TOWN OF CHRISTIANSBURG

Flood Resilience Plan

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Town of Christiansburg

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Definitions

General Definitions

Gray Infrastructure – "Gray infrastructure is traditional stormwater infrastructure in the built environment such as gutters, drains, pipes, and retention basin" (EPA, 2023).

Green Infrastructure – "A strategically planned and managed network of natural lands, working landscapes, and other open spaces that conserves ecosystem values and functions and provides associated benefits to human populations" (Benedict, Allen, and McMahon, 2006). "Green infrastructure planning involves the coordination of "conservation values and actions in concert with land development and growth management" (Benedict, Allen, and McMahon, 2004). Examples include raingardens, rainwater harvesting systems, permeable pavement, and constructed wetlands.

Heat Island Effect – "Urbanized areas that experience higher temperatures than outlying areas. Structures such as buildings, roads, and other infrastructure absorb and re-emit the sun's heat more than natural landscapes such as forests and water bodies. Urban areas, where these structures are highly concentrated and greenery is limited, become "islands" of higher temperatures relative to outlying areas" (EPA, 2023-c).

Nature Based Approach/Solution – "An approach that reduces the impacts of flood and storm events through environmental processes and natural systems. A nature-based solution may provide additional benefits beyond flood control, including recreational opportunities and improved water quality. This includes a project that reduces these impacts by protecting, restoring, or emulating natural features (DCR.gov, n.d.).

Rainfall-derived infiltration and inflow – "is the increased portion of water flow in a sanitary sewer system that occurs during and after a rainfall as a source of operation problems in sanitary sewer systems. RDII is the main cause of sanitary sewer overflows" (EPA, 2023-b).

Resilience / Resiliency – Resilience is the ability of citizens and the institutions that shape our communities to identify risks, positively adapt, and build the capacity to respond to environmental stressors that impact our built infrastructure. Successful implementation of resilience efforts allows communities to rapidly regain functionality and vitality in the face of chronic stressors or severe disturbances.

Town / the Town – The Town of Christiansburg, Virginia

FEMA Definitions

The following definitions are derived from FEMA.gov if residential properties are added to the project list in the future:

Property Damage – Damage to personal property resulting from flooding. "Damage caused by falling water and wind is not considered flood damage" (FEMA.org, 2010).

Repetitive Loss Property – "Any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. A RL property may or may not be currently insured by the NFIP. Currently there are over 122,000 RL properties nationwide," (FEMA.gov, 2005).

Roadway Flooding – Flooding of "The portion of roads designed to carry traffic. Roads are paved or unpaved. Other public facilities may include bike paths, pedestrian ways, sidewalks and maintained trails" (FEMA.org, 2022).

Severe Repetitive Loss Property – "A single family property (consisting of 1 to 4 residences) that is covered under flood insurance by the NFIP and has incurred flood-related damage for which 4 or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding $5,000 and with cumulative amount of such claims payments exceeding $20,000; or for which at least 2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property"(FEMA.gov, 2005).

Matrix Definitions

The following definitions are derived from DCR's 2021 Criteria for ranking community projects for flood funding:

Acquisition of Property – "Acquisition of property consistent with an overall comprehensive local or regional plan for purposes of allowing inundation, retreat, or acquisition of structures" (DCR.gov, n.d.).

Community Scale Benefit/ Community Scale Project – "A project that provides demonstrable flood reduction benefits at the US census block level or greater" (DCR.gov, n.d.).

Impact NFIP Participation – (NFIP = Nation Flood Insurance Program) - This criterion answers the question, "Is this proposed project part of an effort to join or remedy the community's probation or suspension from the NFIP?" (DCR.gov, n.d.).

Low-income Geographic Area – "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" (DCR.gov, n.d.).

Project Area Socially Vulnerable – (Based on ADAPT VA's Social Vulnerability Index Score.) (DCR.gov, n.d.). Alternatively, socially vulnerable can be defined as "the susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood" (FEMA, n.d).

TMDL Benefit – (TMDL = Total Maximum Daily Load) Projects eligible for funding may also reduce nutrient and sediment pollution to local waters and the Chesapeake Bay and assist the Commonwealth in achieving local and/or Chesapeake Bay TMDLs. Does the proposed project include implementation of one or more best management practices with a nitrogen, phosphorus, or sediment reduction efficiency established by the Virginia Department of Environmental Quality or the Chesapeake Bay Program Partnership in support of the Chesapeake Bay TMDL Phase III Watershed Implementation Plan? (DCR.gov, n.d.).

Acronyms

CFPF	Community Flood Preparedness Fund
CIP	Capital Improvement Plan
CMP	Corrugated Metal Pipe
DCR	Virginia Department of Conservation and Recreation
DEQ	Virginia Department of Environmental Quality
ESC	Erosion and Sediment Control
EPA	United States Environmental Protection Agency
GI	Green Infrastructure
GIS	Geographic Information System
MS4	Municipal Separate Storm Sewer System
n.d.	"No Date" (an abbreviation used for citations when a source does not contain a publication date).
RCP	Reinforced Concrete Pipe
RDII	Rainfall-derived infiltration and inflow
SWM	Stormwater Management
TMDL	Total Maximum Daily Load
VDOT	Virginia Department of Transportation
WLA	Waste Load Allocation

Executive Summary

This Flood Resilience Plan for the Town of Christiansburg (Plan) provides an overview of the flood resilience planning efforts undertaken by the Town of Christiansburg, Virginia (Town). The Plan examines historical flooding in the Town and reviews current and proposed strategies for flood prevention and resilience. Flooding in the Town poses significant threats to public safety, infrastructure, and local economy. An increase of storm events with greater rainfall intensity and duration compounds these impacts. This Plan aims to reduce vulnerabilities and promote flood resilience in the Town through policy and sound engineering practices and maintenance.

Recognition of the need to implement flood resilience in communities across the Commonwealth has increased. The increasing frequency, intensity and duration of rainfall has proven to hinder the functionality of current infrastructure and flood prevention measures within the Town. Prior to 2014, stormwater runoff regulations were limited or nonexistent. Limited past stormwater regulations, geological conditions, and more frequent rain events are all concerns for flood resilience and prevention.

Assessment of current defenses within the Town found opportunities for improvement of stormwater quantity and quality. Rehabilitation and maintenance to gray infrastructure within Town watersheds can alleviate or prevent flooding. It is anticipated that the Town's Comprehensive Plan can recommend policies and practices for promoting flood resilience will be updated in the 2023-2024 edition. Some of these policies will include increased use of green techniques and infrastructure; operation and maintenance of SWM and sewer infrastructure; and construction of new stormwater management infrastructure that helps to reduce run-off and pollution. Increased use of green techniques and green infrastructure will promote stormwater quantity and quality. The Plan also explores future projects to promote or improve the Town's flood resilience.

Current and prospective projects were reviewed, scored, and placed in a ranking matrix. Gray infrastructure project recommendations will help mitigate or prevent flooding events, create more connectedness to a greater stormwater system, and ensure that engineered solutions are maintained for functionality. In addition, green infrastructure should be utilized as often as possible to enhance gray infrastructure capabilities. Incorporating other green infrastructure techniques will assist in flood prevention and resilience.

The Town, like many other communities will continue to experience the impacts of severe weather and frequent rainfall events. This Plan provides opportunities for improvement to current defenses and assesses the suitability of new projects and policies for the Town.

