water and Sewer Master Plan." Kilmarnock's "Water and Sewer Master Plan" (Master Plan) was prepared for the town by Waste Water Management, Inc., and is dated February 4, 2010. The Master Plan is incorporated by reference in this document.

Kilmarnock's water system was created in 1916. When Kilmarnock was incorporated in 1930, ownership, maintenance and operation of the water system were transferred from the privately owned company to the Town. Kilmarnock's water system consists of: 1) three wells, each of which is 800

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feet in depth, with a combined capacity to pump approximately 854,000 gallons of potable water per day* from an underground aquifer; 2) three water towers with a combined capacity to store 560,000 gallons of water; and 3) roughly 9 miles of piping. From the wells, water is pumped to the three storage towers where it is stored until needed. Gravity moves the water from storage through piping, under pressure, to homes and businesses. The water wells and storage towers are located in proximity to Radio Road, Church Street and adjacent to the Rappahannock General Hospital. (*Note: This figure was taken from the “Comprehensive Plan: 2006 - Town of Kilmarnock, VA” adopted February 27, 2006, Chapter 4, page 5).

The water storage tanks, located in proximity to the three wells, are generally located as follows:

Existing Water Storage - Kilmarnock, VA

General Location	Capacity
Near Downtown and North of Church Street	60,000 gallons
Near the RGH	250,000 gallons
Near Radio Road	250,000 gallons

Water lines generally follow development patterns and virtually duplicate the sewer line pattern. For this reason, Figure 2.5 (Chapter 2) delineating areas served by the Town’s public sewer system, is a reasonable representation of the area served by water lines. One notable exception is the Forest Hills residential subdivision, located in the northwest corner of Kilmarnock, which is developed with septic systems but served by the Town’s public water system.

The Town Code prohibits drilling or digging of private wells except in unusual circumstances, subject to the approval of Town Council. Similar to the public sewer system, new development, such as subdivisions, buildings and other facilities intended for human occupancy, requires connection to the town’s public water system at the owner’s expense, with a few minor exceptions. Chapter 50 (Utilities), Article II (Water System) of the Town Code requires that all new development within 250-feet of a water line connect to the public water system.

Within the Town’s corporate limits, Kilmarnock’s water system connects to approximately 695 residences and 278 commercial establishments. Outside of the Town’s boundaries, (i.e., Hills Quarter) there are an additional 171 residential and 7 commercial connections to the water system for a total of 1,151 connections. By way of comparison, the Master Plan states there were a total 1,059 water connections in January 2009 and the 2006 Comprehensive Plan identifies 944 connections at that time. The town’s records indicate that the existing system is currently pumping about 200,000 gallons of water per day, or about 190 to 200 gallons per day per connection. A “reserve” water supply is also required for fire protection.

The consulting firm responsible for preparation of the Master Plan analyzed various scenarios to assess future water demand in Kilmarnock. These scenarios are the same as those described in the “Wastewater Disposal” section above. Based on the analysis, the study concludes that the proposed peak water demand would total 340,000 gallons of water per day (Source: “Water and Sewer Master Plan,” February 4, 2010, p. 23). Proposed water demand at full build out coupled with existing water usage of roughly 200,000 gallons of water per day results in a future demand of roughly 540,000 gallons per day of water.

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Based on the above findings, Kilmarnock's water system has the capacity to serve existing customers plus projected build out of the undeveloped property in town, as well as Hills Quarter. However, the system may not have the capacity, particularly in terms of storage and an adequate reserve for fire protection, to serve additional out-of-town customers without sacrificing capacity for future residents of Kilmarnock.

The Town is likely to upgrade its water system well before full build out of Kilmarnock may occur. An assessment of the system's capacity, both in terms of water production and storage, to serve additional development beyond that identified in the preceding paragraph, would be appropriate at the time an upgrade is required and/or during the next Comprehensive Plan update.

Similar to the discussion in the above "Wastewater Disposal" section, as development in Kilmarnock continues, the Town should consider innovative ways of funding infrastructure improvements including expansion of the water system. For example, the town may consider an agreement with a developer to pay for additional water storage to serve an entire major development. Communities have come to realize it is the developers who should be paying for the upgrades and not the municipalities themselves. This is particularly true with smaller utilities which often struggle to maintain financial viability and balanced budgets.

Other factors, in addition to build out projections, need to be incorporated to accurately estimate both the Town's current and projected water usage. These factors include, but aren't necessarily limited to, the following: (a) the reserve capacity necessary to provide back-up during times of unusually high water usage (e.g., drought), fire protection or other emergency; and (b) potential development, such as certain commercial/industrial uses, that may have high water consumption requirements. Careful evaluation of new businesses and industrial uses during the planning process would enable the town to avoid (or at least mitigate) a development that would require an unusually large amount of potable water.

Policies, similar to those that apply to sewer connections and extensions, also apply to the town's water system. Specifically, new development is required to connect to the Town's water system. Potable water connections serving new lots are installed at the owner or developer's expense. Once this is complete, the extensions are dedicated to the Town which assumes responsibility for operation and maintenance.

The following policies apply to the Town's water supply system:

50. Continue existing policies to require new buildings and facilities intended for human occupancy or use to connect to the Town's public water system. Under such policies, developers (owners) are required to extend water lines from the public water system to new construction at their own expense. Once complete and approved by the Town, the water lines, associated equipment, as well as utility easements, shall be dedicated to the Town of Kilmarnock.
51. The existing water system may not have the capacity to serve additional out-of-town customers, beyond the undeveloped portion of Hills Quarter, without sacrificing capacity for future residents of Kilmarnock. Connection to Kilmarnock's water system by new development located outside of the town's corporate limits should be discouraged unless expansion of the water system (e.g., construction of an additional well(s) and/or water storage facility) allows for additional capacity.
52. The Town should consider innovative ways of funding upgrades and/or expansion of the water system. One example would be for the Town to enter into an agreement with a developer of a major project to pay the cost to upgrade and/or expand the water system to serve the development.

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53. New development that may potentially require a high volume of water should be reviewed carefully during the planning process prior to construction and/or establishment of the use. Various programs (e.g., an on-site water recycling/reuse system) may be implemented to reduce the high water demand. Rappahannock General Hospital has implemented such a system and is successful in terms of reducing its wastewater and water use.

3. Additional Water Quantity Issues and Policies

Water conservation measures are important to ensure the long-term viability of Kilmarnock's public water supply. These conservation efforts are discussed further in the following Chapter 5 (Preservation of Resources).

The Town has taken steps to address these issues to include adoption of a "Drought Management Plan," incorporated by reference in this document, and implementation of an ongoing program to repair failing and leaking sewer mains. These repairs have greatly reduced the infiltration and inflow rates (I/I) resulting in a lower volume of wastewater at the sewage plant.

In addition, a "Northern Neck Water Supply Plan" has been prepared for the Northern Neck Planning District by EEE Consulting Inc., (2010) and is incorporated by reference in this document. Preparation of the plan was funded by the Virginia Department of Environmental Quality (DEQ). The report addresses regional water supply issues for the Counties of Lancaster, Northumberland, Richmond and Westmoreland, as well as the incorporated towns of Colonial Beach, Irvington, Kilmarnock, Montross, Warsaw, and White Stone, all of which encompasses the Northern Neck Planning District region.

The purpose of the study is to depict and assess current and future water supply conditions in the Northern Neck and contribute to the development of a comprehensive statewide water supply planning process that would: 1) ensure that adequate and safe drinking water is available to all citizens; 2) encourage, promote, and protect all other beneficial uses of water resources; and 3) encourage, promote, and develop incentives for alternative water sources. The Town of Kilmarnock continues to participate in this regional water supply planning effort.

Policies to help ensure the long-term sustainability of Kilmarnock's public water supply, relative to water conservation, are included in the next Chapter 5 (Preservation of Resources) in the section titled "Preservation of Water Quantity."

4. Water Quality

Kilmarnock's goal is to provide the general public with a safe and dependable supply of drinking water. The quality of the Town's potable water supply must meet state and federal requirements, administered by the Virginia Department of Health, consistent with the federal Safe Drinking Water Act. Kilmarnock's water supply is continually monitored for various contaminants to ensure compliance with regulatory requirements. An annual "Consumer Confidence Report" is published by the Town of Kilmarnock. The most recent report for 2012 (as well as annual reports prepared previously) concludes that "all identified containments are within the limits established by the Virginia Department of Health. No items require actions to be taken." (Source: "2012 Consumer Confidence Report: Your Guide to Your Drinking Water, Town of Kilmarnock, June 2013.)

B. TRANSPORTATION: STREETS AND HIGHWAYS

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The primary mode of transportation in Kilmarnock is by automobile on roads owned and maintained by the Virginia Department of Transportation (VDOT). State roads are generally classified as primary or secondary. Primary roads (those with numbers lower than 600) carry the majority of vehicular traffic and receive the highest priority for improvements. Two such primary traffic arteries are Routes 3 and 200 which intersect in downtown Kilmarnock and link the town to other communities in the region.

Secondary roads are those with numbers 600 or higher. For the most part, roads with numbers from 600 to 999 are rural roads. In a few cases, these rural roads carry traffic volumes at levels similar to primary roads. The primary and secondary road classification used by VDOT does not necessarily reflect the amount of traffic that may use a particular road. Roads with numbers 1000 and above usually designate local streets in towns, villages and subdivisions.

While VDOT roads are identified based on the above numerical classifications, most local governments have named the roads and streets to comply with 911 emergency operations. Except for new subdivisions, roads are constructed and maintained by VDOT. In new subdivisions, roads are built by the developer to state standards and dedicated to VDOT, at which time the state assumes responsibility for their operation and maintenance.

State highways establish the framework for vehicular circulation in Kilmarnock. Practically all traffic flows through Kilmarnock on Routes 3 and 200, connecting the town with other communities. The town's highway network includes:

Route 200: (Irvington Road) extends from the westerly corporate town limits to Main Street (a.k.a Route 3). At this intersection, Route 200 follows Main Street or Route 3 for approximately two blocks, connects to Church Street, and extends to the Town's corporate limits on the east.

Route 3: (Main Street – North and South) extends in a north and south direction through the entire Town of Kilmarnock.

Route 608: (Waverly Avenue) extends from downtown at Main Street in a southeast direction to and beyond the town limits.

Route 688: (James B. Jones Memorial Highway) from Irvington Road north connecting to Route 3 (North Main Street).

Route 1026: (School Street) extends north from Irvington Road to North Main Street.

Route 1036: (Harris Road) extends from Irvington Road to Route 3 at the southern end of town.

Route 3 – Truck Bypass: The “Route 3 thru Truck Restriction” bypass directs truck traffic away from the downtown commercial area (Main Street) from Route 3 at the southern edge of Town to Harris Road and James B. Memorial Highway, ultimately connecting to the North Main Street commercial business district to the north. VDOT has installed truck route signage identifying the bypass at various locations along Route 3, Harris Road and James B. Jones Memorial Highway.

Traffic volumes and circulation patterns are described in detail in the final traffic report prepared for VDOT titled “Southern Lancaster County: Sub-Area Planning Study” dated May 2009. VDOT's traffic study is incorporated by reference in this document.

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The VDOT traffic report finds that based on historical data the volume of traffic has increased within the study area by roughly 4 percent per year. The level of traffic using a particular road is the result of its location in relation to establishments that generate high traffic volumes and/or where primary highways intersect.

Routes 3 and 200 intersect on Main Street, within the downtown business district of Kilmarnock, between Irvington Road and Church Street resulting in through traffic converging and increased congestion. According to VDOT's 2009 study, the only area in Kilmarnock where congestion is particularly noticeable during AM and PM peak traffic flow hours is in this area of downtown Kilmarnock. Based on projected development, VDOT concludes that by 2030, many of the east bound and north bound lanes at the two intersections will operate at a Level of Service (LOS) D to F. VDOT defines a LOS "C" or better as an acceptable threshold for major intersections. If the LOS falls below the allowable threshold to LOS D – F, improvements are required to increase the capacity of the intersection. Improvements proposed by VDOT to mitigate congestion at these intersections include: 1) remove the bump out and parking spaces on southbound Route 3 to provide a southbound right-turn lane to Irvington Road; and 2) remove the bump out and parking on northbound Route 3 to provide receiving lanes for dual left-turn from north/eastbound Route 200 or Church Street. (Source: VDOT Study, "Recommended Improvements," p. 29, May 2009).

In addition to VDOT's study and recommendations, the vision statement adopted by Town Council for Kilmarnock also addresses transportation issues with the intent of establishing a workable transportation pattern throughout the community. The Town's stated "vision" is "to provide a network of streets accommodating a compatible relationship among various forms of traffic [to include] vehicular, pedestrian, and bicycle [and to] supplement traffic routes with adequate parking facilities." (Source: Comprehensive Plan: 2006, A Vision for Kilmarnock, adopted by Town Council on February 27, 2006.)

Consistent with Council's vision statement, implementation of several local programs and policies are ongoing, some of which have occurred since adoption of the Comprehensive Plan in 2006. These ongoing efforts include:

Downtown Revitalization Plan: Adoption and ongoing implementation of the Town's Downtown Revitalization Plan. Downtown improvements, pursuant to the Revitalization Plan, are directed toward upgrading the function and appearance of the commercial district as well as ensuring that the community is "pedestrian friendly." The recent work in downtown enhanced the streetscape, pedestrian circulation, and included adjustments to on-street parking. In addition four public parking areas are now located in the downtown commercial district to alleviate parking and traffic congestion on Main Street and in the downtown business district as a whole.

Step toe's Overlay District: Step toe's Overlay District includes the downtown area of Kilmarnock. The primary purpose of this zoning overlay designation is to recognize and promote the unique character of the town's downtown area. However, for the purpose of this discussion, the regulations for the overlay district allow for flexibility specifically in terms of parking requirements. Compliance with off-street parking requirements for a specific business may be problematic, particularly for those establishments along Main Street since they front on the street with alleys located to the rear for deliveries, etc. Sidewalks are also required for new development in this district if a structure is within 75-feet of an existing sidewalk.

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Community Development Block Grant (CDBG): Funding pursuant to a CDBG has been provided to extend the infrastructure and sidewalks along South Main Street to, among other things, connect pedestrian access to the downtown business district.

Virginia Department of Transportation (VDOT) Coordination: The Town of Kilmarnock continues to coordinate planning issues regarding roads, traffic and congestion management with VDOT. The Town's goal is to continue to improve traffic circulation, establish appropriate signage, and consider improvements (i.e., sidewalks and bicycle lanes) that reduce traffic flow and provide non-vehicular public access to community services.

The Town, in conjunction with VDOT, recently established a truck bypass (described above) to remove as much unrelated truck traffic as possible from the downtown business district. The purpose of the bypass is to mitigate traffic congestion, as well as minimize parking and pedestrian conflicts with truck traffic.

In addition to the ongoing implementation of the programs and policies described above, the following policies apply consistent with Town Council's vision statement:

54. Continue to identify the need for and develop new sidewalks and areas for bicyclists as part of the annual review process. Particular emphasis should be placed on areas that:
 - Connect residential areas with public and semi-public facilities as well as commercial districts including restaurants, shops and venues for public entertainment;
 - Connect residential areas to major employers in Kilmarnock thereby providing an opportunity for residents to walk and / or bicycle to work;
 - Fill in the gaps between areas that are partially developed with sidewalks, particularly those areas that provide access to public facilities such as the public school, library, fairgrounds, etc.
55. Continue to improve traffic circulation and parking in the downtown area. This can be accomplished in part by identifying new locations for public parking spaces within the downtown business area particularly where on-site parking is limited. There will be an ongoing need for off-street parking to keep pace with growth, as well as changing uses downtown. Visibility and directional signage is an essential part of public parking.
56. Continue to work with VDOT to improve traffic circulation, ingress/egress, parking, and safety for both vehicular and pedestrian traffic within the North Main Street commercial area. Consider extending streetscape, parking and pedestrian facilities beyond the downtown commercial district to North Main Street.
57. Ensure adequate traffic circulation within major undeveloped areas by establishing general routes for a feeder street system, connecting to major rights-of-way. Feeder streets would be designed as part of the planning process and implemented as new subdivisions are developed. Feeder roads are expected to carry more traffic than residential streets (e.g., cul-de-sacs) and should be planned accordingly.

C. OTHER PUBLIC SERVICES AND FACILITIES

As presently structured, services offered by the town government are focused primarily on providing and maintaining a public water and sewerage system, police protection, a utilities department and town government/administrative services. Administrative services consist of the Town Manager, Town Treasurer, Town Planner and Town Clerk. The utilities department operates and maintains the town's water and sewer systems. The Town is also responsible for the ongoing implementation of improvements outlined in the "Downtown Revitalization Plan" including, but not limited to,

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maintenance of: public parking lots; community parks; landscaping in the downtown commercial area including the island median strips; and seasonal decorations. The police department consists of a Chief and officers. Jail facilities are provided through arrangements with Lancaster and Northumberland Counties. Many other community services, available to the citizens of Kilmarnock, are provided by other governmental agencies or by non-profit organizations, semi-public and the private sector.

Some of the more significant public services and facilities in Kilmarnock are identified below:

School: Educational services and facilities are provided by the Lancaster and Northumberland County Public School Systems under the administration of an elected school board. The Lancaster County Middle School, located on School Street, is the only public school facility located within the corporate limits of Kilmarnock. While the town government has no role in the operation or financing of the local school, the school does provide resources that are beneficial to the citizens of Kilmarnock. The Middle School has facilities that may be utilized by the community for non-school functions. For example, the playground and gym offer recreational resources when not in use by the school and the auditorium may be used by the public for performing arts programs.

Community College: The Rappahannock Community College (RCC) – Kilmarnock Campus officially opened in 2012. The campus is located in the Chesapeake Commons complex west of North Main Street. RCC is a non-profit organization offering both traditional college courses and a workforce development training program for the region's residents.

Recreational and Environmental Resources: The Town of Kilmarnock does not operate a recreational program of its own. However, within the near future the town will begin developing such a program. Currently, the town owns and operates several amenities such as the children's playground on Waverly Avenue, the Baylor Park Nature Trail at Norris Pond, and the dog park on the "Town Lot" off North Main Street. The "Town Lot" also serves as a space for different events, shows, festivals, and other gatherings, and is planned to be developed for a public use.

State recreational sites, such as Hughlett Point, Dameron Marsh, Belle Isle State Park and various public boat landings are located in proximity to the Town of Kilmarnock. These areas, along with local and community parks, provide recreational opportunities to county and town residents. Various private or non-profit groups also provide recreational services. A few of these facilities are described below:

- a. The Fair Grounds on Waverly Avenue at Bellview Drive is a five-acre site owned by the Kilmarnock Volunteer Fire Department. Permanent fixtures on the site include a number of carnival rides and small buildings. The fire department operates a carnival here during mid-summer with rides, games and food.
- b. The Lancaster County Middle School on School Street has a sports field equipped for playing soccer and other field games. There is also a small children's area with swings, climbers, and playground equipment.
- c. The YMCA on Harris Road includes amenities such as a gym, swimming pool and facilities for youth programs. Activities include swimming, roller-blading, T-ball, volleyball, basketball, karate, and soccer. The YMCA also operates a variety of other programs at many locations throughout the County. The association sponsors a summer camp and coordinates programs with social services to reach youth, teens and adults.

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- d. The Gloria L. Goodman Youth Park (Dream Fields), located about one-half mile west of the town limits on Route 200, has six baseball fields, four of which are lighted. This park is owned by the Youth Club of Lancaster County, Inc. (Lancaster County Little League) and sponsors baseball programs during the spring and summer seasons.
- e. The Chesapeake Boat Basin, a private marina located on Indian Creek approximately one mile east of Kilmarnock at the end of Route 608 (Waverly Avenue), has a boat launching ramp with fuel and other boating supplies.
- f. The conservation areas in Kilmarnock, defined by stream basins and their banks, provide a large area of open space which has the potential for passive recreational use, such as nature study and walking trails. One example is the Baylor Park Nature Trail at Norris Pond.

The town continues to consider the establishment of new recreational areas. There are opportunities for neighborhood parks in areas that are not extensively developed. The classic method of acquiring a public park is by direct acquisition of a site. A property owner may also choose to donate a specific parcel to the Town for public use or dedicate an easement for public access over a portion of a specific parcel. Another way is to incorporate a recreational area as part of the planning process for major new development.

Dedication of a public access easement would be particularly appropriate within designated resource protection areas that include portions of stream basins. Since these areas have qualities that are adverse to development, they could be used for passive recreational purposes such as nature trails and bird watching. One example is the recently established Baylor Park Nature Trail.

The following policy applies to new recreational opportunities within the Town of Kilmarnock:

58. The Town should continue to seek new and innovative opportunities for public recreational use. These may include: designated bicycle paths; picnic tables; development of existing/publicly owned open space; designation of a local park as part of the planning/subdivision review process for major new development; and dedication of public access easements for passive recreation, such as a walking trail, over resource protection areas which are otherwise undevelopable.

Emergency Services: Non-profit volunteer fire and rescue organizations provide fire protection and ambulance services. The Kilmarnock Volunteer Fire Department, located on School Street, serves the Town and portions of Lancaster County and Northumberland County. The Kilmarnock Volunteer Rescue Squad, located on Route 1036 (Harris Road) near the Rappahannock General Hospital serves an area similar to that served by the Fire Department.

Library: The Lancaster Community Library is located on School Street north of the Lancaster County Middle School. The library is operated by the non-profit organization, Lancaster Community Library, Inc. Financial support is provided by a combination of state and local government funding, as well as community contributions. The library also has a meeting room for community functions.

Medical Services: Hospital, emergency room and related medical services are provided by the 76-bed Rappahannock General Hospital (RGH). Established in 1977, RGH serves approximately 35,000 people from the Northern Neck region and Middlesex County. Services at the Hospital include, but aren't limited to, cancer treatment, cardiac care, mental health treatment, maternity and infant care, and home health care services. The hospital is located within the southeastern area of Kilmarnock on Route 1036 (Harris Road). Doctor's offices, the Northern Neck Free Health Clinic and a rehabilitation center are also located along this route. A variety of other medical offices are also interspersed throughout the Town of Kilmarnock.

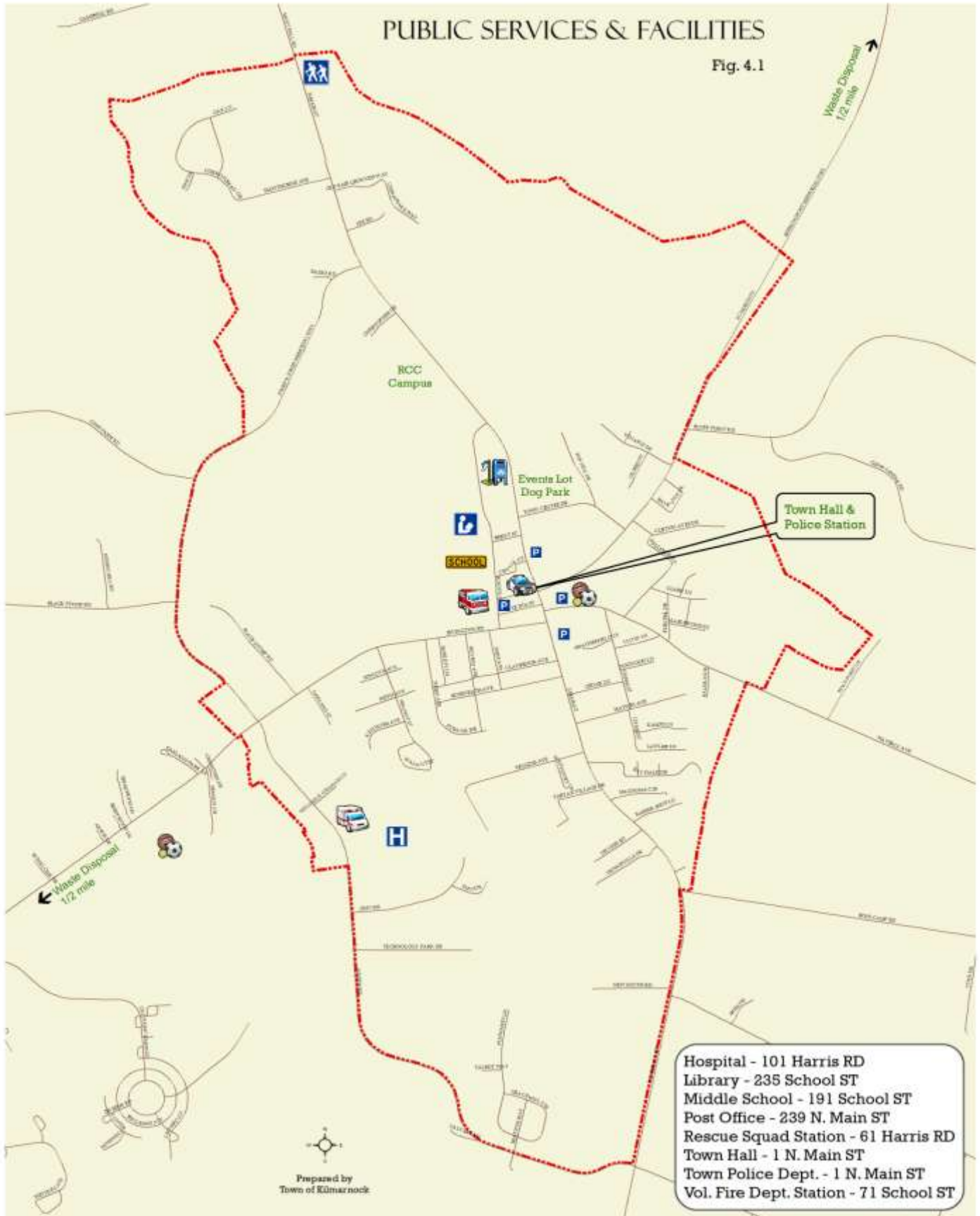
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Solid Waste and Recycling Services: These services are provided by private contractors and Lancaster County.

Virginia Department of Motor Vehicles (DMV): A DMV branch is located on DMV Drive, northeast of the developing business and technology park. All services associated with the State's DMV are provided in this facility.

Town Administration: Town administration and operational facilities are located in Town Hall in the center of Town at 1 North Main Street within the designated "Downtown Commercial District." Offices of the Town Manager, Planning Director, administrative staff, as well as police and utility departments are located in this facility.

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CHAPTER 5
PRESERVATION OF RESOURCES

This Chapter addresses the preservation of natural and cultural resources within the Town of Kilmarnock consistent with federal, state, regional and local mandates. Kilmarnock's Town Council recognizes the importance of preserving the community's resources. The Town's vision, articulated in the Comprehensive Plan, states the importance of protecting the delicate balance and land use compatibility between existing/future development with the natural environment and the community's historic resources. To accomplish this, the Town's long-term goal is to incorporate the preservation of natural environmental and historical features in the community into the planning and implementation of all public and private activities. (Source: "A Vision for Kilmarnock," Comprehensive Plan: 2006 - Town of Kilmarnock, VA)

Significant resources in the community are identified as well as policies to ensure implementation of the Town's vision for their preservation. Topics analyzed in this Chapter include historic resources, preservation of water quality and quantity, protection of surface and groundwater resources and stream bank protection, especially in areas designated for resource protection. Some of the resources discussed in this Chapter, such as water quality/quantity and stream bank stabilization, are similar to topics analyzed in preceding Chapters 2 and 4 since the subjects are the same; however, this Chapter focuses on the protection and preservation of these natural resources.

A. HISTORIC RESOURCES

Kilmarnock has a long and rich history, briefly summarized in Chapter 1. Because of its small-town rural appeal, the Town continues to build upon its role as a "destination" for both residents of the region and visitors to the Northern Neck. As part of planning for the future, the Town's goal is to preserve the past by maintaining and enhancing Kilmarnock's charm as a small town. One way to retain a viable sense of community with a small-town appeal, while enhancing the town's economic base by attracting consumers, is to identify and preserve existing historic structures, especially those located in the downtown commercial district.

Downtown Commercial District: The architectural style in Kilmarnock, especially the downtown area, is eclectic with structures developed during various time periods. Many of the town's original structures were lost when the town was ravaged by two fires in the early and mid 1900s. In addition, new structures have been built during the past few decades which are interspersed throughout the downtown area.

A "Master Plan Report: Kilmarnock Town Study" was prepared by the University of Virginia, School of Architecture in May 1992 (UVA Master Plan). This report is incorporated by reference in this document. The report states that "many of the downtown storefronts can be described as typical American 'Main Street' architecture – displaying decorative brick work and large expanses of glass frontage" (p. 40).

The Town of Kilmarnock recognizes and promotes the unique character of the downtown area and in so doing adopted the "Steptoe's Overlay District" as part of its zoning ordinance. A primary objective of the overlay district is to preserve the character and fabric of the Town's original trade center (Chapter 54, Article VIII, Sec. 54-601 of the Town Code).

Residential Areas: In addition to the downtown commercial area, the UVA Master Plan describes potentially historic structures located within Kilmarnock's established residential areas. The report

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states that, based on preliminary architectural heritage residential surveys in Kilmarnock, “three dominant housing types were observed: the traditional I-house, the Queen Anne style and the bungalow style.

- **The I-House Type:** “The I-house type, used from 1850 to 1890 . . . is a common British folk form particularly seen in the Tidewater south. . . . This type [of residence] is usually seen as a farmhouse. An example of an I-house exists at 222 Main Street” (p. 39).
- **Queen Anne Style:** Another type of historic architecture in Kilmarnock is the Queen Anne style which typically “exhibits a variation in massing with distinctive decorative detailing, including shingle siding, spindle work, stained glass, Palladian windows, finials and turrets. The style was dominant from 1880 to 1900 and later” (p. 40). An example of the Queen Anne style is located at 125 South Main Street.
- **Bungalows:** The third historic architectural style in Kilmarnock is the bungalow. Bungalows exist along most of Kilmarnock’s streets within established residential areas. The UVA Master Plan describes these homes as typically a one-story home with a gently pitched roof, front porch, and large piers to support the roof overhang. Bungalows are often covered in stucco and have sash or casement windows (p. 40). This architectural style was dominant in Virginia beginning in 1905 through 1930.

Gateways to Kilmarnock along Routes 3 and 200: Kilmarnock is a vital community on the Northern Neck. Maintaining and enhancing the small-town charm upon entering Kilmarnock via Routes 3 and 200 is important. Potentially significant historic structures exist along these gateways to the community. The UVA Master Plan states that the “Northern Neck [is] one of the most historically important areas in the state. . . . In recognition of this fact Route 3 has been designated a ‘Historyland Highway’” (page 40). Protection of the gateway approaches to town helps to foster pride in Kilmarnock’s heritage while enhancing the Town’s economic base by enticing visitor’s and tourists to stop in the Town of Kilmarnock.

There are several recommendations in the UVA Master Plan. Most importantly, the report concludes that the small sampling of Kilmarnock’s historic structures produced impressive results in terms of the Town’s architectural heritage. On page 40 of the document the authors state that “this sampling indicates that there is much architectural fabric within the town that should be investigated further.” A survey of historic structures in Kilmarnock may help to establish the framework for a potential program in the future to protect the community’s historical assets and conserve the charm and appeal of the existing rural small-town. As demonstrated in other historical communities, these measures may also augment Kilmarnock’s economy, especially tourism, by maintaining the charm and viability of shops as a basis for ongoing economic development.

Technical and financial assistance to complete an historic survey of Kilmarnock’s structures is available through a variety of state and federal programs. One such program is offered by the Virginia Department of Historic Resources (DHR). Through this program, localities may receive partial funding and partner with DHR to take stock of their historic resources. Further information about incentives and grants can be found at www.dhr.virginia.gov. In addition to state and federal programs, the Town may coordinate efforts with several volunteer and/or non-profit organizations including, but not limited to, the Kilmarnock Museum.

Consistent with the Town’s vision to protect the community’s historical features, coupled with recommendations in the “UVA Master Plan,” Kilmarnock’s policy is as follows:

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59. Conduct a survey of historic structures within the Town of Kilmarnock. Solicit technical and financial assistance to complete the survey and coordinate efforts with local volunteer and/or non-profit organizations including, but not limited to, the Kilmarnock Museum. A survey may help to establish the framework for a potential program in the future to protect the community's historical assets, conserve the charm and appeal of the existing rural small-town, as well as provide an opportunity to educate the public about the Town's historic resources and their protection.

B. PRESERVATION OF WATER QUALITY

The purpose of this Section is to identify policies and programs that protect groundwater from potential contamination to ensure the long-term sustainability of the Town's water supply. The goal is to ultimately eliminate as many contaminants as possible to preserve the underlying water table.

The Town of Kilmarnock relies 100 percent on groundwater for its drinking/potable water supply. In addition, the population of the four Northern Neck counties and incorporated towns (all of which constitute the Northern Neck Planning District) is either served by private residential wells or community public water systems that rely upon deep wells for water supply. For this reason, the ongoing protection of quality groundwater is vital to ensure the public's health, safety and welfare both on a regional and local level. In addition, there are regional, state and federal mandates that require localities to protect surface and ground water to minimize impacts to this essential resource.

1. GROUNDWATER RESOURCES

On a regional level, there are seven major confined aquifers and one unconfined aquifer that reflect the geology of the Coastal Plain Region of Virginia. All of these water tables are at different depths. Kilmarnock is located in the eastern part of the Coastal Plain and obtains its potable water from the unconfined aquifer. This aquifer is essentially replenished by rain and snow melt. Appendix I of the 2010 "Northern Neck Water Supply Plan" or WSP, incorporated by reference in this document, states that "studies conducted by SAIF Water Wells, Inc., in Lancaster and Northumberland counties, utilizing hundreds of laboratory analyses indicate that the surficial aquifer has, for the most part, good quality water" (p. 290).

Current potable water quality standards in Kilmarnock are also in compliance with established standards. The quality of Kilmarnock's water supply and these standards are described in Chapter 4. However, ongoing protection of the quality of the town's water supply is a priority, both for the current population and future generations. Since the water in our region comes from the unconfined aquifer, it is also vulnerable to contaminants and pollution that may seep below the surface. Regional activities outside of the Town limits also affect the underlying unconfined aquifer and have the potential to adversely impact the quality of the Town's water supply. While these activities are not within the Town's regulatory purview, coordination with applicable federal, state, regional, and local regulatory agencies is critical to ensure the long-term quality of the water for the region as well as for Kilmarnock. For this reason two policies are included below to ensure the ongoing coordination with applicable agencies to protect the quality of ground water that serves the Town and the region.

60. Continue coordination with applicable agencies to include: 1) federal (Environmental Protection Agency or EPA/Clean Water Act) and the Chesapeake Bay Preservation Act; 2) state (Virginia Department of Environmental Quality or DEQ / initiatives for protection of the groundwater quality, including establishment of a Groundwater Management Area for this region and the ongoing Source Water Assessment Program or SWAP); 3) regional (Northern Neck Planning District Commission or NNPDC to implement recommendations in the 2003 "Northern Neck

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Ground Water Quality Management Plan” and the 2010 “Northern Neck Water Supply Plan;” and 4) Lancaster and Northumberland counties to ensure protection of the regional and local groundwater supply including, but not limited to development and implementation of the Storm Water Management Plan for the area and the Sediment and Erosion Control Act regulations which are part of the Chesapeake Bay Preservation Act.

61. Consider development of a “Water Quality Plan” for the Town of Kilmarnock to minimize threats to local groundwater, including water quality and quantity. The plan should identify current informational gaps (e.g., inventory of abandoned wells and underground storage tanks) as well as educate the public about protection of the water supply. Development and implementation of many of the policies identified in this Chapter would constitute a “Water Quality Plan” for the Town of Kilmarnock.

There are several potential threats to the groundwater, all of which could potentially impact the Town’s drinking water supply at some point in the future. Because of aquifer’s vulnerability to contaminants, there are certain programs underway and/or proposed in the Town of Kilmarnock to preserve and protect water quality. These are listed below:

Potential Threats to Groundwater Resources: Pollutants can easily find their way into the groundwater. Potential sources of pollution to the region’s groundwater quality include, but aren’t limited to: chemical leaching; residential lawn care; auto pollutants; bio-solid (e.g., fertilizer) applications; abandoned wells; underground storage tanks; improperly disposed household hazardous waste; nonconforming septic systems*; landfills; and/or private waste dumps. In all cases, education of the public regarding these potential threats is paramount. Potential hazards that specifically apply to the Town of Kilmarnock are described below:

***Note:** Groundwater contamination as a result of older outdated septic systems is not a major issue in Kilmarnock. Most of the developed area within the Town is connected to the public sewer system and new development is required to connect if the site is located within 250-feet of a sewer line. Major development such as a large subdivision is also required to provide sewer service. The only areas currently utilizing septic systems are the Forest Hills residential subdivision (with larger lots for adequate leach fields) which is a relatively new development so the septic systems are up-to-date and several legal nonconforming uses interspersed along North Main Street. Future adjustments to the Town’s corporate limits may include existing development served by septic systems. Annexation(s) to Kilmarnock may be an issue, when and if this occurs, especially if the area is large and fully developed with septic systems.

Insecticides, Pesticides and Herbicides: Very little land within the Town of Kilmarnock is being farmed. Therefore the use of fertilizers high in nitrogen, commonly used on crops grown locally, is not within the regulatory purview of Kilmarnock. However, products that should be addressed in Kilmarnock include insecticides, pesticides and herbicides. Many people use these contaminants to maintain residential lawns and gardens. The relationship between the use of these contaminants and groundwater pollution is well known. These products can be washed into drainage ditches and/or absorbed into the ground resulting in an adverse impact to the groundwater.

The purpose of the following policy is to minimize adverse impacts to the quality of groundwater as a result of the use of insecticides, pesticides and herbicides primarily used for landscaping purposes:

62. Increase public awareness about the cumulative effect of these contaminants on our water quality. Information may be posted on a web site and/or included in a handout that identifies the following:

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- list the various contaminants, as well as their impacts, typically used for landscaping maintenance;
- recommend environmentally safe products and/or alternative methods that do not require the use of harmful chemicals for landscaping;
- include a list of native drought-tolerant low maintenance landscaping species that require minimal use of chemicals;
- educate the public about their use and the timing of application.

(Please also refer to policies and related discussion below regarding “Surface Water”).

Underground Gasoline and Oil Storage Tanks: Another potential source of contamination to groundwater may be underground gasoline and/or heating oil tanks. Older homes in Kilmarnock may not have been updated and the use of underground storage tanks over the years may be contaminating the soil. Environmental Protection Agency (EPA) regulations required replacement of single-walled underground storage tanks with double-walled tanks by 1999. (2003 Northern Neck Ground Water Quality Management Plan, page 13). These tanks, if not upgraded or removed, may contaminate the groundwater if they leak and/or collapse.

The Town has completed an assessment of underground storage tanks and has identified ways to mitigate potential contaminants to protect water quality. Implementation of the “Downtown Revitalization Plan” resulted in the removal of many commercial and industrial underground storage tanks. Primarily the only storage tanks that exist in the town, related to this type of land use activity, serve existing gas stations currently in operation. Since underground tanks for commercial and industrial land uses are addressed no further policy is required. However, some of the older residences may have underground tanks for storage of heating fuel. These may not be updated to EPA standards effective in 1999. As a result, the following policy is included to address this issue. This policy is also a recommendation in the 2010 Northern Neck WSP.

63. Consider a requirement to register all residential underground storage tanks, primarily used for heating fuel. At this time, it is not a requirement to register these tanks nor are they monitored by the State. However, leaks from these tanks may pose a potential threat to groundwater quality and an inventory of their location may be useful in the event of any contamination events. Removal and/or upgrading underground tanks may occur when redevelopment of a property is proposed.

(Please also refer to the discussion below related to “Redevelopment.”)

In addition, the “Kilmarnock Watershed Assessment Report, April 2013” (incorporated by reference in this document) identifies “hot spots” within the Town that have the potential to contaminate groundwater. These include certain commercial, industrial, institutional and transportation-related operations that tend to produce higher concentrations of pollution and/or have a higher risk for spills. These “hot spots” include auto repair shops, public works yards, restaurants, and other related land uses (p. 19). Recommendations are included in the report to reduce potential threats and are incorporated in the following policy:

64. Continue to implement recommendations included in the “Kilmarnock Watershed Assessment Report, April 2013.” Specific recommendations for on-site maintenance combined with pollution prevention practices can significantly reduce the occurrence of “hotspot” threats. In addition, areas with high water tables (as shown in Chapter 2) should be protected from construction activity and potentially problematic land uses, especially the types described above that have the

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potential to contaminate the underground water table. (Please refer to policies below and the “Surface Water” discussion relating to runoff.)

Household Hazardous Waste: Household hazardous waste, particularly from products used to maintain vehicles, is also an issue pertaining to the protection of water quality. Proper disposal of paint, batteries, oil, cleaners, tires, etc., is necessary. According to the “Northern Neck Ground Water Quality Management Plan,” there are no known locally operated private waste dumps in Kilmarnock. However, the Northern Neck Soil and Water Conservation District does provide a program for hazardous waste collection twice a year.

65. Increase public awareness about the program for hazardous waste collection. This could be accomplished by including notification in the local newspaper, on the web site and/or in a flyer distributed with the Town’s water and sewer bill or annual property tax statement.

Well Abandonment: Since much of the developed area within the Town of Kilmarnock is connected to the public water system and new construction must also be served by public water, the issue of abandoned wells is not major within the town limits. However, it is important for citizens to know that there are proper procedures for abandonment of wells. This is particularly important in the event the town annexes additional land and expands its corporate limits to include areas currently served by private wells. In addition, existing shallow wells often do not have as many minerals in the water, and, as such, may be used to maintain local environments and landscapes. These shallow wells, if not abandoned properly, are also a source of possible contamination.

66. Consider inventorying abandoned wells within the Town of Kilmarnock and establish a means to ensure proper abandonment. According to authorities, these wells could be filled with non-toxic materials (e.g., stone or dirt) and capped. This approach may be less costly. In addition, developed properties, currently served by wells, which connect to the public water system in the future, should be required to follow proper procedures for the abandonment of an on-site well. Funding from a variety of sources may be available to implement a well abandonment program.

Protection of Public Wells: Protection of public wells that are part of a water system is paramount. Public wells are defined as a well with 15 or more connections and/or 25 people using the source for 8 months a year. In Kilmarnock there are three wells which are part of the town’s water system. In addition, there are other small privately owned water systems that serve the public within the Town of Kilmarnock. The State of Virginia Department of Environmental Quality conducts a “Source” Water Assessment Program (SWAP) for all public wells by testing a 1,050 foot area for contamination around each public well. The SWAP stresses the importance of protecting land around public wells from contaminants. Kilmarnock officials are continually cognizant of land use and related activities around public wells so that contamination of these areas can be avoided. One way to protect the quality of water in Kilmarnock is to adopt and implement a wellhead protection program for the Town’s public wells. The “Northern Neck Water Supply Plan, 2010” strongly encourages local jurisdictions in the region to adopt such a program for protection of public wells. The Town of Warsaw adopted a wellhead protection program in 2005 so procedures for development and implementation are available.

67. Consider adoption of a wellhead protection program to protect the Town’s public (water supply) wells.

2. SURFACE WATER RESOURCES:

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There are primarily two general topics addressed in this section: 1) the Chesapeake Bay Preservation Act (CBPA) and Resource Management Area as they relate to protection of water quality; and 2) runoff (i.e., storm water and pollutants), storm water management and redevelopment. In this section of the Comprehensive Plan, potential impacts to water quality as a result of runoff, new development, land use activities and the natural erosion process are evaluated. Policies, consistent with state and local requirements, are identified to protect the quality of water entering Kilmarnock's watersheds, which ultimately drains into the Chesapeake Bay. The policies are also intended to minimize pollutants in surface water (e.g., runoff) which may seep into the underlying groundwater table.

A. Chesapeake Bay Preservation Act (CBPA) / Resource Management Area (RMA) & Local Resource Protection Areas (RPA):

Chesapeake Bay Preservation Act (CBPA) / Resource Management Area (RMA): The Town of Kilmarnock, as well as other areas within the Chesapeake Bay watershed, is subject to provisions of the CBPA. The primary purpose of the CBPA is to improve the quality of water entering the Bay. Because of this, the Town adopted the "Chesapeake Bay Preservation Overlay District" (Town Code, §54-481). The entire Town of Kilmarnock is located within this "Overlay District" which is also referred to as Kilmarnock's Resource Management Area or RMA. Regulations for the RMA address "land types that, if improperly used or developed, have the potential for causing significant water quality degradation or for diminishing the functional value of the resource protection area" (§54-482, Town Code). As such, regulations for the "Overlay District" apply to all development and land use activity in Kilmarnock. The RMA includes all lands within the town that are not designated as a Resource Protection Area or RPA.

Even though Kilmarnock is not located adjacent to the Chesapeake Bay, it is within the Bay's watershed and, as such, the quality of water entering Kilmarnock's watersheds (see Chapter 2 for a description of the town's three watersheds) must be protected. The source of pollution entering the Bay is typically referred to as a "point or non-point source." Point source pollution, as it relates to the Town of Kilmarnock, is a facility that discharges municipal wastewater directly into a water body which can be traced to a single identifiable source. If this occurs, a National Pollutant Discharge Elimination System (NPDES) permit is required from the U.S. Environmental Protection Agency. In Kilmarnock, the Wastewater Treatment Plant is the only facility in town classified as a "point source" with a "minor" NPDES permit to discharge treated wastewater directly into a tributary to Indian Creek.

With the exception of the Wastewater Treatment Plant, all other sources of water pollution in Kilmarnock are classified as "non-point." The "Kilmarnock Watershed Assessment Report, April 2013" concludes that that "no runoff from other jurisdictions enters the town. [As a result,] the health of streams in Kilmarnock is almost entirely dependent on activities and land uses within its boundaries." (Source: Section 1 – Introduction, 1.1 Executive Summary, p. 5).

Local Resource Protection Areas (RPA): Perhaps the most important areas requiring protection in the Town of Kilmarnock are the stream banks and basins. These tributaries are typically identified as a "Resource Protection Area" (RPA) on various maps including those in Chapter 2 of this document, as well as the Land Use Plan map. The RPA is officially defined as "that component of the Chesapeake Bay Preservation Area comprised of lands adjacent to water bodies with perennial flow that have an intrinsic water quality value due to the ecological and biological processes they perform or are sensitive to impacts which may result in significant degradation to the quality of state waters" (§54-481, Town Code). In the case of Kilmarnock, the definition of an RPA specifically applies to "a

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100-foot vegetated buffer area located adjacent to and landward of . . . both sides of any . . . water bodies with perennial flow. . . . The full buffer area shall be designated as the landward component of the RPA” (§54-482, Town Code). This definition applies to the various unnamed stream basins, the two streams known as Dyer Creek and Norris Prong Creek, and that area adjacent to the Indian Creek tributary where the Wastewater Treatment Plant is located. These areas also include highly erodible soils particularly on the steep slopes.

Development and Land Use: While erosion and runoff occurs naturally, development and land use activities may exacerbate this process, as well as introduce contaminants to environmentally sensitive areas. These issues must be properly addressed and implemented during the planning and construction phase of any new development proposal, especially those located in proximity to a protected area.

Policies pertaining to new development and land use activity which are intended to protect environmentally sensitive areas and natural resources by minimizing surface runoff, soil erosion and the quantity of pollutants entering the tributary stream basins that flow into the Chesapeake Bay are included in Chapter 3 (Land Use Plan). Please refer to Section “B” (Development Policies) sub-section “2” (Resource Protection Areas) of that Chapter.

In addition, zoning regulations in the “Chesapeake Bay Preservation Overlay District,” which apply to all new development and land use activity within the Town of Kilmarnock, address all aspects of development including, but not limited to, land disturbance and redevelopment.

B. Erosion Control, Runoff, Storm Water Management and Redevelopment:

Erosion Control and Protected Areas: Kilmarnock’s goal is to protect both groundwater and surface water resources from any increased pollutant loads as a result of stream bank erosion or other means of sediment transport. Erosion of stream banks and runoff occur naturally, although, as described above, the rate of erosion may be accelerated as a result of land use activities. To minimize and mitigate erosion, runoff and sedimentation, as well as prevent potential slope failure, the following policies apply:

68. Continue to identify and monitor areas where erosion appears to be a critical issue. If there is an area where stream bank erosion is problematic, the Town should delineate the drainage area of that stream bank and implement measures to reduce the rate and volume of storm water runoff for that specific drainage area.
69. Identify funding opportunities to implement stream bank restoration projects.
70. Continue to enforce the Erosion and Sediment Control Act requirements of the Chesapeake Bay Preservation Act to minimize sedimentation and erosion within the three watersheds located in Kilmarnock.

Runoff (Storm Water & Contaminants): The second part of the “Surface Water” section in this chapter focuses on impacts to the quality of water as a result of storm water runoff and contaminants. There are three topics addressed below: 1) issues and “hot spots” identified in the “Kilmarnock Watershed Assessment Report, April 2013;” 2) storm water management; and 3) redevelopment of older buildings and infrastructure. The purpose of this discussion is to identify policies that protect the underlying water table from pollutants which may seep into the aquifer and/or drain into vulnerable or protected areas.

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- **Kilmarnock's Watershed Assessment Report (April 2013):** Several topics are analyzed in the "Kilmarnock Watershed Assessment Report, April 2013," to protect and improve the quality of surface water runoff. Some of these issues also relate to the following "Redevelopment" section. Specific recommendations for improvements to the town's watersheds are included in the report and are part of the following policy:

71. Continue to implement recommendations in the "Kilmarnock Watershed Assessment Report" dated April 2013. Recommendations in the report address: 1) redevelopment; 2) the use of household contaminants for landscaping; and 3) repair, retrofit and redevelop the town's aging infrastructure in specific locations to include storm drains and improperly designed storm water outfalls. (Please refer to policies above in the "Groundwater" and "Stream Bank" protection/restoration sections.)

Storm Water Management: Kilmarnock's goal is to improve and protect water quality by properly managing storm water drainage and runoff. This goal and implementation measures are discussed throughout this section of the chapter. The "Chesapeake Bay Preservation Overlay District" encompasses the entire Town of Kilmarnock. Regulations in this part of the zoning ordinance state that "storm water runoff shall be controlled by the use of water quality BMPs that . . . are consistent with the water quality protection provisions of the Virginia storm water Management Regulations (4 VAC 3-20-10 et seq.)." (Town Code, §54-485(e)).

In addition, the state has adopted a requirement for each county to develop and implement a new Storm Water Management Program effective July 1, 2014. Kilmarnock officials continue to work with Lancaster and Northumberland counties on development of this program. As a result, no policy is required for this issue since the existing zoning regulations, coupled with the recommendations in the town's "Watershed Assessment Report" and the state's mandate to develop and implement a Storm Water Management Plan, adequately address storm water management.

Redevelopment: The Town's goal is to improve surface (i.e., runoff) water quality, as well as protect water resources, when redevelopment occurs. Many developed sites within Kilmarnock, especially those for commercial and industrial use, were constructed prior to consideration of storm water runoff and its impacts to water quality. Improvements that may be implemented as redevelopment occurs include: 1) reduction in the amount of existing impervious surface coverage (this is also described above under "New Development"); 2) replacement of inefficient sewer lines and proper maintenance; and 3) redevelopment of the town's aging infrastructure in specific locations identified in the "Watershed Assessment Report" referenced above.

As stated above, the "Chesapeake Bay Preservation Overlay District" is part of the Town Code and affects the entire Town of Kilmarnock. These regulations address, among other things, redevelopment. Requirements for redevelopment include, but aren't limited to, an overall reduction in impervious surface coverage; an overall decrease in non-point source pollution; and installation of landscaped buffers, especially adjacent to environmentally sensitive areas. Again, no policy is required for this section since the existing zoning regulations pursuant to the CBPA adequately address redevelopment.

C. PRESERVATION OF WATER QUANTITY

Regional Water Quantity: Important as water quality is the issue of water quantity in our area. All of the potable water in our region comes from the unconfined aquifer which is used by numerous localities. According to the Town's 2006 Comprehensive Plan these localities extend beyond the

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Northern Neck to include southern Maryland and some of the Tidewater region. The 2006 Plan (p. 72) states that the entire Northern Neck uses far fewer gallons of water per day (roughly 5.5 million) than the paper mill in West Point (19 million gallons) and the southern Maryland region (26 million gallons). The aquifers that provide drinking water to the region, specifically to the Town of Kilmarnock, are described at the beginning of the “Groundwater Resources” section above.

Because numerous localities in the region draw water from the same aquifer as the Town of Kilmarnock, preservation of the water supply is both a regional and local issue. The Northern Neck WSP prepared in 2010, under the direction of the Northern Neck Planning District, includes an extensive work program for continuous improvements to the area’s water supply and to ensure a sustainable long-term water source in the region (see pages 172 – 173). The purpose of the study is to assess current and future water supply conditions in the Northern Neck and contribute to the development of a comprehensive statewide water supply planning process that would: 1) ensure the availability of adequate and safe drinking water; 2) encourage, promote, and protect all other beneficial uses of water resources; and 3) encourage, promote, and develop incentives for alternative water sources. The Town of Kilmarnock continues to participate in this regional water supply planning effort.

A few of the key recommendations in the WSP include, but aren’t limited to: 1) development of a surface water reservoir(s) in the region; 2) use of reclaimed water; 3) desalination; 4) rain harvesting; 5) designation of the Northern Neck as a “Ground Water Management Area;” 6) implementation of water conservation measures throughout the Northern Neck; 7) development of well head protection programs for all counties and towns in the region; 8) intra-regional water planning negotiations to reduce the impact of extra-regional water uses on the Northern Neck’s groundwater supply; and 9) ongoing assessment of aquifers’ capacity and groundwater quality.

In order to maintain a sustainable water supply in the future for both the region and the Town of Kilmarnock, the following policies apply:

72. Continue to coordinate and participate with applicable governmental agencies, specifically the regional Northern Neck Planning District and its member jurisdictions to implement recommendations in the 2010 WSP (see pages 172-173) to ensure a sustainable long-term water supply for Kilmarnock’s residents and the region’s population.

Town of Kilmarnock - Water Quantity: Kilmarnock’s goal is to also ensure the long-term viability and sustainability of its public water supply. The 2010 WSP “Statement of Need” (p. 169) states that “no current or projected water supply deficits were identified for community sources [i.e., public water systems such as Kilmarnock’s] in the [Northern Neck] Planning Region. Therefore, a formal water supply alternatives analysis is not required for this WSP.”

However, water conservation measures are important for the Town of Kilmarnock and its residents to implement in order to ensure a long-term public water supply for its residents and future generations. Development of water conservation measures is also a recommendation in the WSP for all water users in the region. The town continues to develop and implement measures for water conservation. One recent example is the adoption of a “Drought Management Plan” to restrict water use particularly in emergency situations.

Certain policies pertaining to water conservation are included above and require, among other things, development of a “Water Quality Plan” for the Town of Kilmarnock. The Water Quality Plan would include, but not be limited to, water conservation policies below.

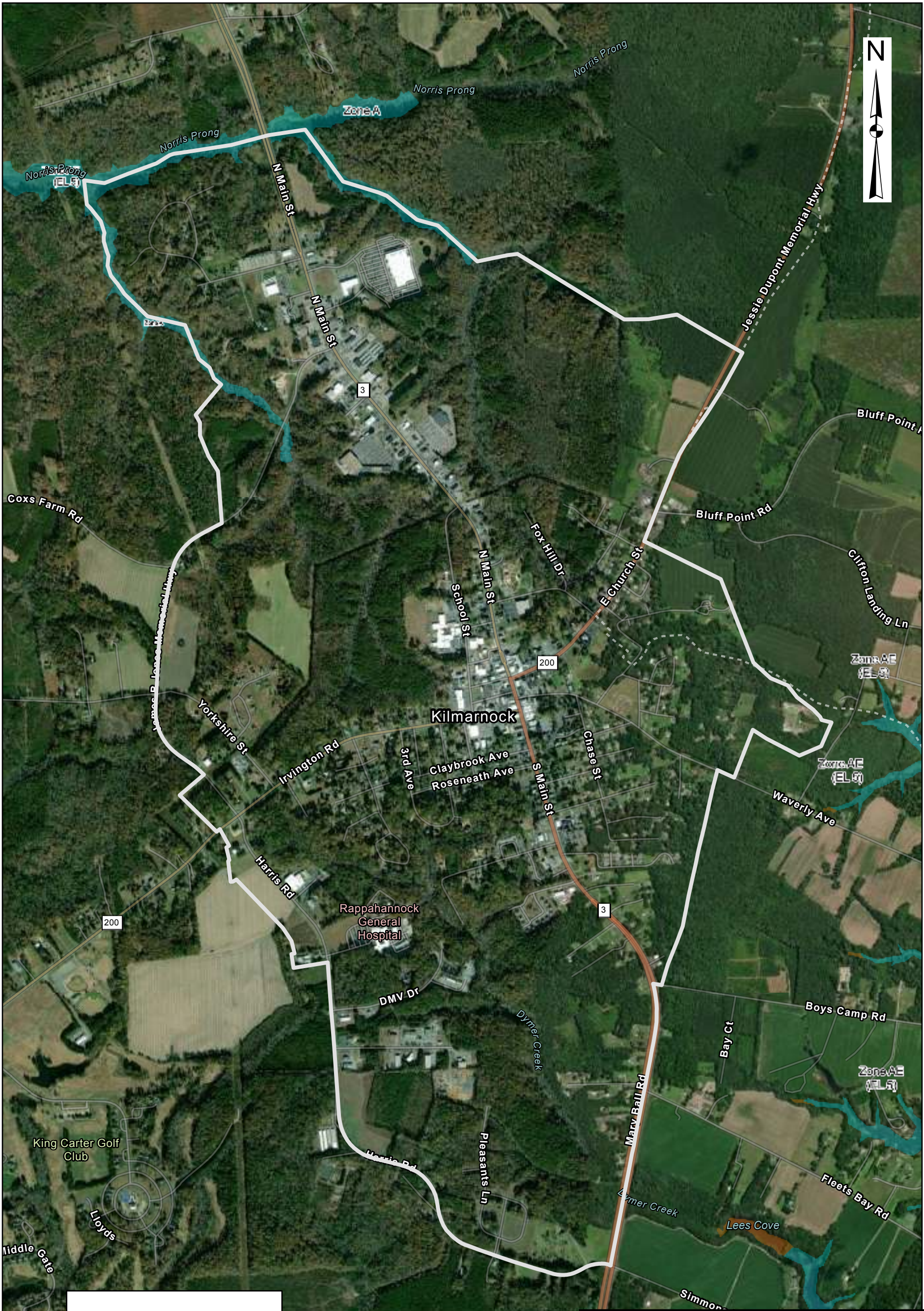
COMPREHENSIVE PLAN: TOWN OF KILMARNOCK

The following policies are included to help ensure the long-term sustainability of Kilmarnock's public water supply, particularly as it relates to water conservation:

73. Continue implementation of the Town's "Drought Management Plan" and requirements to restrict water use in emergency situations. During an emergency situation, such as a fire or drought, restrictions on watering lawns, car washing, and other nonessential uses of water could be implemented.
74. Prevent excessive waste of water from plumbing failures such as broken water lines that are privately owned.
75. Continue to maintain an active infiltration and inflow (I/I) program to identify and repair broken or leaking pipes that are part of the public water and sewage system.
76. Create a water conservation brochure for Town residents and applicants proposing new construction. The brochure could address, among other things, landscaping with native drought tolerant species, new plumbing fixtures and retrofitting older plumbing fixtures with low-flow devices.

The above issues are also discussed briefly in Chapter 4 (Public Services and Facilities) Section A (Water Supply) 3 (Additional Water Quantity Issues and Policies) of this Comprehensive Plan.

Individual property owners are also taking steps to conserve water. One recent example involved the installation of two underground cisterns in 2013 on a property located at 125 South Main Street. The site, designated for commercial use, is developed with an older potentially historic structure that was recently restored. The purpose of the project is to capture storm water runoff in the cisterns for irrigation of landscaping, thereby eliminating the need to rely on potable drinking water from Kilmarnock's water system for that purpose.



Legend

 Town Boundary

Flood Hazard Zones

Zone Type

 1% Annual Chance Flood Hazard

 0.2% Annual Chance Flood Hazard

MAP	
TOWN OF KILMARNOCK, VIRGINIA CFPF ROUND 5 APPLICATION MATERIALS	
FEMA FLOOD HAZARD FIRMS TOWN EXTENT	
DEC 2024	SCALE: NOTED
0 0.1 0.2 0.4 0.6 Miles	

Town of Kilmarnock

VICE MAYOR -DR. CURTIS H. SMITH
COUNCIL MEMBER- KYLIE ABBOTT
COUNCIL MEMBER- MICHAEL BEDELL
COUNCIL MEMBER-EMERSON GRAVATT
COUNCIL MEMBER-REBECCA TEBBS NUNN
COUNCIL MEMBER- LES SPIVEY

MAYOR -MAE P. UMPHLETT



TOWN MANAGER- SUSAN COCKRELL
TOWN ATTORNEY -NANCYELLEN KEANE
TOWN PLANNER - MARSHALL SEBRA
TOWN CLERK -CINDY BALDERSON
TOWN TREASURER - JUDY G. STEVENS
POLICE CHIEF - CLIFF DAWSON

ORDINANCE NO. 2022-004

AN ORDINANCE AMENDING CHAPTER 54, ARTICLE VI, THE ZONING ORDINANCE OF TOWN OF KILMARNOCK, VIRGINIA, BY ESTABLISHING FLOODPLAIN DISTRICTS, BY REQUIRING THE ISSUANCE OF PERMITS FOR DEVELOPMENT, AND BY PROVIDING FACTORS AND CONDITIONS FOR VARIANCES TO THE TERMS OF THE ORDINANCES.

BE IT ENACTED AND ORDAINED BY THE TOWN OF KILMARNOCK, Virginia, as follows:

Section 54-500. GENERAL PROVISIONS

1. Statutory Authorization and Purpose [44 CFR 59.22(a)(2)]

Va. **Code** § 15.2-2283 specifies that zoning ordinances shall be for the general purpose of promoting the health, safety, or general welfare of the public and of further accomplishing the objectives of § [15.2-2200](#) which encourages localities to improve the public health, safety, convenience, and welfare of their citizens. To these ends, flood ordinances shall be designed to provide for safety from flood, to facilitate the provision of flood protection, and to protect against loss of life, health, or property from flood.

In accordance with these directed provisions, this ordinance is specifically adopted pursuant to the authority granted to localities by Va. **Code** § 15.2 - 2280.

The purpose of these provisions is to prevent: the loss of life, health, or property, the creation of health and safety hazards, the disruption of commerce and governmental services, the extraordinary and unnecessary expenditure of public funds for flood protection and relief, and the impairment of the tax base by:

- A. Regulating uses, activities, and development which, alone or in combination with other existing or future uses, activities, and development, will cause unacceptable increases in flood heights, velocities, and frequencies;
- B. Restricting or prohibiting certain uses, activities, and development from locating within districts subject to flooding;
- C. Requiring all those uses, activities, and developments that do occur in flood-prone districts to be protected and/or floodproofed against flooding and flood damage; and,

- D. Protecting individuals from ^{buying} land and structures which are unsuited for intended purposes because of flood hazards.

2. Applicability

These provisions shall apply to all privately and publicly owned lands within the jurisdiction of Town of Kilmarnock and identified as areas of special flood hazard identified by the community *or* shown on the flood insurance rate map (FIRM) or included in the flood insurance study (FIS) that are provided to the Town of Kilmarnock by FEMA.

3. Compliance and Liability

- A. No land shall hereafter be developed and no structure shall be located, relocated, constructed, reconstructed, enlarged, or structurally altered except in full compliance with the terms and provisions of this ordinance and any other applicable ordinances and regulations which apply to uses within the jurisdiction of this ordinance.
- B. The degree of flood protection sought by the provisions of this ordinance is considered reasonable for regulatory purposes and is based on acceptable engineering methods of study, but does not imply total flood protection. Larger floods may occur on rare occasions. Flood heights may be increased by man-made or natural causes, such as ice jams and bridge openings restricted by debris. This ordinance does not imply that districts outside the floodplain district or land uses permitted within such district will be free from flooding or flood damages.
- C. This ordinance shall not create liability on the part of The Town of Kilmarnock or any officer or employee thereof for any flood damages that result from reliance on this ordinance or any administrative decision lawfully made thereunder.

4. Records [44 CFR 59.22(a)(9)(iii)]

Records of actions associated with administering this ordinance shall be kept on file and maintained by or under the direction of the Floodplain Administrator in perpetuity.

5. Abrogation and Greater Restrictions [44 CFR 60.1(b)]

To the extent that the provisions are more restrictive, this ordinance supersedes any ordinance currently in effect in flood-prone districts. To the extent that any other existing law or regulation is more restrictive or does not conflict it shall remain in full force and effect.

These regulations are not intended to repeal or abrogate any existing ordinances including subdivision regulations, zoning ordinances, or building codes. In the event of a conflict between these regulations and any other ordinance, the more restrictive shall govern.

6. Severability

If any section, subsection, paragraph, sentence, clause, or phrase of this ordinance shall be declared invalid for any reason whatever, such decision shall not affect the remaining portions of this ordinance. The remaining portions shall remain in full force and effect; and for this purpose, the provisions of this ordinance are hereby declared to be severable.

7. Penalty for Violations [44 CFR 60.2(e)]

Any person who fails to comply with any of the requirements or provisions of this article or directions of the director of planning or any authorized employee of the Town of Kilmarnock shall be guilty of the appropriate violation and subject to the penalties thereof.

The VA USBC addresses building code violations and the associated penalties in Section 104 and Section 115. Violations and associated penalties of the Zoning Ordinance of Town of Kilmarnock are addressed in Section 54-5 of the Zoning Ordinance.

In addition to the above penalties, all other actions are hereby reserved, including an action in equity for the proper enforcement of this article. The imposition of a fine or penalty for any violation of, or noncompliance with, this article shall not excuse the violation or noncompliance or permit it to continue; and all such persons shall be required to correct or remedy such violations within a reasonable time. Any structure constructed, reconstructed, enlarged, altered or relocated in noncompliance with this article may be declared by the Town of Kilmarnock to be a public nuisance and abatable as such. Flood insurance may be withheld from structures constructed in violation of this article.

Section 54-501. ADMINISTRATION

1. Designation of the Floodplain Administrator [44 CFR 59.22(b)]

The Floodplain Administrator is hereby appointed to administer and implement these regulations and is referred to herein as the Floodplain Administrator. The Floodplain Administrator may:

- A. Do the work themselves. In the absence of a designated Floodplain Administrator, the duties are conducted by the Town of Kilmarnock chief executive officer.
- B. Delegate duties and responsibilities set forth in these regulations to qualified technical personnel, plan examiners, inspectors, and other employees.
- C. Enter into a written agreement or written contract with another community or private sector entity to administer specific provisions of these regulations. Administration of any part of these regulations by another entity shall not relieve the community of its responsibilities pursuant to

the participation requirements of the National Flood Insurance Program as set forth in the Code of Federal Regulations at 44 C.F.R. Section 59.22.

2. Duties and Responsibilities of the Floodplain Administrator [44 CFR 60.3]

The duties and responsibilities of the Floodplain Administrator shall include but are not limited to:

- A. Review applications for permits to determine whether proposed activities will be located in the Special Flood Hazard Area (SFHA).
- B. Interpret floodplain boundaries and provide available base flood elevation and flood hazard information.
- C. Review applications to determine whether proposed activities will be reasonably safe from flooding and require new construction and substantial improvements to meet the requirements of these regulations.
- D. Review applications to determine whether all necessary permits have been obtained from the Federal, State, or local agencies from which prior or concurrent approval is required; in particular, permits from state agencies for any construction, reconstruction, repair, or alteration of a dam, reservoir, or waterway obstruction (including bridges, culverts, structures), any alteration of a watercourse, or any change of the course, current, or cross section of a stream or body of water, including any change to the 100-year frequency floodplain of free-flowing non-tidal waters of the State.
- E. Verify that applicants proposing an alteration of a watercourse have notified adjacent communities, the Department of Conservation and Recreation (Division of Dam Safety and Floodplain Management), and other appropriate agencies (VADEQ, USACE), and have submitted copies of such notifications to FEMA.
- F. Advise applicants for new construction or substantial improvement of structures that are located within an area of the Coastal Barrier Resources System established by the Coastal Barrier Resources Act that Federal flood insurance is not available on such structures; areas subject to this limitation are shown on Flood Insurance Rate Maps as Coastal Barrier Resource System Areas (CBRS) or Otherwise Protected Areas (OPA).
- G. Approve applications and issue permits to develop in flood hazard areas if the provisions of these regulations have been met, or disapprove applications if the provisions of these regulations have not been met.

- H. Inspect or cause to be inspected, buildings, structures, and other development for which permits have been issued to determine compliance with these regulations or to determine if non-compliance has occurred or violations have been committed.
- I. Review Elevation Certificates and require incomplete or deficient certificates to be corrected.
- J. Submit to FEMA, or require applicants to submit to FEMA, data and information necessary to maintain FIRMs, including hydrologic and hydraulic engineering analyses prepared by or for the Town of Kilmarnock, within six months after such data and information becomes available if the analyses indicate changes in base flood elevations.
- K. Maintain and permanently keep records that are necessary for the administration of these regulations, including:
 - 1. Flood Insurance Studies, Flood Insurance Rate Maps (including historic studies and maps and current effective studies and maps), and Letters of Map Change; and
 - 2. Documentation supporting issuance and denial of permits, Elevation Certificates, documentation of the elevation (in relation to the datum on the FIRM) to which structures have been floodproofed, inspection records, other required design certifications, variances, and records of enforcement actions taken to correct violations of these regulations.
- L. Enforce the provisions of these regulations, investigate violations, issue notices of violations or stop work orders, and require permit holders to take corrective action.
- M. Advise the Board of Zoning Appeals regarding the intent of these regulations and, for each application for a variance, prepare a staff report and recommendation.
- N. Administer the requirements related to proposed work on existing buildings:
 - 1. Make determinations as to whether buildings and structures that are located in flood hazard areas and that are damaged by any cause have been substantially damaged.
 - 2. Make reasonable efforts to notify owners of substantially damaged structures of the need to obtain a permit to repair, rehabilitate, or reconstruct. Prohibit the non-compliant repair of substantially damaged buildings except for temporary emergency protective measures necessary to secure a property or stabilize a building or structure to prevent additional damage.
- O. Undertake, as determined appropriate by the Floodplain Administrator due to the circumstances, other actions which may include but are not limited to: issuing press releases, public service

announcements, and other public information materials related to permit requests and repair of damaged structures; coordinating with other Federal, State, and local agencies to assist with substantial damage determinations; providing owners of damaged structures information related to the proper repair of damaged structures in special flood hazard areas; and assisting property owners with documentation necessary to file claims for Increased Cost of Compliance coverage under NFIP flood insurance policies.

- P. Notify the Federal Emergency Management Agency when the corporate boundaries of the Town of Kilmarnock have been modified and:
1. Provide a map that clearly delineates the new corporate boundaries or the new area for which the authority to regulate pursuant to these regulations has either been assumed or relinquished through annexation; and
 2. If the FIRM for any annexed area includes special flood hazard areas that have flood zones that have regulatory requirements that are not set forth in these regulations, prepare amendments to these regulations to adopt the FIRM and appropriate requirements, and submit the amendments to the governing body for adoption; such adoption shall take place at the same time as or prior to the date of annexation and a copy of the amended regulations shall be provided to Department of Conservation and Recreation (Division of Dam Safety and Floodplain Management) and FEMA.
- Q. Upon the request of FEMA, complete and submit a report concerning participation in the NFIP which may request information regarding the number of buildings in the SFHA, number of permits issued for development in the SFHA, and number of variances issued for development in the SFHA.
- R. It is the duty of the Community Floodplain Administrator to take into account flood, mudslide and flood-related erosion hazards, to the extent that they are known, in all official actions relating to land management and use throughout the entire jurisdictional area of the Community, whether or not those hazards have been specifically delineated geographically (e.g. via mapping or surveying).

3. Use and Interpretation of FIRMs [44 CFR 60.3]

The Floodplain Administrator shall make interpretations, where needed, as to the exact location of special flood hazard areas, floodplain boundaries, and floodway boundaries. The following shall apply to the use and interpretation of FIRMs and data:

- A. Where field surveyed topography indicates that adjacent ground elevations:

1. Are below the base flood elevation in riverine SFHAs, or below the 1% storm surge elevation in coastal SFHAs, even in areas not delineated as a special flood hazard area on a FIRM, the area shall be considered as special flood hazard area and subject to the requirements of these regulations;
 2. Are above the base flood elevation and the area is labelled as a SFHA on the FIRM, the area shall be regulated as special flood hazard area unless the applicant obtains a Letter of Map Change that removes the area from the SFHA.
- B. In FEMA-identified special flood hazard areas where base flood elevation and floodway data have not been identified and in areas where FEMA has not identified SFHAs, any other flood hazard data available from a Federal, State, or other source shall be reviewed and reasonably used.
- C. Base flood elevations and designated floodway boundaries on FIRMs and in FISs shall take precedence over base flood elevations and floodway boundaries by any other sources if such sources show reduced floodway widths and/or lower base flood elevations.
- D. Other sources of data shall be reasonably used if such sources show increased base flood elevations and/or larger floodway areas than are shown on FIRMs and in FISs.
- E. If a Preliminary Flood Insurance Rate Map and/or a Preliminary Flood Insurance Study has been provided by FEMA:
1. Upon the issuance of a Letter of Final Determination by FEMA, the preliminary flood hazard data shall be used and shall replace the flood hazard data previously provided from FEMA for the purposes of administering these regulations.
 2. Prior to the issuance of a Letter of Final Determination by FEMA, the use of preliminary flood hazard data shall be deemed the best available data pursuant to Article III, Section 3.1.A.3 and used where no base flood elevations and/or floodway areas are provided on the effective FIRM.
 3. Prior to issuance of a Letter of Final Determination by FEMA, the use of preliminary flood hazard data is permitted where the preliminary base flood elevations or floodway areas exceed the base flood elevations and/or designated floodway widths in existing flood hazard data provided by FEMA. Such preliminary data may be subject to change and/or appeal to FEMA.
 4. Jurisdictional Boundary Changes [44 CFR 59.22, 65.3]

The County floodplain ordinance in effect on the date of annexation shall remain in effect and shall be enforced by the municipality for all annexed areas until the municipality adopts and enforces an ordinance which meets the requirements for participation in the National Flood Insurance Program. Municipalities with existing floodplain ordinances shall pass a resolution acknowledging and accepting responsibility for enforcing floodplain ordinance standards prior to annexation of any area containing identified flood hazards. If the FIRM for any annexed area includes special flood hazard areas that have flood zones that have regulatory requirements that are not set forth in these regulations, the governing body shall prepare amendments to these regulations to adopt the FIRM and appropriate requirements, and submit the amendments to the governing body for adoption; such adoption shall take place at the same time as or prior to the date of annexation and a copy of the amended regulations shall be provided to Department of Conservation and Recreation (Division of Dam Safety and Floodplain Management) and FEMA.

In accordance with the Code of Federal Regulations, Title 44 Subpart (B) Section 59.22(a)(9)(v) all NFIP participating communities must notify the Federal Insurance Administration and optionally the State Coordinating Office in writing whenever the boundaries of the community have been modified by annexation or the community has otherwise assumed or no longer has authority to adopt and enforce floodplain management regulations for a particular area.

In order that all Flood Insurance Rate Maps accurately represent the community's boundaries, a copy of a map of the community suitable for reproduction, clearly delineating the new corporate limits or new area for which the community has assumed or relinquished floodplain management regulatory authority must be included with the notification.

5. District Boundary Changes

The delineation of any of the Floodplain Districts may be revised by the Town of Kilmarnock where natural or man-made changes have occurred and/or where more detailed studies have been conducted or undertaken by the U. S. Army Corps of Engineers or other qualified agency, or an individual documents the need for such change. However, prior to any such change, approval must be obtained from the Federal Emergency Management Agency. A completed LOMR is a record of this approval.

6. Interpretation of District Boundaries

Initial interpretations of the boundaries of the Floodplain Districts shall be made by the Zoning Officer. Should a dispute arise concerning the boundaries of any of the Districts, the Board of Zoning Appeals shall make the necessary determination. The person questioning or contesting the location of the District boundary shall be given a reasonable opportunity to present his case to the Board and to submit his own technical evidence if he so desires.

7. Submitting Model Backed Technical Data [44 CFR 65.3]

A community's base flood elevations may increase or decrease resulting from physical changes affecting flooding conditions. As soon as practicable, but not later than six months after the date such information becomes available, a community shall notify the Federal Emergency Management Agency of the changes by submitting technical or scientific data. The community may submit data via a LOMR. Such a submission is necessary so that upon confirmation of those physical changes affecting flooding conditions, risk premium rates and floodplain management requirements will be based upon current data.

8. Letters of Map Revision

When development in the floodplain will cause or causes a change in the base flood elevation, the applicant, including state agencies, must notify FEMA by applying for a Conditional Letter of Map Revision and then a Letter of Map Revision.

Example cases:

- Any development that causes a rise in the base flood elevations within the floodway.
- Any development occurring in Zones A1-30 and AE without a designated floodway, which will cause a rise of more than one foot in the base flood elevation.
- Alteration or relocation of a stream (including but not limited to installing culverts and bridges) *44 Code of Federal Regulations §65.3 and §65.6(a)(12).*

Section 54-503. ESTABLISHMENT OF ZONING DISTRICTS

1. Description of Special Flood Hazard Districts [44 CFR 59.1, 60.3]

A. Basis of Districts

The various special flood hazard districts shall include the SFHAs. The basis for the delineation of these districts shall be the FIS and the FIRM for the Town of Kilmarnock, VA prepared by the Federal Emergency Management Agency, Federal Insurance Administration, dated July 5, 2022.

The Town of Kilmarnock may identify and regulate local flood hazard or ponding areas that are not delineated on the FIRM. These areas may be delineated on a "Local Flood Hazard Map" using best available topographic data and locally derived information such as flood of record, historic high water marks, or approximate study methodologies.

The boundaries of the SFHA Districts are established as shown on the FIRM which is declared to be a part of this ordinance and which shall be kept on file at the Town of Kilmarnock offices.

1. The **Floodway District** is in an **AE Zone** and is delineated, for purposes of this ordinance, using the criterion that certain areas within the floodplain must be capable of carrying the waters of the one percent annual chance flood without increasing the water surface elevation of that flood more than one (1) foot at any point. The areas included in this District are specifically defined in Table 3 of the above-referenced FIS and shown on the accompanying FIRM.

The following provisions shall apply within the Floodway District of an AE zone [44 CFR 60.3(d)]:

- a. Within any floodway area, no encroachments, including fill, new construction, substantial improvements, or other development shall be permitted unless it has been demonstrated through hydrologic and hydraulic analysis performed in accordance with standard engineering practice that the proposed encroachment will not result in any increase in flood levels within the community during the occurrence of the base flood discharge. Hydrologic and hydraulic analyses shall be undertaken only by professional engineers or others of demonstrated qualifications, who shall certify that the technical methods used correctly reflect currently-accepted technical concepts. Studies, analyses, computations, etc., shall be submitted in sufficient detail to allow a thorough review by the Floodplain Administrator.

Development activities which increase the water surface elevation of the base flood may be allowed, provided that the applicant first applies – with the Town of Kilmarnock’s endorsement – for a Conditional Letter of Map Revision (CLOMR), and receives the approval of the Federal Emergency Management Agency.

If Article III, Section 3.1.A.1.a is satisfied, all new construction and substantial improvements shall comply with all applicable flood hazard reduction provisions of Article 4.

- b. The placement of manufactured homes (mobile homes) is prohibited, except in an existing manufactured home (mobile home) park or subdivision. A replacement manufactured home may be placed on a lot in an existing manufactured home park or subdivision provided the anchoring, elevation, and encroachment standards are met.
2. The **AE, or AH Zones** on the FIRM accompanying the FIS shall be those areas for which one-percent annual chance flood elevations have been provided and the floodway has **not** been delineated. The following provisions shall apply within an AE or AH zone [44 CFR 60.3(c)] where FEMA has provided base flood elevations:

Until a regulatory floodway is designated, no new construction, substantial improvements, or other development (including fill) shall be permitted within the areas of special flood hazard, designated as

Zones A1-30, AE, or AH on the FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the Town of Kilmarnock.

Development activities in Zones A1-30, AE, or AH on the Town of Kilmarnock FIRM which increase the water surface elevation of the base flood by more than one foot may be allowed, provided that the applicant first applies – with the Town of Kilmarnock’s endorsement – for a Conditional Letter of Map Revision, and receives the approval of the Federal Emergency Management Agency.

3. The **A Zone** on the FIRM accompanying the FIS shall be those areas for which no detailed flood profiles or elevations are provided, but the one percent annual chance floodplain boundary has been approximated. For these areas, the following provisions shall apply [44 CFR 60.3(b)]:

The Approximated Floodplain District shall be that floodplain area for which no detailed flood profiles or elevations are provided, but where a one percent annual chance floodplain boundary has been approximated. Such areas are shown as Zone A on the maps accompanying the FIS. For these areas, the base flood elevations and floodway information from Federal, State, and other acceptable sources shall be used, when available. Where the specific one percent annual chance flood elevation cannot be determined for this area using other sources of data, such as the U. S. Army Corps of Engineers Floodplain Information Reports, U. S. Geological Survey Flood-Prone Quadrangles, etc., then the applicant for the proposed use, development and/or activity shall determine this base flood elevation. For development proposed in the approximate floodplain the applicant must use technical methods that correctly reflect currently accepted practices, such as point on boundary, high water marks, or detailed methodologies hydrologic and hydraulic analyses. Studies, analyses, computations, etc., shall be submitted in sufficient detail to allow a thorough review by the Floodplain Administrator.

The Floodplain Administrator reserves the right to require a hydrologic and hydraulic analysis for any development. When such base flood elevation data is utilized, the lowest floor shall be elevated to or above the base flood level plus twenty-four (24) inches.

During the permitting process, the Floodplain Administrator shall obtain:

- a. The elevation of the lowest floor (in relation to mean sea level), including the basement, of all new and substantially improved structures; and,
- b. If the structure has been floodproofed in accordance with the requirements of this article, the elevation (in relation to mean sea level) to which the structure has been floodproofed.

Base flood elevation data shall be obtained from other sources or developed using detailed methodologies comparable to those contained in a FIS for subdivision proposals and other proposed development proposals (including manufactured home parks and subdivisions) that exceed fifty lots or five acres, whichever is the lesser.

2. Overlay Concept

The Floodplain Districts described above shall be overlays to the existing underlying districts as shown on the Official Zoning Ordinance Map, and as such, the provisions for the floodplain districts shall serve as a supplement to the underlying district provisions.

If there is any conflict between the provisions or requirements of the Floodplain Districts and those of any underlying district, the more restrictive provisions and/or those pertaining to the floodplain districts shall apply.

In the event any provision concerning a Floodplain District is declared inapplicable as a result of any legislative or administrative actions or judicial decision, the basic underlying provisions shall remain applicable.

Section 54-504. DISTRICT PROVISIONS [44 CFR 59.22, 60.2, 60.3]

1. Permit and Application Requirements

A. Permit Requirement

All uses, activities, and development occurring within any floodplain district, including placement of manufactured homes, shall be undertaken only upon the issuance of a permit. Such development shall be undertaken only in strict compliance with the provisions of this Ordinance and with all other applicable codes and ordinances, as amended, such as the Virginia Uniform Statewide Building Code (VA USBC) and the Town of Kilmarnock Subdivision Regulations. Prior to the issuance of any such permit, the Floodplain Administrator shall require all applications to include compliance with all applicable State and Federal laws and shall review all sites to assure they are reasonably safe from flooding. Under no circumstances shall any use, activity, and/or development adversely affect the capacity of the channels or floodways of any watercourse, drainage ditch, or any other drainage facility or system.

B. Site Plans and Permit Applications

All applications for development within any floodplain district and all permits issued for the floodplain shall incorporate the following information:

- a. The elevation of the Base Flood at the site.
- b. For structures to be elevated, the elevation of the lowest floor (including basement) or, in V zones, the lowest horizontal structural member.
- c. For structures to be floodproofed (non-residential only), the elevation to which the structure will be floodproofed.
- d. Topographic information showing existing and proposed ground elevations.

2. General Standards

The following provisions shall apply to all permits:

- A. New construction and substantial improvements shall be built according to this ordinance and the VA USBC, and anchored to prevent flotation, collapse, or lateral movement of the structure.
- B. Manufactured homes shall be anchored to prevent flotation, collapse, or lateral movement. Methods of anchoring may include, but are not limited to, use of over-the-top or frame ties to ground anchors. This standard shall be in addition to and consistent with applicable state anchoring requirements for resisting wind forces.
- C. New construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.
- D. New construction or substantial improvements shall be constructed by methods and practices that minimize flood damage.
- E. Electrical, heating, ventilation, plumbing, air conditioning equipment, and other service facilities, including duct work, shall be designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.
- F. New and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system.
- G. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters.
- H. On-site waste disposal systems shall be located and constructed to avoid impairment to them or contamination from them during flooding.

In addition to provisions A – H above, in all special flood hazard areas, the additional provisions shall apply:

- I. Prior to any proposed alteration or relocation of any channels or of any watercourse, stream, etc., within this jurisdiction a permit shall be obtained from the U. S. Corps of Engineers, the Virginia Department of Environmental Quality, and the Virginia Marine Resources Commission (a joint permit application is available from any of these organizations). Furthermore, in riverine areas, notification of the proposal shall be given by the applicant to all affected adjacent jurisdictions, the Department of Conservation and Recreation (Division of Dam Safety and Floodplain Management), other required agencies, and the Federal Emergency Management Agency.
- J. The flood carrying capacity within an altered or relocated portion of any watercourse shall be maintained.

3. Elevation and Construction Standards [44 CFR 60.3]

In all identified flood hazard areas where base flood elevations have been provided in the FIS or generated by a certified professional in accordance with Article III, Section 3.1.A.3 the following provisions shall apply:

A. Residential Construction

New construction or substantial improvement of any residential structure (including manufactured homes) in Zones A1-30, AE, AH, and A with detailed base flood elevations shall have the lowest floor, including basement, elevated to or above the base flood level plus twenty-four (24) inches. See Article III, Section 3.1.A.5 and Article III, Section 3.1.A.6 for requirements in the Coastal A, VE, and V zones.

B. Non-Residential Construction

- 1. New construction or substantial improvement of any commercial, industrial, or non-residential building (or manufactured home) shall have the lowest floor, including basement, elevated to or above the base flood level plus twenty-four (24) inches. See Article III, Section 3.1.A.5 and Article III, Section 3.1.A.6 for requirements in the Coastal A, VE, and V zones.
- 2. Non-residential buildings located in all A1-30, AE, and AH zones may be floodproofed in lieu of being elevated provided that all areas of the building components below the elevation corresponding to the BFE plus two feet are water tight with walls substantially impermeable to the passage of water, and use structural components having the capability of resisting hydrostatic and hydrodynamic loads and the effect of buoyancy. A registered professional

engineer or architect shall certify that the standards of this subsection are satisfied. Such certification, including the specific elevation (in relation to mean sea level) to which such structures are floodproofed, shall be maintained by (title of community administrator).

C. Space Below the Lowest Floor

In zones A, AE, AH, AO, and A1-A30, fully enclosed areas, of new construction or substantially improved structures, which are below the regulatory flood protection elevation shall:

1. Not be designed or used for human habitation, but shall be used solely for parking of vehicles, building access, or limited storage of maintenance equipment used in connection with the premises. Access to the enclosed area shall be the minimum necessary to allow for parking of vehicles (garage door) or limited storage of maintenance equipment (standard exterior door), or entry to the living area (stairway or elevator).
2. Be constructed entirely of flood resistant materials below the regulatory flood protection elevation;
3. Include measures to automatically equalize hydrostatic flood forces on walls by allowing for the entry and exit of floodwaters. To meet this requirement, the openings must either be certified by a professional engineer or architect or meet the following minimum design criteria:
 - a. Provide a minimum of two openings on different sides of each enclosed area subject to flooding.
 - b. The total net area of all openings must be at least one (1) square inch for each square foot of enclosed area subject to flooding.
 - c. If a building has more than one enclosed area, each area must have openings to allow floodwaters to automatically enter and exit.
 - d. The bottom of all required openings shall be no higher than one (1) foot above the adjacent grade.
 - e. Openings may be equipped with screens, louvers, or other opening coverings or devices, provided they permit the automatic flow of floodwaters in both directions.
 - f. Foundation enclosures made of flexible skirting are not considered enclosures for regulatory purposes, and, therefore, do not require openings. Masonry or wood

underpinning, regardless of structural status, is considered an enclosure and requires openings as outlined above.

D. Accessory Structures

1. Accessory structures in the SFHA shall comply with the elevation requirements and other requirements of Article IV, Section 4.3.B or, if not elevated or dry floodproofed, shall:
 - a. Not be used for human habitation;
 - b. Be limited to no more than 600 square feet in total floor area;
 - c. Be useable only for parking of vehicles or limited storage;
 - d. Be constructed with flood damage-resistant materials below the base flood elevation;
 - e. Be constructed and placed to offer the minimum resistance to the flow of floodwaters;
 - f. Be anchored to prevent flotation;
 - g. Have electrical service and mechanical equipment elevated to or above the base flood elevation;
 - h. Shall be provided with flood openings which shall meet the following criteria:
 - (1) There shall be a minimum of two flood openings on different sides of each enclosed area; if a building has more than one enclosure below the lowest floor, each such enclosure shall have flood openings on exterior walls.
 - (2) The total net area of all flood openings shall be at least 1 square inch for each square foot of enclosed area (non-engineered flood openings), or the flood openings shall be engineered flood openings that are designed and certified by a licensed professional engineer to automatically allow entry and exit of floodwaters; the certification requirement may be satisfied by an individual certification or an Evaluation Report issued by the ICC Evaluation Service, Inc.
 - (3) The bottom of each flood opening shall be 1 foot or less above the higher of the interior floor or grade, or the exterior grade, immediately below the opening.
 - (4) Any louvers, screens or other covers for the flood openings shall allow the automatic flow of floodwaters into and out of the enclosed area.

- i. A signed Declaration of Land Restriction (Non-Conversion Agreement) shall be recorded on the property deed.
- E. Standards for Manufactured Homes and Recreational Vehicles
 - 1. In zones A, AE, AH, and AO, all manufactured homes placed, or substantially improved, on individual lots or parcels, must meet all the requirements for new construction, including the elevation and anchoring requirements in Article III, Section 3.1.A.6 and Article IV, Sections 4.2 and 4.3.
 - 2. All recreational vehicles placed on sites must either:
 - a. Be on the site for fewer than 180 consecutive days, be fully licensed and ready for highway use (a recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices and has no permanently attached additions); or
 - b. Meet all the requirements for manufactured homes in Article IV, Section 4.3.E.1.
- 4. Standards for Subdivision Proposals
 - A. All subdivision proposals shall be consistent with the need to minimize flood damage;
 - B. All subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize flood damage;
 - C. All subdivision proposals shall have adequate drainage provided to reduce exposure to flood hazards, and
 - D. Base flood elevation data shall be obtained from other sources or developed using detailed methodologies, hydraulic and hydrologic analysis, comparable to those contained in a Flood Insurance Study for subdivision proposals and other proposed development proposals (including manufactured home parks and subdivisions) that exceed fifty lots or five acres, whichever is the lesser.

Section 54-505. EXISTING STRUCTURES IN FLOODPLAIN AREAS

Any structure or use of a structure or premises must be brought into conformity with these provisions when it is changed, repaired, or improved unless one of the following exceptions is established before the change is made:

- A. The floodplain manager has determined that:
 - 1. Change is not a substantial repair or substantial improvement AND
 - 2. No new square footage is being built in the floodplain that is not complaint AND
 - 3. No new square footage is being built in the floodway AND
 - 4. The change complies with this ordinance and the VA USBC AND
 - 5. The change, when added to all the changes made during a rolling 5-year period does not constitute 50% of the structure's value.
- B. The changes are required to comply with a citation for a health or safety violation.
- C. The structure is a historic structure and the change required would impair the historic nature of the structure.

Section 54-506. VARIANCES: FACTORS TO BE CONSIDERED [44 CFR 60.6]

Variances shall be issued only upon (i) a showing of good and sufficient cause, (ii) after the Board of Zoning Appeals has determined that failure to grant the variance would result in exceptional hardship to the applicant, and (iii) after the Board of Zoning Appeals has determined that the granting of such variance will not result in (a) unacceptable or prohibited increases in flood heights, (b) additional threats to public safety, (c) extraordinary public expense; and will not (d) create nuisances, (e) cause fraud or victimization of the public, or (f) conflict with local laws or ordinances.

While the granting of variances generally is limited to a lot size less than one-half acre, deviations from that limitation may occur. However, as the lot size increases beyond one-half acre, the technical justification required for issuing a variance increases. Variances may be issued by the Board of Zoning Appeals for new construction and substantial improvements to be erected on a lot of one-half acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, in conformance with the provisions of this Section.

Variances may be issued for new construction and substantial improvements and for other development necessary for the conduct of a functionally dependent use provided that the criteria of this Section are

met, and the structure or other development is protected by methods that minimize flood damages during the base flood and create no additional threats to public safety.

In passing upon applications for variances, the Board of Zoning Appeals shall satisfy all relevant factors and procedures specified in other sections of the zoning ordinance and consider the following additional factors:

- A. The danger to life and property due to increased flood heights or velocities caused by encroachments. No variance shall be granted for any proposed use, development, or activity within any Floodway District that will cause any increase in the one percent (1%) chance flood elevation.
- B. The danger that materials may be swept on to other lands or downstream to the injury of others.
- C. The proposed water supply and sanitation systems and the ability of these systems to prevent disease, contamination, and unsanitary conditions.
- D. The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owners.
- E. The importance of the services provided by the proposed facility to the community.
- F. The requirements of the facility for a waterfront location.
- G. The availability of alternative locations not subject to flooding for the proposed use.
- H. The compatibility of the proposed use with existing development and development anticipated in the foreseeable future.
- I. The relationship of the proposed use to the comprehensive plan and floodplain management program for the area.
- J. The safety of access by ordinary and emergency vehicles to the property in time of flood.
- K. The expected heights, velocity, duration, rate of rise, and sediment transport of the flood waters expected at the site.
- L. The historic nature of a structure. Variances for repair or rehabilitation of historic structures may be granted upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure and the variance is the minimum necessary to preserve the historic character and design of the structure.

M. Variances will not be issued for any accessory structure within the SFHA. (*Note: See Article IV, Section 4.3.D.1*).

N. Such other factors which are relevant to the purposes of this Ordinance.

The Board of Zoning Appeals may refer any application and accompanying documentation pertaining to any request for a variance to any engineer or other qualified person or agency for technical assistance in evaluating the proposed project in relation to flood heights and velocities, and the adequacy of the plans for flood protection and other related matters.

