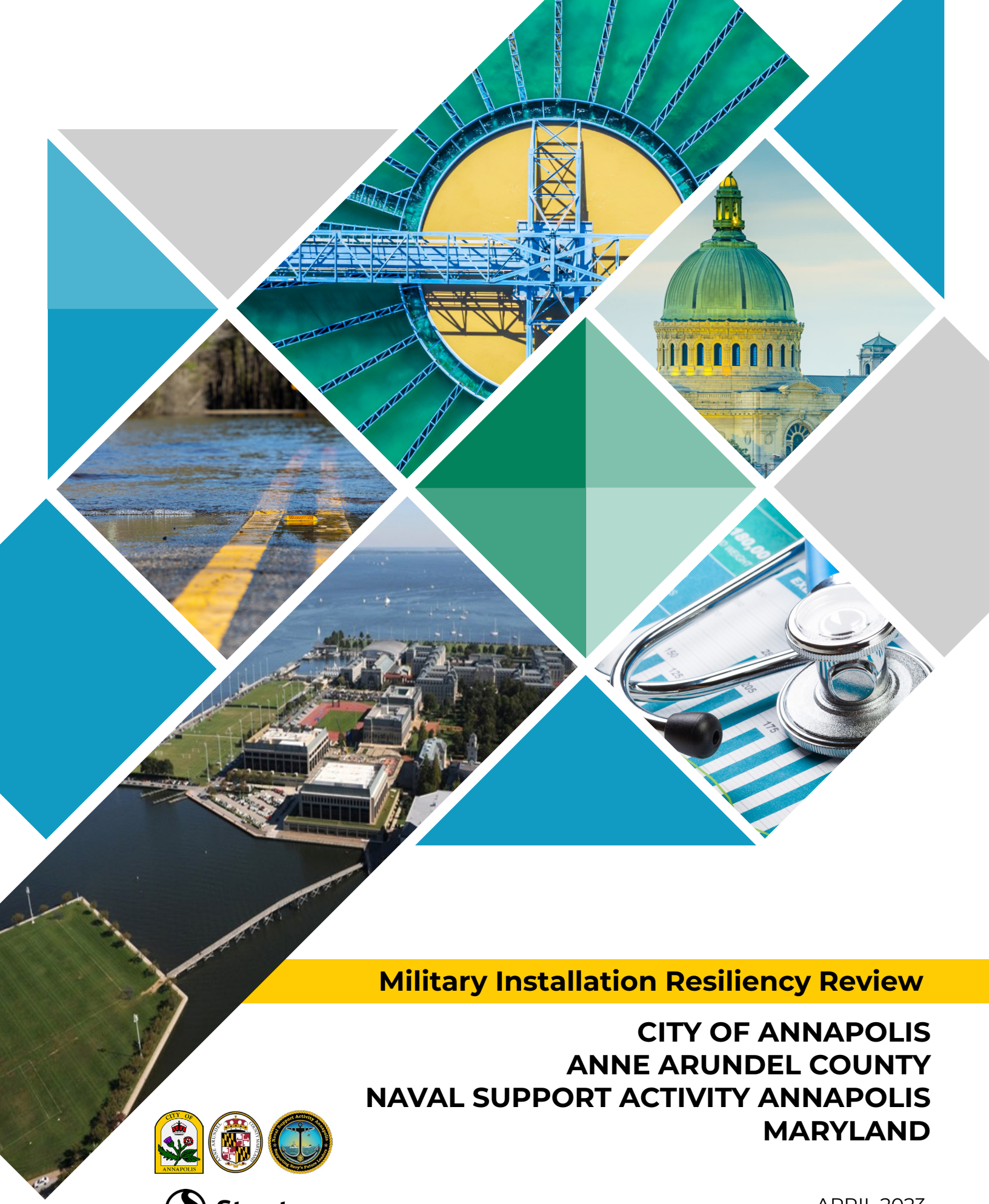

Military Installation Resiliency Review

CITY OF ANNAPOLIS
ANNE ARUNDEL COUNTY
NAVAL SUPPORT ACTIVITY ANNAPOLIS
MARYLAND

Stantec

APRIL 2023

CITY OF ANNAPOLIS
ANNE ARUNDEL COUNTY
NAVAL SUPPORT ACTIVITY ANNAPOLIS
MARYLAND

MILITARY INSTALLATION RESILIENCY REVIEW

The City of Annapolis would like to thank the development team that played an active role in the publication of this Military Installation Resiliency Review. Special thanks to our contacts from Naval Support Activity Annapolis and the array of service and community representatives for their support and technical expertise.

CITY OF ANNAPOLIS

ANNE ARUNDEL COUNTY

NAVAL SUPPORT ACTIVITY ANNAPOLIS

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Figure E1: City of Annapolis City View

Natural disasters and changes in climate and extreme weather events in recent years have amplified vulnerabilities and risks for communities across the United States. Defense communities are deserving of specific attention because they are essential to supporting military installations that maintain our national security. Defense communities provide essential operations, services, and infrastructure necessary for military installations to maintain mission assurance and mission-critical functions. This infrastructure must not only protect and preserve military readiness and defense capabilities but also provide safe places for service members and their families to live, work, and play.

As Defense communities improve their own resilience, they effectively support the broader picture of military operations and national security. The success of defense communities and military installations are interdependent—together they must plan, design, and finance to successfully shape a resilient future. These significant endeavors are best done through strong partnerships formed through shared, cohesive visions and understandings of vulnerabilities and risks, prioritization of resilience projects, and innovative financing tools.

Naval Support Activity (NSA) Annapolis is a major economic engine for the City of Annapolis and Anne Arundel County. Therefore, both the City and County, and the State of Maryland have a vested interest in supporting development and maintenance of infrastructure beyond installation boundaries to support military mission assurance and continued operations. These linkages require an understanding where

vulnerabilities are shared and how working together can help address considerable challenges.

Stantec's Defense Community Resilience Planning Framework, developed in partnership with the Association of Defense Communities, has enabled the City and County to assess vulnerabilities and risks with special attention given to the unique resilience requirements for a key stakeholder—NSA Annapolis. The planning framework provided methods to assess vulnerabilities and risks not only independently but also in coordination with threats to installation resiliency.
Our multidiscipline, practitioner-based team brought an integrated approach for multiple strategies to address key resilience issues that included, but were not limited to, sea-level rise, water and wastewater infrastructure, energy, transportation, communications, cybersecurity, and community health services. Our planning framework, based upon our experience with communities across the country, provided a risk-informed, phased approach to identify and prioritize investments for resilience actions and projects with a focused, action-oriented Resilience Action Plan, including potential funding sources.

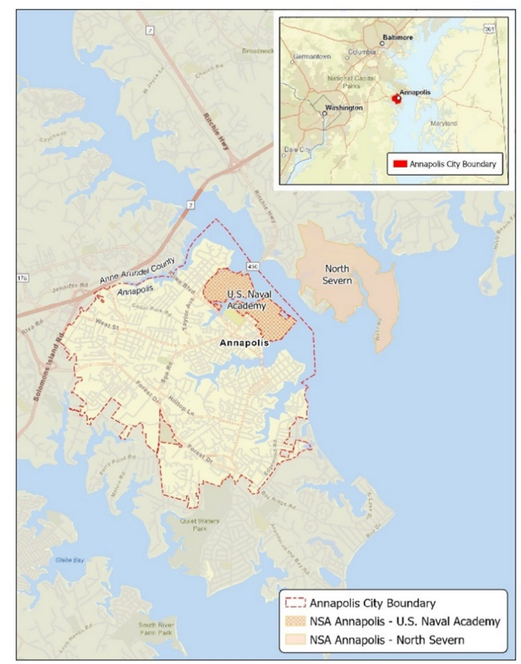

Figure E2: Location Map

The City of Annapolis received a grant from the U.S. Department of Defense (DoD) Office of Local Defense Community Cooperation to undertake this Military Installation Resiliency Review, in partnership with Anne Arundel County and NSA Annapolis, to chart a path for the long-term sustainability and operability of NSA Annapolis and the surrounding region. Refer to Figure E2 - location map. The City of Annapolis sponsored the Military Installation Resiliency Review as a community-led, cooperative strategic planning process among the City, County, NSA Annapolis, and the State of Maryland to analyze and implement actions necessary to foster, protect, and enhance both community and military installation sustainability.

This Military Installation Resiliency Review has enabled the City of Annapolis and Anne Arundel County, together with NSA Annapolis, to assess shared vulnerabilities and risks, with special attention given to unique resilience requirements beyond the military installation boundaries. The focus was to understand and support the interconnectedness and interdependencies of the critical infrastructure assets and systems that link the City, County, and NSA Annapolis. This includes assessing the potential effects of extreme weather

Figure E3: US Naval Academy

events and other changes in environmental conditions that may adversely affect mission-essential functions and the mission sustainability of NSA Annapolis. The comprehensive risk assessment process used the Federal Emergency Management Agency's (FEMA) Community Lifelines to organize, discuss, and compare the most fundamental services in the community that enable all other aspects of society to function. The completed Military Installation Resiliency Review includes a Technical Study Report and a Resilience Action Plan (Appendix A), with prioritized resilience actions and recommended funding sources, that focus on shared critical infrastructure, programs, and services.

The goal for the City of Annapolis, Anne Arundel County, and NSA Annapolis is to plan, design, and finance a resilient future, together. Resilience is about making our communities and military installations stronger, now and in the future, for everyone.

About NSA Annapolis

Charged with delivering base operating support services to tenant commands, NSA Annapolis sits on 7.2 square miles of land, including 17 miles of waterfront on the Chesapeake Bay and Severn River, and is the home to the U.S. Naval Academy (Academy). The Academy is bordered by the City of Annapolis and uses City and Anne Arundel County road networks for ingress and egress from Academy grounds. These shared assets present shared challenges and shared opportunities. The Military Installation Resiliency Review provides opportunities for both the community and installation to leverage resources and partner on resilience planning and projects.

The Mission Today

The major tenants and commands that are part of NSA Annapolis include:

- The United States Naval Academy, which has educated midshipmen since 1845

- North Severn Complex, which houses armory practice ranges, berthing, and maintenance areas for training vessels
- NSA Annapolis Command Headquarters
- Naval Research Laboratory in Chesapeake Bay Detachment (located in Randle Cliff, MD)

Challenges to the mission

The military operations issues studied, analyzed, and assessed were risks associated with extreme weather events and environmental changes associated with climate change, such as flooding, tidal surge, and sea-level rise, in terms of their impacts on water availability, stormwater, wastewater, energy supply, transportation, logistics, and communication infrastructure. The primary concern was flooding.

What is military installation resilience?

The 2019 National Defense Authorization Act includes the following definition for military installation resilience:

"The capability of a military installation to avoid, prepare for, minimize the effort of, adapt to, and recover from extreme weather events, or from anticipated or unanticipated changes in environmental conditions that do, or have the potential to, adversely affect the military installation or essential transportation, logistical, or other necessary resources outside of the military installation that are necessary in order to maintain, improve, or rapidly reestablish installation mission assurance and mission-essential functions."

What is the Resilience Planning Framework?

The Resilience Planning Framework used to support the Military Installation Resiliency Review is presented in Advancing Resilience for Defense Communities: A Planning Framework, an Association of Defense Communities publication that Stantec authored. The planning framework has guided the City's efforts to assess, plan, prioritize, and implement resilience strategies and infrastructure projects, with special attention given to the unique resilience requirements for NSA Annapolis. The planning framework provides methods to assess vulnerabilities and risks not only independently but also in coordination with threats to installation resilience.

The planning framework provides a risk-informed, phased approach to identify and prioritize investments for resilience projects and foster partnership opportunities. The planning framework is comprised of four stages.

- Design a robust and multifunctional resilience network
- Conduct a shared vulnerability and risk assessment
- Conceptualize and prioritize impactful projects
- Identify funding sources and implement resilience projects

Recognizing that NSA Annapolis is an essential part of the regional and state economy, the City and County, together with the broader region and the State of Maryland, have a vested interest in understanding the resiliency of the region's infrastructure that supports the installation and military operations.

The Military Installation Resiliency Review includes the following documents.

Technical Report

Identification of shared hazards, vulnerabilities, and risks affecting the City, the County, NSA Annapolis, and the surrounding region, with special attention given to the unique resilience requirements necessary to support the long-term sustainability and operability of the installation.

Resilience Action Plan

Recommended actions and investments directly beyond the installation boundaries and across the region that may address the identified risks. Refer to Table 1 – Resilience Action Plan Summary Table for a synopsis of recommended resilience projects.

Next Steps

The establishment of a Memorandum of Understanding (MOU) is recommended to implement the Military Installation Resiliency Review project actions and continue permanent long-term communication and collaboration among the City of Annapolis, Anne Arundel County, and NSA Annapolis. Many defense communities across the country have entered into MOUs following joint studies to address issues and concerns that may arise over time and to further the implementation of specific projects. The purpose of the MOU is to:

- Create an ongoing structure for the implementation of the resilience action plan projects. This can include an Implementation Committee for continued communication and sharing of information related to resilience projects after the Military Installation Resiliency Review is completed.
- Enable the City of Annapolis, Anne Arundel County, and NSA Annapolis to more efficiently and effectively communicate and coordinate. A specific schedule of meetings can be established as part of the MOU.
- Create an organizational structure to support transition through changes in installation command and local community leadership.
- Help build new relationships.

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Lifeline/ Topic	Projects	Project Description	Estimated Time to Complete	Estimated Cost (Planning Level)
Anne Arundel Medical Center and Health Department				
	Enhanced Health and Medical Services Communication and Information Sharing	Design and implement a programmatic approach to health and medical coordination and communications between UNA Annapolis and local health and medical partners.	30 months	$260,000
Energy - Baltimore Gas and Electric (BGE)				
	USNA Gate 10 Substation Flooding and Sea Level Rise Mitigation Study	Conduct analysis of future sea level rise projects and review of substation plans to determine feasibility of flood mitigation strategies such as flood walls or raising substation equipment and facilities, or if the substation should be relocated and the associated impacts and modifications to BGE and USNA installation systems.	63 months - 105 months	Varies Per Task - Overall $3.32 M to $31.84 M
Coastal Shoreline Boundaries				
	City Coastal Zone Resilience / Coastal Shoreline Boundaries	To identify, screen, and prioritize a network of perimeter coastal risk mitigation best management practices.	147-252 months	$203,460,000
City/County Water Treatment Plant				
	Severn River Crossing - Arnold Water Treatment Plant	Feasibility study of connecting the 220 and 210 zones via a water transmission pipeline under the Severn River.	72-102 months	$37.5M - $53M
	Interconnection between County and City Systems - Water Supply Connection	Combined the City and County's hydraulic model, test the interconnection, develop SOP for the interconnection.	72-102 months	$3.83M - $6.54M
Cybersecurity				
	Establish Statewide Cybersecurity Planning Committee and a Cybersecurity Plan	Interconnected network infrastructure improves mission effectiveness, but also increases vulnerability to cyber attacks as they create more potential to backdoor attacks. Cyber incident response time is a critical component to effectively neutralize a threat before it compromises assets, but without the appropriate processes, dedicated staff and visibility to monitor and respond, vulnerabilities are compounded. Coordination and collaboration between entities is thus critical to improve the cybersecurity posture. Defense community information sharing through a single pane of glass software* can help bridge the gap and provide dedicated staff the appropriate monitoring capabilities to rapidly detect and respond to a threat. For this to happen, a planning committee comprised of representatives from various community lifelines (education, healthcare, energy, water, military, etc.) needs to be formed in order to address cybersecurity in a coordinated manner.	19 mo.	$953,040