Chapter 1: Introduction

Flooding caused by rainfall events combined with inadequate stormwater infrastructure can cause damage to life and property. The Town of Christiansburg (Town) is undertaking this flood resilience planning effort to gain a better understanding of flooding and related infrastructure impacts in its watersheds to better protect its citizens and their property from flooding. The goal of this plan is to promote flood resilience. Resilience is the ability of citizens and the institutions that shape our communities to identify risks, positively adapt, and build the capacity to respond to environmental stressors that impact our built infrastructure. Successful implementation of flood resilience efforts allows communities to rapidly regain functionality and vitality in the face of chronic stressors or severe disturbances such as severe or frequent rainfall events.

A flood resilience plan provides an assessment of current or potential future projects and policies that promote effective solutions and future prevention measures, tailored to geographical region, climate, infrastructure, and available resources. Well-developed flood resilience plans not only provide current and future flood reduction and prevention, but with the implementation of these strategies, can reduce the degradation of infrastructure, preserve habitat for species that live within the floodplain, and in some cases, increase the aesthetic beauty of the Town through green infrastructure and streetscape design.

Christiansburg, like many localities in the Commonwealth, is looking to flood resilience planning to aid in measures to not only mitigate current flooding and stormwater issues, but to alleviate potential future flood events due to increased rainfall frequencies and durations that are occurring in Virginia (ASCE, 2021).

Plan Development Process

This Flood Resilience Plan for the Town of Christiansburg (Plan) will first discuss regional and state efforts made towards flood resilience. This Plan will then discuss the history of the Town in relation to flooding and rainfall events, and previous resilience coverage measures set in place for reduction or prevention.

Following this chapter, the Plan will discuss the measures that the Town is currently taking to address their stormwater and flooding issues. Current flood resilience measures have been evaluated through the analysis of current Town plans, studies, and policies.

For the final chapter of this Plan, suggested green and gray infrastructure projects from Town documents will be extracted and ranked in accordance with overall flood resilience effectiveness, determined by a score card/matrix system. Recommendations of the most effective projects will be accompanied with implementation details, and other helpful resources.

Regional and State Efforts

Recognition of the need to implement flood resilience in communities has been increasing in recent years in the United States as there has been an increase in storm duration and frequency. The Commonwealth of Virginia has undertaken some specific and intentional initiatives to better prepare the state and its communities for increased rainfall frequency and other various factors of climate change. One such initiative is the Department of Conservation and Recreation (DCR) Community Flood Preparedness Fund (CFPF) that funds studies, planning efforts (including this one) and projects that are implemented to mitigate flooding and to enable more resilient communities.

Another state initiative is the Coastal Resilience Master Plan developed by the Commonwealth in 2022. This plan was developed based on a Master Planning Framework which was produced in December 2021. While this effort focused on coastal areas, both this plan and the DCR CFPF recognized the threats of flooding at a statewide level. The CFPF funds are available and utilized throughout the Commonwealth and are partially funding the development of the Town's Plan.

Most recently, the Virginia Department of Transportation (VDOT) released the VDOT Resilience Plan at the end of 2022. In addition to the VDOT Resilience Plan and the Coastal Resilience Plan development efforts, the Commonwealth also partially funded an Environmental Protection Agency (EPA) initiative to better assess storm frequency and duration across the state. This study provides specific numeric comparisons to the currently used data set (ATLAS 14) at the County level.

Christiansburg's Flood History

One of the major events that kick-started the discussion for water management planning initiatives within the Town in recent years was the flooding event that occurred in September of 2015. Phlegar and Chrisman Streets, and Reading Road were especially affected, as they are located along the Town Branch Watershed. As a result, approximately $1.5 million was budgeted towards developing improved drainage in the downtown area (AMT, 2018).

Figure 1: Historic Flooding in the Town

However, the Town Branch Watershed and its confluence with Crab Creek are not the only watersheds that influence the flooding in Christiansburg. Various watersheds in and surrounding the Town are also components that contribute to and affect the Town's flooding issues. Historically, standing water, flooding issues with public drainage systems, and overtopping of streets have been prevalent issues at various times and locations in the Town.

Even earlier, a flood event occurred in Christiansburg in May of 2009; this event was one of the worst historically for the Town's historical district of Cambria. A local tributary of Crab Creek flooded the area after consistent rain events over a series of weeks. Unfortunately, this event occurred before many of the Town's stormwater flood mitigation projects had been implemented. This flood caused damages to the Oak Tree Townhomes area, College Street, and several other surrounding areas. The rainfall intensity was estimated to be a 200-year event.

To better understand these events, the Town has undertaken several studies to assess areas of flood concern in the Town's watersheds. The map on the following page depicts the areas where these efforts have concentrated. Of note, the Town has assessed each watershed within its boundaries in recent years. These studies have led the Town to have a strong understanding of potential flood concerns within the entire community.

History of Stormwater Management in Virginia

In recent years, laws and regulations in Virginia have undergone significant changes aimed at improving the management of stormwater runoff and reducing negative environmental impacts. These updated regulations went into effect in 2014 and impose more stringent criteria for the management of stormwater after construction to better protect properties adjacent to and downstream from development. Development that occurred before 2014 had less stringent or no requirement to manage runoff from created impervious surfaces, resulting in stormwater infrastructure that is inadequate to handle significant rainfall events. These issues with older infrastructure are compounded today through the occurrence of more frequent storms with increased rainfall intensity and duration.

Virginia's 2014 regulations also have more stringent criteria for new development projects compared to older development. The primary reason for this discrepancy lies in the fact that older properties were typically built before these modern environmental concerns became a priority. Therefore, they were not subject to the same level of scrutiny regarding storm drainage systems and potential flooding.

Retrofitting existing properties to meet the new criteria or to add in additional flood mitigation can be a complex and costly process. As a result, the focus has primarily been on implementing more stringent storm drainage requirements for new developments to ensure they adhere to the latest standards and mitigate potential adverse effects on property, water quality and local ecosystems.

Specifically, Christiansburg experiences increased risk to flooding after the construction of the interstate highway system where drainage was primarily designed to remove runoff from the roadway surface as quickly as possible. At the time, there were no regulations to address the additional runoff volume and rate onto adjacent properties and downstream facilities. As such, during heavy rain events, downstream channels and systems are currently at or beyond their capacity.