Variances shall be issued only after the Board of Zoning Appeals has determined that the granting of such will not result in (a) unacceptable or prohibited increases in flood heights, (b) additional threats to public safety, (c) extraordinary public expense; and will not (d) create nuisances, (e) cause fraud or victimization of the public, or (f) conflict with local laws or ordinances.

Variances shall be issued only after the Board of Zoning Appeals has determined that the variance will be the minimum required to provide relief.

The Board of Zoning Appeals shall notify the applicant for a variance, in writing that the issuance of a variance to construct a structure below the one percent (1%) chance flood elevation (a) increases the risks to life and property and (b) will result in increased premium rates for flood insurance.

A record shall be maintained of the above notification as well as all variance actions, including justification for the issuance of the variances. Any variances that are issued shall be noted in the annual or biennial report submitted to the Federal Insurance Administrator.

Section 54-507. GLOSSARY [44 CFR 59.1]

- A. Appurtenant or accessory structure - A non-residential structure which is on the same parcel of property as the principal structure and the use of which is incidental to the use of the principal structure. Accessory structures are not to exceed 600 square feet.
- B. Base flood - The flood having a one percent chance of being equalled or exceeded in any given year.
- C. Base flood elevation - The water surface elevations of the base flood, that is, the flood level that has a one percent or greater chance of occurrence in any given year. The water surface elevation of the base flood in relation to the datum specified on the community's Flood Insurance Rate Map. For the purposes of this ordinance, the base flood is the 1% annual chance flood.
- D. Basement - Any area of the building having its floor sub-grade (below ground level) on all sides.

- E. Board of Zoning Appeals - The board appointed to review appeals made by individuals with regard to decisions of the Zoning Administrator in the interpretation of this ordinance.
- F. Coastal A Zone - Flood hazard areas that have been delineated as subject to wave heights between 1.5 feet and 3 feet.
- G. Development - Any man-made change to improved or unimproved real estate, including, but not limited to, buildings or other structures, temporary structures, mining, dredging, filling, grading, paving, excavation, drilling or other land-disturbing activities or permanent or temporary storage of equipment or materials.
- H. Elevated building - A non-basement building built to have the lowest floor elevated above the ground level by means of solid foundation perimeter walls, pilings, or columns (posts and piers).
- I. Encroachment - The advance or infringement of uses, plant growth, fill, excavation, buildings, permanent structures or development into a floodplain, which may impede or alter the flow capacity of a floodplain.
- J. Existing construction - For the purposes of the insurance program, structures for which the “start of construction” commenced before the effective date of the FIRM or before January 1, 1975 for FIRMs effective before that date. “Existing construction” may also be referred to as “existing structures” and “pre-FIRM.”
- K. Flood or flooding -
1. A general or temporary condition of partial or complete inundation of normally dry land areas from:
 - a. The overflow of inland or tidal waters; or,
 - b. The unusual and rapid accumulation or runoff of surface waters from any source.
 - c. Mudflows which are proximately caused by flooding as defined in paragraph (1)(b) of this definition and are akin to a river of liquid and flowing mud on the surfaces of normally dry land areas, as when earth is carried by a current of water and deposited along the path of the current.
 2. The collapse or subsidence of land along the shore of a lake or other body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels or suddenly caused by an unusually high water level in a natural body of water, accompanied by a severe storm, or by an unanticipated force of nature such as flash flood or an abnormal tidal surge, or by some similarly unusual and unforeseeable event which results in flooding as defined in paragraph 1 (a) of this definition.

- L. Flood Insurance Rate Map (FIRM) - an official map of a community, on which the Federal Emergency Management Agency has delineated both the special hazard areas and the risk premium zones applicable to the community. A FIRM that has been made available digitally is called a Digital Flood Insurance Rate Map (DFIRM).
- M. Flood Insurance Study (FIS) - a report by FEMA that examines, evaluates and determines flood hazards and, if appropriate, corresponding water surface elevations, or an examination, evaluation and determination of mudflow and/or flood-related erosion hazards.
- N. Floodplain or flood-prone area - Any land area susceptible to being inundated by water from any source.
- O. Floodproofing - any combination of structural and non-structural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents.
- P. Floodway - The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot at any point within the community.
- Q. Freeboard - A factor of safety usually expressed in feet above a flood level for purposes of floodplain management. "Freeboard" tends to compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action, bridge openings, and the hydrological effect of urbanization in the watershed.
- R. Functionally dependent use - A use which cannot perform its intended purpose unless it is located or carried out in close proximity to water. This term includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and shipbuilding and ship repair facilities, but does not include long-term storage or related manufacturing facilities.
- S. Highest adjacent grade - the highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure.
- T. Historic structure - Any structure that is:
1. Listed individually in the National Register of Historic Places (a listing maintained by the Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;

2. Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district;
3. Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of the Interior; or,
4. Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either:
 - a. By an approved state program as determined by the Secretary of the Interior; or,
 - b. Directly by the Secretary of the Interior in states without approved programs.

U. Hydrologic and Hydraulic Engineering Analysis - Analyses performed by a licensed professional engineer, in accordance with standard engineering practices that are accepted by the Virginia Department of Conservation and Recreation and FEMA, used to determine the base flood, other frequency floods, flood elevations, floodway information and boundaries, and flood profiles.

V. Letters of Map Change (LOMC) - A Letter of Map Change is an official FEMA determination, by letter, that amends or revises an effective Flood Insurance Rate Map or Flood Insurance Study. Letters of Map Change include:

Letter of Map Amendment (LOMA) - An amendment based on technical data showing that a property was incorrectly included in a designated special flood hazard area. A LOMA amends the current effective Flood Insurance Rate Map and establishes that a land as defined by meets and bounds or structure is not located in a special flood hazard area.

Letter of Map Revision (LOMR) - A revision based on technical data that may show changes to flood zones, flood elevations, floodplain and floodway delineations, and planimetric features. A Letter of Map Revision Based on Fill (LOMR-F), is a determination that a structure or parcel of land has been elevated by fill above the base flood elevation and is, therefore, no longer exposed to flooding associated with the base flood. In order to qualify for this determination, the fill must have been permitted and placed in accordance with the community's floodplain management regulations.

Conditional Letter of Map Revision (CLOMR) - A formal review and comment as to whether a proposed flood protection project or other project complies with the minimum NFIP requirements for such projects with respect to delineation of special flood hazard areas. A CLOMR does not revise the effective Flood Insurance Rate Map or Flood Insurance Study.

W. Lowest adjacent grade - the lowest natural elevation of the ground surface next to the walls of a structure.

- X. Lowest floor - The lowest floor of the lowest enclosed area (including basement). An unfinished or flood-resistant enclosure, usable solely for parking of vehicles, building access or storage in an area other than a basement area is not considered a building's lowest floor; provided, that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirements of Federal Code 44CFR §60.3.
- Y. Manufactured home - A structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when connected to the required utilities. For floodplain management purposes the term "manufactured home" also includes park trailers, travel trailers, and other similar vehicles placed on a site for greater than 180 consecutive days.
- Z. Manufactured home park or subdivision - a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.
- AA. Mean Sea Level – for purposes of the National Flood Insurance Program, the National Geodetic Vertical Datum (NGVD) of 1929 or the North American Vertical Datum (NAVD) of 1988 to which base flood elevations shown on a community's FIRM are referenced.
- BB. New construction - For the purposes of determining insurance rates, structures for which the "start of construction" commenced on or after September 17, 2010, and includes any subsequent improvements to such structures. For floodplain management purposes, new construction means structures for which the start of construction commenced on or after the effective date of a floodplain management regulation adopted by a community and includes any subsequent improvements to such structures.
- CC. Post-FIRM structures - A structure for which construction or substantial improvement occurred on or after September 17, 2010.
- DD. Pre-FIRM structures - A structure for which construction or substantial improvement occurred before September 17, 2010.
- EE. Primary frontal dune - a continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes immediately landward and adjacent to the beach and subject to erosion and overtopping from high tides and waves during major coastal storms.
- FF. Recreational vehicle - A vehicle which is:
1. Built on a single chassis;
 2. 400 square feet or less when measured at the largest horizontal projection;
 3. Designed to be self-propelled or permanently towable by a light duty truck; and,

4. Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational camping, travel, or seasonal use.
- GG. Repetitive Loss Structure - A building covered by a contract for flood insurance that has incurred flood-related damages on two occasions in a 10-year period, in which the cost of the repair, on the average, equalled 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.
- HH. Severe repetitive loss structure - a structure that: (a) Is covered under a contract for flood insurance made available under the NFIP; and (b) Has incurred flood related damage - (i) For which 4 or more separate claims payments have been made under flood insurance coverage with the amount of each such claim exceeding \$5,000, and with the cumulative amount of such claims payments exceeding \$20,000; or (ii) For which at least 2 separate claims payments have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the insured structure.
- II. Shallow flooding area - A special flood hazard area with base flood depths from one to three feet where a clearly defined channel does not exist, where the path of flooding is unpredictable and indeterminate, and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow.
- JJ. Special flood hazard area - The land in the floodplain subject to a one (1%) percent or greater chance of being flooded in any given year as determined in Article 3, Section 3.1 of this ordinance.
- KK. Start of construction - For other than new construction and substantial improvement, under the Coastal Barriers Resource Act (P.L. – 97-348), means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, rehabilitation, addition, placement, substantial improvement or other improvement was within 180 days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a basement, footings, piers, or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of the construction means the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building.

- LL. Structure - for floodplain management purposes, a walled and roofed building, including a gas or liquid storage tank, that is principally above ground, as well as a manufactured home.
- MM. Substantial damage – Means damage of any origin sustained by a structure whereby the cost of restoring the structure to it's before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred. It also means flood-related damages sustained by a structure on two occasions in a 10-year period, in which the cost of the repair, on the average, equals or exceeds 25 percent of the market value of the structure at the time of each such flood event.
- NN. Substantial improvement - Any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the start of construction of the improvement. The term does not, however, include either:
1. Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions, or
 2. Any alteration of a historic structure, provided that the alteration will not preclude the structure's continued designation as a historic structure.
 3. Historic structures undergoing repair or rehabilitation that would constitute a substantial improvement as defined above, must comply with all ordinance requirements that do not preclude the structure's continued designation as a historic structure. Documentation that a specific ordinance requirement will cause removal of the structure from the National Register of Historic Places or the State Inventory of Historic places must be obtained from the Secretary of the Interior or the State Historic Preservation Officer. Any exemption from ordinance requirements will be the minimum necessary to preserve the historic character and design of the structure.
- OO. Violation - the failure of a structure or other development to be fully compliant with the community's floodplain management regulations. A structure or other development without the elevation certificate, other certifications, or other evidence of compliance required in this ordinance is presumed to be in violation until such time as that documentation is provided.
- PP. Watercourse - A lake, river, creek, stream, wash, channel or other topographic feature on or over which waters flow at least periodically. Watercourse includes specifically designated areas in which substantial flood damage may occur.

Section 54-508. ENACTMENT

Enacted and ordained this 28th day of June, 2022. This ordinance, number 2022-004 of the Town of Kilmarnock, Virginia, shall become effective upon passage.

Signature

Title

Attested

Regional Hazard Mitigation Plan

2023 Update



Prepared By:



Submitted On: _____



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Section 2 Introduction

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2.1 PURPOSE

Hazard mitigation is sustained actions taken to reduce or eliminate long-term risk to people and property from hazards and their effects. A hazard mitigation plan states the aspirations and specific actions a community intends to follow to reduce vulnerability and exposure to future hazard events. A systematic process centered on the participation of citizens, businesses, public officials, and other community stakeholders to formulate these plans

A multi-jurisdictional hazard mitigation plan is the physical representation of a group of local jurisdictions' commitment to reducing risks from natural hazards. Local officials can refer to the Plan in their day-to-day activities and decisions regarding land use and planning, regulation and ordinance creation and enforcement, granting permits, capital improvement investments, and other community initiatives. Additionally, multi-jurisdictional hazard mitigation plans can serve as the basis for states to prioritize future grant funding as it becomes available.

This Plan meets the requirements for a local hazard mitigation plan under regulations within 44 CFR 201.6, published by the Federal Emergency Management Agency (FEMA) in September 2009.

This Plan update allows jurisdictions within the Northern Neck Planning District Commission (NNPDC) to obtain all disaster assistance, including all categories of Public Assistance, Individual Assistance, and Hazard Mitigation grants available through the Robert T. Stafford Disaster Relief and Emergency Assistance Act, P.L. 93288, as amended. In addition, future enhancements of the State All-Hazard Mitigation Plan will allow the State to obtain more significant funding for hazard mitigation planning and projects (20 percent of Federal Stafford Act disaster expenditures versus 7.5 percent for a standard state



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plan). It also keeps the State eligible for the annually funded Building Resilient Infrastructure and Communities (BRIC) Program and the Flood Mitigation Assistance Program.

Without this Plan, all eligible local jurisdictions would be ineligible to receive various disaster recovery programs. Including the Public Assistance Program to repair or replace damaged public facilities and the Fire Management Assistance Program to help the State and communities recover from the costs of major disasters. In contrast, the State and local communities would remain eligible for certain emergency assistance and Human Services programs available through the Stafford Act.

The Northern Neck Regional Hazard Mitigation Plan 2023 Update will continue to be a valuable tool for all community stakeholders by increasing public awareness about local hazards and risks and providing information about options and resources available to reduce those risks. Educating the public about potential dangers will help each jurisdiction protect itself against the effects of future hazards and will enable informed decision-making regarding where to live, purchase property, or locate a business.

The 2017 plan was updated in 2023 by the Northern Neck Planning District Commission. The 2023 version of the Plan includes the most current population and demographics, all mitigation strategies, goals, and objectives, and a review and update of most maps.

2.2 Organization of the Plan

The Plans organization parallels the structure provided in 44 CFR 201.6. It has ten sections, appendices containing mitigation assessment annexes., supporting documentation, and adoption resolutions. In addition, there are references to the CFR throughout the Plan. Where possible, these provide specific section and subsection notations to aid the review process. The plan organization is as follows:

- Section 1: Table of Contents
- Section 2: Introduction
- Section 3: Community Profile
- Section 4: Adoption and Approval
- Section 5: Planning Process
- Section 6: Hazard Identification, Profiling, and Ranking
- Section 7: Risk Assessment
- Section 8: Capability Assessment
- Section 9: Mitigation and Action Plan
- Section 10: Plan Monitoring and Maintenance
- Appendices

There are references to 44 CFR throughout the Plan. The Plan also includes references to the FEMA crosswalk document, which reviews mitigation plans.

2.3 HAZARDS AND RISK ASSESSMENT

2.3.1 HAZARDS

The Hazard Identification and Risk Assessment (HIRA) provides a systematic and objective approach to assessing hazards and their associated risks that provides an objective measure of an identified threat and leads to the ability to mitigate the risk of a hazard. The HIRA assists by providing a tool that jurisdictions can use to assess risk based on potential impacts on a community and the frequency of an event.

Systematic risk assessments can shift the focus of programs from being solely reactive to being proactive. A proactive approach to emergency management leads to more disaster-resilient communities.



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The HIRA is a crucial component of a hazard mitigation plan because it provides a solid fact base on which to base mitigation goals and strategies. The HIRA consists of three components:

1. Identification of hazards that could affect the Northern Neck Region
2. Profiling hazard events and determining what areas and community assets are the most vulnerable to damage from these hazards
3. Estimation of losses and prioritization of potential risks to the community

The Northern Neck Hazard Mitigation Working Group (NNHMMWG) re-evaluated the identified hazards during the planning process to determine the threats with the most significant impacts. However, the NNHMMWG did not address specific hazards due to the infrequency of occurrences and their limited impact. Sections 6 and 7 of this Plan include detailed descriptions of the process used to assess and prioritize the Northern Neck Region's risks from natural hazards and quantitative risk assessments for the region. Ten hazards were initially identified in the 2017 Plan, but the NNHMMWG has specified and included 3 (three) additional hazards in this update. The current list of threats in priority order are:

- Tornado
- Severe Weather
- Coastal Flooding
- Riverine Flooding
- Wildfire
- Winter Storm
- Hurricane/Tropical storm
- Coastal Erosion
- *Pluvial Flooding*
- *Landslide*
- Drought
- *Heatwave*
- Earthquake

Note: Hazards in Italics are additions to this plan update

For each of these hazards, the profiles in Section 6 include:

- Description
- Geographical Extent
- Severity
- Impact on Life and Property
- Occurrence (probability)

2.3.2 Risks

Calculating risk is a numerical indication of potential future damages and is a FEMA requirement. Although the range of events from a tornado to earthquake all have some potential to affect the Northern Neck Region: tornado, severe weather, wildfire, and coastal and riverine flooding are the most significant countywide hazards, based on the criteria and experience.

2.4 HAZARD MITIGATION GOALS, OBJECTIVES, AND ACTIONS

Section 9 of this Plan describes the Northern Neck Region's priorities for mitigation actions. The section divides the actions by priority, and describes the funding required, sources of funding, the level of support,



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and the timing of the action. The section also includes the Northern Neck Region's hazard mitigation goals and objectives.

2.4.1 HAZARD MITIGATION GOALS

The Northern Neck Region Hazard Mitigation Steering Committee and Working Group members used the results of the Hazard Identification and Risk Assessment (HIRA) and the Capability Assessment to assess the stated goals to inform updated strategies, actions, and projects for the region and their jurisdictions. The priorities differ somewhat from jurisdiction to jurisdiction. Each jurisdiction's priorities were developed based on historical damages, existing exposure to risk, community goals, and weaknesses identified in the Capability Assessment.

The Hazard Mitigation Steering Committee supported updating the goals, objectives, and mitigation actions. The mitigation actions provide direction and focus on addressing or solving local mitigation issues and problems effectively. The Northern Neck Regional Hazard Mitigation goals are:

Goal 1: Promote sustainable development utilizing alternative pathways that encompass proactive adaptations to mitigate against the risks posed by natural hazards, anticipate vulnerabilities, and strengthen regional resiliency.

Goal 2: Monitor the impacts of climate change utilizing multiple sources of scientific expertise, historical data, and technological advances to expand problem-solving options and mechanisms that address the threat of natural hazards to the Northern Neck Region.

Goal 3: Pursue opportunities to increase the resiliency of critical infrastructure through ongoing capabilities assessments, known hazard monitoring, and developing comprehensive strategies in the communities.

Goal 4: Enhance the capabilities of local government to address natural hazards to enhance the whole community for increased resilience.

Goal 5: Coordinate education on disaster preparedness by providing knowledge and teaching skills to citizens and visitors, focusing on vulnerable people, to mitigate the risk of casualties.

Goal 6: Encourage education and assist communities in developing and enforcing solid floodplain management programs and participation and compliance with the National Flood Insurance Program (NFIP), utilizing available resources and tools to identify the floodplains and risk areas.

During jurisdictional interviews, the Working Group reviewed the objectives and strategies from the previous plan during Steering Committee and Working Group Meetings and within individual localities. Events, lessons learned, and revised goals were considered during these conversations.

2.4.2 OBJECTIVES

Objectives are well-defined intermediate points in the process of achieving goals. (*Objectives* are generally coterminous with *strategies*.) The Northern Neck's Regional mitigation planning objectives include:

- Pursuing the implementation of the high-priority, low/no-cost recommended actions.
- Keeping the concept of mitigation at the forefront of community decision-making by identifying and stressing the recommendations of the Hazard Mitigation Plan when other community goals, plans, and activities are discussed and decided.
- Maintaining constant monitoring of multi-objective, cost-share opportunities to assist the participating communities in implementing the recommended actions of this plan for which no current regular funding or support exists.



Northern Neck Regional Hazard Mitigation Plan Section 2: Introduction

- Incorporate hazard risk information, and prioritize mitigation actions into appropriate local initiatives and programs through collaborative interaction between all related community departments and staff.
- Evaluating and assessing regional mitigation plan goals and local jurisdiction action effectiveness to reduce hazard risk exposure.

2.4.3 ACTIONS

Actions are detailed and specific strategies, actions, and projects that help support regional natural hazard resilience and mitigation goal achievement. They are highly focused, precise, and measurable. The Northern Neck's Regional mitigation actions include, but are not limited to:

- Installation of check valves in stormwater runoff systems
- Community outreach programs
- Structural retrofits of flood-prone critical infrastructure
- Storm sewer infrastructure improvements
- Engineering studies to improve drainage problems
- Generator installation for critical infrastructure
- Integration of Greenspace, wherever applicable
- Creating public education opportunities
- Acquisition of flood prone properties (least likely scenario in the region)

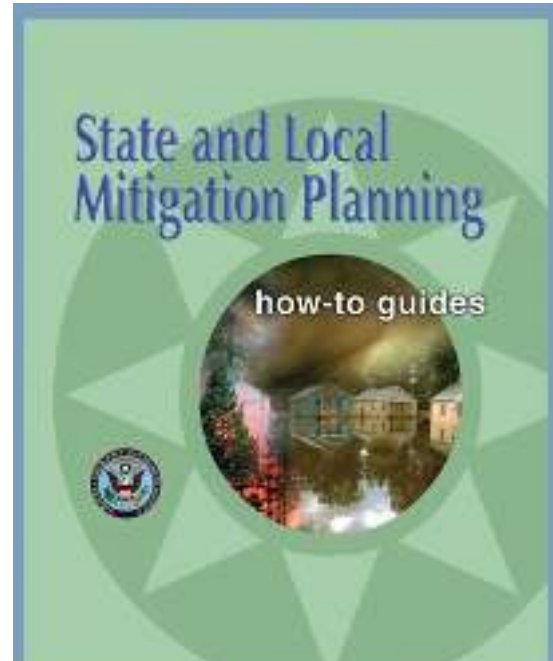
The above list illustrates overall action items rather than an exhaustive list. Please refer to Section 9.3.3 for more information on jurisdictional-specific mitigation actions.

2.5 PLANNING PROCESS

This Plan update is the product of the efforts of a cross-section of people from Lancaster, Richmond, Northumberland, and Westmoreland Counties, federal, state, and local jurisdictions, and other interested stakeholders. This effort builds on several mitigation planning initiatives dating back to 2003. The Executive Director, the staff from the Northern Neck Planning District Commission (NNPDC), Virginia Department of Emergency Management (VDEM Region 5), and Federal Emergency Management Agency (FEMA) Region 3, have provided technical expertise, including a review of previous hazard mitigation planning initiatives, development of mitigation strategies, and the strategy implementation plan.

The Plan update was prepared following the process established in the State and Local Mitigation Plan Development Guides produced by the Federal Emergency Management Agency (FEMA) and 44 CFR 201.6 Local Mitigation Plan.

The process includes four basic steps:





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Step 1 Organize Resources. Organizing resources is in Section 5 (Planning Process). The section details the jurisdictions involved, the processes used to establish leadership and advisory groups, and public and other outreach and involvement efforts.

Step 2 Assess Risks. The risk assessment was completed with the assistance of Olson Group consultants and approved by the NNHMMWG. The Risk Assessment is in Section 7 of the Plan, and a separate Hazard Identification is in Section 6.

Step 3 Develop a mitigation plan. Development of the Mitigation Plan is in Section 5 (Planning Process) and Section 9 (Mitigation Action Plan). Section 5 includes details about who was involved, the processes used, and the products developed. Section 9 provides specific information about identifying and developing mitigation goals, objectives, and actions based on Section 7 (Risk Assessment) and Section 8 (Capability Assessment).

Step 4 Implement the Plan and monitor progress. Implementing the Plan is described in the Mitigation Action Plan in Section 9, which includes details about who is responsible for implementing specific strategies and actions. In Section 10, the Plan Monitoring and Maintenance section describes long-term implementation through periodic updates and reviews.

Once the Plan update is promulgated by the NNPDC and approved by FEMA, the Committee will function as an advisor to the State Hazard Mitigation Officer on hazard mitigation efforts, including future reviews and revisions.

2.6 ADOPTION AND APPROVAL

[NOTE TO VDEM/ FEMA REVIEWERS: The following date will be filled in after these events take place.

The Northern Neck Planning District Commission, with the endorsement of the Northern Neck Regional Steering Committee was responsible for recommending plan approval to the 10 jurisdictions within the Northern Neck Region. The Plan was submitted to VDEM and then FEMA Region III for review. FEMA reviewed and approved the Plan pending adoption on [Insert DATE]. Subsequently, the participating jurisdictions adopted the Plan, submitted their adoption resolutions to FEMA, and received their own approval notifications (see Appendices H and I).

The following 10 jurisdictions participated in the Plan by taking an active part in the planning process, identifying mitigation actions, and will adopt the Plan:

- Lancaster County
- Town of Irvington
- Town of Kilmarnock
- Town of White Stone
- Northumberland County
- Richmond County
- Town of Warsaw
- Westmoreland County
- Town of Colonial Beach
- Town of Montross



Northern Neck Regional Hazard Mitigation Plan Section 2: Introduction

2.7 IMPLEMENTATION

The implementation process is described as part of the specific actions in the Mitigation Action Plan in Section 9.

2.8 MONITORING AND UPDATING THE PLAN

Section 10 (Plan Monitoring and Maintenance) describes the schedule and procedures for ensuring that the Plan stays current. The section identifies when the Plan must be updated, who is responsible for monitoring the Plan, and ensuring that the update procedures are implemented. This section provides a combination of cyclical dates (oriented toward FEMA requirements) and triggering events that will initiate amendments and updates to the Plan.

2.9 PLAN POINT OF CONTACT

The NNPDC Executive Director is responsible for monitoring the Plan and initiating the cyclical update process. The point of contact is:

Jerry W. Davis, AICP
Executive Director
Northern Neck Planning District Commission
PO Box 1600
Warsaw VA 22572
Phone: 804-333-1900



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Northern Neck Regional Hazard Mitigation Plan

Section 3: Community Profile

Section 3

Community Profile

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 - 3.2.2 Hydrology
 - 3.2.3 Physiography
 - 3.2.4 Climate
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 - 3.2.6 Race and Gender
 - 3.2.7 Language
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 - 3.2.10 Income
 - 3.2.11 Housing
 - 3.2.12 Business and Labor
 - 3.2.13 Agriculture
 - 3.2.14 Transportation
 - 3.2.15 Infrastructure
- 3.3 Disadvantaged Communities

3.1 Introduction

The recommendations in the Northern Neck Regional Hazard Mitigation Plan are based on identification of past and potential problems due to natural and man-made hazards. As part of the process of identifying potential problems, it is useful to understand the physical characteristics of the Northern Neck Region.



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3.2 Geography, Climate, and Population of Northern Neck Region

3.2.1 Geography

The Northern Neck Planning District Commission (NNPDC) encompasses four counties and six towns in the eastern part of Virginia:

Counties:

- Lancaster
- Northumberland
- Richmond
- Westmoreland

Towns:

- Town of Colonial Beach
- Town of Irvington
- Town of Kilmarnock
- Town of Montross
- Town of Warsaw
- Town of White Stone

The Potomac River binds the Northern Neck Region north and east, the Chesapeake Bay east, and the Rappahannock River south and west. In total, the planning area encompasses approximately 745 square miles. Lancaster County is the smallest county in the Northern Neck Region, with 133 square miles, based on the total land mass. Westmoreland County is the largest at 229 square miles. Northumberland and Richmond Counties are comparable at 192 and 191 square miles, respectively.

The four counties share more than 1,110 miles of shoreline. Figure 3-1: shows the Northern Neck Planning District. Nearby localities to the south include Caroline County, Essex County, and Middlesex County. The Northern Neck Region is approximately 65 miles northeast of the City of Richmond, the State capital, and 120 miles southeast of Washington, D.C. The northern border is the Potomac River and the State of Maryland.



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Figure 3-1: The Northern Neck Planning District



Source: Northern Neck Soil & Water Conservation District <https://www.nnswcd.org/images/NNmap.jpg>

Lancaster County

Lancaster County covers approximately 135 square miles or about 86,267 acres of land. Lancaster County lies in Virginia's coastal plain and is bound on the east by the Chesapeake Bay and to the south and west by the Rappahannock River. Both water bodies are major contributors to the county's 180 miles of shoreline. The terrain is generally flat with the highest elevations around 100 feet above sea level. The county is rural in nature with limited public infrastructure. Due to limited public water supply and wastewater treatment infrastructure, Lancaster County usually requires on-site sewage facilities for the disposal of waste and individual or community wells for domestic water supplies. In addition, a wide variety of environmentally sensitive areas in the county include steep slopes, floodplains, prime agricultural lands, wetlands, and soils unsuitable for septic systems.

Roughly 65% of Lancaster County's land is limited in some form. Specific physical limitations causing concern include:

- the suitability of soils for septic systems,
- the loss of prime agricultural farmlands to development, and



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- the presence and location of shrink-swell soils.

The continuing loss of farmland to other uses is of great concern. For example, farmlands provide acres of the previous land surface that act as recharge areas for groundwater aquifers and are particularly important to Lancaster County, which depends entirely on groundwater aquifers for its drinking water supply.

Lancaster County is known for its tourist and recreational attractions. Historic sites, buildings, and marinas attract visitors throughout the year. The retiree population is increasing while younger generations are leaving the area.

Town of Irvington

The Town of Irvington is in Lancaster County, located along the shoreline of Carter's Creek, and is approximately 1.8 square miles. The town has over eight miles of shoreline and encompasses a healthy amount of water related business and industry, additionally there are many attractions that draw tourists to the historic town. In 2019 the town received a potential economic boost in the form of the new Compass Entertainment Complex. Construction on the complex began in 2019 and opened in September 2020.

The Town provides water service to residents. However, the majority septic and water services remain via private on-site management. The Tides Inn and the Tides Lodge both maintain their own wastewater treatment facilities.

Town of Kilmarnock

The Town of Kilmarnock is the largest incorporated town in Lancaster County. The town is unique in geography as its borders reach into both Lancaster and Northumberland Counties presenting a of approximately 2 (two) square miles. The town hosts a prominent seafood and agriculture economy and presents a popular tourism market. The town has initiated a grant program to assist business owners with façade improvements as part of town revitalization projects and economic development planning.

Sewage and water are provided by the Town for most properties. Sandy and loamy soils present runoff issues and vegetation growth with elevation above sea level ranging widely.

The town is home to the Bon Secours Rappahannock General Hospital, a satellite campus of the Rappahannock Community College, and Town Centre Park. Town Centre Park presents 9 acres of recreation that utilizes resilient mitigation practices such as underground utility lines. The town's commitment to green infrastructure is apparent in the park with actions such as vegetation being planted to assist with runoff.

Town of White Stone

The Town of White Stone, located in Lancaster County, is laced with history. Famously located in the town is the Robert O. Norris bridge that spans two miles across the Rappahannock River. The town measures approximately one square mile with the majority being land, and an elevation above sea level of 40-50 feet. Seafood and agriculture dominate the economy and provide the town's businesses such as restaurants and markets with supplies. The town's comprehensive plan states that it is identified in two ways, R-1 for residential and C-1 for commercial and states the following in reference to its R-1 district: "This district is composed of certain quiet, low-density residential areas plus certain open areas where similar residential development appears likely to occur. The regulations for this district are designed to stabilize and protect the essential characteristics of the district, to promote and encourage a suitable environment for family life where there are children, and to prohibit all activities of a commercial nature."



Northern Neck Regional Hazard Mitigation Plan

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The Town just executed Phase 1 for a new wastewater treatment plant. The new plant was successfully put into operation on September 22, 2022. The first phase of the project included 175 hook-ups. Recent town upgrades include a business district revitalization project and the White Stone Neighborhood Improvement Project, both of which contribute to the operability of the town and incorporate resilient mitigation measures for the Town of White Stone.

Northumberland County

According to the U.S. Census, the Northumberland County comprises 286 square miles. The Rappahannock River binds Northumberland County to the south, the Potomac River to the north, and the Chesapeake Bay to the east. Northumberland County has an agricultural landscape with significant forestry where farming is dominant. Residential development is concentrated along roads and the waterfront. Manufactured homes are scattered throughout the county but, like other types of residential development, are found primarily along roads, with marinas and industrial construction along the waterfront. Northumberland County is often referred to as “the Mother County of the Northern Neck.”

Elevations in the county vary widely from approximately 5 feet in coastal areas such as Reedville to around 130-140 feet in the most inland landscapes. County water and sewage is serviced in some areas by the Callao and Reedville wastewater treatment plants. Some areas remain dependent on private on-site management systems.

The Village of Callao began a quest to revitalize the area in 2015 noting the need for improvements to the business district, roads, and integration of resilient infrastructure practices in public areas. In 2021 grants funds were awarded to the County and bids were sought for improvements to the Callao and Reedville wastewater treatment facilities.

Richmond County

Richmond County comprises a land area of approximately 192 square miles and 24 square miles of water equaling 216 square miles total. The county is bordered by Westmoreland County to the north, Northumberland County to the east, and the Rappahannock River from west to south. Agricultural land use dominates the landscape of primarily rural Richmond County. Most of the county's land area is agriculture and forestry in nature. Forests cover approximately 59% of the county and a large portion is protected in conservation, with agriculture remaining evident in most of the residual land areas. Six Thousand acres of the Rappahannock River Valley National Wildlife Refuge are in Richmond County. The county boasts some of the highest elevations in the Northern Neck Region with most land elevations reported over 100 feet.

Richmond County manages several solid waste facilities, and the Town of Warsaw maintains a wastewater treatment facility and town water and sewage services. The county widely remains dependent on private on-site management systems such as wells and septic.

Richmond County is steeped with historical significance and was founded in 1692. The county sites in their comprehensive plan the importance of preserving the rurality of the community while working towards technological expansions. Population and occupancy varies widely in Richmond County including fulltime residents of increasing age groups, secondary homes, an Amish community, and a tourism base. Surveys identified the need for more non-motor vehicle transportation paths. The County is currently working through VDOT grants create a recreational trail network that will ultimately connect several main focal points throughout Warsaw.



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Town of Warsaw

The Town of Warsaw, located in Richmond County identifies as “the Heart of Virginia’s Northern Neck” and is comprised of approximately three square miles of which all is land. The town’s elevation is significant within the Northern Neck Region as it is reported as approximately 130 feet. The town’s demographics presents with approximately 29% of the population being of or close to retirement age. Surveys performed by the County presented the need for more non-motor vehicle paths such as walking and biking trails. Warsaw is currently benefiting from that through the County’s development projects’ with VDOT, creating a recreational trail network that intended to connect several main focal points throughout Warsaw.

Warsaw is enriched with historic sites such as Menokin and Sabine Hall and hosts critical facilities that include the Northern Neck Regional Jail and the Warsaw Sewage Plant. Water and sewage services are maintained by the Warsaw Public Works Department.

The town strives to maintain the local history and community awareness. Tourist attractions in the area include historic sites and local shops, as well as the local park, access to the Rappahannock River Valley National Wildlife Refuge, and camping at Naylor’s Mill Campground.

Westmoreland County

Westmoreland County covers 253 square miles, of which only 24 square miles is water. The county is bordered by the Potomac River and Maryland to the north, Northumberland County to the southeast, the Rappahannock River and Richmond County to the south and King George County to the northwest. Westmoreland County is a rural area featuring numerous waterfront communities. Most of the county is forestland. Residences and businesses are distributed throughout the county but are often clustered near the Towns of Colonial Beach and Montross, or in one of the numerous small communities. There is also an unusually high percentage of seasonal homes used recreationally. Residential subdivisions are mostly located along the county’s creeks, bays, or rivers.

Municipal water service is available to various areas in Westmoreland County including the Town of Colonial Beach and the Town of Montross, and wastewater services provided by Westmoreland County serve the Town of Montross and the corridor that runs south along Route 3 to Templeman’s Crossroads. Westmoreland County also attends to the Coles Point and Washington District areas with public wastewater services. The Town of Colonial Beach operates a wastewater treatment plant for the town. Outside of the areas mentioned above, the remainder of properties are managed by private on-site management systems. The Westmoreland County Solar Project is a ground-mounted solar project which is spread over an area of 161 acres and was initiated by Savion LLC in 2021. The project currently is active and sells produced energy to Dominion Power.

The county contains the Westmoreland State Park and Voorhees Nature Preserve. The area is steeped in historic events and figures pertinent to the shaping of the United States. The economy in Westmoreland County is based largely around agriculture and tourism.

Town of Colonial Beach

The Town of Colonial Beach, located in Westmoreland County, located along the Potomac River. The town measures approximately 2.5 square miles of which 0.2 square miles is water and the elevation averages approximately ten feet above sea level. The town is populated relatively evenly across age groups and draws a significant tourist following yearly.



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Colonial Beach provides water and sewage services and has entered multiple improvement projects in recent years. Projects include living shoreline initiatives, water and sewage improvements, the Central District Drainage project, and is currently seeking funding to address a significant erosion issue at North Beach. The town utilizes green infrastructure practices when planning improvements to increase their resiliency.

Colonial Beach boasts a significant tourism market utilizing the history, natural resources, and unique destination to draw visitors. They are working to continue their revitalization project and in 2022 managed a project in which building inventory records were recorded for the town.

Town of Montross

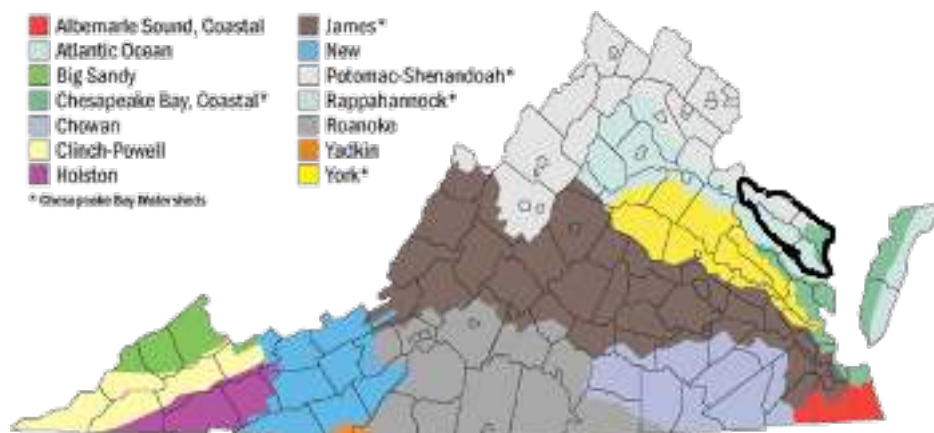
The Town of Montross is the county seat in Westmoreland County with a small population of approximately 500 during the 2020 Census. The town is all land measuring one square mile with an elevation well above 100 feet. Montross encompasses access to the nearby Westmoreland State Park, which provides a nature rich environment for residents and visitors. Municipal water access is provided to residents and businesses of the town as well as some properties just outside of town limits.

Montross underwent a significant revitalization project in the last decade that brought improvements to roadways, drainage, structures, and additional measures such as beautiful public murals, landscaping, and streetlights.

3.2.2 Hydrology

The Northern Neck Region lies within three major watersheds: the Potomac, the Rappahannock, and the Chesapeake Bay Coastal. Numerous creeks traverse the Northern Neck Region, and multiple inlets and coves mark the shoreline. Figure 3-2: Virginia's Major Watersheds, illustrates the significant watersheds of Virginia, emphasizing the Northern Neck Region in a bold black outline.

Figure 3-2. Virginia's Major Watersheds



Source: The Virginia Department of Conservation and Recreation

The Potomac Watershed comprises about 20% of the Chesapeake Bay watershed and is a major factor in the bay's restoration. The Potomac Watershed spans 5,702 square miles, is the third largest in Virginia, and is fed mainly by the Shenandoah, South Branch Potomac, Monocacy, Anacostia Rivers and the Conococheague Creek. Major uses of water in this area are for public and domestic water supply, power plant cooling, industrial use, and agriculture. About 600 million gallons per day (mgd) is used for the water



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supply, of which 500 mgd is used for the Washington area. About 1.6 billion gallons, most of which is returned to streams, is used daily for power plant cooling and industrial use. Population increases in the Washington area increases the strain on the supply of drinking water, leading to issues related to water quality, legacy pollution, emerging contaminants, and reliability and safety of drinking water supplies.

The Rappahannock Watershed is fed primarily by the Rappahannock River, Rapidan River, and Hazel River to the west of the planning district commission. Most of the Northern Neck Region falls within the bounds of this watershed.

The Rappahannock Watershed covers about 2,715 square miles and supports a variety of land uses: primarily fishing with manufacturing, light industrial, and retail applications in the Northern Neck Region. According to U.S. Geological Survey data, the Rappahannock Watershed (above the fall line) has the highest yield (load/unit area) of total nitrogen, total phosphorous, and total suspended solids of all the Chesapeake Bay tributary basins in Virginia, which contributes to localized dead zones (little or no oxygen) closer to the mouth of the Rappahannock each summer due to excess nutrient pollution. In addition, according to the Virginia Marine Resources Commission, commercial fish landings for shad and oysters in this area of the Rappahannock have declined precipitously since the early 1970s.

The Chesapeake Bay Coastal Watershed comprises the Chesapeake Bay and is 2,577 square miles, though only a tiny portion of the Northern Neck Region falls within it. The Great Wicomico and Corrotoman Rivers flow through the watershed. In addition, the Chesapeake Bay Coastal and the Potomac and the Rappahannock watersheds are part of the larger Chesapeake Bay Watershed. The Chesapeake Bay is the largest estuary in North America and the third largest in the world. More than 150 major rivers and streams flow into the bay's 64,299 square mile drainage basin, which covers six states (New York, Pennsylvania, Delaware, Maryland, Virginia, and West Virginia) and all of Washington, D.C. The bay is approximately 200 miles long from its northern headwaters in Havre de Grace, Maryland, to its outlet in the Atlantic Ocean by Virginia Beach, Virginia. The bay and its tidal tributaries have 11,684 miles of shoreline—more than the entire U.S. west coast. Approximately eight million acres of land in the Bay watershed are protected from development.

Since the early twentieth century, the Chesapeake Bay has experienced severe environmental degradation. Problems include:

- significant reductions in seagrass,
- reduced amounts of finfish and shellfish (especially oysters and crabs),
- seasonal depletions in dissolved oxygen, and
- increases in sedimentation.

Environmental concerns were voiced in the 1970s over the damage to critical habitats and the decline in water quality. Species in bay waters were being negatively affected, resulting in threats to commercial and recreational activities. Most marine scientists believe these changes are related to ecological stress due to increased human activities. Causes include deforestation, agriculture (including fertilizers), urbanization, pollution, and sewage. Between 1950 and 2019, there was an observed 119% increase in the watershed's population. In 2020, the Chesapeake Bay Program estimated that 18.4 million people lived in the Chesapeake Bay Watershed, a 0.23% increase from 2019. Experts predict the watershed's population will pass 22 million by 2050. (The Chesapeake Bay Program, <https://www.chesapeakebay.net/state/population>)



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3.2.3 Physiography

The Northern Neck Planning District is part of the greater Atlantic Coastal Plain, a landscape characterized by gently rolling hills and valleys but also can be locally quite rugged where short, high-gradient streams have incised steep ravine systems. The Northern Neck Region falls within two sub-provinces of Virginia's Coastal Plain. Low slopes characterize the upland sub-province and gentle drainage divides. Steep slopes develop in areas dissected by streams and are also present where the upland meets the Potomac and Rappahannock Rivers. Elevations in the upland sub-province ranges from 60 to 250 feet. The other sub-province is the lowland sub-province, which is the flat, low-relief region along major rivers and near the Chesapeake Bay. Elevations in the lowland sub-province ranges from 0 to 60 feet. The fall line, which delineates the division between Coastal Plain and Piedmont, lies west of the Northern Neck Region.

3.2.4 Climate

The Northern Neck Region lies within the Atlantic Coastal Plain, with flat topography and sandy or muddy soil. This region has a humid subtropical climate, with hot summers and a short, mild, to cool winter. This humid subtropical climate is influenced by the Chesapeake Bay and the Atlantic Ocean, which moderate the weather but do not prevent ice formation almost every winter on the bay's northern tributaries. Mountains to the west produce blocking and steering effects on storms and air masses from the Great Lakes. The open water bodies that border the Northern Neck Region provide a buffer to atmospheric changes and allow for breezes that offset humidity.

Average high temperatures in the Northern Neck Region are about 76.1° F in the summer and 39.7° F in the winter. Precipitation is high and subject to seasonal influences, particularly along the coast. The average annual rainfall is approximately 45.19 inches, and the average annual snowfall is 11.5 inches.

3.2.5 Population

The total population for the Northern Neck Region is listed as 50,158 in 2020 using the newest population estimates from the U.S. Census Bureau's 2020 American Community Survey (Table 3-1: Population Statistics for the Northern Neck Region), which is a 1.2% increase in the total population since 2016. Two of the four counties experienced negative growth rates. Population projections for the Northern Neck Region are consistent with the U.S. Census population percent change from 2016 to 2020. Lancaster and Northumberland counties are projected to experience population decreases through 2050, while Richmond and Westmoreland counties are projected to experience population growth (Table 3-2: Population Projections for Northern Neck Region, 2030-2050). Projections predict that the population across the Northern Neck Region will remain stable.

Table 3-1: Population Statistics for the Northern Neck Region

Jurisdiction	Estimated Population, 2020	Percent Change in Population 2016-2020
Lancaster	10,919	-0.49%
Northumberland	11,839	-3.2%
Richmond	8,923	1.7%
Westmoreland	18,477	4.9%
NNPDC (total)	50,158	1.2%

Source: 2020 American Community Survey (ACS), 2020 Decennial Census



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Table 3-2: Population Projections for the Northern Neck Region, 2030-2050.

Jurisdiction	2030	2040	2050
Lancaster	10,297	9,826	9,502
Northumberland	11,185	10,813	10,603
Richmond	8,469	8,400	8,457
Westmoreland	19,220	19,804	20,683
NNPDC (total)	49,171	48,843	49,245

Source: University of Virginia Weldon Cooper Center, Demographics Research Group. (2022). Virginia Population Projections. Retrieved from: <https://demographics.coopercenter.org/virginia-population-projections>

3.2.6 Race and Gender

Nearly the entire population (97.6%) of the Northern Neck Region reports being a single race according to U.S. Census Bureau's 2020 Population Estimates Program. The region's average population by race is 69.4% White alone, 27.0% Black or African American alone, and 0.8% Asian alone (Table 3-3: Racial Demographics of the Northern Neck Region). An average of 0.4% of the NNPDC population reported being other races alone and 2.3% reported being two or more races.

Table 3-3: Racial Demographics of the Northern Neck Region.

Jurisdiction	White Alone	African American Alone	Asian Alone	Other Races Alone	Two or More Races
Lancaster	69.3%	28.2%	0.9%	0.3%	1.4%
Northumberland	72.4%	24.8%	0.6%	0.4%	1.8%
Richmond	66.2%	30.0%	0.7%	0.7%	2.5%
Westmoreland	69.7%	25.0%	0.9%	0.1%	3.3%
NNPDC (average)	69.4%	27.0%	0.8%	0.4%	2.3%

Source: 2020 U.S. Census Bureau Population Estimates Program

In the region, there are slightly more males than females, with male persons accounting for 50.9% of the population and female persons make up the remaining 49.1% of the population. Richmond County has the largest difference in percentage of population that are females versus males, likely due to the presence of a correctional center in Haynesville. See Table 3-4: Gender Statistics for the Northern Neck Region.

Table 3-4: Gender Statistics for the Northern Neck Region.

Jurisdiction	Female	Male
Lancaster	52.0%	48.0%
Northumberland	50.7%	49.3%
Richmond	42.9%	57.1%
Westmoreland	50.6%	49.4%
NNPDC (average)	49.1%	50.9%

Source: 2020 U.S. Census Bureau Population Estimates



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3.2.7 Language

About 3.6% of residents in the Northern Neck Region were foreign-born and 5.0% of persons age five and older speak a language other than English at home. See Table 3-5 Language Statistics for the Northern Neck Region. These statistics indicate there may be a portion of the region that may require special consideration when developing hazard reduction and outreach strategies for the community.

Table 3-5: Language Statistics for the Northern Neck Region

Jurisdiction	Foreign born persons, percent, 2016-2020	Language other than English spoken at home, percent of persons aged 5 years+, 2016-2020
Lancaster	4.5%	3.9%
Northumberland	0.8%	3.2%
Richmond	4.4%	8.9%
Westmoreland	4.6%	3.9%
NNPDC (average)	3.60%	5.0%

Source: 2020 American Community Survey (ACS) 5-Year Estimates

3.2.8 Age

Age can be used to identify certain groups of the population that have heightened risk to certain hazards. The 2020 U.S. Census Bureau's Population Estimates Program data shows that about 5.2% of the population in the Northern Neck Region is under the age of five and approximately 16.5% is under the age of 18 as illustrated in Table 3-6: Age Statistics for the Northern Neck Region. The regional age distribution is less than the Virginia total of 5.7% under the age of five and 21.8% under the age of eighteen. Additionally, the population that is 65 and older (30.2%) is double that of the Commonwealth's 16.3%.

Table 3-6: Age Statistics for the Northern Neck Region.

Jurisdiction	Persons under 5 years	Persons under 18 years	Persons between 18 and 65 years	Persons 65 years and over
Lancaster	3.7%	15.7%	43.9%	36.7%
Northumberland	3.8%	14.6%	45.1%	36.5%
Richmond	4.2%	16.9%	57.9%	21.0%
Westmoreland	5.0%	18.7%	49.9	26.4%
NNPDC (average)	5.2%	16.50%	49.2%	30.2%

Source: 2020 U.S. Census Bureau Population Estimates Program

The counties of the Northern Neck Region are recognized as popular retirement communities. Lancaster and Richmond Counties have seen a trend toward an aging population of long-term residents and newly relocated retirees. New residents are attracted to the region's proximity to water, good land and housing prices, low taxes, and rural character. As a result, there has been an increased demand for residential development, recreational opportunities, and medical services for senior citizens. During the recent recession, the Northern Neck Region had abundant listed residential properties. Consideration of the needs of the younger and older generations should influence the development of public awareness mitigation strategies.



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3.2.9 Education

Data from the U.S. Census Bureau's 2020 Population Estimates Program approximate that about 86.5% of residents in the Northern Neck Region graduated from high school, and 25.7% hold bachelor's degrees or higher. Education levels are lower than Virginia averages (90.3% graduated from high school and 39.5% with bachelor's degrees or higher). Lancaster County has a higher education rate closer to the state average (33.5%). See Table 3-7: Education Statistics for the Northern Neck Region. Education levels and the population characteristics described in the previous paragraphs should influence mitigation and emergency management public outreach program development. The content and delivery of public outreach programs should be consistent with the audiences' needs and ability to understand complex information.

Table 3-7: Education Statistics for the Northern Neck Region

Statistics	High school graduate or higher, percent of persons aged 25 years+	Bachelor's degree or higher, percent of persons aged 25 years+
Lancaster	90.2%	33.9%
Northumberland	92.1%	32.6%
Richmond	80.1%	18.1%
Westmoreland	83.8%	18.30%
NNPDC (average)	90.3%	39.5%

Source: 2020 U.S. Census Bureau Population Estimates Program

3.2.10 Income

As of 2020, the median household income in the Northern Neck Region was approximately \$56,565, 29.8% lower than the state average of \$76,398, according to the U.S. Census Bureau. About 12.9% of residents within the region live below the poverty line. This rate is higher than the national rate of 11.6% in 2020 and higher than the state rate of 9.2%. Lancaster County has a higher median household income and per capita income than the other counties in the Northern Neck Region. Overall, the income statistics summarized in Table 3-8: Income Statistics for Northern Neck Region indicate that a significant portion of the population in the region may not have the resources available to undertake mitigation projects that require self-funding.

Table 3-8 Income Statistics for the Northern Neck Region.

Jurisdiction	Median household income (in 2020 dollars), 2016-2020	Per capita income in past 12 months (in 2020 dollars), 2016-2020	Persons in poverty, percent
Lancaster	\$59,736	\$48,280	10.3%
Northumberland	\$59,437	\$38,679	12.3%
Richmond	\$53,298	\$24,400	16.0%
Westmoreland	\$53,790	\$33,754	12.9%
NNPDC (average)	\$56,565	\$36,278	12.9%

Source: 2020 U.S. Census Bureau Population Estimates Program

3.2.11 Housing

As of July 1, 2021, there were an estimated 31,653 housing units in the Northern Neck Region according to the U.S. Census Bureau (Table 3-9: Housing Statistics for Northern Neck Region). Westmoreland County



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has the most housing units and Richmond County has the least. Only 4.7% of the housing units in the region are multi-unit structures. Lancaster County has the most multi-unit structures (560 units) while Richmond County has the highest percentage in the region with 7.8% (308 units).

About 77% of residents own their homes. Northumberland County has the highest homeownership rate of 83.70% while Richmond County has the lowest at 74.40%. All the homeownership rates are significantly higher than the national average of 63.90% or the state average of 66.20%. When considering mitigation options, special attention should be given to the difference in capabilities between owners and renters. As previously stated, it is a “buyer’s market” within the Northern Neck Region with many residential properties currently listed for sale. Many of these are “second” homes used as vacation or weekend homes by out-of-area owners from Northern Virginia or the Richmond Metropolitan area. A surge of homes was listed for sale during the recession during the past decade with many remaining on the market.

Table 3-9: Housing Statistics for the Northern Neck Region.

Jurisdiction	Housing units as of July 1, 2021	Owner-occupied housing unit rate	Median value of owner-occupied housing units
Lancaster	7,464	75.8%	\$236,500
Northumberland	8,993	89.4%	\$270,900
Richmond	3,952	64.2%	\$193,700
Westmoreland	11,244	73.9%	\$201,000
NNPDC	31,653	75.8%	\$225,525

Source: 2020 U.S. Census Bureau Population Estimates

3.2.12 Business and Labor

Most Northern Neck Region’s jurisdictions face unemployment and underemployment challenges. The decline in traditional industries and the growth in retirement and second-home development are changing the employment landscape. The area’s unemployment rates remain like the U.S. rates but higher than Virginia’s average (Table 3-10: Northern Neck Regional Unemployment Rates). The Virginia Employment Commission (VEC) projects that employment for the regional jurisdictions will increase by about 9.25% by 2024. It is worth noting that the United States and the Commonwealth of Virginia declared a state of emergency for the COVID-19 pandemic which contributed immensely to the steep increases in 2020, which carried into 2021.

Table 3-10: Northern Neck Regional Unemployment Rates.

Year	NNPDC	Virginia	United States
2013	7.00%	5.70%	7.40%
2014	6.70%	5.20%	6.20%
2015	5.70%	4.50%	5.30%
2016	4.90%	4.00%	4.90%
2017	4.60%	3.75%	4.35%
2018	3.90%	3.0%	3.90%
2019	3.70%	2.8%	3.70%
2020	6.10%	6.2%	8.10%
2021	4.60%	3.9%	5.40%

Source: Virginia Employment Commission, Economic Information & Analytics, Local Area Unemployment Statistics.



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The rural nature of the communities in the Northern Neck Region is reflected in the top nine employment sectors summarized in Table 3-11: Top Nine Employment Sectors in the Northern Neck Region.

Table 3-11: Top Nine (9) Employment Sectors in the Northern Neck Region.

Industry	Employment
Local Government	2,059
Health Care and Social Assistance	1,607
Manufacturing	1,191
Accommodation and Food Service	907
Construction	817
State Government	672
Retail Trade	541
Other Services (except Public Administration)	512
Professional, Scientific, and Technical Services	415

Source: Virginia Employment Commission, Economic Information & Analytics, Community Profile – Northern Neck PDC – Update 09/07/2022

According to profiles developed by the Virginia Economic Development Partnership, major employers in the Northern Neck Region are listed by county below.

Lancaster County:

- Rappahannock General Hospital
- Lancaster County School Board
- Rappahannock Westminster Canterbury
- Walmart
- Tides Inn

Northumberland County:

- Northumberland County School Board
- Omega Protein
- Manufacturing Techniques Inc.
- County of Northumberland
- Carry On Trailer Corporation

Richmond County:

- Haynesville Correctional Institute
- Richmond County School Board
- Rappahannock Community College
- Riverside Regional Medical Center
- County of Richmond

Westmoreland County:

- Westmoreland County School Board
- Carry On Trailer Corporation
- County of Westmoreland
- Bevans Oyster Company
- Town of Colonial Beach Schools

Northern Neck Region:



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- Westmoreland County School Board
- Haynesville Correctional Institute
- Rappahannock General Hospital
- Lancaster County School Board

3.2.13 Agriculture

Agriculture is a significant economic sector in the Northern Neck Region. Total agricultural sales exceed \$99 million annually, with most of the revenue from the sales of crops, including those from nurseries, greenhouses, and vineyards. Major crops in the region include soybeans, corn, and wheat.

According to the 2010 U.S. Census, employment in Lancaster County related to farming, fishing, and forestry declined over 72% between 1990 and 2010 (253 jobs to 69 jobs). Table 3-12: Northern Neck Regional Agriculture summarizes agriculture in the Northern Neck Region based on 2017 Agricultural Census statistics.

Table 3-12: Northern Neck Regional Agriculture

Jurisdiction	Land in Farms (acres)	Total Value of Agricultural Products Sold	Total Value of Crops, including nursery and greenhouse crops	Total Value of livestock, poultry, and their products
Lancaster	16,238	\$5,550,000	\$5,101,000	\$450,000
Northumberland	43,480	\$20,052,000	\$17,212,000	\$2,840,000
Richmond	31,952	\$16,814,000	\$16,024,000	\$790,000
Westmoreland	52,619	\$57,092,000	(D)*	(D)*
NNPDC	144,282	99,508,000	**	**

Source: 2017 U.S. Census of Agriculture * USCA report withheld figures to avoid disclosing data for individual farms. **Totals unavailable secondary to (D) figures.

3.2.14 Transportation

The Northern Neck is a peninsula bound by two rivers and the Chesapeake Bay. As a result, transportation options are somewhat more limited than in surrounding counties.

US-360 is the main east-west route, while State Route-3 (SR-3) is the major north-south route in the Northern Neck Region. No interstate serves the Northern Neck Region directly, though Interstate 95, the central north-to-south road on the East Coast, is easily accessible via SR-3 (about 30 miles from the northernmost point in Westmoreland County). Likewise, US-17 is accessible via US-360 (across the Rappahannock River over Downing Bridge).

The closest commercial airports are in Richmond and Newport News (both approximately 55 miles away from the Northern Neck Region). Two general aviation facilities, Tappahannock Municipal Airport and Hummel Field, also serve the region. There is no rail service to the Northern Neck Region.

The Potomac, Rappahannock Rivers, and the Chesapeake Bay are all navigated by medium to large ships. However, the nearest major commercial ports are in Richmond and Norfolk, Virginia. Several grain barge facilities in the Northern Neck Region are used to transport agricultural products. In addition, many local marinas provide docking for pleasure craft along the shorelines of the Northern Neck jurisdictions.



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A bridge on SR-3 crosses the Rappahannock River between White Stone in Lancaster County and Grey's Point in Middlesex County, with an additional bridge on US-360 spans the Rappahannock River at Richmond County and Tappahannock in Essex County. Seasonal (summer) passenger ferries run to Tangier Island. In addition, VDOT operates two ferries in the Northern Neck Region, one at Sunnybank in Northumberland County and the other at Merry Point in Lancaster County.

3.2.15 Infrastructure

3.2.15.1 Electricity

The Northern Neck Region is served by two electricity providers: Dominion Virginia Power and the Northern Neck Electric Cooperative (Touchstone Energy Cooperatives). The Virginia Electric & Power Company operates a Petroleum Power Plant in the Town of Warsaw, Richmond County. Dominion Energy, Inc operates the Montross Solar Power Plant just outside of the Town of Montross, located in Westmoreland County.

Northumberland County's Middle/High School was the first of its kind at the time to have a wind turbine installed on February 11, 2011. The turbine is primarily used as an educational tool, allowing the students to learn through hands-on and interactive curricula, and sponsored by the "Wind for Schools" initiative through the U.S. Department of Energy.

3.2.15.2 Heating and Gas

Quarles Propane & Heat in Burgess, NWP Energy in Kilmarnock, and Frederick Northup, Inc in Warsaw serve the Northern Neck Region area's heating and fuel needs.

3.2.15.3 Telephone

The primary telephone service provider for the Northern Neck Region is Verizon.

3.2.15.4 Public Water and Wastewater

Public water systems serve residents and businesses within the towns of Colonial Beach, Kilmarnock, Montross, and Warsaw. Wastewater treatment is available in the towns of Colonial Beach, Montross, Kilmarnock, and Warsaw. The Reedville Sanitary District and Montross-Westmoreland Sewer Authority provide wastewater services. Westmoreland County also serves Machado Neck, Coles Point, and Washington District areas with public wastewater services. Additionally, the Town of White Stone is in the process of constructing a wastewater treatment plant.

Private wells and onsite sewage systems serve the remainder of the Northern Neck Region. However, according to the 2016 Northumberland County Comprehensive Plan (currently undergoing an update), there is a high concentration of soils of poor quality for septic tanks located in the low-lying areas seaward of the Suffolk Scarp, in addition to other upland regions located along stream beds and banks. This poor soil quality challenges future development in this region.

3.2.15.5 Television

Cable television is available in the region through DirecTV, Dish TV, Breezeline, and Verizon Fios.

3.2.15.6 Internet

Internet access varies throughout the Northern Neck Region. Service providers include Breezeline (cable internet), Verizon (DSL), Brightspeed (fixed wireless), and HughesNet (satellite internet). In addition, in



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2022, a public private partnership between All Points Broadband and the Northern Neck Planning District Commission—including the participation of Dominion Energy and the Northern Neck Electric Cooperative (NNEC)---began construction of Phase 1 of a new fiber network. Phase 2 will overlap Phase 1, with all work scheduled to be completed by the end of 2023. The result will be high-speed, wired Internet connectivity available to every household and business that does not currently have wired service in King George, Lancaster, Northumberland, Richmond, and Westmoreland Counties. Funding for the project was provided by private investments from Dominion Energy, All Points Broadband, and NNEC, plus public investment from all participating Counties, in addition to grants from the Virginia Telecommunication Initiative and the American Rescue Plan Act. Once the project is completed at the end of 2023, Virginia's Northern Neck peninsula will be the first rural region in the country with universal broadband coverage via wired services.

3.3 Disadvantaged Communities

It is essential to determine if any jurisdiction within the region would qualify as a Disadvantaged Community, formerly known as a special consideration community. Disadvantaged Communities are often eligible for grants for hazard mitigation and other community improvements on a preferential basis or with less stringent requirements for the non-federal, local share of grants. The Federal government defines a Disadvantaged Community as one with 3,000 or fewer individuals in a rural community and not within the corporate boundaries of a larger jurisdiction. In addition, to be categorized as a Disadvantaged Community, a jurisdiction must be economically disadvantaged, with residents having an average per capita annual income not exceeding 80% of the national per capita income based on the best available data. Further, Disadvantaged Communities must have a local unemployment rate that exceeds—by one percentage point or more—the most recently reported average national unemployment rate.

Currently, none of the jurisdictions in the Northern Neck Region meet all the above the criteria and are therefore not considered Disadvantaged Communities.



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Section 4 Adoption and Approval

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- 4.2 Authority
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- 4.3 Adoption and Approval Procedure
- 4.4 Adoption Resolutions
- 4.5 Approval Letters

4.1 44 CFR Requirement for Adoption and Approval

Requirement §201.6(c)(5): *[The local hazard mitigation plan shall include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council). For multi-jurisdictional plans, each jurisdiction requesting approval of the plan **must** document that it has been formally adopted.*

Requirement §201.6(a)(3): *Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process ... Statewide plans will not be accepted as multi-jurisdictional plans.*

4.2 Authority

Article VII. The Constitution of Virginia – Article VII. Local Government, gives authority to and defines the organization of communities, powers, duties, structure of governing bodies, procedures, and property use. Local governments in Virginia, including those in the Northern Neck Region, have a wide range of tools for implementing mitigation programs, policies, and actions. A hazard mitigation program can use any or all the four broad types of government powers granted by the Commonwealth of Virginia, which are (a) regulation, (b) acquisition, (c) taxation, and (d) spending. The scope of this local authority is subject to constraints. However, all of Virginia’s political subdivisions must not act without proper delegation from the Commonwealth. Therefore, all power is vested in the Commonwealth and can only be exercised by local governments to the extent it is delegated (per Dillon’s Rule).

Under the 1968 Virginia Area Development Act and modified by the Regional Cooperation Act, 21 Planning District Commissions were formed within the Commonwealth. Beginning in 2003, the Commonwealth of Virginia encouraged these twenty-one planning districts to lead the development of local hazard mitigation plans. These plans, which are required by the Disaster Mitigation Act of 2000 (DMA 2000), help local governments determine risks and vulnerabilities and identify projects to reduce these risks.

The communities of the Northern Neck Region have established a Local Emergency Planning Committee (LEPC) to address local emergency management issues. Resolution by the counties appoint members to the LEPC. The mission of this committee was closely aligned with the needs of a Mitigation Advisory



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Committee. The Northern Neck Planning District Commission decided to utilize the existing LEPC as its Mitigation Advisory Committee. Representatives included:

- County administrators.
- Planning directors.
- Emergency services staff.
- School board officials.
- Local non-profits.
- State agencies such as the Virginia Department of Transportation.

4.2.1 Planning

According to State statutes, local governments in Virginia may create or designate a planning agency. The planning agency may perform several duties, including:

- Make studies of the area.
- Determine objectives.
- Prepare and adopt plans for achieving those objectives.
- Develop and recommend policies, ordinances, and administrative means to implement plans.
- Perform other related duties.

The requirement illustrates the importance of the planning powers of local governments that zoning regulations be made per a comprehensive plan. While the ordinance itself may provide evidence that zoning is being conducted "per a plan," a separate planning document ensures that the government is developing regulations and ordinances that are consistent with the community's overall goals.

Each county in the Northern Neck Region and the Town of Colonial Beach have dedicated planning staff, zoning regulations, and comprehensive plans. Town managers, with county assistance, perform planning and floodplain management functions. In addition, the towns in the study area all have planning commissions that meet regularly, receiving support as necessary from county planning departments.

4.3 Adoption and Approval Procedure

Upon the Federal Emergency Management Agency (FEMA) Region III determination that the Northern Neck Regional Hazard Mitigation Plan (the Plan) was "approvable pending adoption," the Northern Neck Planning District Commission, Steering Committee, and Working Group will meet and recommended that the participating jurisdictions should adopt the Plan. Accordingly, the Plan will be submitted to the appropriate entity for each participating jurisdiction for review and adoption. The resulting Adoption Resolutions will then be forwarded to FEMA Region III for approval and the appropriate documentation will be added to the Plan appendices F: Adoption Resolutions and G: Approval Letters. FEMA will subsequently issue formal approval letters to the Virginia Department of Emergency Management (VDEM) for each participating jurisdiction that adopted the Plan. VDEM, in turn, will give approval letters to the approved jurisdictions.

4.4 Adoption Resolutions

Appendix F contains the signed Adoption Resolutions for the participating jurisdictions.

4.5 Approval Letters

Appendix G contains the formal Approval Letters from FEMA Region III for the participating jurisdictions.



Section 5 Planning Process

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 - 5.2.5 Step 4: Implement the Plan and Monitor Progress
- 5.3 Involvement by the Public and Other Interested Parties
- 5.4 Review and Incorporation of Plans, Studies, Reports, and Other Information

5.1 44 CFR Requirements for the Planning Process

Requirement §201.6(c) (1): *[The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

Requirement §201.6(b): *An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:*

- (1) *An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval*
- (2) *An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and non-profit interests to be involved in the planning process; and*
- (3) *Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*

5.2 Description of the Planning Process

5.2.1 How the Plan was Prepared (Overview)

The Northern Neck Regional Hazard Mitigation Plan (the Plan) was updated in accordance with the process established in the State and Local Mitigation Planning How-to Guides (FEMA Publication Series 386) produced by the Federal Emergency Management Agency (FEMA), and the requirements of 44 CFR part 201.6. The process established in the FEMA 386 guides includes four basic steps.

- Step 1: Organize resources
- Step 2: Assess risks
- Step 3: Update the 2017 mitigation plan
- Step 4: Implement the plan and monitor progress



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5.2.2 Step 1: Organize Resources

The Northern Neck Regional Planning District Commission (NNPDC) was the lead agency to update the 2017 Northern Neck Regional Hazard Mitigation Plan. At the beginning of the process, a consultant firm, The Olson Group, LTD (OGL), was hired to provide technical support to the NNPDC and participating jurisdictions. In addition, several individuals and organizations worked together to update the Plan. These participants were organized into two different committees, the:

- Northern Neck Region Hazard Mitigation Steering Committee
- Northern Neck Region Hazard Mitigation Working Group Committee

The Northern Neck Region Hazard Mitigation Steering Committee (HMSC) was comprised principally of Planning District Commission personnel, selected county agency representatives, elected local representatives, and private concerned parties. This committee was formed to provide focus and leadership on behalf of all participating jurisdictions in the update of this Plan. HMSC meetings were regularly attended by other key county agency staff, including representatives from departments of planning, public works, and additional emergency management staff, in addition to Virginia Department of Emergency Management (VDEM) staff. The HMSC met at scheduled meetings as recorded, during the update process to receive progress reports from the consultant, review, and comment upon draft documents and procedures, implement relevant tasking, and coordinate efforts within their communities or organizations.

The Northern Neck Region Hazard Mitigation Working Group Committee (HMWG) comprises the county and local jurisdiction representatives in the Northern Neck Regional Planning District. The majority of the HMWG membership has regular interaction with the NNPDC. In addition, the HMWG comprises representatives from each participating jurisdiction's OEM, other governmental representatives, related agencies within the counties, and public entities that wish to participate in the update effort. The duties and responsibilities of the HMWG consisted of representing their communities' interests, serving as the point of contact between their communities and the HMSC, and completing necessary planning tasks, including data collection, identification of local mitigation actions, and reviewing the plan products of the HMSC.

With input and consensus from the HMWG, the HMSC identified the 13 most significant countywide hazards for a risk assessment to be completed. Table 5-1: Northern Neck Region Hazard Mitigation Steering Committee shows the primary membership of the HMSC.

Table 5-1: Northern Neck Regional Hazard Mitigation Steering Committee (HMSC) Members

Name	Organization
Jerry W Davis, AICP Executive Director	Northern Neck Region Planning District Commission
John Bateman, Regional Planner	Northern Neck Region Planning District Commission
Alex Eguiguren, Project Manager	Northern Neck Region Planning District Commission

Table 5-2: Northern Neck Region Hazard Mitigation Working Group (HMWG) Members lists the membership of the Northern Neck Region HMWG.



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Table 5-2: Northern Neck Regional Hazard Mitigation Working Group (HMWG) Members

Name	Organization
Jerry W Davis, AICP Executive Director	Northern Neck Planning District Commission
John Bateman, Senior Regional Planner	Northern Neck Planning District Commission
Alex Eguiguren, Project Manager	Northern Neck Planning District Commission
Luttrell Tadlock, County Administrator	Northumberland County
Drew Bayse, Asst. County Administrator	Northumberland County
Wes Packett, Director of Emergency Services	Northumberland County
Phillip Marston, Zoning Administrator	Northumberland County
R. Morgan Quicke, County Administrator	Richmond County
Mitch Paulette, Chief, Department of Emergency Services	Richmond County
Hope Mothershead, Planning and Zoning Administrator	Richmond County
Norm Risavi, County Administrator	Westmoreland County
Philip Marsten, Zoning Administrator	Westmoreland County
Bill Cease, Director of Emergency Management and Technology	Westmoreland County
Beth McDowell, Director of Planning and Community Development	Westmoreland County
Darrin Lee, Assistant Planning Director	Westmoreland County
Olivia Hall, Environmental Codes Compliance Officer	Lancaster County
Don Gill, County Administrator	Lancaster County
Matthew Smith, Chief of Emergency Services	Lancaster County
Jim Canter, Building Official	Lancaster County
Bill Farrell, Director of Planning and Land Use	Lancaster County
Marshall Sebra, Planning-Zoning Director	Town of Kilmarnock
Susan Cockrell, Town Manager	Town of Kilmarnock
Julie Harris, Mayor	Town of Irvington
Laurel Taylor, Town Clerk	Town of Irvington
Patrick Frere, Town Manager	Town of White Stone
Melinda George, Town Clerk	Town of White Stone
India Adams-Jacobs, Town Manager	Town of Colonial Beach
J.C. LaRiviere, Grants Writer	Town of Colonial Beach
Matthew Smith, GIS/Asset Manager	Town of Colonial Beach



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Name	Organization
Joseph Quesenberry, Town Manager	Town of Warsaw
Melissa Coates, Director of Planning and Community Development	Town of Warsaw
Patricia Lewis, Town Manager	Town of Montross
Matt Dalon, Program Manager, Virginia Coastal Resilience Master Plan	Virginia Department of Conservation and Recreation
Lydia Bienlien, Sea Grant Commonwealth Coastal & Marine Policy Fellow – Dam Safety and Floodplain Management	Virginia Department of Conservation and Recreation
Stacey Farinholt, Program Admin Specialist – Dam Safety and Floodplain Management	Virginia Department of Conservation and Recreation
Mark Killgore, Lead Dam Safety Engineer	Virginia Department of Conservation and Recreation
Angela Davis, Floodplain Program Planner	Virginia Department of Conservation and Recreation
Chris Bruce, All Hazards Planner	VDEM, Region 5 Representative
Shannon Burke, Mitigation Planner	FEMA, Region 3 Representative
Michele Zucker, Supervisory Community Planner	FEMA, Region 3 Representative
Shannon Hutton, Geographer	Old Dominion University
Montrose Gray, Assistant Director of the Coastal Policy Center	William & Mary University

5.2.2.1 Meeting Schedule

There were several meetings conducted during the update of the Plan per Table 5-3: Committee Meeting Schedule. The meetings focused primarily on the review of work-in-progress for the update of the Plan. However, in some cases, the meetings were essentially working sessions for the current needs of the update such as verification of hazard priorities, processes validation and draft documents review.

Table 5-3: Committee Meeting Schedule

Date	Meeting	Attendees
June 23, 2022	Introductory Meeting	NNPDC, FEMA, VDEM, OGL
July 15, 2022	HM Steering Committee Meeting	HMSC, OGL
July 29, 2022	HM Working Group Meeting	HMWG, OGL
August 12, 2022	HM Working Group Meeting & Public Input Meeting	HMWG, OGL
September 9, 2022	HM Working Group Meeting & Public Input Meeting	HMWG, OGL
September 19, 2022	Northumberland County Jurisdictional Interview	Locality representatives, J. Bateman, OGL
September 20, 2022	Richmond County Jurisdictional Interview	Locality representatives, J. Bateman, OGL
September 20, 2022	Westmoreland County Jurisdictional Interview	Locality representatives, J. Bateman, OGL



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Date	Meeting	Attendees
June 23, 2022	Introductory Meeting	NNPDC, FEMA, VDEM, OGL
September 20, 2022	Lancaster County Jurisdictional Interview	Locality representatives, J. Bateman, OGL
September 21, 2022	Town of Montross Jurisdictional Interview	Locality representatives, J. Bateman, OGL
September 22, 2022	Town of Irvington Jurisdictional Interview	Locality representatives, J. Bateman, OGL
September 22, 2022	Town of Warsaw Jurisdictional Interview	Locality representatives, J. Bateman, OGL
September 22, 2022	Town of Colonial Beach Jurisdictional Interview	Locality representatives, J. Bateman, OGL
September 22, 2022	Town of Kilmarnock Jurisdictional Interview	Locality representatives, J. Bateman, OGL
September 23, 2022	HM Steering Committee, HM Working Group Meeting	HMSC, HMWGC, OGL
October 7, 2022	HM Working Group Meeting & Public Input Meeting	HMWGC, OGL
October 7, 2022	Town of White Stone Jurisdictional Interview	Locality representatives, J. Bateman, OGL
November 16, 2022	HM Steering Committee Meeting	HMSC, OGL
February 3, 2023	HM Steering Committee Meeting	HMSC, OGL, VDEM
February 3, 2023	HHPD Information Meeting	HMSC, OGL, VDEM, DCR

Appendix C.1 contains documentation for these meetings including agendas, attendance rosters, presentation materials, and meeting notes where appropriate.

5.2.3 Step 2: Assess Risks

Under general mitigation planning practices and the process FEMA established in FEMA Local Mitigation Planning Handbook and FEMA Local Mitigation Planning Policy Guide, the risk assessment forms the basis for this Plan by quantifying and rationalizing information about how natural and human-caused hazards affect the Northern Neck Region and its participating jurisdictions.

The processes used to complete the hazard identification and risk assessment update and the results of these activities are described in Sections 6, 7, Appendices D and E. The assessment determined several aspects of the risks of hazards faced by the region and the participating jurisdictions:

- The natural hazards that are most likely to affect the region
- How often hazards are expected to impact the region
- The expected severity of the hazards
- Which areas of the region are likely to be affected by hazards
- How the regions assets, operations, people, and infrastructure may be impacted by hazards
- How private and commercial assets, operations, infrastructure may be impacted by hazards
- The expected future losses if the risk is not mitigated

The HMSC first verified the already identified hazards and added three additional to be assessed, with the potential to impact the region. Next, using a rating system called the Calculated Priority Risk Index (CPRI), explained in Section 6, the HMSC reassessed the region-wide hazards considered the most relevant for



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this planning process. The results of this selection process were discussed and validated by the HMSC. These hazards are described in the Plan's Hazard Identification, Profiling, and Ranking portion (Section 6).

As a result, the HMSC and HMWG were able to make qualitative determinations that allowed further refinement of the focus of this plan update to thirteen hazards: tornado, severe weather, coastal flooding, riverine flooding, wildfire, winter storm, hurricane/tropical storm, coastal erosion, pluvial flooding, landslide, drought, heatwave, and earthquake. The HMSC considers these to represent the most predominant risks to the region. The results of this secondary selection process were also discussed and validated by the HMWG.

For each of these hazards, the consultants performed detailed risk assessments, i.e., calculations of future expected damages, expressed in dollars where appropriate. The risk assessment results were also made available to the public during the public presentations (The entire process and results of this work are presented in the Risk Assessment portion of this Plan (Section 7).

5.2.4 Step 3: Update the Mitigation Plan

The Plan has a developed series of goals and objectives directly linked to updated risk assessment results. An updated capability assessment was also conducted to help determine the capacity of the region and the participating jurisdictions to implement hazard mitigation projects. In addition, the HMSC and the consultant worked individually with the participating jurisdictions to identify potential problems and mitigation solutions to be included in the updated Mitigation Action Plan. The Mitigation Action Plan was reviewed and validated by the HMSC and HMWG. The results of these efforts are detailed in Sections 8 and 9.

5.2.5 Step 4: Implement the Plan and Monitor Progress

Finally, the HMSC identified a process for on-going monitoring and revisions to the Plan over the next five years. Section 10 details the resulting monitoring, evaluation, and plan update procedures. This step was also reviewed and validated by the HMWG.

5.3 Involvement by the Public and Other Interested Parties

During the update of this Plan, the public was involved by requesting their participation in public presentations/meetings, providing drafts of the Plan for review, and inviting comments on the contents of the Plan. For each meeting, the public and interested parties were notified of the meetings via public notice in area newspapers, notice on the NNPDC website, and emails to interested groups. It is to be noted that while the public was invited via website announcement and open public meeting notice as required, no comments were provided by the public for incorporation into the plan and no participants from the public attended any of the Public Input meetings. The public outreach, meeting attendance lists, public presentations and meetings are detailed in Table 5-4: Public Involvement. In addition, continued outreach by the NNPDC and jurisdictional staff, including public education and work with stakeholders and other interested parties between now and the next five-year Plan update, will be included as part of the Mitigation Action Plan in Section 9.

Table 5-4: Public Involvement

Date	Type of Involvement	Meeting Location
July 2022 – updated throughout planning process	Website with hazard mitigation and Plan development information posted	https://www.northernneck.us/regional-northern-neck-hazard-mitigation-plan/



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Date	Type of Involvement	Meeting Location
August 12, 2022	Public meeting with presentation and open discussion	Microsoft TEAMS Virtual Online Meeting
September 9, 2022	Public meeting with presentation and open discussion	Microsoft TEAMS Virtual Online Meeting
October 7, 2022	Public meeting with presentation and open discussion	Microsoft TEAMS Virtual Online Meeting
September 19, 2022	Press release regarding hazard mitigation and Plan development issued	Issued to Northern Neck News and The Rappahannock Record
September 29, 2022	Press release regarding hazard mitigation and Plan development issued	Rappahannock Record
November 2, 2022	Plan posted to website for public comment	https://www.northernneck.us/regional-northern-neck-hazard-mitigation-plan/
December 15, 2022	Second draft forwarded to Working Group members via email.	Not Applicable
February 6, 2023	Final Draft Plan distributed to surrounding communities and agencies for viewing.	Via email and NNPDC website

As part of the development of the Plan, Floodplain Administrators were engaged in Plan update and review in many jurisdictions. Involvement of Floodplain Administrators in the Northern Neck Region is shown in Table 5-5: Northern Neck Regional Floodplain Administrator Involvement. Additional outreach to Floodplain Administrators should result in enhanced participation in the next Plan update.

Table 5-5: Northern Neck Regional Floodplain Administrator Involvement

Jurisdiction	Floodplain Administrator Name	Method of Involvement in Plan
Lancaster County	Don Gill	Active Working Group Member
Town of Irvington	Justin Nelson	Participated in the Town of Irvington's jurisdictional interview and mitigation actions update.
Town of Kilmarnock	Marshall Sebra	Active Working Group Member Participated in the Town of Kilmarnock's jurisdictional interview and mitigation actions update.
Town of White Stone	Patrick Frere	Active Working Group Member Participated in the Town of White Stone's jurisdictional interview and mitigation actions update.
Northumberland County	Phillip Marsten	Active Working Group Member Participated in Northumberland County's jurisdictional interview and mitigation actions update.
Richmond County	Hope Mothershead	Active Working Group Member



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Jurisdiction	Floodplain Administrator Name	Method of Involvement in Plan
Lancaster County	Don Gill	Active Working Group Member Participated in Richmond County's jurisdictional interview and mitigation actions update.
Town of Warsaw	Joseph Quesenberry	Active Working Group Member Participated in the Town of Warsaw's jurisdictional interview and mitigation actions update.
Westmoreland County	Beth McDowell	Active Working Group Member Participated in Westmoreland County's jurisdictional interview and mitigation actions update.
Town of Colonial Beach	India Adams-Jacobs Kaylin DeBernard (secondary)	Participated in the Town of Colonial Beach's jurisdictional interview and mitigation actions update.
Town of Montross	Patricia Lewis	Active Working Group Member Participated in the Town of Montross's jurisdictional interview and mitigation actions update.

Copies of the plan were made available to the Northern Neck Region's neighbors, the George Washington Regional Commission, and the Middle Peninsula Planning District Commission for their review and input. In addition, the plan was shared with the Rappahannock Community College, the College of William & Mary, and Old Dominion University.

Minutes of meetings with associated attendee lists, and copies of relevant correspondence are included in Appendix C.

Beyond this, email, and phone solicitations for involvement by potential stakeholders and interested parties, including non-profits, area utilities, school boards, significant employers, and others, were conducted during Plan development and reviews.

Relevant correspondence is contained in Appendix C3. Response to this outreach was sparse, but outreach by the NNPDC, including public education and work with stakeholders and other interested parties between now and the next five-year Plan update, should improve such involvement during the Plan update.

5.4 Review and Incorporation of Plans, Studies, Reports, and Other Information

The Northern Neck Regional Hazard Mitigation Plan 2023 Update incorporates information from multiple other plans, studies, and reports. Information about how these plans and studies were incorporated into the plan update is found in Sections 7, 8, and 9. These sections are where relevant and specific data sources are provided. Complete reference information is provided in Appendix B: Sources. The progress of plan implementation, including the monitoring schedule, evaluation of progress, success, lessons learned, and updates, are included in Section 8: Capability Assessment and Section 10: Plan Monitoring and Maintenance.



Section 6

Hazard Identification, Profiling, and Ranking

Contents of this Section

- 6.1 44 CFR Requirement for Hazard Identification and Profiling
- 6.2 Hazard Identification
- 6.3 Overview of Type and Location of Hazards That Can Affect the Northern Neck Region
 - 6.3.1 Tornadoes
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 - 6.3.3 Coastal Flooding
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 - 6.3.6 Winter Storm
 - 6.3.7 Hurricane/Tropical Storm
 - 6.3.8 Coastal Erosion
 - 6.3.9 Pluvial Flooding
 - 6.3.10 Landslide
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- 6.4 Identifying Hazards of Concern
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 - 6.5.2 Previous Occurrences of Dam Failures
 - 6.5.3 Probability of Future Risks and Failures
- 6.6 Summary
 - 6.6.1 Summary Description of the Region's Vulnerability to Hazards

6.1 44 CFR Requirement for Hazard Identification and Profiling

Requirement §201.6(c)(2)(i): *The risk assessment shall include a description of the location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.*

6.2 Hazard Identification

The Hazard Vulnerability Analysis aims to provide an overview of how various natural hazards impact Virginia's Northern Neck Region.



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The Hazard Identification and Risk Assessment (HIRA) assesses all natural hazards deemed a threat through previous Hazard Identification Risk Assessments and the qualitative priorities of the Local Emergency Planning Committee (LEPC), which serves as the plan update's Working Group Committee. The analysis presented in Section 7 uses an all-hazards identification, classification, and vulnerability indexing process to ensure hazard analysis is comprehensive and as qualitative as possible based on all available data sources. The HIRA provides information to allow the planning district commission and its communities to understand local hazards and the risks they pose to people, property, and infrastructure so that mitigation goals, strategies, actions, and projects to reduce risk exposure to dangers will make the Northern Neck Region more resilient.

For the HIRA, a natural hazard is a physical event or condition that can cause fatalities, injuries, property and infrastructure damage, agricultural loss, damage to the environment, interruption of business, or other types of harm or loss.

Identifying the risk and vulnerability of a community is critical when determining how to allocate finite resources to carry out feasible and appropriate mitigation actions. The hazard analysis involves identifying all the hazards that potentially threaten the Northern Neck Region and then analyzing them to determine the degree of threat posed by each hazard and hazard vulnerability. Addressing risk and vulnerability through hazard mitigation measures will reduce societal, economic, and environmental exposure to natural hazard impacts.

The Northern Neck Region is exposed to many natural hazards affecting people and property. The following hazard categories were reviewed during the 2023 plan update process, where the Working Group agreed that the 2017 plan hazards were still relevant with the addition of landslide, heat wave, and pluvial flooding:

- Tornado
- Severe Weather (high winds, hail, lightning)
- Coastal Flooding
- Riverine Flooding
- Wildfires
- Winter Storm
- Hurricane/Tropical Storm
- Coastal Erosion
- Pluvial Flooding
- Landslide
- Drought
- Heatwave
- Earthquake

The impact of each natural hazard is presented in each respective hazard section. Coastal Erosion is excluded from Table 6-1 as available data is insufficient to report to parameters.



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Table 6-1: Hazard Events for Northern Neck Regional Counties (date range as noted)

Hazards	Reported Events	Property Damage	Crop Damage	Deaths	Injuries
Lancaster	143			0	3
Tornado	9 (1975-2022)	\$6.58 million	\$0.00	0	0
Severe Weather (hail, lightning, severe wind)	64 (1955-2022)	\$3.55 million	\$0.00	0	3
Coastal Flooding	14 (1996-2022)	\$1.87 million	\$0.00	0	0
Riverine Flooding	5 (1996-2022)	\$112,000***	\$0.00	0	0
Wildfire	52 (2009-2022)	\$1000**	66.3 acres	0	0
Winter Storms	34 (1996-2022)	\$40,000	\$0.00	0	0
Hurricanes/Tropical Storms	7 (1996-2022)	\$722,000	\$503,000	0	0
Pluvial Flooding	10 (1996-2022)	Not available	Not available	0	0
Landslide	0* (2010-2019)	\$0.00	\$0.00	0	0
Drought	3 (1996-2022)	\$0.00	\$3.88 million	0	0
Heat Wave	3 (1996-2022)	\$0.00	\$0.00	0	0
Earthquake	3** (1950-2022)	\$0.00	\$0.00	0	0
Northumberland	164			0	9
Tornado	8 (1969-2022)	\$1.56 million	\$0.00	0	9
Severe Weather (hail, lightning, strong wind)	68 (1976-2022)	\$18,262,979.95	\$0.00	0	0
Coastal Flooding	14 (1996-2022)	\$20.63 million	\$0.00	0	0
Riverine Flooding	8 (1996-2022)	\$112,000***\$0.00	\$0.00	0	0
Wildfire	38 (2009-2022)	\$3,100	120 acres	0	0
Winter Storms	43 (1996-2022)	\$40,000	\$0.00	0	0
Hurricanes/Tropical Storms	7 (1996-2022)	\$917,000	\$1.15 million	0	0



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Hazards	Reported Events	Property Damage	Crop Damage	Deaths	Injuries
Pluvial Flooding	10 (1996-2022)	Not available	Not available	0	0
Landslide	0* (2010-2019)	\$0.00	\$0.00	0	0
Drought	2 (1996-2022)	\$0.00	\$3 million	0	0
Heat Wave	3 (1996-2022)	\$0.00	\$0.00	0	0
Earthquake	1** (1950-2022)	\$0.00	\$0.00	0	0
Richmond	199			0	5
Tornado	8 (1996-2022)	\$3.4 million	\$0.00	0	2
Severe Weather (hail, lighting, strong wind)	102 (1958-2022)	\$335,000	\$5,000	0	3
Coastal Flooding	3 (1996-2022)	\$1.8 million	\$0.00	0	0
Riverine Flooding	17* (1996-2022)	\$492,000***	\$0.00***	0	0
Wildfire	18 (2009-2022)	\$63,000	25.3 acres	0	0
Winter Storms	48 (1996-2022)	\$95,000	\$0.00	0	0
Hurricanes/Tropical Storms	2 (1996-2022)	\$129, 000	\$812,000	0	0
Pluvial Flooding	13 (1996-2022)	\$664,000	\$200,000	0	0
Landslide	0* (2010-2019)	\$0.00	\$0.00	0	0
Drought	2 (1966-2022)	\$0.00	\$2 million	0	0
Heat Wave	3 (1996-2022)	\$0.00	\$0.00	0	0
Earthquake	1** (1950-2022)	\$0.00	\$0.00	0	0
Westmoreland	179			0	0
Tornado	36 (1950-2022)	\$12.73 million	\$78, 000	0	16
Severe Weather (thunderstorm, hail, lighting, and winds)	211 (1955-2022)	\$19.46 million	\$5,000	0	6
Coastal Flooding	5 (1996-2022)	\$220,000	\$0.00	0	0



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Hazards	Reported Events	Property Damage	Crop Damage	Deaths	Injuries
Riverine Flooding	12* (1996-2019)	\$101,000***	\$0.00***	0	0
Wildfire	33 (2009-2022)	\$0	75 acres	0	0
Winter Storms	48 (1996-2022)	\$85,000	\$0.00	0	0
Hurricanes/Tropical Storms	4 (1996-2022)	\$515,000	\$950,000	0	0
Pluvial Flooding	10 (1996-2022)	\$195,000	\$55,000	0	0
Landslide	1 (2010-2019)	\$0.00	\$0.00	0	0
Drought	2 (1996-2022)	\$0.00	\$5 million	0	0
Heat Wave	3 (1996-2022)	\$0.00	\$0.00	0	0
Earthquake	1* (1950-2022)	\$0.00	\$0.00	0	0

Source: NOAA NCEI Storm Events Database; *FEMA National Risk Index; **VDOF Fire Incident Database ***HAZUS

Table 6-2: Total Unique Hazard Events in the Northern Neck Region (as of June 30, 2022)

Hazard	Total Unique Events
Tornado	36
Severe Weather	211
Coastal Flooding	18
Riverine Flooding	17*
Wildfire	141
Winter Storm	53
Hurricane/Tropical Storm	8
Coastal Erosion	Not available
Pluvial Flooding	22
Landslide	1
Drought	3
Heatwave	3
Earthquake	1
Total	497

Source: NOAA NCEI Storm Events Database; *FEMA National Risk Index. **USGS Earthquake Database ***HAZUS

This table only summarizes the events found in sources such as the NCEI Database, NRI, HAZUS, VDOF, and USGS. These estimates underrepresent the actual damages since some hazard losses go unreported



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or are challenging to quantify accurately; this is especially true with crop damage. Therefore, other best-available national and local data sets were utilized in some hazard sections to quantify losses.

6.2.1 Presidential Disaster Declarations

The Federal Emergency Management Agency (FEMA) maintains the National Disaster Declarations Summary dataset. The first disaster declared in the national dataset was in 1953 and was supplemented with the Robert T. Stafford Disaster Recovery Act and related Department of Homeland Security regulations. For an event to be declared a disaster by FEMA, the Governor of Virginia must declare a state of emergency and then formally demonstrate to the President that Commonwealth and local government resources to support disaster recovery are exhausted, necessitating Federal assistance. Table 6-3 shows the FEMA Disaster Declarations Summary for events declared within the Northern Neck Region from 1953 to June 30, 2022. Eighteen significant disaster declarations have been since 1969, and eight emergency declarations since 1993, totaling 26. In addition, six emergency declarations have been made since the update in 2017.

Table 6-3: FEMA Declared Disasters for the Northern Neck Region (1953-June 30, 2022)

Disaster Number	Disaster Type	Incident Type	Incident Begin Date	Programs Declared			
				IH	IA	PA	HM
274	Major Disaster	Hurricane	8/23/1969	No	Yes	Yes	Yes
339	Major Disaster	Flood	6/23/1972	No	Yes	Yes	Yes
525	Major Disaster	Freezing	1/26/1977	No	Yes	No	No
3046	Emergency	Drought	7/23/1977	No	No	Yes	Yes
755	Major Disaster	Flood	11/9/1985	No	Yes	Yes	Yes
3112	Emergency	Snow	3/13/1993	No	No	Yes	Yes
1014	Major Disaster	Snow	2/8/1994	No	No	Yes	Yes
1086	Major Disaster	Snow	1/6/1996	No	No	Yes	Yes
1135	Major Disaster	Hurricane	9/5/1996	No	Yes	Yes	Yes
1293	Major Disaster	Hurricane	9/13/1999	No	Yes	Yes	Yes
3147	Emergency	Hurricane	9/13/1999	No	No	Yes	No
1318	Major Disaster	Severe Storm(s)	1/25/2000	No	No	Yes	Yes
1491	Major Disaster	Hurricane	9/18/2003	Yes	Yes	Yes	Yes
3240	Emergency	Hurricane	8/29/2005	No	No	Yes	No
1661	Major Disaster	Severe Storm(s)	8/29/2006	No	No	Yes	Yes
4024	Major Disaster	Hurricane	8/26/2011	No	No	Yes	Yes
3329	Emergency	Hurricane	8/26/2011	No	No	Yes	No
4045	Major Disaster	Severe Storm(s)	9/8/2011	No	No	Yes	Yes
4092	Major Disaster	Hurricane	10/26/2012	Yes	No	Yes	Yes
3359	Emergency	Hurricane	10/26/2012	No	No	Yes	No
4401	Major Disaster	Hurricane	09/08/2018	No	No	Yes	Yes
3403	Emergency	Hurricane	09/13/2018	No	No	Yes	Yes
4411	Major Disaster	Hurricane	10/09/2018	No	No	Yes	No
3448	Emergency	Pandemic	01/20/2020	No	No	Yes	No
4512	Major Disaster	Pandemic	01/20/2020	No	Yes	Yes	Yes
4602	Major Disaster	Winter Storms	02/11/2021	No	No	Yes	Yes

FEMA Disaster Declarations Summary – Open Government Dataset. <https://www.fema.gov/openfema-data-page/disaster-declarations-summaries-v1>



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6.3 Overview of the Type and Location of Hazards that can affect the Northern Neck Region

6.3.1 Tornadoes

A tornado is a violently rotating column of air extending from a thunderstorm to the ground. The rotating column of air often resembles a funnel-shaped cloud. Winds are typically less than 100 mph, with the most violent tornado wind speeds exceeding 250 mph. The widths of most Virginia tornadoes are generally several yards across, but the path length can vary from a few hundred yards to dozens of miles long. A tornado moves at speeds between 30 and 125 miles per hour (mph) and can generate winds that reach 300 mph.

