

## **Appendix A: Application Form for Grant Requests for All Categories**

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Virginia Department of Conservation and Recreation  
Virginia Community Flood Preparedness Fund Grant Program

**Name of Local Government:** City of Alexandria

**Category of Grant Being Applied for (check one):**

Capacity Building/Planning

Project

Study

**NFIP/DCR Community Identification Number (CID)** 515519

**If a state or federally recognized Indian tribe, Name of tribe** \_\_\_\_\_

**Name of Authorized Official:** Mr. Jesse Maines

**Signature of Authorized Official:** 

**Mailing Address (1):** 301 King Street, City Hall

**Mailing Address (2):** \_\_\_\_\_

**City:** Alexandria **State:** VA **Zip:** 22314

**Telephone Number:** [REDACTED] **Cell Phone Number:** [REDACTED]

**Email Address:** [REDACTED]

Contact Person (If different from authorized official): Jessica Lassetter

Mailing Address (1): 2900 B Business Center Drive

Mailing Address (2): \_\_\_\_\_

City: Alexandria State: VA Zip: 22314

Telephone Number: [REDACTED] Cell Phone Number: [REDACTED]

Email Address: [REDACTED]

Is the proposal in this application intended to benefit a low-income geographic area as defined in the Part 1 Definitions? Yes        No X      

**Categories (select applicable project):**

**Project Grants (Check All that Apply)**

- Acquisition of property (or interests therein) and/or structures for purposes of allowing floodwater inundation, strategic retreat of existing land uses from areas vulnerable to flooding; the conservation or enhancement of natural flood resilience resources; or acquisition of structures, provided the acquired property will be protected in perpetuity from further development.
- Wetland restoration.
- Floodplain restoration.
- Construction of swales and settling ponds.
- Living shorelines and vegetated buffers.
- Structural floodwalls, levees, berms, flood gates, structural conveyances.
- Storm water system upgrades.
- Medium and large scale Low Impact Development (LID) in urban areas.
- 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 restoration or removal.
- Stream bank restoration or stabilization.
- Restoration of floodplains to natural and beneficial function.
- Developing flood warning and response systems, which may include gauge installation, to notify residents of potential emergency flooding events.

**Study Grants (Check All that Apply)**

- Studies to aid in updating floodplain ordinances to maintain compliance with the NFIP or to incorporate higher standards that may reduce the risk of flood damage. This must include establishing processes for implementing the ordinance, including but not limited to, permitting, record retention, violations, and variances. This may include revising a floodplain ordinance when the community is getting new Flood Insurance Rate Maps (FIRMs), updating a floodplain ordinance to include floodplain setbacks or freeboard, or correcting issues identified in a Corrective Action Plan.
- Revising other land use ordinances to incorporate flood protection and mitigation goals, standards and practices.
- Conducting hydrologic and hydraulic studies of floodplains. Applicants who create new maps must apply for a Letter of Map Revision or a Physical Map Revision through the Federal Emergency Management Agency (FEMA). For example, a local government might conduct a hydrologic and hydraulic study for an area that had not been studied because the watershed is less than one square mile. Modeling the floodplain in an area that has numerous letters of map change that suggest the current map might not be fully accurate or doing a detailed flood study for an A Zone is another example.
- Studies and Data Collection of Statewide and Regional Significance.
- Revisions to existing resilience plans and modifications to existing comprehensive and hazard.
- Other relevant flood prevention and protection project or study.

**Capacity Building and Planning Grants**

- Floodplain Staff Capacity.
- Resilience Plan Development
  - Revisions to existing resilience plans and modifications to existing comprehensive and hazard mitigation plans.
  - Resource assessments, planning, strategies and development.
    - Policy management and/or development.
    - Stakeholder engagement and strategies.

**Location of Project (Include Maps): Four Mile Run Watershed, Alexandria, VA (See Map)**

**NFIP Community Identification Number (CID#):(See appendix**

**F CID515519**

**Is Project Located in an NFIP Participating Community?**    Yes    No

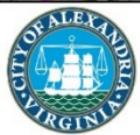
**Is Project Located in a Special Flood Hazard Area?**    Yes    No

**Flood Zone(s) (If Applicable):** 1% Chance FEMA AE

**Flood Insurance Rate Map Number(s) (If Applicable):** 5155190033F (Preliminary)

**Total Cost of Project:** \$192,000

**Total Amount Requested** \$144,000



**Commonwealth Ave. and Glebe Rd. and  
Ashby St. and Glebe Rd. Storm Sewer Improvements VIC Map**  
**June 2021**

0 0.015 0.03 0.06 Miles

# Scope of Work & Budget Narrative

## **Scope of Work Narrative – *Resilient Stormwater Capacity and Green Streets Project for Alexandria, VA***

### **Overview**

A Resilient Stormwater Capacity and Green Streets Project for Alexandria will consider a range of flooding mitigation options in the overall strategy, including integrated green infrastructure, storage, and, conveyance designs near two intersections (Commonwealth Avenue & E. Glebe Road and Ashby Street & E. Glebe Road) in the Four Mile Run watershed to mitigate flooding issues for properties on multiple blocks that experience repetitive flooding due to capacity issues in the existing storm sewer systems. Green infrastructure design elements may include tree box filters, green gutters, high-low infiltration devices, and retrofits of medians to include bioswales and focal point infiltration systems to reduce volume and provide treatment. Each of these elements contributes to a 'Resilient Green Street' or a street scape which is enhanced by nature-based climate mitigation solutions.

### **Siting Strategies**

Nature-based solutions like green infrastructure, along with more traditional approaches like storage and conveyance enhancements, provide holistic community-scale resiliency solutions that contribute to an enhanced urban environment, flood mitigation and stormwater management, water quality improvements, and reductions in urban heat island impacts. Each of these outcomes benefit human health, safety, and the resilience of Alexandria to repetitive flood events.

The following tasks will be completed through this project and are described in further described later in the application:

- Task 1 Context Setting
- Task 2 Pilot Projects Field Exploration
- Task 3 Conceptual Design and Modeling
- Task 4 Preliminary Permitting Analysis
- Task 5 Public Engagement
- Task 6 Final Report
- Task 7 Grant Management and Status Updates



*Source: City of Portland*

### **Flooding is a Rising Issue in Alexandria**

The City of Alexandria is experiencing more frequent and severe flood events that damage residential and commercial properties, impact critical assets, and cause day-to-day disruptions and economic losses. Extreme precipitation events have occurred more frequently in the last few years. The City has experienced four major flooding events since 2019, including July 8, 2019, July 23, 2020, September 10, 2020, and most recently August 15, 2021. All of these events are characterized between 50 to 100-yr level rainstorm events. Except for August 15 of this year, which was recorded by our new gauges, with actual accumulation of 5.19-inches in 2 hours, to be between 100 and 500-

yr level rain when compared to the statistical expectations derived for the city's Intensity-Duration-Frequency (IDF) curves developed in the 1980's for the City, which actually is more conservative than NOAA's predictions for the region. Meaning, what NOAA would call a 12-hour 25-yr rainfall, Alexandria would call it closer to a 15-yr rainfall.

Incidentally, there were at least three storms in 2018 that reached the 20-yr intensity or greater., Due to the density of development along the city's waterbodies and aging infrastructure, the storm sewer system is not able to convey the volume of flooding experienced in these types of extreme events.

Alexandria is one of Virginia's densest cities, and it is important that residents are protected from floods that threaten their life safety, health, and the security of their homes.

### Need for Resilient Nature-Based Solutions

The City is applying for grant assistance under the CFPF 'Project' category to aid in the completion of design for the holistic green infrastructure and flood storage projects in the Four Mile Run East sub-basin of the Four Mile Run Watershed. These projects were identified in the City of Alexandria Storm Sewer Capacity Analysis (CASSCA), which assessed the ability of the system to handle a 10-year, 24-hour storm event through modeling. The model identified high priority junctions based on their inability to handle the water volume from the storm event.

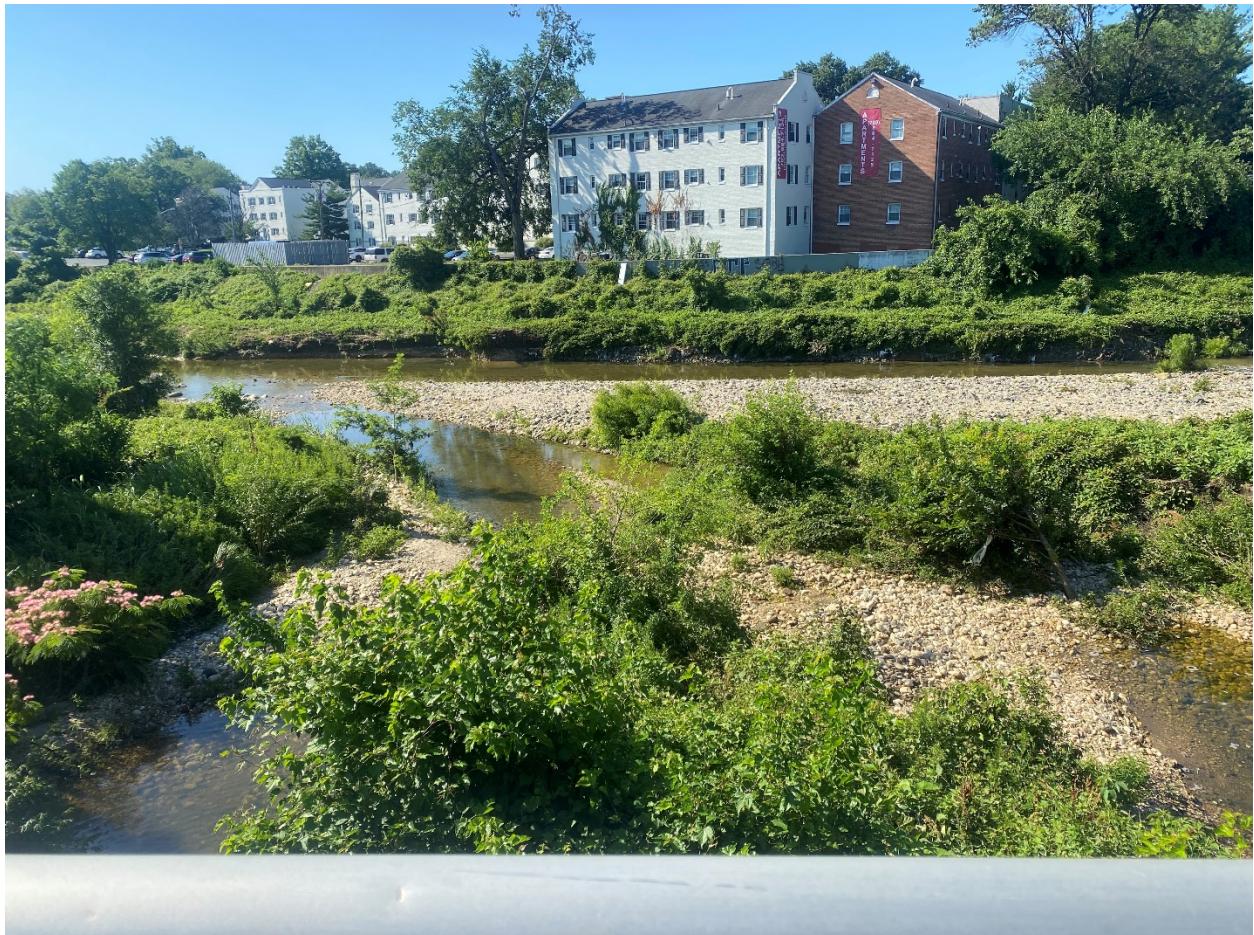
The implementation of green infrastructure and flood storage systems will help reduce the load on this junction in Alexandria's storm sewer system. Green infrastructure contributes to water-capture, groundwater recharge, and conveyance, lessening the impact that flooding causes in areas with significant impervious area. Water captured and conveyed by green infrastructure upstream reduces downstream impacts, which is why adding green infrastructure at E. Glebe Road and Commonwealth Avenue (priority area 101) and E. Glebe Road and Ashby Street (priority area 102) will contribute to community-scale flood resilience for the northern Del-Ray and adjacent Arlandria communities in the City.