NSA Annapolis Access Roads				
	Replace Gate 1 Option 1 - would include improvements to nearby City streets to raise those streets to same elevation as the replacement gate 1. Option 2 - would include improvements to City street(s) between gate 3 and King George St.	Gate 1 is the main vehicular access to NSA Annapolis. Gate 1 will be under sea-level by approximately 1.6 feet (i.e. below average daily high tide) in 2100. Gate 1 will be 100-year flood tide surge will be approximately 7.5' above existing gate 1 due to SLR by 2100.	3-4 years	$500,000-$750,000
	Md 450 /King George St. bridge over College Creek Replacement bridge to be above the year 2100 tide surge elevation.	Rebuild bridge above the projected 100-year tide surge elevation as of 2100.	2-3 years	$500,000 - $800,000
	Prince George Street Current Flood Issues	Investigate the causes and evaluate potential solutions for the current flooding issues at Prince George Street adjacent to Gate 1 area.	1-2 years	$50,000-$100,000
	Traffic Signal and ITS Upgrades	Additional infrastructure and/or communications are necessary to fully utilize up to 30 updated traffic signals and ITS equipment to coordinate and enhance emergency evacuation routes to support NSA Annapolis/US Naval Academy and surrounding region.	2-5 years	$12 million
Sewershed Annapolis Wastewater Reclamation				
	Installation Sewer Capacity Requirements	Installation and City to partner to complete inflow study to assess conveyance system capacity risk.	6 months	$100,000
	Randall and Compromise Street Sewer Scoping Study	1. Evaluate options to assess the condition of the Randall Street Sewer 2. Evaluate options to assess the condition of the Compromise Sewer condition from Randall street to the Shipwright Siphon 3. Provide a concept to refurbish or replace the Randall Street sewer, assessing disruption to the business and residences in the area. 4. Provide two concepts to deliver the sewage from the installation not using the existing Randall Street sewer	13 months	$375,000

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Sewershed Annapolis Wastewater Reclamation (cont'd)				
	Shipwright Siphon Condition Assessment Scoping Study	The City indicated that the Siphon may not be able to be inspected or repaired. A scoping study will identify the cause of this and provide a plan and budget to enable the inspection of the siphon.	6 months	$150,000
	Annapolis Water Reclamation Facility (AWRF) Final Effluent Filter Pumps Replacement - Preliminary Design	Develop a preliminary design to replace the final effluent filter pumps with pumps that will not be damaged if under water.	1 year	$500,000
	Replacement Road Map for the AWRF Primary Sludge Conveyance Infrastructure	Prepare a strategy and budget to either refurbish or replace the primary sludge conveyance from the settling tanks to sludge processing.	1 year	$250,000

EXECUTIVE SUMMARY

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ACRONYMS / ABBREVIATIONS

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AEP	Annual Exceedance Probability
ARPA-E	Advanced Research Projects Agency-Energy
BACM	Best Available Control Measures
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CMAQ	Congestion Mitigation and Air Quality Improvement Program
COG	Council of Governments
CRP	Carbon Reduction Program
DBE/SS	Disadvantaged Business Enterprise Supportive Services Program
DoD	Department of Defense
FEMA	Federal Emergency Management Agency
GIS	Geographical Information Systems
ISO	Insurance Services Office
NEVI	National Electric Vehicle Infrastructure
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
NPL sites	National Priorities List sites
NSA Annapolis	Naval Support Activity Annapolis
NSFLTP	Nationally Significant Federal Lands and Tribal Projects
OLDCC	Office of Local Defense Community Cooperation
PE	Petroleum Extraction
PGA	Peak Ground Accelerations
PROTECT	Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation
RACM	Reasonably Available Control Measures
RDAT&E	Research, Development, Acquisition, Test, and Evaluation
SME	Subject Matter Expert
SPEI – 3	Standardized Precipitation and Evaporation Index calculated over 3-month periods.
TA	Transportation Alternative
US EPA	United States Environmental Protection Agency

GLOSSARY

Acute Hazard	Hazards that impact assets over a relatively short period (e.g., hours to days).
Adaptation	In human systems, the process of adjustment to actual or expected climate and its effects to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects.
Chronic Hazard	Hazards that gradually impact assets over a longer period (e.g., years to decades) or occur regularly on an annual basis.
Climate	Climate is the long-term weather pattern in an area, typically over a 30-year period.
Climate Adaptation	Climate adaptation is the international practice of assessing and implementing strategies to respond to local variability in climate-related elements such as temperature, precipitation, wind, storm events, and sea-level rise. It is important for communities to assess how increased variability in climate trends might affect the daily lives of the people, processes, and systems within them. Adaptation can take many forms and can be tailored to the specific needs of a community or region.
Climate Change	A change of climate, attributed directly or indirectly to human activity, that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods.
Community Lifelines[1]	Lifelines enable the continuous operation of critical government and business functions and are essential to human health and safety or economic security. The integrated network of assets, services, and capabilities that provide lifeline services are used day-to-day to support the recurring needs of the community and enable all other aspects of society to function.
Community Resilience	Is widely accepted in the planning industry as the sustained ability of a community to respond to, withstand, and recover from adverse situations. Resilient communities can respond to and adapt quickly to system shocks while maintaining their economic, environmental, and social functionality.
Consequences	The consequences of realized risks on natural and human systems, where risks result from the interactions of climate-related hazards (including extreme weather/climate events), exposure, and vulnerability. Impacts generally refer to effects on lives; livelihoods; health and well-being; ecosystems and species; economic, social, and cultural assets; services (including ecosystem services); and infrastructure. Impacts may be referred to as consequences or outcomes and can be adverse or beneficial.
Critical Asset	Are those where loss of functionality could lead to loss of life, serious injury, threatened safety, public health impacts, or quality of life reduction (e.g., long-term economic impacts or impacts to installation mission readiness).
Hazard	The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.
Hazard Mitigation	Hazard mitigation is any action taken to reduce risk before, during, or after a hazard event. As a planning concept, it looks to reduce harmful impacts from natural hazards, such as flooding, wildfires, earthquakes, severe weather, and hurricanes, or from human-induced threats, such as chemical releases, cyberattacks, and terrorism. Hazard mitigation planning can incorporate climate adaptation by assessing and seeking to reduce future risks.

GLOSSARY

Likelihood	The chance of a specific outcome occurring where it might be estimated probabilistically.
Military Installation Resilience	The capability of an installation to avoid, prepare for, minimize the effect of, adapt to, and recover from extreme weather events, or from anticipated or unanticipated changes in environmental conditions, that do, or have the potential to, adversely affect the military installation or essential transportation, logistical, or other necessary resources outside of the military installation that are necessary in order to maintain, improve, or rapidly reestablish installation mission assurance and mission-essential functions.
Redundancy	The concept of redundancy within resilience focuses on achieving safeguards against the failure of a system. Redundancy aims to increase reliability and predictability by providing alternatives when a primary system or process fails.
Resilience	The capacity of interconnected social, economic, and ecological systems to cope with a hazardous event, trend, or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure. Resilience is a positive attribute when it maintains capacity for adaptation, learning, and/or transformation.
Risk	The potential for adverse consequences for human or ecological systems, recognizing the diversity of values and objectives associated with such systems. In the context of climate change, risks can arise from potential impacts of climate change as well as human responses to climate change. In the context of climate change impacts, risks result from dynamic interactions between climate-related hazards with the exposure and vulnerability of the affected human or ecological system to the hazards. Hazards, exposure, and vulnerability may each be subject to uncertainty in terms of magnitude and likelihood of occurrence.
Smart Community	The smart community movement encompasses the broad concept of creating interconnected communities that leverage technologies and data to improve day-to-day problems people experience, and to benefit community activities[2]. Smart technology and informed approaches to problems can be integrated into resilience projects, often amplifying the effects of larger capital improvements.
Sustainability	While resilience captures the ability to respond to shocks to a system, sustainability speaks to the long-term ability to maintain or improve functions. Sustainability emphasizes the importance of economic efficacy, environmental stewardship, and equity or social vitality through what is often referred to as the "triple bottom line" concept. Sustainability recognizes that these three pillars are essential in maintaining and improving long-term functionality and quality of life within communities. Defense communities face the added complexity of considering their relationship with the local military installation when striving to balance these goals during the decision-making process.
Vulnerability	The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

[1] *Community Lifelines, Federal Emergency Management Agency. Accessed January 16, 2023. https://www.fema.gov/emergency-managers/practitioners/lifelines*
[2] *Nam, Taewoo and Theresa Pardo (2011). Conceptualizing Smart City with Dimensions of Technology, People, and Institutions. Center for Technology in Government, University at Albany, SUNY. Retrieved from https://inta-aivn.org/images/cc/Urbanism/background%20documents/dgo_2011_smartcity.pdf.*

Figure 1.1: Aerial View of Annapolis

Introduction

Increases in extreme weather events related to climate change, human-induced hazards, and a global pandemic shed light on risks and vulnerabilities within our communities. Across the United States, we are facing devastating effects from natural and nonnatural disasters and the realities of resiliency shortfalls that communities must respond to in real time as we see a rise in billion-dollar disasters. Annually, natural and human-caused hazards take the lives of hundreds and cost taxpayers billions of dollars to help communities, organizations, businesses, and individuals recover. In 2021, $145 billion was the price tag for weather and climate disasters, with 20 separate billion-dollar weather and climate disasters across the United States[3].

We are also experiencing significant human-induced incidents such as civil unrest, cybersecurity threats, and aging infrastructure. It is apparent that communities need to better understand their collective vulnerabilities and risks to these types of events and their effect on the people, services, facilities, and systems on which they rely for daily life.

Climate-related extreme weather events affect military readiness, alter the operational environment, and drain resources. Wildfires have forced evacuations at installations in the western United States while hurricanes on the East Coast and flooding in the Midwest have inflicted billions of dollars of damage on facilities that are home to key warfighting capabilities[4].

A local example of a climate-related extreme weather event is the 2021 Halloween weekend flooding that impacted City Dock (see image below). The flooding at City Dock is frequently driven by sea level, rather than rainfall, and with increasing sea-level elevations, high-tide events already and will further flood the historic City Dock area. City Dock means many things to many people

[3] 2021 U.S. Billion-Dollar Weather and Climate Disasters in Historical Context. National Oceanic and Atmospheric Administrations. Accessed November 18, 2022. https://www.climate.gov/news-features/blogs/beyond-data/2021-us-billion-dollar-weather-and-climate-disasters-historical

[4] Department of Defense, Office of the Undersecretary of Defense (Acquisition and Sustainment). 2021. Department of Defense Draft Climate Adaptation Plan. Report Submitted to National Climate Task Force and Federal Chief Sustainability Officer. 1 September 2021.

[5] High-Tide Flooding Disrupts Local Economic Activity. Science Advances. February 15, 2022. Volume 5, Issue 2. https://www.science.org/doi/10.1126/sciadv.aau2736

and is a critical asset when considering community identity, local economy, tourism, and USNA. With the addition of sea-level rise, the area will experience more frequent flooding and more extreme flood events, further impacting economic resilience, access to community spaces/parking lots, and access to the USNA. The disruption to local businesses equated to a loss of approximately 3,000 visits in 2017 and a revenue loss of $86,000 to $172,000 in 2017 due to high-tide flooding for City Dock businesses[5].

Community resilience is widely accepted in the planning industry as the sustained ability of a community to respond to, withstand, and recover from adverse situations. Resilient communities can respond to and adapt quickly to system shocks while maintaining their economic, environmental, and social functionality. The more recent emphasis by Congress and DoD on supporting military installation resilience presents significant opportunities for defense communities to improve their resilience while effectively supporting the broader requirements of military operations and national security. Defense communities are deserving of specific attention because they are essential to supporting the military installations they host, helping maintain our national security. Defense communities are part of a larger network of essential operations, services, and infrastructure necessary for the military installation to sustain continued military operations and readiness.

Military installations are often the economic engine of a community, region, and even a state. Therefore, state and local governments have a vested interest in supporting the development and maintenance of infrastructure beyond installation boundaries to support military mission assurance and continued operations. This

Figure 1.2: View of City Dock Flooding, Photo Provided by Susan Walsh

infrastructure not only supports, protects, and preserves military readiness and defense capabilities, it also provides safe places for military personnel and their families to live, work, and play. Defense communities and the military installations they host must understand these shared vulnerabilities and risks, and work together to address the considerable challenges.

1.1 Department of Defense Installation Resilience Program

The City of Annapolis is serving as the Military Installation Resiliency Review sponsor with technical and financial support from the DoD Office of Local Defense Community Cooperation (OLDCC) through its Installation Resilience Program.

The Installation Resilience Program is designed to help communities make informed decisions and support continued partnering with the installation they host to respond to, address, and mitigate activities that are either impairing or likely to impair the use of the installation. The overarching goal is to increase the military value of the installation by preserving the military mission and promoting continued

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community growth, resilience, and economic development. When done successfully, communities may increase the military value of the installation by preserving the military mission.

DoD Installation Resilience Program: The program is designed to support local and state government initiatives to identify, analyze, and implement actions necessary to foster, protect, and enhance military installation sustainability that promotes both community and installation resilience and compatible community development.

Military installation resilience is defined as the capability of a military installation to avoid, prepare for, minimize the effect of, adapt to, and recover from extreme weather events, or from anticipated or unanticipated changes in environmental conditions, that do, or have the potential to, adversely affect the military installation or essential transportation, logistical, or other necessary resources outside of the military installation that are necessary in order to maintain, improve, or rapidly reestablish installation mission assurance and mission-essential functions[6].

This Military Installation Resiliency Review plays a critical role in protecting both the military and the greater region to ensure continued military mission and effectiveness; continued community growth and economic development; and adequate and resilient shared critical infrastructure such as drinking water, stormwater, wastewater, energy, transportation, installation access, medical services, and communications.

1.2 Defense Community Resilience Planning Framework

A resilient defense community is a community, in partnership with its respective military installation, that understands its vulnerabilities, is prepared to respond to a shock, and proactively mitigates risks associated with a broad array of current and future hazards; and a community that when it does experience a shock or disruption, is able to absorb the hit, rebound forward, and recover rapidly. The community needs to understand and support the interconnectedness and interdependencies of the critical infrastructure assets and systems that link the community, military installation, and greater region.

Stantec's Defense Community Resilience Planning Framework allowed for the identification of opportunities to strengthen resiliency in and around NSA Annapolis including identification of shared vulnerabilities and risks; identification of critical infrastructure; and strategies to address, including possible funding sources, to chart a path for the long-term sustainability and operability of NSA Annapolis and the surrounding region through analysis and implementation of necessary actions to foster, protect, and enhance both community and military installation resilience.

[6] *FY2019 National Defense Authorization Act. S.1790 - 116th Congress (2019-2020): National Defense Authorization Act for Fiscal Year 2020 | Congress.gov | Library of Congress*

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The Military Installation Resiliency Review provides the opportunity to continue and expand the established community and military partnerships essential to address the growing challenges to human health and safety, quality of life, infrastructure, economic growth, and military operations and readiness. Critical military infrastructure is essential to operational readiness and national security. Understanding infrastructure vulnerabilities, both inside and outside installation boundaries, is key to mitigating risks and enhancing military resilience. The Military Installation Resiliency Review explores how community partnerships can sustain an installation's ability to prepare for an extreme event and maintain or rapidly reestablish mission-related functionality .

1.3 Purpose

The City of Annapolis, Anne Arundel County, NSA Annapolis, and the greater region are exposed to a range of natural and human-made hazard threats like coastal hazards, flooding and sea-level rise, coastal/shoreline erosion, winter storms, tornadoes, thunderstorms, droughts, extreme heat, hurricanes, tropical storms and nor'easters, extreme temperatures, infectious disease, and cybersecurity threats. The frequency, magnitude, and impact of many of these hazards are worsening with climate change, amplifying the necessity to increase and invest in the resilience of the City of Annapolis, Anne Arundel County, NSA Annapolis, and the surrounding region. As defense communities improve their own resilience, they effectively support the broader picture of military operations and national security. These significant endeavors are more effective through strong local partnerships with shared visions and understandings of vulnerabilities and risks, prioritization of resilience projects, and innovative financing tools.