6.3.1.1 Type and Location

The total number may be higher as incidents may occur over areas with sparse populations or may not cause any property damage. The Tornado season is typically March through August; however, tornadoes can occur in any month.

In Virginia, peak tornado activity is in July since hot, humid conditions stimulate tornado growth. Strong tornadoes may be produced by thunderstorms and are often associated with the passage of hurricanes. Tornadoes may occur in any location across the Northern Neck Region, as seen in the figure below.

In the United States, tornadoes have been classified on the Fujita Scale, assigning numeric scores from zero to five (or higher) based on the severity of observed damages. The traditional Fujita scale, introduced in 1971, was used to rate the intensity of tornadoes after that and was also applied to previously documented tornadoes. The scale assigns numerical values for wind speeds inside the tornado according to the type of damage and degree.

Most tornadoes are F0 and F1, resulting in widespread minor damage. Low-intensity tornadoes will cause localized transportation route disruption due to the amount of debris, and utilities can also be out of service for several days due to downed power and phone lines. A tornado's intense power can destroy buildings, primarily manufactured homes, down power lines, and cause significant agricultural damage.

In February 2007, an "enhanced" Fujita scale was implemented with somewhat lower wind speeds at the higher F-numbers and more thoroughly refined structural damage indicator definitions. In addition, it was developed to align tornado wind speeds with associated damages with better accuracy. Figure 6-1 demonstrates the "EF" tornado scale presented by the National Weather Service (NWS).



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Figure 6-1: EF Rating Scale

EF Rating	Wind Speeds	Expected Damage		
EF-0	65-85 mph	"Minor" damage: shingles blown off or parts of a roof peeled off, damage to gutters/siding, branches broken off trees, shallow rooted trees snapped.		
EF-1	86-110 mph	"Moderate" damage: more significant roof damage, windows broken, exterior doors damaged or lost, mobile homes overturned or badly damaged.		
EF-2	111-135 mph	"Considerable" damage: roofs torn off well constructed homes, homes shifted off their foundation, mobile homes completely destroyed, large trees snapped or uprooted, cars can be tossed.		
EF-3	136-165 mph	"Severe" damage: entire stories of well constructed homes destroyed, significant damage done to large buildings, homes with weak foundations can be blown away, trees begin to lose their bark.		
EF-4	166-200 mph	"Extreme" damage: Well constructed homes are leveled, cars are thrown significant distances, top story exterior walls of masonry buildings would likely collapse.		
EF-5	>200 mph	"Massive/Incredible" damage: Well constructed homes are swept away, steel-reinforced concrete structures are critically damaged, high-rise buildings sustain severe structural damage, trees are usually completely debarked, stripped of branches and snapped.		

Fujita scale	Wind speeds (7-s gust)		Enhanced Fujita scale	Wind speeds (7-s gust)	
	m s ⁻¹	mph		m s ⁻¹	mph
F0	29-35	45-78	EF0	29-38	65-85
F1	36-52	79-117	EF1	39-49	86-110
F2	53-70	118-161	EF2	50-60	111-135
F3	73-93	162-209	EF3	61-74	126-165
F4	94-117	210-261	EF4	74-89	166-200
F5	118-142	262-317	EF5	>89	>200

Source: <https://www.weather.gov/images/cae/EF-Ratings.jpg>

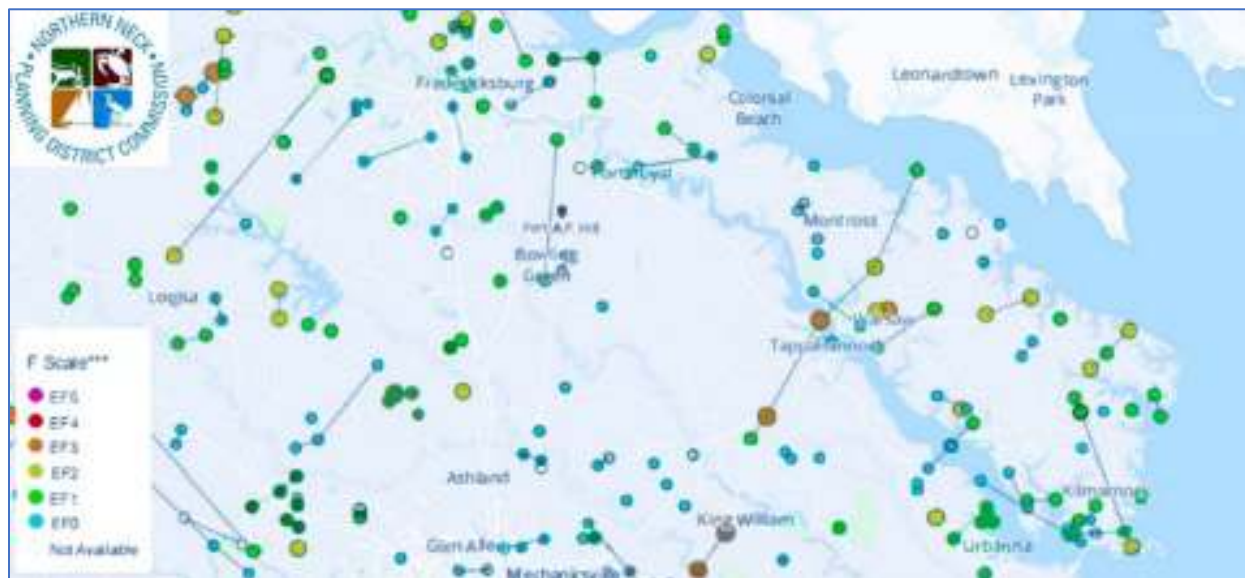
6.3.1.2 – Previous Occurrences

According to the NCEI storm events database, there have been 36 recorded tornado events since 1950, which includes two funnel clouds and two waterspouts. These tornado events have resulted in a total of \$12.73 million in property damage and \$78, 000 in crop damage. Figure 6-2 shows the location of historic tornado tracks and touch downs in the Northern Neck Region. Table 6-4 lists the most significant of these events along with recent events not recorded by the NCEI database.



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Figure 6-2: Tornadoes in the Northern Neck Region 1950-2022



Source: NOAA and News Leader: Tornado Archive: <https://data.newsleader.com/tornado-archive/>



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Table 6-4: Previous Occurrences of Tornado Events

Event Date	Hazard History
May 10, 1990	Lancaster County. This tornado traveled in an east-northeast direction from two miles southwest of White Stone and ended about two miles east-northeast of White Stone. The path was just over four miles long, and it was intermittent. The most significant damage occurred in the center of White Stone. In addition to considerable tree damage, three buildings were heavily damaged, five stores lost plate-glass windows, and trees destroyed a mobile home.
August 06, 1993	White Stone. At 1515 EDT, a tornado moved northeast through White Stone. Trees were broken and knocked down damaging homes.
June 24, 1996	Westmoreland County. A brief tornado touched down at Westmoreland State Park. Numerous trees and power lines were downed throughout the park. In addition, the roofs of three cabins were damaged by downed trees. One cabin suffered the most damage as a large tree trunk crashed through the roof, damaging the rafters and inside walls of the kitchen and bedroom.
September 10, 1997	Northumberland County. Tornado damage occurred from Burgess to Oyster Cove. The most significant damage was found in the Edwardsville area, where nearly 20 mobile homes were severely damaged or destroyed. Numerous trees were downed or suffered damage. Nine, mostly minor, injuries were reported.
	Westmoreland County. The same storm which produced the Edwardsville storm produced a second weaker tornado in Hague. One house sustained minor damage, and numerous trees were sheared off or uprooted.
September 10, 1997	Northumberland County. A tornado damaged five homes, with a large porch on one house and a garage/breezeway on another home destroyed. Damage to 2 other homes was primarily incidental and caused by flying debris. The fifth home sustained siding and substantial roof damage. Several boats were damaged/overturned at a local marina. One rowboat near the initial damage area was lifted and tossed 300-400 yards from its tied-down position. Two cars were damaged, one severely. Several trees were severely damaged; one tree was uprooted by an airborne boat. There were no injuries or fatalities. Property damage totaled about \$150,000.
May 25, 2004	Lancaster County. A waterspout formed over Carters Creek and came ashore at Irvington Marina as a tornado. A boat house was blown over and numerous boats damaged. Several cars were also damaged.



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Event Date	Hazard History
February 24, 2016	Lancaster County. The tornado, which began as an EF0 in Middlesex County, intensified briefly to an EF1 in the Norwood Church Road area near Flagstaff Road in Lancaster County. In this area, a brick wall on a garage was flattened, the roof was ripped off a house, and an outbuilding was destroyed. Numerous large trees were snapped, including two-foot diameter pine trees. The tornado continued north and northeast for a short distance before lifting.
	Richmond County. Tornado crossed the Rappahannock River from Essex County into Richmond County. The tornado struck Naylor's Beach as an EF2 tornado removing significant portions of the upper floor of one two story home and destroying several other smaller homes. At this point, the tornado was 300 yards wide with winds around 120 mph. The tornado then crossed Newland Road, weakening slightly to low end EF1 with winds around 90 mph and continuing to Tallent Town Road and Piney Grove Road. The tornado then tracked into Westmoreland County. The tornado caused over \$3.3 million in property damage.
February 24, 2016 (continued)	Westmoreland County. The tornado was re-intensified as it moved from Richmond County into Westmoreland County, crossing Kings Highway (Route 3) west of Nomini Grove as a high EF1 tornado. Tornadoic winds increased to 100 mph, severely damaging two homes, and destroying a mobile home along Kings Highway. It continued to Cople Highway near Mount Holly, severely damaging numerous homes. After crossing Nomini Creek, the tornado struck Bushfield Road damaging several homes. The tornado then continued northeast along Mount Holly Road uprooting and snapping trees before moving into the Potomac River toward Maryland. Reported property damages totaled over \$900,000 in Westmoreland County and over \$78,000 in crop damage.
April 6, 2017	Town of Irvington. On April 6, 2017 an enhanced risk for severe weather was issued for parts of the Mid-Atlantic region. An EF1 touched down in the Town of Irvington in Lancaster County. Some windows were blown out at the local hospital, forcing the hospital to operate on emergency power for a of couple hours. Homes in the town had their roofing material, gutters or awnings, and siding material damaged. Numerous trees were snapped or uprooted.
May 5, 2017	Town of Colonial Beach. Tornado watches, warnings, and straight-line winds. EF-1 tornado near Dahlgren in King George County. Colonial Beach in Westmoreland County experienced more than \$8 Million in damages to residential and commercial property from this system. More than 150 residences were affected, mostly due to damage from downed trees and debris.



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Event Date	Hazard History
August 04, 2020	Lancaster County. An EF-2 tornado traveled 14.21 miles after touching down while the region was suffering the effects of Tropical Storm Isaias. Trees were downed or uprooted, structural damages to homes and buildings, and 5 injuries occurred. \$3 million in damages was reported in Lancaster County. *Tropical Storm Isaias spawned 7 tornadoes Region 5 on August 4, 2020.
	Browns Store, Northumberland County. Numerous trees were downed or broken as the remainder of the EF-2 tornado from Lancaster County tracked through Northumberland as an EF-1 causing approximately \$5,000 in damages.
	Fleeton, Northumberland County. An EF-1 tornado (separate from the EF-2 starting in Lancaster County above) moved onshore from the Chesapeake Bay damaging several homes, breaking uprooting trees, and causing further structural damages. \$626,000 in damages were reported.



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6.3.2 – Severe Weather

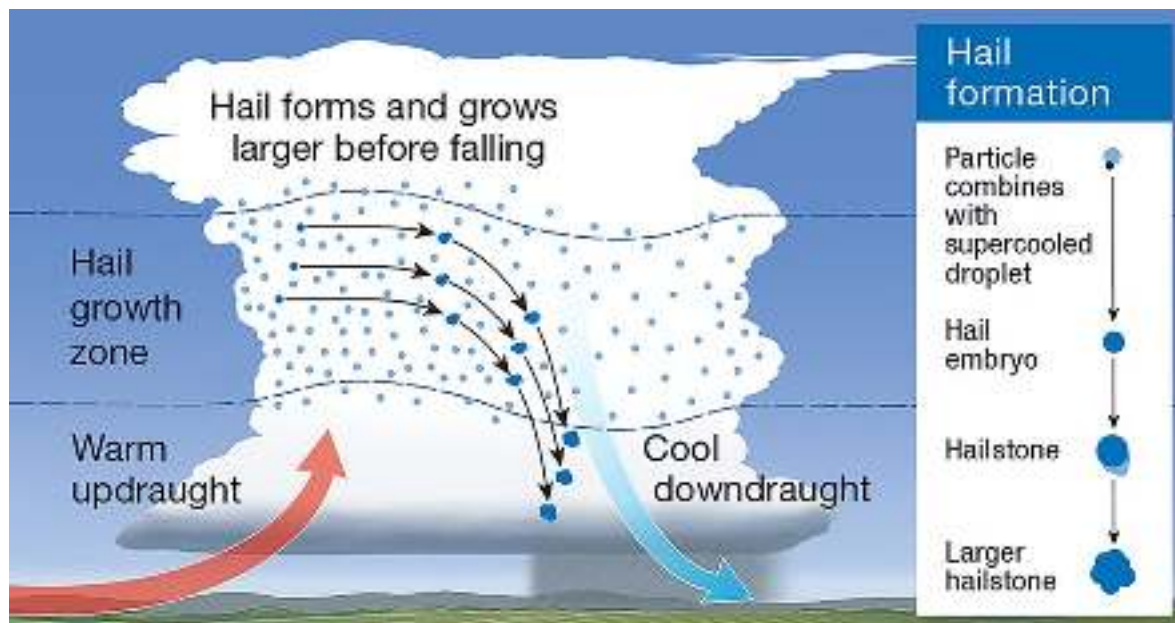
For the hazard mitigation plan update, severe weather includes thunderstorms, extreme wind, lightning, and hail. The National Weather Service (NWS) defines a thunderstorm as a localized storm produced by a cumulonimbus cloud and accompanied by lightning and thunder. Thunderstorms are typically the result of warm, moist air that is pushed upwards into the atmosphere, where it cools and forms cumulonimbus clouds. As the air continues to cool, it starts to form water droplets or ice, rain or hail. As these droplets or ice begin to fall, they may collide and combine many times into larger forms before reaching the earth's surface. These severe storms are associated with the presence of strong winds, thunder, and lightning. It is also possible to experience a thunderstorm with no precipitation, which can cause wildfires.

Thunderstorms can form in any geographic region and sometimes cause other natural phenomena such as downburst winds, heavy rain, flash floods, large hailstones, tornadoes, and waterspouts.

Hail is precipitation in the form of ice pellets larger than five mm that forms in thunderstorms between currents of rising air (updrafts) and currents of descending air (downdrafts), as shown in Figure 6-3. These events typically occur in late spring and early summer. As defined by the NWS, one criterion for severe thunderstorms is hail that is one inch in diameter (quarter-size) or larger.

The NWS defines lightning as a visible electrical discharge (i.e., lightning bolt) produced by a thunderstorm. The release may occur within or between clouds, the cloud and air, a cloud, and the ground, or between the earth and a cloud. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. Lightning rapidly heats the sky as it flashes, but the surrounding air cools following the bolt. This rapid heating and cooling of the surrounding air cause thunder.

Figure 6-3: Hail Formation Process



Source: National Weather Service: <https://www.weather.gov>

6.3.2.1 – Type and Location

All areas within the Northern Neck Region are assumed to be equally at risk of the damaging effects of a thunderstorm that causes high wind, lightning, or hail. Therefore, all regional assets should be considered vulnerable to these hazards, and precautions should be taken to protect them.



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Using the NWS definition for a severe thunderstorm, dime-sized hail is considered a minimum hazard, and quarter-sized hail is regarded as a major hazard. Quarter-sized hail can cause significant damage to crop and livestock, as well as property such as automobiles, aircraft, and roofs. Although rare, large hailstones may even cause injury or death. However, the amount of cover obtained during a hailstorm can significantly reduce the risk to human health during these events.

While there is no established index for lightning, a lightning strike is of minimum severity when it has limited impacts on infrastructure (ex., tree limbs) and significant severity when it causes extensive damage (ex., loss of life, fire, structural damage). The potential damages resulting from lightning strikes are primary injury, loss of life, power outages, business interruption, fire, and minor structural damage. A false sense of security often leads people to believe they are safe from a lightning strike because it may not appear near their location. However, lightning can strike ten miles away from a rain column, putting people still in clear weather at risk.

High wind events can occur for various reasons: low or high-pressure systems, isolated thunderstorms, tropical cyclones, and nor'easters. Using the NWS severe wind categories listed above, sustained non-convective winds of 40 mph or more significant lasting for one hour or longer or winds (sustained or gusts) of 58 mph for any duration, on a widespread or localized basis are considered a minimum severity event. A significant severe event would be wind events greater than 58 mph or a wind event resulting in death, injury, or consequential damage.

6.3.2.2 – Previous Occurrences

There have been 211 Severe Weather events occurring since 1955, 182 significant wind events, five lightning strikes, and 53 hail events. Some events occurred individually, but most were storms that ensconced multiple hazards. Based on the NCEI Storm Events Database, the most significant severe weather events in the Northern Neck Region are extracted and summarized in Table 6-5. Notable events include any event that caused a death or injury (direct or indirect) and the top costly events in terms of property damage. No natural deaths or indirect injuries were reported. The likelihood and potential severity of thunderstorm wind, lightning, and hail events can be assessed by reviewing the number and severity of thunderstorm events in the period of history available for the Northern Neck Region. Table 6-6 shows the distribution of events by recorded wind speed in knots and the distribution of hail events by recorded hail size in localities across the region.



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Table 6-5: High Wind Events the Northern Neck Region

Location	Event Date	Event Type	Magnitude	Injuries	Deaths	Property Damage
Northumberland	09/01/2006	High Wind	37	0	0	\$15,000,000
Lancaster	07/12/2009	Thunderstorm Wind	52	0	0	\$1,000,000
Lancaster	07/12/2009	Thunderstorm Wind	52	0	0	\$1,000,000
Lancaster	07/12/2009	Thunderstorm Wind	50	0	0	\$1,000,000
Lancaster	09/01/2006	High Wind	35	0	0	\$200,000
Lancaster	07/16/2000	Lightning	Unavailable	0	0	\$50,000
Lancaster	08/06/2000	Lightning	Unavailable	0	0	\$50,000
Westmoreland	04/21/2017	Thunderstorm Wind & Hail	50	0	0	\$45,000
Richmond	06/22/2022	Thunderstorm Wind	50	0	0	\$32,000
Richmond	03/02/2018	High Wind	55	3	0	\$30,000
Lancaster	04/06/2017	Thunderstorm Wind	65	0	0	\$27,000
Lancaster	05/04/2021	Thunderstorm Wind	65	0	0	\$25,000
Northumberland	06/02/2022	Thunderstorm Wind	50	0	0	\$13,000
Richmond	6/13/2013	Thunderstorm Wind	52	0	1	\$5,000
Lancaster	5/2/1989	Thunderstorm Wind	100	3	0	\$0

Source: NOAA NCEI Storm Events Database

Table 6-6: Frequency of Winds and Hail in Severe Weather Events

Wind Speed	No Record	0-30kts	31-40kts	41-50kts	51-60kts	61-70kts	71-80kts	81-100kts	Total
# Of Events	20	24	2	114	14	6	1	1	182
Hail Size	0.5 inch	0.75 inch	0.88 inch	1 inch	1.25 inch	1.5 inch	1.75 inch	2 inches	Total
# Of Events	0	15	7	18	1	3	6	3	53

Source: NOAA NCEI Storm Events Database

6.3.3 – Coastal Flooding

Coastal flooding is the inundation of land areas along the coasts of oceans, bays, estuaries, and coastal rivers by seawater greater than regular tide action. Coastal floods are caused by extreme sea levels, which arise from four main factors: waves, astronomical tides, storm surges, and relative mean sea levels. This advancing surge combines with normal tides to create a storm tide that can increase the mean water level



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by 15 feet or more. Severe storm surge is also frequently associated with coastal-influenced storm systems, such as nor'easters and hurricanes that impact the Northern Neck Region.

A nor'easter is a low synoptic-scale cyclone that can form during the fall, winter, or early spring and produces heavy snow, high wind, and rain. The term "nor'easter" refers to the direction of the system's counterclockwise winds, which usually manifests as an offshore air mass rotating counterclockwise northeast-to-southwest over the northwest quadrant of the cyclone or storm system. According to the National Weather Service, the U.S. East Coast provides an ideal breeding ground for nor'easters.

6.3.3.1 – Type and Location

The entirety of the Northern Neck Region is susceptible to the damaging effects of coastal flooding due to its location adjacent to the Chesapeake Bay and near the Atlantic Ocean. In addition, its low-lying coastal areas near the shore, sounds, and estuaries are particularly exposed to the threat of flooding from storm surges and wind-drive waves associated with coastal storms.

Storm surge heights, wind speed, fetch length, pressure, and associated waves depend on the configuration of the continental shelf (narrow or wide) and the measurement of the water depth (bathymetry). These, as well as other factors, can impact storm surge height and wave height. For example, a narrow shelf that drops steeply from the shoreline and produces deep water near the coastline tends to have a lower surge but higher and more powerful storm waves.

6.3.3.2 – Changing Flood Risk

The *North Atlantic Coast Comprehensive Study* was conducted by the U.S. Army Corps of Engineers. The results were published in a report detailing the two-year study to address coastal storm and flood risk to vulnerable populations, property, ecosystems, and infrastructure affected by Hurricane Sandy in the United States North Atlantic region. This study is designed to help communities better understand how climate change is changing and provide tools to help communities better prepare for future flood risk. The study builds on lessons learned from Hurricane Sandy and attempts to provide the latest scientific information for state, local, and tribal planners. The Northern Neck Region communities are a part of the study area, and the study's results should be consulted when developing climate change adaptation measures based on future flood risk.

The Future Sea Level and Recurrent Flooding Risk Report for Coastal Virginia, produced by the Commonwealth Center for Recurrent Flooding Resiliency, presented the conclusion that sea level rise will significantly impact the Northern Neck Region by 2040. In addition, the Commonwealth of Virginia released the Coastal Resilience Master Plan (CRMP) which is set to assist with identifying, adapting, and protecting the coastal areas. The Technical Study within the CRMP examines nine coastal flood events presenting varying magnitudes that can be compared over time horizons: 2020, 2040, 2060, and 2080, with 2020 acting as the baseline representation of conditions. Literature from the CRMP states "Understanding these potential impacts is critical to selecting resilience projects which will minimize potential damage or disruption to a region's way of life."

6.3.3.2 – Previous Occurrences

The NCEI storm events database contains reports of many coastal flood events in the Northern Neck Region area, totaling millions of dollars in reported property damage. These events are primarily the result of storm surges associated with events such as coastal storms, nor'easters, and tropical cyclones. Table 6-7 lists the notable coastal flood events that have affected the Northern Neck Region. The general description applies to the entire region when no community-specific description is given.



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Table 6-7: Notable Coastal Flooding Events in the Northern Neck Region

Event Date	Hazard History
January 27 – 28, 1998	A nor'easter battered eastern Virginia on Tuesday, January 27 th , 1998 and Wednesday, January 28 th , 1998. The slow movement of the storm combined with the highest astronomical tides of the month resulted in an extended period of gale to storm force onshore winds which drove tides to 6.44 feet above Mean Lower Low Water (MLLW) at Sewell's Point in Norfolk. Locally moderate coastal flooding was reported across the Middle Peninsula and Northern Neck Region areas.
February 4 – 6, 1998	A nor'easter battered eastern Virginia from Tuesday, February 3 rd , 1998, through Thursday, February 5 th , 1998. The slow movement of the storm resulted in an extended period of gale to storm force onshore winds which drove tides to 7.0 feet above Mean Lower Low Water (MLLW) at Sewells Point in Norfolk.
September 1, 2006	Tides of 4 to 5 feet above normal, combined with 6-to-8-foot waves caused significant damage to homes, piers, bulkheads, boats, and marinas across portions of the Virginia's Northern Neck Region and Eastern Shore. Some of the most significant damage occurred in the Lewisetta area of Northumberland County. More than \$21 million in damage was reported in the Northern Neck Region from this event.
November 12 – 14, 2009	An intense Nor'easter produced moderate to severe coastal flooding across much of eastern and southeast Virginia and the Virginia Eastern Shore. Several streets, homes and businesses were flooded in low lying areas that are close to or directly exposed to the Chesapeake Bay. There were also damaged piers, bulkheads, and groins.
October 28 – 29, 2012	Superstorm Sandy moved northward well off the Mid-Atlantic Coast then northwest into extreme southern New Jersey produced very strong northeast winds followed by very strong west or northwest winds. Very strong winds caused moderate to severe coastal flooding across portions of eastern and southeast Virginia. Water levels reached 2.0 feet to 3.5 feet above normal adjacent to the Chesapeake Bay and Rappahannock River resulting in moderate to severe coastal flooding. Reported property damages totaled more than \$600,000 in the Northern Neck Region.
October 2– 5, 2015	A combination of Hurricane Joaquin near the Bahamas and intense high pressure over New England produced solid onshore winds over the Mid-Atlantic. The strength and duration of the onshore winds had moderate coastal flooding along the Atlantic Coast and the Chesapeake Bay. A tidal departure of 2 to 3 feet resulted in moderate flooding along the Rappahannock River, Potomac River, and the Chesapeake Bay. Several roads were closed, and several homes and other buildings sustained flood-related damage. Hundreds of residents were evacuated from low-lying Lancaster County in Virginia's Northern Neck Region. Reported property damages exceeded \$1 million.



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Event Date	Hazard History
September 30, 2016	Prolonged east-to-northeast winds produced minor to moderate coastal flooding in parts of the Chesapeake Bay region. Water levels reached average flood levels in the Northern Neck Region. Tides 2 feet above regular caused moderate flooding near the Potomac River and areas adjacent to the Chesapeake Bay. Water levels reached nearly 3.7 feet MLLW at Lewisetta, VA. No damage was reported in the Northern Neck Region.
October 12, 2019	The combination of low pressure from the New Jersey coast and intense high pressure over southeast Canada resulted in persistent north or northeast winds over the Chesapeake Bay. These constant north or northeast winds and high waves allowed water levels to rise throughout the bay. Continuous north or northeast winds and high tides produced tidal anomalies between 2.0 and 3.0 feet over the middle of the Chesapeake Bay, which caused moderate to major coastal flooding over portions of Lancaster County. Windmill Point reached 4.07 feet MLLW on October 12 th , 2019. No damages were reported.
April 04, 2020	Minor tidal flooding occurred over portions of Northumberland County along the Potomac River. Lewis Jetta reached 3.52 feet MLLW.
October 10, 2021	The combination of King Tides and high pressure over the Canadian Maritimes and low pressure just off the North Carolina coast produced east-northeast winds which caused minor to moderate (tidal) coastal flooding over portions of Lancaster and Northumberland Counties adjacent to the Chesapeake Bay. Windmill Point reached 3.51 feet MLLW at 230 pm on Sunday, October 10 th , 2021.
October 28, 2021	Low solid pressure tracked from the Middle Mississippi Valley east northeast toward the Northeast United States from Thursday, October 28 th , 2021, into Saturday, October 30 th , 2021. This system produced powerful east-southeast winds and strong south-to-southwest winds throughout the period, which caused moderate to major (tidal) coastal flooding across portions of Northumberland and Lancaster Counties. Lewis Jetta reached 4.78 feet MLLW at 900 pm on Friday, October 29 th , 2021.
January 03, 2022	A combination of higher astronomical tides and deepening surface low pressure tracking across North Carolina, then northeast out to sea, produced strong northeast or north winds which caused moderate (tidal) coastal flooding over portions of Lancaster County adjacent to the Chesapeake Bay. Windmill Point reached 3.78 feet MLLW at 1100 am on Monday, January 3 rd , 2022.
May 10, 2022	A combination of high surface pressure centered over the Canadian Maritimes and surface low pressure spinning off the Mid-Atlantic Coast resulted in strong northeast or north winds which caused minor to moderate (tidal) coastal flooding over portions of Lancaster County adjacent to the Chesapeake Bay. Windmill Point reached 3.93 feet MLLW. Lewis Jetta reached 3.93 feet MLLW.



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6.3.4 – Riverine Flooding

Riverine flooding occurs when a channel, such as a stream or a river, receives more water than it can hold, and the excess water overflows the channel banks flooding the surrounding area. Heavy rain and large amounts of snow melt can cause riverine flooding. In the Northern Neck Region, coastal influenced storms such as nor'easters, tropical storms, and hurricanes have been known to cause severe riverine flooding due to high rainfall rates and coastal storm surge that causes water to become trapped in the tributaries of the Chesapeake Bay.

6.3.4.1 – Type and Location

The Northern Neck Region is boarded by the Potomac River, the Rappahannock River, and the Chesapeake Bay. The proximity of multiple large rivers to this region puts it at high risk of experiencing riverine flooding. The floodplain delineates areas of risk, an area typically adjacent to rivers, streams, and shorelines that experiences periodic flooding that is expected to occur based on established recurrence intervals. The recurrence interval of a flood is defined as the average time interval, in years, expected between a flood event of a particular magnitude and an equal or more significant flood. Flood magnitude increases with increasing recurrence interval.

Floodplains are designated by the frequency of the flood that is large enough to inundate the area. Flood frequencies such as the 100-year flood are determined by plotting a graph of the size of all known torrents for a place and determining how often floods of a particular size occur. Another way of expressing the flood frequency is the chance of occurrence at any time, expressed as a percentage of the probability of flooding each year. For example, a 100-year flood has a one percent chance of occurring in any given year. The 500-year flood zone has a 0.2 percent chance of occurrence in any given year. Flood Insurance Rate Maps (FIRMs) are developed as part of a FEMA Flood Insurance Study (FIS) to delineate the areas at risk of being flooded during a one percent chance or 100-year flood event. The one percent chance floodplains are called the Special Flood Hazard Area (SFHA).



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Figure 6-4: FEMA Flood Zones in the Northern Neck Region



Source: HAZUS

6.3.4.2 – Previous Occurrences

According to the NRI Community Risk Report and NCEI database, 17 riverine flood events have been recorded in the Northern Neck Region since 1996. Table 6-8 lists the most significant of these events. While tropical storms or hurricanes caused these events, the specific events reported resulted from heavy rainfall associated with the storm, not flooding caused by the storm surge, which will be addressed in subsequent sections.



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Table 6-8: Previous Occurrences of Flooding Events in the Northern Neck Region

Event Date	Hazard History
September 16, 1999	Heavy rain from Hurricane Floyd produced widespread flooding and flash flooding across central and eastern Virginia. The flooding was a 500-year flood of record. Richmond and Westmoreland's counties reported property damages totaling \$850,000 and crop damages of about \$255,000.
August 27, 2011	Heavy rains associated with Hurricane Irene produced widespread low-land flooding across much of the Northern Neck Region, including washed-out or closed roadways. Storm total rainfall generally ranged from six to eleven inches. Lottsburg reported 8.67 inches of rain. Newland said 10.50 inches of rain. Montross reported 7.20 inches of rain.
September 08, 2011	The combination of the remnants from Tropical Storm Lee and a frontal boundary draped over the region caused heavy rain, which produced flash flooding across portions of central and eastern Virginia. In Westmoreland, many streets were closed by VDOT and the Fire Department. As a result, many homes were flooded on Washington and Irving Streets. Flooding was also reported on Monticello Road.
October 29, 2012	Superstorm Sandy, which moved northward well off the Mid-Atlantic coast, produced heavy rain, which caused flooding across much of eastern and southeast Virginia. Numerous roads were closed due to flooding. Total rainfall ranged from three to ten inches across the Northern Neck Region. Total rainfall of 9.90 inches was reported at Reedville. Total rainfall of 6.77 inches was reported at Lottsburg.
July 28, 2017	Scattered thunderstorms in advance of and along a frontal boundary produced heavy rain and flash flooding across central and eastern Virginia portions. Portions of Route 202 in Callao were flooded. A rainfall total of 7.15 inches was measured at Lottsburg.
May 17-22, 2018	Multiple occurrences of showers and thunderstorms associated with areas of low pressure along a frontal boundary produced heavy rain, causing flash flooding, standing water, and pluvial flooding. As a result, northern Neck Region communities suffered flooding and road closures over a week due to heavy rainfall and ground saturation.
June 22, 2018	Scattered thunderstorms along a frontal boundary produced heavy rain, which caused flash flooding across portions of central Virginia. Mobile home development in Wellford (Richmond County) suffered flooding that invaded homes.



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Event Date	Hazard History
October 11, 2018	Tropical Cyclone Michael tracked from South Carolina up the Atlantic coast producing heavy rain and flash flooding. Rainfall totals reported across the Northern Neck Region included: 8.3 inches at Kennard, 7.1 inches at Kinsale, 4.8 inches at Mt Holly, 6.5 inches at Mollusk, 7.9 inches at Howland, and 7.1 inches at Lottsburg. Roads across the region remained closed, washed out, or impassable over 2-3 days.
June 11, 2021	Scattered thunderstorms along a frontal boundary produced heavy rain, which caused flash flooding across portions of central and eastern Virginia. Flood waters on Cat Point Creek in Newland resulted in the dam failure of Chandlers Mill Pond – a water rescue was necessary because of the dam failure. In addition, portions of Route 3 and other major roads were closed due to water. Rainfall totals ranged from 4-10 inches across the region.



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6.3.5 – Wildfire

A wildfire is an undesirable fire occurring in a forest, brushland, marsh, coastal vegetative areas, or wooded development that is a severe and growing hazard over much of the United States. Fires ignited by natural causes such as lightning or a controlled burn process are part of the wildfire cycle and an essential contributor to forest health.

Wildfires are uncontrolled fires spreading through vegetative fuels, exposing and possibly consuming structures for areas more significant than one acre. Wildfires may create additional environmental concerns after extinguishing, such as increased erosion and water quality in stormwater runoff. Three main factors influence wildfire behavior – topography, fuel, and weather. Other hazards can contribute to the potential for wildfires or influence wildfire behavior. For example, high winds can blow down power lines, and lightning can spark fires. Drought conditions also increase wildfire potential by decreasing fuel moisture. Warm winters, hot, dry summers, severe drought, insect and disease infestations, years of fire suppression, and growth in the wildland-urban interface (WUI) continue to increase wildfire risk and the potential for catastrophic wildland fires. Forest insect epidemics and forest parasites contribute to wildfire potential by increasing fuel loading.

Humans cause nearly 85% of wildland fires in the United States. Human-caused fires result from campfires left unattended, debris burning, equipment use and malfunctions, negligently discarded cigarettes, and intentional acts of arson. (*Source: National Park Service (NPS): Wildfire Causes and Evaluations*).

6.3.5.1 – Type and Location

WUI refers to the zone of transition between unoccupied land and human development. It is the line, area, or location where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. Communities adjacent to and surrounded by wildland are at varying degrees of risk from wildfires. (*WUI: Desk Reference Guide*)

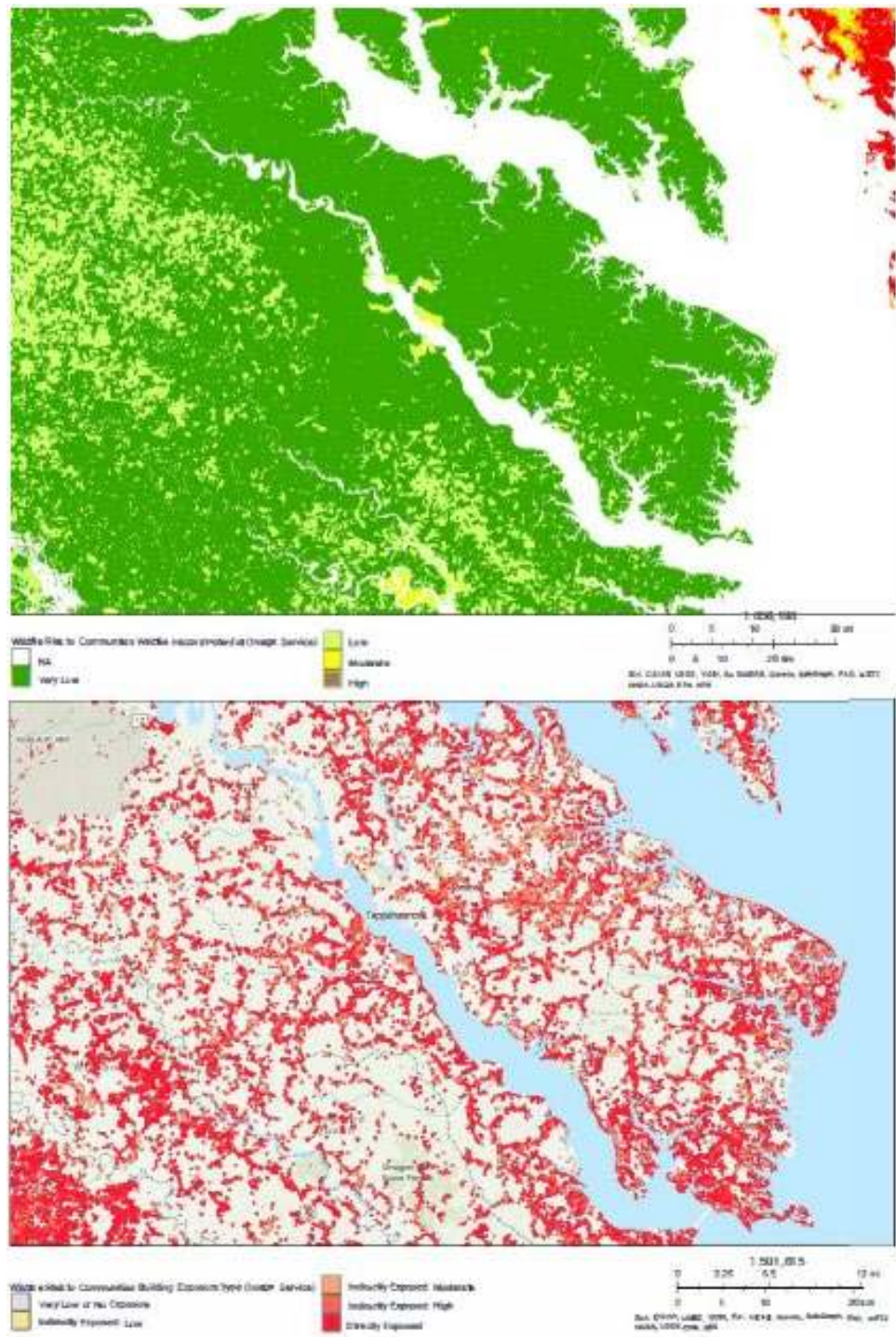
Wildland fires have recently grown in prominence across the United States, and the risk is not missed in the Northern Neck Regions. Although there are not many records of significant wildland fires in the Northern Neck Region, wildland fires have affected Region 5, such as the Great Dismal Swamp Fire in 2011, and in February of 2022, nearby Virginia Beach battled multiple wildfires in the Back Bay National Wildlife Refuge.

The Northern Neck Region has a significant means of fuel and conditions that could feed wildfires, and limited first responders, distance, and water access contribute to the possibility of wildfires growing and decreasing the chances of controlling the fire quickly. In the summer seasons, precipitation is often scarce, and coastal vegetation, farmland, debris, and woodland are dry with decreases in the water supply that depend on rainwater to replenish the reservoirs.



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Figure 6-5: Wildfire Risk to Communities and Buildings



Source: Wildfire Risk Map Layer <https://www.arcgis.com/apps/mapviewer/index.html>



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6.3.5.2 – Previous Occurrences

According to the Virginia Department of Forestry 2009-2022 statistics, there are 141 incidents reported in the Northern Neck Region. Table 6-9 presents statistics for wildfires from 2009-2022 provided by the Virginia Department of Forestry (VDOF). Figure 6-6 shows wildfires recorded from the VDOF database for the region during 2002-2021.

Table 6-9: Wildfire Statistics in the Northern Neck Region

Jurisdiction Data	Lancaster	Northumberland	Richmond	Westmoreland	Northern Neck Region
Total Wildfires	52	38	18	33	141
Total Acres Burned	66.3	120	25.3	75	286.6
Homes Damaged/Destroyed	0/0	0/0	1/0	0/0	1/0
Homes Damaged/Destroyed Value	\$0	\$0	\$58,000	\$0	\$58,000
Buildings Damaged/Destroyed	1/0	3/1	1/2	0/0	5/3
Buildings Damaged/Destroyed Value	\$1,000	\$3,100	\$5,000	\$0	\$9,100
Other Items Damaged/Destroyed	21	42	1	18	82
Other Items Damaged/Destroyed Value	\$225,400	\$508,000	\$40,000	\$11,700	\$857,100

Source: Virginia Department of Forestry Fire provided data



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Figure 6-6: Northern Neck Regional Wildfires and Risks to the Community 2002-2021



Source: VDOF database

6.3.6 – Winter Weather

Winter storms are events in which varieties of precipitation are formed that only occur at low temperatures, such as snow or sleet, or a rainstorm where ground temperatures are low enough to form ice (i.e., freezing rain). The following are the National Weather Service's descriptions of various components of a winter storm:

- **Heavy snowfall.** The accumulation of six or more inches of snow in 12 hours or eight inches in 24 hours.
- **Blizzard.** Sustained wind speeds over 35 mph accompanied by heavy snowfall or large amounts of blowing or drifting snow for more than three hours.
- **Freezing rain.** Precipitation falls as a liquid but freezes on contact with roads, trees, power lines, and other surface structures below 32 degrees F, forming a dangerous ice laze.
- **Ice storm.** A type of winter storm characterized by freezing rain results in a dangerous coating of ice on trees, power lines, and road surfaces.
- **Sleet.** Solid grains or pellets of ice formed by the freezing of raindrops or the refreezing of primarily melted snowflakes. Sleet does not cling to surfaces.
- **Wind chill.** A calculated temperature index that describes the combined effect of wind and low air temperatures on exposed skin.

Winter storms usually form along a stationary front. An area of lower pressure develops along the front as the atmosphere tries to even out the pressure difference. This pressure difference creates wind that blows from high to low pressure to move enough air to even out the pressure difference. As the air moves toward the low-pressure area, it has nowhere to go but up into the colder regions of the atmosphere, which causes



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water vapor in the air to condense and fall as snow. To the south, if the temperatures are warm enough, it can fall as heavy rain in thunderstorms.

6.3.6.1 – Type and Location

Winter storms derive energy when two air masses of substantially different temperatures and moisture levels meet. In Northeastern Virginia, winter storms usually form when an air mass of cold, dry Canadian air moves south and interacts with a warm, moist air mass moving north from the Gulf of Mexico. The point where these two air masses meet is called a front. If cold air advances and pushes away the warm air, it forms a cold front. When warm air advances, it rides up over the denser, cold air mass to create a warm front. If neither air mass advances, it forms a stationary front.

In the temperate eastern Virginia climate, winter storms infrequently occur during late fall or spring but are contained mainly in the winter season, particularly between January and early March. Winter storms can include heavy snow, freezing rain, and high winds that completely disrupt communities' transportation networks, cause power outages, close schools, and hamper communication.

6.3.6.2 – Previous Occurrences

According to the NCEI Storm Events Database, there have been 53 recorded winter storm events across the Northern Neck Region counties since 1996, including the following types of events: Blizzards, heavy snow, ice storm, and winter storm.

These severe winter weather events have resulted in \$260,000 in property damage. In addition, the Northern Neck Region has had five major disaster declarations and two emergency declarations related to winter storm weather. Table 6-10 identifies some of the most significant of these events.

Table 6-10: Previous Occurrences of Winter Storm Events in the Northern Neck Region

Event Date	Hazard History
January 26, 1987	A record 17.0 inches of snow fell 24 hours on January 26, 1987, in Richmond County.
March 13, 1993	The "Blizzard of '93", also known as the "Superstorm '93" and the first coined "Storm of the Century" during the 90s, was an incredibly intense nor'easter that impacted the entire East Coast of the U.S. An emergency declaration was made for the Northern Neck Regional jurisdictions.
January 6, 1996	The blizzard of 1996 was a strong winter storm that impacted the eastern United States, especially the metropolitan areas of Washington, DC, Philadelphia, New York City, and Boston. Three-day snowfall totals ranged from 10-20 inches in the Northern Neck Regional area. As a result, a presidential disaster was declared that included Northern Neck Regional jurisdictions.
December 23, 1998	A significant ice storm affected central and eastern Virginia from Wednesday, December 23, into Friday, December 25, including all four counties in the Northern Neck Region. A prolonged period of freezing rain and some sleet resulted in ice accumulations of one-half inch /0.50/ to one inch /1.00/ in many locations. The heavy ice accumulations on trees and power lines caused widespread power outages across the region. Approximately 400,000 customers were without power during the maximum outage period, Christmas Eve day. Some customers were without power for about ten days.



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Event Date	Hazard History
	Many accidents occurred due to slippery road conditions, especially bridges and overpasses. Secondary roads were impassable due to fallen tree limbs and, in a few cases, whole trees.
January 25, 2000	A significant winter storm dumped more than one foot of snow across much of central and eastern Virginia, with isolated amounts of up to 19 inches reported. There was also significant blowing and drifting of snow as winds gusted over 30 mph during the storm. The Richmond International Airport was closed during this storm. A frigid air mass built into the region after the storm, preserving the snowpack for over a week in many areas. Snow totals in the Northern Neck Region included: Richmond County 11 to 12 inches, Westmoreland County 12 to 13 inches, and Northumberland County 12 inches.
January 30, 2000	An ice storm affected a large portion of central and eastern Virginia with ice accumulations of up to one-half inch. Freezing rain mixed with sleet and snow spread over the area during the morning hours. Freezing rain then mixed with rain during the afternoon and evening along the eastern counties of Richmond, and Westmoreland Counties. More than \$30,000 in property damage was reported.
April 7, 2007	Low pressure developed over southern Virginia and deepened as it moved offshore. A band of moderate to heavy snow fell over portions of eastern Virginia as the storm strengthened off the Atlantic seaboard. Heavy snow in Richmond, Northumberland, and Lancaster Counties.
January 30, 2010	Low pressure moving off the coastal Carolinas produced between five and fifteen inches of snow across central and eastern Virginia from Friday night, January 29th, into Saturday night, January 30th. Snowfall amounts reported in the Northern Neck Regional jurisdictions ranged from as low as seven inches to thirteen inches of snow reported in Richmond County.
February 5, 2010	Low pressure moving off the coastal Carolinas produced between four and twelve inches of snow across central and eastern Virginia from Friday afternoon, February 5th, through Saturday afternoon, February 6th. In the Northern Neck Region, some of the heaviest snow fell in Newland, Richmond County, with 11 inches.
January 22, 2016	Intense low pressure moving from the Southeast United States northeast and off the Mid-Atlantic Coast produced between five and thirteen inches of snow and strong winds across the Virginia Northern Neck Region and south-central Virginia. Heathsville reported 11 inches of snow.
January 7, 2017	Low-pressure tracking northeast off the Southeast and Mid-Atlantic Coasts produced heavy snow and strong winds across eastern Virginia. In Northumberland and Lancaster Counties, snowfall totals were generally between 8 inches and 12 inches. Strong north winds affected the area, producing some blowing snow and reduced visibility. Heathsville and Brook Vale reported 12 inches of snow.



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Event Date	Hazard History
February 11, 2021	Colder air at the surface filtering in from the north, combined with weak low-pressure areas tracking across the Carolinas, produced snowfall totals between three and six inches across central Virginia, the Virginia Northern Neck Region, and the Virginia Eastern Shore. Snowfall across the Northern Neck Region equaled 3-5 inches causing travel issues and some power outages.

6.3.7 Hurricane/Tropical Storms

The NOAA's National Hurricane Center defines a tropical cyclone as a warm-core non-frontal synoptic-scale cyclone originating over tropical or subtropical waters, with organized deep convection and a closed surface wind circulation about a well-defined center. In addition, tropical cyclones are defined by atmospheric and hydrologic characteristics such as severe winds, storm surge flooding, high waves, coastal erosion, extreme rainfall, thunderstorms, lightning, and, in some cases, tornadoes. Tropical cyclones that impact the east coast of the United States originate in the Atlantic basin, which includes the Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico.

Depending on strength, tropical cyclones are classified as hurricanes or tropical storms. The Saffir-Simpson Hurricane Wind Scale (Figure 6-7) uses wind speed, central pressure, and damage potential to create storm classifications. This scale is the standard describing an event's disaster potential. The scale uses a 1 to 5 categorization based on the hurricane's intensity at the indicated time. The scale provides examples of damage and impacts in the United States associated with winds of the indicated intensity. In general, damage rises by about a factor of four for every category increase.

Figure 6-7: Saffir-Simpson Hurricane Wind Scale

Category	Sustained Wind Speed	Impacts due to Wind
5	157 mph or higher 137 kt or higher 252 km/h or higher	Catastrophic Impacts: High percentage of homes will suffer severe damage or destruction, due to breached openings, roof failure, and wind-driven rain. Fallen trees and power lines will isolate neighborhoods. Disruption to utilities may last weeks or months.
4	130-156 mph 113-136 kt 209-251 km/h	Catastrophic Impacts: Homes will suffer severe damage to roof structure, exterior walls, and windows. Wind-driven rain may cause interior damage. Numerous trees will be snapped and uprooted. Disruption to utilities may last weeks.
3	111-129 mph 96-112 kt 178-208 km/h	Devastating Impacts: Homes will incur major damage to exterior walls, roof shingles and decking. Snapped trees and downed power lines will block numerous roads. Disruption to utilities may last days to weeks.
2	96-110 mph 83-95 kt 154-177 km/h	Extensive Impacts: Many homes will incur damage to siding, roof shingles and decking. Many trees will be snapped, uprooted, and block some roads. Power outages expected for several days.
1	74-95 mph 64-82 kt 119-153 km/h	Homes could have damage to shingles, wind siding, and gutters. Trees may lose major branches; smaller trees may uproot. Power loss could last days.
Tropical Storm	39-73 mph 34-63 kt 63-118 km/h	Damage to some trees and power lines. Power loss in some areas. Outdoor items may become airborne and dangerous.

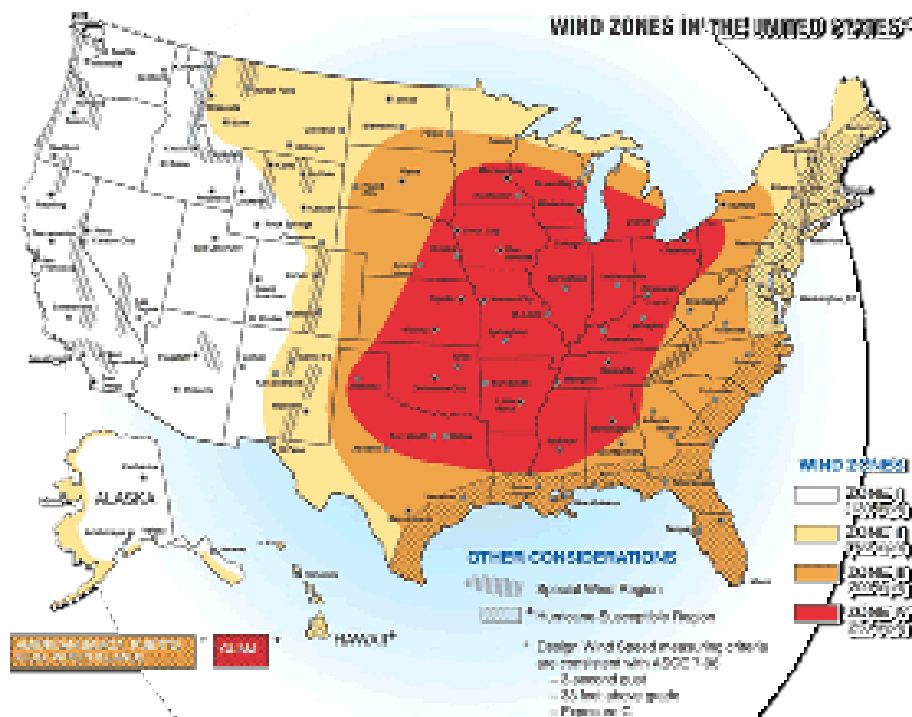
Source: NOAA NHC: <https://www.nhc.noaa.gov/>

6.3.7.1 – Location and Extent

All areas within the Northern Neck Region are equally at risk of being affected by a hurricane, but storm damage depends on factors such as the specific storm track, tides, and temperatures. The hurricanes that affect Virginia typically form in the Atlantic or Gulf of Mexico during the months of June through November. These storms form from low-pressure solid systems originating in the tropics, which cause the updraft of warm ocean water. Typically, these systems damage solid winds and high seas that can cause flooding and shoreline erosion. A storm in the Atlantic is defined as a hurricane when the maximum sustained winds reach 74 miles per hour. Below this level is defined as either a tropical storm or a tropical depression.

A hurricane or storm track is the line that delineates the path of the eye of a hurricane or tropical storm. The average diameter of hurricane-force winds is 100 miles, with tropical-storm-force winds extending out 300 – 400 miles. Figure 6-8 shows the distribution of the four wind zones in the United States that reflect the number and strength of extreme windstorms. For example, the Northern Neck Region is in a “Hurricane-Susceptible Region” of Zone II, where damaging wind speeds of up to 160 mph can be experienced. Buildings should be built to withstand this level of wind event.

Figure 6-8: National Wind Zones



Source: National Institute of Standards and Technology: <https://www.nist.gov/image/windzonemapjpg>

Storm surge flooding can push inland, and riverine flooding associated with heavy inland rains can be extensive. High winds are associated with hurricanes, with two significant effects: widespread debris due to downed and damaged trees and building debris; and power outages. The Northern Neck Region is especially vulnerable to hurricanes and their impacts. A tropical cyclone or hurricane has the potential to affect the entire region demonstrated by many past tropical depressions, tropical storms, and hurricanes. As a storm moves into more shallow waters, wave heights may lessen, but water levels rise, bulging up on



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the storm's front right quadrant in the "storm surge." that is the deadliest part of a hurricane. Storm surges and wind-driven waves can devastate a coastline.

6.3.7.2 – Previous Occurrences

According to the NCEI database, the only storms that have impacted the Northern Neck Region at hurricane strength: were Hurricanes Fran, Floyd, and Isabel. While these storms did not directly track over the Northern Neck Region, damages were reported in the area due to coastal flooding and high wind associated with the storms because of their relatively high strength in their northeastern quadrant. Tropical storms most often impact the region as the remnants of a hurricane moving up the east coast, and these storms frequently bring significant risks and damages. Table 6-11 summarizes the hurricanes and tropical storms to impact the Northern Neck Region since 1996.



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Table 6-11: Previous Occurrences of Hurricanes in the Northern Neck Region

Event Date	Hazard History
September 5, 1996	Hurricane Fran was a Category 3 hurricane that struck Virginia and North Carolina in September 1996. In Virginia, winds between 39 and 73 mph lashed the Chesapeake Bay and increased water levels in the Potomac River around the nation's capital. There was severe damage to power lines that left 415,000 households in Virginia without electricity, making it the most significant storm-related power outage in history until Hurricane Isabel in 2003. Along the Rappahannock River, a storm surge of 5 feet damaged or sank several small boats and damaged wharves and bulkheads. In addition, an F1 tornado touched down in Lancaster County in the Northern Neck Region, producing winds up to 90 mph that caused \$2.5 million in residential damage to 45 structures and \$200,000 in commercial damage.
September 15, 1999	Hurricane Floyd was a Category 1 hurricane as it entered Virginia on September 15, 1999. For the Northern Neck Region area, Hurricane Floyd brought heavy rainfall due to a stalled frontal boundary. The downpour led to overflowing rivers in the Chowan River Basin, some exceeding 500-year flood levels. Northumberland and Lancaster counties reported \$1.1 million in property damage and \$147,000 in crop damage due to this storm.
September 18, 2003	Hurricane Isabel was a Category 1 hurricane crossing the Virginia Beach area. Sustained tropical storm force winds with frequent gusts to hurricane force occurred over Eastern Virginia, along and near the Chesapeake Bay and Atlantic coastal waters. While Hurricane Isabel ultimately made landfall in Ocracoke Island, NC, and tracked inland west of Richmond, Virginia, the high winds, and storm surge greatly affected the Northern Neck Region. For example, the storm surge at Colonial Beach in Westmoreland County reached 6.5 feet. The storm caused widespread power outages, downed numerous trees, and eroded beaches throughout the Northern Neck Region. In addition, Westmoreland County reported about \$450,000 in crop damage because of the storm.
September 1, 2006	The remnants of Tropical Storm Ernesto interacted with extremely high pressure over New England to generate strong winds, heavy rainfall, and storm surge-related tidal flooding and damage. Five to 8 inches of rainfall were typical across central and eastern Virginia. This rainfall caused flooding in many areas, although no substantial river flooding resulted from the heavy rain. Wind gusts of 60 to 70 mph occurred on the Eastern Shore of Virginia and areas adjacent to the Chesapeake Bay from Yorktown northward. Tides were exceptionally high from communities adjacent to the York River, northward through the Rappahannock River, to tidal portions of the Potomac River. Tides 4 to 5 feet above average, combined with 6-to-8-foot waves, caused significant damage to homes, piers, bulkheads, boats, and marinas across portions of the Peninsula and Middle Peninsula near the Chesapeake Bay and adjacent tributaries. At some locations on the Middle Peninsula, Northern Neck Region, and Eastern Shore, the tidal flooding and damage rivaled that from Hurricane Isabel in 2003. Power outages were widespread across



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Event Date	Hazard History
	Virginia's Northern Neck Region and Middle Peninsula. Reported property damages in Northumberland County were over \$23 million (2017\$).
August 27, 2011	Hurricane Irene affected the Mid-Atlantic Region by bringing strong winds, storm surge flooding, and up to 12 inches of rain across eastern North Carolina, central and eastern Virginia, and the DELMARVA peninsula. Although Irene passed east of the Mid-Atlantic coast, the most substantial wind damage occurred in a swath from Caroline and Westmoreland counties (Northern Neck Region) southward into the Richmond metropolitan area, then southeastward into Surry, Sussex, James City, and Southampton counties. Winds estimated between 70 and 80 mph downed many trees, blocked roads, and caused widespread power outages. In addition, the Richmond Times-Dispatch reported widespread downed trees, standing water, and minor damage to homes.
October 28, 2012	Hurricane Sandy was the deadliest and most destructive hurricane of the 2012 Atlantic hurricane season and the second-costliest hurricane in United States history. On October 26, Governor of Virginia Bob McDonnell declared a state of emergency. Moderate to severe flooding occurred along the coast and the Rappahannock River in the Northern Neck Region.
September 02, 2016	Hurricane Hermine tracked up the east coast from the Caribbean, leaving large amounts of rainfall, deaths and injuries, wind damage, and flooding. The Northern Neck Region suffered minor damages compared to other storms. Periods of heavy rain, beach erosion, and high tides were notable.
October 8, 2016	Hurricane Matthew was a powerful and devastating tropical cyclone that became the first Category 5 Atlantic hurricane since Hurricane Felix in 2007. While the damage was primarily confined to the coast in Florida and Georgia, torrential rains spread inland in the Carolinas and Virginia, causing widespread flooding. Impacts to the Northern Neck Region were localized.
August 04, 2020	Hurricane Isaias tracked north just inland of the central Atlantic coast of Virginia as a tropical storm producing tropical storm force winds, significant structural damages, coastal damages, and \$250k in the Northern Neck Region localities. In addition, region 5 in Virginia reported \$2.8 million in damages.
July 08, 2021	Hurricane Elsa was not a significantly costly storm for localities in the Northern Neck Region. It tracked north inland of the central Atlantic coast producing tropical storm force winds causing damage, downing trees, and power lines, and causing power outages. In addition, minor structural damage was reported in the region.



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6.3.8 – Coastal Erosion

Coastal erosion is the landward displacement of the shoreline caused by the forces of waves and currents. Sea level rise, land subsidence, and increasing rates of shoreline development intensify tidal erosion, causing property loss and water quality degradation. As a result, coastal erosion significantly impacts water quality and natural resources. According to the Virginia Department of Conservation and Recreation's Shoreline Advisory Service, there is a state of constant change in the shorelines, and some shorelines in Virginia have historical erosion rates of up to 30 feet per year. (Source: <https://www.dcr.virginia.gov/soil-and-water/seas>).

Coastal erosion poses an increasingly severe threat to the region's local governments since each county features significant shoreline areas encompassing a large percentage of each community's higher-value residential building stock. In addition, coastal erosion is wearing away the land exacerbating the removal of beach or dune sediments. Wind and fast-moving motor craft can also cause coastal erosion, initiating temporary or long-term loss of deposits and rocks and redistributing coastal sediments. These processes often result in shoreline loss due to erosion in one location balanced by nearby accretion.

6.3.8.1 – Type and Location

Coastal erosion impacts the jurisdictions in the Northern Neck Region in varying degrees. The two driving forces of coastal erosion in the Northern Neck Region are the slow rise in sea level that started about 15,000 years ago that has flooded the coastal plain watersheds and wave action from hurricanes and nor'easters¹. As the shorelines recede and erode, the bank material creates sandy beaches and is carried offshore to make sand bars.

Erosion rates and potential impacts are highly localized. Four principal factors determine coastal erosion rates: storm frequency; storm type and direction; resulting wind, tides, current, and waves; and storm intensity and duration. Other forces which cause increased levels of stormwater runoff and coastal erosion are:

- human activity
- grading
- upland runoff
- vegetation removal

The beaches and dune system along the Chesapeake Bay are protected by the Coastal Primary Sand Dune Protection Act of 1980². Research by Hardaway *et al.* (2001) located, classified, and counted the dune systems within the eight localities listed in the Act, including Northumberland and Lancaster Counties. Subsequently, the Northumberland County Dune Inventory was created by Hardaway *et al.* in 2003 to detail the location and nature of the primary jurisdictional dunes along the Northumberland County Chesapeake Bay shoreline. Figure 6-9 outlines a typical Chesapeake Bay dune profile.

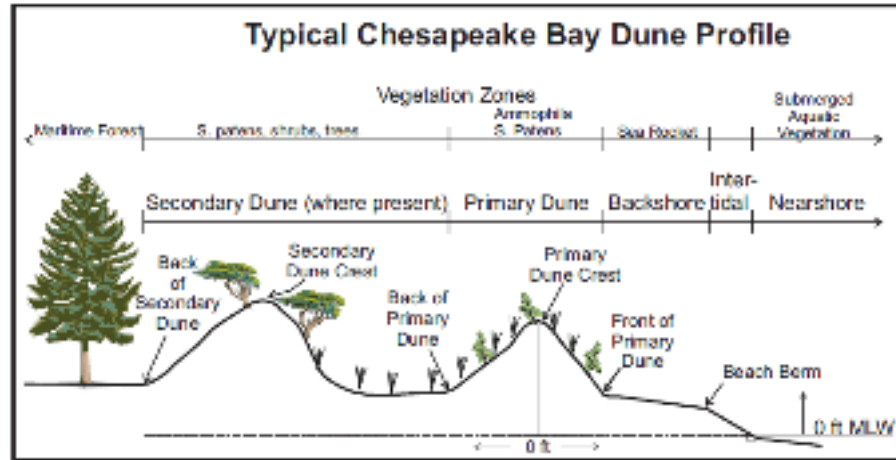
¹The General Assembly of Virginia enacted the Coastal Primary Sand Dune Protection Act (the Dune Act) in 1980.

² The Dune Act was initially codified in § 62.1-13.21 to -13.28. The Dune Act is now recodified as Coastal Primary Sand Dunes and Beaches in § 28.2-1400 to -1420.



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Figure 6-9: Typical profile of a Chesapeake Bay Dune System



Source: Virginia Institute of Marine Science, Chesapeake Bay Shoreline Evolution Reports

Updated shoreline evolution studies were completed for Northumberland (August 2014), Lancaster (March 2012), Richmond (September 2011), and Westmoreland (September 2012) Counties by the Virginia Institute of Marine Science (VIMS) in conjunction with The College of William & Mary, which presents how these dune profiles have evolved since 1937 using aerial imagery. The localized effect of land subsidence and flood heights can vary by several feet over the tidal areas, given basin shape, wind direction, and tide state.

6.3.8.2 – Previous Occurrences

There is no single continuous record of coastal erosion events for the Northern Neck Region, and coastal erosion is a constant and pervasive issue that could cost the Northern Neck Region billions in future property damages. The Northern Neck Region includes more than 1,000 miles of shoreline, including beaches, marinas, and historic towns with valuable waterfront property. Shoreline erosion is greatly influenced by coastal storms, sea-level rise, tidal patterns, and stormwater runoff.

Stormwater runoff rate and volume increase with the amount of solid impermeable surfaces located near the shoreline that prevent water from soaking into the ground. High water levels during a storm often result in shoreline erosion and can affect the performance of erosion control efforts such as living shoreline efforts.

A noteworthy example of erosion from storm events:

- Hull Springs Farm, Lower Machodoc Creek, Westmoreland County
 - Due to Tropical Storm Ernesto in 2006, the base of the bank was significantly impacted, and the nature of the long-term erosion was dramatically revealed. The wave action cut bank scarp generated from the storm was 6 ft high and eroded 1 to 2 ft in some areas.

6.3.9 – Pluvial Flooding

Pluvial flooding occurs when the ground is saturated with water and falling rain has nowhere to go. Large amounts of rainfall in short periods leave the water with nowhere to go if the ground is already saturated or if there has been a prolonged period without precipitation, and the ground will not readily soak up liquids at a rapid pace resulting in poor stormwater runoff and can cause flash flooding, roadway inundation, and dangerous road conditions.



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6.3.9.1 – Type and Location

The landscape and location of the communities in the Northern Neck Region increase flooding risks in general. The risks of excessive rainfall from coastal storms and severe weather events further increases the risk of pluvial flooding.

6.3.9.2 – Previous Occurrences

Table 6-12: Previous Pluvial Flooding Events in the Northern Neck Region

Date	Description
September 05, 2006	High water was reported on several roads across the county, including State Routes 202 and 3. SR 202 was reported to have water and soil spill over the road due to an erosion.
July 28, 2017	Scattered thunderstorms in advance of and along a frontal boundary produced heavy rain and flash flooding across portions of central and eastern Virginia. Portions of Route 202 were flooded.
September 09, 2018	Scattered showers and thunderstorms along a stationary boundary produced heavy rain which caused flash flooding across portions of the Virginia Northern Neck Region. Several roads were flooded over portions of eastern Lancaster County, especially around the Town of Kilmarnock. Radar estimates indicated that up to three inches of rain had fallen in the area. Portions of Route 354 was reported under water.
June 11, 2021	Scattered thunderstorms along a frontal boundary produced heavy rain which caused flash flooding across portions of central and eastern Virginia. Route 354 (River Road) was flooded near Belle Isle Road in Lancaster. In Northumberland, Route 202 (Hampton Hall Road) was closed at Callao due to vehicles stranded in flood waters. Valley Drive was flooded. Vehicles were stranded and a water rescue occurred from a vehicle in about 3 feet of water. In Richmond County, roads were flooded from Warsaw to Oldhams, many roads were closed due to flooding, a water rescue occurred on Peach Grove Road due to flood waters on Cat Point Creek resulting from the dam failure of Chandlers Millpond. Westmoreland was faced with multiple road closures due to flooding, including several main routes into towns.

6.3.10 – Landslide

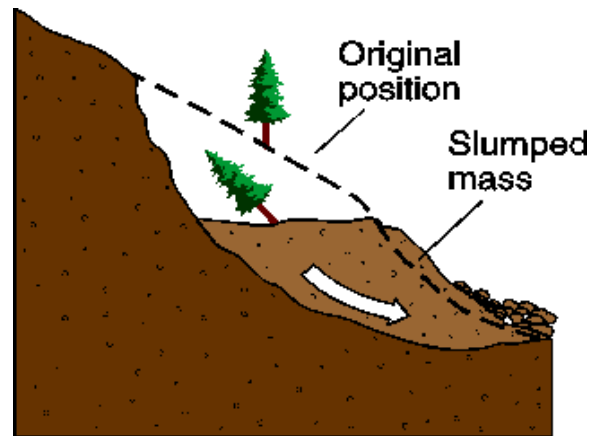
The USGS defines landslide as the movement of a mass of rock, debris, or earth down a slope and the term incorporates five modes of slope movement: falls, topples, slides, spreads, and flows. Landslide is not an everyday event. The type of geologic material involved can determine further the type of landslide that may occur in an area such as rock falls and debris flows. Debris flows would be the most direct of concerns in the Northern Neck jurisdictions. One event is recorded in the NCEI, and the NRI has not recorded any since 1996. Nevertheless, there is concern among the Region that some of the inland river areas have a risk for landslide events, and the NRI notes Landslide as a “Relatively Moderate or Low” Risk



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with an Index Score of 19.64 in Lancaster, 15.92 in Northumberland, 17.78 in Richmond, and 15.74 in Westmoreland. Figure 6-10 demonstrates a before and after example of a landslide.

Figure 6-10 Landslides



Source: BC Ministry of Energy, Mines and Petroleum Resources

6.3.10.1 – Type and Location

One of the most significant areas of concern for this hazard include the cliffs in Westmoreland State Park. The displacement of soil during heavy rainfall may cause collapse of the cliffs.

6.3.10.2 – Previous Occurrences

There is a previously reported collapse of a portion of the Nomini Cliffs in Westmoreland County as can be seen in Figure 6-11 below.

Figure 6-11: Nomini Cliffs Landslide



Source: 2017 Northern Neck Regional HMP

Additionally, in 2018, Richmond County faced a landslide that presented the County and region with firsthand experience of the consequences of improperly clearing lands without sediment and erosion control, and proper stormwater management practices. In 2017, 13 acres of forested land was cleared by developers without proper permits or inspections. The land is directly adjacent to the Fones Cliffs in Richmond County, and that as well as surrounding lands are preserved under environmental protections for historical purposes and the high number of American Bald Eagles that nest along the cliffs. On May 24,



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2018, during heavy rains a portion of the Fones Cliffs, collapsed into the Rappahannock River. The resulting landslide can be seen in Figure 6-12 below, and shows the disturbance of a large amount of dirt, stone, silt, and trees.

Richmond County had placed a stop work order on the developers, citing the lack of permits, prior to the event, and the Department of Environmental Quality had issued citations. It should be noted that the local and State agencies did intervene, but the damage that the developers had caused prior to their knowledge and intervention was detrimental. The Virginia Department of Environmental Quality and the State Water Control Board eventually filed a lawsuit against the developer for repeat environmental violations after DEQ referred the case to the Virginia Attorney General's office.

This event is a prime example of the need for mitigation integration and enforcement of zoning and floodplain practices as well as pursuing education in stormwater management practices.

Figure 6-12: Fones Cliffs Landslide May 24, 2018



Source: Friends of the Rappahannock <https://riverfriends.org/landslide-at-fones-cliff-caused-by-inadequate-controls/>

6.3.11 – Drought

A drought is when an unusual scarcity of rain causes a severe hydrological imbalance in which water supply reservoirs empty, water wells dry up, and crop damage ensues. A prolonged period of drought may or may not accompany periods of extreme heat. Drought is a complex physical and social process that can vary nationally. Unlike floods, droughts are not a specific event and typically do not have a well-defined start or end date.

- A drought can last for months or years or may be declared after as few as 15 days. Droughts are classified based on meteorological, agricultural, hydrological, and socio-economic effects:
- A meteorological drought is an extended period (six or more months) with precipitation of less than 75% of normal. Meteorological drought usually precedes other types of droughts.
- Arid conditions characterize agricultural droughts during the growing season. A traditional agricultural drought is caused by an extended period of below-average precipitation.
- Hydrological drought occurs when water reserves available in aquifers, lakes, and reservoirs fall below the statistical average. Hydrological drought tends to emerge more slowly because it involves stored water that is used but not replenished.



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- Socio-economic droughts result from water shortages that limit the ability to supply water-dependent products in the marketplace.

6.3.11.1 – Type and Location

Agricultural droughts are the most common form of drought in the Northern Neck Region and pose the greatest threat to the region's agricultural operations. High summer temperatures can exacerbate the severity of a drought. When soils are wet, a significant portion of the sun's energy goes toward the evaporation of the ground moisture. However, when drought conditions eliminate soil moisture, the sun's energy heats the ground surface, and temperatures can soar, further drying the soil. Figure 6-12 summarizes the levels of drought severity and their possible impacts on a community.

Figure 6-13: Drought Severity Classification and Possible Impacts

Category	Description	Possible Impacts
D0	Abnormally Dry	• Going into drought. • Plant mortality and slowing planting, growth of crops or pasture. • Coming out of drought. • Some lingering water deficits. • Pastures or crops not fully recovered.
D1	Moderate Drought	• Some damage to crops, pastures. • Economic hardship, variable soil, some water damage, livestock not performing. • Voluntary water use restrictions requested.
D2	Severe Drought	• Crop or pasture loss likely. • Economic hardship common. • Mandatory water use restrictions imposed.
D3	Extreme Drought	• Major crop/pasture losses. • Economic hardship, drought conditions.
D4	Exceptional Drought	• Localized and widespread crop/pasture losses. • Shortages of water in households, industry, and agriculture, and on crops/livestock.

Source: United States Drought Monitor

The Drought Monitoring Task Force (DMTF) is a Commonwealth of Virginia interagency group of technical representatives from state and federal agencies responsible for monitoring natural resource conditions and the effects of drought on people, businesses, and natural resources. When activated, the Drought Task Force meets to assess conditions and make recommendations regarding drought status. The Task Force periodically releases Drought Status Reports summarizing drought conditions in the Commonwealth. Through the DMTF, the group can make recommendations for declaring four Drought Stages based on how the measured groundwater levels compare to historical levels: Normal, Watch, Warning, and Emergency. Each Drought Stage involves a list of response activities generally initiated when a specific Drought Stage declaration is made³.

Table 6-13 summarizes the 2017 US Census of Agriculture information by county in the Northern Neck Region. As of 2017, a total of 401 farms produces more than \$77 million in regional agricultural production annually.

³ National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center, [Climate at a Glance](https://www.noaa.gov/climate-at-a-glance)



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The 2022 US Census of Agriculture was ongoing during the 2023 plan update; therefore, 2017 data was used (the most current information available).

Table 6-13: 2017 U.S. Census of Agriculture General Information by County

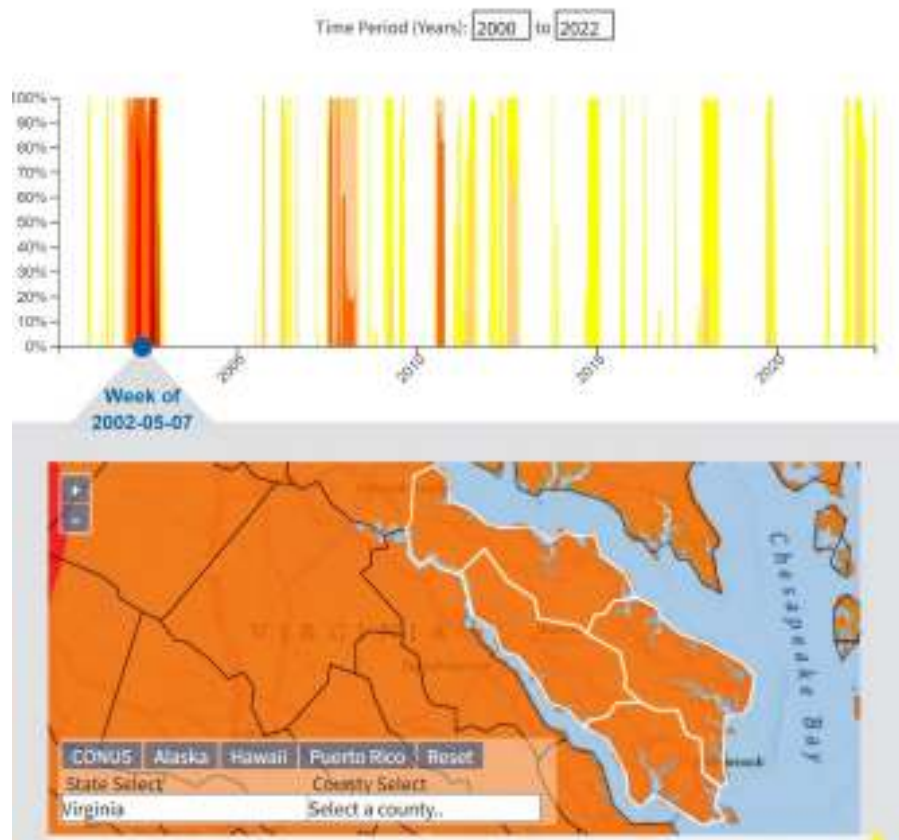
Jurisdiction	Number of Farms	Land in Farms (Acres)	Average Size of Farm (Acres)	Market Value of Products	Average Value Per Farm
Lancaster	80	16,238	203	\$5,555,000	\$860,073
Northumberland	134	43,480	324	\$20,052,000	\$975,400
Richmond	98	31,952	326	\$16,814,000	\$1,289,515
Westmoreland	183	52,619	288	\$57,092,000	\$1,073,155
NNPDC	495	144,289	285.25	\$99,513,000	\$1,049,536

Source: 2017 U.S. Census of Agriculture

6.3.11.2 – Previous Occurrences

Historically, Virginia droughts have tracked somewhat consistently with precipitation levels, whether a limited drought or a longer-term agricultural drought. The Northern Neck Region last saw a severe (D-2) drought in August of 2010, this affected the entire region and surrounding areas.

Figure 6-14: Historical Drought Conditions in the Northern Neck Region 2000-2022



Source: U.S. Drought Monitor: <https://droughtmonitor.unl.edu/DmData/TimeSeries.aspx>



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According to the NCEI database, three recorded droughts between 1996-1998 have affected all the Northern Neck Regional jurisdictions. Table 6-14 lists the most significant droughts that impacted the Northern Neck Region, which occurred several decades ago. No further occurrences are recorded in the NCEI database. Figure 6-13 above, illustrates periods of drought in the Northern Neck Region from 2000 to June 30, 2022. A drought is a cyclical event dependent upon precipitation amounts, humidity, and temperatures.

Table 6-14: Previous Occurrences of Drought Events in the Northern Neck Region

Event Date	Hazard History
September 1, 1997	A very dry period from May through September resulted in drought-like conditions across much of central and eastern Virginia. Of the four Northern Neck Region's counties, Lancaster reported \$1,880,000 in crop damages because of this drought.
October 1, 1998	A very dry period from July through October resulted in drought-like conditions across much of the eastern piedmont and Northern Neck Region of Virginia. The four Northern Neck Regional counties reported a total of \$8 million in crop damage because of this drought.
November 1, 1998	Drought-like conditions continued to affect much of the eastern Piedmont and Northern Neck Region through November. This was the fifth month in a row that drought conditions were seen across Northern Virginia. Persistent high pressure over the Southeast U.S. forced rain producing low pressure systems to steer north of the region. There was an additional \$4 million in reported crop damage in the Northern Neck Region. This was the first year the USDA Farm Service Agency had to make direct payments for grazing losses. The extended drought damaged root systems of grass and was expected to influence the 1999 hay crop. The drought also contributed to a high frequency of forest and brush fires.
August 10, 2010	Westmoreland and Northumberland seek emergency declarations from the Governor for drought conditions that had been affecting the area since April of 2010. The drought lasted well into the fall and USDA declared a disaster in 59 counties across the Commonwealth, including Lancaster, Northumberland, Westmoreland, and Richmond on November 4, 2010.
October 10, 2019	A drought watch advisory was issued across VA by the Department of Environmental Quality after a prolonged period of heat and lack of precipitation that started in July of 2019. Northern Neck Region localities issued prolonged burn bans and Fall/winter crop planting was delayed due to severely low subsoil moisture. Livestock farmers were forced to begin feeding hay earlier in the season due to poor grazing fields in Westmoreland and Richmond. The soil in Lancaster County was too dry to plant wheat and the corn crops suffered decreasing some farmer's incomes 30-40%. Soybean crops suffered a 14% loss as well.

Source: NCEI Storm Events Database, FEMA ArcGIS Mapping US Drought Intensity Layer



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6.3.12 - Heatwave

The NCEI is the utilized source that provided dates of heatwave events and does not present records of a heatwave since 2017, however it shows three events from 1996-2012. The NRI notes nine occurrences between 2005-2017 but specific dates for those events are not available. Data to date is only located for the three within the NCEI, as stated below. The NRI estimates that the Northern Neck Region communities can expect to suffer one heat wave per year (0.7/year). Much of the risk in heat waves is to the population, primarily vulnerable populations, and persons with functional access needs. The climate and coastal location of the region contribute to high humidity that will increase the effects of high heat indexes, raising the hazards associated with heat waves.

6.3.12.1 – Type and Location

A heat wave and heat-related events would most likely affect the entirety of the region. Heat-related events could be one day of extreme heat expanding to multiple days. Such events can cause schools and facilities without adequate air conditioning to close, leaving citizens without means to cool their homes and needing assistance such as a cooling shelter.

6.3.12.2 – Previous Occurrences

There are 3 noted heatwave incidents in the NCEI database as noted in Table 6-15 below.

Table 6-15: Historical Heatwave Events in the Northern Neck Region

Date	Details
05/18/1996	An early-season four-day heat wave produced record or near record high temperatures across central and eastern Virginia. High temperatures were in the 80s and low 90s across the region on May 18. Then, on May 19, May 20, and May 21, high temperatures were in the 90s throughout the area. May 20 was the hottest of the four days as readings climbed into the mid to upper 90s. Also, Norfolk international airport set a record with 98 degrees and Farmville (co-op observer station) set a record with 96 degrees. Unfortunately, though, the heat wave was responsible for numerous reports of heat exhaustion and forced many non-air-conditioned schools to close or have early dismissals.
07/21/2011	An extended period of excessive heat and humidity occurred across most of central and eastern Virginia from July 21st to July 23rd. High temperatures ranged from 96 to 103 degrees during the afternoons, with heat index values ranging from 110 to 119. Overnight lows only fell into the lower 70s to lower 80s.
07/05/2012	High Pressure centered just to the west of the Middle Atlantic Region produced hot and humid weather over central and eastern Virginia from July 5th through July 8th. High temperatures ranged from the mid-90s to lower 100s, and low temperatures ranged from the mid-70s to lower 80s across the area.

Source: NCEI Storm Events Database

Though there are limited records of heatwave events mitigation and planning efforts should remain vigilant as climate patterns evolve and the risk of heatwaves and its effects on the communities grows. A data gap



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was noted during the hazard assessment and HMWG members took note of the need to record additional data in the face of incidents such as heatwave that are often not reported upon outside of individual jurisdictions.

6.3.13 – Earthquake

The earth's surface is covered by solid rock approximately 50 miles thick, referred to as the lithosphere. The lithosphere comprises the earth's crust, which ranges in size from about 22 miles thick for continents to about five miles thick for the oceans, and the upper mantle, which is composed of solidified magma. This lithosphere "floats" above a thick layer of molten rock known as the lower mantle. The lithosphere is divided into large and small sections that geologists call plates. Earthquakes occur when those geologic plates slide against each other, resulting from the sudden release of energy that creates seismic waves. Most movements between plates are minimal, generating tiny earthquakes that people cannot sense. However, other less frequent activities between plates can be quite large, generating powerful earthquakes that can shake the ground surface and cause widespread damage. Earthquakes can be violent enough to destroy whole cities.

The term "earthquake" is used to describe any seismic event, whether natural or caused by humans, that generates seismic waves. Earthquakes are caused mainly by the rupture of geological faults and other events such as volcanic activity, landslides, mine blasts, and nuclear tests. An earthquake's point of initial break is called its focus or hypocenter. The epicenter is the point at ground level directly above the hypocenter.

Most earthquakes occur at weak points in the earth's crust along surfaces where two or more geologic plates meet, called faults. Significant faults within the earth's crust result from the action of plate tectonic forces, with the largest forming the boundaries between the plates. Therefore, the location of faults can indicate where future earthquakes are likely to occur. Some of the more active earthquake faults in the United States include the San Andreas Fault in California and the New Madrid Fault in the Midwest.

6.3.13.1 – Type and Location

Earthquakes in the United States occur most frequently along the West Coast, where both convergent and transform plate boundaries are present. However, earthquakes also occur along the East Coast of the United States, but the mechanisms causing these earthquakes are not well understood, as these occur within the plate rather than at plate boundaries.

According to the USGS *"Science of Earthquakes"*, scientists have tried many ways of predicting earthquakes, but none have been successful. On any fault, scientists know there will be another earthquake sometime in the future, but they have no way of telling when it will happen.



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Figure 6-15: Mercalli Scale

Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Source: United States Geological Survey: <https://www.usgs.gov/products/data>

Figure 6-16: Intensity vs Magnitude

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC. (%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL. (cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Source: United States Geological Survey: <https://www.usgs.gov/products/data>

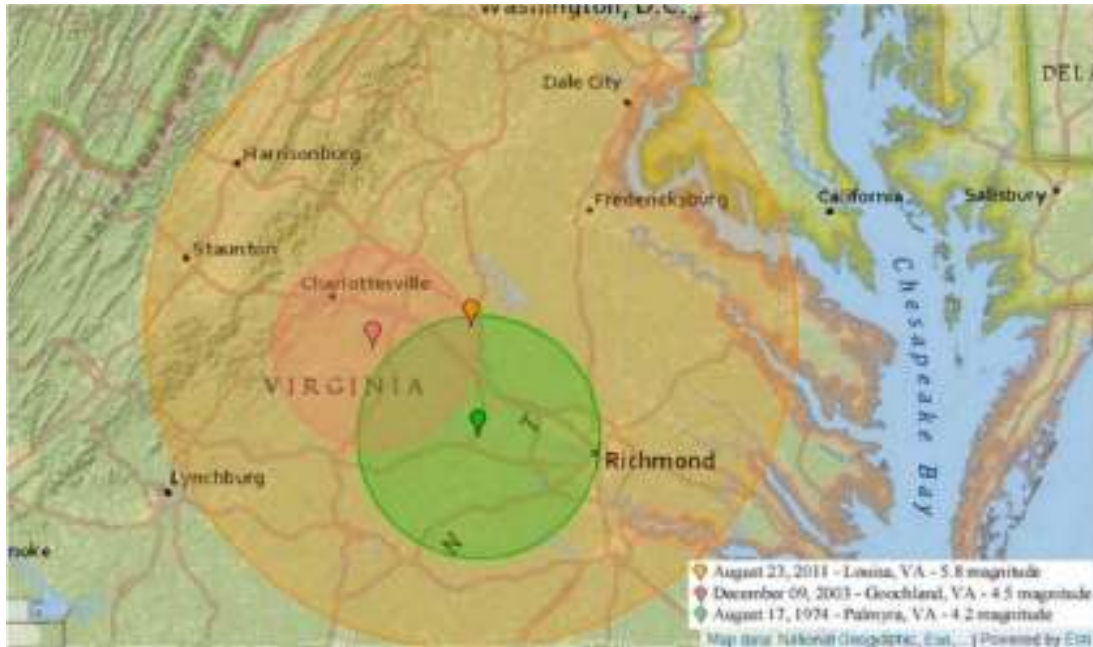


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6.3.13.2 – Previous Occurrences

Since 1900, there has been no record of an earthquake having its epicenter within the boundaries of the Northern Neck Region. The earthquake on August 23, 2011, with an epicenter in Louisa County, Virginia, resulted in a Federal Disaster Declaration in nine jurisdictions and was felt as far north as Vermont. Due to the orientation of the fault, this earthquake was minimally felt in the Northern Neck Region. Figure 6-16 shows the location of past earthquakes in the Commonwealth relative to the Northern Neck Region.

Figure 6-17: Historical Earthquakes



Source: Virginia Tech Seismological Observatory

6.4 Identifying Hazards of Concern

The table on the following pages lists the hazards, describes the rationale for identifying (or not identifying) hazards as significant, shows sources of information that were consulted for the determination.

It also indicates the hazards identified by NNPDC for a detailed risk assessment.

Table 6-16: Northern Neck Regional Hazard Identification

Hazard	Identified Natural Hazard?	Rationale	Sources	Detailed Risk Assessment?
Tornado	Yes	Widespread impacts, history of occurrences in the county, significant damages Increasing frequency.	NCEI; HAZUS; NRI:	Yes



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Hazard	Identified Natural Hazard?	Rationale	Sources	Detailed Risk Assessment?
Severe Weather (Thunderstorms, Hail, High winds, Lighting)	Yes	Severe sudden storms often increase in severity with little to no warning. The proximity to several bodies of water increases the risk of flash flooding and the outdoor recreation in the area increase the risk for lightning strike casualties. High winds pose a greater risk to utility interruptions, debris, and downed trees.	NCEI; HAZUS; NRI	Yes
Wildfire	Yes	Relatively low annual probability for a significant size event, but potential for substantial consequences	VDOF, USGS	Yes
Coastal Flooding	Yes	The entire region is surrounded by the Chesapeake Bay and its tributaries. An abnormally high tide causes inundation of some areas without other hazards increasing the water levels. Coastal storms, rising sea level, and climate change all increase the damage potential. Damage estimates are substantial in flooding events.	NCEI; HAZUS; NRI; USGS; VA Coastal Resilience Master Plan	Yes
Riverine Flooding	Yes	High annual probability with impacts potentially severe in site specific areas. Severe thunderstorms cause pluvial flooding issues. Coastal storms cause water trapping increasing flood levels and prolonging the period.	NCEI HAZUS; NRI;	Yes
Winter Weather	Yes	High annual probability, widespread impacts, but losses generally limited except in most extreme events.	NCEI; NRI;	Yes



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Hazard	Identified Natural Hazard?	Rationale	Sources	Detailed Risk Assessment?
Hurricane/Tropical Storm	Yes	High annual probability, widespread impacts, losses are great when affected by a storm of this nature.	NCEI; HAZUS, NRI;	Yes
Coastal Erosion	Yes	Low to moderate annual probability with impacts relatively substantial over time. Coastal erosion increases in conjunction with other coastal events such as hurricanes and Nor'easters.	NCEI; Virginia Coastal Resiliency Master Plan; CCRFR;	Yes
Drought	Yes	High annual probability, but impacts generally limited	NCEI; NRI;	Yes
Pluvial Flooding	Yes	Moderate to high annual probability, Impacts significant in areas with poor drainage or proximity to bodies of water. Flash flooding risk increases risk of casualties.	NCEI; NRI;	Yes
Landslide	Yes	Low Probability but noteworthy due to certain landscape aspects.	NRI	Yes
Drought	Yes	High annual probability, with high agricultural risk, but impacts are generally limited.	NCEI; USDA; NRI;	Yes
Heatwave	Yes	Relatively high annual probability, but impacts are limited	NCEI; NRI;	Yes
Earthquake	Yes	Low probability, low risk of effects.	NCEI; USGS; HAZUS	Yes

Note: See Appendix B (Section 6) for a complete listing of all sources.

6.5 High Hazard Potential Dams

6.5.1 Risks of High Hazard Probability Dams in the Northern Neck Region

Dams are manufactured structures that serve a variety of uses such as flood protection, power production, agriculture, water supply, and forming recreational areas. They are typically constructed of earth, rock, or concrete and come in all shapes and sizes. The Commonwealth of Virginia's Hazard Mitigation Plan of March 2018, Chapter 3.11 "Flooding Due to Impoundment Failure" reports dam failure as the uncontrolled release of impounded water or sludge resulting in downstream flooding causing secondary impacts threatening lives and property. Dams can fail because water heights or flows are above the capacity the structure was designed for (including flooding) or because the structure failed in some way. Structures fail for many reasons, including lack of maintenance, erosion, seismic events, insufficient design, development



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or alteration of the floodplain, or improper construction. Concrete/masonry dams usually fail from the loss of a section or undermining, while the primary causes of earthen dam failure are overtopping, piping failure, and foundation failure. In addition, concrete or masonry dams tend to fail suddenly, while earthen dams usually take longer. Human factors must also be considered in this portion of the risk assessment as negligent operation and acts of terrorism are risk factors to be taken seriously.

A levee or floodwall is defined as a “man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water to reduce the risk from temporary flooding.” Levees that meet protection standards to a minimum of the 100-year annual flood chance may be eligible for accreditation by FEMA. With accreditation, the area around the levee shown on a FIRM map will be re-zoned as “moderate” risk instead of “high” risk. There is not an accredited levee in the Northern Neck Region.

Dam Hazard Potential Classifications

The Virginia Department of Conservation and Recreation maintains the Division of Dam Safety and Floodplain Management (DSFPM). The Northern Neck PDC and jurisdictions strive to maintain an open working relationship with DCR to ensure that dams located within the region are mitigated to decrease the threat of future life-threatening incidents.

Dam safety inspections and monitoring have become essential tools in evaluating dam failure risk, ensuring proper maintenance, and prioritizing actions. The ranking of assessments is often based on a classification system according to the potential impact a dam failure or mis operation would have on nearby populations and property. Virginia and FEMA utilize a Hazard Potential Classification System for dams that categorize them as Low, Significant, or High. Table 6-17 presents the dam classification system in Virginia, with the inspection guidelines that DCR and the Dam Safety Program utilizes.

Table 6-17: Dam Classification System in Virginia

Hazard Potential	Description	Inspection
High (Class I)	Failure will cause probable loss of life or serious economic damage (to buildings, facilities, major roadways, etc.)	Annual, with inspection by a professional engineer every 2 years.
Significant (Class II)	Failure may cause loss of human life or appreciable economic damage (to buildings, secondary roadways, etc.)	Annual, with inspection by a professional engineer every 3 years.
Low (Class III)	Failure would result in no expected loss of human life, and cause no more than minimal economic damage.	Annual, with inspection by a professional engineer every 6 years.

Source: The Commonwealth of Virginia Hazard Mitigation Plan, March 2018: Table 3.11-1

Owners of dams classified based on Table 6-17 are required to obtain assessment by a licensed professional and an Emergency Actions Plan, in addition to applying for an Operation and Maintenance Certificate through DCR. The emergency actions plan must be filed with the local administrative agency and VDEM. Table 6-18 identifies the list of dams, and pertinent available information, present in the Northern Neck Region.