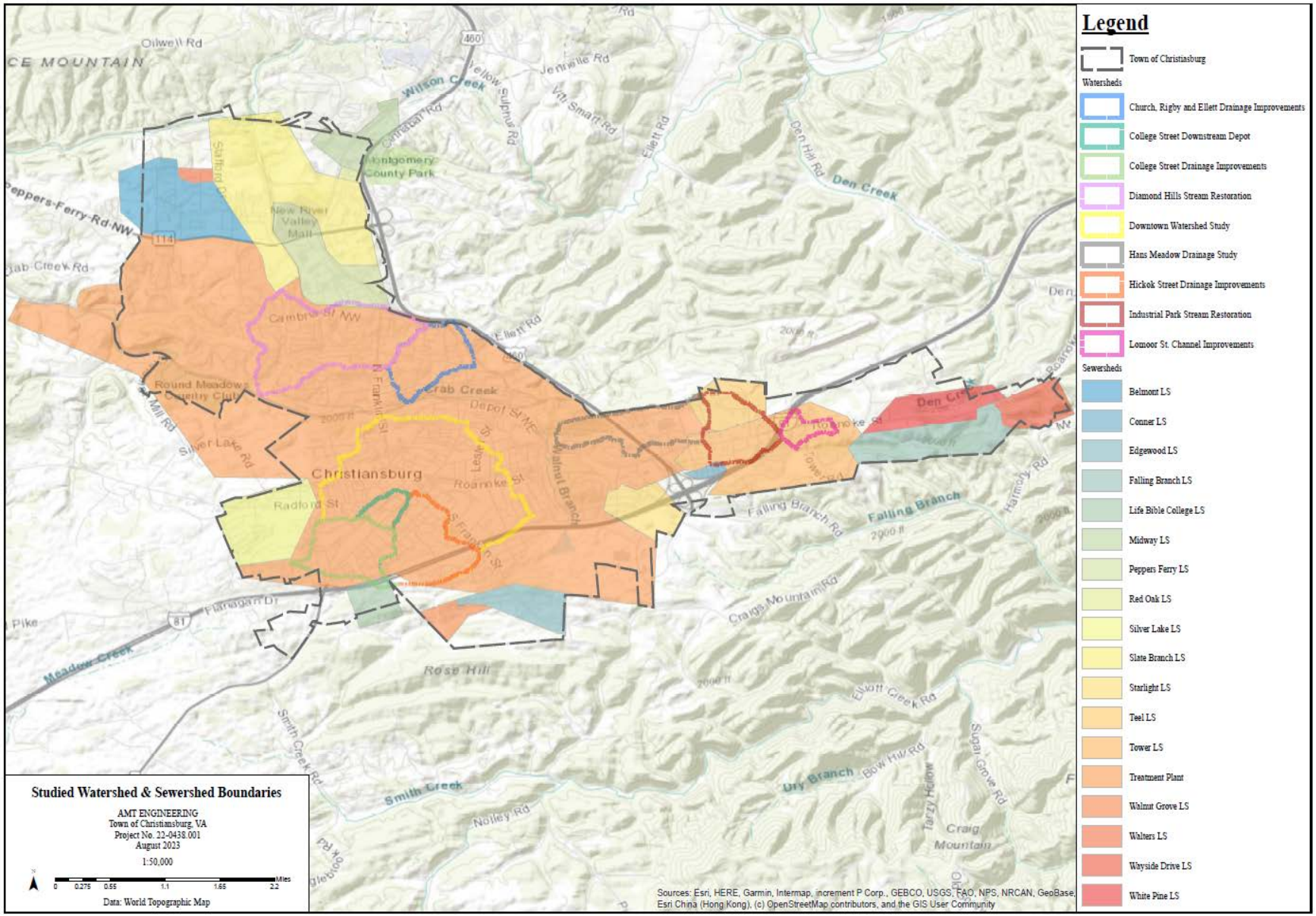

Figure 2: Studied Watershed & Sewershed Boundaries

Chapter 2: Current vs. Future Flood Prevention and Flood Resilience Efforts

Throughout the Commonwealth, including the Town of Christiansburg, Virginians have experienced the increase of storms events with greater rainfall intensity and duration. In addition, the landscape specific to Christiansburg can be characterized by its karst topography, steep slopes and prevalence of shallow soils which limits rain permeability (Town of Christiansburg, 2017). Combining these elements with heavy rains not only increases the concentration of flooding which leads to the clogging and overflowing of Town drainage infrastructure. These elements also lead to a cascading effect of other issues such as water contamination and impaired water bodies), but it can also lead to landslides and the formation or further degradation of sinkholes.

These hazards to infrastructure and human well-being have been pinpointed in areas of Christiansburg through continuous studies and improvement projects issued by the Town. Many of these projects have been associated with the greater downtown area and its associated streets and residential communities. More socially vulnerable populations living within this flood prone area are faced with the aftermath of damaged homes, sometimes on a reoccurring basis. Not all citizens can recuperate from these kinds of losses and may even be forced to move out of their homes and leave their communities.

Figure 3: Downtown Christiansburg Flooding

In recent years, the Town has increased their focus on flood reduction/prevention efforts in the form of projects and policies. Types of projects that help define the Town's flooding reduction/prevention efforts can be categorized as green infrastructure (natural-based solutions such as stream restorations, wetland installations, rainwater harvesting, etc.) and gray infrastructure (solutions such as inlets, outlets, culverts, and drainage solutions). These two types of projects are most effective when implemented in tandem with one another. Christiansburg's policies that mitigate/prevent flooding can often fall under the green

and/or gray infrastructure categories as well. These policies are framed as general goals and strategies that underline the Town's strong stance on policy goals- for both current strategies and future goals.

These current projects and policies can be found within the numerous Town documents and data files reviewed in preparation for this Plan. These documents include comprehensive plans; preliminary engineering reports; as-built monitoring reports; Erosion and Sediment Control (ESC) and Stormwater Management (SWM) plans and assessments; Stormwater Local Assistance Fund applications; drainage improvement studies; watershed studies; and all associated technical specifications, modeling, and Geographic Information System (GIS) data that come with these documents.

Current projects and policies can help to provide data for what flood prevention defenses are in use, and their effectiveness. The Town documents also provide project recommendations for future projects ("prospective projects") and suggests "goals" or policies to be expanded upon. The objective of the following section is to analyze current efforts in the form of current projects and policies, and then to compare these current defenses to future/prospective projects and future goals/policies.

Current Defenses – Studies, Projects, and Policies

Sewershed Studies

The Town's sewer system evaluation studies conducted for Arrowhead, College Street and Phlegar Street Sewersheds, and the Crab Creek Inceptor were aimed at reducing rainfall-derived infiltration and inflow (RDII) through evaluating which sewer systems had high RDII rates, and then providing rehabilitation recommendations (Town of Christiansburg, 2019). This evaluation resulted in the detection of high RDII rates for every sewer system in the study. Recommendations included manhole rehabilitation and replacement; sewer line and lateral rehabilitation; maintenance rehabilitation and on-going monitoring. Alleviating high rates of inflow can reduce the likelihood of a flood event, making these sewershed studies an important part of understanding Christiansburg's current flood resilience defenses.

Watershed Studies

Two major watershed studies conducted by the Town includes the Downtown Watershed Study (2018), and the Diamond Hills Basin Watershed Study (2013). The purpose of these studies was to analyze the current conditions of these watersheds and to provide potential outcomes of different stormwater solutions for the watersheds. The Diamond Hills Basin Watershed Study provided 2-year and 10-year storm event data that confirmed the water quantity and water quality benefits of the Diamond Hills Park Stream Restoration project, and the Diamond Hills Upper Basin Stormwater Management Facility (Balzer and Associates, 2013). The Downtown Watershed Study focused specifically on drainage and flooding concerns issues along the Town Branch Tributary that flows through Christiansburg's Downtown area. Based on review of previous Town drainage improvement studies, surveys, community meetings, and the addition of a new hydrology analysis of the watershed, 10 drainage improvement projects were recommended, prioritized, and scored.

Targeted Drainage Studies

Like the Town's watershed studies, targeted drainage Improvements projects and studies have been ramping up over the past decade to help assess specific "hotspots" where flooding occurs most often. These study areas include College Street, W. Main Street (Hickock Street), Sleepy Hollow Road, and Hans Meadow Drive. These studies have assessed current conditions, followed by recommendations derived

from projected hydrology calculations, and include design/conceptual plans with projected cost estimates. These drainage and watershed studies resulted in a variety of recommended improvements ranging from native vegetation installation, demolition of drainage infrastructure, installation of drainage infrastructure, earthwork and ESC measures, BMP installations and upgrades.

Run-Off /Pollution Studies

Identifying and recommending flooding solutions is instrumental in flood resilience planning, but further assessment of these approved projects may be needed to ensure water quality and flow functionality. Follow up studies involving approved (but not yet built) stream restorations, floodplain/overbank wetlands installations and detention ponds installations, confirm the proposed-BMP's effectiveness of keeping the local watersheds clean, which can also indicate improved stormwater overflow prevention and floodplain management. Three of the Town's drainage basins: Diamond Hills, Towne Branch (Depot Street), and Christiansburg Industrial Park were studied for their effectiveness in runoff and pollution reduction (EEE, 2013). These studies determined that these approved improvements would be effective in reducing Waste Load Allocations for the Crab Creek and New River Basins, which also indicated improved flow functionality.