These large capacity projects in the Four Mile Run watershed will provide community scale benefits to reduce flooding for the northern Del Ray neighborhood. These projects not only reduce flooding at the location of implementation, they provide community-scale benefits such as enhanced awareness of flood risk, greening of the streetscape, and contribute to watershed-wide water management goals.

The project includes a community engagement component that will increase awareness of flood risk and illustrate the benefits of nature-based solutions in the neighborhood. This type of engagement encourages private property owners, such as homeowners and business owners, to implement their own green infrastructure solutions such as rain gardens, impervious paving, and increased tree canopy that are eligible practices that may lead to a reduction in the property's Stormwater Utility (SWU) fee via the SWU Credit Program. At the same time, it helps build consensus around changes in the neighborhood. Most importantly, it calls attention to the risks of flooding, provides information on how residents might prepare, and reassures residents that Alexandria is prioritizing resilience solutions. While engagement will be more focused on neighborhoods within the Four Mile Run watershed, including Potomac Yard, Del Ray, and Arlandria, these projects are high-profile and are shared with the whole community to include the City Council and the City Council appointed Ad Hoc Stormwater Utility and Flood Mitigation Ad Hoc Advisory Group. These neighborhoods are regularly

impacted by severe flood events caused by overtopping of the Four Mile Run stream and the Potomac River, in addition to stormwater accumulation during severe precipitation events.

*Image of Four Mile Run looking towards properties in Alexandria*



Four Mile Run is a nine-mile-long stream located in a highly urbanized area in Northern Virginia. It's 19.6 square mile watershed covers portions of Arlington and Fairfax Counties and the Cities of Alexandria and Falls Church. The lower portion of Four Mile Run, from I-395 at the upstream end to National Airport at the mouth, is contained in a hardened flood control channel and marks a rough boundary between Arlington County and the City of Alexandria. Because of the highly urbanized nature of the Four Mile Run watershed, the neighborhoods and businesses adjacent to this portion of the run were subjected to repeated flooding, beginning in the 1940s. Implementation of the two green infrastructure and flood storage projects will contribute to flood mitigation and resilience in the Four Mile Run sub-basin, and are a part of a larger vision for citywide green infrastructure.

FIGURE 6-2  
Selected Technology by Problem Area  
City of Alexandria Storm Sewer Capacity Analysis

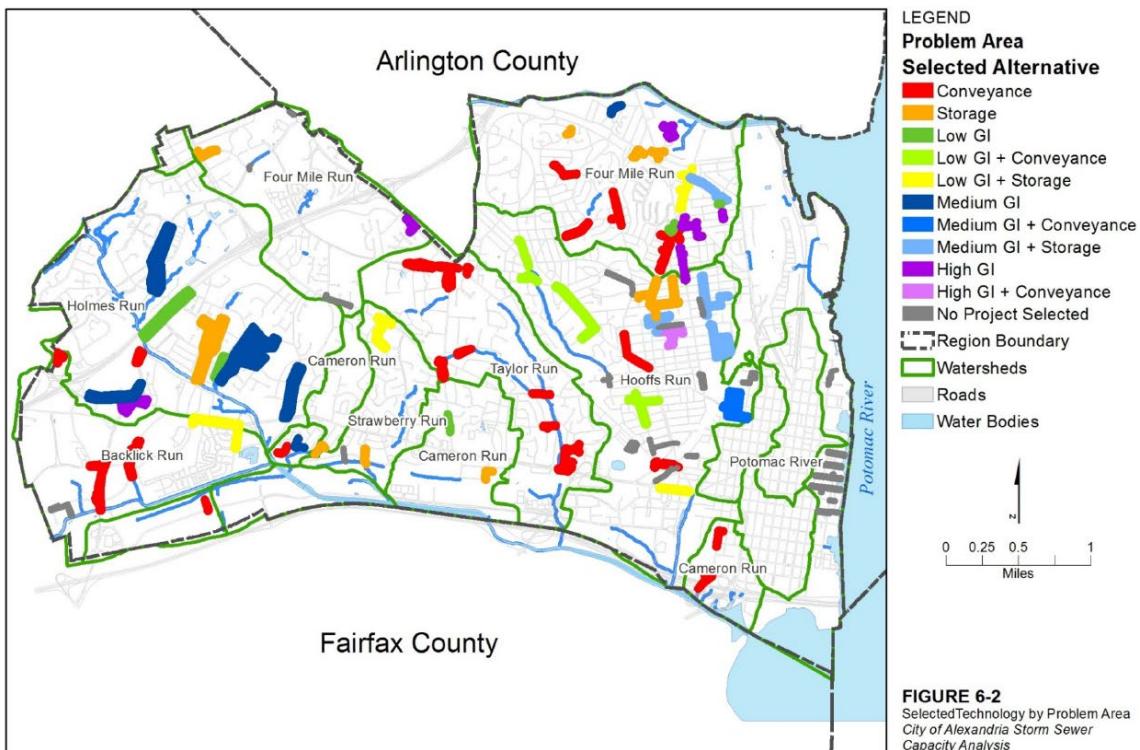


FIGURE 6-2  
Selected Technology by Problem Area  
City of Alexandria Storm Sewer Capacity Analysis

*GI opportunities identified citywide in the Storm Sewer Capacity Analysis*

## Maintenance Plan

Funded by the Stormwater Utility Fee, the project team will work with the City to develop an operation and maintenance (O&M) guidelines report with a schedule for major activities for a minimum of five years after project implementation. The O&M guidelines will include how to care for and maintain vegetation (trees, perennials), inlet and overflow structures, underground storage structures, as well as trash/debris removal. The project team will design green infrastructure elements that are lower maintenance through careful selection of native vegetation appropriate for the sites and by considering the existing maintenance capabilities of the City, including staff, training, schedule, tools and vehicles. Selections of vegetation, soil depth specifications, and other design features will align with the Alexandria Landscape Guidelines.

## Robust Resilience Planning Effort

Alexandria has integrated flood mitigation and resilience goals across areas of the local government. Alexandria has invested in a robust planning process around climate risk and resilience, and this project will advance the priorities identified in these plans. Flood resilience is a priority addressed holistically through master planning, small area planning, and waterfront planning. The City has established development controls in the floodplain through zoning and the local floodplain ordinance. The Transportation and Environmental Services Department is implementing resilient stormwater system upgrades informed by the Storm Sewer Capacity Analysis and making spot improvements to high priority flood risk areas. Parks and new public landscape features are being

designed based off the City's new landscape guidelines, which emphasize native species, restoration, and climate resilience features. Additionally, the City understands the importance of engaging with frontline communities impacted by frequent flood events and in high risk areas. The City recently launched a flood mitigation grant program for homeowners to make improvements to, and protect, their home through flood barrier implementation and structural adaptations. The City recently released an Environmental Action Plan with a roadmap for climate mitigation and resilience activities, accompanied by a new Climate Task Force. These initiatives are grounded by the City's new Equity ordinance, which commits to addressing racial, social, and economic disparities in all areas of local government. The projects proposed in this application fulfil the requirements and support the goals of each of these resilience planning efforts.

A summary of Alexandria's resilience planning efforts and how they comply with the Resilience Plan standards identified in CFPF Appendix G are included as an attachment to this application. Alexandria's Resilience Plan does not exist as one uniform document, but as elements integrated across the City's plans, regulations, programs, and projects. Resilience-focused initiatives are summarized in the list below with hyperlinks.