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Table 6-18: Dams in the Northern Neck Region

Dam & (Other Name)	ID #	Hazard Classification	Location	Owner	Dam Type
Twin Branch Milldam (Davis Millpond)	103001	Unknown	Lancaster County	F. Martin, T. Little, Vernon Grammar	Earth
Lancaster Roller Mill Dam	103002	Unknown	Lancaster County	Not listed	Earth
Stevens Dam	103003	Unknown	Lancaster County	Not Listed	Earth
Golden Eagle Dam (Stevens or Stephens Dam)	103004	LOW	Lancaster County	Not Listed	Earth
Balls Millpond Dam	103005	Unknown	Lancaster County	Not Listed	Earth
Marsh Dam	103006	Unknown	Lancaster County, Richmond County	Not Listed	Earth
Blackmore Millpond Dam (Blakemore Millpond Dam)	103007	Unknown	Lancaster County	Not Listed	Earth
Chinns Dam	159001	Unknown	Lancaster County, Richmond County	Not Listed	Earth
Lancaster County Dam #1	103008	Unknown	Lancaster County	Not Listed	Not listed
Lancaster County Dam #2	103009	Unknown	Lancaster County	Not Listed	Not Listed
Lancaster County Dam #3	103010	HIGH	Lancaster County	Janet Sowder	Not Listed
Fisher Quarry Dam	103011	Unknown	Lancaster County	Theodore Fishers and Sons	Earth
Falling Mill Dam	133001	Unknown	Northumberland County	Not Listed	Earth
Clarks Mill Dam	133002	Unknown	Northumberland County	Not Listed	Earth
Sydnors Millpond Dam	133003	Unknown	Northumberland County	Not Listed	Earth
Hale Dam	133004	Unknown	Northumberland County	Not Listed	Earth
Courtney Millpond Dam (Kissinger Road Dam)	133005	Unknown	Northumberland County	Not Listed	Earth
Hurst Dam	133006	Unknown	Northumberland County	Not Listed	Earth
Private Road Dam (Bogey Neck)	133007	Unknown	Northumberland County	Not Listed	Earth
Snowden Park Dam	133008	Unknown	Northumberland County	Not Listed	Earth
Headleys Mill Pond Dam	133009	Unknown	Northumberland County	Not Listed	Earth
Gardy Millpond	193008	LOW	Northumberland County, Westmoreland County	Virginia Department of Wildlife Resources	Earth
Northumberland County Dam #1 (133dd004)	133010	Unknown	Northumberland County	Not Listed	Not Listed



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Flyway Lake Dam (Northumberland County Dam #1)	133011	Unknown	Northumberland County	Mallard Bay Property Association	Not Listed
Eagle Lake Dam (Mallard Bay Dam)	133012	Unknown	Northumberland County	Mallard Bay Property Association	Earth
Tipers Creek Pond	133013	Unknown	Northumberland County	Not Listed	Earth
Mount Airy Dam	159003	Unknown	Richmond County	Not Listed	Earth
Garland Millpond Dam	159002	SIGNIFICANT	Richmond County	Not Listed	Earth
Huggins Dam 2 (159dd002)	159011	Unknown	Richmond County	H.T. Huggins	Not Listed
Deland Dam	159004	Unknown	Richmond County	Not Listed	Earth
CBM Dam (159dd005)	159013	Unknown	Richmond County	CBM Investment, Inc.	Not Listed
Huggins Dam (159dd001)	159010	Unknown	Richmond County	H.T. Huggins	Not Listed
Lanier-Davis Dam	159007	Unknown	Richmond County	Not Listed	Earth
France Dam (159dd006)	159014	Unknown	Richmond County	Not Listed	Earth
Connellee Dam	159009	SIGNIFICANT	Richmond County	Trustees of Robert H. and Elsie Gruver	Earth
Marshall Dam	159005	Unknown	Richmond County	Not Listed	Earth
Huggins Dam 3 (159dd003)	159012	Unknown	Richmond County	H.T. Huggins	Not Listed
Omohundra Millpond Dam	159006	Unknown	Richmond County, Westmoreland County	Not Listed	Earth
Hogans Mill Dam	159008	Unknown	Richmond County, Westmoreland County	Not Listed	Earth
Morris Dam (Potomac Mills Pond Dam)	193001	Unknown	Westmoreland County	Not Listed	Earth
Latanes Dam	193002	Unknown	Westmoreland County	Not Listed	Earth
Flemmer Dam	193003	Unknown	Westmoreland County	Not Listed	Earth
Lake Independence Dam	193004	SIGNIFICANT	Westmoreland County	Not Listed	Earth
Horners Dam	193005	Unknown	Westmoreland County	Edward and Jeanne Mella	Earth
Placid Lake Dam	193006	LOW	Westmoreland County	Placid Bay Civic Association & Westmoreland County	Earth
Thomas Branch Dam	193007	Unknown	Westmoreland County	Walter Hendricks	Earth
Marshall Creek Dam	193009	Unknown	Westmoreland County	Not Listed	Earth
Newtons Dam	193010	Unknown	Westmoreland County	Not Listed	Earth



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Chandler's Mill Dam	193011	HIGH	Westmoreland County	Private/Virginia Department of Wildlife Resources	Earth
Travis Dam	193012	Unknown	Westmoreland County	Not Listed	Earth
Weavers Dam	193013	Unknown	Westmoreland County	Not Listed	Earth
Red Oak Dam (Red Oak Nursery Dam)	193014	SIGNIFICANT	Westmoreland County	J. Clifford Hutt	Earth
Westmoreland County Dam #1 (193dd004)	193015	Unknown	Westmoreland County	Not Listed	Not Listed
Westmoreland County Dam #2 (193dd041)	193016	Unknown	Westmoreland County	Not Listed	Not Listed
Westmoreland County Dam #3 (193dd054)	193017	Unknown	Westmoreland County	Not Listed	Not Listed
Westmoreland County Dam #4 (193dd056)	193018	Unknown	Westmoreland County	Not Listed	Not Listed
Westmoreland County Dam #5 (193dd057)	193019	Unknown	Westmoreland County	Not Listed	Not Listed
Erica Road Dam	193020	Unknown	Westmoreland County	Belvoir Farm, Inc	Earth

Source: Data provided by the Virginia Department of Conservation and Recreation, Dam Safety Program

6.5.2 Previous Occurrences of Dam Failures

There have been three recent dam failure events in the Northern Neck Region, all of them at the Chandler's Mill Dam in Westmoreland County which is located near the entrance to the Town of Montross. The dam faced a failure in 2015 after a severe storm destabilized the dam. The dam was then rebuilt with completion in August of 2020. On November 12, 2020, the dam did not face physical failure, but the falling rains caused water to overtop the embankments and subsequently flooding and closing Route 3. Repairs from the 2020 event had not yet been completed in June of 2021 when up to ten inches of rain fell across the Northern Neck Region in a 200-year storm event. The dam pond was empty, and outflows open at the start of the event, but the pond filled extremely fast, and water overtopped Route 3/Kings Highway at the lake crossing. The resulting water caused flash flooding and necessitated water rescue; Route 3 and Peach Grove Road was also closed in the face of potential instabilities.



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Figure 6-18: Dam Failure at Chandlers Mill Dam



Source: News on the Neck

6.5.3 Probability of Future Risks and Failures

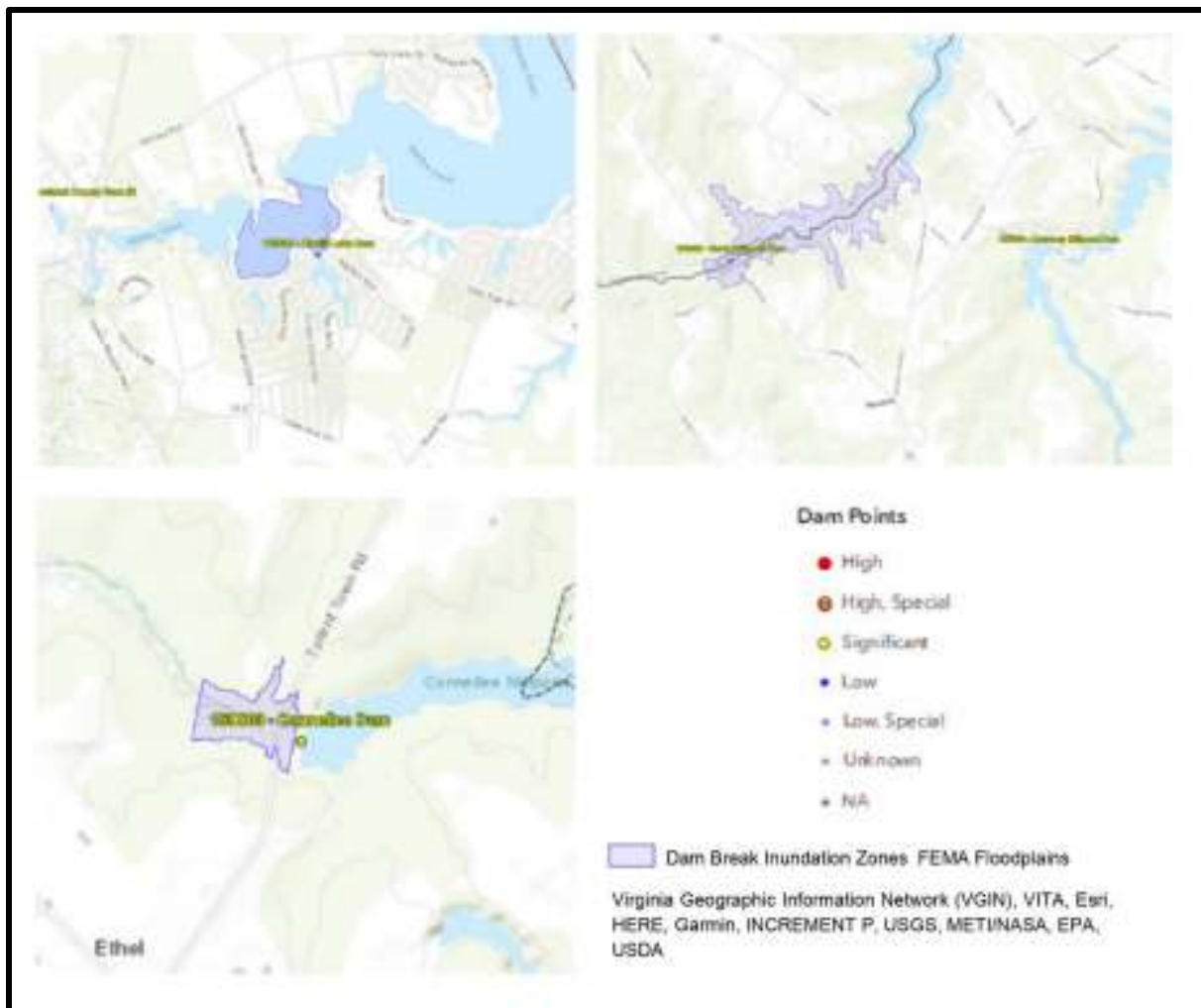
As shown in Table 6-18 there are a considerable number of dams in the Northern Neck Region, the classification of the majority of those is currently “unknown.” Virginia’s DSFPM is in the process of developing modified dam break inundation studies and emergency action plans for dams that currently do not have a regulatory classification. The critical information provided from those actions will allow local, regional, and state agencies greater planning abilities against unclassified dams. *FEMA Rehabilitation of High Hazard Potential Dams: Grant Program Guidance June 2020: Section 5.8.1.3* identifies three types of dam risks:

- Incremental – The risk (likelihood and consequences) to the pool area and downstream floodplain occupants that can be attributed to the presence of the dam should the dam breach prior or subsequent to overtopping, or undergo component malfunction or mis operation, where the consequences considered are over and above those that would occur without dam breach.
- The risk in the reservoir pool area and affected downstream floodplain due to ‘normal’ dam operation of the dam (e.g., large spillway flows within the design capacity that exceed channel capacity) or ‘overtopping of the dam without breaching’ scenarios.
- The risk that remains after all mitigation actions and risk reduction actions have been completed. With respect to dams, FEMA defines residual risk as “risk remaining at any time” (FEMA, 2015, p A-2). It is the risk that remains after decisions related to a specific dam safety issue are made and prudent actions have been taken to address the risk. It is the remote risk associated with a condition that was judged to not be a credible dam safety issue.



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Figure 6-19: Dam Break Inundation Zones in FEMA Floodplains



Source: Virginia DCR VGIN Dam Break Inundation Zone Layer

Currently, available information is insufficient to conduct a thorough analysis of the HHPD inventory in the Northern Neck Region relative to incremental, non-breach, and residual risk. Participating jurisdictions and the Northern Neck PDC acknowledge the definitions of the risks as identified by FEMA and have integrated mitigation goals and actions into this Plan that will encourage growth and advancements to HHPD mitigation planning. Actions that will reduce long-term vulnerabilities are addressed in Section 9, Table 9-3, Actions 7 & 8. Action 7 addresses education and initiating planning processes, while Action 8 provides technical assistance from the PDC to jurisdictions to manage HHPD mitigation projects. Both actions are new to the Plan in 2023 and align with guidance from the *Fiscal Year 2021 Rehabilitation of High Hazard Potential Dams – Notice of Funding Opportunity (NOFO)*. The 2023 plan does not include advanced statistics of occurrence or probabilities due to the current lack of information. The HHPD section of the plan has been written with the best available information at the time that the update was performed. This will be monitored with the annual reviews during plan maintenance and updates will be applied as seen fit and under the guidance of Virginia DSFPM.



Northern Neck Regional Hazard Mitigation Plan Section 6: Hazard Identification, Profiling, and Ranking

6.6 Summary

As indicated in the above table, 13 natural hazards were identified as hazards of concern. As the regulations state, all these identified hazards must be profiled, their vulnerability assessed, and mitigation actions developed for them:

- Tornado
- Severe Weather Events
- Coastal Flooding
- Riverine Flooding
- Wildfire
- Winter Storm
- Hurricane/Tropical Storm
- Coastal Erosion
- Pluvial Flooding
- Landslide
- Drought
- Heatwave
- Earthquake

6.6.1 Summary Description of the County's Vulnerability to Hazards

The DMA 2000 legislation and related FEMA planning guidance require mitigation plans to discuss community vulnerability to natural hazards. Vulnerability is generally defined as the damage (including direct damage and loss of function) that occurs when various risks impact a structure, operation, or population. For example, vulnerability can be expressed as the percent damage to a building when it is flooded or the number of days a government office will be shut down after a windstorm, assuming sufficient detailed data is available to support the calculations.

Because this Plan includes multiple jurisdictions and the available data is not very detailed, it is not practical to complete vulnerability assessments on the many individual assets, operations, and populations in respective jurisdictions.

However, it is appropriate for participating jurisdictions embark on a program to address these data deficiencies over the next five years in anticipation of the following Plan update. In addition, it is possible to make general observations based on the hazard identifications and risk assessments that are the subjects of Sections 6 and 7 of this Plan.

As illustrated in Section 6 (Hazard Identification), the communities in the Northern Neck Region are subject to numerous natural hazards, human-caused, although in some cases, the hazards have rarely impacted the area, or their effects have been relatively minor. Although relatively localized, flooding, and severe storms are the most frequent and damaging natural hazards, as with many parts of the mid-Atlantic. However, it is crucial to recognize that several other hazards present significant risks (i.e., the potential for future losses) to the communities, even though they have occurred infrequently or have not caused much damage. Not all hazards carry the same weight risk. All hazards have some risk. The Northern Neck Planning District Commission and the Working Group Members strive to seek out proactive strategies.



Section 7 Risk Assessment

Contents of this Section

- 7.1 44 CFR Requirement for Risk Assessments
- 7.2 Overview and Analysis of the Northern Neck Region's Vulnerability to Hazards
- 7.3 Estimate of Potential Losses (Risk Assessment)
 - 7.3.1 Tornado Risk in the Northern Neck Region
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 - 7.3.3 Coastal Flooding Risk in the Northern Neck Region
 - 7.3.4 Riverine Flooding Risk in the Northern Neck Region
 - 7.3.5 FEMA Flood Zones in the Northern Neck Region
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 - 7.3.15 Earthquake Risk in the Northern Neck Region
- 7.4 Northern Neck Region's Critical Facilities Risk Assessment
- 7.5 Northern Neck Region's Future Development Trends
- 7.6 Summary of Risk Assessment

7.1 44 CFR Requirement for Risk Assessments

Requirement §201.6(c)(2): *The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.*

Requirement §201.6(c)(2)(ii): *The risk assessment shall include a description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.*

Requirement §201.6(c)(2)(ii): *The risk assessment must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged floods.*

Requirement §201.6(c)(2)(ii)(A): *The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.*



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Requirement §201.6(c)(2)(ii)(B): [The plan **should** describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.

Requirement §201.6(c)(2)(ii)(C): [The plan **should** describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Requirement §201.6(c)(2)(iii): For multi-jurisdictional plans, the risk assessment **must** assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

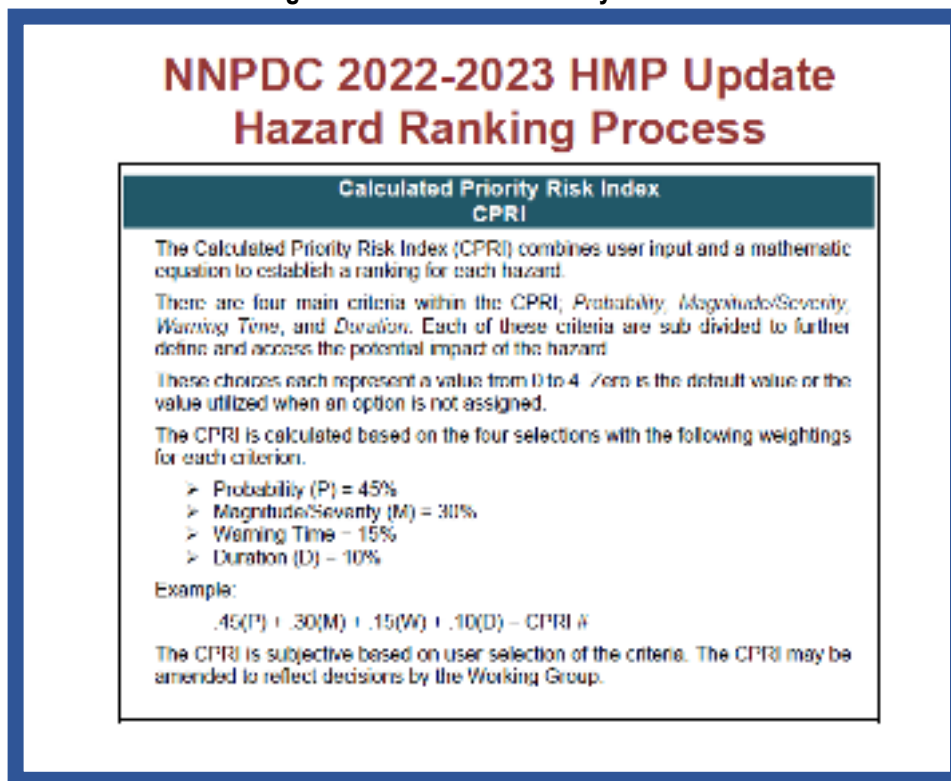
7.2 Overview and Analysis of the Northern Neck Region's Vulnerability to Hazards

The hazard identification and risk assessment aim to provide a factual basis for developing mitigation strategies by prioritizing areas most threatened and vulnerable to natural hazards.

Multiple resources were used in obtaining a comprehensive dataset while assessing hazards for the Northern Neck Regional jurisdictions during the 2023 HMP hazard assessment review. Primary databases include the National Weather Service/National Oceanic and Atmospheric Administration's Storm Database at the National Center for Environmental Control (NCEI). NCEI provided the primary historical base data for most natural hazards. In addition, tools such as the National Risk Database, USGS Earthquake database, ArcGIS layers, and HAZUS were utilized to gather the best available data to encourage informed decision-making.

Hazards were ranked utilizing the Calculated Priority Risk Index (CPRI). The figures below, Figure 7-1: Calculated Priority Risk Index and Figure 7-1: CPRI Categories and Risk Levels, demonstrate the ranking process performed using the CPRI formula and present the CPRI categories and risk levels.

Figure 7-1: Calculated Priority Risk Index





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Figure 7-2: CPRI Categories and Risk Levels

CPRI Category	Level III	Degree of Risk Description	Index Value	Assigned Weighting Factor
Probability	Unlikely	- Rare with no documented history of occurrences in event. - Annual probability of less than 0.01.	1	40%
	Possibly	- Infrequent occurrence with at least 1 documented or anecdotal historic event. - Annual probability that is between 0.1 and 0.01.	2	
	Likely	- Frequent occurrence with at least 2 or more documented historic events. - Annual probability that is between 1 and 0.1.	3	
	Highly Likely	- Common events with a well-documented history of occurrences. - Annual probability that is greater than 1.	4	
Magnitude /Severity	Negligible	- Negligible property damages (less than 1% of critical and non-critical facilities and infrastructure). - Injuries / illnesses are treatable with first aid with no deaths. - Negligible quality of life loss. - Shut down of critical facilities for less than 24 hrs.	1	30%
	Limited	- Single property damages (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure). - Injuries / illnesses do not result in permanent disability with no deaths. - Moderate quality of life loss. - Shut down of critical facilities for more than 1 day and less than 1 week.	2	
	Critical	- Moderate property damages (greater than 25% and less than 50% of critical and non-critical facilities and infrastructure). - Injuries / illnesses result in permanent disability and at least 1 death. - Shut down of critical facilities for more than 1 week and less than 2 months.	3	
	Catastrophic	- Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure). - Injuries / illnesses result in permanent disability and multiple deaths. - Shut down of critical facilities for more than 1 month.	4	
Warning Time	Less than 6 hrs.	Self-evacuatory	4	15%
	6 to 12 hrs.	Self-evacuatory	3	
	12 to 24 hrs.	Self-evacuatory	2	
	More than 24 hrs.	Self-evacuatory	1	
Duration	Less than 6 hrs.	Self-evacuatory	1	10%
	Less than 12 hrs.	Self-evacuatory	2	
	Less than 1 week	Self-evacuatory	3	
	More than 1 week	Self-evacuatory	4	

7.3 Estimate of Potential Losses (Risk Assessment)

This section describes the risks to the Northern Neck Region, including its citizens, residential, government, and commercial assets, from the named hazards determined by the Northern Neck Regional Hazard Mitigation Steering Committee. As noted above, the term risk is an expression of expected future monetary losses that result from the impacts of natural hazards.

This subsection of the Plan provides estimates of future losses. Each loss calculation is based on the best available data, but they must be considered estimates because highly detailed engineering was not performed as part of this planning process.

7.3.1 Tornado Risk in the Northern Neck Region

As demonstrated in Section 6, tornadoes present an increasing risk to the communities in the region, noting an increase in frequency and, as a result, damages, and loss. Tornadoes present a significant threat to life.

7.3.1.1 Vulnerabilities

Table 7-1 demonstrates the estimated annualized damages for tornado events in the Northern Neck Region. The NCEI and NRI note an alarming increase in tornadic events and risk to property and life. It should be noted that tornado and high wind event frequencies have increased substantially in the last 20 years. In addition, increases in vulnerable populations and a decline in property upkeep contribute to the losses and level of damages incurred by tornadoes.

Table 7-1: Estimated Annualized Events

Tornadoes	Annualized Events	Annualized Property Damages	Annualized Crop Damages	Annualized Total Damages	Deaths	Injuries
Lancaster	1	\$65,781	\$108	\$136,432	0.0	0.4
Northumberland	1	\$106,726	\$366	\$188,467	0.0	0.4
Richmond	1	\$51,601	\$356	\$117,815	0.0	0.4
Westmoreland	1	\$102,364	\$0	\$184,576	0.0	0.4



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A structure's tornado vulnerability is the same as other extreme wind events, which are based on building construction and standards. Other factors, such as location, condition, and maintenance of trees, also play a significant role in determining vulnerability. A tornado will cause severe damage or destruction to any structure in its path. Clusters of mobile homes are more vulnerable to tornadoes. Proper anchoring can reduce damage exposure, but not entirely, as these structures are extremely vulnerable to damage from downed trees and a tornado's effect on the structure of the manufactured home itself.

Human vulnerability is based on the availability, reception, and understanding of early warnings of tornadoes, such as warnings issued by the NWS and access to safe, substantial indoor shelters. Once warned of an impending tornado hazard, seeking shelter indoors on the lowest floor of a substantial building away from windows is recommended as the best protection. All populations and communities are at risk for tornado damages as there is little to no warning generally, structures in the region are generally not built with basements to move to, and the elevated number of aging populations will have difficulty moving themselves to a protected area. Agriculture and aquaculture facilities are at a particularly high risk for harvest and equipment loss.

Electrical utilities and communications infrastructure are also vulnerable to tornadoes. For example, damage to power lines or communication towers can cause power and communication outages for residents, businesses, and critical facilities. In addition to lost revenues, downed power lines threaten personal safety. Further, downed wires and lightning strikes have been known to spark fires.

Table 7-2: CPRI Tornado Hazard Priority

Probability	Magnitude	Warning Time	Duration	Total Score	Threat
1.35	0.9	0.9	0.1	3.25	Significant

7.3.1.2 Effects of Climate Change and Tornadoes

As demonstrated in the historical data presented, the occurrence of tornadoes in the Northern Neck communities has increased significantly over the last 20 years. Tornadoes are most often spawned by severe thunderstorms and considering the frequency of severe thunderstorms and coastal systems, the risk of additional tornados is considered significant. According to the Center for Climate and Energy Solutions, conditions that produce the most severe thunderstorms from which tornadoes may form are more likely as the world warms. Climate change may also cause a shift in the seasonality of severe thunderstorms and the regions that are most likely to be hit. The jurisdictions of the Northern Neck Region recognize the increasing risk and the need for education and awareness in the communities.

7.3.2 Severe Weather Risks in the Northern Neck Region

Severe weather includes thunderstorms, severe wind, lightning, and hail events outside of tropical storm systems.

The chance of future occurrences of high wind, hail, and lightning in the Northern Neck Region is high: and an average of seven events per year is expected based on data collected from the NCEI and NRI reports. In addition, hail may be expected once every 1-2 years on average and strong winds may be expected as frequently as all severe weather events, including thunderstorms, winter storms, and coastal storm events.



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7.3.2.1 Vulnerabilities

Table 7-3 shows the annualized damages for severe weather events in the Northern Neck Region. The NCEI Storm Events data were annualized by dividing the number of severe weather events by the record length. The annualized values should only be used to estimate what can be expected each year. An individual county can expect to experience between one to two severe weather events annually using historical records. Therefore, the NNPDC can expect to see between five and six events annually. Annual total damages from these events for each county were estimated to be between \$89,000 and \$140,000. However, it is possible that actual annual damages in some counties could be higher due to unreported damages. There is a single reported injury though it should be considered that not all injuries would be reported. No casualties have been reported per the data utilized.

Communities in the Northern Neck Region have seen a steep increase in the severity of thunderstorms and severe weather that is not directly related to hurricanes or tropical systems. These storms are a very high concern for planning and response personnel as the best protection for these storms is community education and mitigation actions such as stormwater drainage and erosion prevention. Properties and citizens who live along the coast are open to high winds and flooding, and properties with debris and trees risk injury from projectiles. Access and functional needs populations will be at a higher risk during these events as they may lose power for medical devices or be unable to call for help or escape on their own from a dangerous situation.

Table 7-3: Estimated Annualized Loss in the Northern Neck Region

Severe Weather	Annualized Events	Annualized Property Damages	Annualized Agriculture Value	Annualized Total Damage	Deaths	Injuries
Lancaster	7	\$53,083	\$3,013	\$89,529	0	0.11
Northumberland	7	\$71,733	\$11,195	\$139,544	0	0.11
Richmond	7	\$16,738	\$1,717	\$103,046	0	0.11
Westmoreland	7	\$32,030	\$0	\$91,409	0	0.11

The priority hazard ranking process for the 2023 hazard risk assessment determined severe weather events to be a “significant” hazard to the Northern Neck Region’s communities. Severe weather events within the region pose greater risks as the events are often associated with more severe effects, bringing additional hazards such as tornadoes, high levels of rainfall, and pluvial flooding.

Table 7-4: CPRI Severe Weather Hazard Priority

Probability	Magnitude	Warning Time	Duration	Total Score	Threat
1.8	0.6	0.3	0.20	2.9	Significant

7.3.2.2 Effects of Climate Change and Severe Weather Events

Many severe weather events have affected the communities of the Northern Neck Region, some have even caused damage that exceeded that of coastal storms. According to the EPA, rising global average temperature is associated with widespread changes in weather patterns. Studies indicate that extreme weather events such as heat waves and large storms are likely to become more frequent or more intense.



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7.3.3 Coastal Flooding Risk in the Northern Neck Region

The extensive coastal areas of the Northern Neck Region are considered equally at risk of experiencing the damaging effects of future coastal flooding events. Inland areas where waves and currents aren't as prominent of a threat, many of those areas still have rivers where coastal tides and water trapping may influence levels during storms. The coastal storms, coastal erosion, sea level rise, and increasing tidal volumes present growing concerns and risks for the communities. Table 7-5 displays the annualized damages for coastal flooding in the Northern Neck Region. The NCEI Storm Events database and the National Risk Index Community Risk Report were utilized for the data in Table 7-5. The NNPDC can expect an average of four coastal flooding events per year.

Damages from these events for each county were between \$107,000 and \$1,959,692. It is important to note that the losses and casualties noted here may be lower than actual as not all may have been reported.

Table 7-5: Expected Annual Loss from Coastal Flooding

Coastal Flooding	Annualized Events	Annualized Property Damages	Annualized Agriculture Value	Annualized Total Damage	Deaths	Injuries
Lancaster	4.4	\$1,542,957	\$0	\$1,548,667	0	0
Northumberland	4.4	\$1,959,692	\$0	\$1,965,226	0	0
Richmond	4.4	\$331,574	\$0	\$333,574	0	0
Westmoreland	4.4	\$103,906	\$0	\$107,930	0	0

Comparatively, in the Virginia Coastal Resilience Master Plan the loss statistics are higher as noted below. Datasets vary widely and Table 7-5 is based on the NRI which compares data nationally, where the Virginia CRMP notes recent research and a localized approach to present a specific picture. The annual average loss data for each locality is noted below:

- Lancaster: \$2 million at year 2020
- Northumberland: \$10.5 million at year 2020
- Richmond: \$2 million at year 2020
- Westmoreland: \$5 million at 2020

7.3.3.1 Vulnerabilities

The low-lying coastal areas of the Northern Neck Region are most vulnerable to the damaging effects of storm surges due to nor'easters and Hurricanes and above-average tidal flooding. Non-elevated structures built before the 1980s, when National Flood Insurance Program (NFIP) building standards were adopted, are especially vulnerable to damage. Storm surge has the potential to cause damage to foundations of structures, damage contents, cut off utilities such as power, damage infrastructures such as bridges and roads, and cause extensive beach erosion. Coastal erosion will be addressed as a separate hazard in Section 7.3.8. Many of the same vulnerabilities and impacts to people and property described in the riverine flooding section also apply to coastal flooding.

The priority hazard ranking process for the 2023 hazard risk assessment identified that coastal flooding remains a significant threat to the Northern Neck Region. Coastal flood events within the region are increasing in frequency; from 1998 to 2010, four events were recorded (33%), whereas from 2011 to June



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30, 2022, nine events were recorded (78%). Coastal storm events have a high range of impacts with the potential for millions of dollars in damages to property and a significant risk of casualties. Table 7-6 outlines the hazard ranking for each of the hazard priority criteria related to coastal flooding.

Flooding most often damages property and land mass. Flash flooding presents a high risk to life especially when waters are rising quickly. Generally coastal residents are advised to evacuate when coastal flooding is forecasted. Populations that choose not to evacuate, citizens who are incapable of doing so on their own, and other institutions such as medical or assisted living facilities pose a challenge to emergency management staff. Northumberland, Westmoreland, and Lancaster face the highest risk with the large coastal borders they serve.

Table 7-6: CPRI Coastal Flooding Hazard Priority

Probability	Magnitude	Warning Time	Duration	Total Score	Threat
1.8	0.6	0.15	0.3	2.85	Significant

7.3.3.2 Effects of Climate Change and Coastal Flooding

The Impact of Climate Change on Virginia's Coastal Areas states "For Virginians living on the coast, the immediate consequences will be rising sea levels, more intense and frequent storms, and warmer and more variable local temperatures. These primary drivers translate into recurrent flooding, saltwater intrusion into drinking water, inundation of septic systems, and threats to public health, among other issues." This speaks to the risks that coastal communities in the Northern Neck are facing in the future as sea-level rises. Jurisdictions are utilizing multiple sources of guidance and resources to mitigate shoreline erosion. Green spaces, living shorelines, and restrictions to development in the SFHA are at the forefront of mitigation actions.

7.3.4 Riverine Flooding Risk in the Northern Neck Region

The Northern Neck Region is bordered by the Potomac River, the Rappahannock River, and the Chesapeake Bay. The proximity of multiple large rivers to this region puts it at high risk of experiencing riverine flooding. In addition, annual rainfall amounts in the region have increased by 3" since the 2017 update, according to data from the NCEI database. The increased rainfall amount and the frequency of severe storms will continue to increase the risk of riverine flooding in the region.

Riverine and flash floods have the potential to pick up chemicals, sewage, and toxins from roads, factories, and farms; therefore, any property affected by a flood may be contaminated with hazardous materials and present a health and safety risk to residents. Debris from vegetation and structures may also become hazardous after a flood. In addition, floods may threaten water supplies and quality, creating health issues like mold. Damages from stormwater runoff events also include wall damage due to "wicking," mildew damage, damages to building contents, minor foundation damage, damage to water distribution systems, and potable water contamination. Public-related costs include debris clearance; equipment, material, and labor expenses related to emergency response; and building or facility repair or replacement (county parks, utilities, communications, buildings, vehicles, etc.).



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Table 7-7: Expected Annual Loss from Riverine Flooding

Coastal Flooding	Annualized Events	Annualized Property Damages	Annualized Agriculture Value	Annualized Total Damage	Deaths	Injuries
Lancaster	0.3	\$379,069	\$83	\$389,830	0	0
Northumberland	0.3	\$349,149	\$200	\$351,081	0	0
Richmond	0.7	\$40,061	\$1243	\$47,362	0	0
Westmoreland	0.5	\$12,681	\$0	\$30,411	0	0

7.3.4.1 Vulnerabilities

Development, or the presence of people and property in hazardous areas, is critical in determining vulnerability to flooding. In addition, riverine flooding often occurs as a flash flood with little warning and evacuation time, increasing the chance of casualties. Additional factors that contribute to flood vulnerability range from specific characteristics of the floodplain to characteristics of the structures located within the floodplain and are further explained in the FEMA Flood Zones section below.

The priority hazard ranking process for the 2023 hazard risk assessment determined riverine flooding as a “significant” hazard in the Northern Neck Region. Flood events in the region vary with the type of event. For example, riverine flooding can occur with severe weather, such as thunderstorms with high rainfall amounts in short periods with little to no warning, and a coastal storm that can cause water trapping. The unpredictability of flooding mandates vigilance in mitigation activities.

Table 7-8: CPRI Riverine Flooding Hazard Priority

Probability	Magnitude	Warning Time	Duration	Total Score	Threat
1.8	0.6	0.15	0.20	2.75	Significant

7.3.4.2 Effects of Climate Change and Riverine Flooding

Climate change may cause river floods to occur more often and be more significant than they used to be. The EPA notes that “as warmer temperatures cause more water to evaporate from the land and oceans, changes in the size and frequency of heavy precipitation events may in turn affect the size and frequency of river flooding.” River flooding can cause significant losses in some communities in the Northern Neck and the communities continue to mitigate against the risks.

7.3.5 FEMA Flood Zones in the Northern Neck Region

Additional factors that contribute to flood vulnerability range from specific characteristics of the floodplain to characteristics of the structures located within the floodplain. Those factors include:

- *Flood depth:* The greater the depth of flooding, the higher the potential for significant damages.
- *Flood duration:* The longer duration of time that floodwaters are in contact with building components the greater the potential for damage. Floodwaters may linger because of the low relief of the area, but the degree varies.



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- **Velocity:** Flowing water exerts force on the structural members of a building, increasing the likelihood of significant damage.
- **Elevation:** The lowest possible point where floodwaters may enter a structure is the most significant factor contributing to its vulnerability to damage due to flooding.
- **Construction type:** Certain types of construction are more resistant to the effects of floodwaters than others. Masonry buildings, constructed of brick or concrete blocks, are typically the most resistant to flood damages significant damage.

Figure 7-3 Lancaster County Flood Map



Figure 7-4 Northumberland County Flood Map



Figure 7-5 Richmond County Flood Map



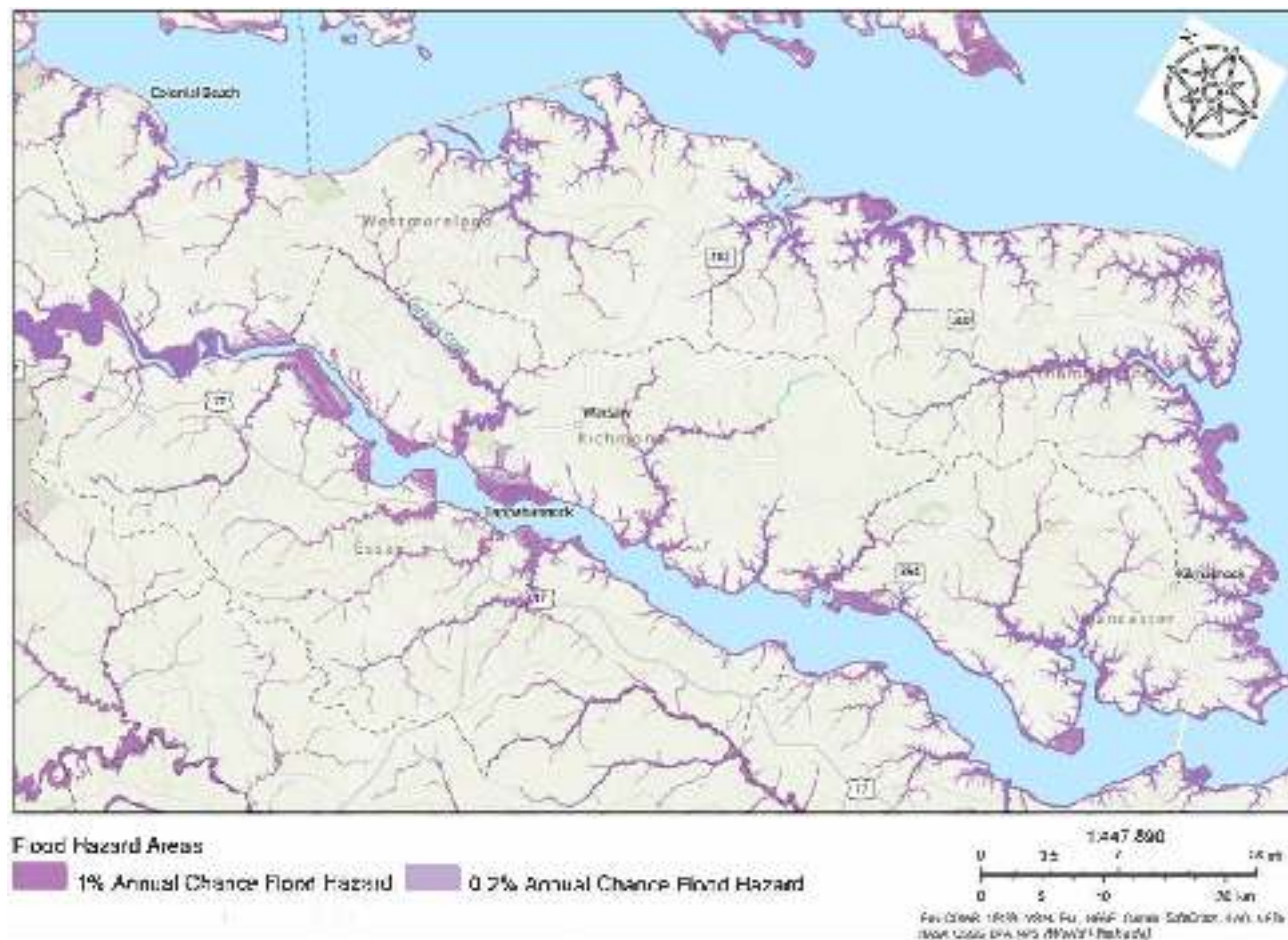
Figure 7-6 Westmoreland County Flood Map





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Figure 7-7 Flood Zones in the Northern Neck Region



Source: USGS ArcGIS Flood Hazard Areas Layer

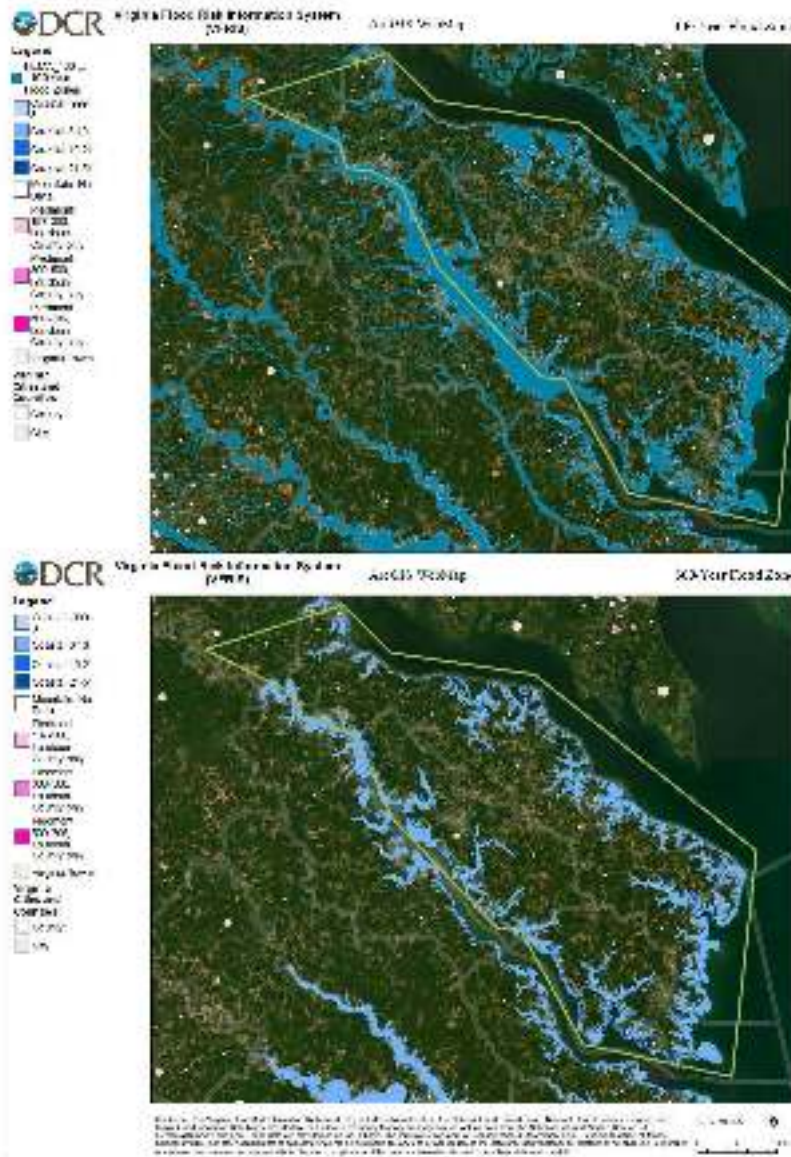
FEMA's HAZUS Tool and FEMA ArcGIS layers were utilized to assist in flood modeling and data collection. The flood data was run at Level 1. A Level 1 analysis run based primarily on data within the HAZUS software, such as census reports, regional building footprints, and property value calculations. Figures 7-3: Flood Zones in the Northern Neck Region, 7-4: 100-year and 500-year Flood Risk in the Northern Neck Region and Table 7-8: Threat Exposure in the Flood Zone for the Northern Neck Region in this section will demonstrate the flood zone's estimated losses and total exposure.

Flood hazard areas identified on a Flood Insurance Rate Map (FIRM) are identified as a Special Flood Hazard Area (SFHA). SFHAs are defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood, and the 0.2-percent-annual-chance is referred to as a 500-year flood.



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Figure 7-8: 100-year and 500-year Flood Risk in the Northern Neck Region



Source: Virginia Department of Conservation Flood Risk Information System

Table 7-9: Threat Exposure in the Flood Zone for the Northern Neck Region

County	Jurisdictions	100 Year Exposure	500 Year Exposure
Lancaster	County Total	\$131,000,000	\$176,000,000
Northumberland	County Total	\$98,800,000	\$113,000,000
Richmond	County Total	\$16,000,000	\$21,000,000
Westmoreland	County Total	\$101,000,000	\$115,000,000
Total	Northern Neck Region	\$346,800,000	\$425,000,000



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Figure 7-9: Estimated Damage Cost in Flood Zones



Source: HAZUS

7.3.6 FEMA National Flood Insurance Program Participation

The National Flood Insurance Program (NFIP) is a federal program that enables property owners in participating communities to purchase insurance for flood losses. For a community to participate in the NFIP, they must adopt FEMA's flood risk maps, the flood Insurance Study, and floodplain management regulations that reduce future flood damages.

Flood insurance is designed to provide an alternative to disaster assistance to reduce the escalating costs of repairing damages to buildings and their contents caused by floods. Nationally, flood damage is reduced by nearly \$1 billion annually through community implementation of sound floodplain management requirements and property owners purchasing flood insurance. Additionally, buildings constructed in compliance with NFIP building standards suffer approximately 80% less damage annually than those which predate floodplain management regulations or are not built within compliance.

In addition to providing flood insurance and reducing flood damages through floodplain management regulations, the NFIP identifies and maps the nation's floodplains. Mapping flood hazards creates broad-



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based awareness of these hazards and provides the data needed for floodplain management programs and to actuarially rate new construction for flood insurance.

Floodplain management regulations are the cornerstone of NFIP participation. Communities participating in the NFIP must adopt and enforce floodplain management regulations. These regulations apply to all types of floodplain development and ensure that development activities will not cause an increase in future flood damage. Buildings are required to be elevated at or above the Base Flood Elevation, which is the predicted level of the one-percent flood.

Communities participating in the NFIP must adopt and enforce the minimum federal NFIP floodplain management regulations. These regulations apply to all types of floodplain development and ensure that development activities will not cause an increase in future flood damage. Buildings are required to be reasonably safe from flooding, which usually requires the finished floor elevation at or above the site's Base Flood Elevation (BFE). The BFE is determined based on modeling and mapping detailed in the community's Flood Insurance Study (FIS).

The FIS and its corresponding Flood Insurance Rate Maps (FIRMs) provide information on flood risk areas per NFIP standards. FIRMs identify areas with a one-percent annual chance of flooding and those with a 0.2%-annual chance of flooding. When new structures are built or existing structures are improved at more than 50 percent of their market value, they must adhere to floodplain management regulations. If the structure is financed through a federally insured loan, there is a mandatory flood insurance purchase requirement. Many mortgage lenders in high-hazard areas now require flood insurance even for structures outside the regulated floodplain. Ensuring high-risk structures are one method the NFIP uses to offset the escalating costs of flood disasters.

The Towns of Irvington, Kilmarnock, White Stone, and Colonial Beach, as well as the unincorporated parts of Lancaster, Northumberland, Richmond, and Westmoreland Counties, participate in the NFIP but do not participate in the Community Rating System. In addition, the Town of Montross in Westmoreland County and the Town of Warsaw in Richmond County do not participate in the NFIP. NFIP participation and each county and town's current effective map dates are listed in Table 7-10. The Reg-Emer Date is the date the community first joined the NFIP. All jurisdictions listed below participate in the "Regular" Program.

Table 7-10: Northern Neck Regional Jurisdictions NFIP Participation Dates

County	Jurisdiction	Initial FHBM Identified	Initial FIRM Identified	Current Effective Map Date	Reg-Emer Date
Lancaster	Irvington, Town of	10/18/1974	08/04/1987	07/06/2022	08/04/1987
	Kilmarnock, Town of	N/A	09/17/2010	07/05/2022	09/17/2010
	Unincorporated County	01/24/1975	03/04/1988	07/05/2022	03/04/1988
	White Stone, Town of	08/30/1974	09/24/1984	11/17/2020	09/24/1984
Northumberland	Unincorporated County	12/13/1974	07/04/1987	12/30/2021	07/04/1989
Richmond	Unincorporated County	04/11/1975	03/16/1989	07/26/2022	03/16/1989
Westmoreland	Colonial Beach, Town of	08/09/1974	09/18/1974	05/17/2022	09/18/1987
	Unincorporated County	07/18/1975	09/18/1987	05/17/2022	09/18/1987

Source: FEMA. NFIP – Data & Analytics: <https://nfipservices.floodsmart.gov/reports-flood-insurance-data>



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Table 7-11 shows the total policies in force in the Northern Neck Region, 1,942 policies, and their associated insurance value and premiums. Table 7-12 summarizes the NFIP policy and claim statistics for the counties and towns within the Northern Neck Region Planning District Commission.

Reported losses include all flooding events. It should be emphasized that these numbers include only those losses to structures insured through the NFIP and losses in which claims were sought and received, except for those labeled as Closed Without Payment (CWOP). It is likely that there are additional instances of flood losses in the counties and towns that were uninsured, denied claims payment, or not reported.

Table 7-11: NFIP Policies in Force in the Northern Neck Region

County	Jurisdiction	Policies In-Force	Insurance In-Force Whole \$	Written Premium In-Force
Lancaster	Irrington, Town of	6	\$1,762,600	\$7,746
	Kilmarnock, Town of	1	\$350,000	\$519
	Unincorporated County	521	\$151,332,500	\$406,797
	White Stone, Town of	2	\$700,000	\$1,101
Northumberland	Unincorporated County	638	\$199,970,000	\$463,266
Richmond	Unincorporated County	64	\$278,714	\$62,721
Westmoreland	Colonial Beach, Town of	191	\$52,827,400	\$137,484
	Unincorporated County	256	\$80,438,000	\$258,536
Total	Northern Neck Region	1679	\$487,659,214	\$1,338,260

Table 7-12: Repetitive and Severe Repetitive Loss Properties in the Northern Neck Region

Jurisdiction	RLP	RLP NFIP Insured	RLP Not NFIP Insured	RLP SDF	Severe RLP	SRLP NFIP Insured	SRLP Not NFIP Insured	SRLP SDF	Residential	Commercial	Institutional	Unknown Use
Lancaster	68	27	40	1	3	0	2	1	64	0	0	7
Northumberland	72	31	34	7	9	2	1	6	79	1	0	1
Richmond	10	7	3	0	1	1	0	0	10	0	0	0
Westmoreland	40	19	21	0	2	2	0	0	36	0	0	7
Northern Neck Region	190	84	98	8	15	5	3	7	189	1	0	15



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Table 7-13: NFIP Claims as of September 2022

County	Jurisdiction	Total Losses	Closed Losses	Open Losses	CWOP Losses	Total Payments
Lancaster	Irvington, Town of	14	12	0	2	\$268,192
	Kilmarnock, Town of	1	1	0	0	\$12,259
	Unincorporated County	367	287	1	79	\$5,462,158
	White Stone, Town of	11	5	0	6	\$63,849
Northumberland	Unincorporated County	381	279	0	102	\$6,788,171
Richmond	Unincorporated County	53	50	0	3	\$1,274,479
Westmoreland	Colonial Beach, Town of	87	73	0	14	\$3,622,592
	Unincorporated County	140	97	0	43	\$2,817,324
Total	Northern Neck Region	1,054	804	1	249	\$20,309,024

Source: FEMA NFIP Provided by FEMA September 202227.3.6.1 FEMA Repetitive Loss and Severe Repetitive Loss Properties

The NFIP defines Repetitive Loss as two or more claims of at least \$1000 over a ten-year rolling period. This is the data that appears in this plan. 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.

Identifying RL and SRL properties is an important element in conducting a local flood risk assessment. The inherent characteristics of properties with multiple flood losses strongly suggest that they are at a high risk of future flood losses. RL and SRL properties are also important to the NFIP since structures that flood frequently put a strain on NFIP funds. A primary goal of FEMA is to reduce the number of structures that meet these criteria, whether through elevation, acquisition, relocation, or a flood control project that lessens the potential for future losses. Since FEMA's database tracks RL and SRL properties on a rolling ten-year basis, the number of properties fluctuates based on flooding events.

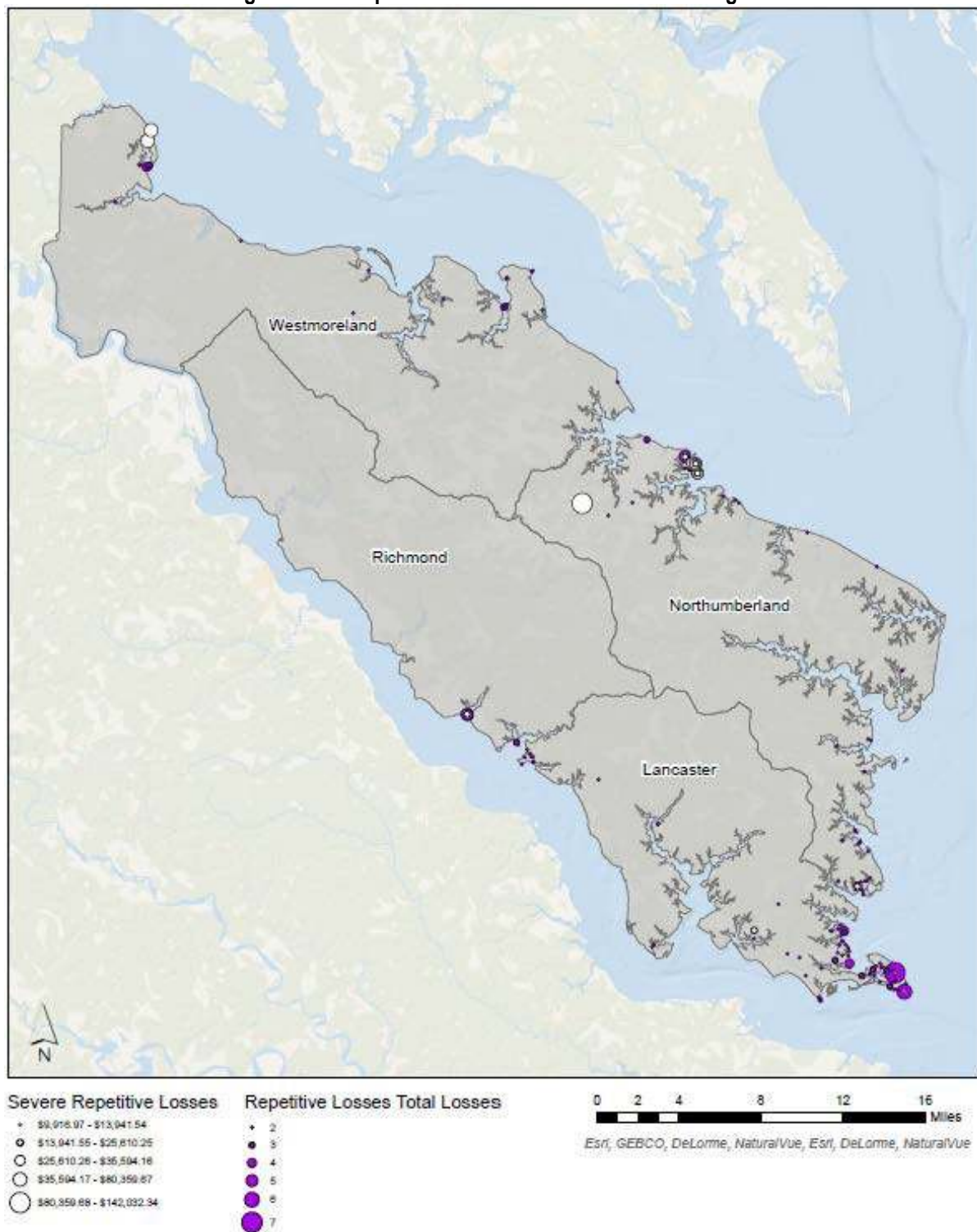
Using the redacted data provided by FEMA, the Northern Neck Region has 190 (one hundred and ninety) repetitive loss properties and 15 severe repetitive loss properties. The current RL and SRL list may not represent all properties that have been previously affected or could be affected by future flooding.

Figure 7-6 below shows the general location of RL and SRL properties within the Northern Neck Region.



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Figure 7-10: Repetitive Loss in the Northern Neck Region



Source: HAZUS, ArcGIS, and FEMA Repetitive Loss Report



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7.3.6.1 Floodplain Management

Statutes of the Commonwealth of Virginia provide cities and counties with land use authority. Floodwater control is empowered through §15.2-2223 and §15.2-2280 of the Code of the Commonwealth of Virginia. Each Northern Neck Regional jurisdiction with land use authority has adopted a local floodplain ordinance as a requirement of participation in the NFIP.

7.3.7 Wildfire Risk

Wildfires can have disastrous consequences causing damage to residences, commercial buildings, timber, agricultural areas, and natural resources. Economic consequences include the cost of suppression, reduced property values, lost sales and business revenues, reduced tourism, and increased water treatment costs. Resources threatened include communities, homes, gas transmission lines, electrical facilities and lines, timber, watershed and recreation areas, and wildlife. In addition, wildfires may create additional environmental concerns after they are extinguished, such as increased erosion and water quality concerns in stormwater runoff.

Timber loss and environmental damage frequently result from wildfires. Wildfire poses a significant threat to nearby buildings and populations. Forest damage from thunderstorms may block interior access roads and fire breaks, pull down overhead power lines, or damage pavement and underground utilities, thereby creating heavy fire load and making suppression and response more difficult. While the risk is apparent with many second homes located in wooded areas, wildfire size remains small even with limited volunteer fire departments. The lack of drought during the past two decades has greatly helped reduce wildfire occurrence and limit size that would exceed local resources. Table 7-13 presents loss data provided by the National Risk Assessment (NRI) tool.

Table 7-14: Estimated Annualized Loss from Wildfires

Wildfires	Chance of yearly Occurrence per NRI	Expected Annual Property Loss Values	Expected Annual Total Loss Values	Estimated Injuries	Estimated Deaths
Lancaster	0.03%	\$1,901	\$2,030	0	0
Northumberland	0.03%	\$15,601	\$16,456	0	0
Richmond	0.03%	\$926	\$1,036	0	0
Westmoreland	0.03%	\$4,707	\$4,760	0	0

7.3.7.1 Vulnerabilities

The Northern Neck Region has a significant means of fuel and conditions that could feed wildfires. In addition, the area is limited by low numbers of first responders, distance, and water access, all of which contribute to the possibility of wildfires growing and decreasing the chances of controlling the fire quickly. In the summer seasons, precipitation is often scarce, and coastal vegetation, farmland, debris, and woodland are dry with decreases in the water supply that depend on rainwater to replenish the reservoirs. Both the coastal areas with vegetation and open farm/wooded areas in all jurisdictions in the region are at risk for wildfires. This risk is increased during a drought and places all populations and wildlife at risk. That risk of injury or death is increased for civilians with limited mobility.

The probability of wildfires in the future is relatively unpredictable; still, if information is studied, such as that provided by the National Park Service publication *"Wildfire Causes and Evaluations"* March 8, 2022, then it



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can be assessed that through the increase in human carelessness, the increase in severe weather events (high winds and lightning), and in some cases poorly maintained or hard to maintain areas of high debris. Agencies such as the Virginia Department of Forestry, DEQ, and the National Weather Service gather statistics, monitor conditions, and issue watches, warnings, and burn bans.

The priority hazard ranking process for the 2023 hazard risk assessment determined wildfires to be a “moderate” hazard in the Northern Neck Region. Data utilized for the ranking included Virginia Department of Forestry records and the NRI. The risks to the community in the event of a large fire incident are significant. The occurrence of a large-scale event is infrequent. Therefore, the frequency of wildfires reported to the VDOF encourages mitigation actions based on numbers. It is to be considered that most of the events reported in this plan are small events that did not exceed 10 acres nor exceed the local resources.

Wildfire ranks moderate for having a warning time of fewer than 24 hours before an event. Table 7-14 outlines the hazard rankings related to wildfires.

Table 7-15: CPRI Wildfire Hazard Priority

Probability	Magnitude	Warning Time	Duration	Total Score	Threat
1.8	0.3	0.6	0.1	2.8	Moderate

7.3.7.1 Effects of Climate Change and Wildfires

Wildfire events of significant size are infrequent in the Northern Neck Region however, the risk is elevated as noted in the CPRI scoring. The risks of wildfires to the Northern Neck Region lies in the amount of potential fuel and limited resources. According to NOAA’ Wildfire Climate Connection “Research shows that changes in climate create warmer, drier conditions, leading to longer and more active fire seasons. Increases in temperatures and the thirst of the atmosphere due to human--caused climate change to have increased aridity of forest fuels during the fire season.”

7.3.8 Winter Storm Risks in the Northern Neck Region

Based on the NCEI historical records of winter storm activity in the Northern Neck Region, it is estimated that the region will experience two significant winter weather events per year. This includes blizzards, heavy snow, ice storms, and winter storms. While this data includes weaknesses discussed previously, it is reasonable to conclude that severe winter weather events will likely continue to occur regularly in the region and should be properly mitigated.

Table 7-15 illustrates the annualized damages for winter storm events in the Northern Neck Region. Data from the NCEI database and NRI community reports were utilized to create an annualized estimate of the risks associated with winter weather events in the Northern Neck Region. There are no reported injuries or deaths reported in the NCEI database. It must be considered that in winter storms, there are motor vehicle accidents that occur when citizens attempt to travel on unsafe roads, and these injuries and property damages may not be reported as part of the event losses and casualties.



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Table 7-16: Estimated Annual Loss Values from Winter Storm Events

Winter Storms	Annualized Events	Annualized Property Damages	Annualized Crop Damages	Annualized Total Damages	Deaths	Injuries
Lancaster	2	\$312	\$1	\$2030	0	0
Northumberland	2	\$327	\$3	\$5,386	0	0
Richmond	2	\$188	\$3	\$4,247	0	0
Westmoreland	2	\$542	\$0	\$11,982	0	0

7.3.8.1 Vulnerabilities

All critical facilities in the Northern Neck Region are considered vulnerable to the effects of severe winter storms due to the potential disruption of services and transportation systems and possible structural failure due to heavy snow loads. The level of vulnerability of a building depends on the age of the building (and the building codes in effect at the time of construction), construction type, and the structure's condition. In addition, FEMA Risk Management has published a Snow Load Safety Guide¹. The guide states:

Most buildings are not at risk of snow-induced failure. Attempting to remove snow from a roof is more hazardous than beneficial, posing a risk to both personnel and the roofing structure. However, more than building design conditions, snow accumulation can result in more than a temporary loss of electrical power and inaccessible roads. Buildings may be vulnerable to structural failure and possible collapse if basic preventative steps are not taken in advance of a snow event. Knowledge of the building roof framing system and proper preparation before a snow event is instrumental in reducing risk to the structure.

According to the FEMA Snow Load Safety Guide, it is certain that certain roof types and materials are more susceptible to snow-induced collapse. Buildings vulnerable to increased snow accumulation and unbalanced loads include:

- Gable/multi-span gable roof
- Mono-slope roof
- Flat or low-slope roof with or without roof drains
- Stepped roof
- Saw-tooth roof

Even small ice accumulations can cause a significant hazard, especially on power lines and trees. An ice storm occurs when freezing rain falls and freezes immediately upon impact. Communications and power can be disrupted for days, and even small ice accumulations may cause extreme hazards to motorists and pedestrians. Extended power outages from ice storms would require residents to look for supplemental heat sources; improper use of these sources could result in house fires. Injuries could result from slipping on ice if residents, especially the elderly, were to leave their homes.

The priority hazard ranking process for the 2023 hazard risk assessment determined winter storms to be a “moderate” hazard in Northern Neck Region. Winter storm-related events within the region are likely, with two significant events expected annually. Winter storms in the Northern Neck Region cause more

¹ FEMA Risk Management Series: Snow Load Safety Guide. FEMA P-957 January 2013.
https://www.fema.gov/sites/default/files/documents/fema957_snowload_guide.pdf



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problems with impacts on transportation networks and power outages. This leads to school, government, and business closings.

Table 7-17: CPRI Winter Storm Hazard Priority

Probability	Magnitude	Warning Time	Duration	Total Score	Threat
1.8	0.6	0.15	0.20	2.75	Moderate

7.3.8.1 Effects of Climate Change and Winter Storms

It appears as a contradiction that warming temperatures contributing to so many hazard events may also contribute to severe winter weather. However, a warmer planet is evaporating more water into the atmosphere. That additional moisture means increasing precipitation in the form of heavy snowfall if the temperatures are favorable. Winter storms do not frequently affect the region however, during significant events there are considerable factors that jurisdictions address in mitigation action planning. For example, a tropical storm occurring in August presents flooding and wind potential, however, a similar storm in January when temperatures fall below freezing adds additional risks such as citizens without heating sources and hazardous roadways.

7.3.9 Hurricane/Tropical Storm Risks in the Northern Neck Region

Hurricanes and tropical storms are events that can greatly impact large areas. Based on the NCEI historical records of hurricane activity in the Northern Neck Region, it is estimated that the area will experience one hurricane or tropical storm every three years. Virginia's hurricane season is June 1 through November 30, but the most intensive hurricanes usually occur during August and September.

Table 7-16 shows the annualized damages for hurricanes/tropical storms in the Northern Neck Region. The NCEI Storm Events data were annualized by dividing the total number of hurricane events by the length of the record. The annualized values should only be used to estimate what can be expected annually. Using historical records, individual counties can expect to experience one hurricane or tropical storm every three years. The region can expect to experience hurricanes and tropical storms at a similar frequency. Table 7-17 notes the expected annualized loss values from hurricanes and tropical storms with data provided by the NCEI database and NRI reports.

7-18: Expected Annualized Loss Values from Hurricanes/Tropical Storms

Hurricane/ Tropical Storm	Annualized Events	Annualized Property Damages	Annualized Agriculture Value	Annualized Total Damages	Deaths	Injuries
Lancaster	0.3	\$275,695	\$33,527	\$323,758	0	0
Northumberland	0.3	\$297,265	\$135,223	\$448,002	0	0
Richmond	0.3	\$12,825	\$69,144	\$93,864	0	0
Westmoreland	0.3	\$39,033	\$35,849	\$74,882	0	0



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7.3.9.1 Vulnerabilities

Historically hurricanes have affected the Northern Neck region the worst in flood zones. However, in recent years hurricanes have brought tornadoes and severe wind damages that are of increasing severity. All populations in all jurisdictions of the region are at risk. Specialized attention is focused on citizens with access and functional needs, mobility issues, and institutional facilities. Coastal flood zones are frequently ordered to evacuate to reduce loss of life. Lancaster and Northumberland have more coastal property and therefore face immediate effects the worst however, Westmoreland has a unique situation of the Nomini Cliffs where they have the concern of precipitation contributing to landslides. All jurisdictions have to face the effects of these storms considering the size of region and the unique location in the Chesapeake Bay.

The priority hazard ranking process for the 2023 hazard risk assessment ranked hurricane/tropical storms as a significant hazard risk. Hurricane events within the region are somewhat likely with less than one event annually. Secondary effects from influenced fronts or remnants pose an increasing risk. Tropical cyclone events have a “high” range of impacts in annualized property damages, and the potential exposure for hurricane events is “high” with more than \$1 million in potential damages. Hurricane is ranked low for having a warning time of at least two days before an event. Table 7-18 outlines the hazard ranking for each of the hazard priority criteria related to hurricane events.

Table 7-19: CPRI Hurricane/Tropical Storm Hazard Priority

Probability	Magnitude	Warning Time	Duration	Total Score	Threat
1.35	0.9	0.15	0.10	2.5	Moderate

7.3.9.1 Effects of Climate Change and Hurricane/Tropical Storms

In June of 2022 NOAA released A Force of Nature: Hurricanes in a Changing Climate in brief stating, “Due to global warming, global climate models predict hurricanes will likely cause more intense rainfall and have an increased coastal flood risk due to higher storm surge caused by rising seas. Additionally, the global frequency of storms may decrease or remain unchanged, but hurricanes that form are more likely to become intense. The incidence systems that impact the region at hurricane strength are minimal. Mitigation actions and planning remain at the forefront due to the risk factors and coastal location of the communities.

7.3.10 Coastal Erosion Risks in the Northern Neck Region

Some of the assets most vulnerable to coastal erosion in the Northern Neck Region are infrastructures such as bridges and roads, personal property, public and private beaches, and the natural habitats of shorebirds and other wildlife. Severe storms such as hurricanes and nor’easters that impact the Northern Neck Region can exacerbate the coastal erosion due to the higher wave action and storm surge. Severe storms can reduce the size of beaches and destroy substantial dunes in a single event.

Shoreline protection installations, such as bulkheads and seawalls, can positively and negatively affect the surrounding area. For example, eroding sediment banks that once provided sand for beaches, spits, and offshore bars no longer have a supply of natural sand input. In addition, these now-protected shoreline segments will remain as hard points or headland features while adjacent unprotected properties will continue to erode, sometimes at an accelerated rate.



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By the year 2040, it is estimated the 492 buildings in the Northern Neck Regional communities will be lost to coastal erosion and sea level rise, according to the report “Future Sea Level and Recurrent Flooding Risk for Coastal Virginia” published in 2021 by the Commonwealth Center for Coastal Recurrent Flooding Resiliency. Table 7-19 demonstrates the effects that coastal erosion and rising sea levels may have on the Northern Neck Region in the future.

Table 7-20: The Potential Effects of Coastal Erosion on Assets in the Northern Neck Region

Asset	2040	2060	2080
Buildings	492	846	1425
Miles of roadway	6	24	45
Land area in square miles	22	29	37
Number of parcels	10,322	11,052	11,887

Source: “Future Sea Level and Recurrent Flooding Risk for Coastal Virginia” 2021 CCRFR

7.3.10.1 Vulnerabilities

The priority hazard ranking process for the 2023 hazard risk assessment determined coastal erosion to be a moderate hazard in the Northern Neck Region. Coastal erosion events can have a wide range of impacts; however, no recorded property damages were available to quantify that prior impact. Coastal erosion is a top priority in all 4 counties, and all are seeking means to reinforce coastal and waterway banks with means such as living shorelines. Erosion is a risk primarily to land but ultimately to population as the land disappears it decreases size and destabilizes the area. The more erosion that occurs the higher the flood risk will become. Damages have been ranked “significant” because damages are reported as caused by hurricanes, tropical cyclones, nor’easters, and other severe weather events. Table 7-20 outlines the hazard rankings for each hazard priority criterion related to coastal erosion. With ongoing climate change, sea level rise, and coastal erosion research, it is highly likely that the coastal erosion ranking will grow to ‘significant’ in the following plan update hazard risk assessment.

Table 7-21: CPRI Coastal Erosion Hazard Priority

Probability	Magnitude	Warning Time	Duration	Total Score	Threat
1.8	0.3	0.15	0.1	2.35	Moderate

7.3.10.1 Effects of Climate Change and Coastal Erosion

Coastal Erosion concerns are present in some portion of every County in the Northern Neck Region. Westmoreland has cliffs that are prone to collapse, and beaches and wetlands are frequently suffering damage and loss from storms that cause significant erosion events, such as Hurricane Sandy in 2012. NOAA’s Climate Resilience Toolkit for Coastal Erosion teaches “as global sea level rises, the action of waves at higher elevations increases the likelihood for extensive coastal erosion.” Communities in the region are working to integrate better ordinances, limit development in the SFHA, create more green spaces, and increase shoreline protection measures such as living shorelines and water runoff diversion techniques.



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7.3.11 Pluvial Flooding Risks in the Northern Neck Region

Development, climate change, and aging stormwater infrastructure increase flash floods and surface water runoff risks. Surface flooding can lead to catastrophic damage. The unique landscape and location of the Northern Neck Regional communities creates an increased risk to the entirety of the region. Data contained in this plan show increasing severe weather events, rainfall, and flash flooding throughout the region, resulting in an increased risk of casualties, property damage, and assets.

Pluvial flooding is only recently being tracked as a separate damage classification and therefore there is little data to show monetary damage estimates or casualties. Multiple instances demonstrated in Section 6 provide evidence of the hazards of pluvial flooding to the Northern Neck Region.

The risk for occurrence is one event every two years. Although this is most likely higher with all events not being reported and the increasing number/severity of severe weather hazards.

7.3.11.1 Vulnerabilities

Pluvial flooding is a newly assessed hazard to the 2023 HMP. Events of this nature are more recently being brought to the forefront and noted for the damages caused. The priority concern across all jurisdictions participating are areas of poor stormwater drainage. The proximity to the coast with poor drainage and a storm that may drop an unexpected amount of precipitation in a short amount of time, may leave towns such as Colonial Beach and Kilmarnock with too much water and nowhere for it to go. This can result in flash flooding invading homes, roadways, and businesses. It can also cause dams to overtop and/or fail.

Table 7-22: CPRI Pluvial Flooding Hazard Priority

Probability	Magnitude	Warning Time	Duration	Total Score	Threat
1.35	0.3	0.15	0.2	2.0	Moderate

7.3.12 Landslide Risks in the Northern Neck Region

Landslides are not a common event in the region. There has been one landslide event recorded in the NCEI, and the NRI does not record any since 1996. There is concern among some working group members and localities that portions of inland river areas contain risk for landslide events, and the Nomini cliffs near Westmoreland State Park have a history of and future risks for collapse secondary to coastal erosion and storm damage. The NRI notes landslide as a “Relatively Moderate or Low” risk with an Index Score of 19.64 in Lancaster, 15.92 in Northumberland, 17.78 in Richmond, and 15.74 in Westmoreland.

Table 7-23: Estimated Annualized Loss from Landslide in the Northern Neck Region

Landslide	Chance of yearly Occurrence per NRI	Expected Annual Property Loss Values	Expected Annual Total Loss Values	Estimated Injuries	Estimated Deaths
Lancaster	0	\$1,104	\$32,334	0	0
Northumberland	0	\$1,175	\$40,084	0	0
Richmond	0	\$1,826	\$48,868	0	0
Westmoreland	1	\$1,112	\$33,899	0	0



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7.3.12.1 Vulnerabilities

Landslide risk in the Northern Neck is relatively low in most jurisdictions. It is a concern in areas with slopes in the higher elevation areas of Westmoreland. Specifically, the areas in the State Park surrounding Nomini Cliffs where a collapse has occurred before. Although the HMWG does not see landslide as a significant risk for the majority of the region, it was felt that with the history and the NRI Index Scores that it should be placed in the hazard assessment for mitigation considerations.

Table 7-24: CPRI Landslide Hazard Priority

Probability	Magnitude	Warning Time	Duration	Total Score	Threat
0.9	0.3	0.6	0.1	1.9	Low

7.3.12.1 Effects of Climate Change and Landslides

Landslides are uncommon in the Northern Neck Region. However, the geography presents potential for events. Climate change data provided by NOAA shows that rainfall amounts are expected to increase in frequency and intensity. Concerns within these events include increased sediment movement in waterways and increasing erosion. All the factors contribute to the concern for landslide potential in the Northern Neck Region and the first step in the process of awareness and mitigation planning for landslides is to recognize the hazard in the Northern Neck Regional HMP 2022 update.

7.3.13 Drought Risks in the Northern Neck Region

Table 7-24 shows the annualized damages for drought events in the Northern Neck Region. Data for the droughts in the Northern Neck Region was drawn from multiple sources, including the NCEI, NRI Tool, USDA National Agricultural Statistics Service, and FEMA ArcGIS Mapping tool US Drought Intensity Layer. The events noted in Section 6 are major events with declaration-level damages and often occur over a prolonged period. The region often is affected by shorter droughts, periods of extreme heat, or shortages of water that go unreported to major agencies as they are dealt with internally in the community. Droughts are not a common occurrence (five major events since 1996) in the Northern Neck Region, as noted in Table 7-23. When there is a drought of noteworthiness, the losses are substantial in monetary measures as well as the survival of the agricultural community. The Annualized Events are from the major events listed in Section 6 occurring between 1996-2022. It should be considered that the NRI reports 91 drought events in Lancaster and Northumberland, and 122 events in Richmond between 2000-2017.

Table 7-25: Estimated Annualized Loss from Drought in the Northern Neck Region

Drought	Annualized Events	Annualized Property Damages	Annualized Agricultural Loss Values	Annualized Total Damages	Deaths	Injuries
Lancaster	0.2	\$0	\$215,814	\$215,814	0	0
Northumberland	0.2	\$0	\$130,003	\$130,003	0	0
Richmond	0.2	\$0	\$123,194	\$123,194	0	0
Westmoreland	0.2	\$0	\$339,126	\$339,126	0	0



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7.3.13.1 Vulnerabilities

A significant drought event brings economic, social, and environmental impacts to the entire region. One of the most significant economic effects of a drought is the agricultural impact, which includes the undernourishment of livestock and crop damage. Droughts severely impact farm income and can increase the cost of potable water if water supplies must be augmented. Even with the region being surrounded by water it does not decrease the risks of drought to citizens or land. Populations with limited access to move about are at the highest risk as they cannot leave their home for cooler areas when needed and may not be able to access safe drinking water. All jurisdictions in the Northern Neck Region are at a potentially even risk for effects from drought. Agriculture and Livestock farmers would/could suffer the worst losses without enough water to care for their crops and animals.

High summer temperatures can exacerbate the severity of a drought. When soils are wet, a significant portion of the sun's energy goes toward the evaporation of the ground moisture. Yet, when drought conditions eliminate soil moisture, the sun's energy heats the ground surface, and temperatures can soar, further drying the soil. The impact of excessive heat is most prevalent in urban areas, where urban heat-island effects prevent inner-city buildings from releasing heat built up during daylight hours. The secondary impacts of excessive heat severely strain the electrical power system.

Droughts also create conditions that enable the occurrence of other natural hazard events, such as wildfires and wind erosion. The likelihood of pluvial and flash flooding increases if a period of severe drought is followed by extreme precipitation. Low-flow conditions also decrease the quantity and pressure of water available to fight fires, while dry conditions increase the likelihood that fires will occur.

The priority hazard ranking process for the 2023 hazard risk assessment determined drought to be a moderate hazard in the Northern Neck Region. The warning time for drought allows for preparations; however, it is rarely possible to forecast the length of time that drought will last; therefore, the warning time is somewhat complicated. The significant loss to agriculture ranks drought as a significant hazard. Frequency ranking can depend on what level (D0-D4) the community records and how damages are recorded. The NRI guidance recommends a higher frequency rating than cumulative statistics gathered from other sources. Table 7-25 outlines the hazard ranking for each of the hazard priority criteria related to drought.

Table 7-26: CPRI Drought Hazard Priority

Probability	Magnitude	Warning Time	Duration	Total Score	Threat
0.9	0.3	0.15	0.1	1.45	Moderate

7.3.13.1 Effects of Climate Change and Drought

USGS states that "Climate change exacerbates droughts by making them more frequent, longer, and more severe." In this update of the Northern Neck HMP, drought remained on the lower end of the hazard risk list but the threat remains moderate. Drought is directly affected by precipitation amounts, specifically less precipitation contributes to worsening drought conditions. Communities are encouraging mitigation actions through education and awareness, and actions such as debris clearing and encouraging the removal of items such as dilapidated buildings that could be a fuel source.



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7.3.14 Heatwave Risks in the Northern Neck Region

Much of the risk from heatwaves is to the population, primarily vulnerable populations, and persons with functional access needs. The climate and coastal location of the region contribute to high humidity that will increase the effects of high heat indexes, further raising the hazards associated with heat waves.

Table 7-27: Estimated Annualized Losses from Heatwave in the Northern Neck Region

Heat Wave	# Of Events NCEI	Estimated Population Equivalence	Expected Annual Total Loss Values	Estimated Injuries	Estimated Deaths
Lancaster	3	\$23,339	\$23,346	0	0
Northumberland	3	\$25,263	\$25,290	0	0
Richmond	3	\$18,960	\$18,983	0	0
Westmoreland	3	\$30,740	\$30,740	0	0

When calculated with available data, heat waves are ranked as a “Low” priority. Likewise, probability, magnitude, and warning time favor the region with the lowest scores. Duration is an unknown factor as most events that present as heatwaves may present in short periods of time and then end, or they may “pulse” with a period of heat that decreases and then returns.

7.3.14.1 Vulnerabilities

Vulnerable populations across the region include wildlife, animals, access and functional needs persons, elderly, and children that can not move themselves into cooler areas. All jurisdictions in the Northern Neck Region have populations that would suffer during a heatwave. The higher humidity of the outlying water front areas would contribute to worsening the heat index with increased humidity. Heatwave and drought often accompany each other in the summer and subsequently increase the chance of wildfire.

Table 7-28: CPRI Heatwave Hazard Priority

Probability	Magnitude	Warning Time	Duration	Total Score	Threat
0.9	0.3	0.15	0.3	1.65	Low

7.3.14.1 Effects of Climate Change and Heatwave

The Center for Climate and Energy Solutions states that heatwaves are increasing in frequency. Additional statements note, “If greenhouse gas emissions are not significantly curtailed, daily high and low temperatures will increase by at least five degrees F in most areas by mid-century, rising to 10 degrees F by late century. The National Climate Assessment estimates 20-30 more days over 90 degrees F in most areas by mid-century. Facing these estimates, the jurisdictions in the region have included heatwave as a new hazard of consideration to ensure inclusion in mitigation actions and planning.



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7.3.15 Earthquake

Although earthquakes may occur infrequently, they can have devastating impacts that affect entire communities and regions. An earthquake's destructiveness depends on several factors, including the magnitude of the tremor, the direction of the fault, distance from the epicenter, regional geology, and the design characteristics of buildings and infrastructure. Moderate and even very large earthquakes are inevitable; consequently, buildings in these regions are seldom designed to deal with an earthquake threat; therefore, they are extremely vulnerable.

Earthquake intensity is generally greater on soft soils than on solid rock. Areas in the Northern Neck Region that contain alluvial soils are more at risk of destabilization occurring in the event of an earthquake. Other effects of a strong earthquake include landslides, fissuring, slumping at the ground surface, and even tsunamis. When the epicenter of a large earthquake is located offshore, the seabed may be displaced sufficiently to cause a tsunami. Tsunami waves can travel across the ocean at very high speeds, depending on the location and source of the seismic event.

Table 7-29: Estimated Annualized Loss from Earthquake in the Northern Neck Region

Earthquakes	Chance of yearly Occurrence per NRI	Expected Annual Property Loss Values	Expected Annual Total Loss Values	Estimated Injuries	Estimated Deaths
Lancaster	0.03%	\$14,133	\$14,518	0	0
Northumberland	0.03%	\$11,897	\$12,270	0	0
Richmond	0.03%	\$11,669	\$12,180	0	0
Westmoreland	0.03%	\$25,337	\$26,163	0	0

7.3.15.1 Vulnerabilities

If an earthquake were to effect the Northern Neck the vulnerable population would depend on the jurisdiction that it affected and how high the Richter reading is. The damages to buildings and infrastructure would be a primary concern. Earthquakes can trigger many other incidents such as tsunamis (not a hazard risk in the NN Region), dam failure, erosion, structural damages, and debris instability. The additional incidents that earthquakes can trigger increase the potential level of vulnerabilities.

The priority hazard ranking process for the 2023 hazard risk assessment determined earthquakes to be a limited hazard in the Northern Neck Region. As described in the profile above, earthquakes are unlikely events with no epicenters recorded in the Northern Neck Region. There are no recorded property damages secondary to earthquakes. The potential exposure for an earthquake event is "significant," with greater than \$1 million in potential damages. Due to the infrequency of events in this area, infrastructure could sustain considerable damage in a medium-strength earthquake. Earthquake is ranked high for having a warning time less than 24 hours before the event. Table 7-29 outlines the hazard rankings for each of the hazard priority criteria related to earthquakes.

Table 7-30: CPRI Earthquake Hazard Priority

Probability	Magnitude	Warning Time	Duration	Total Score	Threat
0.45	0.3	0.9	0.1	1.75	Low



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7.3.14.1 Effects of Climate Change and Earthquake

In the Northern Neck, earthquakes are a minimal risk with almost no historical data to show any major risk. However, Virginia has many fault lines that are inactive but that doesn't negate the responsibility of the jurisdictions to consider mitigation actions for earthquakes. The James River follows the Central Virginia Seismic Zone between Charlottesville and Richmond. To date earthquake occurrences are not predictable and an earthquake can occur at any time without warning.

7.4 Northern Neck Region's Critical Facilities

A critical facility is defined as a facility in the public or private sector that provides essential products and services to the public; is necessary to preserve the welfare and quality of life in the community; or fulfills important public safety, emergency response, and/or disaster recovery functions. Examples include public safety facilities (police, fire, and emergency medical services), cell towers, courthouses, medical facilities, utilities, transportation networks, and schools.

Table 7-30 summarizes the number of critical facilities by type in the Northern Neck Region, and Figure 7-7 maps their relative location.

7-31: Critical Facilities in the Northern Neck Region

Facility Type	Number of Facilities
Emergency Medical Services (EMS)	9
Emergency Operations Centers (EOC)	4
Fire	17
Government	4
Medical	20
Police	14
School	20
Utility	15
Total	124

Source: U.S. Geological Survey data pulled 10/03/2022



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Figure 7-11: Critical Facilities in the Northern Neck Region



Source: <https://www.arcgis.com/apps/mapviewer/index.html?layers=f36207114ae94f3987e5f0423170f2a5>

7.5 Northern Neck Region's Future Development Trends

Administered by the Commonwealth of Virginia, the Bay Act Program comprehensively addresses the effects of land use planning and development on water quality. The Bay Act recognizes that local governments are primarily responsible for land use decisions. It expands their authority to manage water quality and establish a direct relationship between water quality protection and local land use decision-making. All participating communities have regulations limiting or prohibiting development in the SFHA, and all have plans to continue enforcing and expanding on those regulations.

7.6 Summary of Risk Assessment

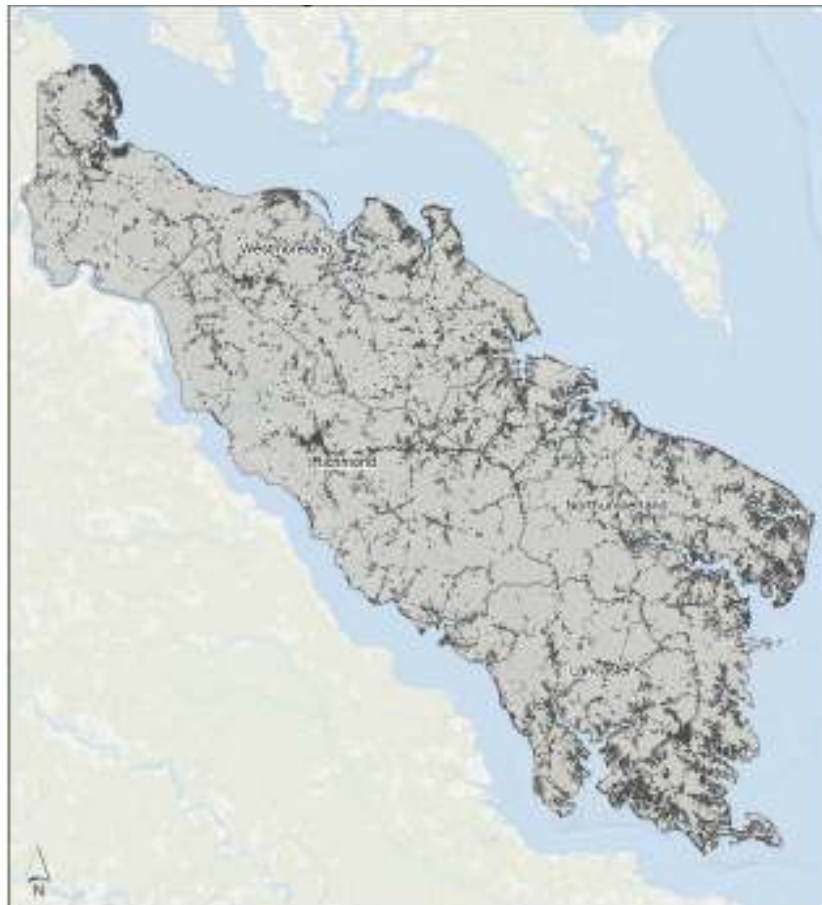
A variety of natural hazards have the potential to impact the Northern Neck Region. In addition to the potential for injury or loss of life and damage to property and crops, a hazardous event can disrupt utilities, communication, and transportation, impacting the well-being of people and communities. Since so many residents are second homeowners along the region's coastal shores, a full understanding of hazard potential, severity, and recovery after an event is a unique challenge to the area. It is important to point out that data limitations for some hazards prevented a complete analysis of past occurrences and potential



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future losses. Figure 7-8 presents the current building footprint for the communities in the Northern Neck Region.

Figure 7-12: Building Footprint in the Northern Neck Region



Source: HAZUS

The purpose of the hazard ranking is to categorize and prioritize all potential hazards for the Northern Neck Region based on risk. Combined with the asset inventory and quantitative vulnerability assessment, the summary hazard classifications allow for the prioritization of those high-hazard risks for mitigation purposes and, more specifically, the identification of hazard mitigation opportunities for the Northern Neck Region to consider as part of their proposed mitigation strategy. Hazards were ranked utilizing the CPRI process identified in Section 7.2. This index was then used to rank the hazards to give the community some sense of how the hazards ranked in comparison to the others. Table 7-31 provides a summary of the hazards, categories, scoring, and ultimate ranking.



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Table 7-32: Calculated Priority Ranking Index Summary

Hazard	Probability	Magnitude and/or Severity	Warning Time	Duration	CPRI Score	Hazard Ranking
Tornado	1.35	0.9	0.6	0.1	2.95	1
Severe Weather (High winds, hail, lightning)	1.8	0.6	0.3	0.2	2.9	2
Coastal Flooding	1.8	0.6	0.15	0.3	2.85	3
Riverine Flooding	1.8	0.6	0.15	0.2	2.75	4
Wildfire	1.8	0.3	0.6	0.1	2.8	5
Winter Storm	1.8	0.6	0.15	0.20	2.75	6
Hurricane/Tropical Storm	1.35	0.9	0.15	0.3	2.7	7
Coastal Erosion	1.8	0.3	0.15	0.2	2.45	8
Pluvial Flooding	1.35	0.3	0.15	0.2	2	9
Landslide	0.9	0.3	0.6	0.1	1.9	10
Drought	0.9	0.3	0.15	0.40	1.75	11
Heatwave	0.9	0.3	0.15	0.3	1.75	12
Earthquake	0.45	0.3	0.6	0.1	1.45	13

As described in the sections on hazard-specific estimated loss, there have been 352 storm events since the 1950 report across the Northern Neck Region, as recorded in the NOAA NCEI Storm Events database. This total accounts for any duplication in instances where the same storm event was reported in multiple counties in the NNPDC. Total damages, which are also reported on a county level, are not duplicative since each county only reports its local damages. Similarly, deaths and injuries are not duplicative. The NOAA NCEI Storm Events Database data were annualized using the total years of record for each hazard category. When the NCEI did not offer sufficient data, the NRI, VDOF, and HAZUS were utilized to provide the best available data. Table 7-32 summarizes the region's estimated annualized events and damages. This information is additionally presented by county in Table 7-33.

Table 7-33: Northern Neck Regional Annualized Hazard Events, Damages, Deaths, and Injuries

Hazard	Events	Property Damages	Crop Damage	Total Damage	Deaths	Injuries
Tornado	0.4	\$172,204	\$1,162	\$173,367	0	0.2
Severe Weather	3.2	\$360,170	\$105	\$360,275	0	0
Coastal Flooding	0.5	\$1,317,887	\$0	\$1,317,887	0	0
Riverine Flooding	0.5	\$56,339	\$16,922	\$73,261	0	0
Wildfire	141	\$5,161	\$65,930	\$71,091	0	0
Winter Storm	4.2	\$1,926	\$0	\$1,926	0	0
Hurricane/Tropical Storm	0.3	\$117,741	\$175,147	\$292,888	0	0
Coastal Erosion	**	TBD	TBD	TBD	0	0
Pluvial Flooding	0.5-2	TBD	TBD	TBD	0	0
Landslide	0.1	TBD	TBD	\$1.5 M	0	0
Drought	0.1	\$0	\$943,399	\$943,399	0	0



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Hazard	Events	Property Damages	Crop Damage	Total Damage	Deaths	Injuries
Heat Wave	0.7	\$0	\$0	\$30K	0	0
Earthquake	0.03	\$64,000	\$0	\$64,000	0	0

Table 7-34: Annualized Hazard Events by County in the Northern Neck Region

Hazard	Lancaster	Northumberland	Richmond	Westmoreland	NNPDC
Tornado	1	1	1	1	1
Severe Weather	7	7	7	7	7
Coastal Flooding	4.4	4.4	4.4	4.4	4.4
Riverine Flooding	0.3	0.3	0.7	0.5	0.45
Wildfire	6.7	4.5	1.3	3.8	4.1
Winter Storm	2	2	2	2	2
Hurricane/Tropical Storm	0.3	0.3	0.3	0.3	0.3
Coastal Erosion	n/a	n/a	n/a	n/a	n/a
Pluvial Flooding	4	4	1	7	4
Landslide	0	0	0	1	0.25
Drought	0.2	0.2	0.2	0.2	0.2
Heatwave	0.12	0.12	0.12	0.12	0.12
Earthquake	0.03	0.03	0.03	0.03	0.03



Section 8 Capability Assessment

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 - 8.5.5 Technical, Administrative, and Regulatory Capacity
 - 8.5.6 The Chesapeake Bay Protection Regulations
- 8.6 Current and Completed Hazard Mitigation Programs and Projects
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8.1 Overview and Purpose of Capability Assessment

Although not specifically required by Disaster Mitigation Act of 2000 or 44 CFR 201.6, a capability assessment adds context to a mitigation plan by providing an inventory of a Jurisdiction's programs and policies, and an analysis of its capacity to carry them out. These are essential for developing mitigation strategies and actions.

The capability assessment is a review of the Northern Neck Region's resources to identify, review, and analyze what the jurisdictions are currently doing to reduce losses, and to identify the framework that is in place for the implementation of new mitigation activities. This section of the Plan also facilitates efforts with the Virginia Department of Emergency Management (VDEM) and with federal agencies and resources. In addition, this assessment will be useful in gauging whether the current local organizational structures and inter-jurisdictional or county coordination mechanisms for hazard mitigation could be improved, and how.

This local capability is extremely important because the municipal officials know their own landscape best. Additionally, many of the most critical and effective hazard mitigation strategies and programs, including floodplain management, enforcement of building codes, and land-use planning, require a strong local role to achieve effective implementation.

State statutes require each Jurisdiction to assign an individual to be responsible for its local emergency management duties. The jurisdiction's emergency management coordinator is responsible for coordinating emergency response and recovery operations with local, regional, state, and federal officials.