Projects as a Result of the Towns Studies

As a result of the Town's plans and studies, several of the project recommendations were approved and are at various stages of design and construction. The project recommendations derived from the Hickok Street and College Street Drainage Improvement studies are still being implemented as well as several of the recommended projects from the Downtown Watershed Study. (Town of Christiansburg, n.d.). Construction for Hans Meadow Drainage Project (Phase II) and Diamond Hills Park Stream Restoration was completed in 2019, and Town Branch Stream Restoration was completed in 2018 (Town of Christiansburg, n.d.).

Figure 4: College Street Flooding

Other recently completed drainage improvements and stream restoration projects includes Church, Rigby, and Ellett Storm Drainage Improvements (completed in 2019); Blue Leaf Stream Restoration Project (2017); Brown, Church and Lucas Streets Storm Drain Improvements (2017); and North Franklin Street Drainage Improvements (2017).

Figure 5: Church Street - Drainage Issues

These projects provide a start to achieve long-lasting results that will continue to improve flooding resilience for the Town. However, other identified projects lack funding to move forward, but would further the Town's goal of increasing flood resilience if implemented.

Current Policies

Periodically, the Town of Christiansburg outlines their flooding-related policies in their Comprehensive Plan. The current 2013 version will soon be replaced by a revised edition. For brevity, below is a summary of policy themes within the 2013 Comprehensive Plan that assist in the promotion of flooding resilience, currently being implemented by the Town:

- Increased use of green techniques and infrastructure
- Water quality improvement
- Operation and maintenance of SWM and sewer infrastructure
- Execution of the MS4 plan
- Improvement or replacing of existing SWM and sewer infrastructure
- Construction of new SWM infrastructure that helps to reduce run off and pollution

These policies are designed to fully encompass the various factors that come into play regarding flooding resilience needs.

Future Projects – Studies, Projects, and Policies

Future Studies and Projects

To date, several potential projects identified in the watershed and sewershed plans have not been implemented, for various reasons. This Plan will evaluate and prioritize these potential projects to determine if they can assist the Town in its goal of increasing flood resilience.

Additionally, other projects may be considered that could provide greater flood control capabilities. Proposed mixed-use developments near Uptown Christiansburg (formerly New River Mall), Hickok Street, W. Main Street, Phlegar Street, N. Franklin Street, and College Street as proposed in the Town's Urban Development Areas document (2016) provide several opportunities to implement new and/or improved stormwater or drainage solutions for the Town.

Future Policies

Earlier in this chapter, current policies to promote the Town's flood resilience were summarized. These policies remain general to allow the easy application of flooding resilience action items. This plan will evaluate these current policies for improvement or enhancement, in addition to other policies that have not yet been pursued. For brevity, summaries of Town policies not yet explored or pursued are included in the list below:

- Landscape improvement
- Pollution reduction
- Mitigation of stormwater runoff by increasing tree canopy
- Limiting development on steep slopes (to slow down stormwater flow velocity, and decrease instances of erosion, sedimentation, and landslides)
- Increased awareness of development opportunities and restrictions on varying soil types.
- Protection of floodplains
- Creation, preservation, and maintenance of open space (including parkland)
- Design criteria using more conservative storm intensity, duration, and frequency data (IDF Curves)
- Updated subdivision guidelines encouraging best practices for stormwater collection, conveyance, and infiltration
- Consideration of karst hydrology

Chapter 3: A Plan for Flood Resilience

Methodology of Matrix/Score Card Ranking System

Based on the collection and review of Town literature (i.e., studies, plans, reports, GIS files), flood prevention and mitigation measures currently in place (current projects and policies) were identified. Potential future projects were also identified in this literature review and additional suggestions were added on by the Town Staff. The list of prospective projects and policies were then narrowed down based on optimal effectiveness, determined by the Town, and the consulting engineers assisting with this Resilience Plan.

The list of the Town's resources reviewed for determining current projects, potential projects, and other additional findings, can be found in the Appendix of this plan. Graphical representation of current resilience project coverage is demonstrated on page 9 of Chapter 1. For purposes of this resilience plan, the potential projects evaluated were based on flood and watershed studies and did not focus on sewershed based projects.

These potential projects were then ranked in accordance with a customized resilience matrix with weighted criteria, resulting in a numerical score. The matrix criteria were derived from DCR project ranking criteria that was developed by the state for the Community Flood Preparedness Fund (CFPF). The potential projects with the higher scores demonstrate a greater benefit to the Town's resilience efforts.

Some pre-existing flood prevention and mitigation projects were also evaluated using this prioritization methodology as a way for the Town to conceptualize the matrix process, its criteria, and its weighted scoring system.

Ranking Matrix Clarifications

The following caveats are to be considered when reviewing the Christiansburg Flood Resilience Ranking Matrix:

- It is important to note that the ranking of projects through this matrix scoring does not imply the order in which projects are carried out to completion. The timeline of each project depends on several factors including funding availability and project feasibility.
- Project costs for engineering and construction listed in the matrix have not been re-calculated with consideration to current-day inflation data. The matrix lists the year in which cost data was derived and is subject to change if projects are selected and implemented in the future.
- Project data displaying as "N/A" indicates that the cost to design, or remediate project is undetermined as this time.
- The following projects were not included in the matrix, as each of these involved several sub-projects, rendering the data values in the table as unquantifiable:
    - Public Works ditch work priority list
    - Public Works culvert replacement priority list
    - Other residential properties taking street water
    - Possible urban development areas designed for mixed use developments
- An additional matrix criterion to be considered for the future is the "acquisition of property" category. Acquisition can at times be the most cost-effective solution for reoccurring flooding

issues for residential properties. However, for privacy purposes, properties that specify addresses have been removed from this report.

- FEMA criteria can be added to this matrix for future grant funding consideration regarding residential properties.
    - Categories such as "Severe Repetitive Loss", "Repetitive Loss Property", "Property Damage", "Roadway Flooding", and "Potential Roadway Flooding", accompanied by a maximum point valuation can be added to this matrix, if residential properties are added to the project list in the future.
- Projects listed in the matrix that are currently marked as "*" or "**" (projects located in the floodplain and floodway, respectively) should be separately evaluated for FEMA grant funding.
- Please see the Christiansburg Floodplain/Floodway Map further along in this Chapter in the section titled "Resilience Score Card Results".
- The DCR ranking criteria can be found in Appendix A.
- Additional criteria were added to the final ranking matrix to account for estimated costs and the readiness of the project to proceed. For example, there are projects in the matrix that may score high based on the DCR criteria but do not have engineering and/or construction costs developed or may only be conceptual in design. These projects may need more development to be eligible for consideration for implementation.
- The focused list of recommended projects includes more shovel-ready projects that score highly and will also best address recurring flood issues in the Town based on the drainage studies.

Resilience Score Card Results

Detailed in the table below, are the top-ranked projects accompanied by a brief narrative and their final score. These projects represent shovel-ready projects that have been identified in previous drainage studies as the best options to alleviate recurrent flooding in the Town. An opinion of probable cost was developed for each of the recommended resilience projects based on available data. In each case, soft costs and a 30% contingency were included in the estimates as a conservative approach to budgeting. Details for each estimate can be found in the Appendix.