NSA Annapolis serves as a significant economic engine for the City of Annapolis, Anne Arundel County, and the State of Maryland. All parties have a vested interest in supporting the development and maintenance of infrastructure beyond installation boundaries to support military mission assurance and continued military operations. These linkages require an understanding of where vulnerabilities are shared and how working together can help address considerable challenges. Together, all parties benefit from jointly defining success and the metrics to evaluate success.

1.4 Project Objectives

Stantec conducted the Military Installation Resiliency Review based upon our Defense Community Resilience Planning Framework with a focus on the interdependencies of the City of Annapolis, Anne Arundel County, NSA Annapolis, and the surrounding region. This resilience planning framework is intended to support the City's efforts to assess, plan, prioritize, and implement resilience strategies and infrastructure projects to provide critical services and infrastructure in support of maintaining military mission assurance and mission-essential functions as well as continued community growth and economic development.

1.5 Approach

The Defense Community Resilience Planning Framework provides a method to assess vulnerabilities and risks within the jurisdiction's boundary, but also in coordination with threats to installation resiliency. It provides a risk-informed, phased approach to identify and prioritize investments for resiliency projects and includes opportunities to foster partnerships.

The process is broken into the following four phases and can be followed in a strictly linear manner (see Figure 1.3) or complementary tasks within phases can occur in tandem

1. Design a robust and multifunctional resilience network
2. Conduct a shared vulnerability and risk assessment
3. Conceptualize and prioritize impactful projects
4. Identify funding sources and implement the projects

The concept of resilience is linked to a wide variety of planning approaches, methodologies, and design concepts aimed at reducing risk to or lessening the impacts of shocks and stressors. Communities can enhance resiliency through hazard mitigation planning, climate change adaptation, smart technology, redundancy, sustainability efforts, or a combination of these approaches, to protect communities from the loss of life and damages to infrastructure and property while simultaneously seeking to expedite the recovery process that improves the quality of life for community members. To ensure a comprehensive approach to resilience planning, it is important to understand key planning concepts when executing a resilience strategy.

- **Hazard Mitigation** – Hazard mitigation is any action taken to reduce risk before, during, or after a hazard event. As a planning concept, it looks to reduce harmful impacts from natural hazards, such as flooding, wildfires, earthquakes, severe weather, and hurricanes, or from human-induced threats, such as chemical releases, cyberattacks, and terrorism. Hazard mitigation planning can incorporate climate adaptation by assessing and seeking to reduce future risks.
- **Climate Adaptation** – Climate adaptation is the international practice of assessing and implementing strategies to respond to local variability in climate-related elements such as temperature, precipitation, wind, storm events, and sea-level rise. It is important for communities to assess how increased variability in climate trends might affect the daily lives of the people, processes, and systems within them. Adaptation can take many forms and can be tailored to the specific needs of a community or region.
- **Smart Community** – The smart community movement encompasses the broad concept of creating interconnected communities that leverage technologies and data to improve day-to-day problems people experience, and to benefit community activities[7]. Smart technology and informed approaches to problems can be integrated into resilience projects, often amplifying the effects of larger capital improvements.
- **Redundancy** – The concept of redundancy within resilience focuses on achieving safeguards against the failure of a system. Redundancy aims to increase reliability and predictability by providing alternatives when a primary system or process fails.

[7] *Nam, Taewoo and Theresa Pardo (2011). Conceptualizing Smart City with Dimensions of Technology, People, and Institutions. Center for Technology in Government, University at Albany, SUNY. Retrieved from https://intd-aivn.org/images/cc/Urbanism/background%20documents/dgo_2011_smartcity.pdf.*

[8] *Goodland, Robert. The Concept of Environmental Sustainability. Annual Review of Ecology and Systematics (1995), 26: 1-24. Retrieved from https://www.jstor.org/stable/2097196*

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- **Sustainability** – While resilience captures the ability to respond to shocks to a system, sustainability speaks to the long-term ability to maintain or improve functions. Sustainability emphasizes the importance of economic efficacy, environmental stewardship, and equity or social vitality through what is often referred to as the "triple bottom line" concept[8]. Sustainability recognizes that these three pillars are essential in maintaining and improving long-term functionality and quality of life within communities. Defense communities face the added complexity of considering their relationship with the local military installation when striving to balance these goals during the decision-making process.

Resilience planning is not meant to be a linear process but rather a cyclical one to support the City of Annapolis in the development of an overall resilience program, with the goal of continuous improvement in resilience, quality of life, and public safety, and the overarching tenet of national security. In the long term, defense communities can continue to evaluate and build upon their resilience strategy and implementation. As the City of Annapolis becomes more resilient, it can further its resilience on a broader scale, strengthening regional and national defense resilience strategies as well.
In recent years, DoD has placed a growing emphasis on resilience to natural hazards as it relates to impacts on military installations

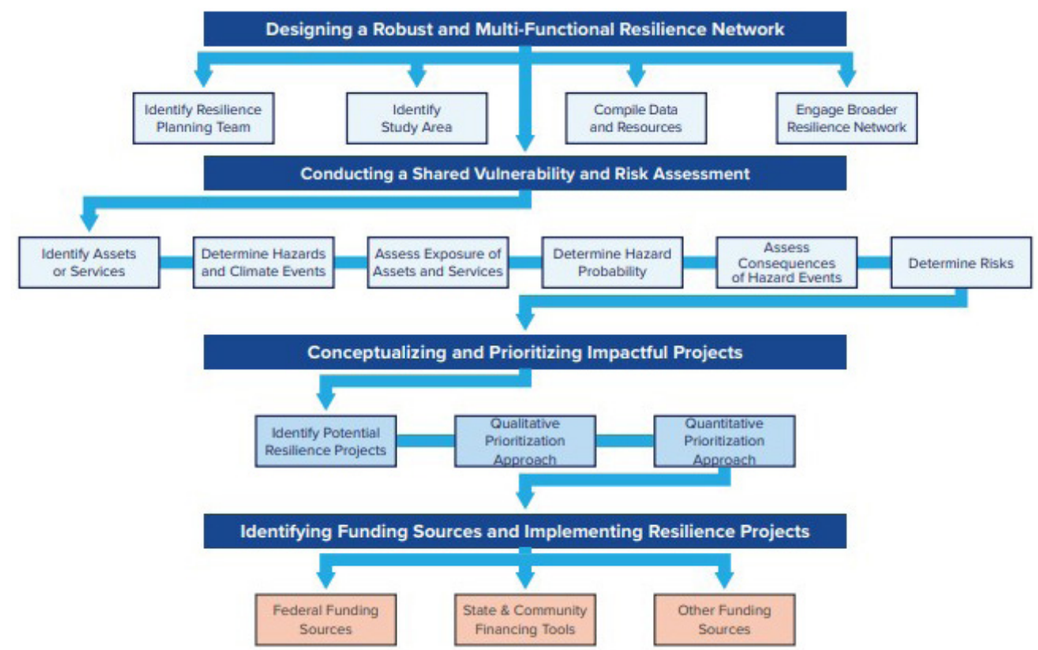

Figure 1.3: Defense Community Resilience Planning Framework Overview.

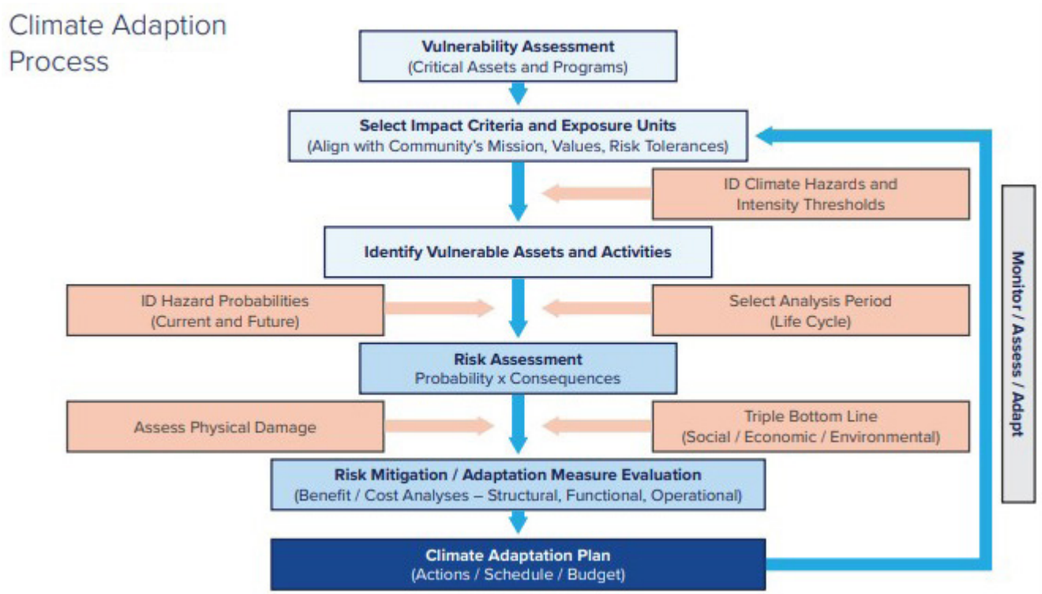

Figure 1.4: General Process Flow of Resilience Risk and Vulnerability Assessment of Adopted from ISO Climate Adaptation Process

and mission-essential functions, recognizing that climate hazards pose threats to national security.

DoD and installation resources can support and inform a defense community's resilience planning efforts and advance military installation resilience by funding and implementing identified solutions. In addition, the adjacent defense community perspective is needed to ensure facilities, infrastructure, and services beyond the installation boundaries that are also critical to continue military operations and readiness are identified, understood, and preserved.

An opportunity is presented for broader, more coordinated, and impactful resilience initiatives by the City of Annapolis, Anne Arundel County, NSA Annapolis, and the region working together. A more holistic and robust assessment of essential community infrastructure and services beyond the installation fence line are identified to maintain mission-essential functions. An overview of resilience planning with a shared community and installation perspective is outlined in Figure 1.5 – Shared Vulnerability Assessment Approach to Capture Joint Vulnerabilities and Risks.

The process applied to this project followed the process outlined on page 10. This process is explained in sections 4 and 5.

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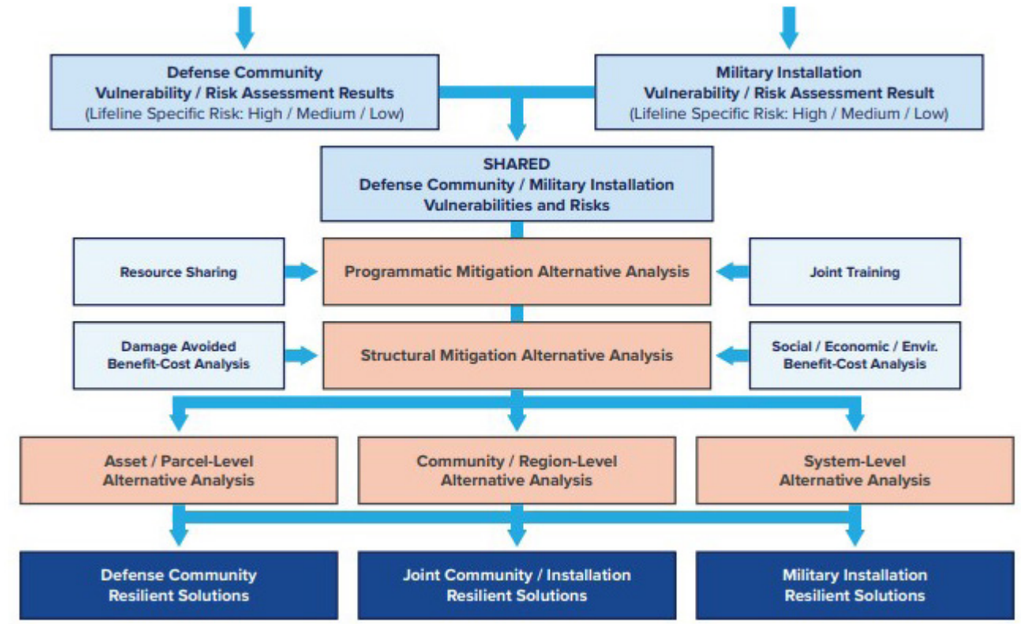

Figure 1.5: Shared Vulnerability Assessment Approach to Capture Joint Vulnerabilities and Risks

PROCESS FOR MILITARY INSTALLATION RESILIENCE ASSESSMENT

#1
SET CLIMATE SCENARIOS

#2
IDENTIFY CRITICAL ASSETS/ PROGRAMS & HIGH HAZARDS

#3
PRIORITIZE ASSETS & HAZARDS

#4
SCORE CONSEQUENCE & ASSESS RISK

#5
PRIORITIZE PROJECTS

#6
PREPARE FOR IMPLEMENTATION

1 Query potential climate scenarios. Compare varied results and select based on complementary models to existing locally utilized models for comparison and continuity.

2 Survey, Workshop with breakout groups by Community Lifeline, data request and collection

3 Community Lifeline Interviews, spatial data analysis of hazard exposure, priority ranking of critical assets

4 Workshop to , asset owner , spatial data analysis

5 Project refinement with Stantec Subject Matter Experts and Asset Owners

6 Funding strategy development, Resilience Action Plan, report

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2.1 Study Area

The City of Annapolis, in partnership with Anne Arundel County, received a grant from the U.S. Department of Defense Office of Local Defense Community Cooperation to undertake a Military Installation Resiliency Review that charts a path for the long-term sustainability and operability of NSA Annapolis, including the U.S. Naval Academy, in consort with the surrounding communities. The study area focuses on the U.S. Naval Academy, the City of Annapolis, and portions of Anne Arundel County near the U.S. Naval Academy. Refer to Figure 2.1 – Location Map. The Military Installation Resiliency Review is a community-led, cooperative strategic planning process among NSA Annapolis, the surrounding local jurisdictions, and the State of Maryland to analyze and implement actions necessary to foster, protect, and enhance both community and military installation sustainability.

The project includes the identification of shared vulnerabilities and opportunities to develop strategies to enhance resilience in response to extreme weather events and environmental changes associated with sea-level rise and climate change, including specific transportation and evacuation strategies. The goal is to protect and preserve military readiness and support continued community and economic development.

This project enabled the City of Annapolis and Anne Arundel County, together with NSA Annapolis, to assess shared vulnerabilities and risks, with special attention given to unique resilience requirements for NSA Annapolis beyond their installation boundaries. The process focused on shared critical infrastructure, programs, and services including energy, water and wastewater, stormwater conveyance, transportation and emergency evacuation, communication networks, health services, schools, and daycare centers. The completed review includes a Resilience Action Plan with recommended resilience actions and prioritized projects, along with recommended funding sources.

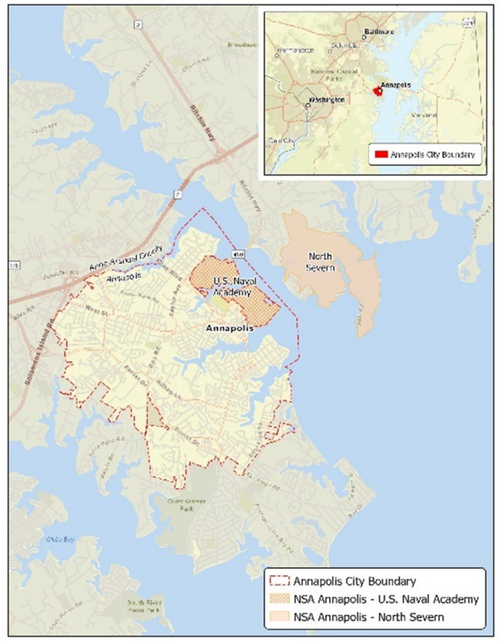

Figure 2.1: Location Map

The goal for the community and NSA Annapolis is to plan, design, and finance a resilient future, together.