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8.2 Methodology

This capability assessment results from research, interviews, and surveys. Relevant documents were reviewed related to hazard mitigation, including the Commonwealth of Virginia Hazard Mitigation Plan (2018), as well as state and federal sources related to funding, planning, and regulatory capability. For the participating jurisdictional capability assessments, a series of in-depth individual interviews provided key insights and information. These interviews were conducted during the month of September 2022. Table 8-1 notes the interview attendees.

Table 8-1: Jurisdiction Capabilities Assessment Interviews

Agency/Locality	Representatives
Northern Neck Planning District Commission	John Bateman
Lancaster County	Matthew Smith – Chief of Emergency Services Bill Farrell – Director of Planning and Land Use Jim Canter – Building Official Olivia Hall – Environmental Codes Compliance Officer
Town of Irvington	Julie Harris – Mayor Laurel Taylor – Town Clerk Justin Nelson – Zoning Administrator
Town of Kilmarnock	Marshall Sebra – Planning and Zoning Director
Town of White Stone	Patrick Frere – Town Manager
Northumberland County	Wes Packett – Director of Emergency Services Lutrell Tadlock – County Administrator Phillip Marston – Zoning Administrator
Richmond County	Hope Mothershead – Code Compliance Officer Mitch Paulette – Chief, Department of Emergency Services
Town of Warsaw	Melissa Coates – Director of Planning and Community Development Joseph Queensberry – Town Manager
Westmoreland County	Bill Cease – Director of Emergency Management and Technology Darrin Lee – Assistant Planning Director Beth McDowell – Director of Planning and Community Development
Town of Colonial Beach	J.C. Lariviere – Grants Writer India Adams-Jacobs – Town Manager Kaylynn DeBernard – Town Planner Darla Odom – Zoning Administrator Brooke Shamblin – Community Development Officer Matt Smith – GIS
Town of Montross	Patricia Lewis – Town Manager

To complete the capability assessment, interviews were held with each jurisdiction individually. In preparation for the interviews, packets were sent to each locality to review with previous capabilities and mitigation goals and actions from the 2017 plan. The interviews addressed the following subjects:

- Staff, personnel, and technical capability
- Knowledge of Federal Emergency Management Agency (FEMA) mitigation programs
- Current/ongoing mitigation efforts



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- Intra- and inter-governmental coordination
- Land use and regulation
- Floodplain management
- Building code inspection
- Capital improvement
- Land conservation programs

8.3 Federal and State Regulations, Plans, and Funding Sources

The responsibility to the public for effective hazard mitigation rests with the elected officials, which in the Northern Neck Region are the County Boards of Supervisors and the Town Councils. They enact the codes, regulations, and ordinances through the authorities granted them by the Commonwealth of Virginia under the Dillon Rule. Emergency management is directed through local emergency management or emergency services offices. County and town leaders direct local hazard mitigation efforts and work cooperatively as appropriate on regional initiatives through the Northern Neck Region Local Emergency Planning Committee or with specific counties to provide FEMA-VDEM Hazard Mitigation Assistance (HMA) grant project administration and management. Many related regional plans and programs are administered by the Northern Neck PDC that directly inform and benefit its local governments related to natural resources, economic development, climate change and sea level rise.

This plan fulfills the standard local mitigation planning requirements (44 CFR §201.4) of the Disaster Mitigation Act of 2000 (Public Law 106-390, signed into law October 10, 2000). The Disaster Mitigation Act 2000 mends the 1988 Robert T. Stafford Disaster Relief and Emergency Assistance Act, and reinforces the importance of mitigation planning, emphasizing planning for disasters before they occur. Section 322 of the Act specifically addresses mitigation planning at state and local levels. New requirements are identified that allow Hazard Mitigation Grant Program (HMGP) funds to be used for mitigation activities and projects for states and localities with Hazard Mitigation Plans approved by November 1, 2004.

Federal regulations such as the *Code of Federal Regulations, Title 44, Chapter 1, Part 201 (44 CFR Part 201)*, the *Sandy Recovery Improvement Act (SRIA) of 2013*, the *National Flood Insurance Act of 1968*, and the *Water Infrastructure Improvements for the Nation (WIIN) Act of 2016* outline regulations of compliance in proper hazard mitigation planning that opens the ability to apply for funding such as:

- Hazard Mitigation Grant Program
- Building Resilient Infrastructure and Communities
- Fire Management Assistance Grant Program
- Public Assistance Grant Program
- Rehabilitation of High Hazard Potential Dam Grant Program

8.4 Capability Assessment for the Northern Neck Region

The purpose of conducting the capability assessment is to assess methods that the Northern Neck Region's County and local governments, have available to implement successful mitigation programs. Through careful analysis, existing gaps, shortfalls, or weaknesses within existing governmental activities that could exacerbate a community's vulnerability were identified. The assessment also highlights the positive measures underway at the local level that will continue to be supported and enhanced through future mitigation efforts.

The Capability Assessment Matrix, found in Appendix D, serves as the foundation for designing an effective hazard mitigation strategy. It not only helps inform Plan goals to be both achievable but aspirational to



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reduce regional exposure to natural hazards. The 2017 Capability Assessment Matrix did not contain the assessment for all participating communities. The towns of Irvington, Kilmarnock, Montross, White Stone, and Warsaw were added to the Capabilities Matrix and now encompasses all participating jurisdictions. Table 8-3 below, presents the complete capabilities review of all jurisdictions participating in the 2023 Northern Neck Regional Hazard Mitigation Plan.

The Northern Neck PDC acts in an advisory role in many of the capability categories contained in this assessment. Therefore, the Northern Neck PDC does not staff technical positions such as civil engineers and building officials. The Northern Neck PDC employs planners and hazard mitigation personnel that assist in advisory roles in planning, mitigation programs, floodplain, and stormwater management protocols, and they manage a range of community programs assisting citizens and jurisdictions with mitigation and planning efforts, such as the Septic Pump Out Assistance Program. Many regional plans and programs are administered by the Northern Neck PDC that directly inform and benefit its local governments related to natural resources, economic development, climate change and sea level rise.

Northern Neck Region's local governments do not have dedicated mitigation funding project sources to manage and administer HMP grant-funded projects, so the Northern Neck PDC supports the administrative aspects of those project by facilitating the Hazard Mitigation Assistance grants process to assist with elevations of structures in the flood zones, specifically those of Repetitive Loss/Severe Repetitive Loss (RLP/SRLP) status. The Northern Neck PDC's website offers a central location to publicize information about a variety of different hazard mitigation and planning efforts throughout the region.

8.5 Capability Assessment for Jurisdictions within the Northern Neck Region

This portion of the Plan assesses the current capacity of the communities of the Northern Neck Planning District to mitigate the effects of the natural hazards identified in Section 6 of the plan. This assessment includes a comprehensive examination of the following local government capabilities:

- *Administrative Capability* – describes the forms of government in the region, including the departments that may be involved in hazard mitigation.
- *Technical Capability* – addresses the technical expertise of local government staff.
- *Fiscal Capability* – examines budgets and currently used funding mechanisms.
- *Relevant Ordinances and Policies* – examines existing plans and policies (e.g., emergency operations plan, comprehensive plan).
- *Regulatory Authority* – describes how jurisdictions in the region use the four broad government powers (i.e., regulation, acquisition, taxation, and spending) to influence hazard mitigation activities.

The complete capabilities assessment is compiled in Table 8-2 below for all participating jurisdictions.

8.5.1 Relevant Ordinances and Policies

This section provides guidance pertinent to the ordinances and policies that have the potential to affect and/or promote mitigation within the jurisdictions. Understanding which ordinances and policies affect mitigation is a helpful component to mitigation activities. Many of the ordinances and policies that most directly affect development in relation to hazards reside at the municipal level. These include zoning, floodplain management, and building code enforcement.

- **Comprehensive Plans** – All ten jurisdictions maintained a locality Comprehensive Plan
 - Lancaster, Northumberland, Richmond, Westmoreland, the Town of Colonial Beach have infused a hazard mitigation element into their comprehensive plan.



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- Richmond and Lancaster counties have updated their plans and are expecting to adopt prior to the completion of this plan (November 2022).
- The Towns of Irvington and Warsaw's plans are currently under revision.
- Enterprise Zones - Each of the jurisdictions have enterprise zones. Additionally, building priority areas of primary and secondary growth exist, with the design intent to better situate development in areas that are less susceptible to natural hazards. This will assist in decreasing damages and loss and increase the jurisdiction and regional resiliency capabilities. (Source: <https://www.northernneck.us/enterprise-zones/>).
 - New or expanding businesses located on an Enterprise Zone parcel may qualify for an Enterprise Zone incentive grant if the establishment or expansion of the business creates jobs or requires a real-property investment.
 - Established by the General Assembly in 1982, the Virginia Enterprise Zone Program is a partnership between the state and local governments to stimulate job creation and private investment within designated areas throughout Virginia. Currently, the Northern Neck region has over 11,000 acres designated as enterprise zones.
 - Enterprise Zones offer businesses a package of state and local incentives in the form of tax relief and grants, local regulatory flexibility, and local infrastructure development.
 - Regionally there is a monetary incentive for new and expanding businesses that create 25 new full-time jobs, invest \$250,000, and have an average annual wage that is at least 125% of the area average.
 - Lancaster County offers additional incentives including grants (not to exceed \$1,000) to businesses improving their property's façade, zero percent (0%) interest loans for micro-enterprise development and a tax credit for businesses rehabilitating property within the zone.
 - Richmond County offers additional incentives such as financial inducement for businesses creating at least 25 jobs, investing \$250,000 or above on industrially zoned properties in the Zone, and paying employees an average annual wage of at least 115 percent of the area average. Furthermore, a ten-year decreasing property tax exemption of the increase in assessed value of certain rehabilitation of commercial or industrial properties, is offered.
 - The Town of Kilmarnock offers businesses exemptions from zoning permit fees, water and sewer connection fees, business, professional and occupational licenses, auto decal fees, and subdivision permit fees at the Kilmarnock Business and Technology Park.
 - The Town of Warsaw offers incentive grants (up to \$1,000) to zone businesses making façade improvements and a three-year 50% tax credit (Town tax only) on the assessed value of a new building in the zone costing at least \$100,000.



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Figure 8-1: Enterprise Zone Map for the Northern Neck Region



Source: Northern Neck Planning District Commission <https://www.northernneck.us/enterprise-zones/>

- Floodplain Management Ordinances – All four counties maintain Floodplain Ordinances and comply with NFIP regulations by enforcing them.
 - The ten jurisdictions maintain ordinances that fulfill the principles of the Chesapeake Bay Preservation Area Designation and Management Regulations.
 - The Towns of Irvington, Kilmarnock, and Colonial Beach maintain their own floodplain ordinances
 - The Towns of White Stone, Warsaw, and Montross utilize their respective county's ordinance as applicable.
- Stormwater Management Plan – All four counties maintain Stormwater Management ordinances.
 - The Town of Warsaw maintains a Stormwater Management Plan
 - The Town of Colonial Beach applied for grant funding in November of 2021 to build a Stormwater Management Plan
 - The Towns of Irvington, Kilmarnock, White Stone, and Montross utilize their respective county's ordinance as applicable.
 - Stormwater management is regulated by the Department of Environmental Quality's Chesapeake Bay Preservation Program for all localities in addition to any local plans that may be adopted.
- Subdivision Regulations – All participating jurisdictions enforce a Subdivision Regulation except for the Town of Montross.
 - The Town of Montross utilizes their respective county's regulation.



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- Emergency Operations Plan – all four counties maintain a current Emergency Operations Plan (EOP)
 - The Towns of Warsaw and Colonial Beach maintain individual EOPs
 - The Towns of Irvington, Kilmarnock, White Stone, and Montross utilize their respective county's EOP.
- Erosion and Sediment Control Ordinance – all four counties maintain ordinances to address erosion and sediment control.
 - The 10 jurisdictions maintain and/or comply ordinances that fulfill the principles of the Chesapeake Bay Preservation Area Designation and Management Regulations.
 - All six towns utilize their county's respective ordinance as applicable.
- Continuity of Operations Plan – COOP is not a requirement for hazard mitigation. It is a beneficial planning document that is recommended to be integrated for cross planning purposes.
 - Northumberland County has a completed COOP that is going through the final adoption process at the time of time update. It is expected to be active by November 2022.
 - The County of Richmond adopted a new COOP in 2021.
 - The Town of Irvington maintains a COOP plan.

8.5.2 Fiscal Capabilities

For the Fiscal Year 2023 (FY23), the budgets of the participating jurisdictions range from about \$22 million (Richmond County) to \$51.3 million (Lancaster County) and smaller budgets for towns. Revenues which support local budgets come from property taxes, State and local sales taxes, local service fees, and through restricted intergovernmental contributions (federal and state pass through dollars). Mitigation projects have been funded through FEMA's post-disaster Hazard Mitigation Grant Program (HMGP). The Commonwealth of Virginia historically and presently provides 20 percent of the required non-federal project match, leaving only a required 5 percent local match, typically using in-kind services or property owner resources.

FY23 budgets provided by local jurisdiction representatives and published jurisdiction budgets are shown in Table 8-2, Northumberland County has created a development impact fee structure to supplement county income. Capital Improvement Plans (CIPs) and intergovernmental agreements are used by three of the four Northern Neck Region's counties.

Table 8-2: Fiscal Budget Information

Jurisdiction	Total FY23 Budget	Public Safety FY23 Budget
Lancaster	\$51.3 million	\$7 million
Northumberland	\$45.8 million	\$5.6 million
Richmond	\$37.2 million	\$3.7 million
Westmoreland	\$32.6 million	\$8.6 million
NNPDC	\$15.1 million	N/A



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Jurisdiction	Total FY23 Budget	Public Safety FY23 Budget
Town of Colonial Beach	\$8.8 million	\$1.9 million
Town of Irvington	\$425,000	\$30,000
Town of Kilmarnock	\$2.9 million	\$685,722
Town of Montross	\$316,541	\$23,250
Town of Warsaw	\$3.1 million	\$791,559
Town of White Stone	\$226,545	\$51,370

N/A – not applicable. *Source: FY23 Budgets for corresponding jurisdiction.*

8.5.3 Taxes

The power to levy taxes and special assessments is an important tool delegated to local governments by Virginia's law. The power of taxation extends beyond merely the collection of revenue and can have a profound impact on the pattern of development in the community. Communities have the power to set preferential tax rates for areas which are more suitable for development to discourage development in otherwise hazardous areas. Local units of government also have the authority to levy special assessments on property owners for all or part of the costs of acquiring, constructing, reconstructing, extending or otherwise building or improving flood protection works within a designated area. This can serve to increase the cost of building in such areas, thereby discouraging development. Localities in Virginia collect a 1% sales tax. In addition, all the counties in the Northern Neck PDC levy property taxes.

8.5.4 Spending

The fourth major power that has been delegated from the Virginia General Assembly to local governments is the power to make expenditures in the public interest. Hazard mitigation principles can be made a routine element of all spending decisions made by local governments, including during adoption of annual budgets and the Capital Improvement Plan (CIP) for protection of critical facilities.

A CIP is a schedule for provision of town or county services over a specified period. By tentatively committing itself to a timetable for the provision of capital to extend services, a community can control growth in areas where the provision of on-site sewage disposal and water supply are unusually expensive. In addition to forming a timetable for provision of services, a local community can regulate the extension of and access to services. Participating jurisdictions that engage a CIP are presented in Table 8-3.

8.5.5 Technical, Administrative, and Regulatory Capacity

This section provides a review of the administrative and technical resources within the individual jurisdictions and assists with identifying any gaps, needs, available staff, use of available outside contractors, or other arrangements such as mutual aid agreements. The following resources and further associated items are presented in the Capabilities Matrix in Table 8-3, below.

8.5.5.1 Technical

Mitigation is multi-disciplinary. For a successful mitigation program, it is necessary to have a broad range of people involved who can inform and contribute to holistic mitigation programs through diverse backgrounds and experience. The Northern Neck Region's local governments do not have dedicated mitigation funding project sources to manage and administer HMP grant-funded projects, so the Northern Neck PDC supports the administrative aspects of those projects. The Northern Neck PDC's website offers a central location to



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publicize information about a variety of different hazard mitigation and planning efforts throughout the region. Emergency managers devote staff time and use existing web sites, social media and events like tornado awareness month and hurricane preparedness month as a platform for mitigation messaging. Strong preparedness and mitigation messages, techniques, and program links are provided on local websites to enable residents and businesses to create disaster preparedness plans and carry adequate flood insurance on at-risk properties and property contents.

- Hazard Mitigation Assignment – is Hazard Mitigation assigned to a specific department?
 - All four counties and the Town of Colonial Beach have done so.
 - The Towns of Irvington, Kilmarnock, White Stone, Warsaw, and Montross utilize their respective county's hazard mitigation efforts.
 - Hazard mitigation planning and actions is supported in all regions by the Northern Neck Planning District Commission.
- GIS Coordinator
 - All four counties and the Towns of Kilmarnock, Warsaw, and Colonial Beach employ GIS staff.
 - The Towns of Irvington, White Stone, and Montross utilize their respective county's GIS services or contract out as needed.
- Zoning Staff – All four counties report fulltime Zoning and Building Officials staffing.
 - All six towns report at least parttime Zoning staff.
 - All six towns report utilizing their respective county's Building Inspectors.
- Floodplain Management Staff – All participating jurisdictions report having a dedicated floodplain manager except the Town of Montross
 - The Town of Montross utilize their respective county's Floodplain Manager.

Overall, the participating jurisdictions have a well-rounded technical staffing capability. All jurisdictions report the need for higher staff volume. However, staffing and capability levels show improvement in the five years since the 2017 HMP plan update.

8.5.5.2 Administrative

The Northern Neck Region LEPC designates the following departments with specific responsibilities for hazard mitigation:

- Board of Supervisors, Town Councils and Local Government Administrators
 - The responsibility to the public for effective hazard mitigation rests with the elected officials, which in the Northern Neck Region are the different County Board of Supervisors and the Town Councils. They enact the codes, regulations, and ordinances through the authorities granted them by the Commonwealth of Virginia under the Dillon Rule.
 - The importance of this is high at this time with the increased unpredictable severe weather events, communities facing sea level rise and continued accelerating coastal erosion. The Region is taking steps to reverse the impact of the COVID-19 pandemic. The nation, State, and entire Northern Neck Region were immobilized during the shelter-in-place orders issued. Communities are facing the effects of economic losses, rising costs and supply chain issues.



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- Land use - Regulatory powers granted by the state to local governments are the most basic way a local government can control the use of land within its jurisdiction. Through various land use regulatory powers, a local government can control the amount, timing, density, quality, and location of new development. All these characteristics of growth can determine the level of vulnerability of the community in the event of a natural hazard. Land use regulatory powers include the power to engage in planning, and to enact and enforce zoning ordinances, floodplain ordinances, and subdivision controls. Each local community possesses great power to prevent unsuitable development in hazard-prone areas.
- Emergency Management
 - County and town emergency management operations are focused in two areas. First responders, which remain largely dependent on volunteers support immediate response to incidents such as building, brush and woodland fires, medical emergencies, accidents, and hazardous materials spills.
 - Emergency managers are responsible for the mitigation, preparedness, response, and recovery operations in relative to natural and man-made disaster events. Specifically, County Administrators and Town Managers, in their roles as Coordinator of Emergency Services, have designated management responsibility for the floodplain management and emergency management programs, often including hazard mitigation program, and assigns program operations to appropriate departments or staff.
- Department of Health
 - The Virginia Department of Health enforces ordinances related to safe handling and the emergency distribution of water and food and are responsible for the prevention or reduction of spreading disease.
 - The Northern Neck Region is served by the Three Rivers Health District. Employees support the ten-county region of the Northern Neck and Middle Peninsula. An emergency planner and epidemiologist are on District staff. Staffing levels have seen many changes since Virginia declared a state of emergency for the COVID-19 pandemic in March of 2020.
- Building/Planning/Zoning
 - Planning, zoning, and site inspections are conducted by staff or departments which have responsibility for administering and enforcing existing building codes and zoning ordinances.
 - Planning and code compliance staff also ensure that all new construction, repair and building additions or improvements comply with state and county building codes, zoning, and land-use regulations.
 - Local compliance with the Chesapeake Bay Preservation Act, erosion and sediment control regulations and stormwater management starts with proposed development plan review by local planners with additional technical and field inspection support provided by the Northern Neck Regional Soil and Water Conservation District. In addition, these departments support project review and code enforcement for hazard mitigation such as elevation of flood prone residential buildings and ensure that FEMA Elevation Certificates and Floodproofing Certificates are properly completed for applicable projects.



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- The County Building Official is licensed by the Commonwealth of Virginia and locally enforces the Virginia Uniform Statewide Building Code (VUSBC). This code includes implications for floodplain management. Local Planning or Community Development departments address land use planning and, in most cases, house the local floodplain management program enforcing the local floodplain management regulations.
- Law Enforcement
 - Each county has a Sheriff's Department which is primarily funded by the Commonwealth of Virginia Compensation Board. In most instances the county is providing additional budget funds to increase the coverage and abilities of their law enforcement agencies. Leaders of law enforcement agencies are included in hazard mitigation planning. All the jurisdictions in the regional planning area have enacted and enforce regulatory ordinances designed to promote the public health, safety, and general welfare of its citizenry.
 - The Towns of Kilmarnock, White Stone, Warsaw, and Colonial Beach maintain a local jurisdiction police department as well.
 - Sworn officers in all departments have the responsibility as essential personnel to respond in the face of a natural disaster.
 - Virginia's local governments have been granted broad regulatory powers in their jurisdictions. The statutes of the Commonwealth of Virginia bestow the general police power on local governments, allowing them to enact and enforce ordinances which define, prohibit, regulate, or abate acts, omissions, or conditions detrimental to the health, safety, and welfare of the people, and to define and abate nuisances (including public health nuisances). Since hazard mitigation can be included under the police power (as protection of public health, safety, and welfare), towns, cities, and counties may include requirements for hazard mitigation in local ordinances. Local governments also may use their ordinance-making power to abate "nuisances," which could include, by local definition, any activity or condition making people or property more vulnerable to any hazard.
- Public Safety (including EMS, fire department, and rescue squads)
 - Participating jurisdictions are facing this issue with the addition of paid staff employed by the local government. Emergency Medical Services (EMS) staff such as EMTs and Paramedics are hired to ensure ambulances can respond to 911 calls. The majority of fire service personnel remain volunteers with assistance from agencies such as VDEM which provides Regional HAZMAT Officers and teams that respond to assist as needed. The Virginia Department of Forestry staff aide response to brush, woodland, and wildfires.
 - Virginia has a statewide fire code. The code establishes statewide standards to safeguard life and property from the hazards of fire or explosion arising from the improper maintenance of life safety, and fire prevention and protection of materials, devices, systems, and structures. The Virginia State Fire Marshal's Office is charged with enforcement of the code statewide except in those localities that choose to enforce the code locally. Localities that choose to enforce the code locally must employ their own certified fire official.



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- Public Works
 - Departments have a role in hazard resiliency through oversight and maintenance of local infrastructure, some critical, which varies amongst Northern Neck Regional jurisdictions. While the responsibilities and infrastructure are varied, critical infrastructure includes wastewater treatment facilities, a few local water treatment systems, and several new local drainage systems.
 - Primary and secondary road maintenance is largely the responsibility of the Virginia Department of Transportation which coordinates closely with local emergency managers during and immediately after disaster events and storms to address road closures and detours, debris management and messaging. The Town of Colonial Beach owns all its town roads except for Colonial Ave and Washington Ave. Other departments may have responsibilities for programs that could complement hazard mitigation activities. For instance, parks and recreation departments may be responsible for open space programs. If demolition/acquisition projects are undertaken, coordination to manage created open space may include the parks and recreation staff.

8.5.5.3 Regulatory

Following a state or federal emergency and disaster declaration, VDEM coordinates recovery efforts with local governments through the LEPC, local emergency managers, and VDEM Regional Support teams. The following items are utilized in jurisdictions to assist with Hazard Mitigation and Emergency Management planning. Local governments in Virginia, including those in the Northern Neck Region, have a wide range of tools available to them for implementing mitigation programs, policies, and actions. A hazard mitigation program can use any of the four broad types of government powers granted by the State of Virginia, which are (a) regulation, (b) acquisition, (c) taxation, and (d) spending. The scope of this local authority is subject to constraints. All of Virginia's political subdivisions must not act without proper delegation from the state. All power is vested in the State and can only be exercised by local governments to the extent it is delegated (in accordance with Dillon's Rule).

- Emergency Operations Plans
 - The Northern Neck PDC Emergency Operations Plan was last updated in 2011. Counties in the Northern Neck Region are required to establish and maintain an Emergency Operations Plan for their locality. EOPs are to be updated every 4 years. This requirement is mandated under the following:
 - *The Code of Virginia Chapter 3.2 - Ch. 3.2 of the Code of Virginia establishes the State's Department of Emergency Management and provides the legal authority for the development and maintenance of the Commonwealth's emergency management program. Additionally, it defines the emergency powers, authorities, and responsibilities of the Governor and State Coordinator and requires that state and local governments be prepared for a variety of natural and human-caused hazards by developing, maintaining, and ensuring their ability to implement an emergency operations plan (EOPs).*
 - All four counties in the region along with the Towns of Warsaw and Colonial Beach have an EOP. The remaining Towns of Irvington, Kilmarnock, White Stone, and Montross act under their respective county's EOP.



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- Comprehensive Plans
 - A community's comprehensive plan provides the future vision for the community regarding growth and development. However, many of the plans include land use or environmental protection goals that could support future mitigation efforts. For example, limiting development in the floodplain (which is considered mitigation) may also help meet open space goals laid out in a comprehensive plan. Several comprehensive plans address mitigation, resiliency, and long-term community sustainability. These are new inclusions, and as communities continue to update their comprehensive plans it is anticipated that mitigation and resiliency issues will be more comprehensively addressed. Virginia comprehensive plans are usually updated on a five-year cycle.
 - For the most part, the region's comprehensive plans include strategies that address development in the floodplain or otherwise flood-prone areas. The comprehensive plans indicate that communities in the Northern Neck Region use zoning and subdivision regulations to retain the rural character of their areas while they preserve traditional livelihoods like agriculture, forestry, fishing, and aquaculture.
 - Lancaster County
 - Hazard mitigation concepts are found throughout the Lancaster County Comprehensive Plan.
 - The shoreline protection plan included in this document advocates for the use of vegetative methods as opposed to structural solutions such as rip- rap and groins on individual parcels. The plan also encourages a coordinated approach to shoreline protection suggesting that density credits and other innovative techniques could be used to encourage such actions. The Living Shorelines Initiative contributes to this cause.
 - The plan notes that a variety of growth tools may be appropriate for Lancaster County including performance standards, conservation easements, use valuation taxation, overlay zones, and open space provisions which prioritize flood control.
 - Town of Irvington
 - Irvington's comprehensive plan notes that it "is a community of choice for seasonal and weekend residents and extended renters". This lights a potential decrease in population growth and the plan notes that the town will need to grow and consider addition infrastructure to draw a fulltime population back to the town. In the opening remarks the town notes its dedication to preserving the natural environment and waterways and to encourage green space in the community.
 - Portions of Irvington present flooding issues while a majority of the town rises to 20-30 feet above sea level. The greatest concern mentioned is stormwater runoff in pluvial flooding events and coastal erosion issues along the shoreline. The town has only a few residences in the flood hazard zone.
 - There weren't many hazard mitigation actions noted in the comprehensive plan. It was stated during the jurisdiction interviews that the town is currently in the process of updating the comprehensive plan and will consider integrating an HMP element.



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- Town of Kilmarnock
 - Kilmarnock presents with a unique situation as it is in north Northumberland and Lancaster counties and the surrounding waterways are numerous. This location places the town on the shorelines of the Chesapeake Bay as well as exposed to the Potomac and Rappahannock Rivers. Kilmarnock contains designated Resource Protection Areas (RPAs). "The RPAs shall remain largely undeveloped according to the regulations in the town's zoning ordinance and the policies set forth in this Comprehensive Plan. RPA's include tidal wetlands, non-tidal wetlands that are connected by surface flow and contiguous to tidal wetlands or water bodies with perennial flow, tidal shores, and a 100 ft vegetated buffer area that is located adjacent to and landward of water bodies with perennial flow as well as all the aforesaid components."
 - The goals include open hazard mitigation potential with protecting "the delicate balance and land use compatibility between existing/future land use development and the natural environment" and "Incorporate the preservation of natural environmental, historical, and cultural features of the community into planning and implementation of all public and private activities."
 - Kilmarnock estimates an above sea level ranging from 10-90 feet with several steep slope areas, the town's drainage moves into basins that eventually reach the Chesapeake Bay creating concern for runoff and pollution during high precipitation events.
- Town of White Stone
 - The Town of White Stone boasts significantly less coastal flood areas than other jurisdictions in the Northern Neck region. The town does suffer some significant flooding from pluvial type events. One of the primary goals in the Comprehensive Plan notes "Improve storm water drainage in Town in order to enhance public safety and to protect property values.", which they have made significant progress towards in working with VDOT to clear ditches and make roadway improvements throughout the troubled areas.
 - Despite having limited coastal properties in the town, their comprehensive plan indicates implemented zoning provisions that act to conserve "wooded buffer areas along stream banks and limit development adjacent to streams." White Stone has also adopted an "Erosion and Sediment Control Ordinance" under the guidance of Lancaster County, that is an element of the Chesapeake Bay Preservation Act.
 - The Comprehensive Plan does not currently contain a specific Hazard Mitigation section. The objectives and goal contain many mitigation activities that would address preservation, erosion, open space preservation, stormwater management and drainage, and green energy goals.
- Northumberland County
 - Northumberland County's plan includes a section on flood-prone areas and delineates numerous goals and strategies directed toward protection of life and property from floods. These strategies include public education, performance standards, enforcement of existing ordinances, and utility siting criteria. The plan also highlights that the current county regulations require that any building constructed within the floodplain have a finished floor elevation two feet above the base flood elevation.



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- Shoreline erosion remains a concern for Northumberland. The plan includes numerous strategies designed to protect shorelines. These include use of vegetation for shoreline protection and performance standards for structures that modify the shoreline. The plan also recognizes the need for coordinated or subdivision wide actions.
- Richmond County
 - Richmond County's Comprehensive Plan calls for accommodating future growth while maintaining the rural character of the county. The recommendations in the plan also recognize that growth cannot occur unchecked but should be guided away from environmentally sensitive areas such as floodplains. For instance, the plan calls for the use of cluster design techniques to allow for environmentally sensitive areas to remain undeveloped.
 - Shoreline erosion is featured in the Richmond County Comprehensive Plan. One recommendation calls for promoting the use of natural shoreline protection strategies. Vegetation and living protection measures were mentioned.
 - Recommendations include establishing setbacks in known erosion areas, the use of other natural features to protect the shoreline, enforcement of existing ordinances and facility siting requirements.
 - The plan also recommends that the county develop programs to encourage maintenance of existing properties. Hazard mitigation principles could be incorporated into such a program.
- Town of Warsaw
 - Warsaw's plan opens with the following purpose and scope "The Warsaw Comprehensive Plan is the policy document around which the Town endeavors to set a path for its future. The focus of the Plan is to establish a policy framework for the specific issues of land use and water quality protection. As such, this document represents the Town of Warsaw's recognition of its role in the protection of state waters and the Chesapeake Bay and its tributaries. The Plan is intended to carry out the goals of the Chesapeake Bay Preservation Act and has been developed in accordance with the Chesapeake Bay Preservation Area Designation and Management Regulations."
 - Warsaw's comprehensive plan primarily focuses on environmental protection measures, land use, and water quality preservation. Noting inadequate stormwater management resources despite the 140 ft above sea level elevation, the community targets concern for flooding, erosion and sedimentation, and pollutants entering the waterways. One of the mitigation actions mentioned is to minimize vegetation disturbance and decreased impermeable surface area that results in stormwater runoff.
- Westmoreland County
 - Flood is a primary concern in Westmoreland the comprehensive plan suggests that appropriate development practices, land use controls and protection of vulnerable shoreline and drainage should be improved to minimize the effects of flooding. One of the goals to address flooding is to "follow proper design practices including community retention ponds and other measures to improve flood-insurance ratings for the county."



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These recommendations were informed by the *Westmoreland County Shoreline Management Plan, 2013*, which was prepared for the county and the Virginia Coastal Zone Management Program by the Virginia Marine Institute of Marine Science, College of William and Mary.

- The comprehensive plan recommends a variety of studies to address shoreline erosion and storm water drainage. The future land use plan also includes a conservation designation that incorporates areas of the floodplain and calls for limited to no future development. The plan recommends that Westmoreland County pursue measures to facilitate entry into the Community Rating System.
- The County is willing to use easements to protect land. The plan was reaffirmed in 2022 and hazard mitigation, water quality, and coastal protection elements are incorporated. In addition, the plan addresses changing hazards in dam management.
- Town of Colonial Beach
 - The plan's opening statement shows its commitment to resiliency and preservation. They view the coastline, marshes, and waterways as an asset and a means to seek natural solutions to improve park and recreation facilities and create open community areas. The plan recognizes the mitigation action of protecting living shorelines with the preservation of the tidal marshes and vegetation.
 - One of the suggestions is that the "Town incorporate Low-Impact Development standards into the planning and permitting process."
 - Colonial Beach integrated the 2017 Northern Neck Regional HMP into their comprehensive plan, specifically, hazard identification and risk assessment, mitigation strategies, capabilities, plan implementation, and maintenance.
 - The Town will also use the Resilience Adaptation Feasibility Tool (RAFT) to help improve resilience to flooding and other coastal storm hazards while remaining economically and socially viable
- Town of Montross
 - The purpose and scope of the community's comprehensive plan states: "Land use, protection of natural resources, and transportation issues are the development categories that require the most informed decisions. This 2018 revision of the Town of Montross Comprehensive Plan aims to be a helpful analysis of these categories."
 - The plan cites Montross as a dry area above the wetlands and shorelines. Cited in the plan is how residential and commercial activities affect groundwater and stormwater runoff.
 - Agriculture is a high priority to Montross, and the priority is mitigating losses in disaster situations. "Agricultural uses are still active in some places throughout the Town and outskirts. Some parts of the Town remain forested, mostly within the ravines. In a sense, the region's most valuable natural resources are within the Chesapeake Bay and along its shorelines. The viability of those resources is fundamentally dependent upon the water quality of the Bay and its tributaries."



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- Goals included in the plan include minimizing land disturbance and vegetation on slopes, restricting land disturbance at development sites on or near steep slopes, and development of greenways within the Town and surrounding areas.

8.5.6 The Chesapeake Bay Protection Regulations

The Chesapeake Bay Preservation Act (Bay Act) was enacted by the Virginia General Assembly in 1988 as a critical element of Virginia's non-point source management program. The Bay Act program is designed to improve water quality in the Chesapeake Bay and other waters of the State by requiring the use of effective land management and land use planning.

Virginia designed the Bay Act to enhance water quality with continued reasonable development. The Chesapeake Bay Act balances state and local economic interests and water quality improvement by creating a unique cooperative partnership between State and Tidewater local governments to reduce and prevent nonpoint source pollution. Local governments retain the primary responsibility for land use decisions, expanding local government authority to manage water quality, and establishing a more specific relationship between water quality protection and local land use decision-making.

The Chesapeake Bay Act Program is the only program in Virginia State government that deals comprehensively with the relationships between water quality, and land use planning and development. It is also the only program that assists local governments with land use planning needs to meet water quality goals: the development of land use regulations, ordinances, and comprehensive plans.

Virginia is a signatory to the Chesapeake Bay Agreement, a unique regional partnership aimed at restoration of the Chesapeake Bay. Communities in certain parts of the state are required to implement local land use controls to minimize runoff and other adverse impacts to the water quality of the Bay. Each Northern Neck PDC jurisdiction is part of the Tidewater area and therefore required to enforce Bay Act provisions locally. The program's agricultural non-point source pollution reduction efforts have been led by the Northern Neck Regional Soil and Water Conservation District. Prevention of sediment, nutrient and other pollution from land development is directed through erosion and sediment control and stormwater management ordinances.

Upcoming changes that will affect the Northern Neck Region as this plan is adopted include:

- **Code of Virginia Article 2.5. Chesapeake Bay Preservation Act. § 62.1-44.15:72. Board to develop criteria. (H.)**
- "Effective July 1, 2023, requirements promulgated under this article directly related to compliance with onsite sewage system pump-outs shall be managed and enforced by the Department of Health in Accomack, Essex, Gloucester, King and Queen, King William, Lancaster, Mathews, Middlesex, Northampton, Northumberland, Richmond, and Westmoreland Counties, and the incorporated towns within those counties."



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Table 8-3: Capability Assessment

Programs and Capabilities	NNPDC	Lancaster County	Town of Irvington	Town of Kilmarnock	Town of White Stone	Northumberland County	Richmond County	Town of Warsaw	Westmoreland County	Town of Colonial Beach	Town of Montross
Comprehensive Plan		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
With Hazard Mitigation Element	Advisor	Y	N	N	N	Y	Y	N	Y	Y	N
Adoption		Nov. 2022****	Sept 2017****	April 2014	Oct. 2013	Nov. 2016	Nov. 2022	May 2013*	Dec. 2010	May 2017	Feb. 2018
With Coastal Protection Element		Y	N	N/A	N/A	Y	Y	N	Y	Y	N
Capital Improvement Plan	Advisor	Y	N	Y	Y	Y	Y	Y	Y	Y	N
Economic Development Plan	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y
Downtown Development/Re-Development Authority Plans	Advisor	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
Enterprise Zones	Advisor	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
Transportation Planning	VDOT/PD C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Subdivision Regulations	N/A	Y	Y	Y	1	Y	Y	Y	Y	Y	1
Zoning Ordinance	N/A	Y	Y	Y	1	Y	Y	Y	Y	Y	1
Site Plan Review Procedures		Y	Y	Y	1	Y	Y	Y	Y	Y	1
Building Code (or ordinance) addresses flood	N/A	Y	1	1	1	Y	Y	1	Y	Y	1
Designated Building Official		Y	1	1	Y	Y	Y	1	Y	Y	1
Regular Inspection Protocols		Y	1	1	1	Y	Y	1	Y	Y	1
Civil Engineer Staff		N	1	5	N	N	5	N	N	N	N
GIS Coordinator		Y	1	Y	1	Y	Y	Y	Y	Y	1
Mitigation Projects											
Private Residential Elevations (self-financed)	N/A	Y	1	N/A	N/A	Y	Y	N/A	Y	Y	N/A
Resident and Community Outreach Inc. Ready.gov	Y	Y	1	1	1	Y	Y	N/A	Y	Y	1
Exclude critical infrastructure	N/A	Y	N	N/A	Y	Y	Y	N/A	Y	Y	N/A



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Programs and Capabilities	NNPDC	Lancaster County	Town of Irvington	Town of Kilmarnock	Town of White Stone	Northumberland County	Richmond County	Town of Warsaw	Westmoreland County	Town of Colonial Beach	Town of Montross
from SFHA											
Elevate Residences or Property Protection through HMA grants	Y	2	2	N/A	N/A	2	2	2	N/A	N/A	N/A
Grant Officials		Y	N	N	N	N	Y	N	Y	Y	N
Natural Systems Protection											1
Natural or Cultural Resources Inventory		Y	Y	Y	Y	Y	Y	N	Y	Y	1
Open Space		Y	Y	Y	Y	Y	Y	Y	Y	Y	1
Parks and Recreation		Y	Y	N	N	Y	Y	N	Y	Y	N
Living Shorelines Program	Y	Y	Y	N/A	N/A	Y	Y	N/A	Y	Y	N/A
Stormwater Management and Water Quality Programs											
Stormwater Management Plan		Y	1	1	1	Y	Y	Y	Y	Y	1
Total Daily Maximum Load (TMDL) Stream Segments**	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Watershed Improvement Plans***	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Erosion or Sediment Control Program	N/A										
Erosion and Sediment Control Ordinances		Y	1	1	1	Y	Y	1	Y	Y	1
Floodplain Management	N/A										
RAFT Card (Resilience Adaptation Feasibility Tool)		Y	N/A	Y	Y	Y	Y	Y	Y	Y	N/A
Floodplain Administrator		Y	Y	Y	Y	Y	Y	1	Y	Y	1
Participates in NFIP		Y	Y	Y	Y	Y	Y	1	Y	Y	1
Year Joined NFIP		03/04/1988	10/18/1974	09/17/2010	09/24/1984	7/4/1989	3/16/1989	N/A	9/18/1987	9/18/1987	N/A
Effective FIRM Date		07/05/2022	08/04/1987	07/05/2022	11/17/2020	12/30/2021	06/26/2022	N/A	05/17/2022	05/17/2022	N/A



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Programs and Capabilities	NNPDC	Lancaster County	Town of Irvington	Town of Kilmarnock	Town of White Stone	Northumberland County	Richmond County	Town of Warsaw	Westmoreland County	Town of Colonial Beach	Town of Montross
Additional Freeboard Requirements (inches)		18"	N/A	18"	N/A	24"	N/A	N/A	18"	36"	N/A
LiMWA standards in High Hazard Coastal Areas		Y	N	N/A	N/A	Y	N/A	N/A	Y	Y	N/A
Participates in CRS		N	N	N	N	N	N	N	N	N	N
Emergency Operations Management	LEPC	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Emergency Operations Plan		Y	1	1	1	Y	Y	1	Y	Y	1
Local Government EOPs	VDEM advisor	Y	1	1	1	Y	Y	1	Y	Y	1
Continuity of Operations Plan	N	N	N****	N	N	N****	Y	N	N	N	N
Warning Sirens or warning alert systems		Y	1	Y	1	Y	Y	1	Y	Y	1
Evacuation Plans		Y	1	1	1	Y	Y	1	Y	1	1
Shelter and Family Re-Unification Plan		Y	1	1	1	Y	Y	1	Y	1	1
Special Needs Population Emergency Planning		Y	1	1	1	Y	Y	1	Y	1	1
Companion Animal Sheltering and Re-Unification Plan		Y	1	1	1	Y	Y	1	Y	1	1
Dedicated Emergency Management Website	Y	Y	1	1	1	Y	Y	1	Y	1	1
Education Programs	N/A	Y	N/A	Y	1	Y	Y	1	Y	Y	1
School Facility Emergency Operations Plans		Y	N/A	Y	N/A	Y	Y	1	Y	unknown	1
School Emergency Notification, Evacuation and Emergency Planning		Y	N/A	Y	N/A	Y	Y	1	Y	unknown	1
College Campus Plans		Y	N/A	Y	N/A	N/A	Y	1	N/A	N/A	N/A



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Programs and Capabilities	NNPDC	Lancaster County	Town of Irvington	Town of Kilmarnock	Town of White Stone	Northumberland County	Richmond County	Town of Warsaw	Westmoreland County	Town of Colonial Beach	Town of Montross
College/University Emergency Notification, Evacuation and Emergency Planning		Y	N/A	Y	N/A	N/A	Y	1	N/A	N/A	N/A
Tourism	3	Y	3	3	3	Y	Y	3	Y	Y & 3	3
Community Planner		Y	1	Y	Y	Y	Y	Y	Y	Y	1
Additional Capabilities						Debris Mgmt. Plan			Debris Mgmt. Plan		
Note: Many functions for towns are performed by their respective county. Stormwater management is regulated by the Department of Environmental Quality's Chesapeake Bay Preservation Program for all localities in addition to any local plans that may be adopted. N/A - not applicable. 1 – Assisted by county 2 – Utilizes the NNPDC for assistance. 3 – Utilizes the Northern Neck Regional Tourism Cooperative and/or River Realm 4 – Utilizes the Northern Neck Regional Historic Preservation Society 5 – Contracted as needed. *Currently under revision. **All stream segments in each county are a part of the Chesapeake Bay Total Daily Maximum Load (TMDL) monitoring area. ***All stream segments part of the Chesapeake Bay WIP. **** Currently in progress. (Town of Irvington is in development.) (Northumberland County's COOP is complete and to be presented for adoption in January 2023) (Lancaster County's Comprehensive Plan is planned to be adopted in March 2023.)											



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8.6 Current and Completed Hazard Mitigation Programs and Projects

Table 8-4 Hazard Mitigation Programs and Projects

Jurisdiction	Mitigation Action	Hazards Addressed
Lancaster	Considered and took steps towards the CRS Program. Attended CRS Workshop.	Property Protection Education and Community Outreach
Lancaster	Completed Private Demonstration Sites - Develop vegetative planting programs for public shoreline property to serve as a model for public education purposes.	Property Protection Public Education & Outreach
Lancaster	Initiated NOAA radio purchase for Sheriff's Office	Emergency Services
Lancaster	Adopt or maintain a floodplain management ordinance that at a minimum regulates the following: Issue permits for All proposed developments in the SFHA, Obtain, review, and utilize any base flood elevation and floodway data, and require BFE data for subdivisions proposals and other development proposals larger than 50 lots or five acres; Identify measures to keep All new and substantially improved construction reasonably safe from flood to or above the Base Flood Elevation (BFE), including anchoring, using flood resistant materials, designing, or locating utilities, and service facilities to prevent water damage;	Property Protection Structural
Lancaster	Enforce the floodplain management ordinance by monitoring compliance and taking remedial action to correct violations by increasing staff to assist with accomplishing this goal.	Property Protection
White Stone	Initiated Phase 1 of a new sewage system for the town. Connections to citizens have begun.	Property Protection
White Stone	Initiated the development and implemented a ditch maintenance program consisting of routine inspections and subsequent debris removal	Property Protection Natural Resource Protection
Northumberland	Researched and updated FIRMS for accessory structures.	Property Protection
Northumberland	Adopt or maintain a floodplain management ordinance that at a minimum regulates the following: Issue permits for All proposed developments in the SFHA, Obtain, review, and utilize any base flood elevation and floodway data and require BFE data for subdivisions proposals and other development proposals larger than 50 lots or 5 acres. Identify	Property Protection



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Jurisdiction	Mitigation Action	Hazards Addressed
	measures to keep all new and substantially improved construction reasonably safe from flood to or above the Base Flood Elevation (BFE), including anchoring, using flood resistant materials, designing, or locating utilities, and service facilities to prevent water damage;	
Northumberland	Initiated and continuing the adoption of activities that extend beyond the minimum requirements, including those identified for participation in the Community Rating System, freeboard, prohibition of production or storage of chemicals in SFHA, prohibition or certain types of structures such as: hospitals, nursing homes, jails, prohibition of certain types of residential housing such as manufactured homes, and finally floodplain ordinances, that prohibit any new residential or non-residential structures in the SFHA.	Structural Property Protection
Richmond	Sought and completed training for GIS staff and increased in house GIS capabilities.	Property Protection Prevention Emergency Services
Richmond	Adopt or maintain a floodplain management ordinance that at a minimum regulates the following. Issue permits for All proposed developments in the SFHA, Obtain, review, and utilize any base flood elevation and floodway data, and require BFE data for subdivisions proposals and other development proposals larger than 50 lots or five acres: Identify measures to keep All new and substantially improved construction reasonably safe from flood to or above the Base Flood Elevation (BFE), including anchoring, using flood resistant materials, designing, or locating utilities, and service facilities to prevent water damage;	Property Protection Flooding
Warsaw	Initiated stormwater management measures – sidewalk and drainage project.	Property Protection
Westmoreland	Sought and attended training and system upgrades for GIS capabilities.	Property Protection Prevention Emergency Services
Westmoreland	Accomplish growth to enforce zoning and building codes to prevent construction within the floodplain	Structural Property Protection
Westmoreland	Evaluate the potential costs versus benefits of continuing the freeboard requirement for all new structures within the 100-year floodplain.	Structural



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Jurisdiction	Mitigation Action	Hazards Addressed
Westmoreland	Adopt or maintain a floodplain management ordinance that at a minimum regulates the following: Issue permits for All proposed developments in the SFHA, Obtain, review, and utilize any base flood elevation and floodway data, and require BFE data for subdivisions proposals and other development proposals larger than 50 lots or five acres; Identify measures to keep all new and substantially improved construction reasonably safe from flood to or above the Base Flood Elevation (BFE), including anchoring, using flood resistant materials, designing or locating utilities, and service facilities to prevent water Damage.	Property Protection Structural
Westmoreland	Integrated elements of hazard mitigation into the county comprehensive plan.	Prevention Natural Resources Protection Property Protection
Colonial Beach	Evaluate exiting storm water system to determine if it is adequate for existing (or future) flood Hazards. Completed and writing plan.	Property Protection Structural Natural Resources Protection
Colonial Beach	Develop a detailed building inventory for all structures in the jurisdiction, which catalogues information such as value of the structure, contents, age, location (latitude and longitude), etc.	Structural Property Protection Emergency Services
Colonial Beach	Integrated hazard mitigation elements into the town's comprehensive plan and initiated integration into the resiliency plan.	Emergency Services Property Protection Natural Resources Protection
Colonial Beach	Investigate, develop, or enhance a regional public notification system utilizing Code Red.	Outreach & Education Emergency Services
Colonial Beach	Adopt or maintain a floodplain management ordinance that at a minimum regulates the following: Issue permits for All proposed developments in the SFHA, Obtain, review, and utilize any base flood elevation and floodway data, and require BFE data for subdivisions proposals and other development proposals larger than 50 lots or five acres; Identify measures to keep all new and substantially improved construction reasonably safe from flood to or above the Base Flood Elevation (BFE), including anchoring, using flood resistant materials, designing or locating utilities, and service facilities to prevent water Damage.	Property Protection Structural
Colonial Beach	Enforce the floodplain management ordinance by monitoring compliance and taking remedial action	Property Protection



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Jurisdiction	Mitigation Action	Hazards Addressed
	to correct violations by increasing staff to assist with accomplishing this goal.	
Montross	Adopt or maintain a floodplain management ordinance that at a minimum regulates the following: Issue permits for All proposed developments in the SFHA, Obtain, review, and utilize any base flood elevation and floodway data, and require BFE data for subdivisions proposals and other development proposals larger than 50 lots or five acres; Identify measures to keep all new and substantially improved construction reasonably safe from flood to or above the Base Flood Elevation (BFE), including anchoring, using flood resistant materials, designing or locating utilities, and service facilities to prevent water Damage as is applicable to the locality.	Property Protection Structural

8.7 Summary and Conclusions

In conclusion, there are several areas which may be further investigated to determine the relevance of developing hazard mitigation strategies to fill gaps or shortcomings. Particularly these areas include resources and coordination.

As noted, additional time and resources need to be devoted at the local level on hazard mitigation related activities. These activities include project identification, data gathering, and overall knowledge about FEMA grants. Furthermore, additional education and training for current staff regarding hazard mitigation, the resources available, and methods of using specified grant funding could assist the Northern Neck Region in reducing future risk. This knowledge would also assist in preparing better project applications that may be selected based on a competitive selection process. Increasing staff and resources would subsequently allow for greater coordination among all levels of government.

Jurisdictions and communities in the Northern Neck Region are still processing and recovering from the economically damaging COVID-19 pandemic that was declared a State of Emergency in Virginia in March 2020. At the time of this update the COVID-19 pandemic is ongoing, and jurisdictions will need to utilize lessons learned from this event to improve their respective locality plans.



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Northern Neck Regional Hazard Mitigation Plan Section 9: Mitigation Action Plan

Section 9 Mitigation Action Plan

Contents of this Section

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- 9.2 Hazard Mitigation Goals
 - 9.2.1 RAFT
 - 9.2.2 Community Rating System
- 9.3 Identification and Analysis of Mitigation Actions
- 9.4 Flood Mitigation Projects
- 9.5 Prioritization and Implementation of Mitigation Actions
 - 9.5.1 Prioritization
 - 9.5.2 Implementation

9.1 44 CFR Rule Requirement for the Mitigation Action Plan

Requirement §201.6(c)(3): *The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs, and resources, and its ability to expand on and improve these existing tools.*

Requirement §201.6(c)(3)(i): *The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

Requirement §201.6(c)(3)(ii): *The mitigation strategy **shall** include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.*

Requirement: §201.6(c)(3)(iii): *The mitigation strategy section **shall** include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization **shall** include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*

Requirement §201.6(c)(3)(iv): *For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting Federal Emergency Management Agency (FEMA) approval or credit of the plan.*



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9.2 Hazard Mitigation Goals

This section contains goals, objectives, and action items for the Northern Neck Regional Hazard Mitigation Plan. For the purposes of this Plan, the following definitions are accepted:

- **Goals** are general guidelines that explain what the county and participating municipalities want to achieve. Goals are expressed as broad policy statements representing desired long-term results.
- **Objectives** (or strategies) describe strategies to attain an identified goal. Objectives are more specific statements than goals; objectives are also usually measurable and can have a defined completion date.
- **Mitigation Actions** are the specific steps (projects, policies, and programs) that advance a given objective. They are highly focused, specific, and measurable.

The hazard identification and risk assessment in Sections 6 and 7 consisted of identifying the hazards that affect Northern Neck Region and the potential for damage to community assets that are vulnerable to the hazards. Section 8 identified the strengths and weaknesses of state and local capabilities. The goals and objectives described below, in Table 9-1 were established by the Northern Neck PDC's Hazard Mitigation Steering Committee and validated by the Northern Neck PDC's Hazard Mitigation Working Group members in response to these assessment results. Many of the actions described below apply to the counties and all participating communities.

The broad goals of the Northern Neck Regional Hazard Mitigation Plan are as follows:

Table 9-1: 2023-2027 Northern Neck Region Goals and Objectives

Goal #1	Promote sustainable development utilizing alternative pathways that encompass proactive adaptations to mitigate against the risks posed by natural hazards, anticipate vulnerabilities, and strengthen the regional resiliency.
Objective	Increase green infrastructure measures utilizing natural vegetation and soils, pervious pavements, buffer zones, and living shoreline programs reducing storm water runoff and improve the drainage of flood waters.
2017 Goal	Promote new development that avoids undue risks posed by natural hazards and is resilient to natural disasters.
Goal #2	Monitor the impacts of climate change utilizing multiple sources of scientific expertise, historical data, and technological advances to expand problem solving options and mechanisms that address the threat of natural hazards to the Northern Neck region.
Objective	Utilize the Coastal Resiliency Master Plan data and seek out new studies and educational opportunities. Guide jurisdictions in the integration of climate change and hazard mitigation into other policy and planning efforts, to include comprehensive plans, local resiliency plans, and mitigation project plans.



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2017 Goal	Address natural hazards and vulnerabilities that represent a threat to the community.
Goal #3	Pursue opportunities to increase the resiliency of critical infrastructure by means of ongoing capabilities assessments, known hazard monitoring, and development of inclusive strategies in the communities.
Objective	Employ lessons learned from participation in the RAFT Program and utilize the Resilience Action Checklists in prioritizing mitigation strategies and seeking sources to assist in implementation.
2017 Goal	Ensure that the appropriate infrastructure is in place and maintained to ensure continued functionality of all critical services necessary to protect the residents, property, and critical infrastructure of the Northern Neck Region.
Goal #4	Enhance the capabilities of local government to address natural hazards and the effect of natural hazards on infrastructure such as high hazard potential dams, to benefit the whole community for increased resilience.
Objective	Provide technical assistance to jurisdictions in locally led planning efforts. Emphasize a culture of preparedness through public engagement and educational opportunities, strengthening infrastructure and reinforcing existing structures, coding, and enforcement.
2017 Goal	Enhance the capabilities of local government to address natural hazards to enhance the whole community for increased resilience.
Goal #5	Coordinate activities and educational opportunities focusing on natural hazard awareness and disaster preparedness activities to edify populations in the Northern Neck Region. Provide knowledge, motivate, and teach skills to citizens and visitors, focusing on vulnerable populations, to mitigate the risk of casualties.
Objective	Expand upon current and create new public outreach activities. Research and study the benefits of creating a regional "Program for Public Information" (PPI) Committee to assist localities with education, distribution, and management.
2017 Goal	Increase natural hazard awareness of our citizens. Educate the Northern Neck Region's citizens and part time residents on citizen and Community Hazard resilience.



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Goal #6	Encourage education and assist communities in the development and enforcement of solid floodplain management programs and participation/compliance with the National Flood Insurance Program (NFIP), utilizing available resources and tools to identify the floodplains and risks areas.
Objective	Lead communities in flood mitigation efforts utilizing data and Flood Resistant Design and Construction guidance (ASCE 24-05) to limit development in floodplain areas, adopt and enforce building codes that increase resiliency and decrease natural habitat detriment, and to plan and execute projects for stormwater management/stormwater runoff improvements. Promote implementing floodplain management techniques that exceed minimum requirements.
2017 Goal	Participate and Comply with the National Flood Insurance Program (NFIP) through Floodplain Identification, Mapping, and Floodplain Management.

Specific objectives and actions to support these goals are described in Table 9-2 and jurisdiction specific actions are described in Table 9-3.

9.2.1 RAFT

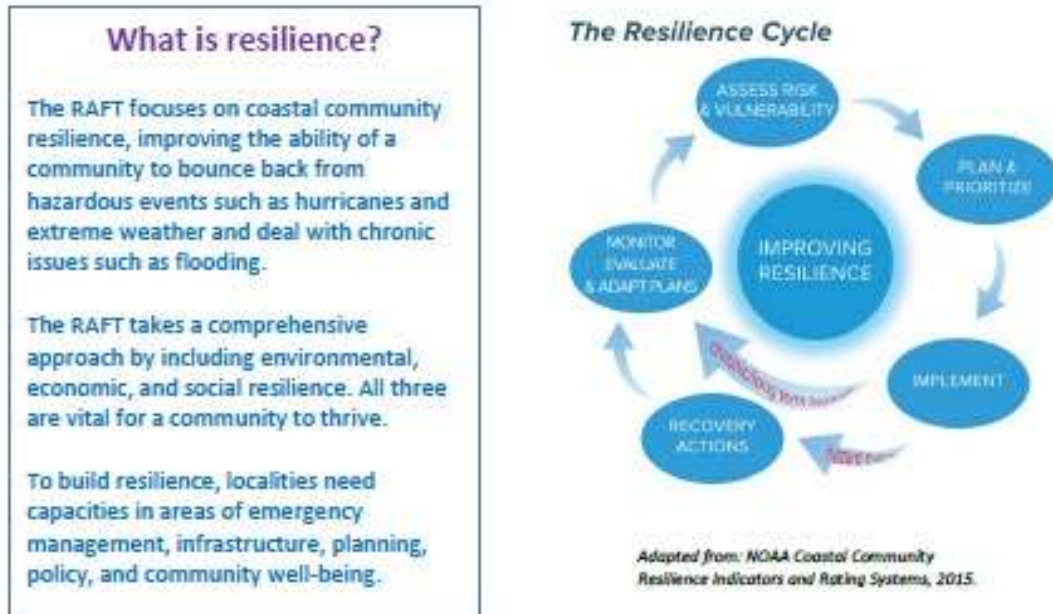
The Resilience Adaptation Feasibility Tool is an instrument provided through a collaborative effort of The Institute for Engagement & Negotiation at the University of Virginia, The Virginia Coastal Policy Center at William & Mary Law School, and Old Dominion University/Virginia Sea Grant Climate Adaptation and Resilience Program. The tool assists communities in self-assessment and emergency risk communications to identify needs, goals, and objectives. Participating communities receive a report referred to as the "RAFT Scorecard," which provides an in-depth valuation of the community's resilience, and then attend a workshop to review the information and recommendations on the RAFT Scorecard. A plan for improving mitigation actions in the community starts at this workshop, followed by an established timeline for the review of completed projects at the one-year mark. Participating in a RAFT process provides the communities with opportunities to identify planning tasks and more funding opportunities and can increase a community's Community Rating System (CRS) score.

Eight of the ten participating jurisdictions participated in a RAFT process in 2020-2022, with Montross and Irvington being included in their respective counties' process. The results of the workshops were taken back to the jurisdictions and utilized by emergency management personnel to strive for a better understanding of their needs and to begin working through the action plan created.



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Figure 9-1: Resilience Cycle



Source: RAFT - <https://raft.iem.virginia.edu/>

Each jurisdiction was scored based on categories as defined below and then demonstrated in Table 9-2 and each category offers up to possible points.

- *Policy, Leadership, & Collaboration* – Measures policy and legislation in place for coastal resilience and includes coordination and collaboration between various levels of government, and how accessible and open government data is to the public.
- *Risk Assessment & Emergency Management* – Examines how well a locality has conducted risk assessments to prepare for coastal storm hazards, identified vulnerable populations and their needs during or after a coastal storm hazard, and developed plans for disaster preparedness, including a Hazard Mitigation Plan.
- *Infrastructure Resilience* – Assesses how well the locality has identified methods and plans for storm water and protecting critical infrastructure including using natural and nature-based features (NNBF).
- *Planning for Resilience* – Assesses the comprehensive plan and zoning code for resilience, how a locality is using incentives to promote resilience in building and development, how policies protect ecosystems, how they use green infrastructure to improve resilience, and how much resilience has been incorporated into planning.
- *Community Engagement, Health, and Wellbeing* – Assesses how the community engages with residents in planning for coastal storm hazard including social equity considerations and examines the locality's attention to issues of health and wellness during and after coastal events.



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Table 9-2: Northern Neck Jurisdiction's RAFT Scorecard Data

Jurisdiction	Policy, Leadership, & Collaboration	Risk Assessment & Emergency Management	Infrastructure Resilience	Planning for Resilience	Community Engagement, Health, & Well Being	Total Score
Lancaster County	14	16	14	12	13	69
Town of Irvington	n/a	n/a	n/a	n/a	n/a	Incorporated into Lancaster County's
Town of Kilmarnock	9	13	10	9	10	51
Town of White Stone	7	15	9	3	5	39
Northumberland County	14	15	10	17	11	67
Richmond County	11	16	11	9	8	55
Town of Warsaw	8	15	11	14	13	62
Westmoreland County	11	18	13	10	6	58
Town of Colonial Beach	9	14	9	12	10	54
Town of Montross	n/a	n/a	n/a	n/a	n/a	Incorporated into Westmoreland County's

The Commonwealth of Virginia published the *Coastal Resilience Master Plan* in 2021 in which 2,000 stakeholders assisted to compile the data and subsequent publication that presents the impacts of future flooding scenarios on coastal Virginia, its resources, and community infrastructure. Takeaways from the plan were alarming for an area such as the Northern Neck with data providing indications of the following between 2020 and 2080:

- An estimated 170,000 acres (89%) of existing tidal wetlands and 3,800 acres (38%) of the existing dunes and beaches may be permanently lost to open water.
- Annualized flood damages are expected to increase by 1,300% (\$0.4 billion to \$5.1 billion)
- The number of residents and their homes that will be exposed to extreme coastal flooding shows projections growing 160% (360,000 to 943,000)
- Buildings of all natures, residential, public, and commercial, present a potential increase from 140,000 to 340,000 (nearly 150%)
- An increase of almost 280% is projected in the number of miles of roadway exposed to chronic coastal flooding (approximately 1,000 to 3,800 miles)



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The Commonwealth of Virginia Coastal Resilience Master Plan is a phased plan, the 2024 phase is forecasted to address subjects relative to pluvial flooding, riverine flooding, and compound flooding, in addition to expanding upon current resiliency projects, working with stakeholders, and extending the plan actions to jurisdictions further inland to expand statewide resiliency.

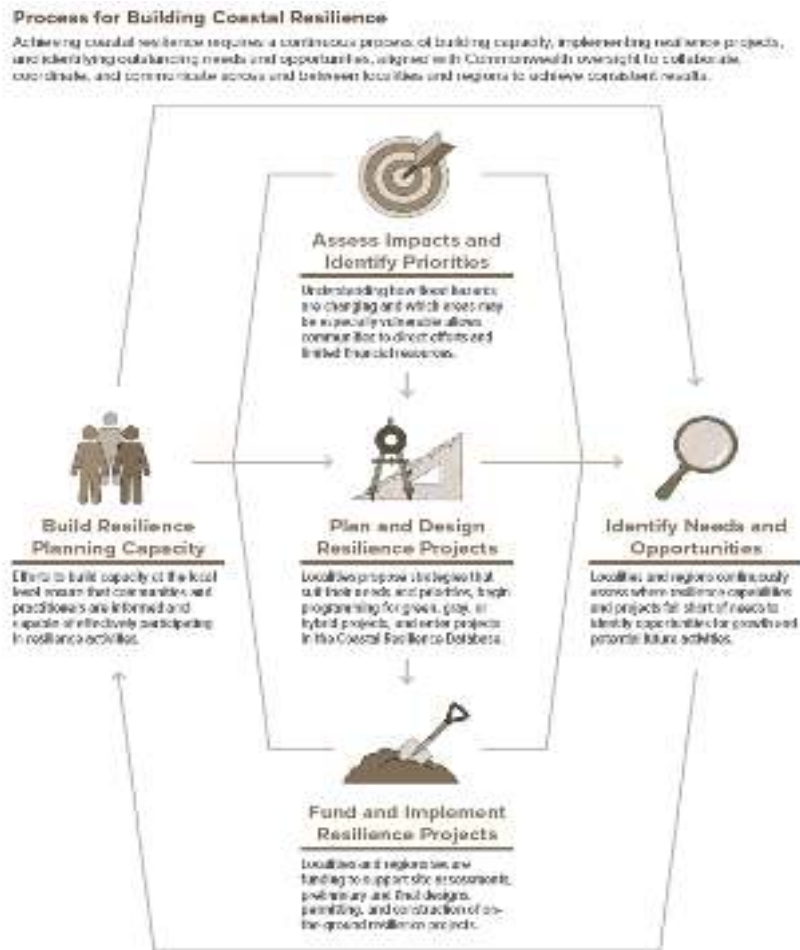
The Northern Neck Region embraces the State's stance on coastal resiliency and is committed to the following guiding principles – the "Commonwealth Resilience Planning Principles", which this plan has incorporated throughout.

1. Acknowledge climate change and its consequences, and base decision making on the best available science.
2. Identify and address socioeconomic inequities and work to enhance equity through adaptation and protection efforts.
3. Utilize community and regional scale planning to the maximum extent possible, seeking region-specific approaches tailored to the needs of individual communities.
4. Understand fiscal realities and focus on the most cost-effective solutions for the protection and adaptation of communities, businesses, and critical infrastructure. The solutions will, to the extent possible, prioritize effective natural solutions.
5. Recognize the importance of protecting and enhancing green infrastructure in all regions and in the coastal region, natural coastal barriers, and fish and wildlife habitat by prioritizing nature-based solutions.



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Figure 9-2: Process for Building Coastal Resilience



Source: The Commonwealth of Virginia Coastal Resilience Master Plan

9.2.2 Community Rating System

Per FEMA, “The Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the NFIP.” (<https://www.fema.gov/floodplain-management/community-rating-system>). Jurisdictions that participate in the CRS program are demonstrating that efforts are being taken to do the follow:

- Lessen and avoid flood damage to insurable property
- Support and reinforce the insurance aspects of the NFIP
- Foster comprehensive floodplain management

The Northern Neck Regional jurisdictions that participated in the RAFT process above participated in a workshop to explore the potential of joining the CRS. The workshops and RAFT assisted each jurisdiction in elevating their scores and increasing the potential for lower insurance rates and it is a step towards already being compliant with the program at the time a decision may be made to join. Jurisdictions are awarded points and a community classification based on criteria in four categories:

- Public Information



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- Mapping and Regulations
- Flood Damage Reduction
- Warning and Response

Flood insurance premium rates in Community Rating System communities are discounted in increments of 5%. Participation in the CRS is under consideration by the Northern Neck Region's jurisdictions and is a noted 2023 Mitigation Action Goal for several jurisdictions. This can be viewed in the jurisdiction matrixes below.

9.3 Identification and Analysis of Mitigation Actions

Actions are detailed and specific strategies and projects that help support regional natural hazard resiliency and mitigation goal achievement. The actions from the 2017 plan formed a platform for discussing mitigation actions for the 2023 plan. The goal-action mitigation strategy structure was continued, and objectives were outlined as well to meet current standards and to provide a clear picture of the mission of the mitigation actions and strategies. A discussion was held via electronic means, interviews, and conversations at official meetings concerning the 2017 plan mitigation actions and strategies to help frame which actions should be continued and what organizational form the 2023-2027 mitigation actions should take.

Each community participated in an individual interview process attended by local personnel, NNPDC Staff, and Olson Group, LTD personnel. In addition, the jurisdiction representatives evaluated the actions for inclusion in the plan with the following criteria from the FEMA Local Mitigation Planning Guidebook:

- What long-term goals does the community want to achieve?
- What specific actions will local government, community organizations, and others take to reduce risks to hazards?
- How will the actions be implemented and prioritized?
- How effectively will the action protect lives and prevent injuries?
- How significant will the action be at eliminating or reducing damage to structures and infrastructure?
- Is the mitigation action technically feasible? Is it a long-term solution?
- Does the public support the mitigation action? Is there the political will to support it?
- Does the community have the personnel and administrative capabilities to implement the action and maintain it, or will outside help be necessary?
- Does the action advance other community objectives, such as capital improvements, economic development, environmental quality, or open space preservation?

The 2023-2027 mitigation actions are organized into six major categories. Mitigation actions per community are organized by the following action types:

- 1) Prevention
 - a. Planning and zoning
 - b. Building codes
 - c. Open space reservations
 - d. Floodplain regulations
 - e. Stormwater management regulations
 - f. Drainage system maintenance



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- g. Capital improvements programming
 - h. Shoreline/Riverine setbacks
- 2) Property Protection
 - a. Acquisition/demolition
 - b. Relocation
 - c. Building elevation
 - d. Critical facilities protection
 - e. Retrofitting (wind proofing, flood proofing, seismic design)
 - f. Safe rooms, shutters, shatter resistant glass
 - g. Insurance
- 3) Natural Resource Protection
 - a. Land Acquisition
 - b. Floodplain protection
 - c. Watershed management
 - d. Beach and dune preservation
 - e. Riparian buffers
 - f. Forest and vegetation management (fire resistant landscaping, fuel breaks)
 - g. Erosion and sediment control
 - h. Wetland preservation and restoration
 - i. Habitat preservation
 - j. Slope stabilization
 - k. Historic properties and archaeological site preservation
- 4) Structural Projects
 - a. Reservoirs
 - b. Dams/levees/dikes/floodwalls/seawalls
 - c. Diversions/detention/retention
 - d. Channel modification
 - e. Beach nourishment
 - f. Storm sewers
- 5) Emergency Services
 - a. Warning systems
 - b. Evacuation planning and management
 - c. Emergency response training and exercises
 - d. Sandbagging for flood protection
 - e. Installing temporary shutters for wind protection
- 6) Education & Awareness
 - a. Outreach projects
 - b. Speaker series/demonstration events
 - c. Hazard mapping
 - d. Real estate disclosure
 - e. Library materials
 - f. School children's educational programs
 - g. Hazard expositions



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Table 9-3: 2023-2027 Northern Neck Regional Mitigation Actions

#	Mitigation Action	Hazard(s) Addressed	Project Type	Applies to Existing or New Structures	Responsible Party	Timeframe	Estimated Cost (\$)	Possible Funding Source	Priority
Northern Neck Region Planning District Commission									
1	Support mitigation projects that conform to the requirements of the HMA program in terms of eligibility for participation and projects.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Prevention - Property Protection - Natural Resource Protection - Structural - Emergency Services - Education & Outreach	All	Agency Wide	Initiated & Ongoing	TBD on a case-by-case basis	HMGP FMA	High
2	Promote and expand upon the Living Shoreline Initiative in both its non-structural and combined structural/non-structural aspects. Utilize techniques such as grading land away from eroding shorelines, maintaining, and upgrading riparian buffers adjacent to shorelines, and implementing green infrastructure and stormwater management improvements.	- Flooding - Coastal Erosion	- Prevention - Property Protection - Natural Resource Protection - Structural - Emergency Services - Education & Outreach	All	Agency Wide	Initiated & Ongoing	\$1 million	Coastal Resiliency Programs HMGP	High



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#	Mitigation Action	Hazard(s) Addressed	Project Type	Applies to Existing or New Structures	Responsible Party	Timeframe	Estimated Cost (\$)	Possible Funding Source	Priority
3	Provide technical assistance to Northern Neck jurisdictions, to integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as comprehensive and resiliency plans, and capital improvement plans.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Prevention - Property Protection - Natural Resource Protection - Structural - Emergency Services - Education & Outreach	All	Agency Wide	Ongoing	N/A	Existing Budget	High
4	Promote practices implementing nature-based approaches that increase regional resiliency. Projects sought include but are not limited to: Ecosystem restoration and adaptation, green infrastructure, and eco-system-based approaches addressing climate change, coastal resources, and conservation of protected areas.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Prevention - Property Protection - Natural Resource Protection	All	Agency Wide	Ongoing	N/A	Existing Budget	High



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#	Mitigation Action	Hazard(s) Addressed	Project Type	Applies to Existing or New Structures	Responsible Party	Timeframe	Estimated Cost (\$)	Possible Funding Source	Priority
5	Seek data sources and educational opportunities that increase regional hazards awareness and provide additional knowledge to jurisdictional personnel that will be applied to project building and initiation.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Prevention - Emergency Services - Education & Outreach	All	Agency Wide	1-2 years	\$50,000	Existing Budget	High
6	Expand upon current and create new public outreach activities. Utilize the PDC's website to advise citizens and visitors of local natural hazard risks, encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information" (PPI) Committee to assist with educating, distribution, and management. (*PPI is a suggestion under Activity 322 in the CRS Manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Education & Outreach	All	Agency Wide	Ongoing	\$60,000	DCR, USACE	High
7	Seek education and funding to initiate a program that will organize investigations and risk assessments	Flooding	- Prevention - Property Protection	All	Agency Wide	1-3 years	N/A	Existing Budget	High



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#	Mitigation Action	Hazard(s) Addressed	Project Type	Applies to Existing or New Structures	Responsible Party	Timeframe	Estimated Cost (\$)	Possible Funding Source	Priority
	that will utilize FEMA's risk prioritization methodology to define the HHPDs within the Region.		- Natural Resource Protection - Structural		Regional Planner Project Manager				
8	Provide technical assistance to Northern Neck jurisdictions to organize projects that will repair, remove, or provide other structural or non-structural means to rehabilitate eligible HHPDs	Flooding	- Prevention - Property Protection - Natural Resource Protection - Structural	All	Agency Wide Project Manager Regional Planner	5 years	N/A	Existing Budget	Medium



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Mitigation action plans were developed for all the identified actions. Each mitigation action plan includes:

- Goal(s) it is intended to help achieve,
- Hazard(s) it is designed to mitigate,
- Agency assigned responsibility for carrying out the strategy,
- Status of the goal,
- Timeframe for completion, and
- Priority level for its implementation (high, medium, or low).



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Table 9-4: 2023-2027 Northern Neck Region Jurisdiction Specific Mitigation Actions

#	Mitigation Action	Hazard(s) Addressed	Project Type	Applies to Existing or New Structures	Responsible Party(s)	Timeframe	Estimated Cost (\$)	Possible Funding Source	Priority
Lancaster County									
1	Support mitigation projects that conform to the requirements of the HMA program in terms of eligibility for participation and projects.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Prevention - Property Protection - Natural Resource Protection - Structural - Emergency Services - Education & Outreach	All	Lancaster County Emergency Management Building & Zoning NNPDC	Initiated & Ongoing	Staff Time	Lancaster County, HMGP, CDBG	Medium
2	Research and incorporate additional mitigation techniques into community spaces that will further protect flood zones, increase green-space, and improve stormwater drainage capacity, discouraging items such as impermeable surfaces, the disturbance of natural vegetation, or penetration into the floodplains with any structural development not meant to assist in retaining landforms.	- Flood - Coastal Erosion	- Prevention - Property Protection - Natural Resource Protection - Structural	New	Lancaster County Emergency Management Public Works Building & Zoning	1-3 years	Staff Time	Lancaster County, FMA, HMGP, BRIC, DRC	High
3	Seek funding sources to build nature-based shoreline stabilization strategies. Continue best management practices in shoreline erosion prevention, and mandate that new subdivisions require coordinated shoreline protection plans.	- Flood - Coastal Erosion	- Property Protection - Natural Resource Protection	All	Lancaster County Building & Zoning Floodplain Manager	Initiated & Ongoing	Staff Time	CDBG, DRC, HMGP, USACE, VA DEQ	High



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4	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as comprehensive and resiliency plans, and capital improvement plans.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Planning	All	Lancaster County County Administration Emergency Management	Initiate & Ongoing	NNPDC Staff Time, County Staff Time	CDBG, HMGP	Medium
5	Consider using free, simple, and/or permanent easement to prevent development in the highest priority undeveloped floodplain (and/or wetlands) areas. Use these areas as public open space for passive recreational uses including water access.	Flooding	- Prevention - Property Protection - Natural Resource Protection	New	Lancaster County Floodplain Manager Building & Zoning	Ongoing	TBD	HMGP, DRC	Low
6	Identify areas of repetitive loss and severe repetitive loss structures to seek appropriate improvements under HMA guidelines.	Flooding	- Prevention - Property Protection	Existing	Lancaster County Building & Zoning NNPDC	1-5 years	Staff Time, Project Costs TBD	FMA, HMGP	High
7	Encourage waterfront property owners in existing communities to consider community based multi-parcel shoreline protection strategies before they pursue individual approaches.	Coastal Erosion	- Prevention - Property Protection - Natural Resource Protection - Structure	Existing	Lancaster County Building & Zoning NNPDC	Ongoing	Staff Time, NNPDC Staff Time	FMA, HMGP	High



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8	Continue to upgrade and expand the current GIS capabilities, training, and resources throughout the community.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Planning - Emergency Services	Existing	Lancaster County County Administration GIS Coordinator	Initiated & Ongoing	Staff Time	CDBG	Medium
9	Seek further improvements to hazard mitigation elements that will enable the community to become eligible for CRS participation.	Flooding	- Prevention - Emergency Services - Education and Outreach	All	Lancaster County Emergency Management Building & Zoning	Initiated & Ongoing	Staff Time, NNPDC Staff Time	HMGP	Low
10	Expand the purchase and training on the use of NOAA radios. Provide NOAA radios to public facilities.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Planning - Emergency Services	Both	Lancaster County Emergency Management	Initiated & Ongoing	\$50,000	CDBG, HMGP	High
11	Document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures.	Flooding	- Planning - Structural	Both	Lancaster County Building & Zoning	Initiated & Ongoing	\$150,000	CDBG, FMA, HMGP	High
12	Inform community property owners about changes to the DFIRM/FIRM that may impact their insurance rates.	Flooding	Education and Outreach	Both	Lancaster County Building & Zoning	Ongoing	Staff Time, NNPDC Staff Time	Lancaster County	Medium



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13	Expand upon current and create new public outreach activities. Utilize the jurisdiction's website to advise citizens and visitors of local natural hazard risks, encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information" (PPI) Committee to assist with educating, distribution, and management. (*PPI is a suggestion under Activity 322 in the CRS Manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Education and Outreach	All	Lancaster County Emergency Management Community Planning	Initiated & Ongoing	Staff Time, NNPDC Staff Time	Lancaster County, CDBG, FMA, HMGP	High
14	Seek funding for and implement early warning signals/systems/emergency warning tools for residents with increased attention to vulnerable populations.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Planning - Property Protection - Emergency Services	All	Lancaster County County Administration Emergency Management	New	Staff Time, NNPDC Staff Time	Lancaster County, CDBG, FMA, HMGP	High
15	Develop a resident emergency preparedness plan that identifies risks and needs, including knowledge of water safety.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Planning	All	Lancaster County Emergency Management	New	Staff Time, Consultant	Lancaster County, EMPG	Medium



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16	Seek education and funding to initiate a program that will organize investigations and risk assessments that will utilize FEMA's risk prioritization methodology to define the HHPDs within the Region.	Flooding	- Prevention - Property Protection - Natural Resource Protection - Structural	All	Lancaster County Emergency Management Floodplain Administrator	New	Staff Time	Existing Budget	High



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#	Mitigation Action	Hazard(s) Addressed	Project Type	Applies to Existing or New Structures	Responsible Party(s)	Timeframe	Estimated Cost (\$)	Possible Funding Source	Priority
Town of Irvington									
1	Support mitigation projects that conform to the requirements of the HMA program in terms of eligibility for participation and projects.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Prevention - Property Protection - Natural Resource Protection - Structural - Emergency Services - Education & Outreach	All	Town of Irvington Building & Zoning NNPDC	Initiated & Ongoing	Staff Time	Irvington, HMGP, CDBG	Medium
2	Integrate mitigation plan requirements and resiliency actions into other appropriate planning mechanisms such as comprehensive plans and capital improvement plans.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Planning	All	Town of Irvington Emergency Management Town Administration	Ongoing	NNPDC Staff Time, Irvington Staff Time	CDBG, HMGP	High



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3	Expand upon current and create new public outreach activities. Utilize the jurisdiction's website to advise citizens and visitors of local natural hazard risks, encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information" (PPI) Committee to assist with educating, distribution, and management. (*PPI is a suggestion under Activity 322 in the CRS Manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Education and Outreach	All	Town of Irvington Emergency Management Community Planning	Initiated & Ongoing	Staff Time, NNPDC Staff Time	Irvington, CDBG, FMA, HMGP, EMPG	Medium
4	Seek funding for and implement early warning signals/systems/emergency warning tools for residents with increased attention to vulnerable populations.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Planning - Property Protection - Emergency Services	All	Town of Irvington Emergency Management	New	Staff Time, NNPDC Staff Time	Irvington, CDBG, FMA, HMGP	High
5	Seek funding to assess and subsequently improve stormwater management capabilities.	Flooding	- Property Protection - Natural Resources Protection	All	Town of Irvington Floodplain Manager	New	Staff Time, NNPDC Staff Time	Irvington, FMA, HMGP, BRIC	Medium



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#	Mitigation Action	Hazard(s) Addressed	Project Type	Applies to Existing or New Structures	Responsible Party(s)	Timeframe	Estimated Cost (\$)	Possible Funding Source	Priority
Town of Kilmarnock									
1	Support mitigation projects that conform to the requirements of the HMA program in terms of eligibility for participation and projects.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Prevention - Property Protection - Natural Resource Protection - Structural - Emergency Services - Education & Outreach	All	Town of Kilmarnock Building & Zoning NNPDC	Initiated & Ongoing	Staff Time	Kilmarnock, HMGP, FMA, BRIC	Medium
2	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as resiliency and comprehensive plans, and capital improvement plans.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Planning	All	Town of Kilmarnock Emergency Management Town Administration	Ongoing	NNPDC Staff Time, Kilmarnock Staff Time	CDBG, HMGP, EMPG	High



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3	Expand upon current and create new public outreach activities. Utilize the jurisdiction's website to advise citizens and visitors of local natural hazard risks, encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information" (PPI) Committee to assist with educating, distribution, and management. (*PPI is a suggestion under Activity 322 in the CRS Manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Education and Outreach	All	Town of Kilmarnock Town Administration Community Planning	Initiated & Ongoing	Kilmarnock, Staff Time, NNPDC Staff Time	Kilmarnock, CDBG, FMA, HMGP, EMPG	Medium
4	Seek funding for and implement early warning signals/systems/emergency warning tools for residents with increased attention to vulnerable populations.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Planning - Property Protection - Emergency Services	All	Town of Kilmarnock Emergency Management	1-5 years	Kilmarnock, Staff Time, NNPDC Staff Time	Kilmarnock, County, CDBG, FMA, HMGP	High
5	Seek funding to assess and subsequently improve stormwater management capabilities.	Flooding	- Property Protection - Natural Resources Protection	All	Town of Kilmarnock Floodplain Manager	1-3 years	Kilmarnock, Staff Time, NNPDC Staff Time	Kilmarnock, County, CDBG, FMA, HMGP	Medium
6	Document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures.	Flooding	- Property Protection - Flooding	All	Town of Kilmarnock Building & Zoning	Ongoing	Staff Time, Projects TBD	HMGP, FMA, BRIC, EMPG	Medium



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7	Create open communication, education, and planning opportunities between emergency management and the business sector during severe weather emergencies or evacuations.	▪ Tornado ▪ Severe Weather ▪ Wildfire ▪ Flooding ▪ Coastal Erosion ▪ Landslide ▪ Drought ▪ Heatwave ▪ Earthquake	▪ Education and Outreach	Existing	Town of Kilmarnock Emergency Management Community Planning	1-3 years	Kilmarnock Staff Time	FMA, HMGP, CDBG, EMPG	High



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#	Mitigation Action	Hazard(s) Addressed	Project Type	Applies to Existing or New Structures	Responsible Party(s)	Timeframe	Estimated Cost (\$)	Possible Funding Source	Priority
Town of White Stone									
1	Support mitigation projects that conform to the requirements of the HMA program in terms of eligibility for participation and projects.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Prevention - Property Protection - Natural Resource Protection - Structural - Emergency Services - Education & Outreach	All	Town of White Stone Building & Zoning NNPDC	Initiated & Ongoing	Staff Time	White Stone, HMGP, FMA, BRIC	Medium-High
2	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as resiliency and comprehensive plans, and capital improvement plans.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Planning	All	Town of White Stone Emergency Management Town Administration	Ongoing	NNPDC Staff Time, White Stone Staff Time	CDBG, HMGP, EMPG	Medium
3	Seek new and continue incorporating hazard mitigation techniques into new community facilities to minimize damages, such as the new wastewater treatment facility and backup electricity, continuing Phases of project.	Flooding	- Property Protection - Natural Resource Protection	All	Town of White Stone Town Administration Building & Zoning	Initiated & Ongoing	Staff Time, Projects TBD	HMGP, FMA, BRIC	Medium High
4	Evaluate existing storm water system to determine if it is adequate for existing (or future) flood hazards and plan for upgrades.	Flooding	- Property Protection - Natural Resource Protection	All	Town of White Stone Floodplain Manager	1-3 years	\$60,000	HMGP, FMA, CDBG	High



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5	Expand upon current and create new public outreach activities. Utilize the jurisdiction's website to advise citizens and visitors of local natural hazard risks, encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information" (PPI) Committee to assist with educating, distribution, and management. (*PPI is a suggestion under Activity 322 in the CRS Manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Education and Outreach	All	Town of White Stone Emergency Management Community Planning	1-3 years	White Stone, Staff Time, NNPDC Staff Time	White Stone, CDBG, FMA, HMGP, EMPG	Medium
6	Evaluate exiting storm water system to determine if it is adequate for existing (or future) flood hazards and plan for upgrades.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Planning - Property Protection - Emergency Services	All	Town of White Stone Floodplain Manager	1-5 years	\$150,000	HMGP CDBG, EMPG	High
7	Seek funding to identify needs and execute needed upgrades to retrofit critical infrastructure buildings with emergency utility backups.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Emergency Services	Existing	Town of White Stone Town Administration	1-3 years	Study \$75,000 Projects TBD	HMGP, HMGP 5%	High
8	Continue with a ditch maintenance program consisting of routine inspections and subsequent debris	Flooding	- Property Protection - Natural Resource Protection	Existing	Town of White Stone Public Works	Ongoing	White Stone Staff, Upgrades TBD	White Stone Budget	High



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	removal to reduce the risk of pluvial flooding events.								
9	Research and seek funding for upgrades to communications that would include early warning signals/systems/emergency warning tools for residents with increased attention to vulnerable populations.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Emergency Services	All	Town of White Stone Emergency Management	1-3 years	White Stone Staff Time, NNPDC Staff Time	White Stone, CDBG, FMA, HMGP	Medium



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#	Mitigation Action	Hazard(s) Addressed	Project Type	Applies to Existing or New Structures	Responsible Party(s)	Timeframe	Estimated Cost (\$)	Possible Funding Source	Priority
Northumberland County									
1	Support mitigation projects that conform to the requirements of the HMA program in terms of eligibility for participation and projects.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Prevention - Property Protection - Natural Resource Protection - Structural - Emergency Services - Education & Outreach	All	Northumberland County Building & Zoning NNPDC	Initiated & Ongoing	County Staff Time	County, HMGP, FMA, BRIC	High
2	Research and incorporate additional mitigation techniques into community spaces that will further protect flood zones, increase green-space, and improve stormwater drainage capacity, discouraging items such as impermeable surfaces, the disturbance of natural vegetation, or penetration into the floodplains with any structural development not meant to assist in retaining landforms.	- Flooding - Coastal Erosion	- Property Protection - Natural Resource Protection	All	Northumberland County Building & Zoning Floodplain Manager	Ongoing	Staff Time	County, FMA, HMGP, BRIC, DRC	High
3	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as resiliency and comprehensive plans, and capital improvement plans.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Planning	All	Northumberland County Emergency Management County Administration	Initiated & Ongoing	NNPDC Staff Time, County Staff Time	CDBG, HMGP, EMPG	Medium



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4	Seek funding sources to build nature-based shoreline stabilization strategies. Continue best management practices in shoreline erosion prevention, and mandate that new subdivisions require coordinated shoreline protection plans.	Coastal Erosion	- Property Protection - Natural Resources Protection	All	Northumberland County Building & Zoning NNPDC	Initiated & Ongoing	Staff Time	CDBG, DRC, HMGP, USACE, VA DEQ	High
5	Seek new and continue incorporating hazard mitigation techniques into new community facilities to minimize damages, such as the new wastewater treatment facility and backup electricity, continuing Phases of project.	Flooding	- Property Protection - Natural Resource Protection	All	Northumberland County Emergency Management Building & Zoning	Initiated & Ongoing	Staff Time, Projects TBD	HMGP, FMA, BRIC	High
6	Consider using fee simple and/or permanent easements to prevent development in the highest priority undeveloped floodplain (and/or wetlands) areas. Use these areas as public open space for passive recreational uses including water access.	Flooding	- Prevention - Property Protection - Natural Resources Protection - Structural	All	Northumberland County Building & Zoning Floodplain Manager	Ongoing	Staff Time, Projects TBD	County	High
7	Engage in a wetlands acquisition and /or restoration program with Wetlands Watch and other conservation partners.	- Prevention - Flooding - Natural Resources Protection	- Property Protection - Natural Resource Protection	All	Northumberland County Floodplain Manager NNPDC	Ongoing	Staff Time, Projects TBD	HMGP, BRIC, DRC, USACE	Low
8	Expand upon current and create new public outreach activities. Utilize the jurisdiction's website to advise citizens and visitors of local natural hazard risks, encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information" (PPI)	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave	Education and Outreach	All	Northumberland County Emergency Management Community Planning	1-3 years	County Staff Time, NNPDC Staff Time	County, CDBG, FMA, HMGP	Medium



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	Committee to assist with educating, distribution, and management. (*PPI is a suggestion under Activity 322 in the CRS Manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.	Earthquake							
9	Encourage waterfront property owners in existing communities to consider community-based multi-parcel shoreline protection strategies before they pursue individual approaches.	- Flooding - Coastal Erosion	- Property Protection - Natural Resource Protection - Structural	All	Northumberland County Building & Zoning NNPDC	1-5 years	County Staff Time, NNPDC Staff Time	HMGP, DRC	High
10	Work with VDOT to evaluate at-risk roads and implement mitigation measures (e.g., elevation, redesign)	- Prevention - Flooding - Structural	Planning	Existing	Northumberland County Public Works	1-3 years	Staff Time, Projects TBD	HMGP, VDOT, CDBG	High
11	Investigate implementation of cumulative damage provision as part of floodplain ordinance.	Flooding	Property Protection	All	Northumberland County Floodplain Manager	Ongoing	County Staff Time	County, HMGP	Low
12	Assist with local floodplain determinations and maintain a record of approved changes to the local floodplain.	Flooding	- Prevention - Property Protection - Education and Outreach	All	Northumberland County Floodplain Manager	1-3 years	County Staff Time	County, HMGP	Medium
13	Document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures.	Flooding	- Prevention - Property Protection - Structural	All	Northumberland County Building & Zoning	Ongoing	Staff Time, Projects TBD	HMGP, FMA, BRIC, EMPG	Medium
14	Consider adoption of activities that extend beyond the minimum requirements, including those identified for participation in the Community Rating System, freeboard, prohibition of production or	Flooding	Prevention	All	Northumberland County Emergency Management	Ongoing	Staff Time,	HMGP, EMPG	High



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	storage of chemicals in SFHA, prohibition or certain types of structures such as: hospitals, nursing homes, jails, prohibition of certain types of residential housing such as manufactured homes, and finally floodplain ordinances, that prohibit any new residential or non-residential structures in the SFHA.				Building & Zoning Floodplain Manager NNPDC				
15	Seek further improvements to hazard mitigation elements that will enable the community to become eligible for CRS participation.	▪ Tornado ▪ Severe Weather ▪ Wildfire ▪ Flooding ▪ Coastal Erosion ▪ Landslide ▪ Drought ▪ Heatwave ▪ Earthquake	▪ Planning	All	Northumberland County Emergency Management	1-3 years	Staff Time,	HMGP, EMPG	Low
16	Develop a resident emergency preparedness plan that identifies risks and needs, including knowledge of water safety.	▪ Tornado ▪ Severe Weather ▪ Wildfire ▪ Flooding ▪ Coastal Erosion ▪ Landslide ▪ Drought ▪ Heatwave ▪ Earthquake	▪ Planning	All	Northumberland County Emergency Management Community Planning	1-3 years	Staff Time, Consultant	County, EMPG	Medium



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#	Mitigation Action	Hazard(s) Addressed	Project Type	Applies to Existing or New Structures	Responsible Party(s)	Timeframe	Estimated Cost (\$)	Possible Funding Source	Priority
Richmond County									
1	Support mitigation projects that conform to the requirements of the HMA program in terms of eligibility for participation and projects.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Prevention - Property Protection - Natural Resource Protection - Structural - Emergency Services - Education & Outreach	All	Richmond County Building & Zoning NNPDC	Initiated & Ongoing	Staff Time	Richmond County, HMGP	High
2	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as resiliency and comprehensive plans, and capital improvement plans.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Planning	All	Richmond County Emergency Management County Administration	Initiated & Ongoing	NNPDC Staff Time, County Staff Time	CDBG, HMGP	Medium
3	Continue to seek training opportunities for staff to enhance abilities of current GIS capabilities within the jurisdiction.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave	Planning	Existing	Richmond County Emergency Management GIS Coordinator	Ongoing	County Staff Time	CDBG, HMGP, EMPG	Medium



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		Earthquake							
4	Expand upon current and create new public outreach activities. Utilize the jurisdiction's website to advise citizens and visitors of local natural hazard risks, encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information" (PPI) Committee to assist with educating, distribution, and management. (*PPI is a suggestion under Activity 322 in the CRS Manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Education and Outreach	All	Richmond County Emergency Management Community Planning	1-3 years	County Staff Time, NNPDC Staff Time	Richmond County, CDBG, FMA, HMGP	Medium
5	Encourage waterfront property owners in existing communities to consider community-based multi-parcel shoreline protection strategies before they pursue individual approaches.	- Flooding - Coastal Erosion	- Property Protection - Natural Resource Protection - Structural	All	Richmond County Building & Zoning NNPDC	1-5 years	County Staff Time, NNPDC Staff Time	HMGP, DRC	Medium
6	Develop a resident emergency preparedness plan that identifies risks and needs, including knowledge of water safety.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Planning	All	Richmond County Emergency Management	1-3 years	County Staff Time, Consultant	Richmond County, EMPG	Medium
7	Identify funding for non-CIP coastal resilience projects, including priority needs of vulnerable populations.	- Coastal Erosion - Flooding	Planning	All	Richmond County	1-3 years	County Staff Time, Consultant	Richmond County, EMPG	Medium



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					Emergency Management NNPDC				
8	Document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures.	▪ Flooding ▪ Coastal Erosion	▪ Prevention ▪ Structural	All	Richmond County Floodplain Manager	Initiated & Ongoing	Staff Time, Projects TBD	HMGP, FMA, BRIC, EMPG	High



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#	Mitigation Action	Hazard(s) Addressed	Project Type	Applies to Existing or New Structures	Responsible Party(s)	Timeframe	Estimated Cost (\$)	Possible Funding Source	Priority
Town of Warsaw									
1	Support mitigation projects that conform to the requirements of the HMA program in terms of eligibility for participation and projects.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Prevention - Property Protection - Natural Resource Protection - Structural - Emergency Services - Education & Outreach	All	Town of Warsaw Building & Zoning NNPDC	Initiated & Ongoing	Town Staff Time	Warsaw, HMGP	High
2	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as resiliency and comprehensive plans, and capital improvement plans.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Planning	All	Town of Warsaw Emergency Management Town Administration	Initiated & Ongoing	NNPDC Staff Time, Town Staff Time	CDBG, HMGP	Medium



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3	Expand upon current and create new public outreach activities. Utilize the jurisdiction's website to advise citizens and visitors of local natural hazard risks, encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information" (PPI) Committee to assist with educating, distribution, and management. (*PPI is a suggestion under Activity 322 in the CRS Manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Education and Outreach	All	Town of Warsaw Emergency Management Community Planning	Ongoing	Town Staff Time, NNPDC Staff Time	Town, CDBG, FMA, HMGP	High
4	Develop a resident emergency preparedness plan that identifies risks and needs, including knowledge of water safety.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Planning	All	Town of Warsaw Emergency Management	1-3 years	Town Staff Time, Consultant	Town, EMPG	Medium
5	Seek funding for and implement early warning signals/systems/emergency warning tools for residents (especially vulnerable populations).	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Prevention - Planning	All	Town of Warsaw Emergency Management	1-3 years	Town Staff Time, NNPDC Staff Time	Town, CDBG, FMA, HMGP	High



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#	Mitigation Action	Hazard(s) Addressed	Project Type	Applies to Existing or New Structures	Responsible Party(s)	Timeframe	Estimated Cost (\$)	Possible Funding Source	Priority
Westmoreland County									
1	Support mitigation projects that conform to the requirements of the HMA program in terms of eligibility for participation and projects.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Prevention - Property Protection - Natural Resource Protection - Structural - Emergency Services - Education & Outreach	All	Westmoreland County Building & Zoning NNPDC	Initiated & Ongoing	County Staff Time	County, HMGP	Medium
2	Research and incorporate additional mitigation techniques into community spaces that will further protect flood zones, increase green-space, and improve stormwater drainage capacity, discouraging items such as impermeable surfaces, the disturbance of natural vegetation, or penetration into the floodplains with any structural development not meant to assist in retaining landforms.	- Flood - Coastal Erosion	- Prevention - Property Protection - Natural Resource Protection - Structural	New	Westmoreland County Public Works Floodplain Manager	1-3 years	County Staff Time	County, HMGP, BRIC, DRC	High
3	Seek funding sources to build nature-based shoreline stabilization strategies. Continue best management practices in shoreline erosion prevention, and mandate that new subdivisions require coordinated shoreline protection plans with specific attention to the Stratford Hall area erosion and cliff failure issues.	- Flood - Coastal Erosion	- Property Protection - Natural Resource Protection	All	Westmoreland County Floodplain Manager Building & Zoning	Initiated & Ongoing	County Staff Time	CDBG, DRC, HMGP, USACE, VA DEQ	High



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4	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as comprehensive and resiliency plans, and capital improvement plans.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Planning	All	Westmoreland County Emergency Management County Administration	Initiate & Ongoing	NNPDC Staff Time, County Staff Time	CDBG, HMGP	Medium
5	Continue to upgrade and expand the current GIS capabilities, training, and resources throughout the community.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Planning - Emergency Services	Existing	Westmoreland County Emergency Management GIS Coordinator	Initiated & Ongoing	County Staff Time	CDBG	Medium
6	Seek further improvements to hazard mitigation elements that will enable the community to become eligible for CRS participation.	Flooding	- Prevention - Emergency Services - Education and Outreach	All	Westmoreland County Emergency Management	Initiated & Ongoing	County Staff Time, NNPDC Staff Time	HMGP	Low
7	Document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures.	Flooding	- Planning - Structural	Both	Westmoreland County Building & Zoning	Initiated & Ongoing	\$150,000	CDBG, FMA, HMGP	High



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8	Expand upon current and create new public outreach activities. Utilize the jurisdiction's website to advise citizens and visitors of local natural hazard risks, encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information" (PPI) Committee to assist with educating, distribution, and management. (*PPI is a suggestion under Activity 322 in the CRS Manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Education and Outreach	All	Westmoreland County Emergency Management Community Planning	Initiated & Ongoing	County Staff Time, NNPDC Staff Time	County, CDBG, FMA, HMGP	High
9	Consider using fee simple and/or permanent easement to prevent development in the highest priority undeveloped floodplain (and/or wetlands) areas. Use these areas as public open space for passive recreational uses including water access.	Flooding	- Planning - Property Protection	All	Westmoreland County County Administration Building & Zoning	Ongoing	County Staff Time, Projects TBD	County	Medium
10	Evaluate built-upon areas within the floodplain or along the high erosion risk shoreline for possible relocation and/or acquisition. Target FEMA's Repetitive Loss Properties	Flooding	- Property Protection - Structural	All	Westmoreland County Building & Zoning NNPDC	Ongoing	\$85K - \$120K	HMGP, FMA	High



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11	Develop a resident and visitor emergency preparedness plan that identifies risks and needs, including knowledge of water safety.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Prevention - Planning - Education and Outreach	All	Westmoreland County Emergency Management	1-3 years	\$85,000	HMGP, EMPG	Medium
16	Seek education and funding to initiate a program that will organize investigations and risk assessments that will utilize FEMA's risk prioritization methodology to define the HHPDs within the Region.	Flooding	- Prevention - Property Protection - Natural Resource Protection - Structural	All	Westmoreland County Emergency Management Floodplain Administrator	New	Staff Time	Existing Budget	High



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#	Mitigation Action	Hazard(s) Addressed	Project Type	Applies to Existing or New Structures	Responsible Party(s)	Timeframe	Estimated Cost (\$)	Possible Funding Source	Priority
Town of Colonial Beach									
1	Support mitigation projects that conform to the requirements of the HMA program in terms of eligibility for participation and projects.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Prevention - Property Protection - Natural Resource Protection - Structural - Emergency Services - Education & Outreach	All	Town of Colonial Beach Building & Zoning NNPDC	Initiated & Ongoing	Town Staff Time	Town, HMGP	High
2	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as resiliency and comprehensive plans, and capital improvement plans.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Planning	All	Town of Colonial Beach Emergency Management Town Administration	Initiated & Ongoing	NNPDC Staff Time, Town Staff Time	CDBG, HMGP	Medium



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3	Expand upon current and create new public outreach activities. Utilize the jurisdiction's website to advise citizens and visitors of local natural hazard risks, encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information" (PPI) Committee to assist with educating, distribution, and management. (*PPI is a suggestion under Activity 322 in the CRS Manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Education and Outreach	All	Town of Colonial Beach Emergency Management Community Planning	Ongoing	Town Staff Time, NNPDC Staff Time	Town, CDBG, FMA, HMGP	High
4	Develop a resident and visitor emergency preparedness plan that identifies risks and needs, including knowledge of water safety.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Planning	All	Town of Colonial Beach Emergency Management	1-3 years	\$85,000	HMGP, EMPG	Medium
5	Seek funding for and implement early warning signals/systems/emergency warning tools for residents (especially vulnerable populations.)	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Prevention - Planning	All	Town of Colonial Beach Emergency Management	1-3 years	Town Staff Time, NNPDC Staff Time	Town, CDBG, FMA, HMGP	High



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6	Expand upon the stormwater management program consisting of routine inspections and subsequent debris removal and consider additions of culverts where applicable.	- Flooding - Natural Resources	- Prevention - Planning	Existing	Town of Colonial Beach Public Works	Ongoing	Town Staff, Projects TBD	HMGP, FMA CDBG	Medium
7	Identify a program of corrective actions to improve shoreline preservation and protection measures.	- Coastal Erosion - Flooding	Natural Resource Protection	Existing	Town of Colonial Beach Floodplain Manager NNPDC	1-3 years	Town Staff, Projects TBD	HMGP, FMA, DRC, USACE	High
8	Work with VDOT to establish flood level markers along bridges and other structures to indicate the rise of water levels along creeks and rivers in potential flood prone areas.	- Coastal Erosion - Flooding	- Prevention - Education and Outreach	Existing	Town of Colonial Beach Public Works	Ongoing	\$50,000	HMGP VDOT	Low
9	Document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures.	- Coastal Erosion - Flooding	Prevention	All	Town of Colonial Beach Building & Zoning	Ongoing	\$150,000	CDBG, FMA, HMGP	High
10	Consider adoption of activities that extend beyond the minimum requirements, including those identified for participation in the Community Rating System, freeboard, prohibition of production or storage of chemicals in SFHA, prohibition of certain types of structures such as: hospitals, nursing homes, jails, prohibition of certain types of residential housing such as manufactured homes, and finally floodplain ordinances, that prohibit	- Coastal Erosion - Flooding	- Prevention - Planning	All	Town of Colonial Beach Building & Zoning	Ongoing	Town Staff	HMGP	Low



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	any new residential or non-residential structures in the SFHA.								