Potential Project	Project Description	Project Source	Points
Recommended Projects			
Chrisman / Phlegar Street Drainage Improvements: Phase II	Starting at the intersection of Phlegar Street and 3rd Street SW, this project is a series of small box culverts and open channels that convey runoff from the upper watershed to an existing triple 5'x3' box culvert under 1st Street. The channel alignment requires easements across some private properties, and may include stream stabilization measures.	Downtown Watershed Study	**75**

Chrisman / Phlegar Street Drainage Improvements: Phase I	This project collects runoff from existing 30" RCP and 48" RCP pipes under Interstate 81, and conveys the runoff in a closed drainage system along Chrisman Street, then crossing over to Phlegar Street following the alignment of the existing pipes. Recommended pipe sizes increase from 36" initially, to between 48" and 60" in diameter at 3rd Street SW.	Downtown Watershed Study	**73**
College Street Drainage Project - Phase I	Improvements at the nearby school, a reach along the opposite side of College Street, and the Detention Pond with several hundred feet of the outlet pipe downstream which will terminate upstream of the first driveway that crosses the drainage ditch. The installed pipe system below the pond will need to be installed at a flatter grade in Phase I than the final design until Phase II portion may be installed. The drainage will then re-enter the existing drainage ditch behind the residences along College Street.	College Street Drainage Study (scope revised on 06/2023)	**70**
College Street Drainage Project - Phase II	The pipe and structures previously installed below the pond will be re-installed at their originally planned deeper elevations along with the rest of the Phase II construction that extends to Depot St and also captures a large inflow from Main St. This will involve a small amount of redesign for this reach of the pipe installation immediately below the pond.	College Street Drainage Study (scope revised on 06/2023)	**70**
Hickok Street Drainage Improvements	This project conveys runoff in a proposed 10'x4' box culvert under Hickok Street SW to the intersection with Commerce Street, removing a section of drainage conveyance that goes under the existing buildings on West Main Street. Runoff is conveyed either north along Commerce Street to a connection with the existing 72" CMP or west along Hickok Street to College Street, where it connects to the College Street Drainage Improvements (Phase I).	Downtown Watershed Study	**65**

The map on the following page depicts Christiansburg Floodplain/Floodway areas, and a sampling of the top ranked projects per the ranking matrix.

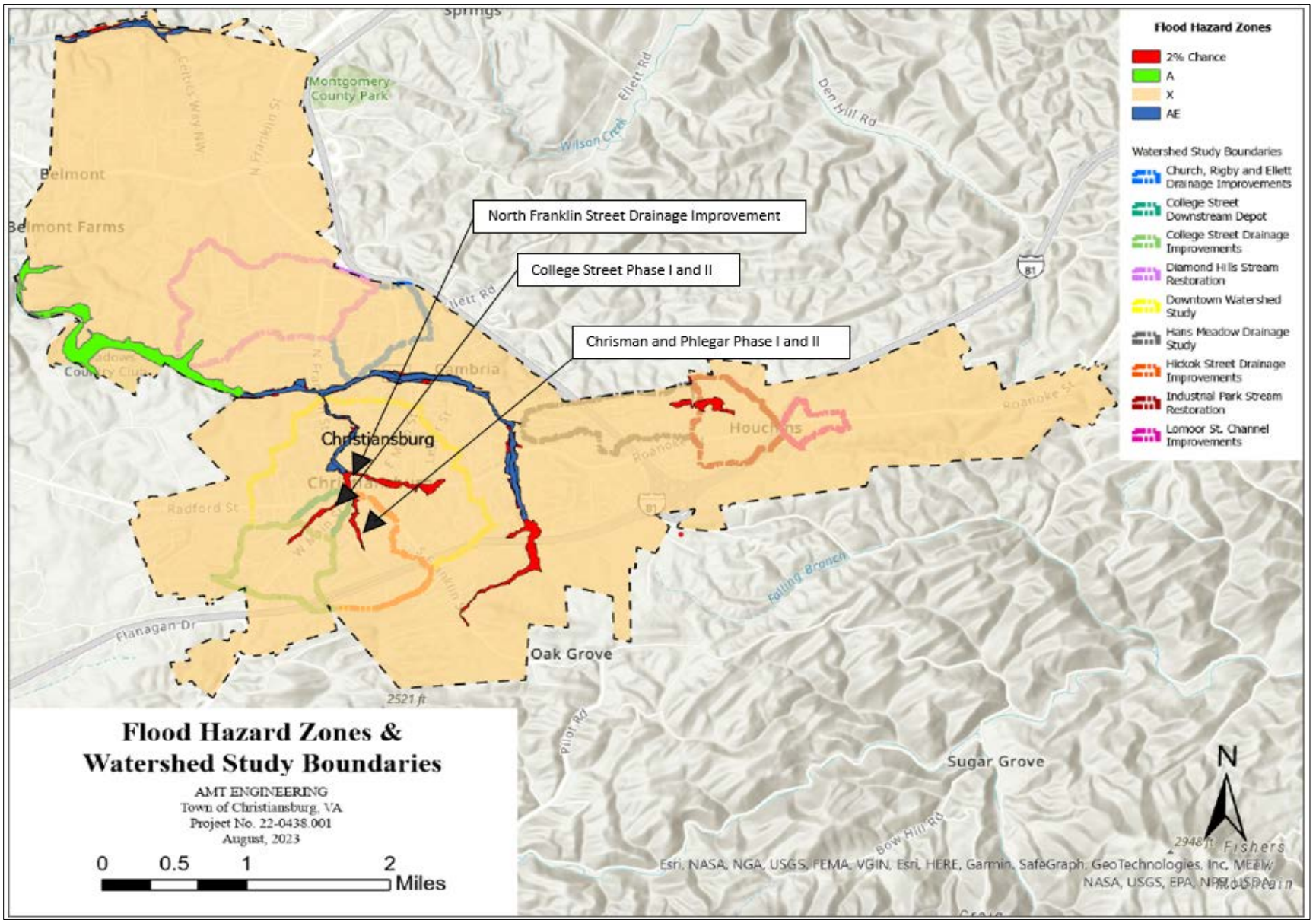

Figure 6: Christiansburg Flood Hazard Zone Map Displaying some Potential Projects and Watershed Study Boundaries

Continuation of Gray Infrastructure Implementation

The resulting gray infrastructure project recommendations from this study will help create more connectedness to a greater stormwater system, preventing or mitigating flooding events. Future new builds and retrofits alike should be designed with specifications that address increased precipitation, intensity and frequency storms, and the potential to mitigate flooding events. Additionally, maintenance protocols should be updated to ensure that these engineered solutions reliably maintain functionality. Lastly, to increase adaptive capacity, gray infrastructure should be designed in tandem with green infrastructure and nature-based solutions.

Continuation of Green Infrastructure Implementation

In addition to the project recommendations in the table above, green infrastructure should be utilized as often as possible to augment gray infrastructures capabilities if time and budgets allow. Green infrastructure is Implementing stream restorations and wetland and riparian buffer installations, and other green infrastructure techniques such as rainwater harvesting systems and pervious pavement will help to extend and reinforce the natural features that assist with flood resilience defense. Making sure our natural environmental is healthy and functional improves human well-being, creating the most immediate benefit to vulnerable communities and providing opportunities for recreation, education, and decreased heat island effect. Included with these implemented green infrastructure solutions should be updated maintenance protocols to ensure that they are functioning as designed.