2.2 Community Profile

The region is intrinsically tied by the employment and economic opportunities shared across installation boundaries ... an anchor for the community - trickle-down effects of the jobs and personnel at NSA Annapolis who live in the surrounding communities of the City of Annapolis and Anne Arundel County.

2.2.1 DEMOGRAPHICS

CITY OF ANNAPOLIS

The population of the City of Annapolis is 40,687. The city is 7.2 square miles. There are 5,663 people per square mile. 50% of households have a bachelor's degree or higher. The average number of persons per household is 2.38.

ANNE ARUNDEL COUNTY

The total population of Anne Arundel County is 590,336. The county is 414.8 square miles. There are 1,418 people per square mile. 43% of households have a bachelor's degree or higher. The average number of persons per household is 2.62.

NSA ANNAPOLIS /USNA

The overall population of the Naval Academy according to census tract information is 5,609. NSA Annapolis has more than 12,958 military, civilian and contractor employees responsible for numerous technical achievements across a broad spectrum of military capabilities[9].

2.2.2 ECONOMY

CITY OF ANNAPOLIS

The median household income in Annapolis is $87,897.

While the City's geographic location on the Annapolis Neck Peninsula, between two rivers, leaves little room for physical expansion, the commercial base has prospered. The historic city core, located on the waterfront, hosts the U.S. Naval Academy, St. John's College, and the Maryland State Government, which are surrounded by residential development. Maritime and sailing industries are significant contributors to the local economy. There are very few vacant parcels within the City.

ANNE ARUNDEL COUNTY

The median household income in Anne Arundel County is $103,225.

Anne Arundel County is the fourth-largest jurisdiction in Maryland and the 115th largest in the U.S. The County has the third-largest economy in the State of Maryland and is home to several statewide and national assets, including BWI Thurgood Marshall Airport, Maryland Live (one of the nation's largest casinos), Fort George G. Meade (third-largest army base in the U.S.), The National Security Agency, U.S. Cyber Command, and the U.S. Naval Academy. [10]

The unemployment rate within Anne Arundel County is 3.7%. The largest job counts by occupation are Executive, Managers and Administrators at 12.13% followed by Office and Administrative Support at 11.68%. The work distribution of employees within Anne Arundel County is 29% blue-collar and 70% white-collar. [11]

[9] FY 2016 Economic Impact Analysis of Maryland's Military Installations Prepared for Maryland Department of Commerce. Regional Economic Studies Institute Townson University. FY 2016 Economic Impact Analysis of Maryland's Military Installations.

[10] "Anne Arundel County Snapshot." Anne Arundel Economic Development Corporation. Accessed December 7, 2022. County Profile | For Business | Anne Arundel County AAEDC

[11] Ibid.

NSA ANNAPOLIS / USNA

According to the FY 2016 Economic Impact Analysis of Maryland's Military Installations, prepared by the Regional Economic Studies Institute (RESI) at Towson University, the annual economic output for NSA Annapolis (the sum of direct, indirect, and induced impacts) is $1.6B, with a total employee compensation of $0.5B. [12]

According to the DoD Office of Local Defense Community Cooperation, Anne Arundel County is a top defense contract spending location, bringing in $4.3 billion in FY2021. In FY2021, Anne Arundel County was among the number one top defense spending locations for top defense contract spending and top personnel spending in the State of Maryland. [13]

2.3 Installation Overview – NSA Annapolis

In 1911, Naval Air Station at Greenbury Point was completed in Annapolis. Between 1911 and World War II, the Naval Air Station witnessed many firsts, including the first flight from a naval air station and the first Yard Patrol craft. During World War II and the years that followed, the Naval Air Station's role and footprint expanded, including the addition of 123 acres, new structures, and the establishment of the Severn River Naval Command, which expanded to include a variety of naval support commands and facilities. In 1962, the Severn River Naval Command, including all missions and personnel, was transferred to the Commanding Officer, Naval Station Annapolis. Naval Support Activity (NSA) Annapolis was officially established in 2006, thus streamlining operations and more efficiently supporting the work and education of the U.S. Naval Academy (USNA).

Naval Support Activity (NSA) Annapolis is home to multiple tenants including the United States Naval Academy (USNA); North Severn Complex; NSA Annapolis Command Headquarters; and Naval Research Laboratory—Chesapeake Detachment in Randle Cliff, Maryland. NSA Annapolis includes more than 400 buildings on 1,500 acres.

The USNA is the undergraduate college of the Naval Service. Naval academy students referred to as midshipmen, graduate with a Bachelor of Science degree and continue to serve in the Navy or Marine Corps. The 338-acre campus hosts 4,000 midshipmen. In addition to the core curriculum and 18 major fields of study, a wide variety of elective courses and advanced study opportunities are available to advance future careers.

2.3.1 LOCATION

Charged with delivering base operating support services to tenant commands, NSA Annapolis sits on 7.2 square miles of land, which includes 17 miles of waterfront on the Chesapeake Bay and Severn River and is the home to the U.S. Naval Academy . The Academy is bordered by the City of Annapolis and uses City and Anne Arundel County road networks for ingress and egress from Academy grounds. These shared assets present shared challenges and shared opportunities.

[12] *"FY2021 Defense Spending Maryland." DoD Office of Local Defense Community Cooperation. Accessed December 7, 2022. https://oldcc.gov/sites/default/files/FY2021%20Defense%20Spending_MD.pdf*

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2.3.2 MILITARY MISSION/OPERATIONS

The major tenants and commands that are part of NSA Annapolis include:

- The United States Naval Academy, which has educated midshipmen since 1845
- North Severn Complex, which houses armory practice ranges, berthing, and maintenance areas for training vessels
- NSA Annapolis Command Headquarters
- Naval Research Laboratory in Chesapeake Bay Detachment (located in Randle Cliff, MD)

2.3.3 MILITARY OPERATIONS

The resiliency threats to military operations are extreme weather events and environmental changes associated with climate change, such as flooding, tidal surge, and sea-level rise. There is concern regarding these impacts on water availability, stormwater, wastewater, energy supply, transportation, logistics, and communication infrastructure. The primary concern is flooding.

RESILIENCE PLANNING TEAM

Establishing a network to support resilience planning efforts is key to the development of impactful resilience actions. Convening the right people, organizations, and resources is essential to identify strategies and projects that are effective and enhance both community and military installation resilience, quality of life, and public safety. The military installation is always represented in an ex officio role to advise the community on perspectives of the installation and military operations.

The resilience planning team is typically comprised of individuals and organizations that work together to gather resources and data, contribute expertise, and help develop the path forward for the community through the representation of a broad range of interests. The resilience planning team for the Military Installation Resiliency Review includes a Policy Committee, which serves as the executive steering committee, and the Technical Committee, which represents a broader stakeholder group with technical expertise tasked with reviewing the vulnerabilities, risks, and development of resilience actions.

The Policy Committee is tasked with executing the planning process and coordinating efforts between the community and the installation while the Technical Committee contributes to the planning process through knowledge sharing and collaboration. A broader coalition of leaders, key stakeholders, entities, resources, data, regulators, and government officials, with a role or vested interest in advancing community and military installation resilience, also engaged with Stantec Subject Matter Experts (SMEs). The SME-led conversations identified and developed specific resilience project actions to address vulnerabilities and risks associated with identified priority critical assets to support infrastructure and services deemed important for resiliency of the City of Annapolis, Anne Arundel County, NSA Annapolis, and the surrounding region.

3.1 Policy Committee

The Policy Committee served as a steering committee to guide the planning process, coordinate efforts, and accept final project deliverables. The Policy Committee developed effective strategies to enhance resilience, promote quality of life and public safety. The Policy Committee worked together to gather resources, data, and contributed expertise to identify a path forward. The Policy Committee defined the geographic boundary of the study area. The Policy Committee defined networks of systems, infrastructure, service, and people needed to maintain both community and installation resilience.

Below is a list of the Policy Committee members:

City of Annapolis

- Jacqueline Guild, Deputy City Manager of Resilience & Sustainability, Committee Chair
- David Jarrell, Director, Department of Public Works
- Steve Rice, Economic Development Manager

Anne Arundel County

- Matt Power, Chief Administrative Officer
- Matthew Johnston, Environmental Policy Director
- Ben Birge, President/CEO Anne Arundel Economic Development Corporation

RESILIENCE PLANNING TEAM

NSA Annapolis

- CAPT Homer Denius, III, Commanding Officer, Ex Officio

Ex Officio Policy Committee Members

- Lisa A. Swoboda, Senior Director, Military & Federal Affairs, Maryland Department of Commerce
- Mark Crampton, Maryland Department of Transportation
- John E. Dulina, Liaison Officer, Maryland Emergency Management Agency

Elected Official

- Sarah K. Elfreth, Maryland State Senator

3.2 Technical Committee

The Technical Committee contributed to the resilience planning process through knowledge, expertise sharing, and collaboration. The Technical Committee represented technical subject matter experts. They interfaced with the consultant team to identify and gather data and resources to support the planning process.

Below is the list of the Technical Committee members :

City of Annapolis

- Eric Leshinsky, Chief of Comprehensive Planning, Department of Planning and Zoning
- Eric Borchers, Comprehensive Planner, Department of Planning and Zoning
- John Menassa, Floodplain Administrator, Department of Planning and Zoning
- Kevin Simmons, Director, Office of Emergency Management
- Dave Mandell, Deputy Director, Office of Emergency Management
- Marcia Patrick, Assistant Director, Department of Public Works
- Michael Johnson, Director, Department of Public Works
- Lisa Grieco, Civil Engineer II, Department of Public Works
- Thora Burkhardt, Civil Engineer II/Utility Engineer, Department of Public Works
- Betsey McKeown, Civil Engineer II, Department of Public Works
- Raycine Hodo, Environmental Programs Coordinator, Office of the City Manager
- Kwaku Agyemang-Duah, Deputy Director, Department of Transportation

Anne Arundel County

- Sam Snead, Transportation Officer, Department of Transportation
- Steve Kaii-Ziegler, Director of Planning and Zoning
- Chris Phipps, Director, Department of Public Works
- Jay Leshinski, Floodplain Manager

NSA Annapolis

- Gail Kenson, Regional Community Planning Liaison Officer, Ex Officio
- Joshua Theisen - Emergency Management Officer, Ex Officio
- Zoe Johnson, Community Planning Liaison Officer, Ex Officio

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3.3 Environmental Working Group

The Environmental Working Group was created as an additional opportunity to engage stakeholders with subject matter expertise around environmental topics. The goals of the group were to identify relevant environmental assets and resources, participate in the resilience planning process, identify nature-based solutions if appropriate, and provide input in preparation of the Resilience Action Plan. The Environmental Working Group shared key data sources, identified environmental areas of concern, and identified relevant existing and future projects.

Below is the list of the Environmental Working Group Members:

City of Annapolis

- Jacqueline Guild, Esq., Deputy City Manager for Resilience & Sustainability; Chair, Policy Committee and Environmental Working Group
- Eric Leshinsky, Chief, Comprehensive Planning, Department of Planning and Zoning
- Rob Savidge, Alderman, Chair of Environmental Committee, City Council
- Randy Rowel, Chair, Environmental Commission
- Bevin Bucheister, Environmental Commission
- John Menassa, Flood Plain Administer
- Shawn Wampler, GIS Coordinator

Anne Arundel County

- Michael Stringer, Senior Planner

NSA Annapolis

- Zoe Johnson, Community Planning Liaison Officer, Ex Officio
- Justin Barlow, Installation Environmental Program Director, Ex Officio

Maryland Department of Natural Resources

- Nicole Carlozo, Planner

Maryland State Senator's Office

- Sarah Elfreth, Senator
- Dylan Behler, Chief of Staff

Federal

- Johnathan Watson, NOAA Fisheries, Greater Atlantic Regional Fisheries Office, NOAA Chesapeake Bay Office
- Wendy O'Sullivan, Chesapeake Superintendent, NPS

Private/Non-profits/Other

- Joanna Ogburn, Principal, JBO Conservation, LLC
- Joel Dunn, President/CEO, Chesapeake Conservancy
- Sarah Knebel, Executive Director, Scenic Rivers Land Trust
- Elvia Thompson, Former President, Annapolis Green
- Sara Caldes, Severn Riverkeeper, Severn Riverkeeper
- Tom Guay, Executive Director, Severn Riverkeeper
- Jim Burdick, Chairman/City Rep, Severn Riverkeeper
- Laura Todd, Green Infrastructure PM, Alliance for the Chesapeake Bay
- Suzanne Etgen, Executive Director, Watershed Stewards Academy

RESILIENCE PLANNING TEAM

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The purpose of stakeholder engagement is to broaden the understanding of the complex issues facing the community of Annapolis while also ensuring that various critical perspectives are incorporated during the project's execution.

Engagement was focused on specific staff at both the City of Annapolis and NSA Annapolis as well as a select group of Policy Committee and Technical Committee members (see Section 3 Resilience Planning Team), the Environmental Working Group, the Transportation Working Group, and identified critical asset owners/operators.

The objective of the stakeholder engagement was twofold:

- Ensure the accurate capture of relevant community infrastructure information including asset data
- Evaluate and assess interim deliverables, providing direction and focus to the project's execution

The timelines and content of each round of engagement are detailed in the following

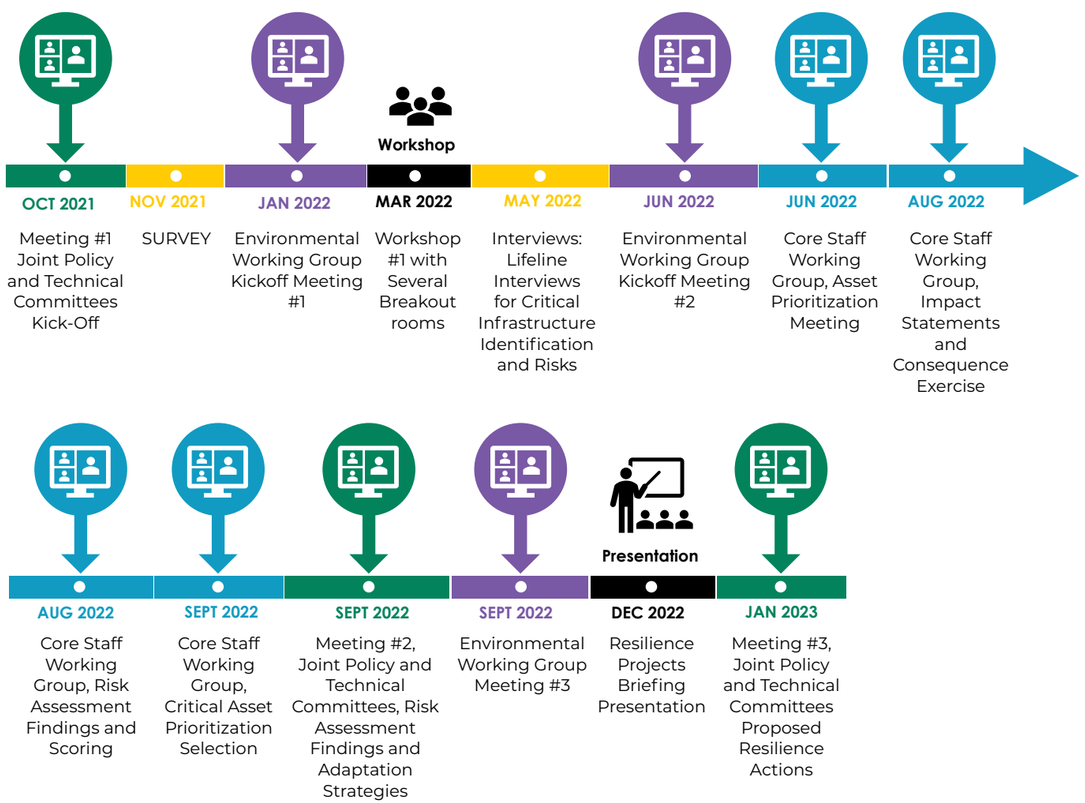

Figure 4.1: Timeline of Project and Stakeholder Engagement

subsections, and Figure 4.1 provides a visual overview.