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#	Mitigation Action	Hazard(s) Addressed	Project Type	Applies to Existing or New Structures	Responsible Party(s)	Timeframe	Estimated Cost (\$)	Possible Funding Source	Priority
Town of Montross									
1	Support mitigation projects that conform to the requirements of the HMA program in terms of eligibility for participation and projects.	▪ Tornado ▪ Severe Weather ▪ Wildfire ▪ Flooding ▪ Coastal Erosion ▪ Landslide ▪ Drought ▪ Heatwave ▪ Earthquake	▪ Prevention ▪ Property Protection ▪ Natural Resource Protection ▪ Structural ▪ Emergency Services ▪ Education & Outreach	All	Town of Montross Building & Zoning NNPDC	Initiated & Ongoing	Town Staff Time	Town, HMGP	High
2	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as resiliency and comprehensive plans, and capital improvement plans.	▪ Tornado ▪ Severe Weather ▪ Wildfire ▪ Flooding ▪ Coastal Erosion ▪ Landslide ▪ Drought ▪ Heatwave ▪ Earthquake	▪ Planning	All	Town of Montross Emergency Management Town Administration	Initiated & Ongoing	NNPDC Staff Time, Town Staff Time	CDBG, HMGP	Medium



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3	Expand upon current and create new public outreach activities. Utilize the jurisdiction's website to advise citizens and visitors of local natural hazard risks, encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information" (PPI) Committee to assist with educating, distribution, and management. (*PPI is a suggestion under Activity 322 in the CRS Manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Education and Outreach	All	Town of Montross Emergency Management Community Planning	Ongoing	Town Staff Time, NNPDC Staff Time	Town, CDBG, FMA, HMGP	High
4	Develop a resident emergency preparedness plan that identifies risks and needs, including knowledge of water safety.	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	Planning	All	Town of Montross Emergency Management	1-3 years	Town Staff Time, Consultant	Town, EMPG	Medium
5	Seek funding for and implement early warning signals/systems/emergency warning tools for residents (especially vulnerable populations).	- Tornado - Severe Weather - Wildfire - Flooding - Coastal Erosion - Landslide - Drought - Heatwave - Earthquake	- Prevention - Planning	All	Town of Montross Emergency Management	1-3 years	Town Staff Time, NNPDC Staff Time	Town, CDBG, FMA, HMGP	High



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6	Consider adoption of activities that extend beyond the minimum requirements, including those identified for participation in the Community Rating System, freeboard, prohibition of production or storage of chemicals in SFHA, prohibition of certain types of structures such as: hospitals, nursing homes, jails, prohibition of certain types of residential housing such as manufactured homes, and finally floodplain ordinances, that prohibit any new residential or non-residential structures in the SFHA.	▪ Flooding	▪ Prevention ▪ Planning	All	Town of Montross Emergency Management Building & Zoning Floodplain Manager	Ongoing	Town Staff	HMGP	Medium



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9.4 Flood Mitigation Projects

Across the region, the participating jurisdictions strive to mitigate the effects of flooding. Counties and towns enforce floodplain regulations, regulate flood zone development, and create stormwater management plans and systems.

In cooperation with the Virginia Department of Emergency Management (VDEM), the Northern Neck Planning District Commission works to assist citizens through the FEMA application process for properties that qualify for a home-elevation grant. Qualification for (HMGP) depends on the history and cost of prior claims made by the homeowner. Depending on the grant, the property can be elevated or demolished and replaced with new construction¹.

Living Shorelines is a shoreline management system designed to protect or restore a natural shoreline ecosystem from powerful storms, accelerated sea level rise, and landward erosion using natural and, sometimes, human-caused elements. Throughout the Northern Neck Region and coastal plain, homes and businesses are experiencing increased erosion from winds, waves, currents, tides, and recreational activities, making homes and businesses more vulnerable. There are two categories for living shorelines – Non-structural and Combined structural/non-structural. Each utilizes vegetation to protect the shoreline from erosion, flooding, and storm surges. Depending on the scope of the living shoreline, landowners can apply for a free “*Living Shoreline Group 1 General Permit*” through the Virginia Marine Resources Commission and the local Wetlands Board².

9.5 Prioritization and Implementation of Mitigation Actions

The preceding sections identify specific actions to achieve identified goals, an appropriate responsible party for each action, and a schedule for accomplishment and suggested funding sources. These tables also indicate an initial prioritization of the actions.

9.5.1 Prioritization

The Hazard Mitigation Steering Committee and Working Group used the STAPLE/E (*Social, Technical, Administrative, Political, Legal, Economic, and Environmental*) criteria to select and prioritize the most appropriate mitigation and adaptation alternatives found in Table 9-5. This methodology requires that social, technical, administrative, political, legal, economic, and environmental elements be considered when reviewing potential actions for Northern Neck Region jurisdictions to undertake. This process was used to help ensure that the most equitable and feasible actions would be undertaken based on each jurisdiction’s capabilities.

¹ <https://www.northernneck.us/flood-hazard-mitigation/>

² <https://www.northernneck.us/living-shorelines-initiative/>



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Table 9-5: STAPLE/E Methodology

STAPLE/ E	Considerations
Social	- is the proposed action socially acceptable to the community(s)? - Are there equity issues involved that would mean that one segment of a community is treated unfairly? - Will the action cause social disruption?
Technical	- Will the proposed action work? - Will it create more problems than it solves? - Does it solve a problem or only a symptom? - Is it the most useful action considering other community(s) goals?
Administrative	- Can the community(s) implement the action? - Is there someone to coordinate and lead the effort? - Is there sufficient funding, staff, and technical support available? - Are there ongoing administrative requirements that need to be met?
Political	- Is the action politically acceptable? - Is there public support both to implement and to maintain the project?
Legal	- Is the community(s) authorized to implement the proposed action? - Is there a clear legal basis or precedent for this activity? - Are there legal side effects? - Could the activity be construed as a taking? - Is the proposed action allowed by a comprehensive plan, or must a comprehensive plan be amended to allow the proposed action? - Will the community(s) be liable for action or lack of action? - Will the activity be challenged?
Economic	- What are the costs and benefits of this action? - Do the benefits exceed the costs? - Are initial, maintenance, and administrative costs considered? - Has funding been secured for the proposed action? If not, what are the potential funding sources (public, non-profit, and private)? - How will this action affect the fiscal capability of the community(s)? - What burden will this action place on the tax base or local economy? - What are the budget and revenue effects of this activity? - Does the action contribute to other community goals, such as capital improvements or economic development?
Environmental	- How will the action affect the environment? - Will the action need environmental regulatory approvals? - Will it meet local and state regulatory requirements? - Are endangered or threatened species likely to be affected?

This method was used by NNPDC and jurisdictions to weigh the various criteria for each of the identified actions and objectives including the relative cost-effectiveness as part of the “Economic” criteria. A priority level was assigned to each project based on the potential for the projects to be initiated and/or completed given the existing and potential funding, staff availability, and time; this prioritization method was selected because the HMSC and HMWG believed it would foster a realistic expectation of what could be accomplished in the next five years. A priority level of **High** indicates that these projects are currently in progress or are planned to be initiated within 1 year, have staff available, and have designated funds for completion or require minimal funds to complete. A priority level of **Medium** indicates that the community is



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likely to receive funding for these particular projects, has limited staff, funding options/opportunities will be sought, and if funding is received, the projects could be initiated/completed within 1-3 years. Lastly, a priority level of **Low** indicates that staff will have to be sought to accomplish, that these actions will be initiated and/or completed only if outside funding becomes available, and that the projects would take at least 3-5 years to initiate/complete. The resulting priority rankings are demonstrated in Table 9-3 and Table 9-4.

Actions for each jurisdiction were pulled from the 2017 plan and reviewed by planning personnel and jurisdiction officials. Then individual jurisdiction interviews were held and each community updated their mitigation actions, as did the Northern Neck Planning District Commission, with the assistance of the Olson Group. Some actions were kept and re-worded for updating purposes, while others were removed as completed or not applicable, and new ones were created to address new items presented by the jurisdictions and the RAFT reports. Mitigation action status are defined as New, Initiated and Ongoing, and Ongoing. **New** indicates an action that was added to the 2023 plan and has not been initiated. **Initiated and Ongoing** refers to an action in which tasks for all or part of the action have begun but not completed, and the progress on the task continues to be pursued. **Ongoing** refers to mitigation actions that were previously initiated and at this update continue to see progress being made. Appendix E notes all changes between the 2017 plan to the 2023 plan.

9.5.2 Implementation

The 2023 Northern Neck Regional Hazard Mitigation Plan outlines many mitigations action identified as “high” priority. The decision to address which actions first presents an ongoing challenge. Each participating jurisdiction is responsible for integrating mitigation actions into various planning documents, processes, and budgets under locally administered governing policies and procedures. Each action is assigned to a responsible department or departments that will work together to implement designated actions.

Funding is a crucial component of implementing mitigation actions. While several counties in the region have been actively pursuing and implementing mitigation projects funded by FEMA/VDEM Hazard Mitigation Assistance programs, low or no-cost high-priority strategies broaden the region’s mitigation and long-term resiliency approach. The Planning District Commission and participating jurisdictions will continue to pursue grant funding to implement more challenging actions. The NNPDC has been successful at obtaining funding for elevations in the region. Over the next five-year period the NNPDC plans to assist participating jurisdictions in seeking funds via programs such as HMGP or BRIC to seek studies and apply improvements to the dams in the Region.

Applying the “snowball” method is another implementation approach that can be effective in prioritizing mitigation actions. Publicizing a successful project can build momentum to implement other mitigation actions.

It is essential to the long-term implementation of the plan update that the underlying principles of the hazard mitigation plan update are incorporated into other community plans and mechanisms, such as:

- Comprehensive plans
- Development ordinances (Zoning Ordinance, Subdivision Ordinance, or Building Code)
- Resiliency planning
- Disaster recovery planning



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- Economic development plans
- Natural resource protection and shoreline protection plans
- Capital Improvement Program (CIP) budgeting

Section 3.0 Community Profile, provides insight into the current comprehensive plans for each community. Communities should work to ensure that the appropriate information from this plan is incorporated into the next update of their comprehensive plan. Data from the hazard identification and risk assessment, mitigation goals, and strategies can be directly included as a complete plan element. Projects that require significant investments, such as at-risk property acquisition or infrastructure hardening, are candidates for inclusion in capital improvement plans. Hazard vulnerability analysis can be incorporated into local emergency operations plans, debris management, coastal protection, and disaster recovery plans. Floodplain management data and mitigation actions can leverage Community Rating System (CRS) program participation. Mitigation is most successful when it is included in the day-to-day functions and priorities of the government. A constant network effort accomplishes integration, identifies, and highlights multi-objective benefits to each program, the communities, and their constituents. This effort is achieved through continuous communication, messaging, monitoring agendas, attending meetings, and sending memos

Simultaneous with these efforts, it will be necessary to constantly monitor funding opportunities that can be used to implement high-priority, high-cost mitigation actions. Funding opportunities that can be monitored include special pre- and post-disaster funds, special district budgeted funds, state or federally earmarked funds, and grant programs that can serve or support multi-objective applications.

With adoption of the 2023 plan update, the Northern Neck Regional communities commit to:

- Pursuing the implementation of the high-priority, low/no-cost recommended actions.
- Keeping the concept of mitigation in the forefront of community decision-making by identifying and stressing the recommendations of the Hazard Mitigation Plan when other community goals, plans and activities are discussed and decided upon.
- Maintaining a constant monitoring of multi-objective, cost-share opportunities to assist the participating communities in implementing the recommended actions of this plan for which no current regular funding or support exists.
- Incorporate hazard risk information, and priority mitigation actions into appropriate local initiatives and programs through collaborative interaction between all related community departments and staff; and
- Evaluating and assessing regional mitigation plan goal and local jurisdiction action effectiveness to reduce hazard risk exposure.

In addition, the communities of the Northern Neck Region remain committed to the NFIP. They will continue to enforce floodplain regulations and undertake other actions to comply with the program, such as continued flood hazard risk evaluation, participation in Community Assistance Visits (CAVs) with the Commonwealth of Virginia NFIP staff, and education and outreach activities directed at flood-prone residents and businesses.



Section 10 Plan Monitoring and Maintenance

Contents of this Section

- 10.1 44 CFR Requirement for Plan Monitoring and Maintenance
- 10.2 Method for Monitoring the Plan
- 10.3 Schedules for Monitoring the Plan
- 10.4 Method and Schedule for Maintaining and Updating the Plan
- 10.5 Circumstances that will Initiate Plan Review and Updates
- 10.6 Other Local Planning Mechanisms
- 10.7 Continued Public Involvement

10.1 44 CFR Requirement for Plan Monitoring and Maintenance

Requirement §201.6(c) (4) (i): *[The plan maintenance process **shall** include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle*

Requirement §201.6(c)(4)(ii): *[The plan **shall** include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.*

Requirement §201.6(c) (4) (iii): *[The plan maintenance process **shall** include a] discussion on how the community will continue public participation in the plan maintenance process.*

10.2 Method for Monitoring the Plan

The Northern Neck Regional Hazard Mitigation Plan (the Plan) will be monitored by the Northern Neck Planning District Commission (NNPDC) for several related purposes:

- Maintain and update of hazard and risk information.
- Ensure that mitigation projects and actions reflect the priorities of jurisdictions that comprise the Northern Neck Region PDC.
- To ensure compliance with Federal Emergency Management Agency (FEMA) and the Commonwealth of Virginia requirements for plan maintenance and maintain the regions jurisdictions eligibility for federal disaster assistance and mitigation grants.

The Northern Neck Planning District Commission Executive Director and staff will continuously monitor the plan with respect to the purposes noted above, according to the schedule described in Section 10.3, and with respect to the update triggers noted in Section 10.5 below.

Specifically, monitoring activities will consist of:

- Soliciting and reviewing reports from participating jurisdictions regarding status of implementation of action items from the Plan. Status reports will indicate if projects have been:
 - Scoped and/or documented for FEMA grant applications
 - Submitted for FEMA funding programs
 - Approved (or denied approval) for FEMA funding



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- Documented for funding by other means (e.g., jurisdictional capital improvement plans)
 - Funded (or not approved for funding) by other means
 - Under construction
 - Projects completed
 - (For completed projects only) Subject to hazard conditions such that avoided losses can be documented.
- Tracking progress of sources of improved or revised data for use in subsequent Plan updates on an annual (at a minimum) basis.
 - Preparing a report of the status of implementation of action items from the Plan and the availability of improved or revised data. The report will include recommendations to the Hazard Mitigation Working Group regarding the need and/or advantages of undertaking updates to all or part of the Plan prior to the five-year required update (see Section 10.4).

10.3 Schedules for Monitoring the Plan

Informal Plan monitoring activities will be ongoing through:

- Annual progress reports from each jurisdiction on Mitigation Action Plan
- An annual review by the Steering Committee
- Annual updates submitted to VDEM and FEMA Region III

Timing of annual reports may coincide with either the anniversary of the approval date or any other date chosen by the committee in consultation with VDEM.

In addition to the scheduled reports, the Northern Neck PDC will convene meetings after damage-causing natural hazard events to review the effects of such events. Based on those effects, adjustments to the mitigation priorities identified in Section 9 may be made or additional event-specific actions identified.

10.4 Method and Schedule for Maintaining and Updating the Plan

Comprehensive evaluation of and updates to this Plan will be undertaken on a five-year cycle (at a minimum). This Plan must undergo a formal FEMA-compliant update process five years from the adoption date of the first jurisdiction to formally adopt the plan. The Working Group Committee will be responsible for setting annual measures of success and a five-year measure of success for each strategy (Table 10-1: Northern Neck Regional Hazard Mitigation Plan Update Maintenance Schedule). These indicators will be used to measure the progress and success of implementation of the mitigation plan during the 2027 update process. The Working Group Committee will be able to use this information to determine if corrective action is needed or if the action should be continued or discontinued. In addition, the Working Group Committee should review the composition of the committee annually and add members if needed.

In evaluating the plan, the Working Group Committee will assess:

- The goals and objectives addressed in the current plan and any expected conditions
- The nature, magnitude, and/or types of risk present in the region and assess if
- those risks have changed
- The current resources that are required and appropriate for implementing the plan
- Issues with implementation, (ex. technical, political, legal, or coordinating with state and federal agencies)
- The outcome of mitigation strategies, and evaluate their success



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- The agencies and partners and their level of participation as originally proposed
- The Mitigation Advisory Committee will determine at the annual meeting if an update of the plan is needed. Factors to consider when determining if an update is necessary include:
 - Lessened vulnerability because of implementing recommended actions,
 - Increased vulnerability because of failed or ineffective mitigation actions, and/or,
 - Increased vulnerability because of new development (and/or annexation).
 - New state/federal laws, policies, or programs
 - Changes in resource availability

Ongoing public outreach will continue, and public participation will be encouraged through available web postings, social media and press releases to local media outlets, primarily weekly community newspapers and radio stations. As with the previous plan, the Local Emergency Planning Committee (serving as the Working Group Committee) shall be charged with maintaining public outreach through reporting back to government officials.

Table 10-1: Northern Neck Regional Hazard Mitigation Plan Update Maintenance Schedule

Timeframe	Activity	Leadership
2023	Jurisdictions Adoption	Local jurisdictions; Northern Neck PDC submittal to FEMA
2024	Annual implementation review	WORKING GROUP COMMITTEE/LEPC
2025	Annual implementation review	WORKING GROUP COMMITTEE/LEPC
2026	Annual implementation review; seek FEMA HMA funding for 2028 plan update	WORKING GROUP COMMITTEE/LEPC
2027	Annual implementation review initiates 2028 Plan update process;	WORKING GROUP COMMITTEE/LEPC
2028	Continue 2028 Plan update process	WORKING GROUP COMMITTEE/LEPC

10.5 Circumstances that will Initiate Plan Review and Updates

A major event, such as a Presidentially declared disaster, may trigger a need to review the plan. If such an event occurs in the Northern Neck Region, the Working Group Committee will coordinate to determine how best to review and update the plan. The updating of the plan will be through written changes and submissions, as the Northern Neck communities and Working Group Committee deem appropriate and necessary. Major changes to the plan will be submitted to FEMA Region III via the State (VDEM).

Public notice will be given, and public participation will be invited, at a minimum, through available web postings and press releases to the local media outlets, primarily newspapers and radio stations. In addition, an annual event will be held to publicize progress on implementing the mitigation plan. This event could be timed to coincide with the anniversary of a significant event or annual awareness event (i.e.,



Northern Neck Regional Hazard Mitigation Plan 2023

Section 10: Plan Monitoring and Maintenance

Hurricane Preparedness Week). The circumstances or conditions under which the PDC will initiate Plan reviews and updates are listed but not limited to:

- On the recommendation of the NNPDC Executive Director, at any time
- At approximately the six-month anniversary of the initial Plan adoption, and every six months thereafter
- After natural hazard events that appear to significantly change the apparent risk to the region's assets, operations, and/or constituents

10.6 Other Local Planning Mechanisms

The PDC has no land use planning and zoning authority, so it has few opportunities to incorporate this Plan into other local mechanisms, such as zoning and subdivision ordinances or master plans. However, this Plan will be included, to the extent possible, in the regional jurisdiction's comprehensive planning and capital improvement programs as opportunities occur.

Participating jurisdictions in this Plan will work to incorporate the goals of this Plan into the next update of relevant plans and regulations, including comprehensive plans, zoning codes, and capital improvement plans. Table 10-2: Updates to Relevant Plans and Documents show dates of upcoming jurisdiction updates to these plans and documents. Jurisdictions are not empowered to make alterations or improvements to the state's building code or the Uniform Construction Code.

Table 10-2: Updates to Relevant Plans and Documents

Plan or Document	Next Update
Lancaster County Comprehensive Plan	Scheduled adoption November 2022
Lancaster County Zoning	As needed
Lancaster County Capital Improvement Plan	Yearly
Town of Irvington Comprehensive Plan	In progress at time of this update
Town of Irvington Zoning	As needed
Town of Irvington Capital Improvement Plan	N/A
Town of Kilmarnock Comprehensive Plan	Not currently scheduled
Town of Kilmarnock Zoning	As needed
Town of Kilmarnock Capital Improvement Plan	Yearly
Town of White Stone Comprehensive Plan	Not currently scheduled
Town of White Stone Zoning	As needed
Town of White Stone Capital Improvement Plan	Yearly
Northumberland County Comprehensive Plan	Not currently scheduled
Northumberland County Zoning	As needed
Northumberland County Capital Improvement Plan	Yearly
Richmond County Comprehensive Plan	Scheduled adoption November 2022
Richmond County Zoning	As needed
Richmond County Capital Improvement Plan	Yearly
Town of Warsaw Comprehensive Plan	In progress at time of this plan
Town of Warsaw Zoning	As needed
Town of Warsaw Capital Improvement Plan	Yearly
Westmoreland County Comprehensive Plan	Not currently scheduled
Westmoreland County Zoning	As needed
Westmoreland County Capital Improvement Plan	Yearly
Town of Colonial Beach Comprehensive Plan	Not currently scheduled
Town of Colonial Beach Zoning	As needed
Town of Colonial Beach Capital Improvement Plan	Yearly
Town of Montross Comprehensive Plan	Not currently scheduled
Town of Montross Zoning	As needed
Town of Montross Capital Improvement Plan	N/A



10.7 Continued Public Involvement

As noted above, this Plan will be evaluated and updated periodically and when certain triggering events occur. The NNPDC will utilize public notices and a centralized website to include the public in the update process. In addition, the NNPDC will undertake public outreach and awareness activities as outlined in the Mitigation Action Plan that will include continuing updates on the progress of implementing the Plan and future updates.



Northern Neck Regional Hazard Mitigation Plan 2023

Section 10: Plan Monitoring and Maintenance

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Appendix A Acronyms

ABFE:	Advisory Base Flood Elevation
AICP:	American Institute of Certified Planners
ASCE:	American Society of Civil Engineers
BCA:	Benefit-Cost Analysis
BFE:	Base Flood Elevation
CAV:	Community Assessments Visit
CCRFR:	Commonwealth Center for Recurrent Flood Resiliency
CFR:	Code of Federal Regulation
CIP:	Capital Improvement Program
CMP:	Comprehensive Management Plan
COOP:	Continuity of Operations Plan
COVID-19:	Coronavirus Disease of 2019
CPRI:	Calculated Priority Risk Index
CRS:	Community Rating System
CZM:	Coastal Zone Management
DC:	District of Columbia
DCR:	Department of Conservation and Recreation
DELMARVA:	Delaware Maryland and Virginia Peninsula
DEQ:	Department of Environmental Quality
DFIRM:	Digital Flood Insurance Rate Map
DLUR:	Division of Land Use Regulation
DMA 2000:	Disaster Mitigation Act of 2000
DMTF:	Drought Monitoring Task Force
EF-Scale:	Enhanced Fujita Scale
EMS:	Emergency Medical Services
EOP:	Emergency Operations Plan
EPA:	United States Environmental Protection Agency
EPCRA:	Emergency Planning and Community Right-to-know Act
ERNS:	Emergency Response Notification System
ESF:	Emergency Support Function



FEMA:	Federal Emergency Management Agency
FHBM:	Flood Hazard Boundary Map
FIRM:	Flood Insurance Rate Map
FIS:	Flood Insurance Study
FMA:	Flood Mitigation Assistance Grant Program
F-Scale:	Fujita Tornado Scale
GIS:	Geographic Information System
HAZUS:	Hazards US
HIRA:	Hazard Identification and Risk Assessment
HMA:	Hazard Mitigation Assistance
HMGP:	Hazard Mitigation Grant Program
HMP:	Hazard Mitigation Plan
HMSC:	Hazard Mitigation Steering Committee
HMWG:	Hazard Mitigation Working Group
IBC:	International Building Code
IRC:	International Residential Code
LEPC:	Local Emergency Planning Committee
LWCF:	Land and Water Conservation Fund
MLLW:	Mean Lower Low Water
NCDC:	National Climatic Data Center
NCEI:	National Center for Environmental Information
NDSP:	National Dam Safety Program
NFIP:	National Flood Insurance Program
NHC:	National Hurricane Center
NNEC:	Northern Neck Electric Cooperative
NNPDC:	Northern Neck Planning District Commission
NOAA:	National Oceanic Atmospheric Administration
NPS:	National Park Service
NRI:	National Risk Index
NWS:	National Weather Service
OEM:	Office of Emergency Management
OGL:	Olson Group, LTD
PA:	Public Assistance Grant Program
PDC:	Planning District Commission
PGA:	Peak Ground Acceleration



RAFT:	Resiliency Adaptation Feasibility Tool
RCRA:	Resource Conservation and Recovery Act
RFC:	Repetitive Flood Claims Grant Program
RLP:	Repetitive Loss Property
SARA:	Superfund Amendments and Reauthorization Act
SF:	Square Feet
SFHA:	Special Flood Hazard Area
SHMP:	State Hazard Mitigation Plan
SHMPU:	State Hazard Mitigation Plan Update
SOE:	State of Emergency
SRLP:	Severe Repetitive Loss Property
STAPLEE:	Social, Technical, Administrative, Political, Legal, Economic, and Environmental
TCPA:	Toxic Catastrophe Prevention Act
TIP:	Transportation Improvement Program
TRI:	Toxic Release Inventory
TSD:	Treatment Storage Disposal
TTF:	Transportation Trust Fund
UASI:	Urban Area Security Initiative
UCC:	Uniform Construction Code
USACE:	United States Army Corp of Engineers
USCA:	United States Census of Agriculture
USDA:	United States Department of Agriculture
USDOT:	United States Department of Transportation
USGS:	United States Geologic Survey
VDEM:	Virginia Department of Emergency Management
VDOF:	Virginia Department of Fire Programs
VDOT:	Virginia Department of Transportation
VDSFPM:	Virginia Dam Safety Floodplain Management
VFRIS:	Virginia Flood Risk Information System
VUSBC:	Virginia Uniform Statewide Building Code
WIP:	Watershed Implementation Plan



Appendix B Sources

B.1 Sources for Introduction (Section 2)

- United States Code of Federal Regulations – Title 44 – Emergency Management and Assistance
 - 44 CFR 201.6 Local Mitigation Plan
- 2017 Northern Neck Regional Hazard Mitigation Plan
- Robert T. Stafford Disaster Relief and Emergency Assistance Act, P.L. 93288
- Commonwealth of Virginia Hazard Mitigation Plan
- FEMA Hazard Mitigation Grants Program Guidance: <https://www.fema.gov/grants/mitigation/hazard-mitigation-assistance-guidance>

B.2 Sources for Community Profile (Section 3)

- United States
- Virginia Water Resources Research Center: <http://www.virginiawaterradio.org/>
- Jurisdictional Comprehensive Plans
 - Lancaster County
 - Town of Irvington
 - Town of Kilmarnock
 - Town of White Stone
 - Northumberland County
 - Richmond County
 - Town of Warsaw
 - Westmoreland County
 - Town of Colonial Beach
 - Town of Montross
- Resiliency Adaptation Feasibility Tool Reports
- The Virginia Department of Conservation and Recreation: VA's Major watersheds: <https://www.dcr.virginia.gov/soil-and-water/wsheds>
- United States Geological Survey: <https://www.usgs.gov/products/data>
- The Chesapeake Bay Program: <https://www.chesapeakebay.net/state/population>
- United States Census Bureau: 2020 American Community Survey & Decennial Census
- University of Virginia Weldon Cooper Center, Demographics Research Group, 202: Virginia Population Projections
- Virginia Employment Commission, Economic Information & Analytics, Local Area Unemployment Statistics; Community Profile
- Virginia Economic Development Partnership: <https://www.chesapeakebay.net/state/population>
- 2017 United States Census of Agriculture



B.3 Sources for Adoption and Approval (Section 4)

- Code of Virginia, Article VII: Local Government of the Constitution of Virginia
- 1968 Virginia Area Development Act and modified by the Regional Cooperation Act, 21
- Disaster Mitigation Act of 2000 (DMA 2000)

B.4 Sources for Planning Process (Section 5)

- FEMA 386: Local Mitigation Planning Guide

B.5 Sources for Hazard Identification, Profiling, and Ranking (Section 6)

- NOAA NCEI Storm Events Database
- FEMA National Risk Index Community Reports
- Virginia Department of Fire Programs Fire Incident Database
- HAZUS
- USGS Earthquake Database
- FEMA Declared Disasters Database: <https://www.fema.gov/disaster/declarations>
- National Weather Service: <https://www.weather.gov/>
- NOAA and News Leader: Tornado Archive: <https://data.newsleader.com/tornado-archive/>
- United States Army Corp of Engineers: *The North Atlantic Coast Comprehensive Study*
- Commonwealth Center for Recurrent Flooding Resiliency: *The Future Sea Level and Recurrent Flooding Report for Coastal Virginia*
- Virginia Department of Conservation and Recreation ArcGIS Flood Layers
- National Park Service (NPS): *Wildfire Causes and Evaluations*
- National Wildfire Coordinating Group: Wildland Urban Interface Wildfire Mitigation Desk Reference Guide
- VDOF ArcGIS: Wildfire Risk Map Layer: <https://www.arcgis.com/apps/mapviewer/index.html>
- NOAA National Hurricane Center: <https://www.nhc.noaa.gov/>
- Source: National Institute of Standards and Technology: <https://www.nist.gov/image/windzonemap.jpg>
- Virginia Department of Conservation and Recreation: Shoreline Advisory Service
- Commonwealth of Virginia: Coastal Primary Sand Dunes and Beaches in § 28.2-1400 to -1420
- Virginia Institute of Marine Science in conjunction with The College of William & Mary: Shoreline Evolution Studies
- BC Ministry of Energy, Mines and Petroleum Resources: Sea-to-Sky Slide Diagram
- United States Drought Monitor: <https://droughtmonitor.unl.edu/Data.aspx>
- Commonwealth of Virginia Drought Monitoring Task Force
- United States Census of Agriculture 2017
- National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center: Climate at a Glance
- FEMA ArcGIS Mapping U.S. Drought Intensity Layer: Historical Occurrences
- United States Geological Study: *"Science of Earthquakes"*
- Virginia Tech Seismological Observatory: http://www.magma.geos.vt.edu/vtso/va_quakes.html#:~:text=Virginia%20has%20had%20over%20160,with%20two%20felt%20each%20year.



- Virginia Department of Conservation and Recreation: Dam Database
- Commonwealth of Virginia Hazard Mitigation Plan
- FEMA Rehabilitation of High Hazard Potential Dams: Grant Program Guidance June 2020: Section 5.8.1.3
- Fiscal Year 2021 Rehabilitation of High Hazard Potential Dams – Notice of Funding Opportunity (NOFO)
- News on the Neck – Chandlers Mill Pond Dam Failure:
https://www.newsontheneck.com/news/heavy-rains-devastate-dam/article_ee3dc382-d53e-11eb-8a7a-9f2f799ef5a4.html

B.6 Sources for Risk Assessment (Section 7)

- NOAA NCEI Storm Events Database
- FEMA National Risk Index Community Reports
- Virginia Department of Fire Programs Fire Incident Database
- HAZUS
- USGS Earthquake Database
- National Flood Insurance Program
- Virginia Department of Conservation and Recreation Flood Risk Information System
- FEMA NFIP – Data & Analytics: <https://nfipservices.floodsmart.gov/reports-flood-insurance-data>
- FEMA. Guidance for Severe Repetitive Loss Properties.
https://www.fema.gov/pdf/nfip/manual201205/content/20_srl.pdf
- Code of the Commonwealth of Virginia: §15.2-2223 and §15.2-2280
- National Park Service: “Wildfire Causes and Evaluations” (March 8, 2022)
- United States Department of Environmental Quality
- FEMA Risk Management: Snow Load Safety Guide P-957
- Commonwealth Center for Coastal Recurrent Flooding Resiliency: “Future Sea Level and Recurrent Flooding Risk for Coastal Virginia”
- USDA National Agricultural Statistics Service
- USGS ArcGIS:
<https://www.arcgis.com/apps/mapviewer/index.html?layers=f36207114ae94f3987e5f0423170f2a5>
- Commonwealth of Virginia: The Bay Act Program

B.7 Sources for Capability Assessment (Section 8)

- 44 CFR §201.4 of the Disaster Mitigation Act of 2000 (DMA2K; Public Law 106-390, signed into law October 10, 2000)
- Code of Federal Regulations, Stafford Act Title 44, Chapter 1, Part 201 (44 CFR Part 201)
- Sandy Recovery Improvement Act (SRIA) of 2013
- National Flood Insurance Act of 1968
- Water Infrastructure Improvements for the Nation (WIIN) Act of 2016
- Chesapeake Bay Preservation Act: Area Designation and Management Regulations
- Virginia Uniform Statewide Building Code (VUSBC)
- The Code of Virginia Chapter 3.2 – Commonwealth of Virginia Department of Emergency Management establishment
- Jurisdiction Comprehensive Plans



- Lancaster County
- Town of Irvington
- Town of Kilmarnock
- Town of White Stone
- Northumberland County
- Richmond County
- Town of Warsaw
- Westmoreland County
- Town of Colonial Beach
- Town of Montross
- Northern Neck Planning District Commission: Regional Enterprise Zones:
<https://www.northernneck.us/enterprise-zones/>
- Virginia Marine Institute of Marine Science, College of William and Mary: Virginia Coastal Zone Management Program
- Code of Virginia Article 2.5. Chesapeake Bay Preservation Act. § 62.1-44.15:72

B.8 Sources for Mitigation Action Plan (Section 9)

- Commonwealth of Virginia Coastal Resiliency Master Plan
- Flood Resistant Design and Construction Guidance: ASCE 24-05
- National Flood Insurance Program
- Institute for Engagement & Negotiation at the University of Virginia, The Virginia Coastal Policy Center at William & Mary Law School, and Old Dominion University/Virginia Sea Grant Climate Adaptation and Resilience Program: Resiliency Adaptation Feasibility Tool and Jurisdiction Score Cards
- FEMA Community Rating System Program
- FEMA Local Mitigation Planning Guidebook

B.9 Sources for Plan Monitoring and Maintenance (Section 10)

- 44 CFR Requirement for Plan Monitoring and Maintenance: Requirement §201.6(c)(4)

B.10 Sources for Hazards

Tornado

- HAZUS
- National Risk Index
- NOAA NCEI Storm Database
- NOAA and News Leader: Tornado Archive: <https://data.newsleader.com/tornado-archive/>

Severe Weather

- HAZUS
- National Risk Index
- NOAA NCEI Storm Database
- United States Army Corp of Engineers: *The North Atlantic Coast Comprehensive Study*



Coastal Flooding

- HAZUS
- National Risk Index
- NOAA NCEI Storm Database
- United States Army Corp of Engineers: *The North Atlantic Coast Comprehensive Study*
- Commonwealth Center for Recurrent Flooding Resiliency: *The Future Sea Level and Recurrent Flooding Report for Coastal Virginia*
- Virginia Department of Conservation and Recreation ArcGIS Flood Layers
- Virginia Institute of Marine Science in conjunction with The College of William & Mary: Shoreline Evolution Studies
- Commonwealth of Virginia Coastal Resilience Master Plan
- National Flood Insurance Program
- Virginia Department of Conservation and Recreation Flood Risk Information System
- USGS ArcGIS:
<https://www.arcgis.com/apps/mapviewer/index.html?layers=f36207114ae94f3987e5f0423170f2a5>
- Commonwealth of Virginia: The Bay Act Program

Riverine Flooding

- HAZUS
- National Risk Index
- NOAA NCEI Storm Database
- Commonwealth Center for Recurrent Flooding Resiliency: *The Future Sea Level and Recurrent Flooding Report for Coastal Virginia*
- Virginia Department of Conservation and Recreation ArcGIS Flood Layers
- National Flood Insurance Program
- Virginia Department of Conservation and Recreation Flood Risk Information System

Wildfire

- HAZUS
- National Risk Index
- NOAA NCEI Storm Database
- Virginia Department of Fire Programs Fire Incident Database
- National Park Service (NPS): *Wildfire Causes and Evaluations*
- National Wildfire Coordinating Group: Wildland Urban Interface Wildfire Mitigation Desk Reference Guide
- VDOF ArcGIS: Wildfire Risk Map Layer: <https://www.arcgis.com/apps/mapviewer/index.html>

Winter Weather

- HAZUS
- National Risk Index
- NOAA NCEI Storm Database
- FEMA Risk Management: Snow Load Safety Guide P-957

Hurricane/Tropical Storm

- HAZUS
- National Risk Index



- NOAA NCEI Storm Database
- NOAA National Hurricane Center: <https://www.nhc.noaa.gov/>
- Source: National Institute of Standards and Technology: <https://www.nist.gov/image/windzonemap.jpg>
- Virginia Department of Conservation and Recreation Flood Risk Information System

Coastal Erosion

- HAZUS
- National Risk Index
- NOAA NCEI Storm Database
- NOAA National Hurricane Center: <https://www.nhc.noaa.gov/>
- Virginia Department of Conservation and Recreation: Shoreline Advisory Service
- Commonwealth of Virginia: Coastal Primary Sand Dunes and Beaches in § 28.2-1400 to -1420
- Virginia Institute of Marine Science in conjunction with The College of William & Mary: Shoreline Evolution Studies
- USGS ArcGIS: <https://www.arcgis.com/apps/mapviewer/index.html?layers=f36207114ae94f3987e5f0423170f2a5>
- Commonwealth of Virginia: The Bay Act Program

Pluvial Flooding

- HAZUS
- National Risk Index
- NOAA NCEI Storm Database
- NOAA National Hurricane Center: <https://www.nhc.noaa.gov/>
- United States Department of Environmental Quality Agency
- Virginia Department of Conservation and Recreation ArcGIS Flood Layers
- National Flood Insurance Program
- Virginia Department of Conservation and Recreation Flood Risk Information System

Landslide

- HAZUS
- National Risk Index
- NOAA NCEI Storm Database
- BC Ministry of Energy, Mines and Petroleum Resources: Sea-to-Sky Slide Diagram

Drought

- HAZUS
- National Risk Index
- NOAA NCEI Storm Database
- United States Drought Monitor: <https://droughtmonitor.unl.edu/Data.aspx>
- Commonwealth of Virginia Drought Monitoring Task Force
- United States Census of Agriculture 2017

Heatwave

- HAZUS
- National Risk Index
- NOAA NCEI Storm Database



- National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center: Climate at a Glance
- FEMA ArcGIS Mapping U.S. Drought Intensity Layer: Historical Occurrences

Earthquake

- HAZUS
- National Risk Index
- NOAA NCEI Storm Database
- United States Geological Study: *"Science of Earthquakes"*
- Virginia Tech Seismological Observatory:
http://www.magma.geos.vt.edu/vtso/va_quakes.html#:~:text=Virginia%20has%20had%20over%20160,with%20two%20felt%20each%20year.



Northern Neck Regional Hazard Mitigation Plan
Appendix B: Sources

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Appendix C Planning Process

C.1 Meetings and Working Sessions

- C.1.1 July 15, 2022 – Northern Neck 2023 HMP Update Steering Committee Kick Off Meeting
- C.1.2 July 29, 2022 – Northern Neck 2023 HMP Update Working Group Meeting
- C.1.3 August 12, 2022 – Northern Neck 2023 HMP Update Working Group and Public Input Meeting
- C.1.4 September 9, 2022 – Northern Neck 2023 HMP Update Working Group and Public Input Meeting
- C.1.5 September 23, 2022 – Northern Neck 2023 HMP Update Working Group Meeting
- C.1.6 October 7, 2022 - Northern Neck 2023 HMP Update Working Group and Public Input Meeting
- C.1.7 November 16, 2022 – Northern Neck 2023 HMP Update Steering Committee Meeting
- C.1.8 February 3, 2023 – Northern Neck 2023 HMP Update Steering Committee Meeting
- C.1.9 February 3, 2023 – Northern Neck 2023 HMP Update HMSC and DCR/Dams Discussion Meeting

C.2 Jurisdictional Individual Interview Meetings

- C.2.1 Lancaster County
- C.2.2 Town of Irvington
- C.2.3 Town of Kilmarnock
- C.2.4 Town of White Stone
- C.2.5 Northumberland County
- C.2.6 Richmond County
- C.2.7 Town of Warsaw
- C.2.8 Westmoreland County
- C.2.9 Town of Colonial Beach
- C.2.10 Town of Montross

C.3 Public Involvement

C.4 Correspondence

C.5 Stakeholders



D. Capabilities Assessments

This section contains the capabilities assessment updates for each jurisdiction participating in the Northern Neck Regional Hazard Mitigation Plan Update.



Northern Neck Regional Hazard Mitigation Plan
Appendix D: Capabilities Assessments

Programs and Capabilities	2017 NNPDC	NEW 2023 NNPDC
Northern Neck Planning District Commission		
Comprehensive Plan	Y	Y
With Hazard Mitigation Element	Advisor	Advisor
Adoption		
With Coastal Protection Element		
Capital Improvement Plan	Advisor	Advisor
Economic Development Plan	Y	Y
Downtown Development/Re-Development Authority Plans	Advisor	Advisor
Enterprise Zones	Advisor	Advisor
Transportation Planning	VDOT/PDC	VDOT/PDC
Subdivision Regulations	N/A	N/A
Zoning Ordinance	N/A	N/A
Site Plan Review Procedures		
Building Code (or ordinance) addresses flood	N/A	N/A
Designated Building Official		
Regular Inspection Protocols		
Civil Engineer Staff		
GIS Coordinator		
Mitigation Projects		
Private Residential Elevations (self-financed)	N/A	N/A
Resident and Community Outreach Inc. Ready.gov	Y	Y
Exclude critical infrastructure from SFHA	N/A	N/A
Elevate Residences or Property Protection through HMA grants	Y	Y
Grant Officials		
Natural Systems Protection		
Natural or Cultural Resources Inventory		N/A
Open Space	N/A	N/A
Parks and Recreation		N/A
Living Shorelines Program	N/A	Y
Stormwater Management and Water Quality Programs		
Stormwater Management Plan		
Total Daily Maximum Load (TMDL) Stream Segments**		Y
Watershed Improvement Plans***	Y	Y
Erosion or Sediment Control Program		N/A
Erosion and Sediment Control Ordinances	N/A	



Northern Neck Regional Hazard Mitigation Plan
Appendix D: Capabilities Assessments

Programs and Capabilities	2017 NNPDC	NEW 2023 NNPDC
Floodplain Management	N/A	N/A
RAFT Card (Resilience Adaptation Feasibility Tool)	N/A	N/A
Floodplain Administrator	N/A	N/A
Participates in NFIP	N/A	N/A
Year Joined NFIP	N/A	N/A
Effective FIRM Date	N/A	N/A
Additional Freeboard Requirements (inches)	N/A	N/A
LiMWA standards in High Hazard Coastal Areas	N/A	N/A
Participates in CRS	N/A	N/A
Emergency Operations Management	LEPC	LEPC
Emergency Operations Plan	2011	N/A
Local Government EOPs		VDEM
Continuity of Operations Plan		advisor
Warning Sirens or warning alert systems		N
Evacuation Plans		
Shelter and Family Re-Unification Plan		
Special Needs Population Emergency Planning		
Companion Animal Sheltering and Re-Unification Plan		
Dedicated Emergency Management Website	Y	
Education Programs	N/A	Y
School Facility Emergency Operations Plans		N/A
School Emergency Notification, Evacuation and Emergency Planning		
College Campus Plans		
College/University Emergency Notification, Evacuation and Emergency Planning		
Tourism	Y*	
Community Planner		3
Additional Capabilities		



Northern Neck Regional Hazard Mitigation Plan
Appendix D: Capabilities Assessments

Programs and Capabilities	2017 Lancaster County	NEW 2023 Lancaster County
Lancaster County		
Comprehensive Plan	Y	Y
With Hazard Mitigation Element	Y	Nov. 2022
Adoption	Oct 2013	Y
With Coastal Protection Element	Y	Y
Capital Improvement Plan	Y	Y
Economic Development Plan	Y	Y
Downtown Development/Re-Development Authority Plans	N	Y
Enterprise Zones	Y	N/A
Transportation Planning	N/A	Y
Subdivision Regulations	Y	Y
Zoning Ordinance	Y	Y
Site Plan Review Procedures	Y	Y
Building Code (or ordinance) addresses flood	Y	Y
Designated Building Official	Y	Y
Regular Inspection Protocols	Y	N
Civil Engineer Staff	Y	Y
GIS Coordinator	Y	Y
Mitigation Projects		Y
Private Residential Elevations (self-financed)	Y	Y
Resident and Community Outreach Inc. Ready.gov	Y	Y
Exclude critical infrastructure from SFHA	Y	2
Elevate Residences or Property Protection through HMA grants	Y	Y
Grant Officials	Y	Y
Natural Systems Protection		Y
Natural or Cultural Resources Inventory	Y	Y
Open Space	Y	Y
Parks and Recreation	Y	Y
Living Shorelines Program	Y	Y
Stormwater Management and Water Quality Programs		Y
Stormwater Management Plan		Y
Total Daily Maximum Load (TMDL) Stream Segments**	Y2	Y
Watershed Improvement Plans***	Y	Y
Erosion or Sediment Control Program	Y	Y
Erosion and Sediment Control Ordinances	Y	



Northern Neck Regional Hazard Mitigation Plan
Appendix D: Capabilities Assessments

Programs and Capabilities	2017 Lancaster County	NEW 2023 Lancaster County
Floodplain Management		Y
RAFT Card (Resilience Adaptation Feasibility Tool)	Y	Y
Floodplain Administrator	Y	Y
Participates in NFIP	Y	Y
Year Joined NFIP	3-4-1988	03/04/1988
Effective FIRM Date	10/02/2014	07/05/2022
Additional Freeboard Requirements (inches)	N/A	18"
LiMWA standards in High Hazard Coastal Areas	Y	N
Participates in CRS	N	Y
Emergency Operations Management	Y	Y
Emergency Operations Plan	Y	Y
Local Government EOPs	Y	N
Continuity of Operations Plan	N	Y
Warning Sirens or warning alert systems	Y	Y
Evacuation Plans	Y	Y
Shelter and Family Re-Unification Plan	Y	Y
Special Needs Population Emergency Planning	Y	Y
Companion Animal Sheltering and Re-Unification Plan	Y	Y
Dedicated Emergency Management Website	Y	Y
Education Programs	Y	Y
School Facility Emergency Operations Plans	UNKNOWN	Y
School Emergency Notification, Evacuation and Emergency Planning	N	Y
College Campus Plans	Y	Y
College/University Emergency Notification, Evacuation and Emergency Planning	Y	Y
Tourism		Y
Community Planner		



Northern Neck Regional Hazard Mitigation Plan
Appendix D: Capabilities Assessments

Programs and Capabilities	2017 Town of Irvington	NEW 2023 Town of Irvington
Town of Irvington		
Comprehensive Plan		Y
With Hazard Mitigation Element		N
Adoption		Sept 2017***
With Coastal Protection Element		N
Capital Improvement Plan		N
Economic Development Plan		N
Downtown Development/Re-Development Authority Plans		N
Enterprise Zones		N
Transportation Planning		N/A
Subdivision Regulations		Y
Zoning Ordinance		Y
Site Plan Review Procedures		Y
Building Code (or ordinance) addresses flood		1
Designated Building Official		1
Regular Inspection Protocols		1
Civil Engineer Staff		1
GIS Coordinator		1
Mitigation Projects		
Private Residential Elevations (self-financed)		1
Resident and Community Outreach Inc. Ready.gov		1
Exclude critical infrastructure from SFHA		N
Elevate Residences or Property Protection through HMA grants		2
Grant Officials		N
Natural Systems Protection		
Natural or Cultural Resources Inventory		Y
Open Space		Y
Parks and Recreation		Y
Living Shorelines Program		Y
Stormwater Management and Water Quality Programs		
Stormwater Management Plan		1
Total Daily Maximum Load (TMDL) Stream Segments**		Y
Watershed Improvement Plans***		Y
Erosion or Sediment Control Program		
Erosion and Sediment Control Ordinances		1



Northern Neck Regional Hazard Mitigation Plan
Appendix D: Capabilities Assessments

Programs and Capabilities	2017 Town of Irvington	NEW 2023 Town of Irvington
Floodplain Management	-	-
RAFT Card (Resilience Adaptation Feasibility Tool)		N/A
Floodplain Administrator		Y
Participates in NFIP		Y
Year Joined NFIP		10/18/1974
Effective FIRM Date		08/04/1987
Additional Freeboard Requirements (inches)		N/A
LiMWA standards in High Hazard Coastal Areas		N
Participates in CRS		N
Emergency Operations Management		Y
Emergency Operations Plan		1
Local Government EOPs		1
Continuity of Operations Plan		N****
Warning Sirens or warning alert systems		1
Evacuation Plans		1
Shelter and Family Re-Unification Plan		1
Special Needs Population Emergency Planning		1
Companion Animal Sheltering and Re-Unification Plan		1
Dedicated Emergency Management Website		1
Education Programs		N/A
School Facility Emergency Operations Plans		N/A
School Emergency Notification, Evacuation and Emergency Planning		N/A
College Campus Plans		N/A
College/University Emergency Notification, Evacuation and Emergency Planning		N/A
Tourism		3
Community Planner		1
**NOTE: Irvington was not included in the capabilities assessment matrix in the 2017 plan.		



Northern Neck Regional Hazard Mitigation Plan
Appendix D: Capabilities Assessments

Programs and Capabilities	2017 Town of Kilmarnock	NEW 2023 Town of Kilmarnock
Town of Kilmarnock		
Comprehensive Plan		Y
With Hazard Mitigation Element		N
Adoption		April 2014
With Coastal Protection Element		N/A
Capital Improvement Plan		Y
Economic Development Plan		N
Downtown Development/Re-Development Authority Plans		Y
Enterprise Zones		Y
Transportation Planning		N/A
Subdivision Regulations		Y
Zoning Ordinance		Y
Site Plan Review Procedures		Y
Building Code (or ordinance) addresses flood		1
Designated Building Official		1
Regular Inspection Protocols		1
Civil Engineer Staff		5
GIS Coordinator		Y
Mitigation Projects		
Private Residential Elevations (self-financed)		N/A
Resident and Community Outreach Inc. Ready.gov		1
Exclude critical infrastructure from SFHA		N/A
Elevate Residences or Property Protection through HMA grants		N/A
Grant Officials		N
Natural Systems Protection		
Natural or Cultural Resources Inventory		Y
Open Space		Y
Parks and Recreation		N
Living Shorelines Program		N/A
Stormwater Management and Water Quality Programs		
Stormwater Management Plan		1
Total Daily Maximum Load (TMDL) Stream Segments**		Y
Watershed Improvement Plans***		Y
Erosion or Sediment Control Program		
Erosion and Sediment Control Ordinances		N/A



Northern Neck Regional Hazard Mitigation Plan
Appendix D: Capabilities Assessments

Programs and Capabilities	2017 Town of Kilmarnock	NEW 2023 Town of Kilmarnock
Floodplain Management		
RAFT Card (Resilience Adaptation Feasibility Tool)		Y
Floodplain Administrator		Y
Participates in NFIP		Y
Year Joined NFIP		09/17/2010
Effective FIRM Date		07/05/2022
Additional Freeboard Requirements (inches)		18"
LiMWA standards in High Hazard Coastal Areas		N/A
Participates in CRS		N
Emergency Operations Management		Y
Emergency Operations Plan		1
Local Government EOPs		1
Continuity of Operations Plan		N
Warning Sirens or warning alert systems		Y
Evacuation Plans		1
Shelter and Family Re-Unification Plan		1
Special Needs Population Emergency Planning		1
Companion Animal Sheltering and Re-Unification Plan		1
Dedicated Emergency Management Website		1
Education Programs		Y
School Facility Emergency Operations Plans		Y
School Emergency Notification, Evacuation and Emergency Planning		Y
College Campus Plans		Y
College/University Emergency Notification, Evacuation and Emergency Planning		Y
Tourism		3
Community Planner		Y
**NOTE: Kilmarnock was not included in the capabilities assessment matrix in the 2017 plan.		



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Appendix D: Capabilities Assessments

Programs and Capabilities	2017 Town of White Stone	NEW 2023 Town of White Stone
Town of White Stone		
Comprehensive Plan		Y
With Hazard Mitigation Element		N
Adoption		Oct. 2013
With Coastal Protection Element		N/A
Capital Improvement Plan		Y
Economic Development Plan		Y
Downtown Development/Re-Development Authority Plans		Y
Enterprise Zones		Y
Transportation Planning		N/A
Subdivision Regulations		1
Zoning Ordinance		1
Site Plan Review Procedures		1
Building Code (or ordinance) addresses flood		1
Designated Building Official		Y
Regular Inspection Protocols		1
Civil Engineer Staff		N
GIS Coordinator		1
Mitigation Projects		
Private Residential Elevations (self-financed)		N/A
Resident and Community Outreach Inc. Ready.gov		1
Exclude critical infrastructure from SFHA		Y
Elevate Residences or Property Protection through HMA grants		N/A
Grant Officials		N
Natural Systems Protection		
Natural or Cultural Resources Inventory		Y
Open Space		Y
Parks and Recreation		N
Living Shorelines Program		N/A
Stormwater Management and Water Quality Programs		
Stormwater Management Plan		1
Total Daily Maximum Load (TMDL) Stream Segments**		Y
Watershed Improvement Plans***		Y
Erosion or Sediment Control Program		
Erosion and Sediment Control Ordinances		N/A



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Appendix D: Capabilities Assessments

Programs and Capabilities	2017 Town of White Stone	NEW 2023 Town of White Stone
Floodplain Management		
RAFT Card (Resilience Adaptation Feasibility Tool)		Y
Floodplain Administrator		Y
Participates in NFIP		Y
Year Joined NFIP		09/24/1984
Effective FIRM Date		11/17/2020
Additional Freeboard Requirements (inches)		N/A
LiMWA standards in High Hazard Coastal Areas		N/A
Participates in CRS		N
Emergency Operations Management		Y
Emergency Operations Plan		1
Local Government EOPs		1
Continuity of Operations Plan		N
Warning Sirens or warning alert systems		1
Evacuation Plans		1
Shelter and Family Re-Unification Plan		1
Special Needs Population Emergency Planning		1
Companion Animal Sheltering and Re-Unification Plan		1
Dedicated Emergency Management Website		1
Education Programs		1
School Facility Emergency Operations Plans		N/A
School Emergency Notification, Evacuation and Emergency Planning		N/A
College Campus Plans		N/A
College/University Emergency Notification, Evacuation and Emergency Planning		N/A
Tourism		3
Community Planner		Y
**NOTE: White Stone was not included in the capabilities assessment matrix in the 2017 plan.		



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Appendix D: Capabilities Assessments

Programs and Capabilities	2017 Northumberland County	NEW 2023 Northumberland County
Northumberland County		
Comprehensive Plan	Y	Y
With Hazard Mitigation Element	Y	Y
Adoption	NOV 2016	Nov.2016
With Coastal Protection Element	Y	Y
Capital Improvement Plan	Y	Y
Economic Development Plan	Y	Y
Downtown Development/Re-Development Authority Plans	N	Y
Enterprise Zones	Y	Y
Transportation Planning	N/A	N/A
Subdivision Regulations	Y	Y
Zoning Ordinance	Y	Y
Site Plan Review Procedures	Y	Y
Building Code (or ordinance) addresses flood	Y	Y
Designated Building Official	Y	Y
Regular Inspection Protocols	Y	Y
Civil Engineer Staff	Y	N
GIS Coordinator	Y	Y
Mitigation Projects		
Private Residential Elevations (self-financed)	Y	Y
Resident and Community Outreach Inc. Ready.gov	Y	Y
Exclude critical infrastructure from SFHA	Y	Y
Elevate Residences or Property Protection through HMA grants	Y	2
Grant Officials	Y	N
Natural Systems Protection		
Natural or Cultural Resources Inventory	Y	Y
Open Space	Y	Y
Parks and Recreation	Y	Y
Living Shorelines Program	Y	Y
Stormwater Management and Water Quality Programs		
Stormwater Management Plan		Y
Total Daily Maximum Load (TMDL) Stream Segments**	Y	Y
Watershed Improvement Plans***	Y	Y
Erosion or Sediment Control Program	Y	Y
Erosion and Sediment Control Ordinances	Y	Y



Northern Neck Regional Hazard Mitigation Plan
Appendix D: Capabilities Assessments

Programs and Capabilities	2017 Northumberland County	NEW 2023 Northumberland County
Floodplain Management	Y	
RAFT Card (Resilience Adaptation Feasibility Tool)	Y	Y
Floodplain Administrator	Y	Y
Participates in NFIP	Y	Y
Year Joined NFIP	7/4/1989	7/4/1989
Effective FIRM Date	2/18/2015	12/30/2021
Additional Freeboard Requirements (inches)	12"	24"
LiMWA standards in High Hazard Coastal Areas	Y	Y
Participates in CRS	Y	N
Emergency Operations Management	Y	Y
Emergency Operations Plan	Y	Y
Local Government EOPs	Y	Y
Continuity of Operations Plan	Y	N****
Warning Sirens or warning alert systems	Y	Y
Evacuation Plans	Y	Y
Shelter and Family Re-Unification Plan	Y	Y
Special Needs Population Emergency Planning	Y	Y
Companion Animal Sheltering and Re-Unification Plan	Y	Y
Dedicated Emergency Management Website	Y	Y
Education Programs	Y	Y
School Facility Emergency Operations Plans	Y	Y
School Emergency Notification, Evacuation and Emergency Planning	Y	Y
College Campus Plans	N/A	N/A
College/University Emergency Notification, Evacuation and Emergency Planning	N/A	N/A
Tourism	Y	Y
Community Planner		Y



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Appendix D: Capabilities Assessments

Programs and Capabilities	2017 Richmond County	NEW 2023 Richmond County
Richmond County		
Comprehensive Plan	Y	Y
With Hazard Mitigation Element	Y	Y
Adoption	Jul. 2013	Nov. 2022
With Coastal Protection Element	Y	Y
Capital Improvement Plan	Y	Y
Economic Development Plan	N	Y
Downtown Development/Re-Development Authority Plans	Y	Y
Enterprise Zones	Y	Y
Transportation Planning	N/A	N/A
Subdivision Regulations	Y	Y
Zoning Ordinance	Y	Y
Site Plan Review Procedures	Y	Y
Building Code (or ordinance) addresses flood	Y	Y
Designated Building Official	Y	Y
Regular Inspection Protocols	Y	Y
Civil Engineer Staff	Y	5
GIS Coordinator	Y	Y
Mitigation Projects		
Private Residential Elevations (self-financed)	Y	Y
Resident and Community Outreach Inc. Ready.gov	Y	Y
Exclude critical infrastructure from SFHA	Y	Y
Elevate Residences or Property Protection through HMA grants	Y1	2
Grant Officials		Y
Natural Systems Protection	Y	Y
Natural or Cultural Resources Inventory	Y	Y
Open Space	Y	Y
Parks and Recreation	Y	Y
Living Shorelines Program	Y	Y
Stormwater Management and Water Quality Programs		
Stormwater Management Plan		Y
Total Daily Maximum Load (TMDL) Stream Segments**	Y	Y
Watershed Improvement Plans***	Y	Y
Erosion or Sediment Control Program	Y	Y
Erosion and Sediment Control Ordinances	Y	Y



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Appendix D: Capabilities Assessments

Programs and Capabilities	2017 Richmond County	NEW 2023 Richmond County
Floodplain Management		
RAFT Card (Resilience Adaptation Feasibility Tool)		Y
Floodplain Administrator	Y	Y
Participates in NFIP	Y	Y
Year Joined NFIP	03-16-1989	3/16/1989
Effective FIRM Date	04/16/2015	06/26/2022
Additional Freeboard Requirements (inches)	N/A	N/A
LiMWA standards in High Hazard Coastal Areas		N/A
Participates in CRS	N	N
Emergency Operations Management	Y	Y
Emergency Operations Plan	Y	Y
Local Government EOPs	Y	Y
Continuity of Operations Plan		Y
Warning Sirens or warning alert systems	Y	Y
Evacuation Plans	Y	Y
Shelter and Family Re-Unification Plan	Y	Y
Special Needs Population Emergency Planning	Y	Y
Companion Animal Sheltering and Re-Unification Plan	Y	Y
Dedicated Emergency Management Website	Y	Y
Education Programs	Y	Y
School Facility Emergency Operations Plans	Y	Y
School Emergency Notification, Evacuation and Emergency Planning	Y	Y
College Campus Plans	Y	Y
College/University Emergency Notification, Evacuation and Emergency Planning	Y	Y
Tourism	Y	Y
Community Planner		Y



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Appendix D: Capabilities Assessments

Programs and Capabilities	2017 Town of Warsaw	NEW 2023 Town of Warsaw
Town of Warsaw		
Comprehensive Plan		Y
With Hazard Mitigation Element		N
Adoption		May 2013*
With Coastal Protection Element		N
Capital Improvement Plan		Y
Economic Development Plan		Y
Downtown Development/Re-Development Authority Plans		Y
Enterprise Zones		Y
Transportation Planning		N/A
Subdivision Regulations		Y
Zoning Ordinance		Y
Site Plan Review Procedures		Y
Building Code (or ordinance) addresses flood		1
Designated Building Official		1
Regular Inspection Protocols		1
Civil Engineer Staff		N
GIS Coordinator		Y
Mitigation Projects		
Private Residential Elevations (self-financed)		N/A
Resident and Community Outreach Inc. Ready.gov		N/A
Exclude critical infrastructure from SFHA		N/A
Elevate Residences or Property Protection through HMA grants		2
Grant Officials		N
Natural Systems Protection		
Natural or Cultural Resources Inventory		N
Open Space		Y
Parks and Recreation		N
Living Shorelines Program		N/A
Stormwater Management and Water Quality Programs		
Stormwater Management Plan		Y
Total Daily Maximum Load (TMDL) Stream Segments**		Y
Watershed Improvement Plans***		Y
Erosion or Sediment Control Program		
Erosion and Sediment Control Ordinances		N/A



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Programs and Capabilities	2017 Town of Warsaw	NEW 2023 Town of Warsaw
Floodplain Management		
RAFT Card (Resilience Adaptation Feasibility Tool)		Y
Floodplain Administrator		1
Participates in NFIP		1
Year Joined NFIP		N/A
Effective FIRM Date		N/A
Additional Freeboard Requirements (inches)		N/A
LiMWA standards in High Hazard Coastal Areas		N/A
Participates in CRS		N
Emergency Operations Management		Y
Emergency Operations Plan		1
Local Government EOPs		1
Continuity of Operations Plan		N
Warning Sirens or warning alert systems		1
Evacuation Plans		1
Shelter and Family Re-Unification Plan		1
Special Needs Population Emergency Planning		1
Companion Animal Sheltering and Re-Unification Plan		1
Dedicated Emergency Management Website		1
Education Programs		1
School Facility Emergency Operations Plans		1
School Emergency Notification, Evacuation and Emergency Planning		1
College Campus Plans		1
College/University Emergency Notification, Evacuation and Emergency Planning		1
Tourism		3
Community Planner		Y
**NOTE: Warsaw was not included in the capabilities assessment matrix in the 2017 plan.		



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Appendix D: Capabilities Assessments

Programs and Capabilities	2017 Westmoreland County	NEW 2023 Westmoreland County
Westmoreland County		
Comprehensive Plan	Y	Y
With Hazard Mitigation Element	Y	Y
Adoption	DEC 2010	Dec.2010
With Coastal Protection Element	Y	Y
Capital Improvement Plan	Y	Y
Economic Development Plan	N	Y
Downtown Development/Re-Development Authority Plans	Y	Y
Enterprise Zones		Y
Transportation Planning	N/A	N/A
Subdivision Regulations	Y	Y
Zoning Ordinance	Y	Y
Site Plan Review Procedures	Y	Y
Building Code (or ordinance) addresses flood	Y	Y
Designated Building Official	Y	Y
Regular Inspection Protocols	Y	Y
Civil Engineer Staff	Y	N
GIS Coordinator	Y	Y
Mitigation Projects		
Private Residential Elevations (self-financed)	Y	Y
Resident and Community Outreach Inc. Ready.gov	Y	Y
Exclude critical infrastructure from SFHA	Y	Y
Elevate Residences or Property Protection through HMA grants	N/A	N/A
Grant Officials		Y
Natural Systems Protection	Y	
Natural or Cultural Resources Inventory	Y	Y
Open Space	Y	Y
Parks and Recreation	Y	Y
Living Shorelines Program	Y	Y
Stormwater Management and Water Quality Programs		
Stormwater Management Plan		Y
Total Daily Maximum Load (TMDL) Stream Segments**	Y	Y
Watershed Improvement Plans***	Y	Y
Erosion or Sediment Control Program	Y	



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Appendix D: Capabilities Assessments

Programs and Capabilities	2017 Westmoreland County	NEW 2023 Westmoreland County
Erosion and Sediment Control Ordinances	Y	Y
Floodplain Management		
RAFT Card (Resilience Adaptation Feasibility Tool)		Y
Floodplain Administrator	Y	Y
Participates in NFIP	Y	Y
Year Joined NFIP	03-16-1989	9/18/1987
Effective FIRM Date	04/16/2015	4/16/2015
Additional Freeboard Requirements (inches)	18"	18"
LiMWA standards in High Hazard Coastal Areas		Y
Participates in CRS	N	N
Emergency Operations Management	Y	Y
Emergency Operations Plan	Y	Y
Local Government EOPs	Y	Y
Continuity of Operations Plan		N
Warning Sirens or warning alert systems	Y	Y
Evacuation Plans	Y	Y
Shelter and Family Re-Unification Plan	Y	Y
Special Needs Population Emergency Planning	Y	Y
Companion Animal Sheltering and Re-Unification Plan	Y	Y
Dedicated Emergency Management Website	Y	Y
Education Programs	Y	Y
School Facility Emergency Operations Plans	Y	Y
School Emergency Notification, Evacuation and Emergency Planning	Y	Y
College Campus Plans	N/A	N/A
College/University Emergency Notification, Evacuation and Emergency Planning	N/A	N/A
Tourism	Y	Y
Community Planner		Y



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Appendix D: Capabilities Assessments

Programs and Capabilities	2017 Town of Colonial Beach	NEW 2023 Town of Colonial Beach
Town of Colonial Beach		
Comprehensive Plan	Y	Y
With Hazard Mitigation Element	Y	Y
Adoption	DEC 2010	Dec.2010
With Coastal Protection Element	Y	Y
Capital Improvement Plan	Y	Y
Economic Development Plan	N	Y
Downtown Development/Re-Development Authority Plans	Y	Y
Enterprise Zones		Y
Transportation Planning	N/A	N/A
Subdivision Regulations	Y	Y
Zoning Ordinance	Y	Y
Site Plan Review Procedures	Y	Y
Building Code (or ordinance) addresses flood	Y	Y
Designated Building Official	Y	Y
Regular Inspection Protocols	Y	Y
Civil Engineer Staff	Y	N
GIS Coordinator	Y	Y
Mitigation Projects		
Private Residential Elevations (self-financed)	Y	Y
Resident and Community Outreach Inc. Ready.gov	Y	Y
Exclude critical infrastructure from SFHA	Y	Y
Elevate Residences or Property Protection through HMA grants	N/A	N/A
Grant Officials		Y
Natural Systems Protection	Y	
Natural or Cultural Resources Inventory	Y	Y
Open Space	Y	Y
Parks and Recreation	Y	Y
Living Shorelines Program	Y	Y
Stormwater Management and Water Quality Programs		
Stormwater Management Plan		Y
Total Daily Maximum Load (TMDL) Stream Segments**	Y	Y
Watershed Improvement Plans***	Y	Y
Erosion or Sediment Control Program	Y	
Erosion and Sediment Control Ordinances	Y	Y



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Programs and Capabilities	2017 Town of Colonial Beach	NEW 2023 Town of Colonial Beach
Floodplain Management		
RAFT Card (Resilience Adaptation Feasibility Tool)		Y
Floodplain Administrator	Y	Y
Participates in NFIP	Y	Y
Year Joined NFIP	03-16-1989	9/18/1987
Effective FIRM Date	04/16/2015	4/16/2015
Additional Freeboard Requirements (inches)	18"	18"
LiMWA standards in High Hazard Coastal Areas		Y
Participates in CRS	N	N
Emergency Operations Management	Y	Y
Emergency Operations Plan	Y	Y
Local Government EOPs	Y	Y
Continuity of Operations Plan		N
Warning Sirens or warning alert systems	Y	Y
Evacuation Plans	Y	Y
Shelter and Family Re-Unification Plan	Y	Y
Special Needs Population Emergency Planning	Y	Y
Companion Animal Sheltering and Re-Unification Plan	Y	Y
Dedicated Emergency Management Website	Y	Y
Education Programs	Y	Y
School Facility Emergency Operations Plans	Y	Y
School Emergency Notification, Evacuation and Emergency Planning	Y	Y
College Campus Plans	N/A	N/A
College/University Emergency Notification, Evacuation and Emergency Planning	N/A	N/A
Tourism	Y	Y
Community Planner		Y



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Appendix D: Capabilities Assessments

Programs and Capabilities	2017 Town of Montross	NEW 2023 Town of Montross
Town of Montross		
Comprehensive Plan		N/A
With Hazard Mitigation Element		N/A
Adoption		N
With Coastal Protection Element		Y
Capital Improvement Plan		1
Economic Development Plan		1
Downtown Development/Re-Development Authority Plans		N
Enterprise Zones		1
Transportation Planning		1
Subdivision Regulations		1
Zoning Ordinance		1
Site Plan Review Procedures		1
Building Code (or ordinance) addresses flood		1
Designated Building Official		1
Regular Inspection Protocols		1
Civil Engineer Staff		1
GIS Coordinator		1
Mitigation Projects		
Private Residential Elevations (self-financed)		N/A
Resident and Community Outreach Inc. Ready.gov		N/A
Exclude critical infrastructure from SFHA		N/A
Elevate Residences or Property Protection through HMA grants		N/A
Grant Officials		N
Natural Systems Protection		1
Natural or Cultural Resources Inventory		1
Open Space		1
Parks and Recreation		N
Living Shorelines Program		N/A
Stormwater Management and Water Quality Programs		
Stormwater Management Plan		1
Total Daily Maximum Load (TMDL) Stream Segments**		Y
Watershed Improvement Plans***		Y
Erosion or Sediment Control Program		
Erosion and Sediment Control Ordinances		1



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Appendix D: Capabilities Assessments

Programs and Capabilities	2017 Town of Montross	NEW 2023 Town of Montross
Floodplain Management		
RAFT Card (Resilience Adaptation Feasibility Tool)		N/A
Floodplain Administrator		1
Participates in NFIP		1
Year Joined NFIP		N/A
Effective FIRM Date		N/A
Additional Freeboard Requirements (inches)		N/A
LiMWA standards in High Hazard Coastal Areas		N/A
Participates in CRS		N
Emergency Operations Management		Y
Emergency Operations Plan		1
Local Government EOPs		1
Continuity of Operations Plan		N
Warning Sirens or warning alert systems		1
Evacuation Plans		1
Shelter and Family Re-Unification Plan		1
Special Needs Population Emergency Planning		1
Companion Animal Sheltering and Re-Unification Plan		1
Dedicated Emergency Management Website		1
Education Programs		1
School Facility Emergency Operations Plans		1
School Emergency Notification, Evacuation and Emergency Planning		1
College Campus Plans		N/A
College/University Emergency Notification, Evacuation and Emergency Planning		N/A
Tourism		3
Community Planner		1
**NOTE: Montross was not included in the capabilities assessment matrix in the 2017 plan.		



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Appendix E

Jurisdiction Mitigation Action Changes

Mitigation Action #	2017 Action	Change Type	Reason for Change	2023 Action
NNPDC-1	Support mitigation projects that will result in protection of public or private property from natural hazards. Eligible projects include but are not limited to: 1. Acquisition of Floodprone property 2. Elevation of Floodprone structures 3. Minor structural flood control projects 4. Relocation of structures from hazard prone areas 5. Retrofitting of existing buildings, facilities and infrastructure 6. Retrofitting of existing buildings and facilities for shelters 7. Critical infrastructure protection measures 8. Stormwater management improvements 9. Advanced warning systems and hazard gauging systems (weather radios, reverse-911, stream gauges, I-flows) 10. Targeted hazard education 11. wastewater and water supply system hardening and mitigation	Updated	Cleaned up the language and streamlined the terminology	Support mitigation projects that conform to the requirements of the HMA program in terms of eligibility for participation and projects.
NNPDC-2	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as comprehensive plans and capital improvement plans.	Updated	Reworded to clarify the purpose and intent.	Provide technical assistance to Northern Neck jurisdictions, to integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as comprehensive and resiliency plans, and capital improvement plans.
NNPDC-3	Promotion, education and implementation of nature-based resiliency practices. Eligible projects include but are not limited to: 1. Ecosystem restoration approaches such as ecological restoration or forest and wetland landscape restoration. 2. Issue-specific	Broken into 2 mitigation actions.	Reworded # 3 and reference New #5 for new mitigation action separated from #3.	Promote practices implementing nature-based approaches that increase regional resiliency. Projects sought include but are not limited to: Ecosystem restoration and adaptation, green infrastructure, and ecosystem-based approaches addressing



Northern Neck Regional Hazard Mitigation Plan
Appendix E: Mitigation Action Changes

	ecosystem related approaches such as ecosystem-based adaptation and mitigation, climate adaptation and ecosystem-based disaster risk reduction. 3. Infrastructure related approaches such as green and blue infrastructure. 4. Ecosystem-based management approaches such as integrated coastal zone and water resources management. 5. Ecosystem protection approaches such as area- based conservation and protected area management.			climate change, coastal resources, and conservation of protected areas.
NNPDC-4	Promote and grow the Living Shoreline Initiative in both its Non- structural and Combined structural/non-structural aspects. Actions taken may include, but are not limited to, grading land away from eroding shoreline, maintain riparian buggar adjacent to shorelines, and complement with other stormwater management (rain barrels, rain garden, conservation landscaping).	Updated	Updated the terminology and corrected grammar issues.	Promote and grow the Living Shoreline Initiative in both its Non- structural and Combined structural/non-structural aspects. Utilize techniques such as grading land away from eroding shoreline, maintaining, and upgrading riparian buffers adjacent to shorelines, and implementing green infrastructure and stormwater management improvements.
NNPDC-5		New	Broken into a separate action from action #3.	Seek data sources and educational opportunities that increase regional hazards awareness and provide additional knowledge to jurisdictional personnel that will be applied to project building and initiation.
NNPDC-6		New	NEW to match a regional intent of support to the jurisdictions' actions with similar intent. These initiatives have been occurring and the intent of this addition is to ensure expansion.	Expand upon current and create new public outreach activities. Utilize the PDC's website to advise citizens and visitors of local natural hazard risks, encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information" (PPI) Committee to assist with educating, distribution, and management. (*PPI is a suggestion under Activity 322 in the CRS Manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.



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Mitigation Action #	2017 Action	Change Type	Reason for Change	2023 Action
Lancaster -1	The publication projects that will result in protection of public or private property from natural hazards. Eligible projects include, but are not limited to 1. Acquisition of flood prone property 2. elevation of flood prone structures 3. Minor structural flooding control projects 4. Relocation of structures from hazard prone areas 5 retrofitting of existing buildings, facilities, infrastructure 6. Retrofitting of existing buildings and facilities for shelters 7. Critical infrastructure 8. Protection measures, stormwater management improvements 9 Advanced warning systems and hazard gauging systems (weather radios, reverse 911, stream gauges. I-Flows.) 10. Targeted hazard education 11. Wastewater and water supply system hardening and mitigation	Updated.	Cleaned up the language and streamlined the purpose of the action.	Support mitigation projects that conform to the requirements of the HMA program in terms of eligibility for participation and projects.
Lancaster-3	Incorporate hazard mitigation techniques into new community facilities to minimize damages.	Updated.	Clarified language and incorporated FEMA and RAFT recommendations.	Research and incorporate additional mitigation techniques into community spaces that will further protect flood zones, increase green space, and improve stormwater drainage capacity - Discouraging items such as impermeable surfaces, the disturbance of natural vegetation, or penetration into the floodplains with any structural development not meant to assist in retaining landforms.
Lancaster-4	Encourage use of vegetation and revetments.to reduce shoreline erosion.	Updated.	Combined # 4,5 and 15. The intent was similar for all.	plumbing sources to build nature-based shoreline stabilization strategies continue best management practices in shoreline erosion



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Appendix E: Mitigation Action Changes

				prevention and mandate that new subdivisions require coordinated shoreline protection plans.
Lancaster-5	Require coordinated joint protection plans in new waterfront subdivisions.	Deleted.	Combine # 4 ,5 and 15. The intent was similar for all.	N/A
Lancaster-7	Identify existing prone structures that may benefit from mitigation measures such as elevation.	Updated.	Expanded and clarified language and intent. Change priority to high. Added property protection and structural to project type.	Identify areas of repetitive loss and severe repetitive loss structures to seek appropriate improvements underage and make guidelines.
Lancaster-8	Encourage waterfront property owners in existing communities to consider multi parcel shoreline protection strategies before they pursue individual approaches.	Updated.	Altered wording.	Encourage waterfront property owners in existing communities to consider community-based type parcel shoreline protection strategies before they pursue individual approaches.
Lancaster-9	Work with VDOT to evaluate at risk roads and implement mitigation measures. (e.g., elevation redesign).	Removed.	Not a County responsible action.	N/A
Lancaster-10	Work with private property owners VDOT and private utilities to trim or remove trees that could down power lines.	Removed.	Not a County responsible action.	N/A
Lancaster-11	Identify training opportunities for staff to chance ability to use GIS for Emergency Management needs.	Updated.	GIS actions have been initiated. Action altered to model the current objectives	Continue.to upgrade and expand the current GIS capabilities, training, and resources throughout the community.
Lancaster-12	Identify means to coordinate, collect and store damage assessment data in GIS format for each natural hazard event that causes death, injury or property damage.	Removed.	Completed and ongoing actions are covered in #11.	N/A
Lancaster-13	Consider participating in FEMA"s community rating system. (CRS)	Updated.	Reworded to encompass the	Seek further improvements to hazard mitigation elements that enable the



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			next actions towards possible CRS. Some actions have been completed or initiated since the 2017 update.	community to become eligible for CRS participation.
Lancaster-14	Continue to enforce zoning and building codes to prevent construction within the floodplain.	Removed.	Not a mitigation action goal.	N/A
Lancaster-15	Develop vegetative planning programs for public shoreline property to serve as a model for public education purposes.	Removed.	Combined with number 4 and #5 due to similar objectives and goals.	N/A
Lancaster-16	Encourage the purchase of flood and or sewer backup insurance.	Removed.	Not a mitigation action goal. And education for such is integrated in new education and outreach goal action.	N/A
Lancaster- 17	Educate residents about flood insurance and ICC (Increased Cost of Compliance) Coverage.	Removed.	Integrated into new education and outreach goal action.	N/A
Lancaster.18	Prepare an advisory pamphlet and distribute to occupants of housing units or businesses known to be in the floodplain, advising them of potential hazards in the area and of evacuation plans in the event of an emergency.	Removed.	Integrated into new education and outreach goal action.	N/A
Lancaster-19	Encourage the purchase and training on the use of NOAA. Radios. Provide NOAA radios to public facilities.	Updated.	Action has been initiated. Some equipment purchased. Action updated to reflect progress.	Expand the purchase and training on the use of NOAA radios. Provide NOAA radios to public facilities.



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Lancaster-20	Maintain a voluntary agreement with FEMA to participate in the NF IP.	Removed.	This is a mandatory action for NFP participants and not a mitigation Goal action.	N/A
Lancaster-21	Maintain a publicly available copy of the effective flood insurance Rate map. (FIRM) and flood insurance study. (FIS). Support local request for updates when available.	Removed.	This is not a mitigation goal action. This is a requirement.	N/A
Lancaster-22	Adopt the most current DFIRM or FIRM and FIS as they become available.	Removed.	This is not a mitigation goal action. This is a requirement.	N/A
Lancaster-23	Share with FEMA any new technical or scientific data that may result in map revisions within six months of creation or identification of new data.	Removed.	This is not a mitigation goal action. This is a requirement.	
Lancaster-24	Assess local floodplain determination and maintain a record of approved changes to the local floodplain.	Removed.	Action has become obsolete with the implementation of FEMA 2.0 Tool.	N/A
Lancaster-25	Adopt or maintain a floodplain management ordinance that, at minimum, regulates the following. Issue permits for all proposed developments in the SFHA. Obtain review and utilize any base flood, elevation and floodway data and require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres. Identify measures to keep all new and substantially improved construction reasonably safe from flood to or above the BFE, including anchoring using flood resistant materials. Designing or locating utilities and service facilities to prevent water damage.	Altered.	The action has been initiated. The completed portion has been moved to completed. The ongoing portion has been retained.	Document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures.



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Lancaster-26	Enforce the floodplain management ordinance by monitoring compliance and taking remedial action to correct violations.	Removed.	This is not a mitigation goal action. It is a requirement, and the County has expanded staffing to better accomplish this task.	N/A
Lancaster-27	Consider adoption of activities that extend beyond the minimum requirements, including those identified for participation in the Community rating system, freeboard prohibition of production or storage of chemicals in the SFHA. Prohibition of certain types of structures, such as hospitals, nursing homes, jails; prohibition of certain types of residential houses, such as manufactured homes and finally floodplain ordinances that now prohibit any new residential or non-residential structures in the SFHA.	Removed.	Objective and intent have been addressed in other actions and some of this has been completed with the RAFT and CRS actions.	N/A
Lancaster-28	Educate community members about the availability and value of flood insurance.	Removed.	County is not responsible for availability of flood insurance, and education is included in the new. Education and outreach action goal.	N/A
Lancaster-30	Provide general assistance to community members relating to insurance issues.	Removed.	County is not responsible for availability of flood insurance, and education is included in the new education and	N/A



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			outreach action goal.	
Lancaster-31	N/A	NEW	Created a new all-encompassing education and outreach action goal. Note: This is a CRS qualifying activity.	Expand upon current and create new public outreach activities. Utilize the jurisdictions website to advise citizens and visitors of local natural hazard risks, Encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information Committee" (PPI) to assist with educating, distribution, and management. (*PPI is a suggestion under Activity 322 in the CRS manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.
Lancaster- 32	N/A	NEW	New mitigation action created from RAFT Scorecard recommendations.	Seek funding for and implement early warning signals/ systems/emergency warning tools for residents with increased attention to vulnerable populations.
Lancaster-33	N/A	NEW	New mitigation action created from RAFT Scorecard recommendations.	develop a resident emergency preparedness plan that identifies risk and needs, including knowledge of water safety.
Lancaster-New	N/A	NEW	New mitigation action created from HHPD section and recognition of HHPD in jurisdiction	Seek education and funding to initiate a program that will organize investigations and risk assessments that will utilize FEMA's risk prioritization methodology to define the HHPDs within the Region.
Mitigation Action #	2017 Action	Change Type	Reason for Change	2023 Action
Irvington-1	Support mitigation projects that will result in protection of public or private property from	Altered.	Cleaned up language and streamlined the	Support mitigation projects that conform to the requirements of the HMA programs in terms of eligibility for participation in projects.



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	natural hazards. Eligible projects include but are not limited to 1. Acquisition of flood prone property 2. Elevation of flood prone structures 3. Minor structural flood control projects 4. Relocation of structures from hazard prone areas 5. Retrofitting of existing buildings, facilities, and infrastructure 6. Retrofitting of existing buildings and facilities for shelters 7. Critical infrastructure protection measures 8. Stormwater management improvements 9. Advanced warning systems and hazard gauging systems (weather radios, reverse-911, stream gauges, I-flows) 10. Targeted hazard education 11. wastewater and water supply system hardening and mitigation.		purpose of this action.	
Irvington-3	N/A	NEW	Created a new all-encompassing education and outreach action goal. Note: This is a CRS qualifying activity.	Expand upon current and create new public outreach activities. Utilize the jurisdiction's website to advise citizens and visitors of local natural hazard risks, encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information" (PPI) Committee to assist with educating, distribution, and management. (*PPI is a suggestion under Activity 322 in the CRS Manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.
Irvington-4	N/A	NEW	New mitigation action created from RAFT Scorecard recommendations.	Seek funding for and implement early warning signals/systems/emergency warning tools for residents with increased attention to vulnerable populations.