RESOURCES

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Appendix

DCR Scoring Criteria

Project Eligible for Consideration		
Scoring Information		
Criterion	**Point Value**	**Points Awarded**
Projects may have components of both a. and b. below; however, only one category may be chosen. The category chosen must be identified as the primary project in the application.		
a. Acquisition of developed property consistent with an overall comprehensive local or regional plan for purposes of allowing inundation, retreat, or acquisition of structures (and where the flood mitigation benefits will be achieved as a part of the same project as the property acquisition).	30	
☐ Wetland restoration. ☐ Floodplain restoration. ☐ Construction of swales and settling ponds. ☐ Living shorelines and vegetated buffers. ☐ Permanent conservation of undeveloped lands identified as having flood resilience value by ConserveVirginia Floodplain and Flooding Resilience layer or a similar data driven analytic tool. ☐ Dam removal ☐ Stream bank restoration or stabilization. ☐ Restoration of floodplains to natural and beneficial function.	25	
b. any other nature-based approach	20	
Is the project area socially vulnerable? (Based on ADAPT VA's Social Vulnerability Index Score.)		
Very High Social Vulnerability (More than 1.5)	10	
High Social Vulnerability (1.0 to 1.5)	8	
Moderate Social Vulnerability (0.0 to 1.0)	5	
Low Social Vulnerability (-1.0 to 0.0)	0	
Low Social Vulnerability (-1.0 to 0.0)	0	
Is the proposed project part of an effort to join or remedy the community's probation or suspension from the NFIP?		
Yes	5	
No	0	
Is the proposed project in a low-income geographic area as defined in the DCR manual?		
Yes	10	

No	0	
Projects eligible for funding may also reduce nutrient and sediment pollution to local waters and the Chesapeake Bay and assist the Commonwealth in achieving local and/or Chesapeake Bay TMDLs. Does the proposed project include implementation of one or more best management practices with a nitrogen, phosphorus, or sediment reduction efficiency established by the Virginia Department of Environmental Quality or the Chesapeake Bay Program Partnership in support of the Chesapeake Bay TMDL Phase III Watershed Implementation Plan?		
Yes	5	
No	0	
Does this project provide "community scale" benefits?		
Yes	30	
No	0	
Total Points		

Top Ranking Project Scorecards

Chrisman / Phlegar Street Drainage Improvements: Phase II

Project Eligible for Consideration		
Scoring Information		
Criterion	**Point Value**	**Points Awarded**
Projects may have components of both a. and b. below; however, only one category may be chosen. The category chosen must be identified as the primary project in the application.		
a. Acquisiion of developed property consistent with an overall comprehensive local or regional plan for purposes of allowing inundation, retreat, or acquisition of structures (and where the flood mitigation benefits will be achieved as a part of the same project as the property acquisition).	30	
☐ Wetland restoration. ☐ Floodplain restoration. ☐ Construction of swales and settling ponds. ☐ Living shorelines and vegetated buffers. ☐ Permanent conservation of undeveloped lands identified as having flood resilience value by ConserveVirginia Floodplain and Flooding Resilience layer or a similar data driven analytic tool. ☐ Dam removal ☐ Stream bank restoration or stabilization. ☐ Restoration of floodplains to natural and beneficial function.	25	**25**
b. any other nature-based approach	20	**5**

Is the project area socially vulnerable? (Based on ADAPT VA's Social Vulnerability Index Score.)		
Very High Social Vulnerability (More than 1.5)	10	
High Social Vulnerability (1.0 to 1.5)	8	
Moderate Social Vulnerability (0.0 to 1.0)	5	
Low Social Vulnerability (-1.0 to 0.0)	0	**0**
Low Social Vulnerability (-1.0 to 0.0)	0	
Is the proposed project part of an effort to join or remedy the community's probation or suspension from the NFIP?		
Yes	5	
No	0	**0**
Is the proposed project in a low-income geographic area as defined in the DCR manual?		
Yes	10	**10**
No	0	
Projects eligible for funding may also reduce nutrient and sediment pollution to local waters and the Chesapeake Bay and assist the Commonwealth in achieving local and/or Chesapeake Bay TMDLs. Does the proposed project include implementation of one or more best management practices with a nitrogen, phosphorus, or sediment reduction efficiency established by the Virginia Department of Environmental Quality or the Chesapeake Bay Program Partnership in support of the Chesapeake Bay TMDL Phase III Watershed Implementation Plan?		
Yes	5	**5**
No	0	
Does this project provide "community scale" benefits?		
Yes	30	**30**
No	0	
Total Points		**75**

Chrisman / Phlegar Street Drainage Improvements: Phase I

Project Eligible for Consideration		
Scoring Information		
Criterion	**Point Value**	**Points Awarded**
Projects may have components of both a. and b. below; however, only one category may be chosen. The category chosen must be identified as the primary project in the application.		

a. Acquisition of developed property consistent with an overall comprehensive local or regional plan for purposes of allowing inundation, retreat, or acquisition of structures (and where the flood mitigation benefits will be achieved as a part of the same project as the property acquisition).	30	
☐ Wetland restoration. ☐ Floodplain restoration. ☐ Construction of swales and settling ponds. ☐ Living shorelines and vegetated buffers. ☐ Permanent conservation of undeveloped lands identified as having flood resilience value by ConserveVirginia Floodplain and Flooding Resilience layer or a similar data driven analytic tool. ☐ Dam removal ☐ Stream bank restoration or stabilization. ☐ Restoration of floodplains to natural and beneficial function.	25	**25**
b. any other nature-based approach	20	**5**
Is the project area socially vulnerable? (Based on ADAPT VA's Social Vulnerability Index Score.)		
Very High Social Vulnerability (More than 1.5)	10	
High Social Vulnerability (1.0 to 1.5)	8	
Moderate Social Vulnerability (0.0 to 1.0)	5	
Low Social Vulnerability (-1.0 to 0.0)	0	**0**
Low Social Vulnerability (-1.0 to 0.0)	0	**0**
Is the proposed project part of an effort to join or remedy the community's probation or suspension from the NFIP?		
Yes	5	
No	0	**0**
Is the proposed project in a low-income geographic area as defined in the DCR manual?		
Yes	10	**10**
No	0	
Projects eligible for funding may also reduce nutrient and sediment pollution to local waters and the Chesapeake Bay and assist the Commonwealth in achieving local and/or Chesapeake Bay TMDLs. Does the proposed project include implementation of one or more best management practices with a nitrogen, phosphorus, or sediment reduction efficiency established by the Virginia Department of Environmental Quality or the Chesapeake Bay Program Partnership in support of the Chesapeake Bay TMDL Phase III Watershed Implementation Plan?		
Yes	5	**3**
No	0	
Does this project provide "community scale" benefits?		
Yes	30	**30**
No	0	

Total Points	73

College Street Drainage Project - Phase I

Project Eligible for Consideration		
Scoring Information		
Criterion	**Point Value**	**Points Awarded**
Projects may have components of both a. and b. below; however, only one category may be chosen. The category chosen must be identified as the primary project in the application.		
a. Acquisition of developed property consistent with an overall comprehensive local or regional plan for purposes of allowing inundation, retreat, or acquisition of structures (and where the flood mitigation benefits will be achieved as a part of the same project as the property acquisition).	30	
☐ Wetland restoration. ☐ Floodplain restoration. ☐ Construction of swales and settling ponds. ☐ Living shorelines and vegetated buffers. ☐ Permanent conservation of undeveloped lands identified as having flood resilience value by ConserveVirginia Floodplain and Flooding Resilience layer or a similar data driven analytic tool. ☐ Dam removal ☐ Stream bank restoration or stabilization. ☐ Restoration of floodplains to natural and beneficial function.	25	**25**
b. any other nature-based approach	20	**5**
Is the project area socially vulnerable? (Based on ADAPT VA's Social Vulnerability Index Score.)		
Very High Social Vulnerability (More than 1.5)	10	
High Social Vulnerability (1.0 to 1.5)	8	
Moderate Social Vulnerability (0.0 to 1.0)	5	
Low Social Vulnerability (-1.0 to 0.0)	0	**0**
Low Social Vulnerability (-1.0 to 0.0)	0	
Is the proposed project part of an effort to join or remedy the community's probation or suspension from the NFIP?		
Yes	5	
No	0	**0**
Is the proposed project in a low-income geographic area as defined in the DCR manual?		
Yes	10	**10**