4.1 Survey

In November 2021, a survey was released to the Policy and Technical Committee members and key stakeholders. Survey responses supported the development of a preliminary list of hazards (natural and man-made) and critical community assets or programs to include in the study's vulnerability and risk assessments. Stantec used the results throughout the resilience study process to prioritize assets and hazards.

There were 49 survey responses:

- 20 survey responses – City of Annapolis
- 15 survey responses – Anne Arundel County
- 14 survey responses – NSA Annapolis / USNA
- 4 survey responses – State of Maryland

The results helped identify hazards of concern to the community and base as well as initial understandings of critical assets to the community. After identifying the top hazards of interest and shared relevance, the list of 25 hazards was initially reduced to five hazards: Flood (coastal, high wave), Coastal Erosion / Sea-Level Rise, Hurricanes and Tropical Storms, Cybersecurity Threats, and Infectious Disease Outbreaks.

Respondents were asked to select three hazards presenting the greatest threat to the City/County and the installation. They were asked to select their three highest concerns for both current hazards (Figure 4.2) and for future hazards (Figure 4.3). The hazard selections were closely aligned across current or future time frames and for both the installation and the City/County.

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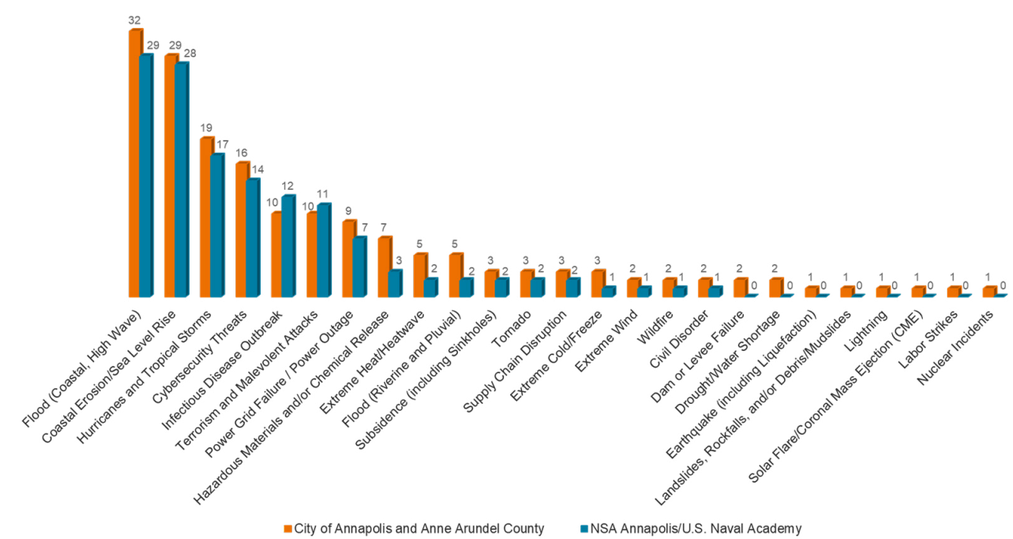

Figure 4.2: Survey Results - Current Hazards

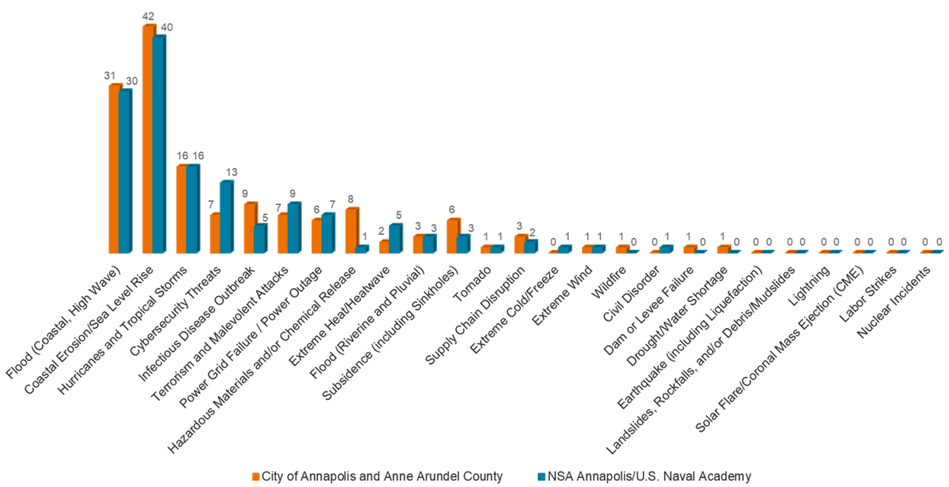

Figure 4.3: Survey Results - Future Hazards

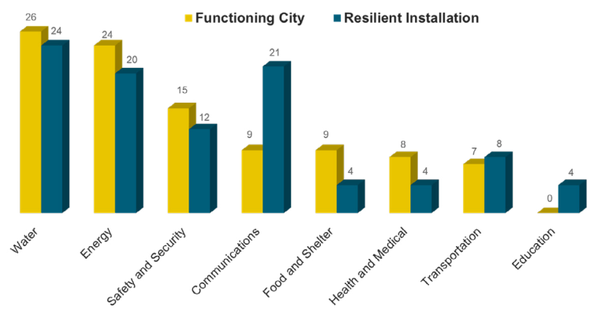

Figure 4.4: Survey Results - Community Lifelines

Another noteworthy survey question asked which FEMA Community Lifelines are most vital to maintaining a functioning city and/or resilient installation (Figure 4.4). Water and energy lifelines were ranked the highest to maintain both a functioning city and resilient installation. In fact, most lifelines closely aligned in their perceived vitality to maintain both a functioning city and resilient installation. One major exception to the shared prioritization values was the communications lifeline, with 21 respondents prioritizing communications for the installation, and 9 respondents prioritizing it for City/County. The core staff group working group attributed this to the daily criticality of maintaining, communicating, and coordinating national defense-related operations.

4.2 Virtual Workshop – Critical Lifeline Threats Findings

A virtual workshop was held on March 4, 2022, to present the survey results, refine the list of critical assets, and gain consensus of the top hazards. The Policy Committee, Technical Committee, Environmental Working Group, Transportation Working Group, and additional regional stakeholders participated in the workshop.

The first half of the workshop provided a project overview, reviewed survey results (see Section 4.1), and described the hazards, with a greater focus on the most consequential hazards per the survey. A broad request for data was also made. Stantec introduced the concept of criticality, defined Critical Assets (Figure 4.5) for the purposes of this project, and introduced FEMA Community Lifelines (see Glossary and Section 5.1). This set the stage for a collaborative discussion on asset and program criticality, and the nexus of community, installation, and regional stakeholders.

Critical Assets are those whereby loss of functionality could lead to:

1. Loss of life
2. Serious injury
3. Threatened safety
4. Public health impacts
5. Quality of life reduction (e.g., long-term economic impacts)
6. Adverse impacts to installation, mission assurance, and readiness
7. Outside the installation boundary

Participants joined one of eight breakout rooms for the second half of the workshop. The City pre-assigned rooms based on stakeholder area of expertise and to engage a broad group of participants in

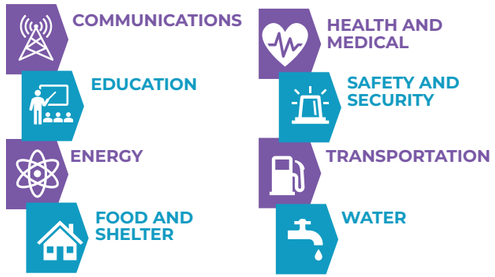

Figure 4.5: FEMA Community Lifelines

each room. The intent of the workshop was to identify the appropriate critical assets and programs by specific name and location falling within each Community Lifeline. Stantec facilitators guided the conversation, collecting asset-specific information while removing some assets from the list and adding others based on stakeholder experience. Following the 60 minutes of discussion, all breakout rooms reconvened and reported notable points from their discussion.

This process helped remove duplicates, identify follow-up points of contact, and gain clarity and a common understanding amongst participants of the goal of the asset identification process.

4.3 Community Lifeline Interviews

From late spring through early summer in 2022, Stantec hosted six interviews structured around the Community Lifeline groups, with around 30 participants from across Annapolis, Anne Arundel County, NSA Annapolis, and other local subject matter experts. Each interview group was kept small with a representative invited from the City, County, NSA Annapolis, and the specific asset. Two Community Lifeline groups were combined on two occasions

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for efficiency and because multiple stakeholders had relatable experience across both lifelines—Education and Food/Shelter, and Communications and Safety/Security.

- Transportation – May 10, 2022
- Health and Medical – June 10, 2022
- Water – May 12, 2022
- Energy – August 2, 2022
- Education, Food and Shelter – April 29, 2022
- Communications, Safety and Security – May 19, 2022

These interviews provided consequential and detailed information about specific infrastructure, processes, organizations, and asset operators. The goals were to:

1. Prioritize a list of critical assets collected to date and add any missing assets;
2. Identify any missing data sources;
3. Provide locations and more specificity for key assets; and
4. Introduce any potential resilience and risk reduction project ideas.

Participants were asked to collectively review the existing list of identified critical assets through a live web map, and rank their criticality as high, medium, or low (see Figure 4.6 from the Education, Food & Shelter call). The Community Lifeline Interviews resulted in a ranked list of 71 critical assets having "high" critically per the project guidelines.

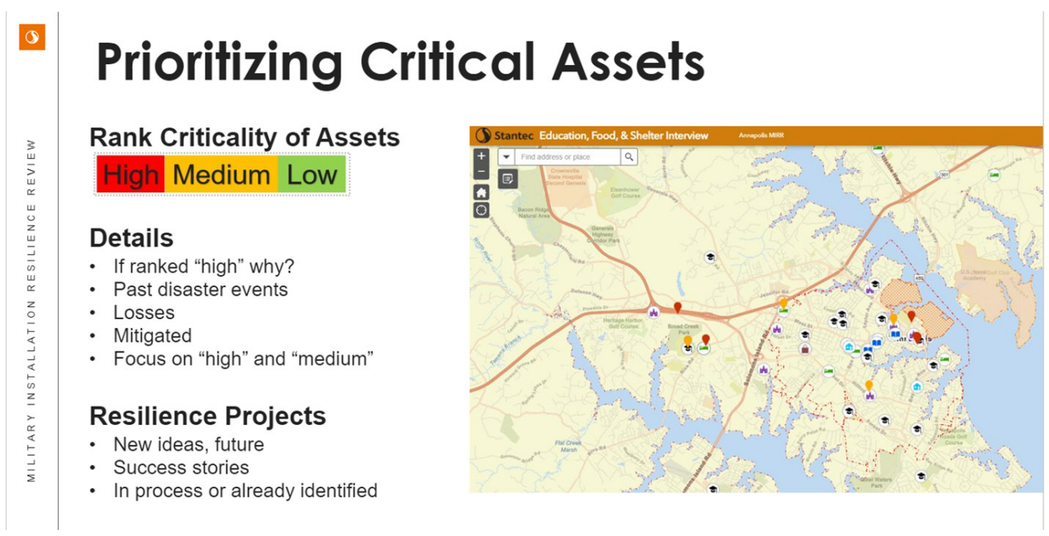

Figure 4.6: Education, Food & Shelter Interview Web Map

4.4 Core Staff Working Group Meetings

The Core Staff Working Group convened, as needed, between larger stakeholder meetings to make key decisions and to provide feedback. The following provides an overview of three of these meetings.

4.4.1 ASSET PRIORITIZATION – JUNE 30, 2022

The purpose of the June 30th Core Staff Working Group meeting was to share the results from the Community Lifeline Interviews; recommend ways to further refine, reduce, and rank critical assets; and share exposure maps of all identified critical assets for the first time.

A critical asset locator map showed the locations of all 175 critical assets (excluding energy), with 71 ranked "high" during the Community Lifeline Interviews. To further refine the list with the end goal to identify resilience actions, City staff directed Stantec to prepare initial recommendations. Stantec recommended a total of 35 critical assets for further consideration based on the following factors:

- The critical asset provides the most basic life-safety services.
- A resilience action/project was already identified by stakeholders.
- Include a variety of critical assets from multiple sectors (e.g., emergency response, community support, necessary utilities, first responder support).
- Include critical assets that utilize a diverse span of solutions across procedures, operations, networks, and facilities. One example of a nonstructural critical asset (procedure) is the relationship between City/County/Capitol police and National Guard for federal events or a mass shooting.
- The assets were referenced in other plans (e.g., capital improvement plan, hazard mitigation plan).

The original meeting goal was to take the list of 35 critical assets and identify 15–20 for inclusion in the next phase of the risk assessment while acknowledging that energy-related assets would be added after successfully connecting with Baltimore Gas and Electric. Through a group conversation, some assets were added back to the list, and others were omitted.

Exposure maps displaying projected sea level rise were shared for the first time. The below map is one example of the 12 maps that visualize sea level rise at current day, the year 2050, and the year 2100, and across four separate geographic scales and locations. All 12 maps are found in Appendix D. Blue represents areas inundated by the projected high tide and magenta represents the areas inundated by high tide with the addition of the 1-percent annual chance flood. More details about the sea level rise model methodology are found in Appendix C.

The visualization of projected sea level rise immediately altered the discussion about potential impacts to critical assets. Seeing that parts of the community would be impacted on daily basis from high tide shifted the focus to different assets with consideration for systems planning and secondary impacts (e.g., access sewer infiltration).

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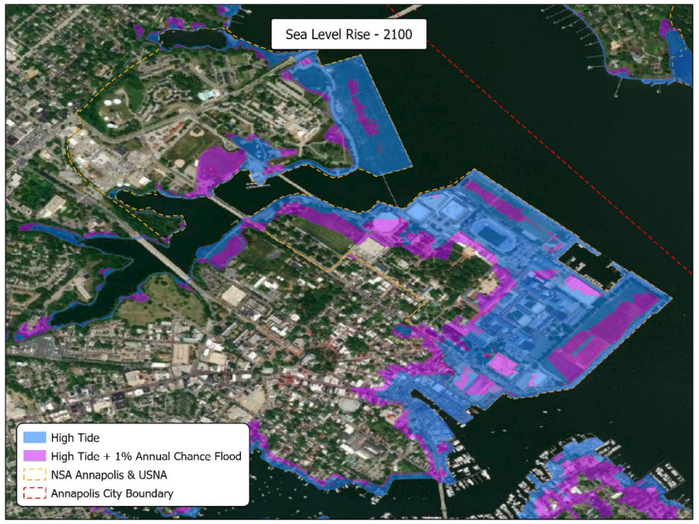

Figure 4.7: Sea Level Rise (2100)

Impact Statements

Critical Asset **x** Hazard Event **= Impact**

Revised Impact Statements	Coastal Flood	Infectious Disease
City Dock	Road closures impact ingress/egress to City Dock area. Water damage to buildings and contents. Business closures. Underground utilities compromised, with seawater infiltration into sewer system.	Shelter in place measures may force retail/restaurant to close. Social distancing measures could affect normal operations. Staff my have reduced numbers due to infections.
Anne Arundel Health Department	Asset likely not exposed to hazard; however Environmental Health Bureau has increased demands as responsible office for inspections of pump stations and wells. Also required to inspect food/restaurant facilities before reopening, causing a shortage in access to food.	Health Department becomes major component of day-to-day operations. Requires increased work hours and expanded services, while managing a potentially reduced staff. Staff diverted to support mass clinics and testing, and coordinate with hospitals serving as conduit between local and state (ESF8).