- [Northern Virginia Hazard Mitigation Plan \(2017\)](#)
- [City of Alexandria Storm Sewer Capacity Analysis \(CASSCA, 2016\)](#)
- [FY 2022 – FY 2031 Storm Sewer Capacity Projects](#)
- [FY 2022 - FY 2031 Stormwater Management Utility Ten-Year Plan](#)
- [Four Mile Run Restoration Master Plan](#)
- [Alexandria's Waterfront Plan](#)
- [Alexandria Floodplain Ordinance](#)
- [Emergency Operations Plan \(EOP\)](#)
- [Flood Action Alexandria](#)
- [Alexandria's Masterplan and Small Area Masterplans](#)
- [Alexandria's Housing Masterplan](#)
- [Resilient Alexandria Charter](#)
- [CRS Community Certification](#)
- [Eco-City Charter](#)
- [Eco-City Action Plan 2040](#)
- [Flood Response Plan](#)

## Resilient Green Streets Builds on Existing Initiatives

The green infrastructure and flood storage projects are a part of a larger flood resilience initiative in Alexandria to protect residents and their property from flood damages. Located within the Four Mile Run watershed, this project complements the Four Mile Run Restoration Masterplan which sets out to do the following:

- Provide a minimum 100-year event flood protection.
- Examine the current extent of the 100-year flood-prone area.
- Consider flood protection for areas not currently protected.



*Rendering from the Four-Mile Run Restoration Masterplan*

The Resilient Green Street will be designed meeting the standards and recommendations identified in the [Alexandria Landscape Guidelines](#) and will contribute to the goals set forth in the [Urban Forest Masterplan](#).

The City is actively supporting residents through a Flood Mitigation Grant Program to facilitate implementation of flood resilience and flood barrier strategies, targeted to areas with frequent flooding, such as the project neighborhood. The design and implementation of GI and storage features will reduce the burden on residents to protect their properties solely on their own and emphasizes the need for neighborhood and district-scale flood protections.

The City's priority list of spot-improvements to the storm sewer infrastructure, of which these two projects are the highest priority, emphasizes a community-scale approach to enhancing resilience across the watersheds.

## Alexandria is an Active Participant in the National Flood Insurance Program

Alexandria established a Floodplain Ordinance through the NFIP Community Rating System, which can be found here: <https://www.alexandriava.gov/uploadedFiles/tes/info/AlexandriaFMP2015.pdf>

There were twelve repetitive loss sites in Alexandria as of 2015, of which six are residential and six are non-residential. These 12 repetitive loss sites have experienced a collective 30 losses, with a total payment of \$1,871,287 (Northern Virginia HMP, 2016 (p.4-68)).

## Resilient Capacity and Green Street Project Context

### Alexandria has a Diverse Population

Alexandria is a city with a population of 159,467 (U.S. Census Bureau, 2020). The medium household income in Alexandria in 2019 was \$100,939. Of the thirty-eight census tracts in Alexandria, ten are below 80% of the median income, as shown in the map below. The census tract in which the green infrastructure pilot projects are located (201204), is not 80% below the median income. However, tract 201204 does have a diversity index score of 81, indicating a high-level of diversity. A diversity index score is measured from 0-100, where a higher diversity index score denotes a high-level of diversity; in other words, a community statistic representing the likeliness of two people chosen at random belong to different race or ethnic groups (ESRI, 2021). Median disposable income, as listed in the table below, is defined as the amount of money that an individual or household has available to save or spend on non-essentials.

Census tract 201204, in which the pilot projects are located, has a population of 3,186 and residents of the immediate area will be positively impacted by the addition of green infrastructure and storage/conveyance practices. It is also important to note that green infrastructure provides upstream flood capture that benefits the sub-basin as a larger geographic area through stormwater management and groundwater recharge. The Four Mile Run East sub-basin pilot projects will impact census tracts 201000, 201203, and 201204. Tract 201203 is below 80% median income and there is a designated Opportunity Zone (51510201203) within this area.

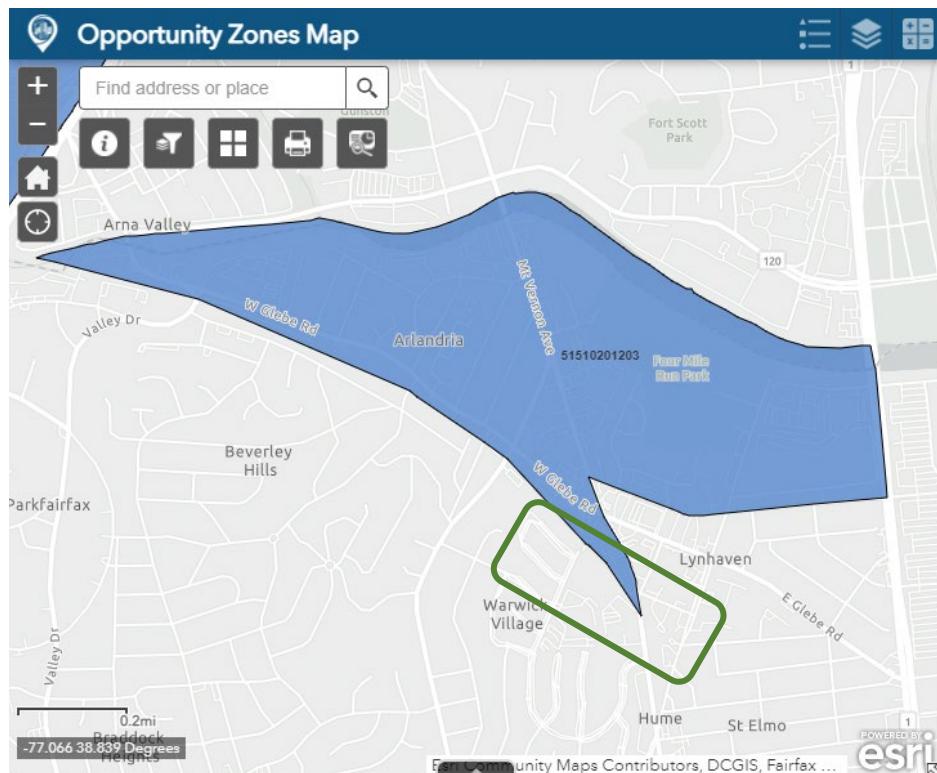
Due to the location of this project along the Four Mile Run, which flows between Alexandria and Arlington, this project will also have regional flood mitigation benefits, in addition to continuing to inspire conversation and build consensus around topics identified in the Four Mile Run Restoration Project. Green infrastructure is a community-scale nature-based solution – its impact exceeds the boundaries of the immediate site.

VA Census Tract	Total Population	Median Age	Diversity Index	Median Household Income	Median Disposable Income
51510201204	3,186	38	81	\$108,056	\$81,268
51510201000	2,861	43	38	\$102,802	\$77,465
51510201203	7,513	34	90	\$66,198	\$53,028

Source: ESRI, 2021

## Socially Vulnerable Residents are Impacted by Resilient Green Streets

The project is in census tract 201204, which has a low social vulnerability score of -0.5. However, the project contributes to larger-scale impacts. The location of green infrastructure upstream contributes to the reduction of flood volumes downstream. As seen in the map below, there is a [designated opportunity zone](#) along the Four Mile Run waterbody immediately adjacent to the project locations on E. Glebe Road, indicated with the green rectangle below.



## Flooding Severely Impacts the Four-Mile Run Watershed and Alexandria as a Whole

The Northern Virginia Hazard Mitigation Plan identified flooding as one of Alexandria's predominant hazards due to riverine, precipitation, tidal, and storm surge flooding. The HMP ranked natural hazards for Alexandria using historical weather-related events based on the Storm Event Database by NOAA's NCDC1. Hazards were ranked using a semi-quantitative scoring system that involved grouping the data values (normalized to account for inflation) based on statistical methods. This method prioritizes hazard risk based on a blend of quantitative factors extracted from NCDC and other available data sources. The parameters considered include:

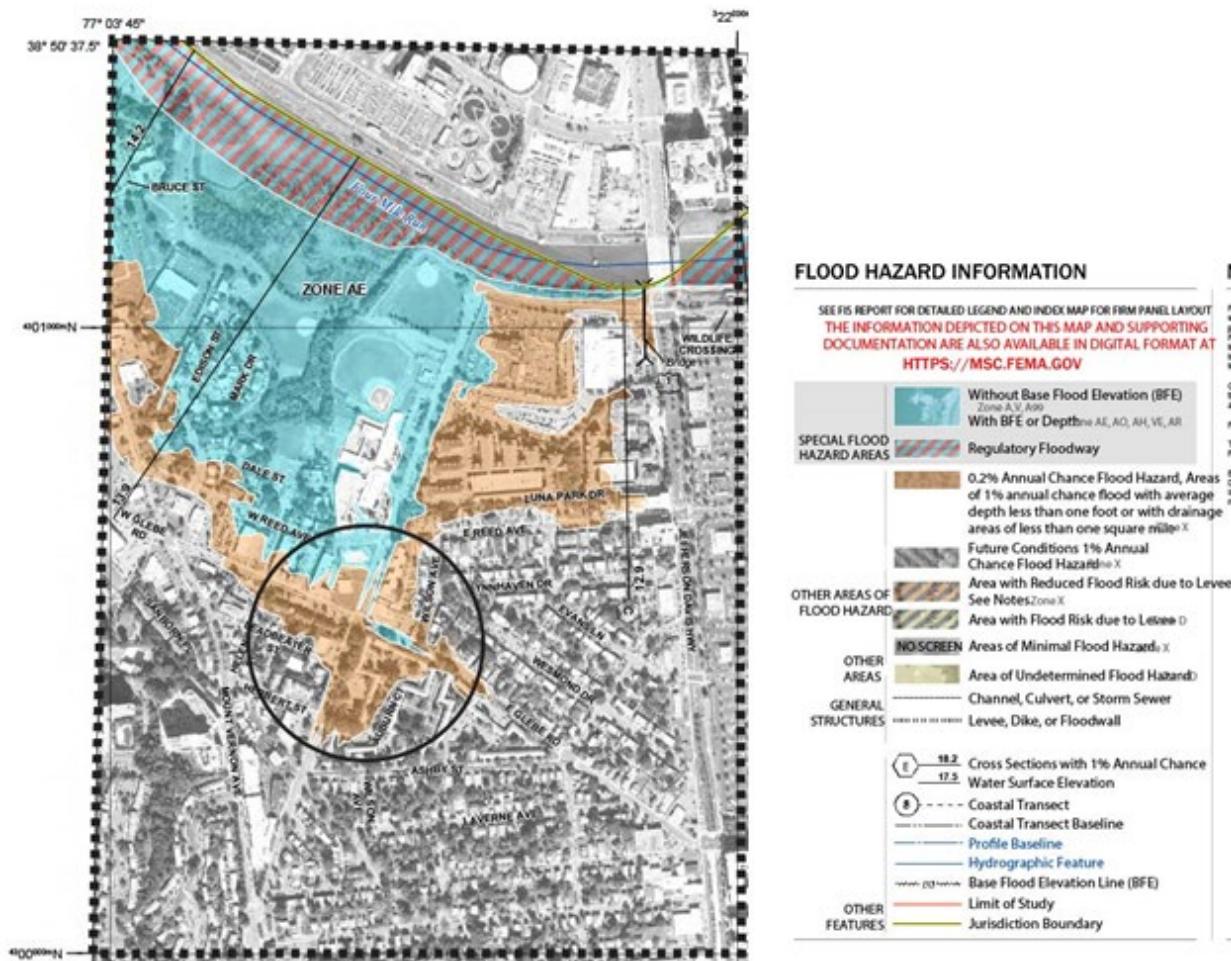
- Historical occurrences;
- Vulnerability of population in the hazard area; and
- Historical impact, in terms of human lives and property and crop damage.