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Irvington-5	N/A	NEW	New mitigation action.	Seek funding to assess and subsequently improve stormwater management capabilities. Open
Mitigation Action #	2017 Action	Change Type	Reason for Change	2023 Action
Kilmarnock-1	Avoid establishing public service facilities and utilities, such as wastewater disposal facilities, within or near the Floodplain where they might create a hazard if damaged during a storm.	Removed.	This is an ordinance, not a future action goal.	N/A
Kilmarnock-2	Incorporate hazard mitigation techniques into new community facilities to minimize damages.	Updated.	Action has been initiated and Status has changed to ongoing.	N/A
Kilmarnock- 3	Investigate all critical community facilities, such as county administrative offices, shelters (non-school buildings), fire stations, and police stations, to evaluate their resistance to flood and wind hazards. Particular attention will be given to the HY AC systems and structural integrity of the buildings. Prioritize facilities in known hazard areas (e.g., floodplains).	Removed.	Action has been integrated. With other action goals. The intent was similar.	N/A
Kilmarnock-4	Implement a ditch maintenance program consisting of routine inspections and subsequent debris removal.	Removed.	This is VDOT's responsibility not the County's.	N/A
Kilmarnock-5	Initiate discussion with private utility companies to incorporate mitigation measures into new and existing development and any infrastructure repairs.	Removed.	Not an applicable action currently.	N/A
Kilmarnock-6	Replace traffic lights hung from wires with traffic lights hung from mast arms. Install all new traffic lights on mast arms. Ensure traffic light mechanisms are weatherproof.	Removed.	Not an applicable action currently.	N/A



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Kilmarnock-7	Identify a program of corrective actions to improve stormwater systems capacity to handle major rain events.	Altered.	Combined multiple actions with the same intent.	Seek funding to assess and subsequently improve stormwater management capabilities. Identify a program of corrective actions to improve stormwater systems capacity to handle major rain events.
Kilmarnock-8	Develop a Continuity of Operations Plan.	Removed.	Not a mitigation plan action.	N/A
Kilmarnock-9	Consider participating in FEMA's Community Rating System (CRS).	Removed	Removed. Not a feasible action currently with lack of resources.	N/A
Kilmarnock-10	Include an assessment and associated mapping of the jurisdiction's vulnerability to location specific hazards and make appropriate recommendations for the use of these hazard areas in the next comprehensive plan.	Removed	Removed – this would be accomplished during the stormwater management study.	N/A
Kilmarnock-11	Investigate using non-conforming or substantial damage provision to require hazard retrofitting of existing development.	Removed	Not a mitigation plan action.	N/A
Kilmarnock-12	Encourage the purchase of flood and/or sewer back-up insurance.	Removed	County is not responsible for availability of flood insurance, and education is included in the new. Education and outreach action goal.	N/A
Kilmarnock-13	Educate residents about flood insurance and ICC (Increased Cost of Compliance) Coverage.	Removed	County is not responsible for availability of flood insurance, and education is included in the	N/A



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			new. Education and outreach action goal.	
Kilmarnock-14	Encourage the purchase and training on the use of NOAA radios. Provide NOAA radios to public facilities.	Removed.	Not an applicable action for locality.	N/A
Kilmarnock-15	Maintain a publicly available copy of the effective Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS), Support local requests for map updates when available.	Removed	This is a requirement not a mitigation action goal.	N/A
Kilmarnock-16	Adopt the most current DFIRM or FIRM and FIS as they become available.	Removed	This is a requirement, not a mitigation action goal.	N/A
Kilmarnock-17	Share with FEMA any new technical or scientific data that may result in map revisions within six months of creation or identification of new data.	Removed	This is a requirement, not a mitigation action goal.	N/A
Kilmarnock-18	Assist with local floodplain determinations and maintain a record of approved changes to the local Floodplain.	Removed.	Obsolete with FEMA's 2.0 tool.	N/A
Kilmarnock-19	Adopt or maintain a floodplain management ordinance that at a minimum regulates the following: Issue permits for All proposed developments in the SFHA, Obtain, review, and utilize any base flood elevation and Floodway data, and require BFE data for subdivisions proposals and other development proposals larger than 50 lots or 5 acres; Identify measures to keep All new and substantially improved construction reasonably safe from flood to or above the Base Flood Elevation (BFE), including anchoring, using flood resistant materials, designing or locating utilities, and service facilities to prevent water damage; Document and maintain records of elevation data that document	Altered	Action has been initiated and is ongoing – portions completed removed and ongoing portions.	Document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures.



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	lowest floor elevation for new or substantially improved structures.			
Kilmarnock-20	Enforce the ordinance by monitoring compliance and taking remedial action to correct violations.	Removed	This is a requirement, not a mitigation action goal.	N/A
Kilmarnock-21	Consider adoption of activities that extend beyond the minimum requirements, including those identified for participation in the Community Rating System, freeboard, prohibition of production or storage of chemicals in SFHA, prohibition of certain types of structures such as: hospitals, nursing homes, jails, prohibition of certain types of residential housing such as manufactured homes, and finally floodplain ordinances, that prohibit any new residential or non-residential structures in the SFHA.	Removed	Moved to completed.	N/A
Kilmarnock-22	Educate community members about the availability and value of flood insurance.	Removed	Integrated into new education and outreach goal action.	N/A
Kilmarnock-23	Inform community property owners about changes to the DFIRM/FIRM that may impact their insurance rates.	Removed	Integrated into new education and outreach goal action.	N/A
Kilmarnock-24	Provide general assistance to community members relating to insurance issues.	Removed	Town is not responsible for insurance and education/outreach action covers the education intent.	N/A
Kilmarnock-25	Support mitigation projects that will result in protection of public or private property from natural hazards. Eligible projects include but are not limited to 1. Acquisition of flood prone property	Altered	Cleaned up language and streamlined the purpose of this action.	Support mitigation projects that conform to the requirements of the HMA program in terms of eligibility for participation and projects.



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	2. Elevation of flood prone structures 3. Minor structural flood control projects 4. Relocation of structures from hazard prone areas 5. Retrofitting of existing buildings, facilities, and infrastructure 6. Retrofitting of existing buildings and facilities for shelters 7. Critical infrastructure protection measures 8. Stormwater management improvements 9. Advanced warning systems and hazard gauging systems (weather radios, reverse-911, stream gauges, I-flows) 10. Targeted hazard education 11. wastewater and water supply system hardening and mitigation.			
Kilmarnock-26	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms and comprehensive plans, and capital improvement plans.	Altered	Altered for the inclusion of resiliency.	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as resiliency and comprehensive plans, and capital improvement plans.
Kilmarnock-NEW	N/A	NEW	Created a new all-encompassing education and outreach action goal. Note: This is a CRS qualifying activity.	Expand upon current and create new public outreach activities. Utilize the jurisdiction's website to advise citizens and visitors of local natural hazard risks, encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information" (PPI) Committee to assist with educating, distribution, and management. (*PPI is a suggestion under Activity 322 in the CRS Manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.
Kilmarnock-NEW	N/A	NEW	Combined and updated for stormwater management.	Seek funding to assess and subsequently improve stormwater management capabilities.



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Kilmarnock-NEW	N/A	NEW	New mitigation action created from RAFT Scorecard recommendations.	Create open communication, education, and planning opportunities between emergency management and the business sector during severe weather emergencies or evacuations.
Mitigation Action #	2017 Action	Change Type	Reason for Change	2023 Action
White Stone-1	Support mitigation projects that will result in protection of public or private property from natural hazards. Eligible projects include but are not limited to 1. Acquisition of flood prone property 2. Elevation of flood prone structures 3. Minor structural flood control projects 4. Relocation of structures from hazard prone areas 5. Retrofitting of existing buildings, facilities, and infrastructure 6. Retrofitting of existing buildings and facilities for shelters 7. Critical infrastructure protection measures 8. Stormwater management improvements 9. Advanced warning systems and hazard gauging systems (weather radios, reverse-911, stream gauges, I-flows) 10. Targeted hazard education 11. wastewater and water supply system hardening and mitigation.	Altered	Cleaned up language and streamlined the purpose of this action.	Support mitigation projects that conform to the requirements of the HMA program in terms of eligibility for participation and projects.
White Stone-2	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms and comprehensive plans, and capital improvement plans.	Altered	Altered for the inclusion of resiliency.	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as comprehensive and resiliency plans, and capital improvement plans.
White Stone-3	Avoid establishing public service facilities and utilities, such as wastewater disposal facilities,	Removed	Completed action.	N/A



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	within or near the floodplain where they might create a hazard if damaged during a storm.			
White Stone-4	Incorporate hazard mitigation techniques into new community facilities to minimize damages.	Altered	Action initiated and ongoing – altered to reflect.	Seek new and continue incorporating hazard mitigation techniques into new community facilities to minimize damages, such as the new wastewater treatment facility and backup electricity. Continuing Phases of project.
White Stone-5	Investigate All critical community facilities, such as county administrative offices, shelters (non-school buildings), fire stations, and police stations, to evaluate their resistance to flood and wind hazards. Particular attention will be given to the HVAC systems and structural integrity of the buildings. Prioritize facilities in known hazard areas (e.g., floodplains)	Removed	Integrated in Action #7 and #8 due to similar intents.	N/A
White Stone-6	Evaluate exiting storm water system to determine if it is adequate for existing (or future) flood hazards.	Altered	Additional intent to upgrade is added.	Evaluate exiting storm water system to determine if it is adequate for existing (or future) flood hazards and plan for upgrades.
White Stone-7	Identify need for backup generators, communications and/or vehicles at critical public facilities. Develop means to address shortfalls identified.	Altered	Clarified and integrated with other actions due to similar intent.	Seek funding to identify needs and execute needed upgrades to retrofit critical infrastructure buildings with emergency utility backups.
White Stone-8	Consider providing necessary electrical hook-up, wiring, and switches to allow readily accessible connections to emergency generators at selected critical public facilities.	Removed	Integrated with other actions of similar intent.	N/A
White Stone-9	Encourage the purchase of flood and/or sewer back-up insurance.	Removed	County is not responsible for availability of flood insurance, and education is included in the new. Education and outreach action goal.	N/A



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White Stone-10	Develop and implement a ditch maintenance program consisting of routine inspections and subsequent debris removal.	Altered	Initiated and ongoing action – altered to reflect	Continue with a ditch maintenance program consisting of routine inspections and subsequent debris removal to reduce the risk of pluvial flooding events.
White Stone-11	Identify program of corrective actions to improve stormwater systems capacity to handle major rain events.	Removed	Integrated with actions of similar intent - #6.	N/A
White Stone-12	Continue to enforce zoning and building codes to prevent construction within the floodplain.	Removed	This is a requirement, not a mitigation action goal.	N/A
White Stone-NEW	N/A	NEW	Created a new all-encompassing education and outreach action goal. Note: This is a CRS qualifying activity.	Expand upon current and create new public outreach activities. Utilize the jurisdiction's website to advise citizens and visitors of local natural hazard risks, encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information" (PPI) Committee to assist with educating, distribution, and management. (*PPI is a suggestion under Activity 322 in the CRS Manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.
White Stone-NEW	N/A	NEW	New mitigation action created from RAFT Scorecard recommendations.	Research and seek funding for upgrades to communications that would include early warning signals/systems/emergency warning tools for residents with increased attention to vulnerable populations.
Mitigation Action #	2017 Action	Change Type	Reason for Change	2023 Action
Northumberland-1	Incorporate hazard mitigation techniques into new community facilities to minimize damages.	Altered	Expanded and integrated with actions of similar intent.	Research and incorporate additional mitigation techniques into community spaces that will further protect flood zones, increase green-space, and improve stormwater drainage capacity, discouraging items such as impermeable surfaces, the disturbance of



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				natural vegetation, or penetration into the floodplains with any structural development not meant to assist in retaining landforms.
Northumberland-2	Encourage use of vegetation and revetments to reduce shoreline erosion.	Altered	Expanded and priority upgraded to HIGH.	Seek funding sources to build nature-based shoreline stabilization strategies. Continue best management practices in shoreline erosion prevention, and mandate that new subdivisions require coordinated shoreline protection plans.
Northumberland-4	Consider implementing a wetlands acquisition and /or restoration program.	Altered	Expanded	Engage in a wetlands acquisition and /or restoration program with Wetlands Watch and other conservation partners.
Northumberland-5	Increase enforcement and education regarding the tie down of propane and other fuel tanks	Removed	Fuel tank security is mandated by fuel companies in installation and the education is integrated into new education and outreach action.	N/A
Northumberland-6	Identify existing flood prone structures that may benefit from mitigation measures such as elevation.	Removed	Integrated with actions of similar intent.	N/A
Northumberland-7	Encourage waterfront property owners in existing communities to consider multi-parcel shoreline protection strategies before they pursue individual approaches.	Altered	Clarified wording	Encourage waterfront property owners in existing communities to consider community-based multi-parcel shoreline protection strategies before they pursue individual approaches.
Northumberland-8	Work with VDOT to evaluate at-risk roads and implement mitigation measures (e.g., elevation, redesign).	Altered	Added "prevention" to project types.	N/A
Northumberland-10	Encourage the purchase of flood and/or sewer back-up insurance.	Removed	County is not responsible for availability of flood insurance, and education is	N/A



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			included in the new education and outreach action goal.	
Northumberland-11	Educate residents about flood insurance and ICC (Increased Cost of Compliance) Coverage.	Removed	County is not responsible for availability of flood insurance, and education is included in the new education and outreach action goal.	N/A
Northumberland-12	Prepare an advisory pamphlet and distribute to occupants of housing units or businesses known to be in the floodplain advising them of the potential hazards in the area and of evacuation plans in the event of an emergency.	Removed	Integrated into the new education and outreach action goal.	N/A
Northumberland-15	Adopt the most current FIRM maps and FIS as they become available.	Removed	This is a requirement, not a mitigation action goal.	N/A
Northumberland-16	Share with FEMA any new technical or scientific data that may result in map revisions within six months of creation or identification of new data.	Removed	This is a requirement, not a mitigation action goal.	N/A
Northumberland-17	Assist with local floodplain determinations and maintain a record of approved changes to the local Floodplain.	Altered	Added "property protection" to project types.	N/A
Northumberland-18	Adopt or maintain a floodplain management ordinance that at a minimum regulates the following: Issue permits for All proposed developments in the SFHA, Obtain, review, and utilize any base flood elevation and Floodway data, and require BFE data for subdivisions proposals and other development proposals	Altered	Action has been initiated and is ongoing. Portions moved to complete and ongoing portion retained.	Document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures.



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	larger than 50 lots or 5 acres; Identify measures to keep all new and substantially improved construction reasonably safe from flood to or above the Base Flood Elevation (BFE), including anchoring , using flood resistant materials, designing, or locating utilities, and service facilities to prevent water damage; Document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures.			
Northumberland-19	Enforce the ordinance by monitoring compliance and taking remedial action to correct violations.	Removed	This is a requirement, not a mitigation action goal,	N/A
Northumberland-21	Educate community members about the availability and value of flood insurance.	Removed	County is not responsible for availability of flood insurance, and education is included in the new education and outreach action goal.	N/A
Northumberland-22	Provide general assistance to community members relating to insurance issues.	Removed	County is not responsible for availability of flood insurance, and education is included in the new education and outreach action goal.	N/A
Northumberland-23	Support mitigation projects that will result in protection of public or private property from	Altered	Cleaned up language and streamlined the	Support mitigation projects that conform to the requirements of the HMA program in



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	natural hazards. Eligible projects include but are not limited to 1. Acquisition of flood prone property 2. Elevation of flood prone structures 3. Minor structural flood control projects 4. Relocation of structures from hazard prone areas 5. Retrofitting of existing buildings, facilities and infrastructure 6. Retrofitting of existing buildings and facilities for shelters 7. Critical infrastructure protection measures 8. Stormwater management improvements 9. Advanced warning systems and hazard gauging systems (weather radios, reverse-911, stream gauges, I-flows) 10. Targeted hazard education 11. wastewater and water supply system hardening and mitigation.		purpose of this action.	terms of eligibility for participation and projects.
Northumberland-24	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as comprehensive, and capital improvement plans.	Altered	Integrated resiliency and changed priority to MEDIUM.	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as comprehensive and resiliency plans, and capital improvement plans.
Northumberland-25	Maintain an Emergency Notification System for citizens (Code Red) which upon voluntary subscription, will notify if an NWS severe weather alert is activated within the County.	Removed	Completed	N/A
Northumberland-NEW	N/A	NEW	Created a new all-encompassing education and outreach action goal. Note: This is a CRS qualifying activity.	Expand upon current and create new public outreach activities. Utilize the jurisdiction's website to advise citizens and visitors of local natural hazard risks, encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information" (PPI) Committee to assist with educating, distribution, and management.



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				(*PPI is a suggestion under Activity 322 in the CRS Manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.
Northumberland-NEW	N/A	NEW	NEW	Seek further improvements to hazard mitigation elements that will enable the community to become eligible for CRS participation.
Northumberland-NEW	N/A	NEW	New mitigation action created from RAFT Scorecard recommendations.	Develop a resident emergency preparedness plan that identifies risks and needs, including knowledge of water safety.
Mitigation Action #	2017 Action	Change Type	Reason for Change	2023 Action
Richmond-1	Support mitigation projects that will result in protection of public or private property from natural hazards. Eligible projects include but are not limited to 1. Acquisition of flood prone property 2. Elevation of flood prone structures 3. Minor structural flood control projects 4. Relocation of structures from hazard prone areas 5. Retrofitting of existing buildings, facilities and infrastructure 6. Retrofitting of existing buildings and facilities for shelters 7. Critical infrastructure protection measures 8. Stormwater management improvements 9. Advanced warning systems and hazard gauging systems (weather radios, reverse-911, stream gauges, I-flows) 10. Targeted hazard education 11. wastewater and water supply system hardening and mitigation.	Altered	Cleaned up language and streamlined the purpose of this action.	Support mitigation projects that conform to the requirements of the HMA program in terms of eligibility for participation and projects.



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Richmond-2	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as comprehensive, and capital improvement plans.	Altered	Integrated resiliency.	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as comprehensive and resiliency plans, and capital improvement plans.
Richmond-3	Consider implementing a wetlands acquisition and /or restoration program.	Altered	Expanded and clarified intent.	Engage in a wetlands acquisition and /or restoration program with Wetlands Watch and other conservation partners.
Richmond-4	Encourage waterfront property owners in existing communities to consider multi-parcel shoreline protection strategies before they pursue individual approaches.	Altered	Clarified wording	Encourage waterfront property owners in existing communities to consider community-based multi-parcel shoreline protection strategies before they pursue individual approaches.
Richmond-5	Work with VDOT to evaluate at-risk roads and implement mitigation measures (e.g., elevation, redesign).	Removed	Not a County level responsibility but VDOT's.	N/A
Richmond-6	Seek training opportunities for staff to enhance GIS ability emergency management needs.			Continue to seek training opportunities for staff to enhance current GIS capabilities within the jurisdiction.
Richmond-7	Evaluate the floodplain manager's roles and responsibilities in each local jurisdiction.	Removed	This is a requirement, not a mitigation action goal.	N/A
Richmond-8	Identify means to coordinate, collect and store damage assessment data in GIS format for each natural hazard event that causes death, injury, and/or property damage.	Removed	Completed	N/A
Richmond-9	Evaluate the potential costs versus benefits of implementing a freeboard requirement for all new structures within the 100-year floodplain.	Removed	Completed	N/A
Richmond-10	Investigate implementation of cumulative damage provision as part of Floodplain ordinance.	Removed	This is a requirement, not a mitigation action goal.	N/A



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Richmond-11	Share with FEMA any new technical or scientific data that may result in map revisions within six months of creation or identification of new data.	Removed	This is a requirement, not a mitigation action goal.	N/A
Richmond-12	Adopt or maintain a floodplain management ordinance that at a minimum regulates the following: Issue permits for All proposed developments in the SFHA, Obtain, review, and utilize any base flood elevation and Floodway data, and require BFE data for subdivisions proposals and other development proposals larger than 50 lots or 5 acres; Identify measures to keep all new and substantially improved construction reasonably safe from flood to or above the Base Flood Elevation (BFE), including anchoring, using flood resistant materials, designing, or locating utilities, and service facilities to prevent water damage; Document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures.	Altered	Action has been initiated and is ongoing. Portions moved to complete and ongoing portion retained.	Document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures.
Richmond-13	Enforce the ordinance by monitoring compliance and taking remedial action to correct violations.	Removed	This is a requirement, not a mitigation action goal.	N/A
Richmond-14	Inform community property owners about changes to the FIRM that may impact their insurance rates.	Removed	This is a requirement, not a mitigation action goal.	N/A
Richmond-15	Provide general assistance to community members relating to insurance issues.	Removed	County is not responsible for availability of flood insurance, and education is included in the new education and	N/A



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Appendix E: Mitigation Action Changes

			outreach action goal.	
Richmond-NEW	N/A	NEW	Created a new all-encompassing education and outreach action goal. Note: This is a CRS qualifying activity.	Expand upon current and create new public outreach activities. Utilize the jurisdiction's website to advise citizens and visitors of local natural hazard risks, encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information" (PPI) Committee to assist with educating, distribution, and management. (*PPI is a suggestion under Activity 322 in the CRS Manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.
Richmond-NEW	N/A	NEW	New mitigation action created from RAFT Scorecard recommendations.	Develop a resident emergency preparedness plan that identifies risks and needs, including knowledge of water safety.
Richmond-NEW	N/A	NEW	New mitigation action created from RAFT Scorecard recommendations.	Identify funding for non-CIP coastal resilience projects, including priority needs of vulnerable populations.
Mitigation Action #	2017 Action	Change Type	Reason for Change	2023 Action
Warsaw-1	Support mitigation projects that will result in protection of public or private property from natural hazards. Eligible projects include but are not limited to 1. Acquisition of flood prone property 2. Elevation of flood prone structures 3. Minor structural flood control projects 4. Relocation of structures from hazard prone areas	Altered	Cleaned up language and streamlined the purpose of this action.	Support mitigation projects that conform to the requirements of the HMA program in terms of eligibility for participation and projects.



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	5. Retrofitting of existing buildings, facilities and infrastructure 6. Retrofitting of existing buildings and facilities for shelters 7. Critical infrastructure protection measures 8. Stormwater management improvements 9. Advanced warning systems and hazard gauging systems (weather radios, reverse-911, stream gauges, I-flows) 10. Targeted hazard education 11. wastewater and water supply system hardening and mitigation.			
Warsaw-2	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as comprehensive, and capital improvement plans.	Altered	Integrated resiliency.	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as comprehensive and resiliency plans, and capital improvement plans.
Warsaw-NEW	N/A	NEW	Created a new all-encompassing education and outreach action goal. Note: This is a CRS qualifying activity.	Expand upon current and create new public outreach activities. Utilize the jurisdiction's website to advise citizens and visitors of local natural hazard risks, encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information" (PPI) Committee to assist with educating, distribution, and management. (*PPI is a suggestion under Activity 322 in the CRS Manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.
Warsaw-NEW	N/A	NEW	New mitigation action created from RAFT Scorecard recommendations.	Seek funding for and implement early warning signals/systems/emergency warning tools for residents (especially vulnerable populations).



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Warsaw-NEW	N/A	NEW	New mitigation action created from RAFT Scorecard recommendations.	Develop a resident emergency preparedness plan that identifies risks and needs, including knowledge of water safety.
Mitigation Action #	2017 Action	Change Type	Reason for Change	2023 Action
Westmoreland - 1	Incorporate hazard mitigation techniques into new community facilities to minimize damages.	Altered	Updated wording and integrated with other actions of the same intent.	Research and incorporate additional mitigation techniques into community spaces that will further protect flood zones, increase green-space, and improve stormwater drainage capacity, discouraging items such as impermeable surfaces, the disturbance of natural vegetation, or penetration into the floodplains with any structural development not meant to assist in retaining landforms.
Westmoreland -3	Identify existing flood prone structures that may benefit from mitigation measures such as elevation.	Removed	Integrated with action #4	N/A
Westmoreland -4	Evaluate built-upon areas within the floodplain or along the high erosion risk shoreline for possible relocation and/or acquisition. Throughout the Northern Neck for possible relocation and/or buy-out.	Altered	Clarified wording and updated with integration of action #3	Evaluate built-upon areas within the floodplain or along the high erosion risk shoreline for possible relocation and/or acquisition targeting FEMA's Repetitive Loss Properties.
Westmoreland -5	Identify funding opportunities to replace vulnerable or undersized culvert stream crossing with bridges or larger culverts to reduce food hazards.	Removed	Completed	N/A
Westmoreland -6	Work with VDOT to evaluate at-risk roads and implement mitigation measures (e.g., elevation, redesign)	Removed	This is VDOT's responsibility, not an action for the county.	N/A
Westmoreland -7	Initiate discussion with private utility companies to incorporate mitigation measures into new and	Removed	Not a county responsibility.	N/A



Northern Neck Regional Hazard Mitigation Plan
Appendix E: Mitigation Action Changes

	existing development and any infrastructure repairs.			
Westmoreland -8	Identify training opportunities for staff to enhance ability to use GIS for emergency management needs.	Altered	Initiated and ongoing – updated to reflect.	Continue to upgrade and expand the current GIS capabilities, training, and resources throughout the community.
Westmoreland -9	Identify means to coordinate, collect and store damage assessment data in GIS format for each natural hazard event that causes death, injury, or property damage.	Removed.	Completed and ongoing actions are integrated in other actions.	N/A
Westmoreland -10	Consider participating in FEMA's Community Rating System (CRS).	Altered	Updated to be more applicable to current community situation.	Seek further improvements to hazard mitigation elements that will enable the community to become eligible for CRS participation.
Westmoreland -11	Continue to enforce zoning and building codes to prevent construction within the floodplain.	Removed	This is a requirement, not a mitigation action goal.	N/A
Westmoreland -12	Review and revise, if required, existing Subdivision Ordinances to include hazard mitigation-related development criteria to regulate the location and construction of buildings and other infrastructure in known hazard areas.	Removed	This is a requirement, not a mitigation action goal.	N/A
Westmoreland -13	Evaluate the potential costs versus benefits of continuing the freeboard requirement for all new structures within the 100-year floodplain.	Removed	This is a requirement, not a mitigation action goal.	N/A
Westmoreland -14	Encourage the purchase of flood and/or sewer back-up insurance.	Removed	County is not responsible for availability of flood insurance, and education is included in the new education and outreach action goal.	N/A



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Westmoreland -15	Educate residents about flood insurance and ICC (Increased Cost of Compliance) Coverage.	Removed	County is not responsible for availability of flood insurance, and education is included in the new education and outreach action goal.	N/A
Westmoreland -16	Prepare an advisory pamphlet and distribute to occupants of housing units or businesses known to be in the floodplain advising them of the potential hazards in the area and of evacuation plans in the event of an emergency.	Removed	New education and outreach action goal created.	N/A
Westmoreland -17	Maintain a voluntary agreement with FEMA to participate in the NFIP	Removed	This is a requirement, not a mitigation action goal.	N/A
Westmoreland -18	Maintain a publicly available copy of the effective Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS), Support local requests for map updates when available.	Removed	This is a requirement, not a mitigation action goal.	N/A
Westmoreland -19	Adopt the most current DFIRM or FIRM and FIS as they become available.	Removed	This is a requirement, not a mitigation action goal.	N/A
Westmoreland -20	Share with FEMA any new technical or scientific data that may result in map revisions within six months of creation or identification of new data.	Removed	This is a requirement, not a mitigation action goal.	N/A
Westmoreland -21	Assist with local floodplain determinations and maintain a record of approved changes to the local Floodplain.	Removed	This is a requirement, not a mitigation action goal.	N/A



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Westmoreland -22	Adopt or maintain a floodplain management ordinance that at a minimum regulates the following: Issue permits for All proposed developments in the SFHA, Obtain, review, and utilize any base flood elevation and Floodway data, and require BFE data for subdivisions proposals and other development proposals larger than 50 lots or 5 acres; Identify measures to keep all new and substantially improved construction reasonably safe from flood to or above the Base Flood Elevation (BFE), including anchoring, using flood resistant materials, designing, or locating utilities, and service facilities to prevent water damage; Document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures.	Altered	Action has been initiated and is ongoing. Portions moved to complete and ongoing portion retained.	Document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures.
Westmoreland -23	Enforce the ordinance by monitoring compliance and taking remedial action to correct violations.	Removed	This is a requirement, not a mitigation action goal.	N/A
Westmoreland -24	Consider adoption of activities that extend beyond the minimum requirements, including those identified for participation in the Community Rating System, freeboard, prohibition of production or storage of chemicals in SFHA, prohibition or certain types of structures such as: hospitals, nursing homes, jails, prohibition of certain types of residential housing such as manufactured homes, and finally floodplain ordinances, that prohibit any new residential or non-residential structures in the SFHA.	Removed	Not an applicable action to the County currently.	N/A
Westmoreland -25	Educate community members about the availability and value of flood insurance.	Removed	County is not responsible for availability of flood insurance, and	N/A



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			education is included in the new education and outreach action goal.	
Westmoreland-26	Inform community property owners about changes to the DFIRM/FIRM that may impact their insurance rates.	Removed	This is a requirement, not a mitigation action goal.	N/A
Westmoreland-27	Support mitigation projects that will result in protection of public or private property from natural hazards. Eligible projects include but are not limited to 1. Acquisition of flood prone property 2. Elevation of flood prone structures 3. Minor structural flood control projects 4. Relocation of structures from hazard prone areas 5. Retrofitting of existing buildings, facilities and infrastructure 6. Retrofitting of existing buildings and facilities for shelters 7. Critical infrastructure protection measures 8. Stormwater management improvements 9. Advanced warning systems and hazard gauging systems (weather radios, reverse-911, stream gauges, I-flows) 10. Targeted hazard education 11. wastewater and water supply system hardening and mitigation.	Altered	Cleaned up language and streamlined the purpose of this action.	Support mitigation projects that conform to the requirements of the HMA program in terms of eligibility for participation and projects.
Westmoreland-28	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as comprehensive, and capital improvement plans.	Altered	Integrated resiliency.	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as comprehensive and resiliency plans, and capital improvement plans.



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Westmoreland-29	Evaluate mitigation funding programs to seek a solution to and funding sources to plans with a focus to the Stratford Hall area erosion and cliff failure issues.	Altered	Clarified intent	Seek funding sources to build nature-based shoreline stabilization strategies. Continue best management practices in shoreline erosion prevention, and mandate that new subdivisions require coordinated shoreline protection plans with specific attention to the Stratford Hall area erosion and cliff failure issues.
Westmoreland-30	Work with VDOT and the Town of Colonial Beach to seek ingress and egress access issue solutions.	Removed	VDOT's responsibility, not the County.	N/A
Westmoreland-NEW	N/A	NEW	New mitigation action created from RAFT Scorecard recommendations.	Develop a resident emergency preparedness plan that identifies risks and needs, including knowledge of water safety.
Westmoreland-NEW	N/A	NEW	New action goal.	Continue to upgrade and expand the current GIS capabilities, training, and resources throughout the community.
Westmoreland-NEW	N/A	NEW	Created a new all-encompassing education and outreach action goal. Note: This is a CRS qualifying activity.	Expand upon current and create new public outreach activities. Utilize the jurisdiction's website to advise citizens and visitors of local natural hazard risks, encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information" (PPI) Committee to assist with educating, distribution, and management. (*PPI is a suggestion under Activity 322 in the CRS Manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.
Westmoreland-New	N/A	NEW	New mitigation action created from HHPD section and recognition of	Seek education and funding to initiate a program that will organize investigations and risk assessments that will utilize FEMA's risk prioritization methodology to define the HHPDs within the Region.



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Appendix E: Mitigation Action Changes

			HHPD in jurisdiction	
Mitigation Action #	2017 Action	Change Type	Reason for Change	2023 Action
Colonial Beach-1	Increase enforcement and education regarding the tie down of propane and other fuel tanks	Removed	Tank security is mandated by the fuel companies and education is integrated into new education and outreach action goal.	N/A
Colonial Beach-2	Evaluate exiting storm water system to determine if it is adequate for existing (or future) flood Hazards.	Removed	Completed	N/A
Colonial Beach-3	Develop and implement a ditch program consisting of routine inspections and subsequent debris removal.	Altered	Altered and updated to include initiation and integrate other actions with similar intent.	Expand upon the stormwater management program consisting of routine inspections and subsequent debris removal and consider additions of culverts where applicable.
Colonial Beach-4	Identify program of corrective actions to shoreline protection measures.	Altered	Updated and expanded to integrate actions with similar intent.	Identify program of corrective actions to improve shoreline preservation and protection measures.
Colonial Beach-5	Develop a detailed building inventory for all structures in the jurisdiction, which catalogues information such as value of the structure, contents, age, location (latitude and longitude), etc.	Removed	Completed	N/A
Colonial Beach-6	Continue to enforce zoning and building codes to prevent construction within the floodplain.	Removed	This a requirement, not a mitigation action goal.	N/A



Northern Neck Regional Hazard Mitigation Plan
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Colonial Beach-7	Include an assessment and associated mapping of the jurisdiction's vulnerability to location specific hazards and make appropriate recommendations for the use of these hazard areas in the next comprehensive plan.	Removed	Removed, this would be accomplished during the stormwater management study.	N/A
Colonial Beach-8	Investigate using non-conforming or substantial damage provision to require hazard retrofitting of existing development.	Removing	This is an ordinance, not a mitigation action goal.	N/A
Colonial Beach-9	Publicize the location of local shelters and emergency phone numbers. Include a map of shelters in local phonebooks or on county websites.	Removed	Integrated into the new education and outreach action goal.	N/A
Colonial Beach-10	Encourage the purchase and training on the use of NOAA radios. Provide NOAA radios to public facilities.	Removed	Not an applicable action to the town currently.	N/A
Colonial Beach-11	Investigate, develop, or enhance a regional public notification system such as low power FM or AM radio.	Removed	Outdated action goal, no longer applicable.	N/A
Colonial Beach-13	Maintain a voluntary agreement with FEMA to participate in the NFIP	Removed	This is a requirement, not a mitigation action goal.	N/A
Colonial Beach-14	Maintain a publicly available copy of the effective Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS), Support local requests for map updates when available.	Removed	This is a requirement, not a mitigation action goal.	N/A
Colonial Beach-15	Adopt the most current FIRM or FIRM and FIS as they become available.	Removed	This is a requirement, not a mitigation action goal.	N/A
Colonial Beach-16	Share with FEMA any new technical or scientific data that may result in map revisions within six months of creation or identification of new data.	Removed	This is a requirement, not a	N/A



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			mitigation action goal.	
Colonial Beach-17	Assist with local floodplain determinations and maintain a record of approved changes to the local Floodplain.	Removed	Obsolete with FEMA's 2.0 tool.	N/A
Colonial Beach-18	Adopt or maintain a floodplain management ordinance that at a minimum regulates the following: Issue permits for All proposed developments in the SFHA, Obtain, review, and utilize any base flood elevation and Floodway data, and require BFE data for subdivisions proposals and other development proposals larger than 50 lots or 5 acres; Identify measures to keep all new and substantially improved construction reasonably safe from flood to or above the Base Flood Elevation (BFE), including anchoring, using flood resistant materials, designing, or locating utilities, and service facilities to prevent water damage; Document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures.	Altered	Action has been initiated and is ongoing. Portions moved to complete and ongoing portion retained.	Document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures.
Colonial Beach-19	Enforce the ordinance by monitoring compliance and taking remedial action to correct violations.	Removed	This is a requirement, not a mitigation action goal.	N/A
Colonial Beach-21	Educate community members about the availability and value of flood insurance.	Removed	County is not responsible for availability of flood insurance, and education is included in the new education and outreach action goal.	N/A



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Colonial Beach-22	Inform community property owners about changes to the FIRM that may impact their insurance rates.	Removed	County is not responsible for availability of flood insurance, and education is included in the new education and outreach action goal.	N/A
Colonial Beach-23	Provide general assistance to community members relating to insurance issues.	Removed	County is not responsible for availability of flood insurance, and education is included in the new education and outreach action goal.	N/A
Colonial Beach-24	Support mitigation projects that will result in protection of public or private property from natural hazards. Eligible projects include but are not limited to 1. Acquisition of flood prone property 2. Elevation of flood prone structures 3. Minor structural flood control projects 4. Relocation of structures from hazard prone areas 5. Retrofitting of existing buildings, facilities, and infrastructure 6. Retrofitting of existing buildings and facilities for shelters 7. Critical infrastructure protection measures 8. Stormwater management improvements 9. Advanced warning systems and hazard gauging systems (weather radios, reverse-911, stream gauges, I-flows)	Altered	Cleaned up language and streamlined the purpose of this action.	Support mitigation projects that conform to the requirements of the HMA program in terms of eligibility for participation and projects.



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	10. Targeted hazard education 11. wastewater and water supply system hardening and mitigation.			
Colonial Beach-25	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as comprehensive, and capital improvement plans.	Altered	Integrated resiliency.	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as comprehensive and resiliency plans, and capital improvement plans.
Colonial Beach-NEW	N/A	NEW	New mitigation action created from RAFT Scorecard recommendations.	Develop a resident and visitor emergency preparedness plan that identifies risks and needs, including knowledge of water safety.
Colonial Beach-NEW	N/A	NEW	New mitigation action created from RAFT Scorecard recommendations.	Seek funding for and implement early warning signals/systems/emergency warning tools for residents (especially vulnerable populations.
Mitigation Action #	2017 Action	Change Type	Reason for Change	2023 Action
Montross-1	Support mitigation projects that will result in protection of public or private property from natural hazards. Eligible projects include but are not limited to 1. Acquisition of flood prone property 2. Elevation of flood prone structures 3. Minor structural flood control projects 4. Relocation of structures from hazard prone areas 5. Retrofitting of existing buildings, facilities and infrastructure 6. Retrofitting of existing buildings and facilities for shelters 7. Critical infrastructure protection measures 8. Stormwater management improvements	Altered	Cleaned up language and streamlined the purpose of this action.	Support mitigation projects that conform to the requirements of the HMA program in terms of eligibility for participation and projects.



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	9. Advanced warning systems and hazard gauging systems (weather radios, reverse-911, stream gauges, I-flows) 10. Targeted hazard education 1. wastewater and water supply system hardening and mitigation.			
Montross-3	Develop a Continuity of Operations Plan.	Removed	This a planning mechanism goal not a mitigation action goal.	N/A
Montross-4	Consider participating in FEMA's community rating system. (CRS)	Updated.	Reworded to encompass the next actions towards possible CRS. Some actions have been completed or initiated since the 2017 update.	Seek further improvements to hazard mitigation elements that enable the community to become eligible for CRS participation.
Montross-5	Encourage the purchase of flood and/or sewer back-up insurance.	Removed	County is not responsible for availability of flood insurance, and education is included in the new education and outreach action goal.	N/A
Montross-6	Encourage the purchase and training on the use of NOAA radios. Provide NOAA radios to public facilities.	Removed	Not an applicable action for the town currently.	N/A
Montross-7	Maintain a voluntary agreement with FEMA to participate in the NFIP	Removed	This is a requirement, not a mitigation action goal.	N/A



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Montross-8	Maintain a publicly available copy of the effective Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS), Support local requests for map updates when available.	Removed	This is a requirement, not a mitigation action goal.	N/A
Montross-9	Adopt the most current DFIRM or FIRM and FIS as they become available.	Removed	This is a requirement, not a mitigation action goal.	N/A
Montross-10	Share with FEMA any new technical or scientific data that may result in map revisions within six months of creation or identification of new data.	Removed	This is a requirement, not a mitigation action goal.	N/A
Montross-11	Assist with local floodplain determinations and maintain a record of approved changes to the local floodplain.	Removed	Obsolete with FEMA's 2.0 tool.	N/A
Montross-12	Adopt or maintain a floodplain management ordinance that at a minimum regulates the following: Issue permits for All proposed developments in the SFHA, Obtain, review, and utilize any base flood elevation and Floodway data, and require BFE data for subdivisions proposals and other development proposals larger than 50 lots or 5 acres; Identify measures to keep All new and substantially improved construction reasonably safe from flood to or above the base flood elevation (BFE), including anchoring , using flood resistant materials, designing or locating utilities, and service facilities to prevent water damage; Document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures.	Removed	Completed	N/A
Montross-13	Enforce the ordinance by monitoring compliance and taking remedial action to correct violations.	Removed	This is a requirement, not a mitigation action goal.	N/A



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Montross-15	Educate community members about the availability and value of flood insurance.	Removed	County is not responsible for availability of flood insurance, and education is included in the new education and outreach action goal.	N/A
Montross-16	Inform community property owners about changes to the DFIRM/FIRM that may impact their insurance rates.	Removed	County is not responsible for availability of flood insurance, and education is included in the new education and outreach action goal.	N/A
Montross-17	Provide general assistance to community members relating to insurance issues.	Removed	County is not responsible for availability of flood insurance, and education is included in the new education and outreach action goal.	N/A
Montross-NEW	N/A	NEW	Created new education and outreach mitigation goal.	Expand upon current and create new public outreach activities. Utilize the jurisdiction's website to advise citizens and visitors of local natural hazard risks, encourage citizen-based mitigation efforts and disaster preparation. Consider creating a "Program for Public Information" (PPI) Committee to assist with educating, distribution, and management. (*PPI is a suggestion under Activity 322 in the



Northern Neck Regional Hazard Mitigation Plan
Appendix E: Mitigation Action Changes

				CRS Manual). Boost increased exposure and awareness to visitors, tourists, and part-time residents.
Montross-NEW	N/A	NEW	New mitigation action created from RAFT Scorecard recommendations.	Develop a resident emergency preparedness plan that identifies risks and needs, including knowledge of water safety.



Appendix F Adoption Resolutions

- F.1 Lancaster County
- F.2 Town of Irvington
- F.3 Town of Kilmarnock
- F.4 Town of While Stone
- F.5 Northumberland County
- F.6 Richmond County
- F.7 Town of Warsaw
- F.8 Westmoreland County
- F.9 Town of Colonial Beach
- F.10 Town of Montross



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F.1 Lancaster County



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F.2 Town of Irvington



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F.3 Town of Kilmarnock



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F.4 Town of White Stone



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F.5 Northumberland County



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F.6 Richmond County



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F.7 Town of Warsaw



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F.8 Westmoreland County



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F.9 Town of Colonial Beach



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F.10 Town of Montross



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Appendix G Adoption Resolutions

- G.1 Lancaster County
- G.2 Town of Irvington
- G.3 Town of Kilmarnock
- G.4 Town of White Stone
- G.5 Northumberland County
- G.6 Richmond County
- G.7 Town of Warsaw
- G.8 Westmoreland County
- G.9 Town of Colonial Beach
- G.10 Town of Montross



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G.1 Lancaster County



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G.2 Town of Irvington



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G.3 Town of Kilmarnock



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G.4 Town of White Stone



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G.5 Northumberland County



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G.6 Richmond County



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G.7 Town of Warsaw



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G.8 Westmoreland County



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G.9 Town of Colonial Beach



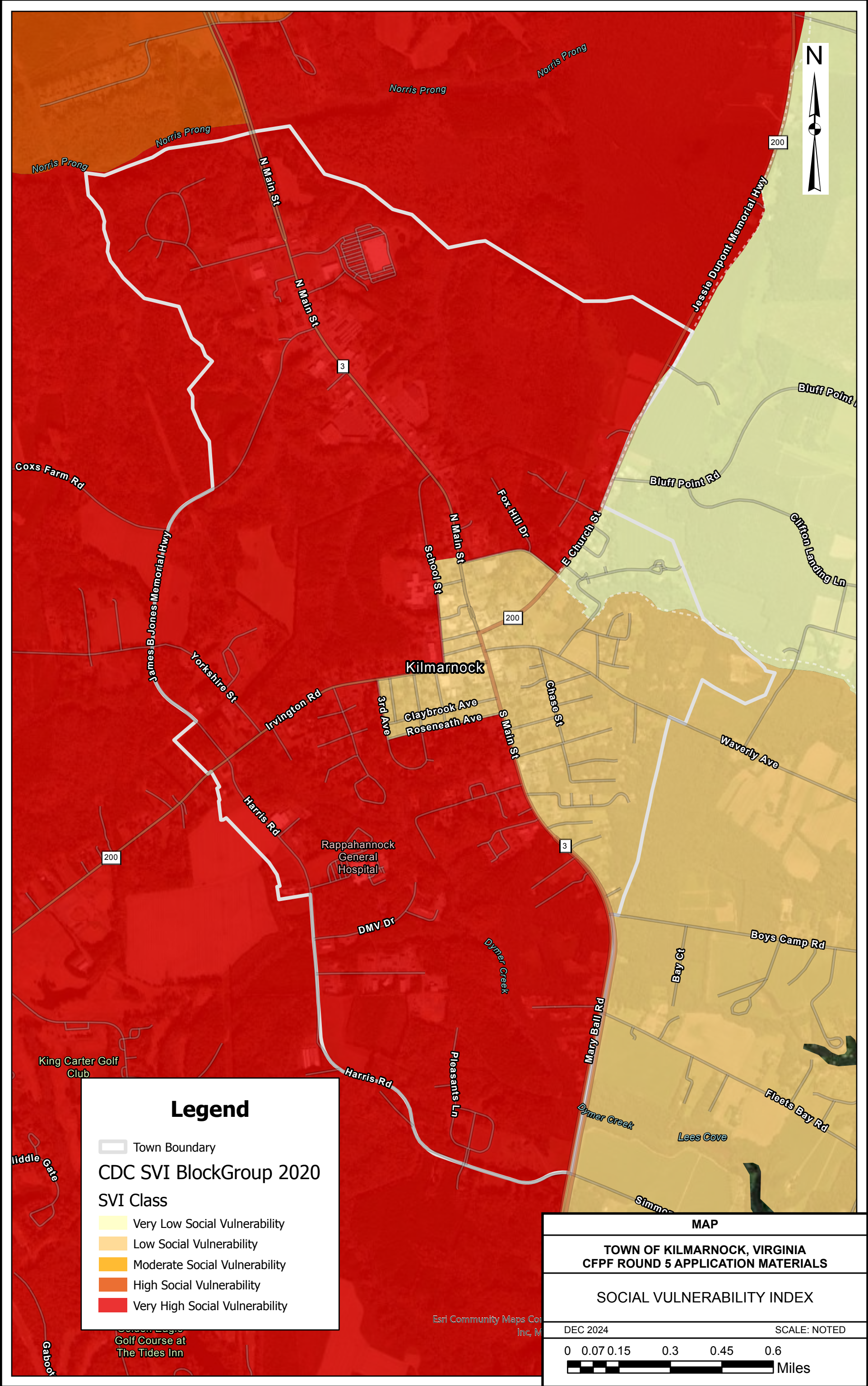
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G.10 Town of Montross



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Kilmarnock Watershed Assessment Report

April 2013

PREPARED FOR:
Town of Kilmarnock, VA

PREPARED BY:



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APPENDIX A. FIELD FORMS

APPENDIX B. STORMWATER RETROFIT CONCEPT SUMMARIES

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SECTION 1. INTRODUCTION

1.1 Executive Summary

The 2158-acre Town of Kilmarnock, Virginia sits at the headwaters of three different watersheds: the Corrotoman River (Norris Prong), Dymmer Creek, and Indian Creek. This location places Kilmarnock in a distinctive position: Because no runoff from other jurisdictions enters the town, the health of streams in Kilmarnock is almost entirely dependent on activities and land uses within its boundaries. In this way, Kilmarnock's decision-makers and citizens are in a unique position to influence their own destiny with regard to water resources, as well as have an influence on downstream waterways and communities.

This assessment of Kilmarnock's watershed conditions and restoration opportunities was made possible by the combined efforts of the Town of Kilmarnock ("the town"), Friends of the Rappahannock, Lancaster County, and the Center for Watershed Protection ("the Center"). As the first stage in characterizing the town's watersheds, the Center reviewed available studies and data on stream quality, land cover and land use, geography, soils, geology, and development. In **Section 2** of this report, you will find the results of that research. In general, the town is characterized by erodible soils, variable topography, steep stream valleys, large stands of forest, old and new commercial and residential development, and very little industry. No water quality studies were found to be available for streams within the town.

Using field methods described in **Section 3**, staff from the four partnering organizations documented a range of restoration opportunities in Kilmarnock's uplands and streams. The assessment identified:

- 5 distinct pollution "hotspots";
- Stewardship opportunities in 20 residential neighborhoods;
- 5 severe stream erosion head cuts; and
- Stormwater retrofit or repair concepts on 11 properties.

Section 4 outlines recommendations for using these findings to help direct watershed management and restoration activities in Kilmarnock in the short and long-term future.

This watershed assessment was financially supported by a grant from the Chesapeake Bay Stewardship Fund of the National Fish and Wildlife Foundation.

1.2 Purpose of Assessment

The Town of Kilmarnock has the opportunity to serve as a positive example to other rural localities on the Northern Neck and beyond for improving water quality in the wake of past development and in the face of projected growth. Town staff and environmental partners in the area are particularly interested in ways to reduce non-point sources of pollution such as stormwater runoff.

However, a comprehensive study of Kilmarnock's watershed conditions had never been done. This field-based watershed assessment serves to (1) characterize current conditions within the town's waterways and uplands, with a special focus on its developed areas, (2) locate potential and actual sources of water pollution, and (3) propose specific physical and behavioral solutions to those pollution problems.

With the results of this assessment in hand, the town can forge partnerships with community groups to implement restoration on public and private land, remedy known existing sources of pollution, make informed decisions about natural resources planning and policies, and encourage its citizens to take on stewardship actions specifically needed in the town. In addition, the findings of this watershed assessment should help inform how to work toward Chesapeake Bay TMDL target pollution reductions in the Kilmarnock area, while also addressing local TMDL stream impairments.

1.3 Caveats

It should be noted that this study assessed watershed conditions in the town at one point in time and did not involve any long-term monitoring of conditions. In addition, this "snapshot" approach did not include any water quality testing.

While sites from across the watershed were assessed, not *all* upland and stream areas were visited due to time and budget limits. Also, most of the field assessment was conducted in developed areas in order to gauge human impact near its source. In the future, additional assessments should be conducted in areas of concern to reflect watershed changes and developments.

SECTION 2. WATERSHED CHARACTERIZATION

2.1 Introduction

2.1.1 Town of Kilmarnock and Counties

The Town of Kilmarnock is located on the Northern Neck of Virginia in Lancaster County, with a small portion located in Northumberland County. The Northern Neck peninsula is bordered by the Potomac River to the north and the Rappahannock River to the south. The town is the business and commercial center for Lancaster and neighboring counties, containing 47 percent of the business and service establishments for Lancaster County (Kilmarnock Planning Commission, 2006).

The town comprises 2,158 acres and had a total population of 1,487 people in 2010 (U.S. Census Bureau, American Fact Finder). Except for one major development in the northern section of town, the entire town is served by public water and sewer. The public drinking water for the town is supplied by three deep aquifer wells and stored in water towers for public use (EEE Consulting Inc., 2009). The town's wastewater is treated at the wastewater treatment plant on Mac's Pond Road using an advanced activated sludge system and is then released into Indian Creek (Kilmarnock Planning Commission, 2006).

2.1.2 Watersheds and Tributaries

The town sits at headwaters of three different waterways: the Corrotoman River (Norris Prong), Dymer Creek, and Indian Creek. Figure 1 delineates three subwatershed areas in which most of the town surface is located. The subwatersheds area mapped in Figure 1 is considered the "study area" for this project. However, it should be noted that the watersheds of the full length of Dymer Creek and Indian Creek are more expansive than those delineated in Figure 1.

The Town's three watersheds are roughly divided along the major highways located on the ridge lines between the streams (Kilmarnock Planning Commission, 2006). The Norris Prong subwatershed is located north of Irvington Road and bordered to the north by Goodluck Road, Route 200 to the east and Cox's Farm Road to the west. The Dymer Creek subwatershed drains the area south of Irvington Road, between Harris Road and Main Street. The Indian Creek subwatershed is located in the southeastern section of town, south of Church Street and east of Main Street. The Norris Prong flows into the Eastern Branch of the Corrotoman River which flows into the Rappahannock River and then into the Chesapeake Bay. Dymer and Indian Creeks, however, flow directly to the Chesapeake Bay (Figure 2).

The study area subwatersheds mapped in Figure 1 total 3,659 acres and contain 17.21 stream miles (perennial and intermittent), approximately ten miles of which are within the town's boundaries. Table 1 lists the distribution of these stream miles in each subwatershed and provides the percent of subwatershed area located in Lancaster County, Northumberland County, and the town. GIS mapping analysis also shows that 52% of the town is within the Corrotoman River watershed, 26% in the Dymer Creek watershed, 12% in the Indian Creek watershed, and 10% in other watersheds.

Table 1. Hydrologic Data about Study Area (Kilmarnock GIS, 2013)			
Subwatershed	Subwatershed Area (acres)	Stream Length (mi)	Jurisdictions (% of subwatershed in respective jurisdiction)
Corrotoman River (Norris Prong)	2,545.99	12.26	Kilmarnock (44.43%) Lancaster Co. (55.47%) Northumberland Co. (0.09%)
Dymer Creek	605.39	3.40	Kilmarnock (94.18%) Lancaster Co. (5.82%)
Indian Creek	499.47	1.55	Kilmarnock (53.41%) Lancaster Co. (28.58%) Northumberland Co. (18.01%)
Total	3,650.85	17.21	Kilmarnock (53.91%) Lancaster Co. (43.55%) Northumberland Co. (2.52%)

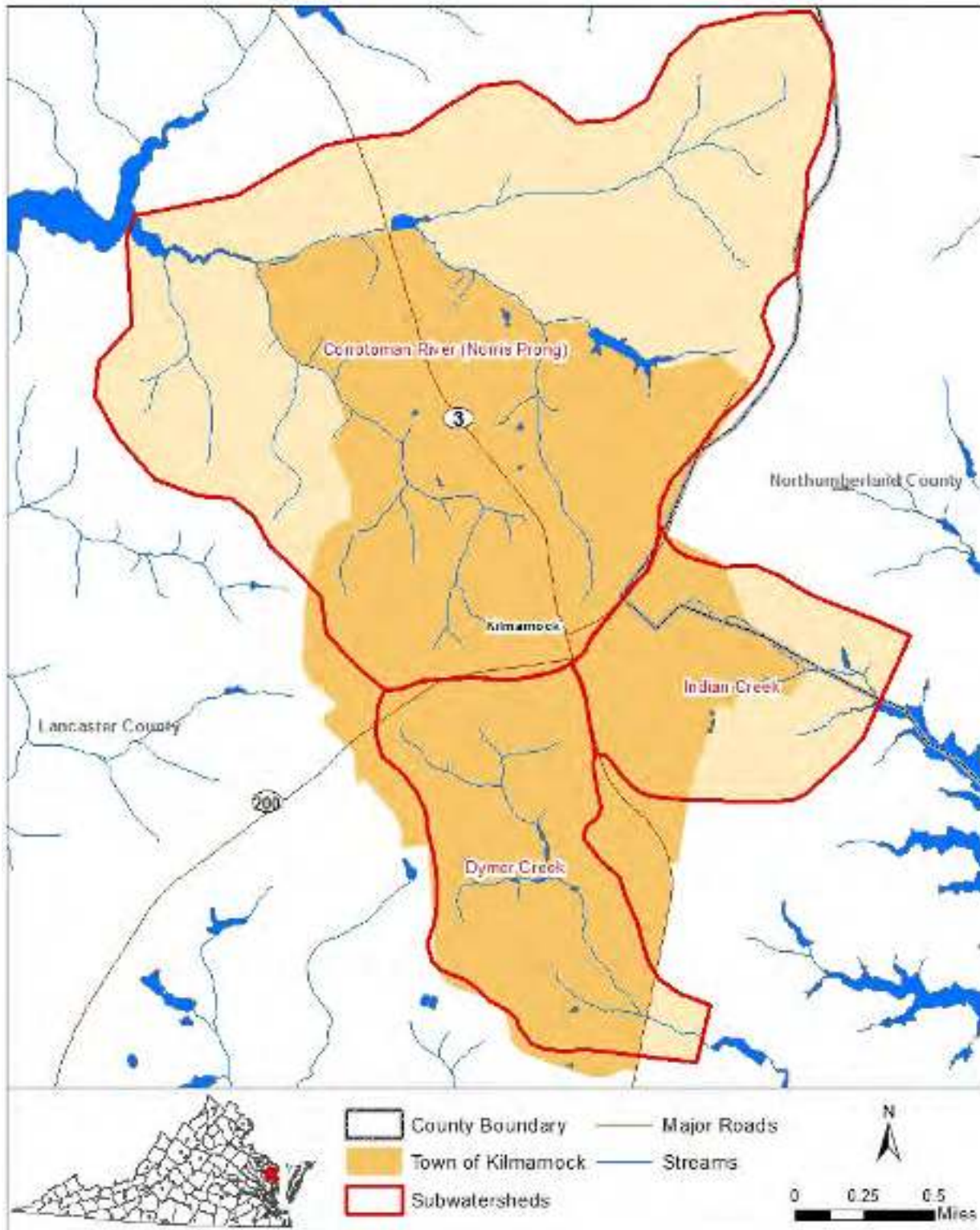


Figure 1. Study area subwatersheds and Kilmarnock town limits.

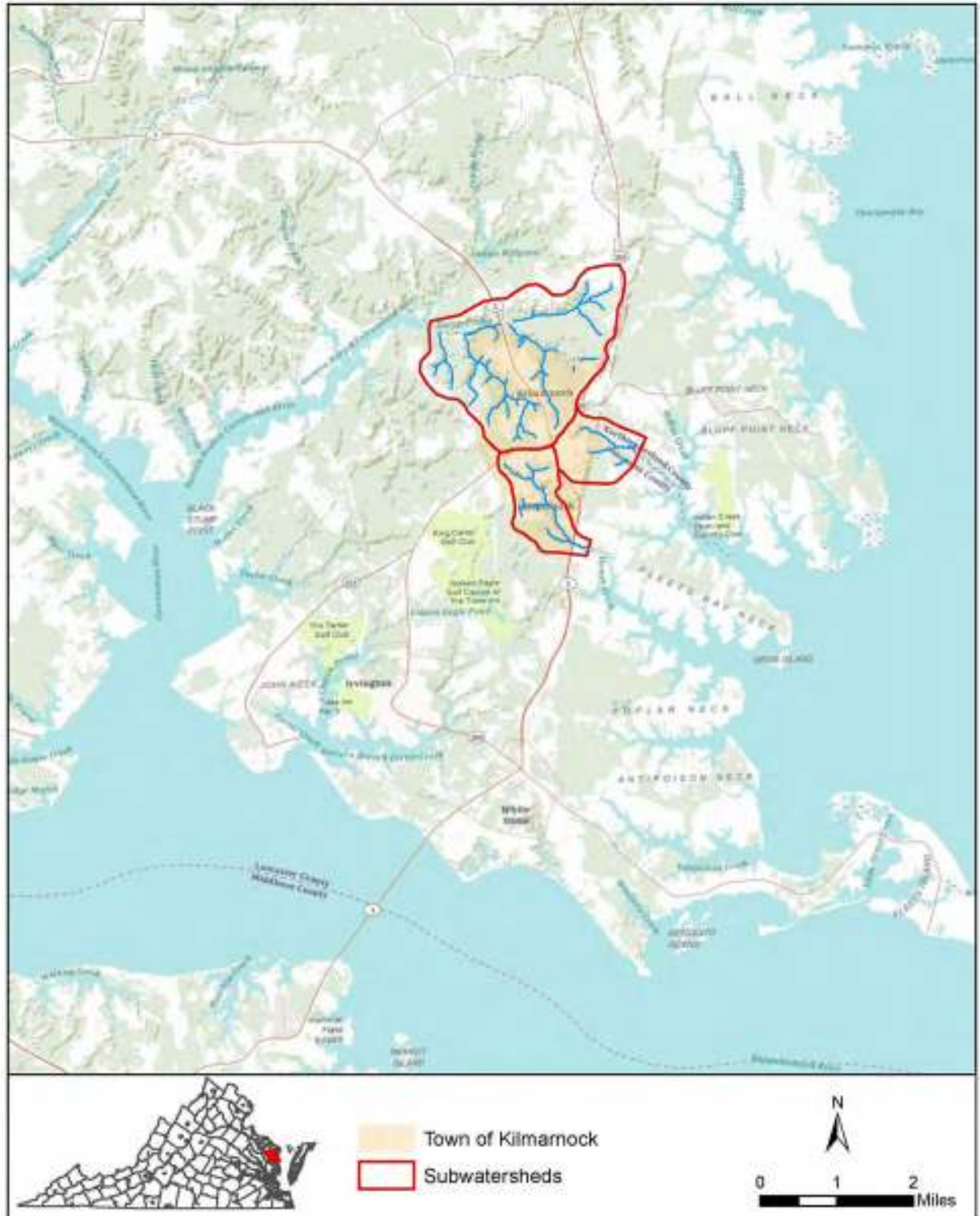


Figure 2. Vicinity of the Town of Kilmarnock draining to the Chesapeake Bay.

2.1.3 Soils and Geology

Elevations in the town range from 2 to 100 feet above level (Figure 3). The town is located along the upper edge of the Suffolk Scarp, a long elevated geologic formation that runs generally north and south across the Northern Neck and Middle Peninsula. This “terrace” is thought to delineate an ancient shoreline that may have been formed by the Chesapeake Bay Impact Crater (Horton et al., 2005). To the west of the Suffolk Scarp land elevations are above 25 feet above sea level and most land area is above 60 feet. To the east are very flat lowlands of tidal marsh, forest and farmland that all sit below 25 feet.

Approximately 13 percent of the town area is considered “stream basin,” i.e., below 50 feet in elevation, and is not usable for development (Kilmarnock Planning Commission, 2006). According to the Northumberland and Lancaster Counties Soil Survey most of the stream corridors in the town are classified in the *Sloping Sandy Land* or *Steep Sandy Land* formation (Figure 4; NRCS, 1963). These soils are highly permeable, commonly have seepage spots, and are droughty, acidic, and not very fertile. These areas are almost solely suited to trees, such as loblolly pine and yellow poplar. These types of soils are also susceptible to erosion. Figure 5 depicts the location of these soil types in the town and shows that these soils are primarily found near streams (NNPDC, 2013).

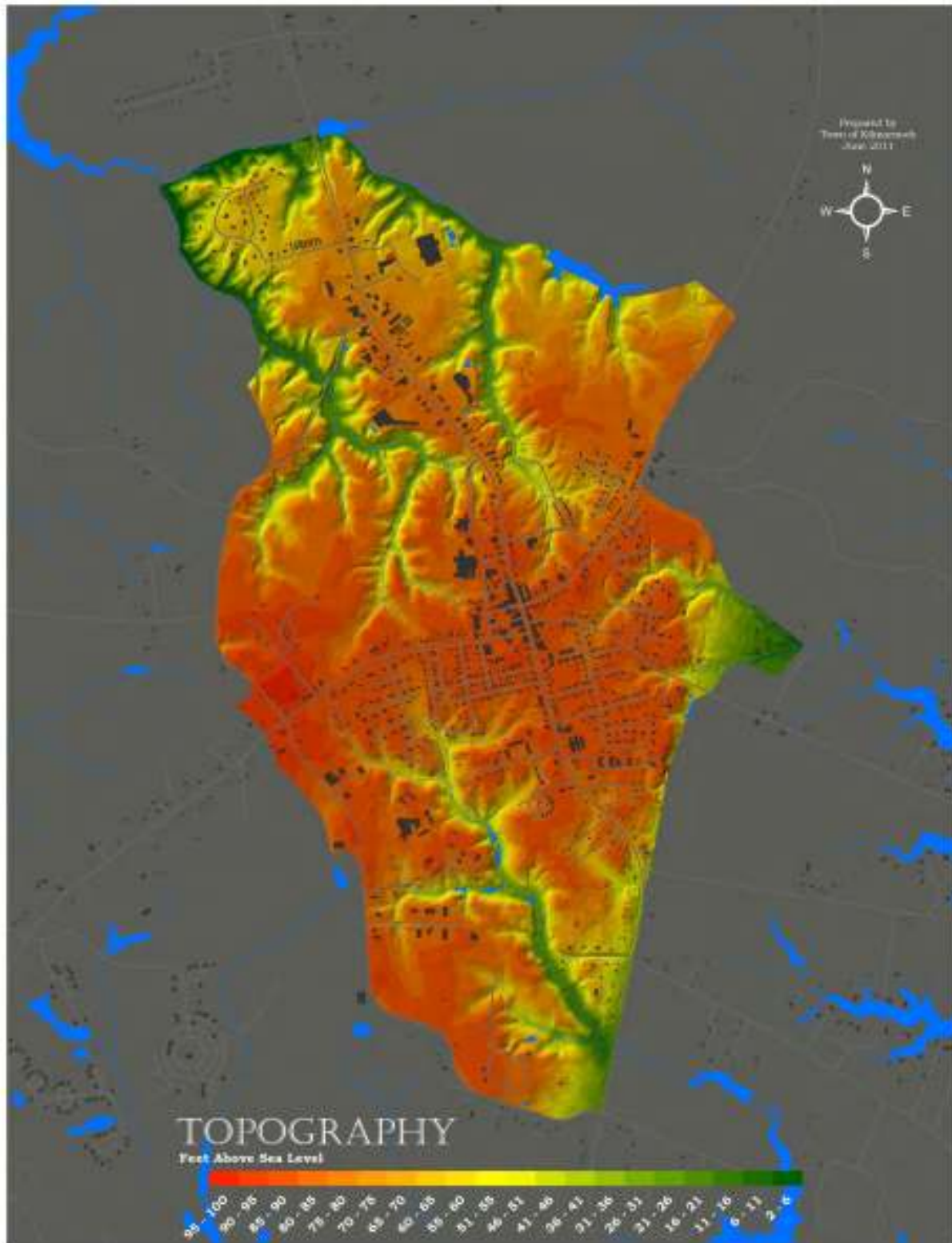


Figure 3. Topography of Kilmarnock (Town of Kilmarnock, 2011).

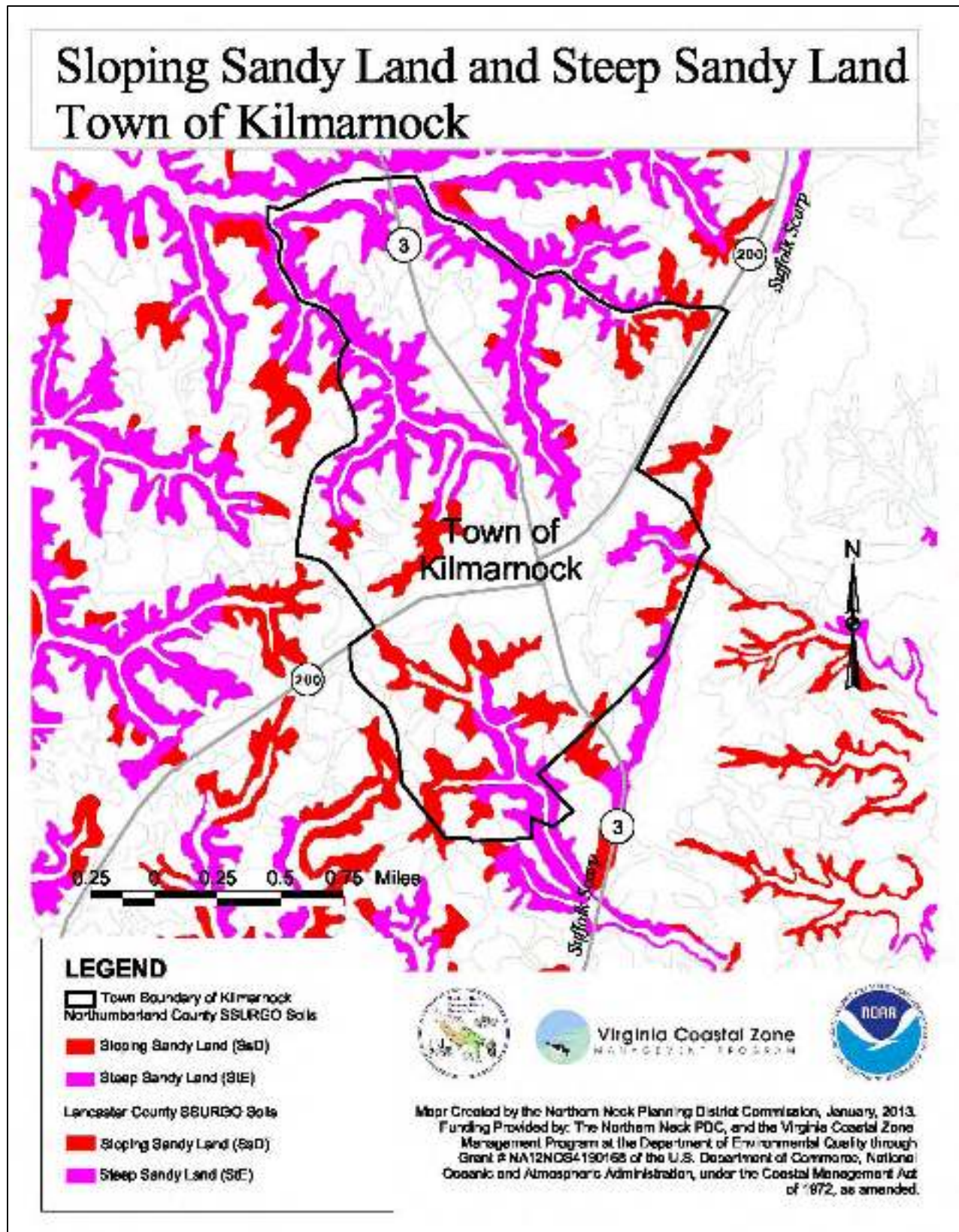


Figure 4. Distribution of *Steep Sandy Land* and *Sloping Sandy Land* in Kilmarnock (NNPDC, 2013).

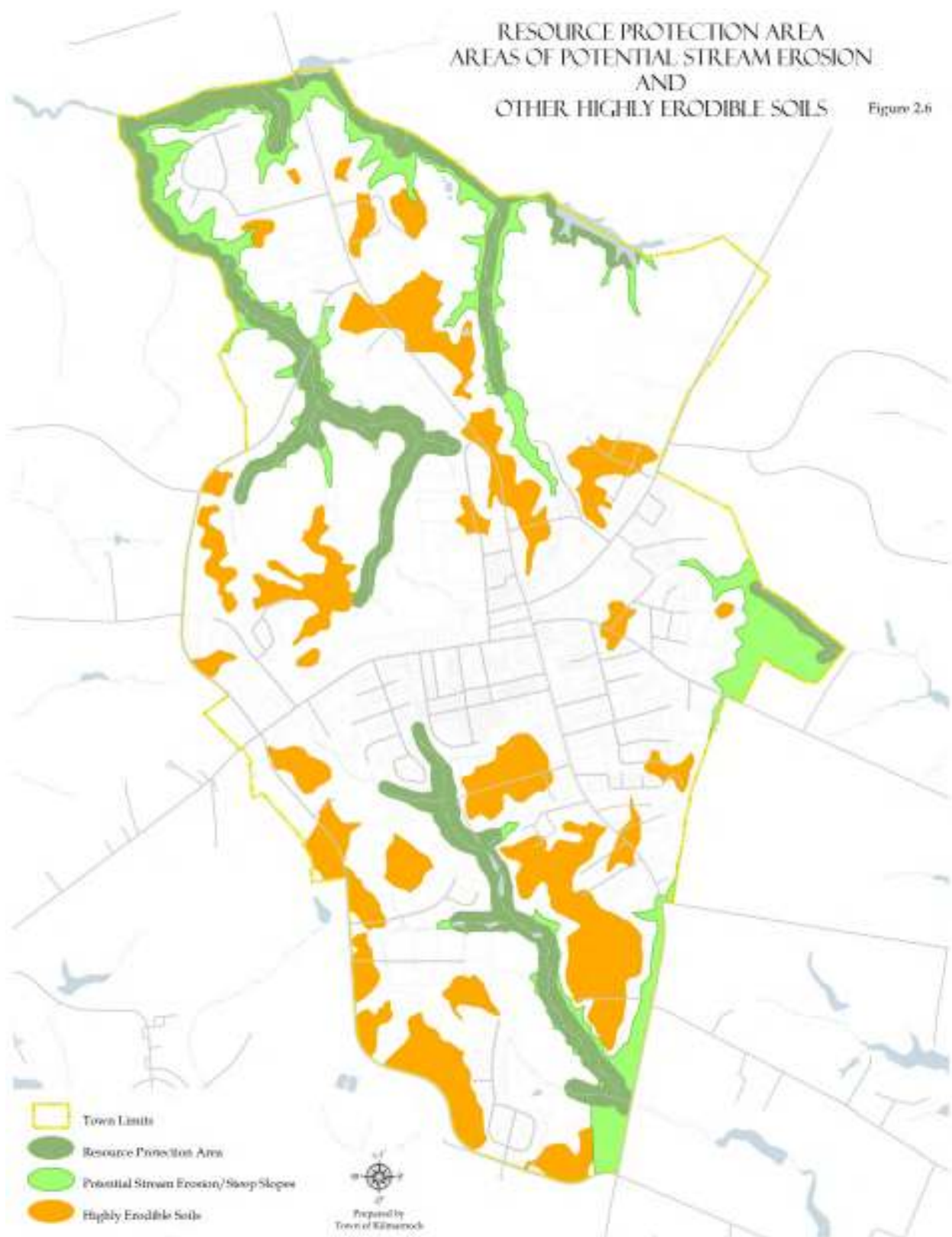


Figure 5. Areas of potential stream erosion and other highly erodible soils (Kilmarnock GIS, 2013)

2.1.4 Land Use

The dominant land uses are vacant land (53.78%), single family residential (28.24%), and commercial (10.89%). Table 2 delineates the land use types in each of the town's three subwatersheds. Note that this table portrays the land use of the *entire* area of each subwatershed, not just the land use within town limits.

Table 2. Land Use in Study Area Subwatersheds (Kilmarnock GIS, 2013)						
	<i>Land Use (% of Subwatershed)</i>					
Subwatershed	Commercial	Industrial	Multi-Family	Office	Single Family Residential	Vacant (i.e. not developed)
Corrotoman (Norris Prong)	14.84	1.16	1.64	1.39	15.5	65.47
Dymer Creek	6.24	3.76	3.48	4.2	31.76	50.56
Indian Creek	4.11	3.06	5.6	1.43	74.77	11.04

2.2 Stream Conditions

2.2.1 Total Maximum Daily Loads

In order to fulfill Clean Water Act Section 303(d) requirements, all states are required to maintain and update a list of impaired and threatened waters (stream segments) and submit the list to the U.S. EPA for approval every two years. This list is then used to develop total maximum daily loads (TMDLs), which quantify the maximum amount of a pollutant that a water body can receive and still meet its designated uses. A TMDL also involves a detailed investigation into the sources of the impairment and reductions required to achieve the target loads. TMDLs must be developed for every water body listed as impaired on the 303(d) list of the Clean Water Act.

The scale of watershed for TMDLs varies greatly. The broad-scale TMDL that affects Kilmarnock is the Chesapeake Bay TMDL, which was finalized in 2010 by the U.S. EPA. This TMDL allocates nutrient and sediment reduction targets for each Bay state, including Virginia, to restore the Chesapeake Bay by the year 2025. These reductions were further broken down by major river basin. At the state level, Phase 1 Watershed Implementation Plans (WIPs) were developed to determine how each state will help meet pollutant reductions. The Phase II WIP for Virginia, which was developed by the state with input from many jurisdictions and other entities, outlines a strategy to meet pollutant load allocations.

Several TMDLs are in place at the local level in the vicinity of Kilmarnock. As shown in Table 3, 14% of the stream miles within the study area are listed as impaired. The Virginia DEQ 2010 303(d) list of impaired waters lists 2.41 miles of the Norris Prong as impaired for Dissolved Oxygen, which impacts the aquatic life designated use of the water body. There are also two TMDLs for bacteria (fecal coliform): *Corrotoman River Watershed TMDL Report for Shellfish Condemnation areas listed due to bacteria contamination* (VDEQ, 2007) and *Indian, Tabbs, Dymer and Antipoison Creeks TMDL for shellfish condemnation areas listed due to bacteria pollution* (VDEQ, 2009). Part of the study area is located within the Corrotoman River

Watershed TMDL area, while the TMDL for Indian and Dymer Creeks are for the tidal sections of these watersheds and located downstream of the study area.

Table 3. Study Area Stream Miles on 303(d) Impaired Waters List		
Study Area Subwatersheds	Stream Length (mi)	Impaired Stream Miles (and % Stream Miles)
Corrotoman River (Norris Prong)	12.26	2.42 (19.73%)
Dymer Creek	3.40	0.00 (00.00%)
Indian Creek	1.55	0.00 (00.00%)
Total	17.21	2.42 (14.06%)

For both TMDLs, the state bacteria standard used in the development of the TMDL is a 90th percentile geometric mean value of 49 most probable number per 100ml (VA water quality standard 9VAC-25-260-5). Sampling was conducted and evaluated using bacterial source tracking to identify the sources of bacteria. The sampling data was used to model the current pollution load in the stream. This load was compared to the state standard to determine the percent reduction needed to achieve water quality standards. For the East Branch Corrotoman River a 69% reduction in bacteria is needed (VDEQ, 2007). The reductions calculated for Indian and Dymer Creeks are 94% and 92%, respectively (VDEQ, 2009).

2.2.2 Sources of Impairment

Nonpoint and point sources are identified as contributors of pollutants in the TMDLs described above. For the Corrotoman River Watershed TMDL, there were no known point sources associated with bacterial contamination of shellfish areas. Therefore, management strategies in that watershed should be focused on reducing nonpoint sources.

For the East Branch Corrotoman River, the results of the bacteria source tracking indicate the major sources of bacteria are from livestock (34%), humans (32%), and pets (29%) (VDEQ, 2007). In the Indian, Tabbs, Dymer and Antipoison Creeks TMDL, there is one point source: the Kilmarnock Wastewater Treatment Plant located in the non-tidal portion of Indian Creek. For Indian Creek, the results of the bacteria source tracking indicate the major sources of bacteria are from humans (65%), wildlife (23%), and pets (9%). For Dymer Creek, the major sources of bacteria are from pets (41%), humans (26%), and wildlife (22%). Nonpoint source contributions generally arise from failing septic systems and associated drain fields, moored or marina vessel discharges, stormwater retention ponds (from concentration of bird droppings), pump station failures and exfiltration from sewer systems.

Point Sources

Facilities that discharge municipal or industrial wastewater or conduct activities that can contribute pollutants to a waterway are required to obtain a National Pollutant Discharge Elimination System (NPDES) permit. Data was obtained from the U.S. EPA Enforcement and Compliance History Online (ECHO) website (<http://www.epa-echo.gov/echo/>). The Kilmarnock Wastewater Treatment Plant is the only facility in the town with an NPDES permit. Its permit is in the category of a “minor” NPDES permit.

2.3 Natural Resources

2.3.1 Protected Lands

Protected lands are summarized in Table 4 for each of the three study subwatersheds. There are no state or federally-protected lands. However, there are two conservation easements: a 195-acre easement held by the Virginia Outdoors Foundation and a 27-acre easement held by the Northern Neck Land Conservancy. A conservation easement ensures the protection of significant natural resources on a property by removing the development rights of the property. In exchange, placing a property under easement may allow the landowner to receive income, or estate and property tax benefits while still maintaining ownership of the property.

Table 4. Summary of Protected Land			
Subwatershed	Protected Land (Acres)	Easement Holder	Percent of Subwatershed Protected (%)
Corrotoman River	195	Virginia Outdoors Foundation	7.6
Dymer Creek	0	None	0
Indian Creek	27	Northern Neck Land Conservancy	5.4
Watershed Total	222		6.1

2.3.2 Chesapeake Bay Preservation Act Areas

The town is regulated under the Chesapeake Bay Preservation Act, which requires 100-foot riparian buffers along both sides of water bodies with perennial flow including tidal wetlands, non-tidal wetlands and tidal shores. These areas are designated as Resource Protection Areas (Kilmarnock Town Code §54-487). All the remaining land within the town is designated as Resource Management Areas, which is defined in the town Code as “land types that, if improperly used or developed, have the potential for causing significant water quality degradation or for diminishing the functional value of the resource protection area (Kilmarnock Town Code §54-481).”

2.3.3 Rare, Threatened, and Endangered Species

There are no documented rare, threatened or endangered species within the town’s limits based on a review provided by the Virginia Department of Conservation and Recreation Natural Heritage Program (Hypes, 2012).

SECTION 3. WATERSHED ASSESSMENT PROTOCOLS AND FINDINGS

3.1 Introduction to the Watershed Assessment

The Watershed Assessment consisted of a field survey of conditions in both the *upland* sections of Kilmarnock (areas draining to local streams) and the *in-stream* areas. The goals of the field surveys were to identify sources of stormwater pollution and provide management options, develop concepts for managing stormwater runoff from developed areas, and discover other restoration needs and opportunities.

Field work for this watershed assessment was conducted by eight staff members from the Center for Watershed Protection, Friends of the Rappahannock, Lancaster County, and the Town of Kilmarnock. The Center served as the technical lead for each field team. Staff from these organizations was divided into three field teams and completed field work on December 18 and 19, 2012. A variety of watershed assessment methods developed by the Center were used, as described in Section 3.2.

In preparation for field work, town staff created a list of forty-one upland and stream sites for the field teams to visit. These sites included existing stormwater management basins, sites known to have problems (e.g., streams with severe erosion), and properties with greater potential for pollution problems due to the nature of activities at the site (e.g. restaurants, vehicle repair shops).

Prior to field work, the Center used GIS to delineate all the residential neighborhoods in the town. In total, twenty four neighborhoods were included in the list of sites to assess in the field with one additional neighborhood identified in the field. As the need or opportunity arose during the field assessment, the field teams also visited sites not already on the pre-determined list.

3.2 Unified Subwatershed and Site Reconnaissance

The field teams used the Unified Subwatershed and Site Reconnaissance (USSR) method to evaluate pollution-producing behaviors and restoration potential in upland areas of the town. The USSR is a set of visual surveys used to determine specific pollution sources and identify areas outside the stream corridor where pollution prevention possibilities exist. The USSR is a tool for shaping initial subwatershed restoration strategies and locating potential stormwater retrofit or restoration opportunities. The goal of the USSR is to quickly identify source areas that are contributing pollutants to the stream, and suggest ways to reduce these pollutant loads through source controls, outreach and change in current practice, and improved municipal maintenance operations. Additional information on the USSR is found in Wright et al. (2005).

3.2.1 Hotspot Investigations

Pollution source control includes the management of potential stormwater “hotspots” which are certain commercial, industrial, institutional, municipal, and transport-related operations that tend to produce higher concentrations of polluted stormwater runoff and/or have a higher risk for spills. They include auto repair shops, public works yards, restaurants, and other types of

commercial, industrial, and institutional sites. Specific on-site maintenance combined with pollution prevention practices can significantly reduce the occurrence of “hotspot” pollution problems.

Assessment Protocol

The Hotspot Site Investigation (HSI) is part of the USSR framework. This survey evaluates commercial, industrial, municipal or transport-related sites that have a high potential to contribute contaminated runoff to the storm drain system or directly to receiving waters. At hotspot sites, field teams investigate vehicle operations, outdoor materials storage, waste management, building conditions, turf and landscaping, and stormwater infrastructure to evaluate potential pollution sources (Table 5). Based on observations at the site, field crews may recommend enforcement measures, follow-up inspections, illicit discharge investigations, stormwater retrofits, or pollution prevention control and education. A wide spectrum of solutions for fixing pollution sources, especially on municipal properties, is described in the manual, *Municipal Pollution Prevention/Good Housekeeping Practices* (Novotney and Winer, 2008).

The overall pollution prevention potential for each hotspot site is assessed using the HSI field form (Appendix A). The assessment identifies observed sources of pollution and the potential of the site to generate pollutants that would likely enter the storm drain network as identified in Table 5.

Table 5. Potential Hotspot Pollution Sources		
Activity Type	Description	Examples
Vehicle Operations	Routine vehicle maintenance and storage practices, as well as vehicle fueling and washing operations	• Vehicle storage and repair • Fueling areas • Vehicle washing practices
Outdoor Materials	Exposure of outdoor materials stored at the site	• Loading and unloading • Outdoor material storage • Secondary containment
Waste Management	Housekeeping practices for waste materials generated at the site	• Dumpster practices • Oil and grease disposal
Stormwater Infrastructure	Practices used to convey or treat stormwater, including the curb and gutter, catch basins, and any stormwater treatment practices	• Catch basin cleanout • Stormwater treatment practices

General Findings

Field teams visited 30 potential pollution hotspot sites to conduct the HSI. At two sites, field teams were unable to access the property to conduct an assessment. The vast majority of the hotspot sites visited was located downtown and in the Main Street commercial corridor north of downtown. These consisted of gas stations, restaurants, grocery stores, shopping centers, vehicle maintenance garages, and car washes. Field teams identified active pollution problems at three of the pre-selected sites. In addition, pollution sources were found at two additional locations

noted during field work. Table 6 lists the pollution problems found during this HSI. Figure 6 illustrates some of the field findings.

Table 6. Identified Hotspot Pollution Problems		
Type of Hotspot	Identified Pollution Problems	Recommendations
Overflowing/Leaking Dumpsters	• Trash around dumpster; over-flowing dumpster at restaurant • Trash accumulation in stormwater basin at shopping center • Significant trash accumulation in pond – mostly plastic bottles • Open, leaking trash dumpster at vehicle maintenance garage	• Ensure dumpsters have lids, keep lids closed • Ensure bottom & corners of container do not have holes • Empty dumpsters on a frequent basis to prevent overflowing • Keep dumpster area clean
Wash water discharge	• Wash water draining to storm drain system from self-service car wash	• Contain wash water within wash bay to prevent spillage into parking lot
Uncovered, leaking outdoor material storage (e.g., grease tanks)	Restaurants: • Uncovered grease tanks, exposed to rain • Grease spills around grease tanks • Open metal drums of liquid with foul odor (unknown substance), exposed to rain Vehicle maintenance garage: • Leaking or over-flowing metal drums of oil at vehicle maintenance garage	• Provide secondary containment around outdoor material • Educate business employees on proper handling, storage and spill clean-up procedures • Empty grease tanks on a frequent basis to prevent overflowing • Keep up-to-date inventory of materials stored outdoors. • Keep spill kit on site to clean up spills
Leaking sewer pipe	• Sewer lateral pipe found leaking at ground level • In turn, town staff found and fixed major sewage block in sewer mains caused by grease and trash accumulation	• Conduct systematic illicit discharge outfall investigations to find and fix other sources of untreated sewage to the stream.

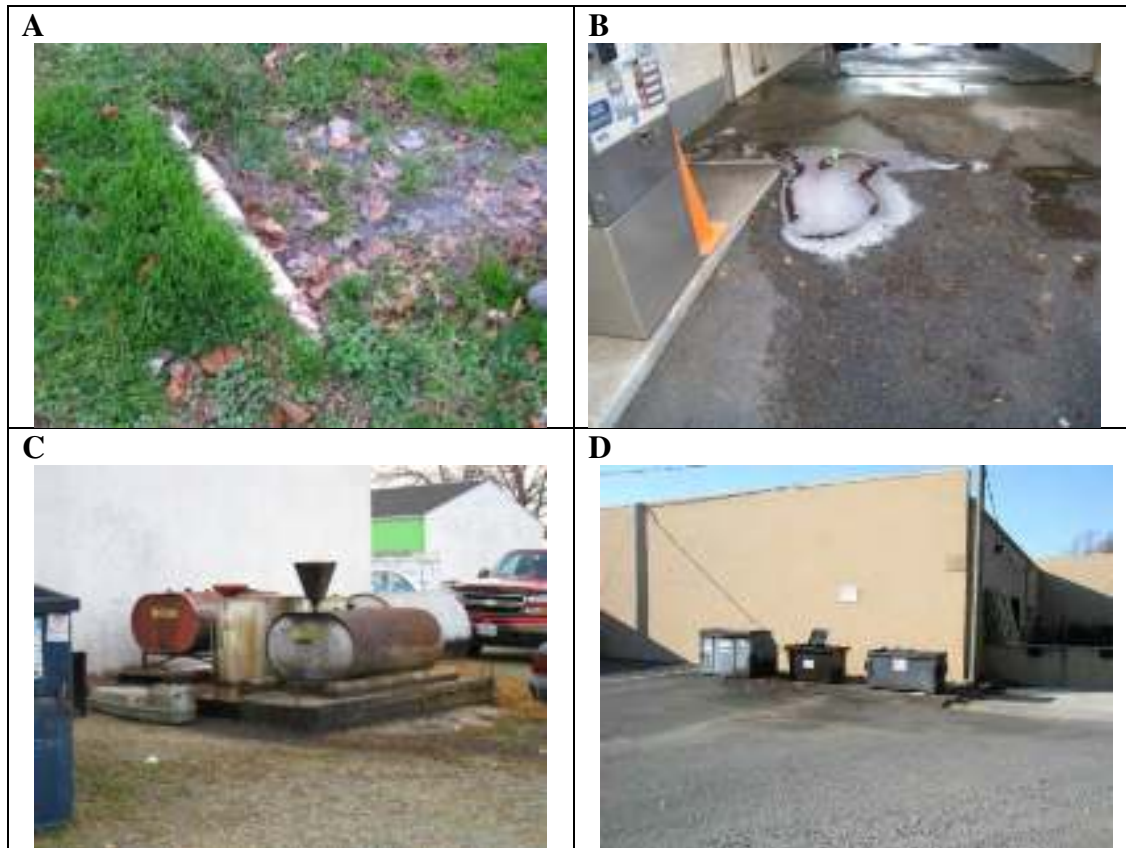


Figure 6. Pollution producing behaviors found during the HSI: A. Leaking sewer lateral pipe; B. Car wash soapy water draining to parking lot; C. Fuel oil containers overflowing; D. Grease and trash containers leaking onto pavement.

3.2.2 Neighborhood Source Assessment

Everyday activities and behaviors conducted within residential neighborhoods can be a source of pollution that influences stream water quality. Some behaviors that negatively influence water quality include over-fertilizing lawns, using excessive amounts of pesticides, and inappropriate trash disposal or storage. Alternatively, positive behaviors such as tree planting and using native plants, disconnecting rooftop downspouts from storm drains, and picking up pet waste can help improve water quality. These residential activities and behaviors were assessed within the town.

Assessment Protocol

The Neighborhood Source Assessment (NSA) was conducted to evaluate pollution source areas within individual residential neighborhoods. It is also part of the USSR framework. This “windshield survey” focuses specifically on yards and lawns, rooftops, driveways and sidewalks, curbs, and common areas. The NSA field form (Appendix A) was used to assess neighborhoods in terms of existing tree cover, stormwater management, fertilizer use on lawns, evidence of pollution sources, and evidence of resident stewardship (e.g., storm drain stenciling, pet waste management signage). In turn, the field teams considered potential restoration and education opportunities for each neighborhood, as identified in Table 7.

Table 7. Typical Projects Identified during a Neighborhood Source Assessment

Project Type	Description	Examples
On-site Retrofits	Homeowners reduce/manage stormwater runoff generated by their lots	• Rain gardens • Rain barrels • Downspout disconnection
Lawn and Landscaping Practices	Better lawn and landscaping practices to minimize the use of chemicals and encourage the use of native landscaping, particularly in neighborhoods where lawns are prevalent and highly managed	• Improved stream buffer protection • Native plantings • Turf reduction • Reduced fertilizer and pesticide application • Reduce ditch erosion
Open Space Management	Management of neighborhood common areas or courtyards	• Landscaping • Tree planting • Pet waste signage and containers • Stream buffer restoration • Trash removal
Education and Outreach	Providing homeowners with additional information to better manage pollution in their residential lots	• Lawn and nutrient management outreach • Pet waste education • Septic system education • Storm drain stenciling

General Findings

Field teams visited 25 residential neighborhoods to conduct the NSA. Most of the town's residential neighborhoods are located south of Route 200 and south of downtown, within the Dyer Creek and Indian Creek subwatersheds (Figure 7). The majority of the neighborhoods assessed have single family homes on quarter-acre or smaller lots. No egregious pollution problems were found, but the field crews identified several opportunities for soil restoration, stewardship projects, and homeowner education. Examples of neighborhood conditions are shown in Figure 8, and Table 8 provides a summary of opportunities for each neighborhood. A general description of these opportunities is provided below.

- *Lack of tree cover* – Most of the homes seen in these neighborhoods have expansive lawns. Trees help catch rainfall before it can turn to runoff. Increasing the tree cover in a watershed is an effective way of reduce runoff and peak flows, promote infiltration to ground water, provide filtration for water quality, moderate the effect of summer heat spikes on stream temperature, and supply food in the way of leaf litter for organisms at the base of the stream food web.
- *Intensely mowed yards* – Too much mowing can compact the soil which reduces the amount of rainfall that can soak into the ground. Also, taller grass reduces runoff more efficiently than very short grass. A recommended practice includes setting mower decks to a higher setting to avoid cutting grass too short. Taller grass produces stronger roots, will reduce stormwater runoff from the site, and will expose less soil to erosion. If possible, also try to reduce frequency of mowing to lessen soil compaction over time.
- *Heavy use of lawn fertilizer* – Several neighborhoods exhibited bright green lawns (in December) which are a likely sign of heavy fertilization. Excessive fertilization can cause nutrients to run off into local streams during storms.
- *Soil erosion problems* – Several neighborhoods had poorly established vegetation due to poor quality topsoil and compaction from over-mowing. Several landscaping changes

could help reduce the amount of bare soil and erosion seen in some of Kilmarnock's neighborhood. To increase the organic matter content of the soil, consider tilling in compost amendments in the fall. Where turf area is still needed, re-seed and straw following the addition of compost. Otherwise, replace turf grass with other perennial ground cover that is better suited to sandy soils and does not need to be mowed as frequently.

- *Roof downspouts connected to storm drain pipes* – This roof drainage design does not allow roof water to soak into the ground. Residential roof downspouts that are connected directly to storm drain pipes can be disconnected and re-routed to an adequately sized lawn or pervious area (disconnection), a rainwater cistern/rain barrel for use in outside irrigation, or a rain garden to filter pollutants.
- *Swimming pools* (only a problem if homeowners drain their chlorinated pool water to the street and/or storm drain network)

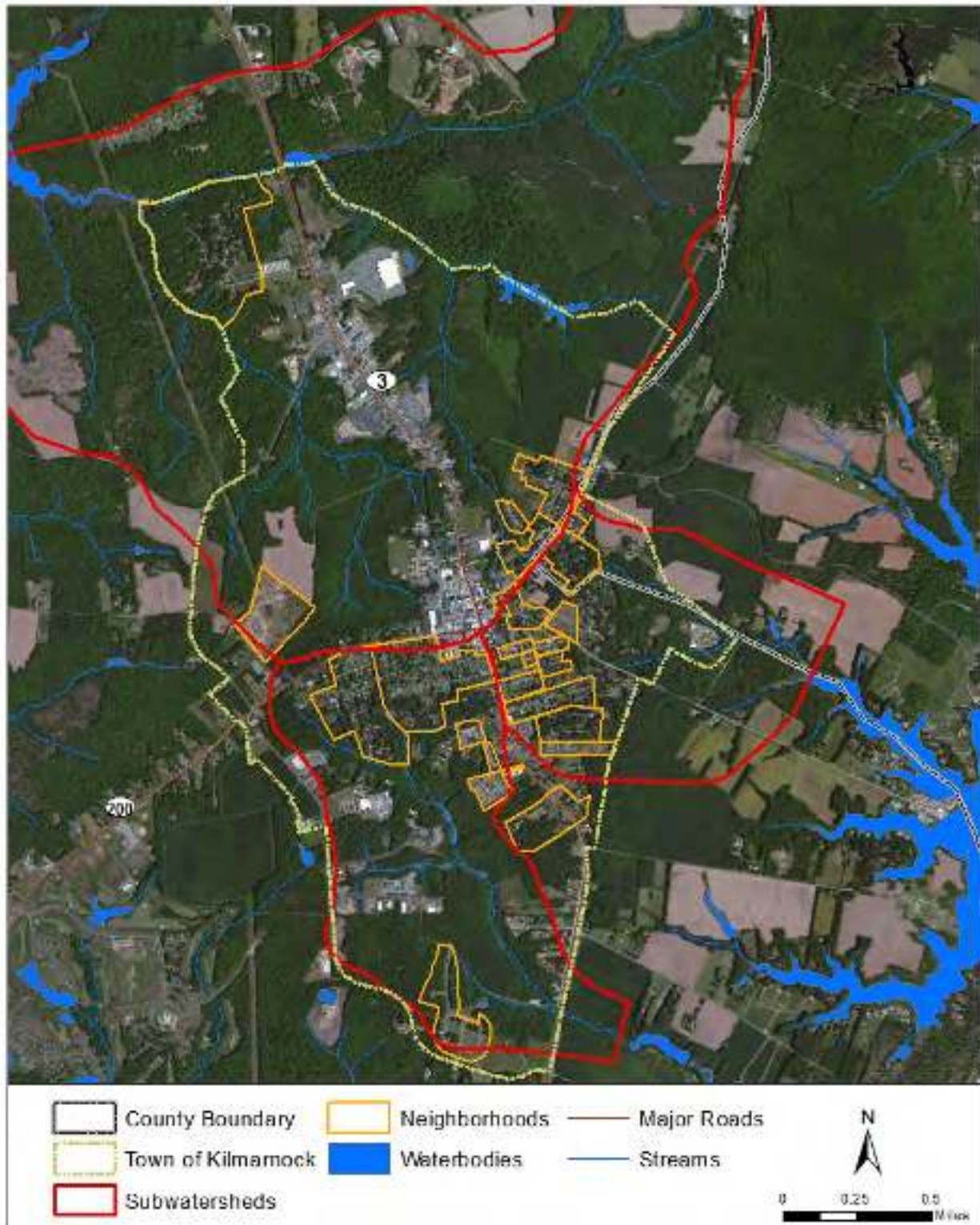


Figure 7. Location of neighborhoods assessed.