Figure 4.8: Impact Statements Examples

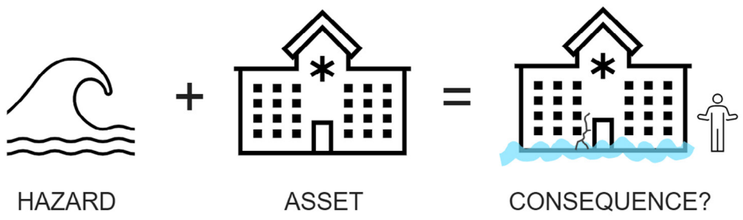

Figure 4.9: Consequence Equation

STAKEHOLDER ENGAGEMENT

4.4.2 IMPACT STATEMENTS AND CONSEQUENCE EXERCISE – AUGUST 12, 2022

The purpose of the August 12th Core Staff Working Group meeting was to introduce impact statements and consequence scoring as part of the overall risk assessment process. Stantec provided a tutorial about reviewing draft impact statements or developing alternative ones for each asset/hazard combination, and how to assign consequence scores. Impact statements summarize how an asset could be or has been impacted by a specific hazard (Figure 4.8). Every combination of critical asset and relevant hazard was considered if the asset was identified as exposed to the specific hazard. Stantec provided draft impact statements as a starting point, based on information shared during the variety of stakeholder meetings and industry knowledge of potential hazard impacts. Most impact statements remained unchanged, but some were fully rewritten by City, County, or NSA Annapolis staff, as necessary.

Consequence measures the degree of severity of the outcome if an asset were impacted by a hazard. In other words, how bad would it be? (see Figure 4.9) When selecting a consequence class, factors evaluated included potential physical damage, operations and maintenance, and service delivery. Figure 4.10 provides a summary of the consequence classes, their descriptions, and the associated score. The exercise required participants to score the consequences of impact statements for their applicable assets using the five-point scale.

Score	Class	Consequence Description
0	Very low	• No effects
1	Low	• Measurable but cosmetic effects • Costs handled within normal budgeting for entity • Correctible using operations and maintenance practices
2	Minor	• Some extra costs to repair but can be covered within current operations and capital budgets • Routine operations for minor incidents; community and assets have capacity to meet demand • Asset or service is still operable and accessible, although minor service disruption may be possible • Slightly reduced ability to perform scheduled maintenance
3	Moderate	• Manageable asset or service damage but repair costs may be beyond current operations and maintenance and capital budgets • Asset or service still operable but some access limited • Brief service disruption may be possible; asset design capacity being reached
4	Major	• Heavy burden on internal resources of the entity to repair or service assets • Significant threat to installation mission critical readiness • Asset or service still operable but accessibility limited • Lengthy service disruption; assets or services operating below capacity for lengthy periods of time
5	Catastrophic	• Loss of life, property, mobility, access to emergency services, or power • Loss of installation mission critical readiness • Complete asset or service replacement due to hazard severity • Need for outside emergency funding (FEMA disaster declaration) • Significant service disruptions may be possible, requiring alternate service delivery • No access to assets

Figure 4.10: Consequence Classes

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4.4.3 RISK ASSESSMENT FINDINGS AND SCORING - AUGUST 22, 2022

The purpose of the August 22nd Core Staff Working Group meeting was to provide a comprehensive overview of the risk assessment methodology, share the risk assessment results, and review the assets at highest risk to determine which ones to carry forward and include in the Resilience Action Plan.

The Risk Assessment Matrix (Figure 4.11) is the evaluation tool used to both classify and compare relative risk to each individual asset. More information about the mechanics of the matrix is described in Section 5. From the original 175 assets (excluding energy), with a few additions during the iterative process, a total of 28 total assets were recommended to be evaluated with every hazard-asset combination across all eight lifelines, totally 336 unique risk scores (Figure 4.11).

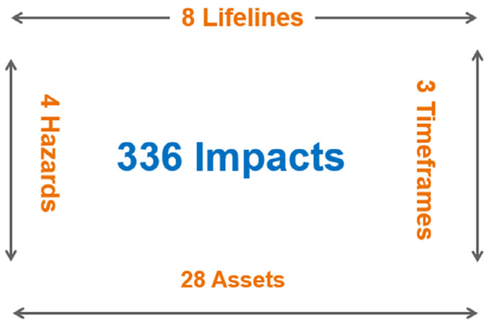

Figure 4.11: Total number of unique risk scores

Consequence							
	Catastrophic	5	5 (Shock)	10	15	20	25
	Major	4	4	8	12	16	20
	Moderate	3	3	6	9	12	15
	Minor	2	2	4	6	8	10
	Insignificant	1	1	2	3	4	5 (Stress)
			1	2	3	4	5
			Rare	*Unlikely*	*Possible*	*Likely*	*Almost Certain*
			Likelihood				

Risk Levels:	Shock/Stress	Low	Medium	High

Figure 4.12 (above): Risk Assessment Matrix
Figure 4.13 (following two pages): Highest Risk Critical Assets

Asset Name	Hazard	Time Frame	Exposure	Likelihood	Consequence	Risk Score	Risk Class
KEY NSA ACCESS ROADS	Coastal Flood	2050	1	1	5	5	Shock
CITY SEWAGE TREATMENT PLANT	Coastal Flood	2022	1	3	5	15	High
CITY SEWAGE TREATMENT PLANT	Coastal Flood	2050	1	4	5	20	High
CITY SEWAGE TREATMENT PLANT	Coastal Flood	2100	1	5	5	25	High
CITY SPS 2ND STREET	Coastal Flood	2050	1	5	4	20	High
CITY SPS 2ND STREET	Coastal Flood	2100	1	5	4	20	High
CITY DOCK	Coastal Flood	2022	1	3	5	15	High
CITY DOCK	Coastal Flood	2050	1	5	5	25	High
CITY DOCK	Coastal Flood	2100	1	5	5	25	High
KEY NSA ACCESS ROADS	Hurricanes and Tropical Storms	2022	1	3	5	15	High
KEY NSA ACCESS ROADS	Hurricanes and Tropical Storms	2050	1	3	5	15	High
KEY NSA ACCESS ROADS	Hurricanes and Tropical Storms	2100	1	3	5	15	High
COUNTY WATER TREATMENT PLANT BROAD CREEK	Hurricanes and Tropical Storms	2022	1	3	5	15	High
COUNTY WATER TREATMENT PLANT BROAD CREEK	Hurricanes and Tropical Storms	2050	1	3	5	15	High
COUNTY WATER TREATMENT PLANT BROAD CREEK	Hurricanes and Tropical Storms	2100	1	3	5	15	High
COUNTY WATER TREATMENT PLANT ARNOLD	Hurricanes and Tropical Storms	2022	1	3	5	15	High
COUNTY WATER TREATMENT PLANT ARNOLD	Hurricanes and Tropical Storms	2050	1	3	5	15	High
COUNTY WATER TREATMENT PLANT ARNOLD	Hurricanes and Tropical Storms	2100	1	3	5	15	High

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CITY SEWAGE TREATMENT PLANT	Hurricanes and Tropical Storms	2022	1	3	5	15	High
CITY SEWAGE TREATMENT PLANT	Hurricanes and Tropical Storms	2050	1	3	5	15	High
CITY SEWAGE TREATMENT PLANT	Hurricanes and Tropical Storms	2100	1	3	5	15	High
MULTIPLE PHYSICAL ASSETS	Cybersecurity	2050 - 2100	1	4	4-5	16/20	High
DISPATCH CITY	Infectious Disease	2050	1	4	4	16	High
DISPATCH CITY	Infectious Disease	2100	1	4	4	16	High
EMERGENCY FOOD	Infectious Disease	2050	1	4	4	16	High
EMERGENCY FOOD	Infectious Disease	2100	1	4	4	16	High
ANNE ARUNDEL MEDICAL CENTER	Infectious Disease	2050	1	4	4	16	High
ANNE ARUNDEL MEDICAL CENTER	Infectious Disease	2100	1	4	4	16	High
ANNE ARUNDEL HEALTH DEPARTMENT	Infectious Disease	2050	1	4	4	16	High
ANNE ARUNDEL HEALTH DEPARTMENT	Infectious Disease	2100	1	4	4	16	High

4.5 Meeting #2: Risk Assessment Findings

In September 2022, Stantec presented the risk assessment results to the Technical and Policy Committee members for review. The purpose of Meeting #2 was to review the risk scores, identify whether any at-risk assets were outliers or surprises to the committees, and gain consensus on the Core Staff Working Group's selection of seven assets (Figure 4.13) to move forward for project development with the Subject Matter Experts (SMEs). The list of assets in Figure 4.13 present the names used during the September meeting, which was later revised in the final Resilience Action Plan. Cybersecurity was atypical from the other six prioritized assets; more closely representing a hazard that impacted multiple physical assets. Energy assets were not included in the list of seven, while awaiting input from Baltimore Gas and Electric.

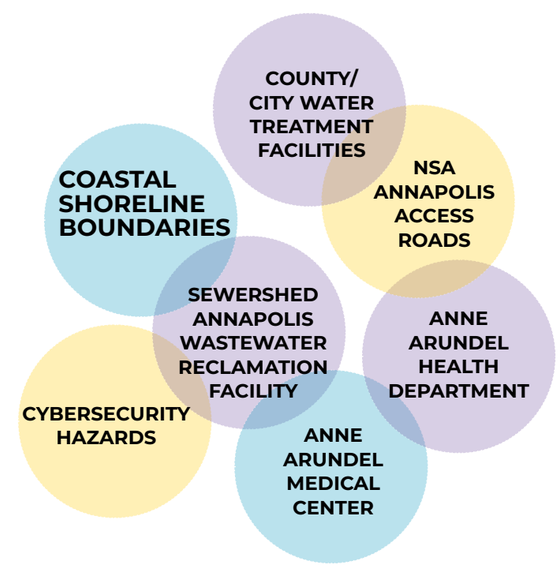

Figure 4.14: Seven assets selected by the Core Staff Working Group at the September 2022 meeting

4.6 Subject Matter Experts Interviewing Asset Owners

Planning for and designing infrastructure and systems improvements requires expertise in resiliency solutions with specific understanding of how climate change factors may influence a solution's future viability. Resilient actions span a huge scale of options—from feasibility studies to interagency agreements to capital improvement plans; from a single piece of stationary infrastructure (e.g., generators) to entire facilities; and from a piece of electrical equipment to software to comprehensive nature-based solutions. To develop recommended resiliency actions and project design concepts for the identified priority critical assets, Stantec engaged our experienced SMEs to interface directly with the experienced asset owners/operators to delve deeper into understanding specific asset vulnerabilities and prepare proposed resilience actions and projects. The SMEs represented expertise focused on the following topics: resilient coastal design, wastewater design and operations, transportation and roadway flooding, emergency management, cybersecurity, energy delivery and reliability, and water delivery and treatment.

Each Stantec SME team engaged directly with the identified asset owners/operators using a step-by-step process to guide the interview process, identify specific issues associated with the asset, and develop resilience actions, including potential funding sources, to address the vulnerabilities and risks. This step-by-step process for each Priority Critical Asset is noted below.

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- Step 1 – Collect Background Information
- Step 2 – Identify Responsible Parties
- Step 3 – Identify Timeline to Carry Out Action
- Step 4 – Identify Potential Funding Sources
- Step 5 – Develop Action Plan Tasks
- Step 6 – Identify Public Support / Co-Benefits
- Step 7 – Identify Alternatives Considered
- Step 8 – Provide Supplemental Documents/Files

4.7 Resilience Actions Briefing

In December of 2022, Stantec Subject Matter Experts (SMEs) presented the resilience project actions to the Core Staff Working Group. The meeting began with an overview of the assessment process including establishing climate scenarios, identifying critical assets and programs, selecting hazards to consider, scoring consequences and assessing risks, and ultimately identifying projects and preparing for implementation.

Stantec SMEs presented the resilience project actions for the following eight critical assets:

- Coastal Shoreline Boundaries
- NSA Annapolis Access Roads
- Annapolis Water Reclamation Facility
- Energy (substations, transmission and distribution)
- Cybersecurity
- City/County Water Treatment Facilities
- Anne Arundel County Department of Health
- Luminis Health Anne Arundel Medical Center

For each of the assets, Stantec described the vulnerability addressed, contextual information from conversations with asset operators/owners, and potential solutions. The information shared at this meeting informed the Resilience Action Plan.

4.8 Meeting #3: Proposed Resilience Actions

The purpose of the January 26, 2023 meeting was to share the proposed resilience actions with the Policy and Technical Committees, and create the opportunity for Stantec SMEs to present the same findings from the December Core Staff Working Group with the Policy and Technical Committees. In addition, Stantec provided a briefing of the Traffic Signalization Study, and Stantec's North American Funding Program team offered a preview of the funding analysis to accompany the Resilience Action Plan.

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RISK ASSESSMENT

The culmination of the previous sections results in the final risk assessment, where assets and programs that are difficult to compare due to their different qualities can be ranked to identify the greatest risks to the defense community and the installation. A Risk Score was developed for each hazard-asset interaction by multiplying the consequence and likelihood scores following the equation:

Risk Score = Likelihood Score x Consequence Score

Likelihood Score: An estimate of the probability of occurrence of a particular hazard.

Consequence Score: Semi-quantitative estimates that characterize the severity of impact if a particular asset were impacted by a hazard.

To account for a changing climate, risks were evaluated for three separate time periods: the baseline (1961–1990), mid-century (2035–2064), and end of century (2070–2100). The condition of assets into the future is assumed to be well maintained and thus will provide a similar level of resilience to hazards (i.e., consequences do not change with time). The risk matrix classification applied is shown in Table 8, which includes Low, Medium, High, Shock (high consequence/low likelihood), and Stress (low consequence/high likelihood) classes.

5.1 Identify Critical Assets and Programs

The first step to estimating risk for the City of Annapolis was to identify critical assets that could be impacted by hazards using FEMA's Community Lifelines.

Consequence	*Catastrophic*	5	5 (Shock)	10	15	20	25
	Major	4	4	8	12	16	20
	Moderate	3	3	6	9	12	15
	Minor	2	2	4	6	8	10
	Insignificant	1	1	2	3	4	5 (Stress)
			1	2	3	4	5
			Rare	*Unlikely*	*Possible*	*Likely*	*Almost Certain*
			Likelihood				

Risk Levels:	Shock/Stress	Low	Medium	High

Figure 5.1: Risk Assessment Matrix

FEMA defines Community Lifeline as an asset, service, or capability that "enables the continuous operation of critical government and business functions and is essential to human health and safety or economic security." Given the list of Community Lifelines, survey respondents were asked to identify assets that are critical to the community and the installation. For this project, critical asset was defined as an asset that if it were to malfunction could lead to at least one of the following adverse outcomes: loss of life, serious injury, health impacts, deterioration in quality of life, or threatened safety (see Section 4.2).

Figure 5.2: FEMA Community Lifelines

Survey respondents provided a list of 220 assets to consider when evaluating criticality. These assets were then screened to identify duplicates and were categorized into lifeline subclasses (these subclasses defined by the project team), which characterized the types of assets included in each lifeline category.

Asset criticality was then revaluated during Meeting #1, Community Lifeline Interviews, and regular Staff Core Team meetings. The various meetings provided an opportunity for stakeholders to discuss details about asset condition, relevant hazards, past

Lifeline
Communications
Education
Energy
Food and Shelter
Health and Medical
Safety and Security
Transportation
Water

Lifeline Subclass
Air
Backup power
Communication admin
Drinking water supply
Emergency management
Emergency services
Energy admin
Energy distribution
First responders – H+M
First responders – S+S
Food
Fuel
Installation security
Internet
Major health center
Power generation
Private health provider
Private schools
Public schools
Radio
Road
Safety admin
Shelter
Stormwater
Telephone
Wastewater
Health admin

Figure 5.3: Lifeline Classes and Subclasses

impacts, and potential adaptation projects, including any existing renovation or upgrade projects. Some new assets were added during the workshops and some assets were removed from the list due to privacy concerns from the asset owner, or because the assets were not exposed to the hazards. Upon completion of this process, a total of 28 separate critical assets were identified and taken forward for the risk assessment.