Table 7.1: Hazard Ranking for Alexandria

Hazard	Flood	Wind	Tornado	Winter Weather	Drought	Earthquake	Landslide	Wildfire	Karst
Ranking	High	High	High	High	Med-High	Med	Low	Med-Low	Med-Low

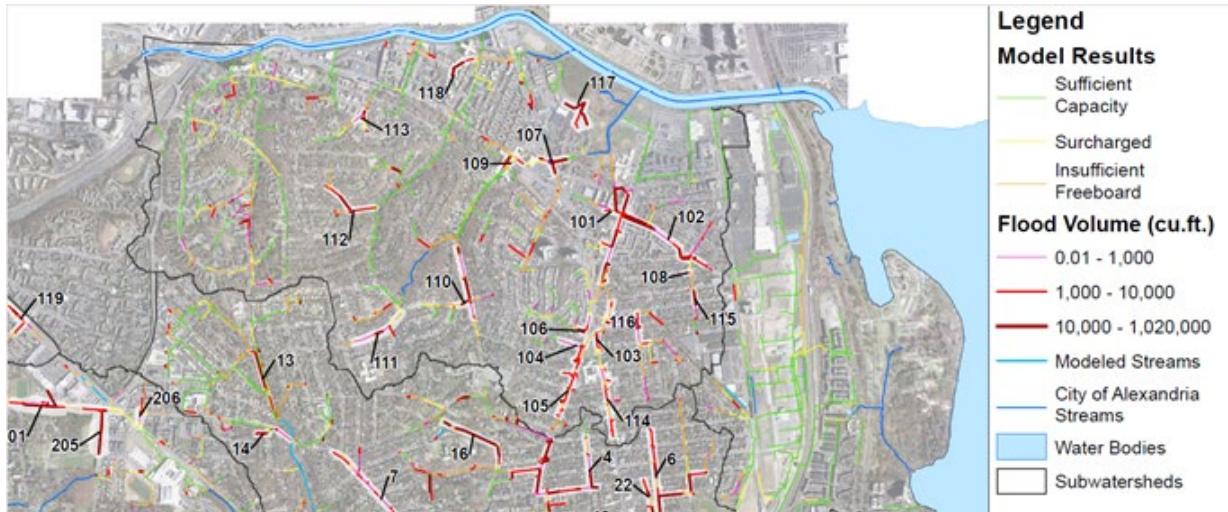
(Northern Virginia HMP, 2017).

Alexandria's watersheds have a significant percentage of impervious surfaces. 43 percent of the City's surface area is comprised of roads, buildings, parking lots, and sidewalks. Impervious surface contributes to the accumulation of stormwater because water is not able to convey and recharge. This type of flooding threatens the continuous operation of roads, emergency access, and property during precipitation events.



FEMA published its preliminary updated maps for Alexandria. The project area is shown in the FIRM above, with a black circle calling out the specific location of the green infrastructure pilot project on E Glebe, which has a projected flood probability of 0.2%. In the future, the City of Alexandria hopes to proactively mitigate these types of adverse impacts by completing projects such as the two being proposed in this application.

The City of Alexandria Storm Sewer Capacity Analysis (CASSCA) provides more localized flood information specific to the system's operating capacity. Through the CASSCA, the City reviewed rainfall data and the City's stormwater design criteria, developed projections for rainfall and tidal boundary conditions based on climate change, and proposed potential revisions to the system as appropriate.



The stormwater runoff and hydraulics of the storm sewer system for each watershed within the City of Alexandria were modeled for a 10-year, 24-hour storm event (the City's recommended design event) using an industry standard approach. The results were used to identify and prioritize flooding areas for future infrastructure improvements. Stormwater management solutions, including green infrastructure (GI), storage, and conveyance improvements, were identified, evaluated and prioritized using a cost benefit analysis. Using criteria determined in collaboration with City staff, including but not limited to proximity to critical infrastructure and roads, predicted magnitude of flooding, and problems reported by the public and city staff, problem flooding locations were ranked. Flooding locations were grouped into high priority problem areas. Overall, 90 problem areas were identified across the City. CASSCA problem areas 101 and 102 are the areas being addressed through this project application and can be seen in red below due to their high flood volume (10,000-1,020,000 cu.ft.). (CASSCA, Executive Summary).

### Alexandria was Recently Impacted by Severe Flood Events

The most devastating flood events to occur in Alexandria in recent history include Hurricane Agnes in June 1972, Hurricane Isabel in September 2003, a major storm in June 2006, Tropical Storm Lee in September 2011, and severe storms in July 2019, July 2020, and September 2020.

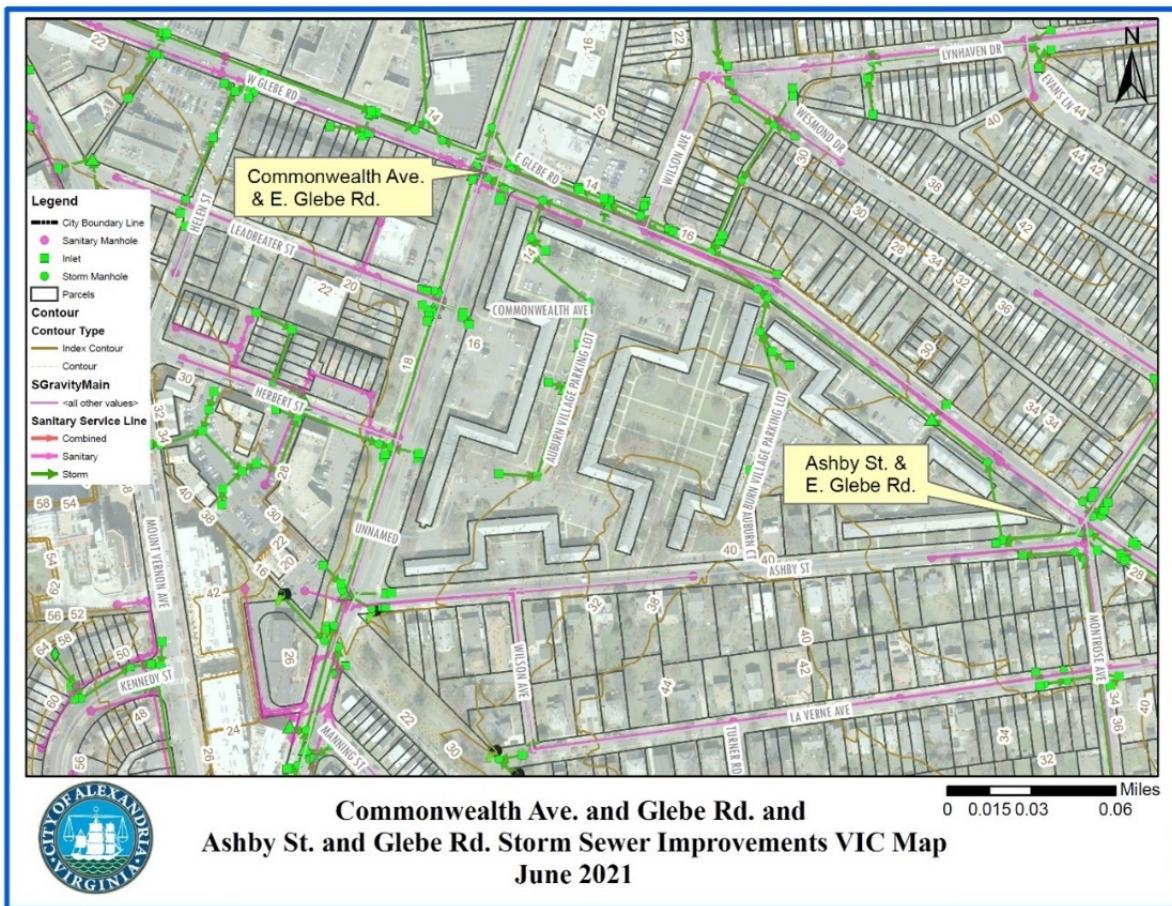
Even more recently, Alexandria received more than five inches of rain over two hours on August 15, 2021, resulting in flash flooding. Heavy rainfall over a short amount of time quickly overwhelmed the stormwater system, and debris blockages in a culvert caused a stream to top its banks. In addition to widespread flooding, the storms caused power outages, road closures, stormwater backflow, and displaced manhole covers. Alexandria residents experienced flooding in their homes, yards, and streets. While no one was injured in this recent storm, the Fire Department was required to assist with water rescues. Cleanup began the following day, August 16<sup>th</sup>, and residents could utilize the city's app "Alex311" to report issues directly to the city departments.