Figure 8. Examples of neighborhood conditions: A & B. Heavy fertilizer use (Sites N-103 & N-111); C. Lack of trees (Site N-121); D. Opportunity for rain garden (Site N-106); E. Establish better topsoil, plant trees and ground cover (Site N-113); F. Control erosion and reduce mowing, plant trees (Site N-112).

Table 8. Neighborhood Restoration Opportunities

Site ID	Street Location	Comments	Restoration Opportunities				
			Plant Trees/ Ground Cover	Rainwater Harvesting	Rain Gardens	Disconnect Downspouts	Fix Erosion Problem
N-100	Corrotoman Circle, Hawthorne Avenue	Potential to treat stormwater at outfalls (e.g., rain gardens)			X		
N-101	Venable Drive, Gilbert Street	None.	X				
N-102	Bayridge Avenue, Avonne Avenue	None.	X	X			
N-103	Clifton Avenue, Oak Ridge Drive	Let grass grow taller	X				
N-104	Fox Hill Drive	None.					
N-105	Waverly Avenue, East Church Street	Educate on proper disposal of pool water.					
N-106	Heatherfield Court	None.			X		
N-107	Lloyd Lane	None.	X				
N-108	Dogwood Lane	None.					
N-109	Hatton Avenue	None.	X		X		
N-110	Cedar Lane	None.	X				
N-111	Kamps Lane, Lawler Lane	Reduce use of lawn fertilizer					
N-112	Baywalk Drive	Erosion due to over-mowing	X				X
N-113	Shamrock Court, Tartan Village Drive	Multiple restoration needs	X				X
N-114	Southport Lane	Disconnect downspouts on back on buildings				X	
N-115	Wiggins Avenue	None.					
N-116	Dilvers Road, Dennisville Drive	None.	X				
N-117	Braxton Way, Pleasants Lane	None.					

Site ID	Street Location	Comments	Restoration Opportunities				
			Plant Trees/ Ground Cover	Rainwater Harvesting	Rain Gardens	Disconnect Downspouts	Fix Erosion Problem
N-118	First Avenue, Second Avenue, Third Avenue, Roseneath Avenue, Claybrook Avenue	Reduce fertilizer use	X				
N-119	Chase Street	None.	X				
N-120	Walnut Street	None.	X		X		
N-121	Byway Drive, Byway Circle	None.	X				
N-122	Town Center Drive, East Church Street	None.		X	X		
N-123	Dixie Avenue	None.					
N-301	Purcell Drive, Waverly Avenue	Town Carnival property	X				X

3.3 Stream Head Cuts

Stream head cutting is a process of active erosion in a channel caused by an abrupt change in slope. Head cuts occur when the turbulence in the water undercuts substrate material resulting in collapse of the upper level. This undercut-collapse process advances up the stream channel.

Assessment Protocol

Town staff identified thirteen headwater channels with existing head cuts for the field teams to investigate, of which two were inaccessible. These channels consist of storm drain outfalls that feed natural ravines, as well as channels that receive very little runoff from developed areas yet still are undergoing considerable erosion. In total, the field teams visited twelve stream channels (one extra head cut was found in the field) for a preliminary investigation. Out of these, seven were identified for a more extensive evaluation based on the potential threat to existing infrastructure, and the potential for ongoing erosion and impacts to receiving waters. Table 9 provides a list and location of the seven head cuts evaluated, and Figure 9 provides a corresponding map.

Table 9. Investigated Channels with Head Cuts		
Map ID	Site Location	Subwatershed
S-100	School Street Pump Station	Corrotoman River (Norris Prong)
S-101	School Street at intersection with North Main Street	Corrotoman River (Norris Prong)
S-102	Behind vacant structure north of Food Lion	Corrotoman River (Norris Prong)
S-103	Walmart Access Road	Corrotoman River (Norris Prong)
S-104	Municipal Parking Lot	Corrotoman River (Norris Prong)
S-108	Food Lion/McDonalds	Corrotoman River (Norris Prong)
S-401	Lancaster Middle School	Corrotoman River (Norris Prong)

A follow-up visit was made to assess the physical conditions and dimensions of head cut S-102 as well as to do a more thorough visual survey of S-103 and S-401. These sites were chosen as representative and high priority in consultation with town officials. Simple transit level and rod measurements were conducted along the length and width of the head cut. These measurements allowed a very preliminary assessment of the total volume of sediment that has mobilized downstream. It is important to note that the measurements are not adequate for a final design, nor were they benchmarked into any horizontal or vertical datum.

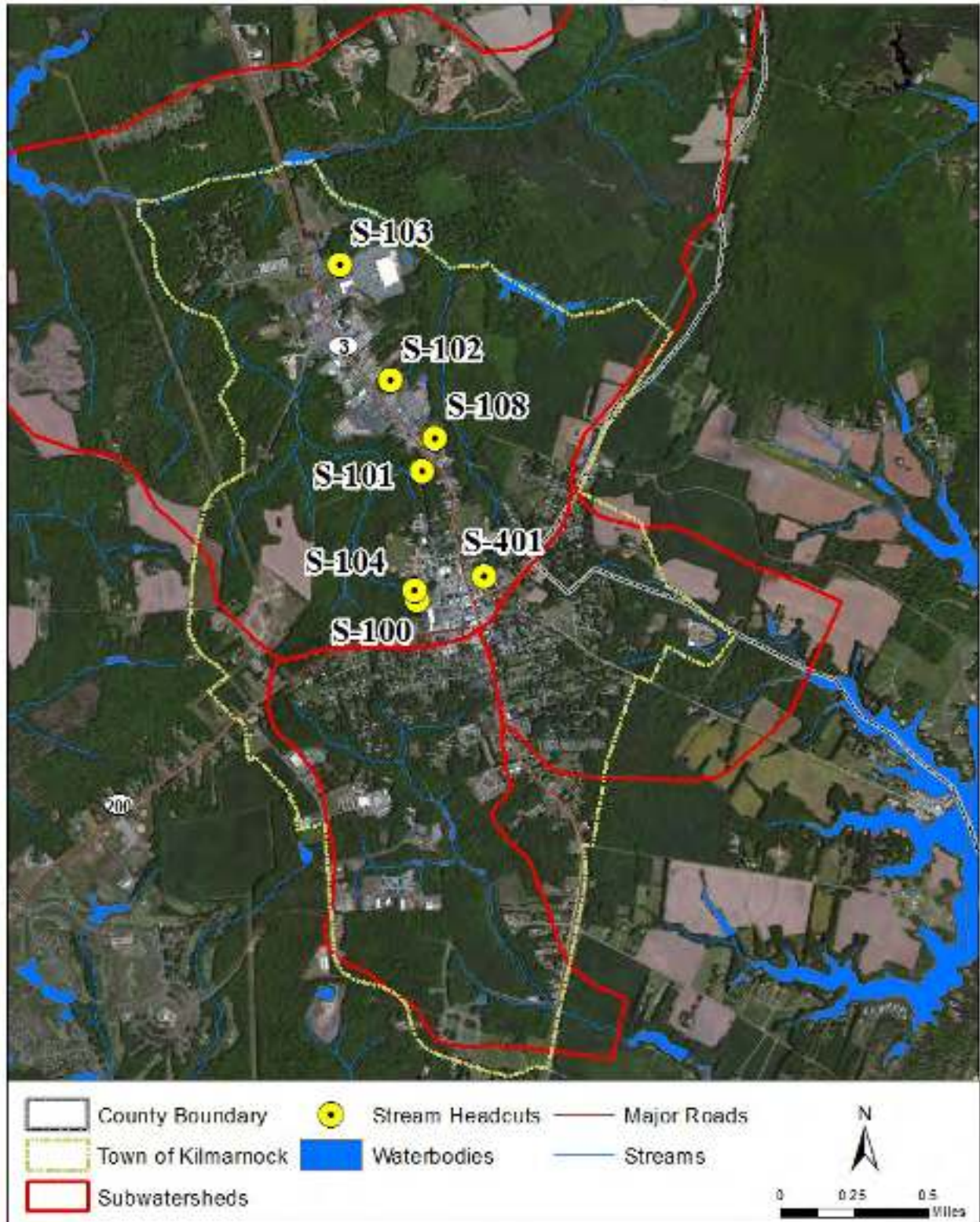


Figure 9. Location of channel head cuts investigated in the field.

General Findings

Most of these channels are not flowing streams; rather they are drainage channels that are generally dry in the upper reaches and drop down a relatively steep vertical grade over a variable distance to the floodplain. The cause of the head cuts may include an increase in impervious cover and stormwater runoff from the contributing drainage area, or channelization within the contributing drainage area that concentrates the runoff into the channel, thereby increasing the erosive energy (with or without an increase in impervious cover). The consistent factors in all the channels are the presence of highly erodible soils at or near the lower elevations of the channel, and an erratic meandering of the newly scoured channel.

The typical evolution of a head cut is a gradual up-gradient migration of the erosion of the underlying soils, causing the topsoil to cave in over top of the scour and be washed downstream. The initial erosion occurs where the gradient of the channel flow intercepts the exposed horizontal layer of erodible soils – this initial exposure can be the result of a single large storm that uproots vegetation, or a long-term increase in flow resulting from changes in the upstream hydrology. In either case, once the process has begun, it becomes very difficult to stop the steady upstream migration due to the highly erodible nature of the soils. Once exposed, even small amounts of runoff can mobilize enough of these soil particles to accelerate the erosion. Eventually, the head cut reaches the upstream drainage system or other infrastructure and must be stabilized or it can damage existing infrastructure.

Of the seven head cuts evaluated, the following five head cuts were identified as the most problematic in Kilmarnock. These are the deepest and longest head cuts, and/or have the potential to put infrastructure at-risk.

Head Cut S-401: Lancaster Middle School

The most immediate impact to infrastructure is at the Lancaster Middle School (S-401). The outlet of the storm drainage pipe system that drains the visitor entrance driveway, the entire teacher parking lot, and the bus loop discharges into the adjacent woods southwest of the school building. The pipe outlet is suspended above a scour hole more than 5 feet deep and only 6 feet from the edge of the service drive to the School Street Pump Station (Figure 10). The outlet channel meanders through the wooded area and eventually meets the main stream channel.



Figure 10. Head cut S-401

The geomorphology of this channel includes a clay layer (blue marl, or marlstone, or other very stable clay-based material) that appears to have stopped the down-cutting of the channel at the elevation of the top of the layer. The channel may continue to erode by widening, but the particular geology of this channel appears to be holding the channel geometry relatively constant. Likewise, the head cut has reached the upstream limit (which has been armored with concrete).

However, the head cutting may continue and eventually undermine the armoring, threatening the drainage pipe and the subgrade of the school's service drive.

Head Cut S-102: Behind vacant structure north of Food Lion

The potential for ongoing erosion and impact to receiving waters appears to be very significant at the outfall channels S-102 and S-103. The outfall channel at S-102 shows evidence of a head cut with an up-gradient extent of between 50 and 90 linear feet from the culvert outlet under North Main Street. The drainage system is a concrete pipe culvert that drains the commercial frontage on the west side of North Main Street for an indeterminate distance along North Main Street (the grades are very flat, and the extent of drainage area from the commercial properties is difficult to determine).

The head cut initially appears as a sunken area of grass that quickly drops into a gully (eighteen inches wide, two feet deep) with exposed soil on the sides and bottom. It then drops into a large cavernous channel (top width of 13 feet, bottom width of 6 feet, and approximately 6 feet deep) within a channel length of 50 feet (Figure 11). This eroded gully cross section continues to increase in size with sharp grade drops at intermediate locations as the channel erodes from the upper elevation down to the floodplain. Figure 12 shows a schematic profile of the channel as measured in the field.



Figure 11: Head cut S-102

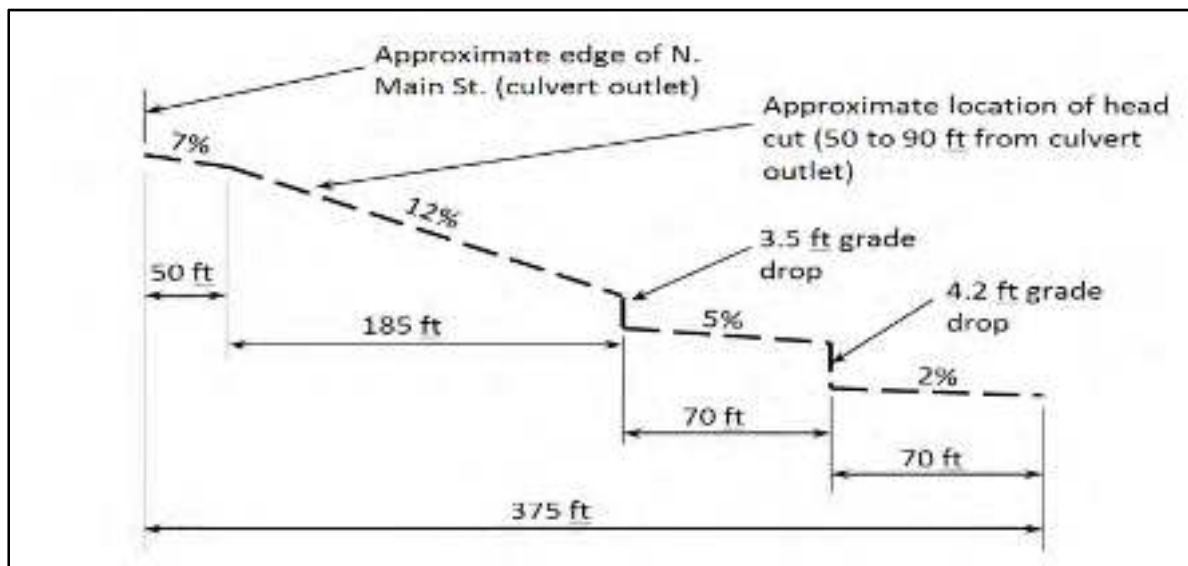


Figure 12. Schematic profile of head cut S-102

The profile of head cut S-102 is consistent with the geomorphologic process of a channel eroding and creating a meander to establish equilibrium between the channel grade and the soil structure.

In the case of the head cuts at S-102 and S-103, the highly erodible soils are being scoured from the upstream channel to fill in the lower channel and create a flatter grade. The 2% grade at the downstream end of the S-102 profile is approaching the relatively flat floodplain grade as the channel travels an additional 1,000 feet to the floodplain of the Corrotoman River (Norris Prong).

The quantity of sediment scoured from the channel can be approximated from the measured cross sections (approximately 3 ft² near the top of the head cut, to approximately 230 ft² at the bottom) and the total length of scour above the floodplain. The total length of scour was measured in a straight line, while the actual distance is considerably longer due to the meandering alignment of the erosion process. An inspection of the wide flat floodplain area (approximately 500 feet from the start of the head cut) reveals the stream's base flow braiding through a thick mat of sediment covering the entire width (Figure 13).



Figure 13: Floodplain below S-102

A very rough and conservative estimate is that approximately 1,650 cubic yards of soil has eroded into the floodplain below this outfall channel. Considering an average dump truck hauling capacity of 10 yd³, approximately 165 truckloads of sediment from S-102 have covered the flood plain and are slowly migrating towards Norris Pond (Figure 14). Unlike the outfall at S-401 there is no apparent clay layer to slow or limit the channel erosion in terms of the depth of the scour. The channel bottom may continue to down-cut with additional grade drops, the channel width may increase as the meander pushes against the near vertical side walls, and the upstream edge of the head cut will undoubtedly continue to migrate up-gradient. The amount of time before the head cut erosion reaches the edge of North Main Street is dependent on the amount and intensity of rainfall.



Figure 14: Sediment from S-102 fills downstream channel

Head Cut S-103: Walmart access road – Old Fairgrounds Way



Figure 15: Concrete headwall above S-103

The head cut in the outfall channel at S-103 is similarly moving upstream. Although the head cut is not visible from Old Fairgrounds Way, there is evidence of soil instability and erosion in the vicinity of the Old Fairgrounds Way concrete retaining wall and the adjacent drainage system headwall (Figure 15). The overall condition of this head cut is very similar to that of S-102. A quick investigation of the downstream edge of the floodplain (where the outfall channel meets the main channel) as observed from the terminal point of the Baylor Park Nature Trail may indicate that the total volume of sediment that has moved downstream into the floodplain is greater than

that of S-102. The sediment appears to be deeper with no evidence of vegetation being able to emerge.

Head Cut S-108: Food Lion/McDonald's

The head cut at S-108 has worked its way upstream to the existing stormwater basin that drains the McDonald's Restaurant and the Food Lion Shopping Center (and adjacent outparcels) on North Main Street. The embankment of the basin has been scoured away, although it is uncertain if this was the result of the up-gradient migration of the head cut or the result of a dam failure during a storm event. In either case, the channel draining this highly impervious area is scoured very similarly to S-102 and S-103 – the only difference being the relatively short distance to the downstream flood plain. The flood plain channel is braided through a thick mat of sediment that is gradually moving downstream.

Head Cut S-104: Municipal Parking Lot

The outfall channel at S-104 drains a municipal parking lot and other impervious areas adjacent to Main Street. The parking lot has a small BMP (see R-400 Site Summary in Appendix B) that treats the water quality volume from the parking lot. The impervious cover and the outfall channel are in the headwaters of the watershed, so the head cut may not be scoured all the way to the floodplain. However, the head cut may continue upstream to the parking lot and commercial property on Main Street.

Remediating these head cuts and the associated erosion and sediment delivery is very complex. Section 4 provides several recommendations for remedies. Given that sediment delivery from head cuts likely exceeds other sources by orders of magnitude, they may be a high priority for restoration as part of an overall plan.

3.4 Stormwater Retrofit Inventory

Stormwater retrofits are structural stormwater management practices that can be used to regulate the volume, duration, frequency, and rate of stormwater runoff. These practices can be installed in upland areas to capture and treat stormwater runoff before it is delivered to the storm drainage system and, ultimately, creeks and ponds in the town. They are an essential element of a holistic watershed restoration program because they can help improve water quality, increase groundwater recharge, and reduce erosion. Without using stormwater retrofits to help establish a stable, predictable hydrologic regime, the effectiveness of many other watershed restoration strategies – such as stream stabilization, erosion control, and aquatic habitat enhancement – will be diminished. Stormwater retrofits can also serve as local demonstration projects of a new generation of stormwater controls, and can help educate residents and build their interest in watershed restoration.

Assessment Protocol

Potential stormwater retrofit opportunities at a number of candidate project sites within the town were assessed. A Retrofit Reconnaissance Inventory (RRI) field form (Schueler, et al., 2007) was used to evaluate retrofit opportunities at candidate sites (Appendix A). Field teams looked specifically at drainage patterns, the amount of impervious cover, available space, and other site constraints when developing concepts for a site. In the town, retrofit opportunities were identified during field work as field teams visited the pre-identified hotspot, neighborhood, and stream head cut sites. Candidate retrofit sites generally had one or more of the following characteristics:

- Located on publicly-owned or operated lands or open spaces (e.g. school sites and parks)
- Located on commercial and industrial sites with large areas of impervious cover
- Potential to serve as a demonstration project; and
- Located at an existing stormwater best management practice (BMP)

It should be noted that the retrofit sites identified in the field represent only a portion of the potential retrofit opportunities in the town. A second field investigation would likely yield more retrofit opportunities.

General Findings

The list of projects provided in this report should not be considered a ranking but rather the basic information on which a ranking system can be based. The ultimate criteria for selecting any one of these retrofit projects should be developed by the town after considering the numerous water quality initiatives and regulatory drivers being developed and implemented in the region, as well as community needs such as protecting infrastructure and recreational amenities. Table 10 provides a list of the retrofit concepts identified in the field, listed in order of their site ID (not a ranking). A project write-up for each retrofit site, including photographs and a detailed description, is provided in Appendix B.

In addition to stormwater retrofit opportunities, three existing BMPs were identified as having experienced an embankment failure. The embankment of the WalMart stormwater pond failed either during construction of the shopping center or shortly thereafter, and has since been repaired. The Bowling Alley and the Food Lion (south) ponds have breached embankments that have not

been repaired. (In addition, a potential future embankment failure was identified at a wet pond behind CVS where the corrugated metal spillway pipe has started to corrode.) The cause of the embankment failures was not confirmed, however, four common causes are suspected:

1. Inappropriate embankment construction material (too sandy or otherwise unsuitable soil);
2. Improper construction techniques:
 - Inadequate seepage controls
 - Failure to adequately compact embankment soil
3. Reduced storage volume due to the accumulation of sediment in the basin; and
4. Embankment undermined from a downstream outfall channel head cut.

These observations are noted because the excessive sediment loading associated with an embankment failure are comparable to the loads associated with the stream head cuts described in Section 3.3. The sediment loads from an embankment failure are more readily addressed through prevention. Due to the highly erodible soils in Kilmarnock, embankments on all impoundment BMPs should be given careful scrutiny during and after construction.

Table 10. Stormwater Retrofit Inventory		
Site ID	Location	Proposed Retrofit
R-300	WalMart Parking Lot	Parking lot bioretention, existing wet pond (embankment failure during construction)
R-301A/B	Holiday Inn Express	Existing BMP retrofit
R-302	Walgreens Detention Pond	Existing BMP retrofit
R-303	CVS Wet Pond	Existing wet pond maintenance (corrosion of spillway pipe)
R-304	Bowling Alley Retention Pond	Existing wet pond repair (embankment failure)
R-400	Municipal Parking Lot	Existing BMP repair
R-401	Lancaster Middle School	Parking lot and adjacent area bioretention and outfall repair (see S401)
R-402	Boys and Girls Club	Impervious disconnection
R-403	Peebles Shopping Center	Parking lot bioretention
H-105, 120, & 121	McDonalds Restaurant and Food Lion Shopping Center	Existing BMP Repair and parking lot bioretention Two wet ponds at Food Lion (south pond, embankment failure)
R-110	Technology Park	Existing BMP repair

SECTION 4. RECOMMENDATIONS

4.1 Recommendations

1. Encourage restoration in residential neighborhoods.

Several opportunities were noted in the residential neighborhoods that include increased tree canopy, reduced use of fertilizer and pesticides, and downspout disconnection (Section 3.2.2). During the neighborhood assessment, large lawns were noted with the potential for increased tree canopy. The town should work with the local soil and water conservation district to provide free tree giveaways to residential homeowners, or similar types of efforts. This program could be incorporated into meeting a tree canopy goal. Additionally, education should be provided to the homeowners and maintenance companies on proper lawn fertilization. An example program is the James City County, VA *Turf Love* program in cooperation with the Virginia Cooperative Extension. This program provides lawn analysis and workshops to educate residents on how to produce a healthy turf while not polluting local waterways. For more information on this program visit http://offices.ext.vt.edu/james-city/programs/anr/Turf_Love.html

Downspout disconnection opportunities were noted in the neighborhoods. This includes simple disconnection to the lawn, a rain barrel or rain gardens. The town should consider providing cost share funding to offset the cost of a rain barrel or rain garden. Additionally, the Friends of the Rappahannock have a program called 'Livable Neighborhoods'. This program develops leaders for neighborhood projects that build a safer and healthier watershed. The goal of the Livable Neighborhood Program is to reach all stakeholders in the watershed, serve as a forum for discussion of the stormwater concerns of the town and its citizens, and educate citizens on simple practices they can take to reduce pollution from their homes. The results from the neighborhood assessment provide a list of restoration and protection projects that can be integrated into the existing Livable Neighborhood Program.

2. Mitigate Hotspot Pollution Problems

At the five sites where pollution problems were found, town staff and/or Lancaster County staff should work with property owners to correct these problems. Town staff has been briefed on the location of these sites.

If an illicit discharge ordinance does not already exist, the Town should consider establishing one in order to have the authority to remedy these types of point source pollution.

In addition, the town could consider establishing a business-oriented clean water incentive program, whereby local businesses are encouraged to adopt a set of clean water practices based on standards or a checklist. The program could be set up to offer signage or other promotion of businesses that "pass the test." The program could feature some type of logo or branding, such "Clean Water Kilmarnock."

3. Address Stormwater Basin Embankment Failures

Several stormwater basin embankment failures were noted during field work (Section 3.4). It is the responsibility of the property owner or developer (if construction permit still active) to fix these embankments, however they may not be aware of the problem. Town staff should work with Lancaster County to inform the property owners of the need to fix these damaged stormwater basin embankments.

Several recommendations are provided to avoid future problems with basin embankments:

1. For new basins, inspections during construction should ensure that embankments are constructed in accordance with the plan specifications and built with the specified materials. In general, basins should not be placed next to streams, so as to avoid erosion of the embankment from the streams' flow.
2. For existing basins, on-going operation and maintenance inspections should ensure that:
 - a. The outlet pipe does not exhibit signs of seepage or excessive corrosion;
 - b. The embankment does not have woody vegetation, or show evidence of animal burrows or sink holes; and
 - c. The sediment forebays and main pool areas have less than one-half of the storage depth filled with sediment.

4. Address Stream Head Cuts

The potential solutions to stabilize and prevent channel head cutting are neither simple nor inexpensive. The primary objectives of any proposal to address these head cuts is to stop the up-gradient migration of the erosion, stabilize the channel itself, and remove or stabilize the sediment that is already in the floodplain. One option is to reduce the amount of runoff from the upstream drainage areas through stormwater retrofitting (Section 3.4, Appendix B). However, given the highly erodible soils that characterize these outfall channels, even the implementation of an aggressive stormwater retrofit strategy to reduce the volume, velocity, and peak flow rate of stormwater runoff may only succeed in slowing the rate of erosion. Similarly, implementing stringent stormwater controls on new development in these watersheds will not eliminate the erosion. The channels will continue to erode to establish the equilibrium of a low gradient channel.

Each head cut investigated will require a detailed assessment to determine the practicality and cost estimate for any proposed solutions. The five head cuts described in Section 3.3 all drain towards Norris Pond which is currently serving as a large sediment basin. The costs for addressing the head cuts should be compared against the cost savings from not having to dredge Norris Pond and not having to repair damage to infrastructure (buildings, utilities) eventually caused by the head cuts.

Three approaches to address these head cuts are discussed below:

1. Stop the up-gradient migration of the head cut by installing a drop structure such as a manhole and pipe, a slope drain, or other means of conveying the stormwater to the appropriate lower elevation. The drop structure can be placed above the highest point of the head and a pipe installed within the existing scoured channel. (Some minor

grading would be required to create suitable pipe bedding. This also assumes that the existing soil material is suitable for the proposed structural improvements.) Careful alignment of the pipe along with suitable soils for backfilling over the pipe can minimize the need to bring in significant amounts of fill material or to excavate and haul material away

2. Stabilize the channel with channel restoration practices such as Regenerative Stormwater Conveyance (RSC) (Figure 16). This is a system of step pools that is designed to bring stormwater down to the bottom elevation and can incorporate water quality treatment. The design of a RSC is somewhat unique for each outfall channel. In general, RSC will include earthwork to create the step pool geometry and large to medium sized rock to create the pools and to withstand the energy of large flows.

Stabilizing the channel can also include different scales of stream restoration or stabilization techniques below a drop structure as previously described. Stabilization techniques can be as simple as laying back the vertical eroded slopes of the channel and installing check dams or other forms of energy dissipation at the appropriate elevations within a newly created (armored or otherwise stabilized) channel. Any remedy should be analyzed carefully to ensure that structures (such as check dams or energy dissipation devices) won't be undermined by continued head cutting of the channel.

3. Removal of sediment may be beyond the reach or capacity of traditional equipment as the floodplains are not easily accessible with heavy equipment. Further, the volume of sediment is such that the excavation and hauling would likely cause more damage than already exists. A possible solution is to establish a traditional floodplain configuration by creating a stable primary low flow channel within the floodplain and stabilize the sediment in flood fringe with native grasses and other vegetation.

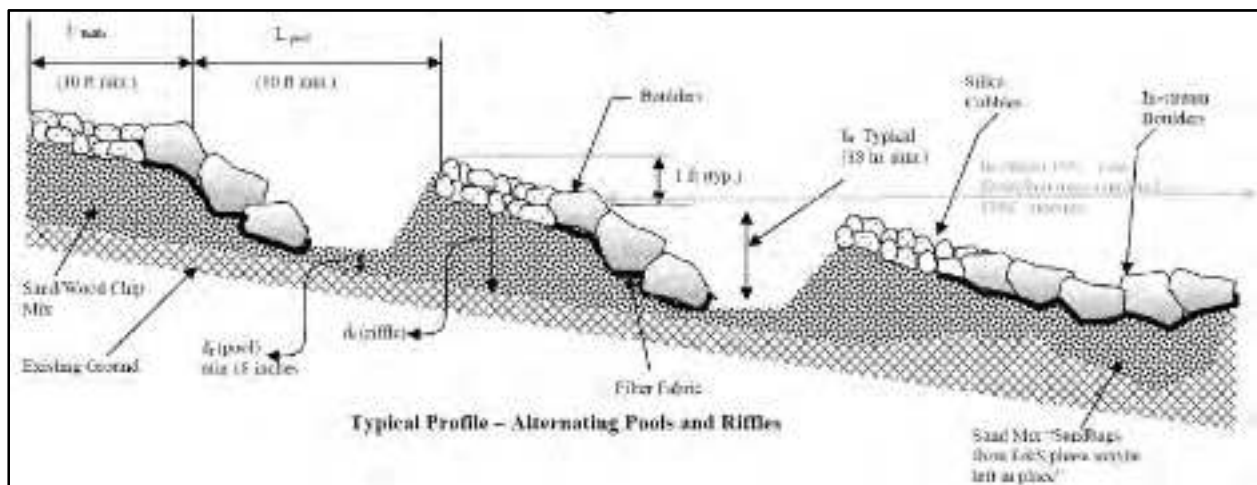


Figure 16. Regenerative Stormwater Conveyance profile (Anne Arundel County, MD, 2012.)

5. Town to provide leadership role in stormwater management

Kilmarnock's Comprehensive Plan (2006) states that, "The focus of policies will be on ways to reduce or minimize the amount of pollutants in the runoff water as well as minimizing the

amount of such water that reaches the Chesapeake Bay tributaries.” Using the retrofit concepts identified in this report, the town can install runoff reduction practices that not only achieve this goal outlined in the Comprehensive Plan, but that also serve as a showcase for the region.

The town and its partners should look for future project funding to install these projects (e.g., National Fish and Wildlife Foundation, Chesapeake Bay Restoration Fund). The projects should have signage installed that describes the benefits of the project and serves to educate town residents. For example, a demonstration retrofit could be installed at the Lancaster Middle School (R-401) where several biofilter systems are proposed in the parking lot. This is a highly visible area and could engage the students by incorporating stormwater and the environment into the school’s science curriculum.

Other stormwater retrofit projects should be prioritized using criteria important to the town. Typical stormwater retrofit ranking criteria include cost, community education and involvement, water quality improvement, and ecological objectives. Once the projects are prioritized, the town should focus efforts on the implementation of the high priority projects.

6. Establish Strong Partnerships for Implementation

Restoring a watershed is most successful through partnerships with organizations that bring together different strengths and resources. Several local organizations that may serve as good partners include Friends of the Rappahannock, Lancaster County, Northern Neck Soil and Water Conservation District, and Lancaster County Cooperative Extension Service. Local partners could meet once a month or quarterly to discuss progress on implementing restoration projects identified in this report. This report should act as a living document to be updated every five years to include additional data on the subwatersheds and restoration progress.

7. Conduct additional watershed assessments

While the scope of this project was limited to the assessments provided, several additional assessments may be useful for watershed restoration. A more extensive stream assessment that involves walking the entire length of streams within Kilmarnock would paint a clearer picture of the physical impacts of the town’s upland areas on the streams. No water quality data is known to exist for streams in Kilmarnock, so this is a gap that would be very useful to fill, perhaps with the help of citizen volunteers.

An assessment of illicit discharges, especially to identify and fix any existing sewer leaks, could reduce a potentially significant source of nutrients and bacteria to local streams. As an example, a leaking sewer lateral pipe was discovered just by chance during this watershed assessment (Section 3.2.1) – other leaks are almost certainly out there.

With a significant amount of undeveloped lands in the town, it would be useful to inventory the extent and type of existing ecological communities, wetlands, contiguous forests, and additional stream assessments. This information would inform Kilmarnock’s decision-makers about the areas of town with the most valuable ecosystems that should be preserved.

4.2 Summary of Proposed Actions

This study proposes a wide variety of actions to improve watershed conditions in the Town of Kilmarnock. Table 11 below summarizes the types of actions proposed and assigns each a relative ranking of (1) the complexity of implementing the practice and (2) the water quality benefit of that practice.

Table 11. Relative Ease and Benefit of Proposed Watershed Actions for Kilmarnock			
Concept	Sites	Complexity*	Water Quality Benefit**
Neighborhoods			
Plant trees and/or ground cover	N-101, N-102, N-103, N-107, N-109, N-110, N-112, N-113, N-116, N-118, N-119, N-120, N-121, N-301	Low	Medium
Disconnect downspouts	N-114	Low	Medium
Fix erosion	N-112, N-113, N-301	Medium	High
Reduce fertilizer use	N-111, N-118	Low	High
Rain gardens	N-100, N-106, N-109, N-120, N-122	Medium	Medium
Rainwater harvesting	N-102, N-122	High	High
Proper pool water disposal	N-105	Low	Low
Basin Repairs			
Repair embankment/dam	R-304, H-105/120/121	Medium	High
Other maintenance	R-303, R-110	Medium	Medium
Retrofits			
Retrofit existing BMP	R-301A & B, R-302	Medium	Medium
New bioretention	H-105/120/121, R-300, R-401, R-403	High	High
Disconnection	R-402	Low	high
Hotspots			
Proper dumpster maintenance		Low	Medium
Wash water containment at car wash		Medium	Medium
Proper outdoor materials storage		Medium	Medium
Fix leaking sewer pipes		Medium	High
Head Cuts			
Stop up-gradient head cut migration		Medium	Medium
Stabilize & restore channel		High	High
Remove sediment from floodplain		High	High
Stabilize floodplain		High	High
* “Complexity” of implementing practice refers primarily to the technical aspects of implementation. Programmatic (e.g., outreach or enforcement) elements may be more difficult.			
** “Water Quality Benefit” of practice is based on pollutant and runoff reduction values described by the Virginia Runoff Reduction Method, EPA Chesapeake Bay Program, and based on best professional judgment.			

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APPENDIX A: FIELD FORMS

This appendix includes the field forms used during Kilmarnock's watershed field assessment:

- Retrofit Reconnaissance Inventory form
- Hotspot Site Investigation form
- Neighborhood Source Assessment form
- Severe Bank Erosion form

WATERSHED:		SUBWATERSHED:		UNIQUE SITE ID:	
DATE:		ASSESSED BY:		CAMERA ID:	
GPS ID:		LMK ID:		LAT:	
				LONG:	
SITE DESCRIPTION					
Name: _____					
Address: _____					
Ownership: ☐ Public ☐ Private ☐ Unknown If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other: _____					
Corresponding USSR/USA Field Sheet? ☐ Yes ☐ No If yes, Unique Site ID: _____					
Proposed Retrofit Location:					
Storage ☐ Existing Pond ☐ Above Roadway Culvert ☐ Below Outfall ☐ In Conveyance System ☐ In Road ROW ☐ Near Large Parking Lot ☐ Other: _____			On-Site ☐ Hotspot Operation ☐ Individual Rooftop ☐ Small Parking Lot ☐ Small Impervious Area ☐ Individual Street ☐ Landscape / Hardscape ☐ Underground ☐ Other: _____		
DRAINAGE AREA TO PROPOSED RETROFIT					
Drainage Area ≈ _____ Imperviousness ≈ _____ % Impervious Area ≈ _____			Drainage Area Land Use: ☐ Residential ☐ Institutional ☐ SFH (< 1 ac lots) ☐ Industrial ☐ SFH (> 1 ac lots) ☐ Transport-Related ☐ Townhouses ☐ Park ☐ Multi-Family ☐ Undeveloped ☐ Commercial ☐ Other: _____		
Notes:					
EXISTING STORMWATER MANAGEMENT					
Existing Stormwater Practice: ☐ Yes ☐ No ☐ Possible If Yes, Describe:					
Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance: Existing Street Width (if applicable): _____					
Existing Head Available:			Note where points are measured from: (i.e. street elevation to catch basin invert, manhole rim to catch basin invert, other)		

PROPOSED RETROFIT

Purpose of Retrofit:

- ☐ Water Quality ☐ Recharge ☐ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other: _____

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:

- ☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☐ Bioretention
☐ Filtering Practice ☐ Infiltration ☐ Swale ☐ Other: _____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

Available Width: _____
Available Length: _____
Available Area: _____
Ponding Depth: _____
Soil Depth: _____

SITE CONSTRAINTS

Adjacent Land Use:

- ☐ Residential ☐ Commercial ☐ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☐ Other: _____

Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☐ No

If Yes, Describe:

Access:

☐ No Constraints

Constrained due to

- ☐ Slope ☐ Space
☐ Utilities ☐ Tree Impacts
☐ Structures ☐ Property

Ownership

☐ Other: _____

Conflicts with Existing Utilities:

	Yes	Possible/ Modifiable	No	Unknown
Sewer:	☐	☐	☐	☐
Water:	☐	☐	☐	☐
Gas:	☐	☐	☐	☐
Electric to				
Streetlights:	☐	☐	☐	☐
Other:	☐	☐	☐	☐

Potential Permitting Factors:

Dam Safety Permits Necessary ☐ Probable ☐ Not Probable
Impacts to Wetlands ☐ Probable ☐ Not Probable
Impacts to a Stream ☐ Probable ☐ Not Probable
Floodplain Fill ☐ Probable ☐ Not Probable
Impacts to Forests ☐ Probable ☐ Not Probable
Impacts to Specimen Trees ☐ Probable ☐ Not Probable

How many? _____

Approx. DBH _____

Other factors: _____

Soils:

Soil auger test holes: ☐ Yes ☐ No
Evidence of poor infiltration (clays, fines): ☐ Yes ☐ No
Evidence of shallow bedrock: ☐ Yes ☐ No
Evidence of high water table (gleying, saturation): ☐ Yes ☐ No

SKETCH

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

☐ Confirm property ownership	☐ Obtain existing stormwater practice as-builts
☐ Confirm drainage area	☐ Obtain site as-builts
☐ Confirm drainage area impervious cover	☐ Obtain detailed topography
☐ Confirm volume computations	☐ Obtain utility mapping
☐ Complete concept sketch	☐ Confirm storm drain invert elevations
☐ Other: _____	☐ Confirm soil types

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION: ☐ YES ☐ NO ☐ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S): ☐ YES ☐ NO ☐ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S): ☐ YES ☐ NO ☐ MAYBE
IF YES, TYPE(S): _____

WATERSHED:		SUBWATERSHED:		UNIQUE SITE ID:	
DATE: ____/____/____		ASSESSED BY:		CAMERA ID:	
MAP GRID:		LAT ____° ____' ____" LONG ____° ____' ____"			LMK #
A. SITE DATA AND BASIC CLASSIFICATION					
Name and Address: _____		Category: ☐ Commercial ☐ Industrial ☐ Miscellaneous			
_____		☐ Institutional ☐ Municipal ☐ Golf Course			
_____		☐ Transport-Related ☐ Marina ☐ Animal Facility			
SIC code (if available): _____		Basic Description of Operation: _____			
NPDES Status: ☐ Regulated ☐ Unregulated ☐ Unknown				INDEX*	
B. VEHICLE OPERATIONS ☐ N/A (Skip to part C)				Observed Pollution Source? ☐	
B1. Types of vehicles: ☐ Fleet vehicles ☐ School buses ☐ Other: _____					
B2. Approximate number of vehicles: _____					
B3. Vehicle activities (circle all that apply): Maintained Repaired Recycled Fueled Washed Stored				☐	
B4. Are vehicles stored and/or repaired outside? ☐ Y ☐ N ☐ Can't Tell				☐	
Are these vehicles lacking runoff diversion methods? ☐ Y ☐ N ☐ Can't Tell				☐	
B5. Is there evidence of spills/leakage from vehicles? ☐ Y ☐ N ☐ Can't Tell				☐	
B6. Are uncovered outdoor fueling areas present? ☐ Y ☐ N ☐ Can't Tell				☐	
B7. Are fueling areas directly connected to storm drains? ☐ Y ☐ N ☐ Can't Tell				☐	
B8. Are vehicles washed outdoors? ☐ Y ☐ N ☐ Can't Tell				☐	
Does the area where vehicles are washed discharge to the storm drain? ☐ Y ☐ N ☐ Can't Tell				☐	
C. OUTDOOR MATERIALS ☐ N/A (Skip to part D)				Observed Pollution Source? ☐	
C1. Are loading/unloading operations present? ☐ Y ☐ N ☐ Can't Tell				☐	
If yes, are they uncovered and draining towards a storm drain inlet? ☐ Y ☐ N ☐ Can't Tell				☐	
C2. Are materials stored outside? ☐ Y ☐ N ☐ Can't Tell If yes, are they ☐ Liquid ☐ Solid Description: _____				☐	
Where are they stored? ☐ grass/dirt area ☐ concrete/asphalt ☐ bermed area				☐	
C3. Is the storage area directly or indirectly connected to storm drain (circle one)? ☐ Y ☐ N ☐ Can't Tell				☐	
C4. Is staining or discoloration around the area visible? ☐ Y ☐ N ☐ Can't Tell				☐	
C5. Does outdoor storage area lack a cover? ☐ Y ☐ N ☐ Can't Tell				☐	
C6. Are liquid materials stored without secondary containment? ☐ Y ☐ N ☐ Can't Tell				☐	
C7. Are storage containers missing labels or in poor condition (rusting)? ☐ Y ☐ N ☐ Can't Tell				☐	
D. WASTE MANAGEMENT ☐ N/A (Skip to part E)				Observed Pollution Source? ☐	
D1. Type of waste (check all that apply): ☐ Garbage ☐ Construction materials ☐ Hazardous materials any of these				☐	
D2. Dumpster condition (check all that apply): ☐ No cover/Lid is open ☐ Damaged/poor condition ☐ Leaking or evidence of leakage (stains on ground) ☐ Overflowing any of these				☐	
D3. Is the dumpster located near a storm drain inlet? ☐ Y ☐ N ☐ Can't Tell				☐	
If yes, are runoff diversion methods (berms, curbs) lacking? ☐ Y ☐ N ☐ Can't Tell if both are yes				☐	
E. PHYSICAL PLANT ☐ N/A (Skip to part F)				Observed Pollution Source? ☐	
E1. Building: Approximate age: _____ yrs. Condition of surfaces: ☐ Clean ☐ Stained ☐ Dirty ☐ Damaged				☐	
Evidence that maintenance results in discharge to storm drains (staining/discoloration)? ☐ Y ☐ N ☐ Don't know				☐	

*Index: ☐ denotes potential pollution source; ☐ denotes confirmed polluter (evidence was seen)

E2. Parking Lot: Approximate age ____ yrs. Condition: ☐ Clean ☐ Stained ☐ Dirty ☐ Breaking up Surface material ☐ Paved/Concrete ☐ Gravel ☐ Permeable ☐ Don't know	○
E3. Do downspouts discharge to impervious surface? ☐ Y ☐ N ☐ Don't know ☐ None visible Are downspouts directly connected to storm drains? ☐ Y ☐ N ☐ Don't know	○
E4. Evidence of poor cleaning practices for construction activities (stains leading to storm drain)? ☐ Y ☐ N ☐ Can't Tell	○
E5. Evidence of poor cleaning practices for washing activities (observed washwater dumping, stains leading to storm drain)? ☐ Y ☐ N ☐ Can't Tell	○
F. TURF/LANDSCAPING AREAS ☐ N/A (skip to part G)	Observed Pollution Source?
F1. % of site with: Forest canopy ____% Turf grass ____% Landscaping ____%	○
F2. Rate the turf management status: ☐ High ☐ Medium ☐ Low	○
F3. Evidence of permanent irrigation or "non-target" irrigation ☐ Y ☐ N ☐ Can't Tell	○
F4. Do landscaped areas drain to the storm drain system? ☐ Y ☐ N ☐ Can't Tell	○
F5. Do landscape plants accumulate organic matter (leaves, grass clippings) on adjacent impervious surface? ☐ Y ☐ N ☐ Can't Tell	○
G. STORM WATER INFRASTRUCTURE ☐ N/A (skip to part H)	Observed Pollution Source?
G1. Are storm water treatment practices present? ☐ Y ☐ N ☐ Unknown If yes, please describe: _____	○
G2. Are private storm drains located at the facility? ☐ Y ☐ N ☐ Unknown Is trash, sediment and/or organic material present in gutters leading to storm drains? (circle appropriate)	○
H. INITIAL HOTSPOT STATUS - INDEX RESULTS	
☐ Not a hotspot (fewer than 5 circles and no boxes checked) ☐ Potential hotspot (5 to 10 circles but no boxes checked) ☐ Confirmed hotspot (10 to 15 circles and/or 1 box checked) ☐ Severe hotspot (>15 circles and/or 2 or more boxes checked)	
Follow-up Action: Immediate (1 week) ☐ Refer for immediate enforcement ☐ Test for illicit discharge ☐ Check to see if hotspot is an NPDES non-filer Mid-term (2-3 months) ☐ Schedule a review of storm water pollution prevention plan ☐ Suggest follow-up on-site inspection Long-term (1 year) ☐ Onsite non-residential retrofit ☐ Suggest pollution prevention training for employees ☐ Other: _____ Identified Opportunities: General ☐ Include in future education effort (add specifics to Notes) ☐ Stencil or mark storm drain inlets ☐ Signage opportunities (buffer, wetland, bacteria, etc.) ☐ Other: _____ Rooftop ☐ Evaluate feasibility of cistern or water reuse (roof area: ____sf) ☐ Downspout disconnection (#: _____) Loading Areas ☐ Sweep loading areas ☐ Cover loading docks or redesign drainage (area: ____sf)	Fueling Islands ☐ Cover fueling islands (covered area: ____sf) ☐ Install dry spill response kits (#: _____) Landscaping / turf ☐ Turf conversion to landscaping / Bayscaping (area: ____sf) ☐ Pervious area restoration (turf area: ____sf) ☐ Tree planting (# or area: _____) ☐ Reduce maintenance (mowing, herbicides, fertilizers) Vehicle repairs ☐ Plumb indoor shop drains to sanitary ☐ Store fluids/batteries inside or under cover Outdoor materials ☐ Provide cover or secondary containment (area: ____sf) ☐ Place materials on pallets Dumpster management ☐ Cover or add/repair lids (#: _____) ☐ Move dumpsters away from storm drains or streams Parking lots ☐ Find and fix fluid leaks ☐ Trash and litter pick-up, sweeping ☐ Identify retrofit projects ☐ Reduce salt application Stormwater Infrastructure ☐ Clean out storm drain inlets ☐ Perform maintenance inspection Notes:

WATERSHED:	SUBWATERSHED:	UNIQUE SITE ID:	
DATE: ____/____/____	ASSESSED BY:	CAMERA ID:	PIC#:
A. NEIGHBORHOOD CHARACTERIZATION			
Neighborhood/Subdivision Name: _____		Neighborhood Area (acres) _____	
If unknown, address (or streets) surveyed: _____			
Homeowners Association? ☐ Y ☐ N ☐ Unknown If yes, name and contact information: _____			
Residential (circle average single family lot size): _____			
☐ Single Family Attached (Duplexes, Row Homes) <1/8 1/8 1/4 1/3 1/2 acre		☐ Multifamily (Apts, Townhomes, Condos)	
☐ Single Family Detached <1/4 1/4 1/2 1 >1 acre		☐ Mobile Home Park	
Estimated Age of Neighborhood: _____ years	Percent of Homes with Garages: _____% With Basements _____%	INDEX*	
Sewer Service? ☐ Y ☐ N			○
Index of Infill, Redevelopment, and Remodeling ☐ No Evidence ☐ <5% of units ☐ 5-10% ☐ >10%			○
Record percent observed for each of the following indicators, depending on applicability and/or site complexity		Percentage	Comments/Notes
B. YARD AND LAWN CONDITIONS			
B1. % of lot with impervious cover			
B2. % of lot with grass cover			○
B3. % of lot with landscaping (e.g., mulched bed areas)			◇
B4. % of lot with bare soil			○
<i>*Note: B1 through B4 must total 100%</i>			
B5. % of lot with forest canopy			◇
B6. Evidence of permanent irrigation or "non-target" irrigation			○
B7. Proportion of <i>total neighborhood</i> turf lawns with following management status:	High: _____		○
	Med: _____		
	Low: _____		
B8. Outdoor swimming pools? ☐ Y ☐ N ☐ Can't Tell Estimated # _____			○
B9. Junk or trash in yards? ☐ Y ☐ N ☐ Can't Tell			○
C. DRIVEWAYS, SIDEWALKS, AND CURBS			
C1. % of driveways that are impervious ☐ N/A			
C2. Driveway Condition ☐ Clean ☐ Stained ☐ Dirty ☐ Breaking up			○
C3. Are sidewalks present? ☐ Y ☐ N If yes, are they on one side of street ☐ or along both sides ☐			
☐ Spotless ☐ Covered with lawn clippings/leaves ☐ Receiving 'non-target' irrigation			○
What is the distance between the sidewalk and street? _____ ft.			◇
Is pet waste present in this area? ☐ Y ☐ N ☐ N/A			○
C4. Is curb and gutter present? ☐ Y ☐ N If yes, check all that apply:			
☐ Clean and Dry ☐ Flowing or standing water ☐ Long-term car parking ☐ Sediment			○
☐ Organic matter, leaves, lawn clippings ☐ Trash, litter, or debris ☐ Overhead tree canopy			◇

* INDEX: ○ denotes potential pollution source; ◇ denotes a neighborhood restoration opportunity

APPENDIX B: STORMWATER RETROFIT CONCEPT SUMMARIES

This appendix contains the following twelve concept summaries of stormwater retrofits, repairs, and/or maintenance actions on eleven different properties in Kilmarnock:

- H-105, 120 & 121: Lancaster Square Shopping Center (Foodlion)
- R-110: Technology Park Drive
- R-113: Tartan Village – elderly independent living neighborhood
- R-300: WalMart Parking Lot
- R-301A: Holiday Inn Express - front
- R-301B: Holiday Inn Express - back
- R-302: Walgreens Detention Pond
- R-303: CVS Wet Pond
- R-304: Bowling Alley Retention Pond
- R-400: Municipal Parking Lot
- R-401: Lancaster Middle School
- R-402: Boys and Girls Club
- R-403: Peebles Shopping Center

H-105, 120 & 121: Lancaster Square Shopping Center (Foodlion)



Figure 1: Existing stormwater basin



Figure 1: Inflow from McDonald's parking lot

Description: Site H-105 is a gas station, H-120 is a McDonald's restaurant, and a third outparcel, a bank, all combine with the main parking lot of the Lancaster Square Shopping Center anchor building, H-121 (Food Lion and several other smaller stores) and drain to an existing stormwater BMP on the southern edge of the parking lot. The BMP is a small basin that could be considered a constructed wetland, extended detention pond with a clogged orifice, or a wet pond with an undersized permanent pool. The site visit noted 3 important observations about the basin:

1. The basin appears to be significantly undersized (Figure 1). The drainage area to the basin is 6.3 acres (which does not include the main building roof drains; it was unclear where those are directed – front or rear of the building. The drainage area is almost 90% impervious.
2. The basin outlet appears to have been a rip-rap weir over the embankment that has been damaged by high flows. The outlet is now is an eroded gully through the embankment and provides little or no detention or retention of the storm flows.
3. A significant amount of debris and trash is mobilized into the site through the existing surface conveyance system (Figure 2).

The total drainage area to the basin is approximately 6.3 acres (90% impervious). This does not include the roof runoff of the grocery store and adjacent businesses (1.5 acres – it is not clear where the roof drains discharge. If they go to the rear of the building they would drain to the basin on the north end of the parcel, behind the shopping center).

Proposed Retrofit: This retrofit includes the following actions:

1. Verify the location of the roof drain discharge, and conduct an "as-built" survey to verify the existing basin volume. Re-grade the basin to provide adequate storage and repair the embankment and outlet structure.

(The basin on the north side of the property is significantly bigger with a much smaller drainage area. If it is assumed that the entire rooftop goes to the north basin, including all the impervious cover associated with the rear access road and loading dock, the total drainage area to the north basin is approximately 2.3 acres, 100% impervious.)

The repair of the basin should also include some form of pre-treatment at the inflow from the McDonald's site. Ideally, a screen or trash rack keeping the trash in or adjacent to the McDonald's parking lot will be much simpler to maintain than having to access the BMP at the bottom of a hill to remove trash.

2. Investigate the existing grass strip and possible BMP on the eastern edge of H-105. This strip divides H-105 from the H-121 shopping center parking lot). This appears to be an ideal location for a dry swale or other linear BMP. However, there appears to be an existing underground structure. The outlet pipe from an existing curb inlet appears to go directly into the grass island, and there is no visible outlet pipe; also, the grass island has two PVC vent pipes protruding from the ground (Figures 3 and 4).



Figure 3: Curb inlet draining 0.8 ac gas station



Figure 4: Grass island with vent pipes (there is no record of a BMP being located there).

R-110 Technology Park Drive



Figure 1: Infiltration trench w/ low earthen berm



Figure 2: Erosion of outlet

Description: The Technology Park located off of Harris Road in the Dyer Creek watershed consists of multiple businesses located on individual parcels. Several of the parcels include relatively new water quality BMPs that are functioning well. However, the last business located at the end of Technology Park Drive has an infiltration trench with low earthen berms to convey runoff from the turf and impervious areas of the site to the trench. The turf areas are cut extremely short (it could be described as too short as there is very little “stem density” to the vegetation and evidence of erosion and sediment transport within the turf areas). The trench has a diversion structure that appears to be designed to bypass larger storm flows. However, the accumulation of sediment appears to divert more flow than designed, and the outlet channel is experiencing erosion (Figure 2).

Proposed Retrofit: The inlet and outlet channel areas of this BMP should be re-shaped and stabilized. The inlet should be retrofitted with a forebay or other pre-treatment to keep the sediment from blocking the flow area. The outlet should be fitted with a level spreader to ensure that the concentrated flow does not continue to erode a channel. (The parcel is relatively flat with most, if not all, of the impervious cover is effectively disconnected. However, the effect of implementing a BMP and conveying runoff to the BMP has created concentrated flows that are causing erosion).

Additionally, and equally important, basic turf grass maintenance should be implemented to establish a better stand of grass on the parcel.

R-113: Tartan Village – elderly independent living neighborhood



Figure 1. Bare soil in communal area



Figure 2. Bare, sandy soil on slopes



Figure 3. Detention basin in communal area



Figure 4. Basin outlet, with erosion at base



Figure 5. Steep basin inlet, eroding

Description: Tartan Village is an independent living complex for elderly residents, managed by Bay Aging. The property consists of multiple one-story apartment buildings and a central communal area for residents. The communal area has a gazebo, benches, two stormwater management basins, and a lot of open grass area. A third small detention basin is located in a corner of the complex. The property is surrounded by woods and the landscaping consists primarily of turf grass.

Soil at this site is very sandy and is not doing a good job of supporting turf grass growth. There are bare patches of soil in the communal area (Figure 1) and some slumping and erosion beginning to occur on slopes (Figure 2). Lawn mower marks are visible in the soil due to compaction by the tires. Compaction from frequent mowing may be one reason the grass is not growing well.

The large detention basin in the central communal area (Figure 3) has some erosion problems, due in part to its steep side slopes, lack of vegetation, and sandy soils. A hole is starting to develop in the ground surrounding the concrete riser structure (Figure 4) and is certain to get worse. And the soil in at least one of the steep rip-rap inlet channels is eroding beneath the stone (Figure 5).

Proposed Retrofits: The stormwater basin shown in Figures 3 – 5 was built with inlets and side slopes that are simply too steep. This is in part to blame for the inlet erosion. If the inlet erosion becomes severe, the property owners may need to re-construct the inlets to reduce their steepness – perhaps by creating more gradually sloped inlets with terraced step-pools. In the meantime, reduce mowing in the basin to allow roots to grow and hold the soil.

The erosion around the concrete riser may be a sign that the joints in the concrete (that are underground) were not adequately sealed, so water is getting sucked in that way. The best solution would be to dig down to the bottom of riser and properly seal the joint.

Other Solutions: Several landscaping changes could help reduce the amount bare soil and erosion in this neighborhood. To increase the organic matter content of the soil, consider tilling in compost amendments in the fall. Where turf area is still needed, re-seed and straw following the addition of compost. Otherwise, replace turf grass with other perennial ground cover that is better suited to sandy soils and does not need to be mowed as frequently.

When mowing, set mower deck to high setting to avoid cutting grass too short. Taller grass produces stronger roots, will reduce stormwater runoff from the site, and will expose less soil to erosion. If possible, also try to reduce frequency of mowing to lessen soil compaction over time.

R-300: WalMart Parking Lot



Figure 1: Proposed bioretention location in green



Figure 2: Drainage area leading to potential retrofit

Description: Most or all of the runoff from the large parking lot and roof at WalMart drains to a wet pond behind the building. There is certainly some water quality treatment benefit to this stormwater management practice, but very little infiltration and groundwater recharge usually occurs in a wet pond. The retrofit proposed here would not only allow better groundwater recharge on the site, but also serve as a highly visible stormwater management and landscaping feature at the entrance of the parking lot.

Proposed Retrofit:

Construct bioretention structure in the relatively un-used section of the front parking lot furthest away from the WalMart store, near corner of Old Fairgrounds Way and Chesapeake Way. Up to 240 feet of parking area along the curb line is present in the vicinity of the existing storm drain inlet (shown just to right of red star in Figure 1).

Asphalt and soil could be removed and replaced with bioretention structure to capture and infiltrate stormwater runoff that would otherwise enter this storm drain inlet and flow to the wet pond. Overflow from the bioretention during heavy rains can go into this existing storm drain. An underdrain pipe would likely not be needed given the sandy nature of soils in Kilmarnock, but an infiltration test of the underlying soils should be conducted in order to verify that the infiltration rate is sufficient (minimum infiltration rate is > 1 inch/hour in order to omit the underdrain).

Surface Area Available $\approx 4,320$ square feet

Drainage Area ≈ 2.78 acres

R-301A: Holiday Inn Express - front**Figure 1:** Northern end of detention basin**Figure 2:** Southern end of detention basin**Figure 3:** Partially clogged inlet to basin

Description: The *detention basin shown in the photos above is located at the edge of the parking lot in front of the Holiday Inn Express. The surface dimensions of the basin are 26' x 153' and runoff from the parking lot enters the basin via several curb inlets, which are partially blocked by grass (Figure 3). There is a concrete riser-type structure at the southern end of the basin, but it is unclear if and how this structure functions as an overflow outlet. The entire basin is currently managed as grass turf and the soil is very sandy.

*Check with Lancaster County staff to ensure that this was not intended as an infiltration basin. The practice should be observed during rain events to see how quickly stormwater currently infiltrates.

Proposed Retrofit: To improve pollutant reduction capabilities of this stormwater basin, two options are suggested:

1. Replace the turf with bioretention-friendly plants that can survive in both wet and dry conditions; or
2. Do a complete retrofit of the basin to convert it into a bioretention facility with layers of gravel, bioretention soil mix, mulch, and plants.

Since the basin currently has very sandy soil, if Option 1 is chosen, organic matter (e.g., compost) may need to be incorporated into the top 3 – 6 inches of soil to improve conditions for new plants.

Surface Area Available $\approx$ 3978 square feet

Drainage Area $\approx$ 1.47 acres

R-301B: Holiday Inn Express - back**Figure 1:** Basin behind Holiday Inn**Figure 2:** Riser structure at northern end of basin

Description: The *detention basin shown in the photos above is located at the back of the parking lot behind the Holiday Inn Express. The surface dimensions of the basin are 29' x 180' and runoff from half of the hotel roof and parking lot enters the basin via several curb inlets. There is a concrete riser-type structure at the northern end of the basin (Figure 2), but it is unclear if and how this structure functions as an overflow outlet. The entire basin is currently managed as grass turf and the soil is very sandy.

*Check with Lancaster County staff to ensure that this was not intended as an infiltration basin. The practice should be observed during rain events to see how quickly stormwater currently infiltrates.

Proposed Retrofit: To improve pollutant reduction capabilities of this stormwater basin, two options are suggested:

1. Replace the turf with bioretention-friendly plants that can survive in both wet and dry conditions; or
2. Do a complete retrofit of the basin to convert it into a bioretention facility with layers of gravel, bioretention soil mix, mulch, and plants.

Since the basin currently has very sandy soil, if Option 1 is chosen, organic matter (e.g., compost) may need to be incorporated into the top 3 – 6 inches of soil to improve conditions for new plants.

Surface Area Available *≈ 3420 square feet*

Drainage Area *≈ 1.41 acres*

R-302: Walgreens Detention Pond



Figure 1: Shrub clippings in detention pond



Figure 2: Trash around outlet structure

Description: Dry detention pond behind Walgreens store. Vegetation is currently managed as grass turf and basin has several minor maintenance needs, as described below.

Proposed Maintenance: Shrub and tree clipping waste was recently deposited in the pond, which is not a good use of the structure (Figure 1). This loose debris could float and clog up the trash rack on the concrete outlet structure. This debris as well as trash accumulated around the inlets and outlet (Figure 2) should be removed.

Proposed Retrofit: To improve the pollutant removal capacity of this stormwater management practice, those who maintain the pond could reduce mowing to only 1 - 2 times a year to allow vegetation to grow taller. Greater plant mass will increase pollutant and nutrient uptake, and water uptake.

More sophisticated retrofit options also exist, including installing pre-treatment forebay cells at the two inlets and retrofitting the bottom of the pond to include multiple ponding areas of different depths. This would increase the flow path between the inlets and the outlet structure and allow for more sediment to drop out of the stormwater before leaving the pond. Figure 3 below shows an example of this type of retrofit design for existing detention ponds.

Surface Area Available $\approx 4,320$ square feet

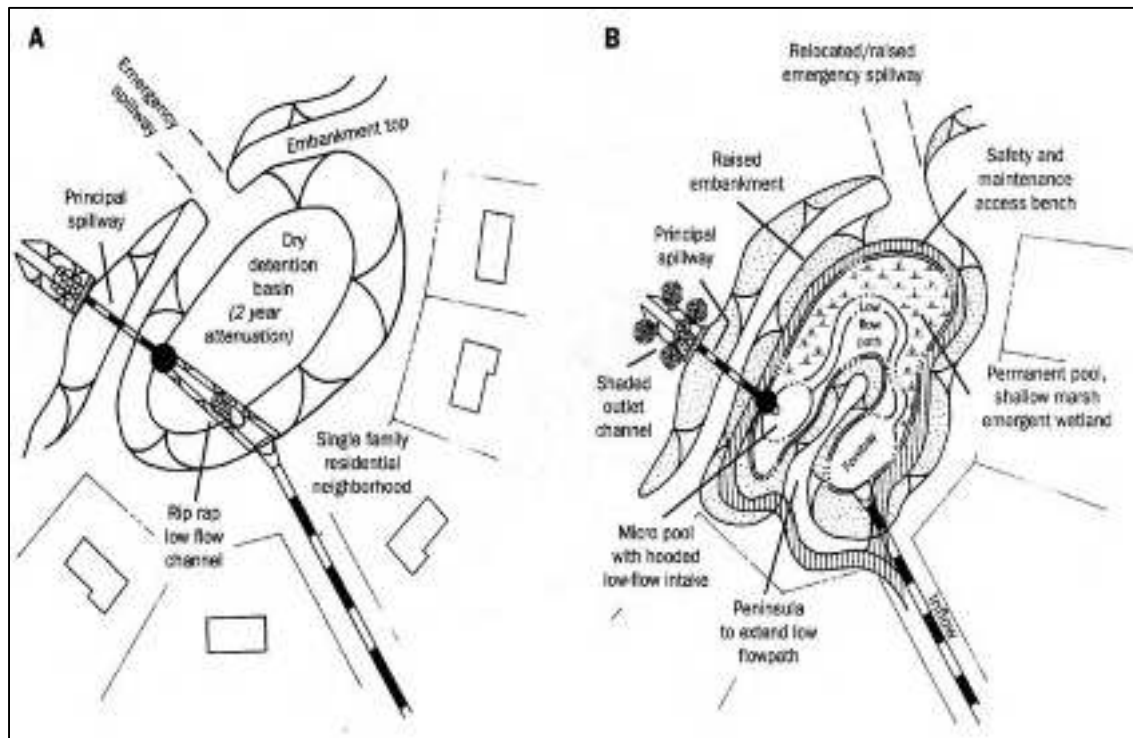


Figure 3: Example of retrofit design to extend flow path in detention ponds.

R-303: CVS Wet Pond



Figure 1: Wet pond with metal overflow structure



Figure 2: Metal outlet pipe partially clogged

Description: Wet retention pond behind CVS. Vegetation around pond is lush, which provides good erosion control and habitat. Although the pond appears to be currently functioning properly, several aspects of its design and/or construction may cause problems in the future: (1) The overflow structure (Figure 1) and the outlet pipe (Figure 2) are made of metal and are beginning to rust. These will eventually need to be replaced with concrete structures to avoid structural problems in the dam. (2) The emergency spillway was placed over top of the dam instead of to the side of the dam. (3) The bottom of the outlet pipe is partially submerged by water and sediment, which could eventually cause the outlet to be clogged. (4) The channel at the outfall is beginning to erode slightly and some trash has accumulated in the vicinity.

Proposed Maintenance: Some of these problems can be dealt with in the near term by the property managers: Remove sediment from the outlet pipe and remove trash from the site; apply better erosion control at the outfall, such as a small plunge pool and/or rip-rap stone apron (see Virginia Erosion and Sediment Control manual for ideas).

Proposed Retrofit: The other problems will have to be addressed with structural retrofits. The corrugated metal pipes will undoubtedly need to be replaced in the future with rust-proof structures such as concrete. The time during which these changes are being made would be a good opportunity to move the emergency spillway to the side of the dam instead of in the center of it.

This pond should be checked annually for any signs of structural failure.

R-304: Bowling Alley Retention Pond



Figure 1: Wet pond behind new bowling alley



Figure 2: Dam section eroded out at spillway



Figure 3: Stream filled in by sand from blown out dam

Description: An existing stormwater detention or retention pond is located behind the new bowling alley on Main Street (Figure 1). A section of the earthen dam has blown out near the rip-rap spillway (Figure 2), depositing sand in the stream. With the dam un-secure, more erosion could occur and the pond will not retain as much stormwater as needed.

Proposed Repair: The cause of the dam failure is unknown, but it appears that the soil used for constructing the dam was too erodible or was not properly compacted. In order to repair the dam, soil with higher clay content may need to be brought in to replace the dam.

The pond is located very close to the stream. Caution must be used to not impact the waterway during repairs.

R-400: Municipal Parking Lot



Figure 1: Existing drainage from parking lot



Figure 1: Downstream of existing BMP

Description: This site was initially looked at as a channel head cut. The two primary drainages contributing to the head cut are the municipal parking lot (Figure 1-east side of North Main Street directly across from Cralle Street), the rear of properties on Church Street, and the Main Street drainage. The drainage all comes together in the woods at the lower end of the parking lot where the municipal parking lot BMP discharges into the channel. Immediately beyond this point is an exposed sanitary sewer connection (Figure 2), and beyond that the channel gradually drops through steps of debris and sediment that appear to be moving downstream with each heavy storm. The channel eventually crosses 1st Street and appears to have reached a lower gradient at that crossing that is accumulating the sediment from the upstream erosion.

The BMP serving the parking lot is completely overgrown with woody scrub vegetation. Deep networks of roots are exposed and provide ample pathways to either infiltrate or simply drain through the BMP without any retention. There is a riser pipe that does not appear to back up any water. The outfall has been undermined by the flow in the adjacent channel, not the discharge of water from the outlet pipe.

Proposed Retrofit: This location can benefit from combined BMP maintenance and channel stabilization effort. The BMP ponding area and embankment should be cleared of woody vegetation. Selectively clearing the vegetation between the BMP and the parking lot will help in keeping the BMP clean and functional since it will be visible. (Figure 3)

The riser and outlet pipe appear in good condition, although the outlet protection should be restored in conjunction with channel stabilization. (Figure 4)

The Channel downstream of the BMP does not appear to have the significant head cut drops of some of the other channels investigated. However, it could benefit from spot clearing of debris and shaping the channel banks. Also, the sewer connection bracing across the channel should be evaluated for stability and durability since it is very exposed.



Figure 3: Inflow to BMP from parking lot



Figure 4: BMP ponding area and riser (blue pipe in background)

R-401: Lancaster Middle School



Figure 1: Parking lot and bus loop



Figure 1: Outfall (end section, upper left)

Description: The Lancaster Middle School property includes a typical amount of impervious cover: a bus loop (Figure 1), teacher and visitor parking, and rooftop, all directly connected to a drainage system. The system outfall is hidden in the dense vegetation adjacent to the property and is undergoing significant erosion (Figure 2).

Proposed Retrofits: There are several opportunities to implement stormwater retrofits on the property. The site investigation identified four potential bioretention areas, and one dry swale (or retention trench).

Each location can be evaluated and implemented individually over time, or all at once. These retrofit opportunities should be considered as 1) an educational tool given that they will be on school grounds and there is science curriculum available that incorporates stormwater treatment, and 2) beneficial to the stormwater infrastructure. Even full implementation of the retrofits will not be able to reverse the damage at the system outfall. However, the retrofits may help reduce the cost of the outfall repair and help to sustain the newly repaired outfall by reducing the stormwater discharges.

Figure 3 provides a photo and retrofit location map: seven photographs and bioretention basins A through D, and a dry swale retention trench.

The Retrofit Reconnaissance Investigation (RRI) Worksheet provides the preliminary design information for evaluating the relative benefits and configuration of the retrofits.



Photo 1: Front driveway – proposed Biofilter A



Photo 2: Driveway drainage to Biofilter B



Photo 3: Proposed Biofilter B (grassy knoll to right)



Photo 4: Drainage to Dry Swale/Retention Trench



Photo 5: Location of Dry Swale (left) & drainage to Biofilter D.



Photo 6: Location of Biofilter D (right) and looking towards outfall



WATERSHED: CORROTOMAN		SUBWATERSHED:		UNIQUE SITE ID: R401	
DATE:		ASSESSED BY:		CAMERA ID:	
GPS ID:		LMK ID:		LAT:	
				LONG:	
SITE DESCRIPTION					
Name: LANCASTER MIDDLE SCHOOL					
Address:					
Ownership: ☒ Public ☐ Private ☐ Unknown If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:					
Corresponding USSR/USA Field Sheet? ☐ Yes ☐ No If yes, Unique Site ID:					
Proposed Retrofit Location:					
Storage			On-Site		
☐ Existing Pond ☐ Above Roadway Culvert ☐ Below Outfall ☐ In Conveyance System ☐ In Road ROW ☐ Near Large Parking Lot ☐ Other: PUBLIC MIDDLE SCHOOL			☐ Hotspot Operation ☐ Individual Rooftop ☐ Small Parking Lot ☐ Small Impervious Area ☐ Individual Street ☐ Landscape / Hardscape ☐ Underground ☐ Other:		
DRAINAGE AREA TO PROPOSED RETROFIT					
Drainage Area ≈ SEE BELOW Imperviousness ≈ 100 % Impervious Area ≈			Drainage Area Land Use: ☐ Residential ☐ Institutional ☐ SFH (< 1 ac lots) ☐ Industrial ☐ SFH (> 1 ac lots) ☐ Transport-Related ☐ Townhouses ☐ Park ☐ Multi-Family ☐ Undeveloped ☐ Commercial ☒ Other: SCHOOL		
Notes: DA'S : BIO A = 0.16 AC RETENTION TRENCH = 0.29 AC BIO B = 0.28 AC BIO C = 0.14 AC BIO D = 0.22 AC					
EXISTING STORMWATER MANAGEMENT					
Existing Stormwater Practice: ☐ Yes ☒ No ☐ Possible If Yes, Describe:					
Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance: Existing Street Width:					
EXISTING DRAINAGE SYSTEM, DROP INLETS & PIPE					
Existing Head Available: SEE NOTES.			Note where points are measured from: (i.e. street elevation to catch basin invert, manhole rim to catch basin invert, other) MEASURED FROM RIM OF MANHOLE		

PROPOSED RETROFIT

Purpose of Retrofit:

- ☒ Water Quality ☐ Recharge ☐ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☒ Other: VOLUME REDUCTION

Retrofit Volume Computations - Target Storage:

BIO A = 552 ft³
 BIO B = 966 ft³
 BIO C = 483 ft³
 BIO D = 759 ft³
 DRY SWALE = 1,000 ft³

Retrofit Volume Computations - Available Storage:

BIO A = 552 ft³
 BIO B = 966 ft³
 BIO C = 483 ft³
 BIO D = 759 ft³
 DRY SWALE = 1,000 ft³

Proposed Treatment Option:

- ☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☒ Bioretention
☐ Filtering Practice ☐ Infiltration ☐ Swale ☐ Other: _____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

EACH RETROFIT CROSS SECTION ON SHEET 4 FIGURES

Available Width: _____

Available Length: _____

Available Area: _____

Ponding Depth: _____

Soil Depth: _____

SITE CONSTRAINTS

Adjacent Land Use:

- ☐ Residential ☐ Commercial ☐ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☒ Other: SCHOOL

Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☐ No

If Yes, Describe: _____

Access:

☐ No Constraints

Constrained due to

- ☐ Slope ☐ Space
☒ Utilities ☒ Tree Impacts
☐ Structures ☐ Property

Ownership

☐ Other: _____

Conflicts with Existing Utilities:

	Yes	Possible/ Modifiable	No	Unknown
Sewer:	☐	☐	☐	☐
Water:	☐	☐	☐	☐
Gas:	☐	☐	☐	☐
Electric to				
Streetlights:	☐	☐	☐	☐
Other:	☐	☐	☐	☐

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☒ Not Probable
Impacts to Wetlands	☐ Probable	☒ Not Probable
Impacts to a Stream	☐ Probable	☒ Not Probable
Floodplain Fill	☐ Probable	☒ Not Probable
Impacts to Forests	☐ Probable	☒ Not Probable
Impacts to Specimen Trees	☐ Probable	☒ Not Probable

How many? _____

Approx. DBH _____

Other factors: _____

Soils:

Soil auger test holes:

Evidence of poor infiltration (clays, fines):

Evidence of shallow bedrock:

Evidence of high water table (gleying, saturation):

- ☐ Yes ☒ No
☐ Yes ☒ No
☐ Yes ☒ No
☐ Yes ☒ No

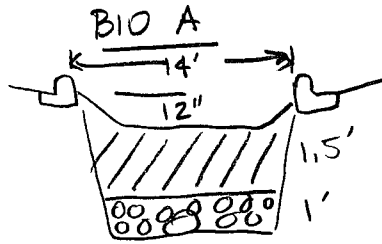
Possible good infiltration

Hand-drawn site plan for a school building and its surrounding landscape. The plan shows the school building with a sidewalk and access road. It details the placement of three proposed biofilters (A, B, and D) and their connection to existing curbs and a retention trench. A fueling station is located near biofilter D. A section A-A is shown, detailing the construction of the biofilter with gravel, soil media, and a perforated arch. The plan also indicates the location of a fueling station, a fueling station, and a fueling station. A north arrow is present.

Key features and labels include:

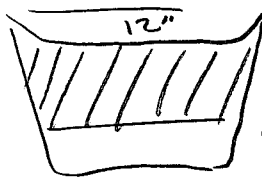
- SCHOOL BUILDING & SIDEWALK**: Located on the right side of the plan.
- ACCESS ROAD**: Located at the top right.
- PROPOSED BIOFILTER A**: Located near the sidewalk, with an elevation of $INV. = 3.9'$.
- PROPOSED BIOFILTER B**: Located in the upper left, with an elevation of $INV. = 4'$.
- PROPOSED BIOFILTER D**: Located in the lower left, with an elevation of $INV. = 4.3'$.
- EXIST. CURB**: Located near biofilter B.
- PROPOSED CURB CUT**: Located near biofilter B.
- RETENTION TRENCH**: Located between biofilters B and D.
- FUELING STATION**: Located near biofilter D.
- SECTION A-A**: A cross-section detail of the biofilter structure, showing a gravel layer, soil media, and a perforated arch. Dimensions include 18" and 24".
- GRASS**: Areas designated for grass near the biofilters.
- APPROX. DRAINAGE DIVIDE**: Indicated near the retention trench.
- EX. INLET FILLED EITHER OUTLET TO EX. CMP OR INLET (DEPENDS ON INV. DEPTH)**: Note near biofilter D.
- EX. CMP**: Existing Catchment Pond.
- CREATE NEW OUTFALL FOR PROP BIOFILTER**: Note near biofilter B.
- N**: North arrow pointing upwards.

DESIGN OR DELIVERY NOTES



VERY TIGHT LOCATION
IN TERMS OF WIDTH
INV. = 3.9'

BIO B



PLENTY OF ROOM
INV. = 4.0'

BIO C - SURFACE AREA TO BE
ALIGNED W/ EXISTING FENCE.
- UNDERDRAIN IS TO BE CONFIGURED
TO DISCHARGE INTO ADJACENT WOODS
MAY NEED SLOPE DRAIN

BIO D

INVESTIGATE OUTFALL OPTIONS.
EITHER DISCHARGE TO ADJACENT
CATCH BASIN (FILLED WITH LEAF
MULCH - INVERT UNKNOWN)
OR

DISCHARGE TO CMP PIPE
FURTHER DOWN SCHOOL STREET

DRY SWALE/RETENTION TRENCH

SEE CROSS SECTION ON
SHEET 3.

ISLAND IS 6' WIDE. COVER
CAN BE GRAVEL OR MULCH
INVERT = 4.3'

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

☐ Confirm property ownership	☐ Obtain existing stormwater practice as-builts
☐ Confirm drainage area	☐ Obtain site as-builts
☐ Confirm drainage area impervious cover	☐ Obtain detailed topography
☐ Confirm volume computations	☐ Obtain utility mapping
☒ Complete concept sketch	☐ Confirm storm drain invert elevations
☐ Other: _____	☐ Confirm soil types

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

EACH PRACTICE AREA SHOULD BE MAXIMIZED TO HELP REDUCE IMPACTS
AT OUTFALL.

SITE CANDIDATE FOR FURTHER INVESTIGATION:

IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):

IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):

IF YES, TYPE(S):

☐ YES	☐ NO	☐ MAYBE
☐ YES	☐ NO	☐ MAYBE
☐ YES	☐ NO	☐ MAYBE

R-402: Boys and Girls Club



Figure 1: Left side of building downspout



Figure 1: Right side downspout

Description: The Boys and Girls Club building on North Main Street is set in a large expanse of pavement that is shared with the adjacent property – more so than appears needed for parking demand (but it's unclear if the area is used temporarily for other purposes; Figure 3). There are two foundation planters in front of the building on either side of the front entrance: see Figure 1 and Figure 2 (planter in Figure 1 is partially hidden by the wooden ramp).

Proposed Retrofits: There are two potential retrofits for this site.

1) Redirect the downspouts located at each corner of the building into the foundation planters. The current downspout configuration includes piping to convey the roof water around, through, or under the planters (the downspout pipe is shown protruding from under the wooden ramp in Figure 1, and in Figure 2, it daylights where the two planter walls meet). This appears to be a very simple retrofit to redirect these downspouts into the existing planters. This type of practice is referred to as Urban Planters in the Virginia Stormwater BMP Design Specifications, primarily because they are suited for buildings in urban areas that may not have room for traditional bioretention.

2) Remove some pavement in the front parking lot (Figure 3) and either replace it with landscaping or bioretention to promote infiltration, or if the parking areas are needed for events, replace it with permeable pavers in select locations. The paved area in front of the building has only minimal markings for parking, so it is difficult to equate the parking demand with a specific number of spaces. However, utilizing input from the building occupants should allow for a quick assessment of the viability of the options – pavement removal and landscaping, or replacement with permeable pavers.



Figure 3: Paved area in front of building

R-403: Peebles Shopping Center



Figure 1: Typical parking lot inlet



Figure 1: Stormwater basin behind shopping center

Description: This shopping center has several tenants – Peebles appears to be the biggest. The entire front of the shopping center is a parking lot, approximately 3.6 acres, served by three drainage inlets. The shopping center rooftop is approximately 2 acres, and additional rooftop and parking for restaurants and a bank are located on the out parcels between the main parking lot and North Main Street (an additional 3 acres of impervious cover). There is also a large stormwater pond behind the shopping center. It is uncertain if this pond was designed to hold water (retention pond), or if it was intended to be a dry (extended detention) pond. In either case, there is evidence of erosion at one pipe outlet into the pond (the relatively small drainage from the rear loading dock) and sloughing on the side slopes in multiple locations. The combined effect of the internal erosion is the loss of storage volume (or pool volume if intended as a wet pond).

Proposed Retrofits: While the pond requires basic maintenance to fix the erosion, it appears to be functioning. A more rigorous analysis of the initial design and a survey of the current condition will verify if any dredging of the storage area is needed. Alternatively, installing bioretention retrofits in the front parking lot can possibly offset the loss in storage and provide an educational tool since it is a high traffic parking lot.

The parking lot is served by 3 inlets, each located in the center of a diagonal parking space row. Each row also incorporates a large landscape island closer to the store front. Installing the bioretention retrofits at the 3 inlet locations would eliminate a significant number of spaces if the retrofits are sized for the full contributing area (this is a big parking lot for only 3 inlets!) There is some flexibility in sizing, in terms of the design volume capture, i.e. capture only a portion of the contributing volume. Since there is plenty of depth, there are also options to add storage under the soil in retrofit A and B (refer to RRI form). If parking is a premium, some spaces can be recovered by converting the existing islands to parking (a swap for the retrofit landscaping – although this would require additional cost to construct). There is adequate drop in each inlet to accommodate a bioretention retrofit, which makes this an excellent demonstration site if even only one location is selected.

WATERSHED: CORROTOMAN		SUBWATERSHED:		UNIQUE SITE ID: R 403	
DATE:		ASSESSED BY:		CAMERA ID:	
GPS ID:		LMK ID:		LAT:	
				LONG:	
SITE DESCRIPTION					
Name: <u>PEEBLES SHOPPING CENTER</u>					
Address: <u>N. MAIN STREET</u>					
Ownership: ☐ Public ☒ Private ☐ Unknown If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other: _____					
Corresponding USSR/USA Field Sheet? ☐ Yes ☐ No If yes, Unique Site ID: _____					
Proposed Retrofit Location:					
Storage			On-Site		
☐ Existing Pond ☐ Above Roadway Culvert ☐ Below Outfall ☐ In Conveyance System ☐ In Road ROW ☐ Near Large Parking Lot ☒ Other: <u>IN PARKING LOT</u>			☐ Hotspot Operation ☐ Individual Rooftop ☐ Small Parking Lot ☐ Small Impervious Area ☐ Individual Street ☐ Landscape / Hardscape ☐ Underground ☐ Other: _____		
DRAINAGE AREA TO PROPOSED RETROFIT					
Drainage Area ≈ <u>SEE BELOW</u> Imperviousness ≈ <u>100%</u> % Impervious Area ≈ <u>SEE BELOW</u>			Drainage Area Land Use: ☐ Residential ☐ Institutional ☐ SFH (< 1 ac lots) ☐ Industrial ☐ SFH (> 1 ac lots) ☐ Transport-Related ☐ Townhouses ☐ Park ☐ Multi-Family ☐ Undeveloped ☐ Commercial ☐ Other: _____		
Notes: <u>A = 1.2 Ac.</u> <u>B = 0.9 Ac.</u> <u>C = 1.5 Ac</u>					
EXISTING STORMWATER MANAGEMENT					
Existing Stormwater Practice: ☐ Yes ☒ No ☐ Possible					
If Yes, Describe:					
Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:					
Existing Street Width: _____					
LARGE PARKING LOT. EXISTING ISLANDS - NO IN LOW POINTS. 3 LARGE INLETS (DI-7) SPACED IN PARKING LOT.					
Existing Head Available:			Note where points are measured from: (i.e. street elevation to catch basin invert, manhole rim to catch basin invert, other)		
YES A = 7.0' B = 5.0' C = 3.9'			MEASURED FROM GRATE.		

PROPOSED RETROFIT

Purpose of Retrofit:

- ☒ Water Quality ☐ Recharge ☐ Channel Protection ☐ Flood Control
☒ Demonstration / Education ☐ Repair ☐ Other: _____

Retrofit Volume Computations - Target Storage:

$$A = 4,138 \text{ ft}^3$$

$$B = 3,104 \text{ ft}^3$$

$$C = 5,173 \text{ ft}^3$$

Retrofit Volume Computations - Available Storage:

FULL STORAGE IS AVAILABLE
BASED ON AVAILABLE SPACE.
SEE PAGE 4.

Proposed Treatment Option:

- ☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☒ Bioretention
☐ Filtering Practice ☐ Infiltration ☐ Swale ☐ Other: _____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

TYPICAL SECTION FOR A + B = 12" PONDING, 24" SOIL MEDIA, 12" STONE
FOR C = 12" PONDING, 18" SOIL MEDIA, 12" STONE

Available Width: _____

Available Length: _____

Available Area: _____

Ponding Depth: _____

Soil Depth: _____

SURFACE AREA FOR ALL THREE IS BASED ON
36' WIDTH OF DIAGONAL PARKING ROW. LENGTH
OF EACH RETROFIT VARIES AND WILL BE BASED
ON PARKING ALLOWANCE.

SITE CONSTRAINTS

Adjacent Land Use:

- ☐ Residential ☒ Commercial ☐ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☐ Other: _____

Possible Conflicts Due to Adjacent Land Use? ☒ Yes ☐ No

If Yes, Describe: PARKING - POSSIBLE SWAP OF
EXISTING ISLANDS WITH NEW BIORETENTION
ISLANDS - MAY BALANCE W/ PARKING

Access:

- ☒ No Constraints
 Constrained due to
☐ Slope ☐ Space
☐ Utilities ☐ Tree Impacts
☐ Structures ☐ Property
 Ownership
☐ Other: _____

Conflicts with Existing Utilities:

	Yes	Possible/ Modifiable	No	Unknown
Sewer:	☐	☐	☐	☒
Water:	☐	☐	☐	☒
Gas:	☐	☐	☐	☒
Electric to				
Streetlights:	☐	☐	☐	☐
Other:	☐	☐	☐	☐

Potential Permitting Factors:

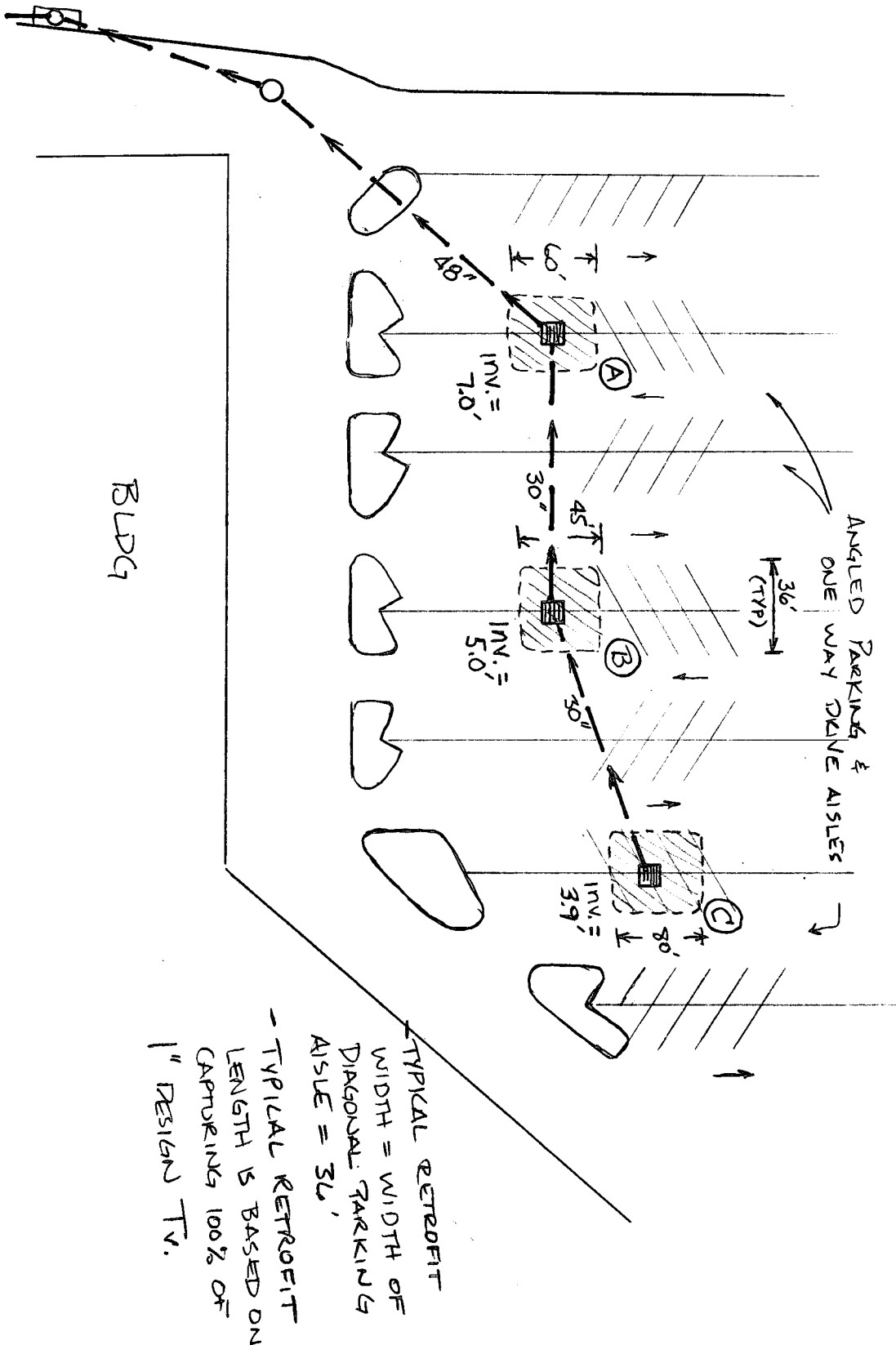
- Dam Safety Permits Necessary ☐ Probable ☒ Not Probable
 Impacts to Wetlands ☐ Probable ☒ Not Probable
 Impacts to a Stream ☐ Probable ☒ Not Probable
 Floodplain Fill ☐ Probable ☒ Not Probable
 Impacts to Forests ☐ Probable ☒ Not Probable
 Impacts to Specimen Trees ☐ Probable ☒ Not Probable
 How many? _____
 Approx. DBH _____

Other factors: _____

Soils:

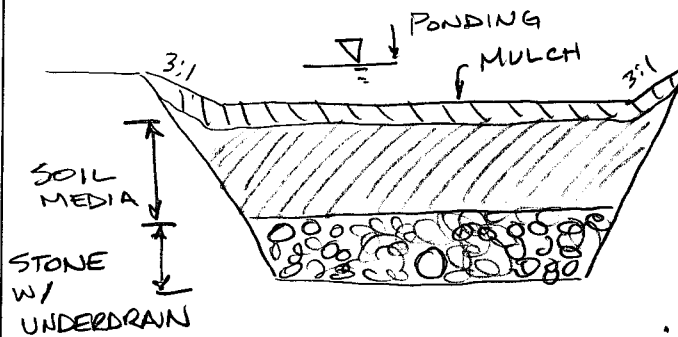
- Soil auger test holes: ☐ Yes ☒ No
 Evidence of poor infiltration (clays, fines): ☐ Yes ☒ No
 Evidence of shallow bedrock: ☐ Yes ☒ No
 Evidence of high water table (gleying, saturation): ☐ Yes ☒ No

SKETCH



DESIGN OR DELIVERY NOTES

TYPICAL SECTION FOR BIORETENTION



RETROFIT A

36' x 60' SURFACE AREA (INCL. SIDE SLOPES)
 = 12" PONDING, 24" SOIL, 12" STONE
 = 4,140 ft³ STORAGE VOLUME
 = 10 PARKING SPACES

RETROFIT B

36' x 45' SURFACE AREA (INCL. SIDE SLOPES)
 = 12" PONDING, 24" SOIL, 12" STONE
 = 3,110 ft³ STORAGE VOLUME
 = 8 PARKING SPACES

RETROFIT C

36' x 80' SURFACE AREA (INCL. SIDE SLOPES)
 = 12" PONDING, 18" SOIL, 12" STONE
 = 5,180 ft³ STORAGE VOLUME
 = 14 PARKING SPACES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

☐ Confirm property ownership	☐ Obtain existing stormwater practice as-builts
☐ Confirm drainage area	☐ Obtain site as-builts
☐ Confirm drainage area impervious cover	☐ Obtain detailed topography
☐ Confirm volume computations	☒ Obtain utility mapping
☒ Complete concept sketch	☐ Confirm storm drain invert elevations
	☐ Confirm soil types
- ☒ Other: VERIFY WILLINGNESS OF OWNER

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

ONLY ISSUES:

- PARKING
- PRIVATE PARKING LOT

SITE CANDIDATE FOR FURTHER INVESTIGATION:

IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):

IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):

IF YES, TYPE(S):

☐ YES	☐ NO	☐ MAYBE
☐ YES	☐ NO	☐ MAYBE
☐ YES	☐ NO	☐ MAYBE

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