The following is a list of the critical assets that were carried forward into the risk assessment in this study.

Communications
Dispatch City
Dispatch County
Emergency Public Notification
Cellular Network
Energy
BGE Substation at USNA Gate 10 (Upper Yard)
BGE Cedar Park Substation
Food and Shelter
Emergency Shelters
Emergency Food
Health and Medical
Luminis Health Anne Arundel Medical Center
Anne Arundel Department of Health
Safety and Security
EOC City
EOC County
Fire Department City
Fire Department County
Fire Department NSA Annapolis
Transportation
Key NSA Annapolis Access Roads
Evacuation Plan
Bridges
Fuel Supply
Water
City Dock / Coastal Shoreline
City Sewer Pumping Station 2nd Street
City Sewer Pumping Station Belmont
Annapolis Water Reclamation Facility
County Water Treatment Plant Arnold
County Water Treatment Plant Broad Creek
County SPS Jennifer Road
Water Supply NSA Annapolis
Watersheds / Natural Flood Storage

Figure 5.4: List of Critical Assets carried forward into the Risk Assessment

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5.2 Hazard Likelihood Scoring

A hazard is an event that may cause an impact to an asset. This study considered natural and manmade hazards as well as acute and chronic hazards. Natural hazards considered in this study include drought, earthquake, extreme heat, extreme wind, flood, and wildfire. Manmade hazards considered in this study include cybersecurity, power grid failure, supply chain disruption, terrorism, and infectious disease.

The initial list of hazards was developed through consultation with the 2018 City of Annapolis Hazard Mitigation Plan and the 2018 Anne Arundel County Hazard Mitigation Plan as well as broader best practice lists for consultation. This list was reviewed and included in the survey, along with input from the Policy Committee, Technical Committee, and the Environmental Working Group. Using the feedback from both, the draft hazard list was finalized for inclusion in the exposure analysis and later the risk assessment.

Chronic hazards are those that gradually impact assets over a longer period (e.g., years to decades) or occur regularly on an annual basis, compared to short-term, acute hazards (e.g., hours to days) that occur once every few years, or more rarely. To address chronic hazards, it is important to consider how these events will change in the future because they can have significant impacts on assets and people over time. Instead of looking at the probability of occurrence of a hazard event, relative changes in frequency compared to the baseline period are used to evaluate chronic hazard likelihoods (Figure 5.5).

Acute hazards are those that impact assets over a relatively short period (e.g., hours to days) compared to chronic hazards (e.g., years to decades). Since acute hazards occur less frequently (rarer) than chronic hazards, the hazard likelihood is evaluated based on the annual exceedance probability (Figure 5.6).

Score	Change in Event Frequency/ Intensity	Qualitative Descriptor
1	>50% decrease compared to baseline	Likely to occur much less frequently than current climate
2	10-50% decrease compared to baseline	Likely to occur slightly less frequently than current climate
3	Within +/-10% compared to baseline	Likely to occur about as frequently as in the current climate
4	10-50% increase compared to baseline	Likely to occur slightly more frequently than current climate
5	>50% increase compared to baseline	Likely to occur much more frequently than current climate

Figure 5.5: Climate hazard likelihood scores for Chronic Hazards

Likelihood Score	Descriptor	Annual Recurrence Interval	Annual Exceedance Probability (AEP)
1	Rare	Greater than 1:100 years	0-1%
2	Unlikely	1:20 to 1:100 years	1-5%
3	Possible	1:6.5 to 1:20 years	5-15%
4	Likely	1:2 to 1:6.5 years	15-50%
5	Almost Certain	Less than 1:2 years	50-100%

Figure 5.6: Climate hazard likelihood scores for Acute Hazards

With the exception of coastal flood, hazard likelihoods were estimated for each hazard using data from climate projections and other resources, providing average values over 30-year periods for three time horizons: **current baseline period (1961–1990), mid-century (2035–2064), and the end-the-century (2070–2100).** This approach provides a more comprehensive estimate of the changing likelihood to various hazards in the future and covers a sufficient period of time to allow for capital planning timelines and large infrastructure renewal.

Hazard likelihoods are quantified based on an "Indicator" parameter. Indicator thresholds are defined for each hazard to identify when assets are likely to be impacted. The annual probability of an indicator exceeding the threshold is referred to as the Annual Exceedance Probability (AEP), which is used to estimate climate hazard likelihood used in the risk assessment. As noted above, we consider the relative change in annual exceedance probability (or frequency) for chronic hazards and the absolute annual exceedance probability for acute hazards.

Figure 19: Summary of likelihood scores assigned for each of the hazards addressed in this study for the baseline, mid-century, and end-of-century periods.

Coastal flood likelihood was estimated at three future time horizons: 2050, 2065, and 2100. Stantec, in consultation with the City of Annapolis, Anne Arundel County, and NSA Annapolis, selected these three time horizons . The 2065 time horizon was selected for consistency with the DoD requirement for military installations.

The following subsections outline the hazards addressed in this study and provide a rationale for the assigned likelihood scores.

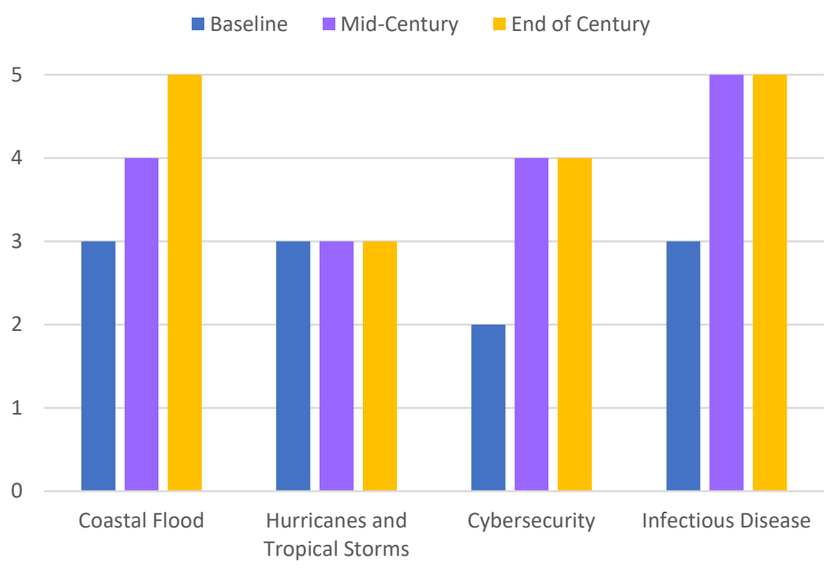

Figure 5.7: Hazard likelihoods for each hazard over three time horizons, Baseline, Mid-Century, and End-of-Century.

SOURCES:

Historical Data (NCEI, NOAA, FEMA, MDH)

Climate Projections (NOAA, MDH, USGCRP, GFDL)

Cybersecurity J100/EPA

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5.2.1 COASTAL FLOODING

For this project, coastal flooding includes chronic coastal flooding, high wave flooding, and sea level rise. Sea level rise is a chronic natural hazard that can also have acute incidents in relation to storms . The survey originally separated this hazard into two separate hazards: Flood (Coastal, High Wave) and Coastal Erosion / Sea level rise. Coastal erosion data from the Maryland Department of Natural Resources was used to assess the threat to the community and critical facilities. Figure 15 shows the coastal erosion data along with 0.1-mile buffers created around any shoreline segments that were attributed as having moderate or high erosion levels. The buffers were created to capture any critical assets that were at risk to coastal erosion. As shown in Figure 5.8, none of the identified critical assets were within 0.1 mile of a shoreline segment identified as having moderate or high erosion. Furthermore, nearly all the shoreline within the City boundary and along NSA Annapolis boundaries is identified as protected, meaning shoreline hardening structures have been constructed to limit coastal erosion. These findings, paired with the unpredictability of future coastal erosion due to increased sea level rise, led the project team to focus primarily on the impacts of sea level rise.

The sea level rise hazard poses the greatest threat to the City of Annapolis and NSA Annapolis. This was reflected in the survey results, which ranked sea level rise as the second-highest-rated threat for the current timeframe and was the highest-rated threat for the future timeframe.

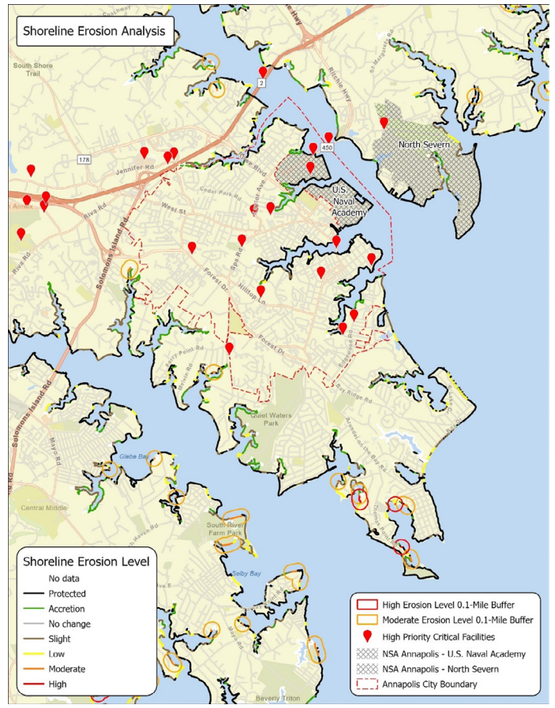

Figure 5.8: Shoreline erosion analysis of the City of Annapolis and surrounding area.

These survey results were supported by an exposure analysis process that modeled projected sea level rise to analyze the threat posed to identified critical assets. To model projected sea level rise, a digital elevation model (DEM), based on 2020 LiDAR data, was downloaded from the Maryland Geographic Information Office. The data represents the most recent and accurate model of the topography of Annapolis and the surrounding area. This data was paired with NOAA sea level Rise

projections published in 2022. Sea level rise is measured using two methods: SLR Increment – the measurement of how much the sea level will rise, and Mean Higher High Water (MHHW) – the average of the higher high-water surface elevation for each tidal day (high tide). As shown in Table 5 below, in 2100, the MHHW is projected to be 6 .07 higher than the base 1992 Mean Sea Level (MSL).

The NOAA 2022 intermediate high elevation projections for the day-to-day high tides and a 100-year storm scenario were applied to the 2020 LiDAR data to create outlines for areas at risk. These mapped areas of risk are shown in Figure 5.10–Figure 5.13.

Annapolis SLR Projections		
Timeframe	*SLR Increment (FT)*	*MHHW (FT relative to MSL)*
2050	1.6	2.36
2065	2.54	3.26
2100	5.35	6.07

Figure 5.9: 2022 NOAA sea level rise projections.

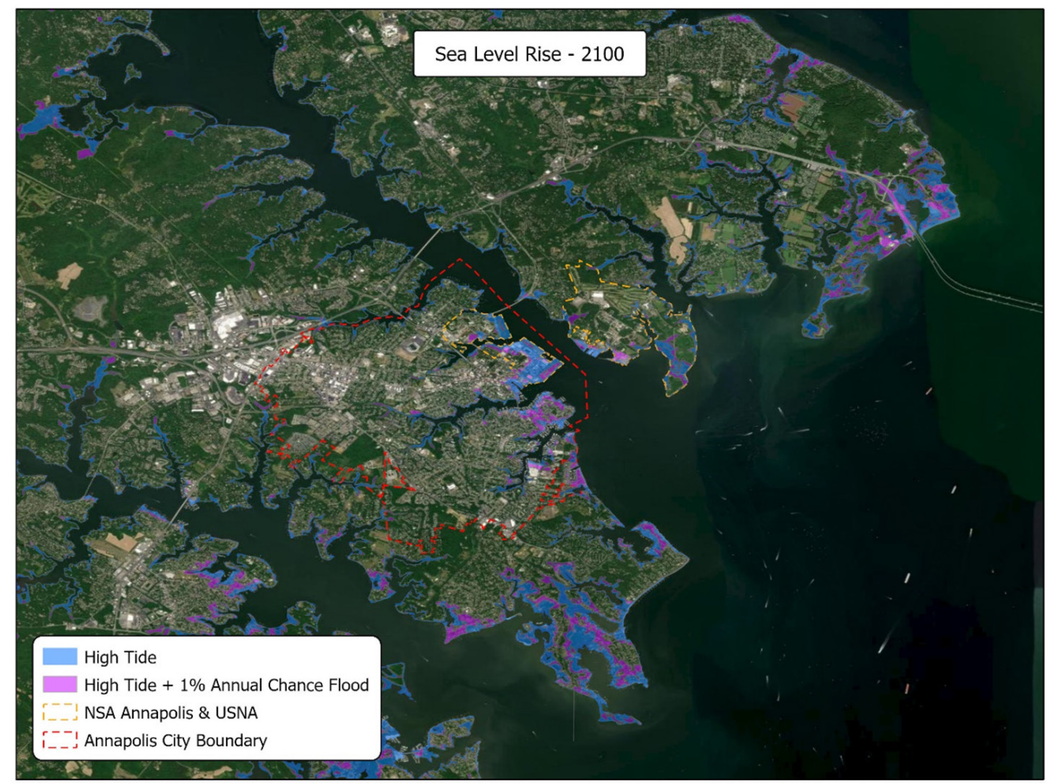

Figure 5.10: Modeled sea level rise for the City of Annapolis and the surrounding area.

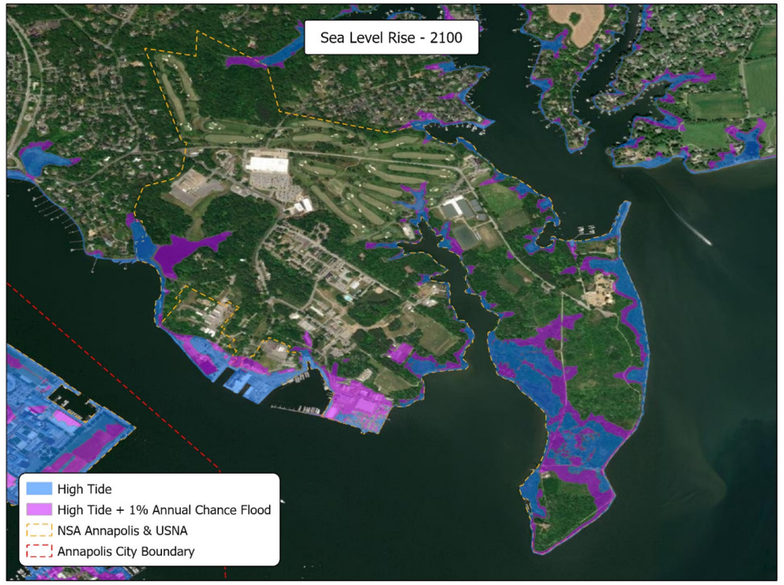

Figure 5.11: Modeled sea level rise for the NSA Annapolis – North Severn area.