### Residential and Commercial Structures in the Project Area Impacted by New Green Infrastructure Projects

The project area is located within the Four Mile Run East watershed. In this watershed there is an array of land use types, including a high amount of residential development, religious facilities, schools, parks, playgrounds, food service, offices, and commercial development. There are 6,382

residential parcels covering an area of 585 acres located fully or partially within the watershed. These residential parcels account for nearly half of the 1,167 acres in the Four Mile Run East watershed. Additionally, there are 260 commercially zoned parcels in the watershed, which include commercial and residential mixed-use. These parcels cover approximately 41 acres.

Houses and apartment buildings line Glebe Road in the immediate vicinity of the project area, between Commonwealth Ave and Ashby Street. The installation of green infrastructure in these areas will reduce the burden on residents who may be impacted by flooding in the homes, yards, and on their commute. There are no designated historical places within the project area.



### Critical Facilities in the Project Area Impacted by New Green Infrastructure Projects

No critical facilities are located within the immediate vicinity of the project area. Installing green infrastructure in these highly flood-vulnerable locations will improve accessibility for emergency response vehicles during a storm event.

## Opportunities for Green Infrastructure

The images below show opportunities for GI in the vicinity



## Need for Assistance

The City has the staff and resources (SWM/SWU CIP), BSEGS 5 rating, CRS Class 6. to implement this project as soon as funding became available. DCR's financial support will help create a more resilient and green Alexandria while we enhance and improve our City's built infrastructure in the Four Mile Run watershed.

## Approach, Milestones, and Deliverables

### Task 1. Project Background and Kickoff

#### 1.1 Project Kickoff Meeting

At the onset of the project, the project team will review and commit to a detailed proposed schedule, which outlines key milestones, including projected meeting dates. An agreed-upon schedule, coupled with Core Team/Steering Committee meetings, will ensure that the project keeps moving forward and is completed within the grant timeframe required by thefunder, the Virginia Department of Conservation and Recreation.

*Deliverables: Meeting agendas and meeting minutes for kick-off meeting*

#### 1.2 Core Team Coordination

The City anticipates that the Core team (key staff) will meet quarterly and:

- set the guiding principles or goals for the project;
- approve the planning framework and schedule;
- provide data and local expertise related to assets and vulnerabilities;
- contribute to the planning of, and participate in, stakeholder and community engagement; and
- finalize priority actions for the final report.

*Deliverables: Meeting agendas and meeting minutes for each quarterly meeting.*

#### 1.3 Review Existing Data and Reports

The data review task will include collecting and reviewing any data or reports available on Alexandria's flood risk, existing flood mitigation activities, and specifically the Four Mile Run watershed in which the proposed project is located. Task 1.2 will also involve integrating the system modeling that occurred as part of this analysis into any new site analysis specific to understanding flood projections and flood volume reductions resulting in the implementation of the two proposed projects.

Other sources of potential information include:

- USGS Soil Survey
- Topographic GIS layers
- Site Utility GIS layers
- The Northern Virginia FEMA Hazard Mitigation Plan
- Alexandria's Floodplain Ordinance

- Storm sewer inspection data
- Historical reports of flooding within the project area
- Site specific drainage information for the two identified green infrastructure pilot projects at East Glebe and Commonwealth Avenue and East Glebe and Ashby.

*Deliverables: Memo summarizes existing data and data gaps*

## **Task 2. Project Field Exploration**

Expanding the dataset collected during previous investigations that documented the major structures and conditions of the Alexandria storm sewer system in its entirety, the project team will conduct surveys and geotechnical and groundwater investigations to inform the design process and project feasibility.

*Deliverables: Existing Conditions Memo, Site Survey Maps, Geotechnical Map/Report, List of actions to address data gaps*

### 2.1 Site Investigations and Survey

The team will conduct site surveys to understand the existing site conditions using tablets and GPS to map property, public right of way, and landscape conditions, and identify unmapped structures at East Glebe and Commonwealth and East Glebe and Ashby (locations 101 and 102 in the map on page 8). A survey team will visit the site to record ground elevations and physical structures at numerous points of interest in the project area surrounding East Glebe and Commonwealth and East Glebe and Ashby for the pilot project areas of interest (e.g., existing culverts, etc.). The site survey will help the design team understand the location and extent of infrastructure, buildings, and natural resources in the project area.

### 2.2 Geotechnical and Groundwater Surveys and Report

The team will conduct geotechnical and groundwater surveys to further the understanding of given pilot project site constraints, concerns, and requirements. Field work will include excavating test pits and borings at the location of GI for both sites. The field crew will record observations, characteristics of materials, and any limitations.

*Deliverable: Summary Memo of Fieldwork*

## **Task 3 Conceptual Design**

### 3.1 East Glebe and Commonwealth and East Glebe and Ashby Green Infrastructure Conceptual Designs

The consultant will develop a conceptual plan for two locations of East Glebe at the intersections of Commonwealth and Ashby with options increasing in space dedicated to green infrastructure. Both sides of the street will include varying green infrastructure elements chosen by function. Conceptual designs will include diagrams, plans, sections, and renderings representing dry and wet conditions for each option. The engineering consultant will work with the City to identify street parking necessities, bus stops/routes, pedestrian crossings, and road dimensions that will inform the location and sizing of the green infrastructure elements. In addition, the consultant will analyze existing public right of way and private property constraints.

The City will provide the engineering consultant with existing road drawings and precise utility locations and drawings. Validation of these elements can occur during field exploration.

*Deliverable: Drawing Set for (2) Pilot Green Infrastructure Projects*

### 3.2 Stormwater Detention/Flood Storage Conceptual Designs

The designs will be evaluated on their ability to reduce peak flow stresses on the current drainage system and provide water quality improvements and potential for reuse. Conceptually, stormwater runoff from streets will be conveyed and detained through green infrastructure elements before re-entering the existing drainage system after the peak flow has passed. Where possible, underground storage systems can be incorporated into or underneath the green infrastructure surface elements. Inclusion of underground storage increases the volume of stormwater removed from current infrastructure systems and can either function as cisterns for future reuse or infiltration. The engineering consultant will evaluate and provide preliminary sizing of underdrainage. Additional deliverables will include diagrams, plans, sections, and visualizations of dry and wet conditions.

*Deliverable: Drawing Set for (2) Flood Storage Projects*

### 3.3 Modelling Design Hydrology

The project team will use a hydrologic and hydraulic (H&H) model to confirm the adequate capacity of the GI unit from the pilot infrastructure project using the EPA's Storm Water Management Model (SWMM) software, or another similar analysis tool. The evaluation will use a range of storm events (e.g., 1-, 2-, 10-, and 100-year events) in both a baseline climate, as well as more recent storm events and appropriate future climate conditions, to identify how the designs function and how they impact flooding.

*Deliverable: Data summary of model results for GI unit from pilot projects*

## **Task 4 – Preliminary Permitting Analysis**

### 4.1 Preliminary Permitting Analysis: E. Glebe Road and Ashby Street and E. Glebe Road and Commonwealth Avenue

The two East Glebe Street designs will require local permitting only as the City maintains the local right-of-way. The permitting analysis will be a preliminary review of the requirements and compilation of drawings and mappings from the site survey and conceptual design development.

*Deliverable: Permitting analysis documentation.*

### 4.2 Preliminary Permitting Analysis: Stormwater Detention/Flood Storage

The project team will prepare a permitting strategy and timeframe that will identify all necessary environmental permits associated with the concept designs.

*Deliverable: Memo summarizing permitting requirements for pilot projects and compiled draft drawings.*

## **Task 5 - Public Engagement**

### **5. 1 Public Engagement**

The project team will create one fact sheet and two flyers for the community meetings to be distributed throughout the City in high traffic areas and local organizations. The project team will write a press release about the project and ways residents can get involved. The project team will create a video about the project to be posted online and used during in-person meetings. The engagement strategy also will utilize a survey for online and in-person use. Social media and website content will round out the digital engagement. A sign about the project will be posted at the GI pilot sites. Translation in Spanish will be provided for the fact sheet, flyers, video, and survey.

*Deliverables may include but are not limited to:*

- (2) Flyers
- Fact Sheet
- Press Kit
- Informational Video for City Website
- Signage for pilot site location
- Survey
- Summary of Survey Results

## **Task 6 - Summary Report**

The project team will draft a report based on the work and findings of the previous tasks and the Four Mile Run Implementation Report components will include the following:

- Summary of Field Exploration and data
- E. Glebe Street Green Infrastructure Plan
- Conceptual designs and 25% construction documents for the two East Glebe St Green Infrastructure Pilot Projects
- Conceptual Designs and 25% construction documents for Flood Storage/Stormwater Detention

*Deliverables:*

- Draft Report
- Final Report

## **Task 7 - Grant Management and Status Updates**

The project team will prepare monthly progress reports to monitor the budget and schedule for submittal to the Virginia Department of Conservation and Recreation. In addition, the City will establish contracts with its consultants at the beginning of the project and close out the grant at the end of the timeline.

Project Schedule:

Assuming the City receives notification of award in September or October 2021, the team anticipates the following timeline to complete the scope of work.

PROJECT SCHEDULE FY22												
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	August
Grant Announcement												
Contract												
Task 1: Project Kickoff & Review of Existing Information												
Task 2: Pilot Project Field Exploration												
Task 3: Design, Modelling												
Task 4: Preliminary Permitting												
Task 5: Public Engagement												
Task 6: Summary Report												
Task 7: Grant Management and Status Update												

### Criteria

Appendix B is attached and complete as part of this application, including relevant documentation of Alexandria's Resilience Plan (Attachment A).

## *Budget Narrative – Resilient Stormwater Capacity and Green Streets Project for Alexandria, VA*

The tasks identified in the Scope of Work are broken down in the Scope of Work and the estimated expenses are indicated below.