No	0	
Projects eligible for funding may also reduce nutrient and sediment pollution to local waters and the Chesapeake Bay and assist the Commonwealth in achieving local and/or Chesapeake Bay TMDLs. Does the proposed project include implementation of one or more best management practices with a nitrogen, phosphorus, or sediment reduction efficiency established by the Virginia Department of Environmental Quality or the Chesapeake Bay Program Partnership in support of the Chesapeake Bay TMDL Phase III Watershed Implementation Plan?		
Yes	5	
No	0	**0**
Does this project provide "community scale" benefits?		
Yes	30	**30**
No	0	
Total Points		**70**

College Street Drainage Project - Phase II

Project Eligible for Consideration		
Scoring Information		
Criterion	**Point Value**	**Points Awarded**
Projects may have components of both a. and b. below; however, only one category may be chosen. The category chosen must be identified as the primary project in the application.		
a. Acquisition of developed property consistent with an overall comprehensive local or regional plan for purposes of allowing inundation, retreat, or acquisition of structures (and where the flood mitigation benefits will be achieved as a part of the same project as the property acquisition).	30	
☐ Wetland restoration. ☐ Floodplain restoration. ☐ Construction of swales and settling ponds. ☐ Living shorelines and vegetated buffers. ☐ Permanent conservation of undeveloped lands identified as having flood resilience value by ConserveVirginia Floodplain and Flooding Resilience layer or a similar data driven analytic tool. ☐ Dam removal ☐ Stream bank restoration or stabilization. ☐ Restoration of floodplains to natural and beneficial function.	25	**25**
b. any other nature-based approach	20	**5**
Is the project area socially vulnerable? (Based on ADAPT VA's Social Vulnerability Index Score.)		
Very High Social Vulnerability (More than 1.5)	10	

High Social Vulnerability (1.0 to 1.5)	8	
Moderate Social Vulnerability (0.0 to 1.0)	5	
Low Social Vulnerability (-1.0 to 0.0)	0	**0**
Low Social Vulnerability (-1.0 to 0.0)	0	
Is the proposed project part of an effort to join or remedy the community's probation or suspension from the NFIP?		
Yes	5	
No	0	**0**
Is the proposed project in a low-income geographic area as defined in the DCR manual?		
Yes	10	**10**
No	0	
Projects eligible for funding may also reduce nutrient and sediment pollution to local waters and the Chesapeake Bay and assist the Commonwealth in achieving local and/or Chesapeake Bay TMDLs. Does the proposed project include implementation of one or more best management practices with a nitrogen, phosphorus, or sediment reduction efficiency established by the Virginia Department of Environmental Quality or the Chesapeake Bay Program Partnership in support of the Chesapeake Bay TMDL Phase III Watershed Implementation Plan?		
Yes	5	
No	0	**0**
Does this project provide "community scale" benefits?		
Yes	30	**30**
No	0	
Total Points		**70**

Hickok Street Drainage Improvements

Project Eligible for Consideration		
Scoring Information		
Criterion	**Point Value**	**Points Awarded**
Projects may have components of both a. and b. below; however, only one category may be chosen. The category chosen must be identified as the primary project in the application.		
a. Acquisition of developed property consistent with an overall comprehensive local or regional plan for purposes of allowing inundation, retreat, or acquisition of structures (and where the flood mitigation benefits will be achieved as a part of the same project as the property acquisition).	30	

☐ Wetland restoration. ☐ Floodplain restoration. ☐ Construction of swales and settling ponds. ☐ Living shorelines and vegetated buffers. ☐ Permanent conservation of undeveloped lands identified as having flood resilience value by ConserveVirginia Floodplain and Flooding Resilience layer or a similar data driven analytic tool. ☐ Dam removal ☐ Stream bank restoration or stabilization. ☐ Restoration of floodplains to natural and beneficial function.	25	**25**
b. any other nature-based approach	20	
Is the project area socially vulnerable? (Based on ADAPT VA's Social Vulnerability Index Score.)		
Very High Social Vulnerability (More than 1.5)	10	
High Social Vulnerability (1.0 to 1.5)	8	
Moderate Social Vulnerability (0.0 to 1.0)	5	
Low Social Vulnerability (-1.0 to 0.0)	0	**0**
Low Social Vulnerability (-1.0 to 0.0)	0	
Is the proposed project part of an effort to join or remedy the community's probation or suspension from the NFIP?		
Yes	5	
No	0	**0**
Is the proposed project in a low-income geographic area as defined in the DCR manual?		
Yes	10	**10**
No	0	
Projects eligible for funding may also reduce nutrient and sediment pollution to local waters and the Chesapeake Bay and assist the Commonwealth in achieving local and/or Chesapeake Bay TMDLs. Does the proposed project include implementation of one or more best management practices with a nitrogen, phosphorus, or sediment reduction efficiency established by the Virginia Department of Environmental Quality or the Chesapeake Bay Program Partnership in support of the Chesapeake Bay TMDL Phase III Watershed Implementation Plan?		
Yes	5	
No	0	
Does this project provide "community scale" benefits?		
Yes	30	**30**
No	0	
Total Points		**65**