Task	Budget
<b>Task 1 Context Setting</b> 1.1 - Project Kickoff Meeting 1.2 - Steering Committee Coordination 1.3 - Review Existing Data and Reports	\$5,000.00
<b>Task 2 Pilot Projects Field Exploration</b> 2.1 – Site Survey and Investigations 2.2 - Geotechnical and Groundwater Surveys and Report	\$40,000.00
<b>Task 3 Design and Modelling</b> 3.1 - Green Infrastructure Conceptual Designs 3.2 - Stormwater Detention/Flood Storage Conceptual Design 3.3 – Modeling Conceptual Design Hydrology	\$120,000.00
<b>Task 4 Preliminary Permitting</b> 4.1 – Green Infrastructure 4.2 - Flood Storage	\$10,000.00
<b>Task 5 Public Engagement</b>	\$10,000.00
<b>Task 6 Final Report</b>	\$5,000.00
<b>Task 7 Grant Management and Status Updates</b>	\$2,000.00
<b>TOTAL</b>	\$192,000.00

Total Project = \$192,000

DCR Funding Requested = 75%, \$144,000

City Cost Share = 25%, \$48,000

### Cost Share

In response to these repetitive flood events, in May 2022 the City Council unanimously adopted [an ordinance to double our Stormwater Utility Fee](#) with a 50% increase in the rate for the May 2022 billing and an additional 50% increase in the rate for the October billing to significantly increase the resources available for investments in our storm sewer infrastructure, with 11 top priority capacity projects and annually increasing funding for spot improvement projects in the FY 2022 – FY 20231 Stormwater Management Utility Ten Year Plan. This increase for the October billing will cost a condo owner an additional \$39 annually, a townhouse owner an additional \$58, a small single-family homeowner an additional \$140, and a large single-family homeowner an additional \$233. The Stormwater Utility Fee revenue, paid by all property owners in the City (including non-taxable properties), will allow for an acceleration of major capacity projects and "spot improvements," an increase in channel maintenance, new "state-of-good repair" investments, property owner grants, and new staffing in support of these projects and the system. The Commonwealth Avenue & E.

Glebe Road and Ashby Street & E. Glebe Road projects are the top two priority flooding mitigation capacity projects in the 10-year SWU CIP.

This increase in revenue will bring in an additional \$8.5 million annually and will support a newly accelerated 10-year program of investments, to include smaller "spot improvement" projects and 11 of the top priority storm sewer capacity projects over the next decade, two of which are the green infrastructure and flood storage and conveyance projects.

*The City confirms that it can cover the Cost Share required for this project from the Stormwater Utility Fee in support of the Commonwealth Avenue & E. Glebe Road and Ashby Street & E. Glebe Road projects, the top two priority flooding mitigation capacity projects in the 10-year SWU CIP.*

## Appendices

Appendix A – Resilience Plan

Appendix B – Scoring

# Appendix A

## City of Alexandria Resilience Plan | September 2021

In response to the resilience planning requirements of the **Community Flood Preparedness Fund** (“the CFPF” or “Fund”) outlined within the [2021 CFPF Grant Manual](#) (Appendix G: Elements of Resilience Plans), the City of Alexandria (“the City”) prepared the following Resilience Planning Overview of formal and relevant plans used to prioritize potential projects, and to assist the City in securing funding for critical resilience plans, studies, and projects.

The **Elements of Resilience Plans** in Appendix G of the 2021 CFPF Grant Manual lists elements that should be included in resilience plans for communities applying for CFPF grant funding. These elements include:

1. *It is project-based with projects focused on flood control and resilience.*
2. *It incorporates nature-based infrastructure to the maximum extent possible.*
3. *It includes considerations of all parts of a locality regardless of socioeconomic or race.*
4. *It includes coordination with other local and inter-jurisdictional projects, plans, and activities and has a clearly articulated timeline or phasing for plan implementation.*
5. *It is based on the best available science, and incorporates climate change, sea level rise, storm surge(where appropriate), and current flood maps.*

Alexandria's resilience planning elements are not currently contained within an adopted “stand alone” plan; however, the City has previously dedicated funding to this effort and is in the process of procuring consulting services to develop a ‘stand alone’ plan that incorporates the above elements and others germane to the City. This Resilience Planning Overview identifies how various resilience planning documents of the City of Alexandria satisfy all the CFPF Resilience Plan elements.

The following plans and studies for the City of Alexandria each have components which satisfy elements of the Resilience Plan requirements. Together they form a Resilience Plan.

- [Northern Virginia Hazard Mitigation Plan \(2017\)](#)
- [City of Alexandria Storm Sewer Capacity Analysis \(CASSCA, 2016\)](#)
- [FY 2022 – FY 2031 Storm Sewer Capacity Projects](#)
- [FY 2022 - FY 2031 Stormwater Management Utility Ten-Year Plan](#)
- [Four Mile Run Restoration Master Plan](#)
- [Alexandria's Waterfront Plan](#)
- [Alexandria Floodplain Ordinance](#)
- [Emergency Operations Plan \(EOP\)](#)
- [Flood Action Alexandria](#)
- [Alexandria's Masterplan and Small Area Masterplans](#)
- [Alexandria's Housing Masterplan](#)
- [Resilient Alexandria Charter](#)

- [CRS Community Certification](#)
- [Eco-City Charter](#)
- [Eco-City Action Plan 2040](#)
- [Flood Response Plan](#)

Appendix G of the 2021 first round CFPF Grant Manual also includes examples of elements of plans that would be “appropriate for inclusion in a submission.” These elements are listed in bold below. Below each element, the City has identified a corresponding Plan and specific plan section that addresses that item, thereby fulfilling the Resilience Plan requirement.

#### **Equity based strategic policies for local government-wide flood protection and prevention.**

[Northern Virginia Hazard Mitigation Plan \(2017\), Section 9.7.1 Alexandria Mitigation and Action Plan](#) prioritizes actions across local government departments including the Department of Transportation, Environmental Services, and Emergency Management. The actions range from compliance with FEMA’s NFIP and participation in the Community Rating System, to nature-based solutions, infrastructure upgrades, and building protections to enhance the resilience of residents.

[Alexandria's Floodplain Ordinance No.4715](#) ensures that future development and major retrofits comply with flood-resilient building standards, which protect residents living in the floodplain.

#### **Proposed projects that enable communities to adapt to and thrive through natural or human hazards.**

[Northern Virginia Hazard Mitigation Plan \(2017\), Section 9.7.1. Alexandria Mitigation and Action Plan](#) prioritizes protection against natural and human hazards through the range of actions described above.

[The Four Mile Run Restoration Masterplan and Tidal Restoration Demonstration Project](#) advance the resilience of the Four Mile Run sub-basin through restoration of the streambank, the creation of a new recreation and green space, and enhancement of the riverine floodplain to better handle future floods.

Additionally, The City launched [Flood Action Alexandria](#) in Spring 2021 to expedite infrastructure improvements, including [11 high-priority Storm Sewer Capacity capital improvement projects](#) and additional neighborhood [Spot Improvement projects](#). The program also expands flood early warning systems and signage; implements a [Flood Mitigation Pilot Grant Program](#) to provide matching grants to property owners who install flood-proofing measures; increases [maintenance capacity](#); and enhances community outreach and engagement, including monthly newsletters. In May 2022, City Council approved the FY 2022 – FY 2031 Stormwater Management Utility Ten-Year Plan that included a new doubling of the [Stormwater Utility Fee](#) to increase operating and capital funding to implement Flood Action Alexandria elements, including a new \$197 million 10-year stormwater capacity and spot improvement capital program (with \$136 million planned for the next five years).

The recently-launched Flood Mitigation Grant Program for property owners impacted by a recent flood event. A brief description of the grant program announcement is included below.

"The City of Alexandria will now begin accepting applications for its new [Flood Mitigation Pilot Grant Program](#) on Monday, August 30. The program offers matching reimbursement grants to property owners who have installed flood mitigation measures on properties impacted by recent flash flooding events dating back to July 2019. Property owners may receive up to 50% reimbursement for completed project costs, up to a maximum of \$5,000, for implementing [eligible flood-proofing measures](#) on their property. Applications will be accepted on an ongoing basis."

[Flood Action Alexandria](#) is an initiative to protect residents citywide from the impacts of flooding through the following programs and actions:

- Storm Sewer Capacity Projects – The [2016 Storm Sewer Capacity Analysis \(CASSCA\)](#) included a modeling effort that identified 90 \*problem areas\* in the City where the model found potential capacity and flooding concerns. The top 11 capacity projects from CASSCA were prioritized based on planning-level cost-benefit analysis and identified capacity issues. These projects, which are funded in the City's Capital Improvement Program, are intended to mitigate flooding for the greatest number of ratepayers, direct investment to areas where the most significant property damage is occurring and provide the greatest overall system benefit. Design of the top three projects begins in FY 2022.
- [Spot improvement projects](#) - Small capital projects managed by the Transportation & Environmental Services Stormwater Management Division (T&ES SWM) to help address localized flooding and drainage issues.
- [Storm & Sanitary Sewer Section](#) – This effort informs residents, business owners, and citizen groups of best practices to avoid sewer backups, and defines responsibilities of the City and the homeowner related to sewer connections. The ultimate goal is to reduce flooding by decreasing mainline blockages, minimizing the infiltration and inflow of storm water in the sanitary system, and evaluating the structural integrity of the entire sewer system.
- [Public Outreach](#) - The City provides information and updates on the progress of the flood mitigation program on the [Flood Action Alexandria website](#) and via subscription to the Flood Action Alexandria e-Newsletter. Residents can subscribe to receive information about how to help flood mitigation efforts, participate in community meetings, engage neighbors in the process, and provide feedback on the implementation of the program. Residents have been invited to log into [Alexandria eNews](#) and opt-in to "Flood Action Alexandria" to subscribe to this e-Newsletter.
- [Early Warning and Emergency Response](#) - The City of Alexandria [Emergency Operations Plan](#) (EOP) is a multi-discipline, all-hazards plan that establishes a single, comprehensive framework for the management of major emergencies and disasters within the city. The EOP is implemented when it becomes necessary to mobilize identified resources to save lives and protect property and infrastructure.
- [Ad Hoc Stormwater Utility and Flood Mitigation Advisory Group](#) – The Advisory Group's responsibilities include: Reviewing and advising in regards to flood mitigation activities, monitoring and measuring progress of the City's proposed flood mitigation efforts, serving as a general body for receipt and dissemination of information for the City's flood mitigation implementation efforts, and reviewing and providing recommendations on proposed Stormwater Utility operating and capital budgets

Documentation of existing social, economic, natural, and other conditions present in the local government.

[Alexandria's Masterplan and Small Area Masterplans](#) for each of its neighborhoods provides comprehensive demographic data and a contextual overview of the population, land use and development, and open space and recreation.

**Review of the vulnerabilities and stressors, both natural and social in the local government.**

[Alexandria's Masterplan and Small Area Masterplans](#) address vulnerabilities and stressors within the economy including small business, the environment, and community. Each plan involved extensive community engagement to identify the neighborhoods' priorities.

[Alexandria Storm Sewer Capacity Analysis](#) assessed and addressed natural stressors to the city's infrastructure which contribute to repetitive flooding.

[Alexandria's Housing Masterplan](#) addresses inequities in housing. As a result of sharply increasing real estate costs and regional development pressures over the past decade, the City faces a severe shortage of affordable housing. Since 2000, there have been dramatic declines in [market affordable rental units](#) (more than 15,500 units have been lost between 2000 and 2018) and in opportunities for affordable homeownership for low- and moderate-income individuals and families. As the growth in housing costs continues to outpace the growth in incomes, Alexandrians are increasingly becoming housing cost burdened (defined as paying 30% or more of household income on housing-related costs).

Resilient ALX focuses on utilizing Alexandria's Citizen Corps Council (CCC) to advise the City on how to enhance community resilience. The project will include creating a Charter, and Assessment and Report. The Charter offers an overarching vision to supplement the goal of Alexandria's Strategic Plan in the area of creating a Safe and Resilient Community. Charter The CCC Charter will utilize the FEMA Lifelines to categorize data from the study. The results of which will inform the Focus Areas of the Assessment and Report. CCC will work collaboratively with related advisory bodies to create a sound and unifying vision for the City.



**Forward-looking goals, actionable strategies, and priorities as seen through an equity-based lens.**

Under the direction of the City's first Race and Social Equity Officer, Jacqueline Tucker, City departments and an interdepartmental work group are building a framework (in collaboration with City employees, community members, and other stakeholders) to ensure policy decisions advance race and social equity for all Alexandria residents.

[Resolution 2974 All Alexandria: Committing to Race and Social Equity](#) commits to:

- 1) Ensure that race and social equity is incorporated and centered in all planning, including:
  - a. Center race and equity throughout the forthcoming FY 2022-FY 2027 Strategic Plan and departmental strategic planning processes;
  - b. Establish specific, measurable, attainable, relevant time-based (SMART) goals race and social equity action plans for City departments;
  - c. Incorporate race and social equity into all staff and leadership talent management programs;
  - d. Establish, strengthen and maintain key partnerships with the Alexandria City Public Schools, other public entities serving our community, community based, non-profit, and faith-based organizations, and businesses in Alexandria to advance racial equity.
- 2) Implement and sustain structures and systems to advance race and social equity, including:
  - a. Adopt and promote practices and policies centered on creating and ensuring racial and social equity through the use of a racial equity tool;
  - b. Conduct race and social equity trainings for City Council, City staff and City boards and commissions;
  - c. Create authentic community engagement best practices for use in evaluating City actions from creation to implementation;
  - d. Maintain membership and active participation in the Government Alliance on Race and Equity (GARE) and Metropolitan Washington Council of Governments (MWCOG) Racial Equity Work Group and newly established Chief Equity Officers Committee.
- 3) Align and implement policy efforts designed to advance race and social equity goals, including:
  - a. Incorporate greatly expanded language access into more City of Alexandria communications and platforms;
  - b. Reduce and eliminate racial and social inequities in the allocation of City resources through the use of a budget equity tool which may entail the adjustment of budgets and funding reallocation;
  - c. Present City Council with a Racial and Social Equity Action Plan, consisting of specific policy initiatives to advance the City's racial equity goals, informed by additional community engagement.
- 4) Ensure accountability mechanisms related to the progression and transparency of work to advance race and social equity, including:
  - a. Develop equity data mechanisms, including equity indicators, equity mapping, and dashboards to transparently monitor, share, view and inform policy decisions that purposefully work toward reducing and eliminating disparities;
  - b. Develop quarterly listen and learn sessions, under the direction of the Race and Social Equity

Officer, to establish ongoing conversation with the community to understand their most pressing issues and to normalize the key concepts of race, social equity and government through collective learning opportunities.

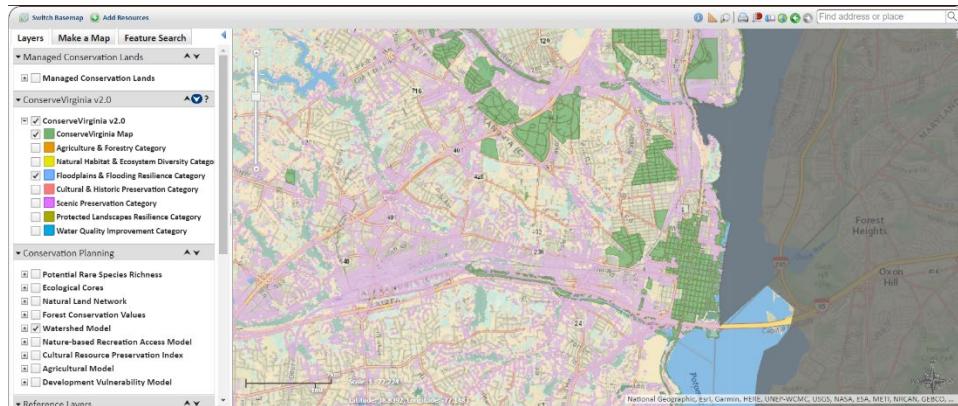
Strategies that guide growth and development away from high-risk locations that may include strategies in comprehensive plans or other land use plans or ordinances or other studies, plans or strategies adopted by a local government.

[Alexandria's Floodplain Ordinance No.4715](#) ensures that future development and major retrofits comply with flood-resilient building standards, which protect residents citywide living in the floodplain. This ordinance also ensures that development is directed away from Special Flood Hazard Areas.

Additionally, [Alexandria's Masterplan and Small Area Masterplans](#) and [Alexandria's Waterfront Plan](#), Chapter 2 – Section: A “Plan for Development” addresses properties along Alexandria's waterbodies and within its floodplains.

Proposed acquisition of land or conservation easements or identification of areas suitable for conservation particularly areas identified as having high flood attenuation benefit by *ConserveVirginia* or similar data driven tools.

Alexandria is mapped within the ConserveVirginia tool. Additionally, Alexandria's Floodplain Ordinance addresses areas to restrict future development due to increased flood risk.



#### Identification of areas suitable for property buyouts in frequently flooded areas.

The City continues to identify areas suitable for property buyouts in frequently flooded areas as needed.

Identification of critical facilities and their vulnerability throughout the local government such as water and sewer or other types identified as “lifelines” by FEMA.

Alexandria has identified and analyzed the vulnerabilities of its infrastructure system through the [Alexandria Storm Sewer Capacity Analysis](#).

Alexandria's drinking water system through Virginia American Water has completed the EPA's requirement for a Risk and Resilience Assessment and Emergency Response Plan.

Identified ecosystems/wetlands/floodplains suitable for permanent protection.

Relevant work includes:

- [Four Mile Run Restoration Master Plan](#)
- Waterfront Masterplan
- [Waterfront Schematic Landscape and Flood Mitigation Design](#)
- [Waterfront Flood Mitigation and Promenade Project](#)

Identified incentives for restoring riparian and wetland vegetation.

Relevant work includes:

- [Four Mile Run Restoration Master Plan](#)
- [City of Alexandria Landscape Guidelines](#)

A framework for implementation, capacity building and community engagement.

The [All Alexandria](#) Initiative focuses specifically on community engagement and outreach to build equity across the city and local government actions.

**Strategies for creating knowledgeable, inclusive community leaders and networks.**

Through All Alexandria, the city is using the [GARE](#) framework to empower community leaders and networks to elevate their voices in local government, and create more inclusive outcomes.

The City's racial and social equity initiative grew from the efforts of an interdepartmental Race and Social Equity Working Group, formed in 2018. These City employees developed and piloted social and racial equity programming in four City departments. The programming was based on the work of the [Government Alliance on Race and Equity](#) (GARE), a national network of governments working to achieve racial equity and advance opportunities for all. The City became a member of GARE in 2019, developing its inaugural Racial Equity Learning as part of the Metropolitan Washington Council of Governments' year-long [Advancing Racial Equity Cohort](#).

**A community dam safety inventory and risk assessment posed by the location and condition of dams.**

Extensive studies of the Alexandria dam were conducted after a major flood event. The components of these studies, flood mapping, and action plans can be found below.

- [2008 Lake Barcroft Inundation Study update](#)
- [2008 Lake Barcroft Probable Maximum Flood Inundation Mapping](#)
- [Presentation from June 24, 2009 Public Meeting](#)
- [Draft Flood Operations Plan](#)
- [Flood Trigger Action Matrix](#)

A characterization of the community including population, economics, cultural and historic resources, dependence on the built environment and infrastructure and the risks posed to such infrastructure and characteristics by flooding from climate change, sea level rise, tidal events or storm surges or other weather.

Alexandria is a city with a population of 159,467 (U.S. Census Bureau, 2020). The medium household income in Alexandria in 2019 was \$100,939. Of the thirty-eight census tracts in Alexandria, ten are below 80% of the median income, as shown in the map below. The census tract in which the green infrastructure pilot projects are located (201204), is not 80% below the median income. However, tract 201204 does have a diversity index score of 81, indicating a high-level of diversity. A diversity index score is measured from 0-100, where a higher diversity index score denotes a high-level of diversity; in other words, a community statistic representing the likeliness of two people chosen at random belong to different race or ethnic groups (ESRI, 2021). Median disposable income, as listed in the table below, is defined as the amount of money that an individual or household has available to save or spend on non-essentials.