Project Ranking Matrix - 10/09/2023

Project Ranking Criteria			Acquisition of developed property consistent with an overall comprehensive local or regional plan for purposes of allowing inundation, retreat, or acquisition of structures	Nature Based Approach	Project Area Socially Vulnerable	Impact NFIP Participation	Low Income Geographic Area	TMDL Benefit? (e.g., N or P)	Community Scale Benefit		Estimated Engineering Cost	Estimated Construction Cost	Total Cost	Cost Notes (*year of cost estimate, does plan include cost?*)	**Total Points**
Categorical Weight			30	20	10	5	10	5	30						
Potential Project	**Project Description**	**Project Source**													
Recommended Projects															
College Street Drainage Project - Phase I	Improvements at the nearby school, a reach along the opposite side of College Street, and the Detention Pond with several hundred feet of the outlet pipe downstream which will terminate upstream of the first driveway that crosses the drainage ditch. The installed pipe system below the pond will need to be installed at a flatter grade in Phase I than the final design until Phase II portion may be installed. The drainage will then re-enter the existing drainage ditch behind the residences along College Street.	College Street Drainage Study (scope revised on 06/2023)	25	5	0	0	10	0	30		$155,852	$2,188,034	$2,238,034	2023	**70**
College Street Drainage Project - Phase II	The pipe and structures previously installed below the pond will be re-installed at their originally planned deeper elevations along with the rest of the Phase II construction that extends to Depot St and also captures a large inflow from Main St. This will involve a small amount of redesign for this reach of the pipe installation immediately below the pond.	College Street Drainage Study (scope revised on 06/2023)	25	5	0	0	10	0	30		$191,099	$1,457,017	$1,864,981	2023	**70**
Hickok Street Drainage Improvements	This project conveys runoff in a proposed 10'x4' box culvert under Hickok Street SW to the intersection with Commerce Street, removing a section of drainage conveyance that goes under the existing buildings on West Main Street. Runoff is conveyed either north along Commerce Street to a connection with the existing 72" CMP or west along Hickok Street to College Street, where it connects to the College Street Drainage Improvements (Phase I).	Downtown Watershed Study	25	0	0	0	10	0	30		$404,000	$2,271,722	$2,675,722 (stated as $2,700,000 in Watershed study)	2017 and later in watershed study in 2018	**65**
Chrisman / Phlegar Street Drainage Improvements: Phase I	This project collects runoff from existing 30" RCP and 48" RCP pipes under Interstate 81, and conveys the runoff in a closed drainage system along Chrisman Street, then crossing over to Phlegar Street following the alignment of the existing pipes. Recommended pipe sizes increase from 36" initially, to between 48" and 60" in diameter at 3rd Street SW.	Downtown Watershed Study	25	5	0	0	10	3	30		$378,000	$2,413,000	$2,800,000	2018	**73**
Chrisman / Phlegar Street Drainage Improvements: Phase II	Starting at the intersection of Phlegar Street and 3rd Street SW, this project is a series of small box culverts and open channels that convey runoff from the upper watershed to an existing triple 5'x3' box culvert under 1st Street. The channel alignment requires easements across some private properties, and may include stream stabilization measures.	Downtown Watershed Study	25	5	0	0	10	5	30		$187,000	$1,113,000	$1,300,000	2018	**75**
Potential Future Projects															
Gray Infrastructure															
Existing SWM Facility with Independence Boulevard Upgrade - project completed but may need further evaluation	N/A	Diamond Hills Basin Watershed Study	0	0	0	0	10	0	30		N/A	N/A	N/A	N/A	**40**
Radford Street Drainage Improvements	This project is smaller than some others in the downtown area, and addresses clogged inlets and undersized pipes along the north side of Radford Street. By increasing the pipe size from 15" to 24" and adding adequately sized throat lengths on the drainage inlets, runoff can be intercepted and conveyed into the existing 36" RCP at Lee Hy Court, then draining along Radford Street to Depot Street and into the downtown area. New sidewalks may also be considered for this area.	Downtown Watershed Study	25	0	0	0	10	0	30		$158,000	$942,000	$1,100,000	2018	**65**
Alleghany St / Canaan Rd / Epperly Drive: Drainage Improvements	This project helps address surface water and groundwater concerns from the Sunset Cemetery and Alleghany Street in areas along Canaan Road and Epperly Drive, by replacing existing 15" pipes with 24" and 30" pipes. Runoff is then conveyed into the rear yards on the south side of Epperly Drive, behind the First Church of God, with a pipe extension to an existing stormwater management basin (dry detention). During engineering design, the Town may choose to retrofit the existing basin to help proect existing drainage systems downstream and to promote improved water quality in the watershed.	Downtown Watershed Study	25	0	0	0	10	5	30		$105,000	$645,000	$750,000	2018	**70**
Stone Street Culvert Replacement at Town Branch	This project replaces an existing quadruple 48" CMP with a dual 10'x5' box culvert, providing increased capacity to convey the 2-year storm under Stone Street without overtopping onto Depot Street. 10-year and 100-year flood depths are reduced with this culvert replacement. Possible impacts of the larger pipes on the stream restoration project in Depot Park will need to be evaluated, as well as the flood reduction benefits of eliminating the abandoned bridge near Stone Street. Enhanced water quality can also be considered with this project, by developing a stream restoration project from Stone Street to North Franklin Street, creating a linear park or greenway concept	Downtown Watershed Study	30	0	5	0	10	5	30		$114,000	$526,000	$640,000	2018	**80**
Roanoke Street Drainage Improvements (near wades)	This project begins at an existing curb inlet near Wade's Foods which has a small diameter pipe draining to Craig Street. The recommendation is to eliminate runoff from Craig Street into the open channel behind 500 Roanoke Street by installing a storm drain system that conveys runoff from the Wade's Foods parking lot and Craig Street to Roanoke Street, where it ties into the existing storm drain system	Downtown Watershed Study	25	0	5	0	10	5	30		$42,000	$168,000	$210,000	2018	**75**
Sherwood Culvert Replacement	Replacement of existing storm drain culvert under Sherwood Drive which is beyond useful life and causing maintenance issues.	Town's Addition (no document source)	25	0	5	0	10	0	30		$25,000	$100,000	$125,000	2022	**70**
Glade Culvert Replacement	Replacement of existing storm drain culvert along Glade Drive which is beyond useful life and causing maintenance issues.	Town's Addition (no document source)	25	0	0	0	10	0	30		N/A	N/A	N/A	N/A	**65**
Public Works Operation Center	Public Works Operation Center is within the 100 year flood plain since it is the location of the old sewer treatment facility. Relocation is the best alternative.	Town's Addition (no document source)	30	20	5	0	10	0	30		N/A	N/A	N/A	N/A	**95**
Evans Street Drainage	Piping of road drainage through a new storm drain system to prevent drainage between and behind residences.	Town's Addition (no document source)	25	0	5	0	10	0	30		$75,000	$325,000	$400,000	2022	**70**
Overhill Drainage	Piping of road drainage through a new storm drain system to prevent drainage between and behind residences.	Town's Addition (no document source)	25	0	0	0	10	0	30		N/A	N/A	N/A	N/A	**65**
Reading Road Drainage	Research and Public outreach is required to address maintenance of drainage infrastructure and/or larger replacement projects to address capacity may be necessary.	Town's Addition (no document source)	25	0	0	0	10	0	30		N/A	N/A	N/A	N/A	**65**
Teel Street	Piping of road drainage through a new storm drain system to prevent drainage between and behind residences.	Town's Addition (no document source)	25	0	5	0	10	0	30		N/A	N/A	N/A	N/A	**70**
N Franklin Street Drainage near Conston	Roadway flooding occurs here frequently with heavy rains. The system is most likely undersized for the area it drains	Town's Addition (no document source)	25	0	0	0	10	0	30		N/A	N/A	N/A	N/A	**65**
West Main Street Drainage (near 1010 W Main, drainage from Robin Rd / Interstate)	Piping of road drainage through a new storm drain system to prevent drainage between and behind residences.	Hickock Drainage Study	25	0	0	0	10	0	30		$404,000	$2,271,722	$2,675,722	2017	**65**
Infrastructure															
Diamond Hills Basin Evaluation of Ultimate Development (including: Stream Restoration & Independence Blvd Upgrade, and Upstream SWM Facility a BMPs);	there are potential projects to come from this basin, work on various stormwater facilities and conveyance channels	Description provided by Town notes	25	0	0	0	10	5	30		N/A	N/A	N/A	N/A	**70**
Christiansburg Industrial Park Restoration and Stormwater BMP Assessment(Town is at 100% design on this and plans to go to construction in the fall…we have the costs available)	Maintenance / Upsizing of existing stormwater quantity pond and channel improvements upstream of facility.	Stream Benefits Analysis Christiansburg Industrial ParkStream Restoration	25	20	5	0	10	5	30		N/A	N/A	$700,000	N/A	**95**
Sleepy Hollow SWM BMP Modification	Maintance or removal of BMP. The embankment is not constructed properly and would need to be rebuit.	WSSI Sleepy Hollow Powerpoint	25	20	0	0	10	5	30		N/A	N/A	N/A	N/A	**90**
Kiwanas Park	Corrective work to address stream erosion along park.	Town's Addition	25	0	0	0	10	5	30		N/A	N/A	N/A	N/A	**70**
Diamond Hills SWM BMP Modification (Food Lion N Franklin St Facility)	Potential modification to address flow through pond to protect downstream channel and Blue Leaf Stream Restoration	Town's Addition (no document source)	25	0	0	0	10	5	30		N/A	N/A	N/A	N/A	**70**

Table Notes:
Project data displaying as "N/A" indicates that the cost to construct, design, or remediate project is undetermined as this time.
Project Name (* = project that is in the floodplain. ** = a project that is in the floodway)
Preferred projects are based on total points, cost considerations and shovel-ready nature of the proposed project.