Alexandria is located in Northern Virginia south across the Potomac River from Washington D.C. The city encompasses 15.75 square miles at an average elevation of 30 feet above sea level. On August 12, 2021, the U.S. Census Bureau released the first local level results from the 2020 Census. Data received indicates that the City of Alexandria's 2020 population is 159,467, an increase of 19,501 residents over the past decade. Alexandria, founded in 1749, has a fascinating history, and many of its historic buildings are still preserved today. During its long history, Alexandria was a tobacco trading post, one of the ten busiest ports in America, a part of the District of Columbia, home to both the largest slave-trading firm in the country and a large free-black community, a Civil War supply center for Union troops, and a street-car suburb for Federal workers. Alexandria was also the hometown of George Washington, Robert E. Lee, Jim Morrison and "Mama" Cass Elliot.

There are only a few other communities in the United States that have as many existing examples of Georgian and Federal period architecture. Old and Historic District, designated in 1946, was the third historic district in the United States, after Charleston and New Orleans. The historic African American community known as Uptown was designated as the Parker-Gray Historic District in 1984, and in 2008 was approved for listing on the Virginia Landmarks Register. Several 20th century neighborhoods have also been recognized for their historic and architectural significance, which are listed below. It is important to note that these older neighborhoods have had significant impacts from flooding from these recent severe storm events. A list of the neighborhoods the City is engaging with who have experienced severe impacts from recent flash flood events is available online at: <https://www.alexandriava.gov/122388>.

- Del Ray and the Town of Potomac. St. Elmo and Del Ray, two subdivisions platted in 1894, were joined together in 1908 to form the incorporated town of Potomac.
- Fairlington. Fairlington is on the National Register of Historic Places, as a notable example of community planning and publicly financed housing built for defense workers and their families during World War II. Learn more about this history of this community, from the Fairlington Historical Society.
- Parkfairfax. Parkfairfax was built during 1941 to 1943 to help alleviate the acute housing shortages resulting from the depression and World War II.
- Rosemont, located northwest of the Old and Historic District of Alexandria, adjacent to Alexandria's Union Station, is an unusually intact example of an early-twentieth century middle-class trolley suburb.

National Historic Landmarks are buildings, sites, districts, structures, and objects that have been determined by the Secretary of the Interior to be nationally significant in American history and culture. This program is administered by the National Park Service In Alexandria. The Alexandria Historic District, Gadsby's Tavern, the Stabler-Leadbeater Apothecary Shop, Christ Church and the Gerald R. Ford, Jr. House have been designated as National Historic Landmarks.

More than 40 Alexandria districts, sites, buildings and structures and six Historic Districts are listed on the National Register of Historic Places, the United States of America's official list of historic properties worthy of preservation.

The City of Alexandria is experiencing more frequent and severe flood events that damage residential and commercial properties, impact critical assets, and cause day-to-day disruptions and economic losses. Extreme precipitation events have occurred more frequently in the last few years. The City has experienced four major flooding events since 2019, including July 8, 2019, July 23, 2020, September 10, 2020, and most recently August 15, 2021. All of these events are characterized between 50 to 100-yr level rainstorm events. Except for August 15 of this year, which was recorded by our new gauges, with actual accumulation of 5.19-inches in 2 hours, to be between 100 and 500-yr level rain when compared to the statistical expectations derived for the city's Intensity-Duration-Frequency (IDF) curves developed in the 1980's for the City, which actually is more conservative than NOAA's predictions for the region.

The Northern Virginia Hazard Mitigation Plan identified flooding as one of Alexandria's predominant hazards due to riverine, precipitation, tidal, and storm surge flooding. The HMP ranked natural hazards for Alexandria using historical weather-related events based on the Storm Event Database by NOAA's NCDC1. Hazards were ranked using a semi-quantitative scoring system that involved grouping the data values (normalized to account for inflation) based on statistical methods. This method prioritizes hazard risk based on a blend of quantitative factors extracted from NCDC and other available data sources. The parameters considered include:

- Historical occurrences;
- Vulnerability of population in the hazard area; and
- Historical impact, in terms of human lives and property and crop damage.

Alexandria's watersheds have a significant percentage of impervious surfaces. 43 percent of the City's surface area is comprised of roads, buildings, parking lots, and sidewalks. Impervious surface contributes to the accumulation of stormwater because water is not able to convey and recharge. This type of flooding threatens the continuous operation of roads, emergency access, and property during precipitation events.

**Strategies to address other natural hazards that would cause, affect or result from flooding events including: Earthquakes, Storage of hazardous materials, Landslides/mud/debris flow/rock falls, Prevention of wildfires that would result in denuded lands causing flooding, mudslides or similar events more likely, Preparations for severe weather events including tropical storms or other severe storms, including winter storms.**

The [Northern Virginia Hazard Mitigation Plan \(2017\)](#) uses a multi-hazard approach to address the hazards listed above. Additionally, this plan provided a hazard profile for Alexandria using both historical data and a statistical analysis to understand the level of future risk caused by each of these threats, summarized in the following table.

Table 7.1: Hazard Ranking for Alexandria										
Hazard	Flood	Wind	Tornado	Winter Weather	Drought	Earthquake	Landslide	Wildfire	Karst	
Ranking	High	High	High	High	Med-High	Med	Low	Med-Low	Med-Low	

# Appendix B

## Appendix B: Scoring Criteria for Flood Prevention and Protection Projects

Virginia Department of Conservation and Recreation  
Virginia Community Flood Preparedness Fund Grant Program

Applicant Name:	City of Alexandria	
Eligibility Information		
Criterion	Description	Check One
<b>1. 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)?</b>		
Yes	Eligible for consideration	X
No	Not eligible for consideration	
<b>2. Does the local government have an approved resilience plan and has provided a copy or link to the plan with this application?</b>		
Yes	Eligible for consideration under all categories	X
No	Eligible for consideration for studies, capacity building, and planning only	
<b>3. If the applicant is <u>not</u> a town, city, or county, are letters of support from all affected local governments included in this application?</b>		
Yes	Eligible for consideration	
No	Not eligible for consideration	
<b>4. Has this or any portion of this project been included in any application or program previously funded by the Department?</b>		
Yes	Not eligible for consideration	X
No	Eligible for consideration	
<b>5. Has the applicant provided evidence of an ability to provide the required matching funds?</b>		
Yes	Eligible for consideration	X
No	Not eligible for consideration	
N/A	Match not required	

Project Eligible for Consideration		<input type="checkbox"/> Yes	<input type="checkbox"/> No
Applicant Name:	City of Alexandria		
Scoring Information			
Criterion	Point Value	Points Awarded	
<b>6. Eligible Projects (Select all that apply)</b>			
<p><b>Projects may have components of both 1.a. and 1.b. below; however, only one category may be chosen.</b></p> <p><b>The category chosen must be the primary project in the application.</b></p>			
1.a. Acquisition of property consistent with an overall comprehensive local or regional plan for purposes of allowing inundation, retreat, or acquisition of structures.	50	0	
<input type="checkbox"/> Wetland restoration, floodplain restoration <input type="checkbox"/> Living shorelines and vegetated buffers. <input type="checkbox"/> Permanent conservation of undeveloped lands identified as having flood resilience value by <i>ConserveVirginia</i> Floodplain and Flooding Resilience layer or a similar data driven analytic tool <input type="checkbox"/> Dam removal <input type="checkbox"/> Stream bank restoration or stabilization. <input type="checkbox"/> Restoration of floodplains to natural and beneficial function. <input type="checkbox"/> Developing flood warning and response systems, which may include gauge installation, to notify residents of potential emergency flooding events.	45	0	
1.b. any other nature-based approach	40	40	
All hybrid approaches whose end result is a nature-based solution	35		
All other projects	25	25	
<b>7. Is the project area socially vulnerable? (Based on <a href="#">ADAPT VA's Social Vulnerability Index Score.</a>)</b>			
Very High Social Vulnerability (More than 1.5)	15		
High Social Vulnerability (1.0 to 1.5)	12		
Moderate Social Vulnerability (0.0 to 1.0)	8		
Low Social Vulnerability (-1.0 to 0.0)	0		
Very Low Social Vulnerability (Less than -1.0)	0	0	
<b>8. Is the proposed project part of an effort to join or remedy the community's probation or suspension from the NFIP?</b>			

Yes	<b>10</b>	
No	<b>0</b>	0
<b>9. Is the proposed project in a low-income geographic area as defined in this manual?</b>		
Yes	<b>10</b>	
No	<b>0</b>	0
<b>10. 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?</b>		
Yes	<b>5</b>	
No	<b>0</b>	0
<b>11. Does this project provide “community scale” benefits?</b>		
Yes	<b>20</b>	20
No	<b>0</b>	
<b>Total Points</b>		<b>85</b>



CFPF, rr &lt;cfpf@dcr.virginia.gov&gt;

## CID515519\_CityofAlexandria\_CFPF

2 messages

**Jessica Lassetter** <[REDACTED]>

Fri, Sep 3, 2021 at 3:39 PM

To: "cfpf@dcr.virginia.gov" &lt;cfpf@dcr.virginia.gov&gt;

Cc: Brian Rahal &lt;[REDACTED]&gt;, Jesse Maines &lt;[REDACTED]&gt;

On behalf of the City of Alexandria, I am pleased to submit the attached application for the inaugural 2021 Virginia Community Preparedness Fund. The City is grateful for the opportunity to engage with the Virginia Department of Conservation and Recreation in cooperation with the Virginia Resources Authority to help create a more resilient Commonwealth through nature-based flood mitigation solutions at the local government scale. Should you have any questions regarding our application, please let me know.

Warm regards,

Jessica

Jessica E. B. Lassetter, MNR

Senior Environmental Specialist

City of Alexandria, Virginia

T&ES Stormwater Management

[REDACTED]  
[REDACTED]

[alexandriava.gov](http://alexandriava.gov)

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9/21, 6:12 PM

Commonwealth of Virginia Mail - CID515519\_CityofAlexandria\_CFPF

Fri, Sep 3, 2021 at 6:12 PM

**CFPF, rr** <cfpf@dcr.virginia.gov>

To: Jessica Lassetter <[REDACTED]>

Cc: Brian Rahal <[REDACTED]>, Jesse Maines <[REDACTED]>

Received, thank you.

[Quoted text hidden]