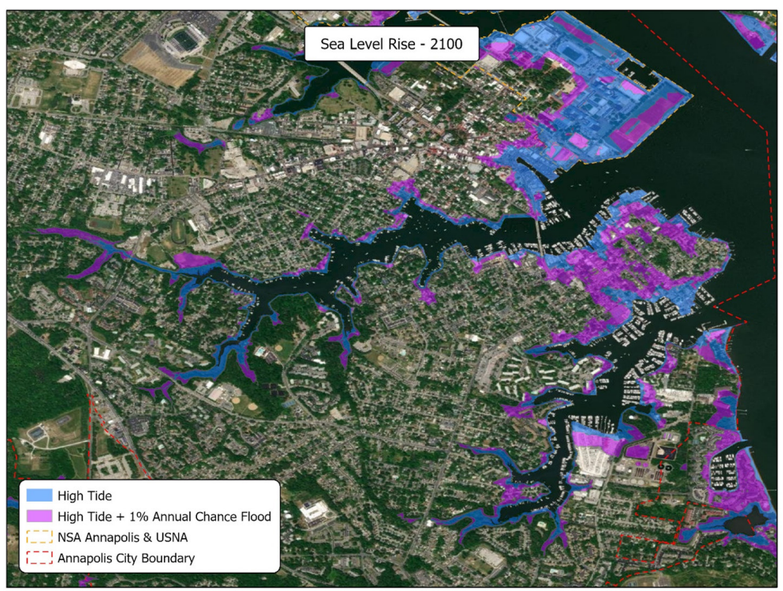

Figure 5.12: Modeled sea level rise for the Spa Creek area.

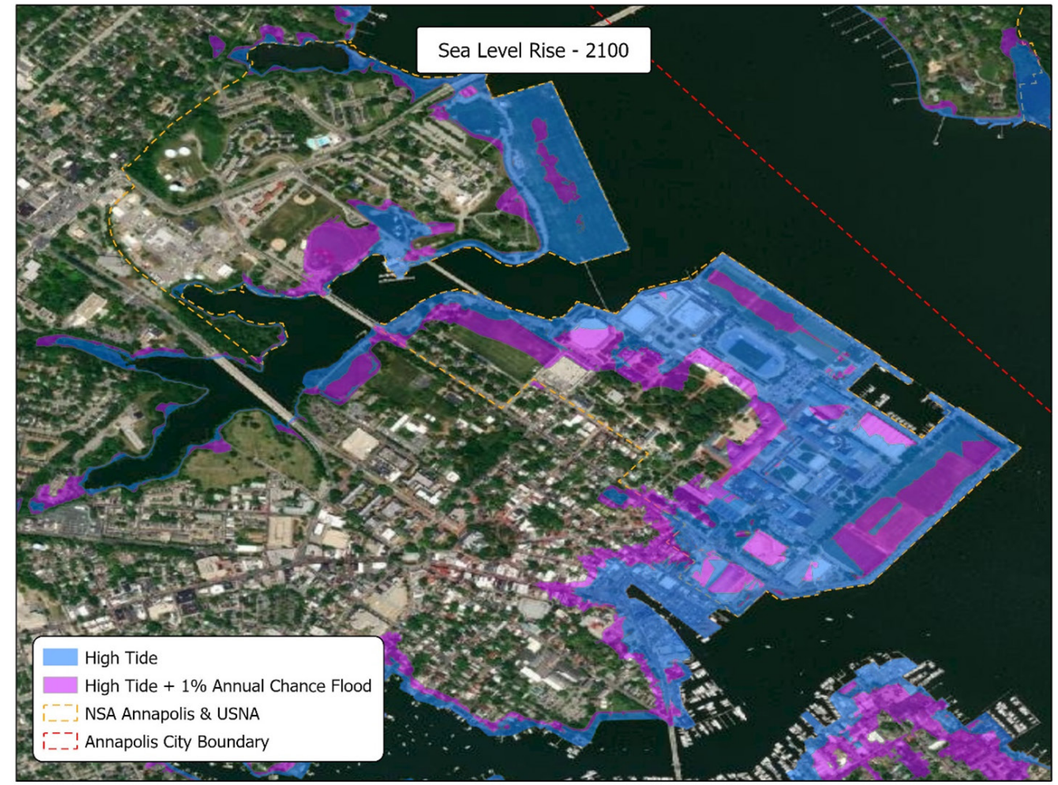

Figure 5.13: Modeled sea level rise for the U.S. Naval Academy and the surrounding area.

Determining probability and likelihood values of coastal flooding is specific to each asset, versus broad probabilistic assumptions for other hazards. For non-point-based locations (i.e., evacuation routes, key access roads, bridges, and City Dock), the approximate lowest elevation was used for the likelihood scoring. Projections through 2050 have a high confidence, and projections for the end-of-century timeframe depend heavily on the future pathway of greenhouse gas emissions. High tide and low tide, as well as storm surges, are expected to increase by approximately the same amount as projected sea level rise increases.

HAZARDS | **HURRICANES AND TROPICAL STORMS**

BASE	MID	END
3	3	3

Hurricanes and tropical storms are acute natural hazards that impact the southeastern, mid-Atlantic, and northeastern portions of the U.S. These storms typically occur between early June and late November, with the most active timeframe being mid-August to mid-November. These storms develop over tropical or subtropical waters just north of the equator, and travel over the Atlantic Ocean, Caribbean Sea, and/or the Gulf of Mexico prior to making landfall. Between 1991 and 2020, the Atlantic basin experienced an average of 14 named storms, 7 hurricanes, and 3 major hurricanes (Category 3 or greater) annually[14].

In our survey results, hurricanes and tropical storms were identified as the 3rd highest-ranking hazard for both the current and future timeframes for the City, County, and NSA Annapolis. The survey results were supported by mapping historic hurricane and tropical storm paths. NOAA's National Centers for Environmental Information's International Best Track Archive for Climate Stewardship (IBTrACS) website was used to download coastal storm track data from the mid-19th century to present for the North Atlantic. This dataset provides the most comprehensive list of all the coastal storms in the North Atlantic based on available data. In addition to the storm tracks in a geospatial format, the data includes the Saffir-Simpson Hurricane Wind Scale rating for each storm. Figure 5.14 shows these mapped historic storm paths.

At this time, NOAA's literature review states that the "data do not provide compelling evidence for a substantial greenhouse warming-induced, century-scale increase in frequency of tropical storms, hurricanes, or major hurricanes, or in the proportion of hurricanes that become major hurricanes[15]. " The frequency is expected to remain the same across the baseline, mid-, and end-of-century timeframes, with a 10% annual probability. Using Figure 5.6, these estimates translate to a likelihood of 3 across all planning timeframes.

Tornado was ranked 12th in the survey and was not included in the risk assessment. However, the City recently experienced a tornado, which was brought up on several occasions throughout the planning process. Many resilience actions that improve the functionality and continued operability of critical assets in response to hurricanes, tropical storms, and nor'easters apply to tornadoes and high wind events. Figure 5.15 shows the historic paths of tornadoes in the region.

[14] National Hurricane Center and Central Pacific Hurricane Center. (n.d.) Tropical Cyclone Climatology. National Oceanic and Atmospheric Administration. Retrieved on January 25, 2023 from Tropical Cyclone Climatology (noaa.gov)
[15] Global Warming and Hurricanes – Geophysical Fluid Dynamics Laboratory (noaa.gov)

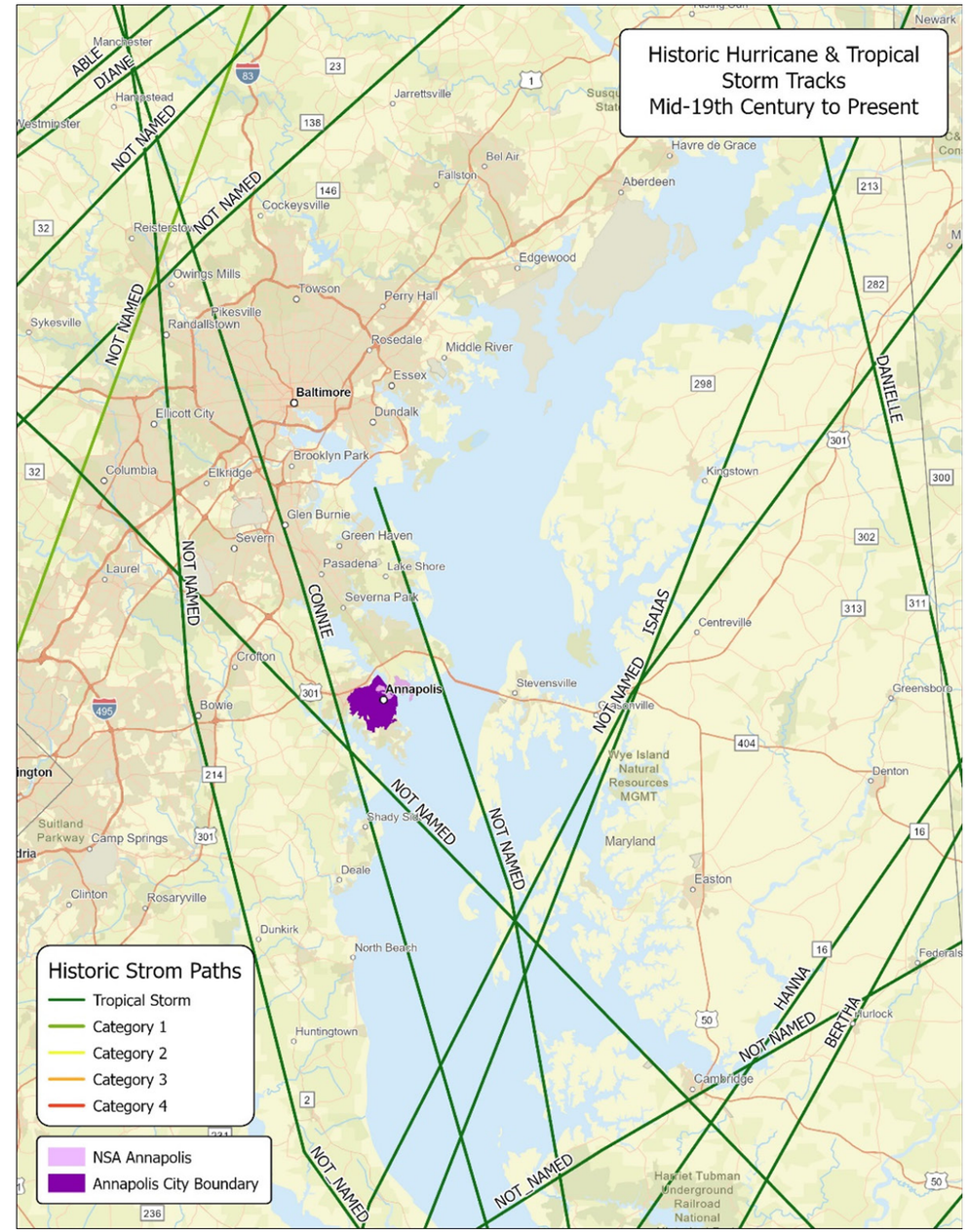

Figure 5.14: Mapped historic storm paths.

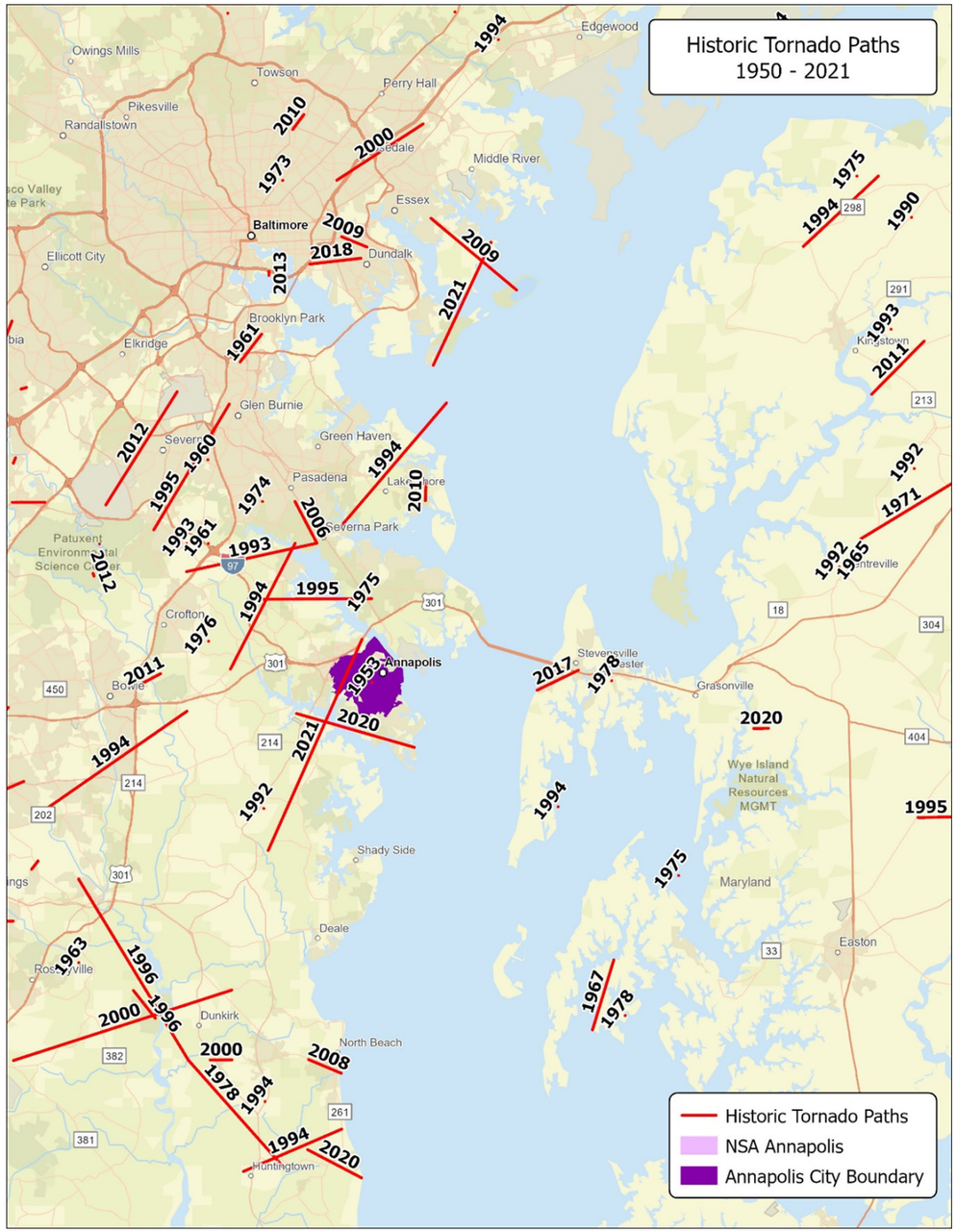

Figure 5.15: Mapped historic tornado paths.

HAZARDS | **CYBERSECURITY**

BASE	MID	END
2	4	4

Cyberattacks are an acute manmade hazard. A successful cyberattack may impact a business enterprise system (e.g., communications, data management, information systems) or a process control system (e.g., monitoring, operations). Examples of cyberattacks include phishing or hacking, resulting in denial-of-service attacks and/or the installation of malware, spyware, or ransomware. Cyberattack attempts may be a chronic problem but most attempts are blocked by basic cyber protections. Successful cyberattacks, in which the perpetrator bypasses cyber controls and is able to access a system, are less common. Likelihood of cyberattacks vary by asset type – healthcare system assets have a relatively high likelihood of being targeted, for example.

Trends show cyberattacks are increasing in frequency. In the U.S., local government agencies are the second-highest victimized group behind academia, with smaller jurisdictions more likely to be targeted as they often have less cyber protections and resources relative to major cities. A survey of local governments found an increase in cyberattacks between 2016 and 2020 as well as a surge in 2021[16]. EPA's Baseline Information on Malevolent Acts for Community Water Systems estimates a 10% probability of an asset being impacted by cyberattacks annually.[17]

The Maryland Health Department experienced a cybersecurity attack December 2021 impacting its electronic operating system statewide, which in turn impacted the Anne Arundel County Department of Health. As a result, health departments were unable to access digital vital records and could not utilize their basic daily reporting and processing functions for three months. This also compromised COVID reporting mechanisms.

The frequency of cyberattacks is expected to increase through the end of the century. As cities continue to become "smarter" by incorporating automation, data, the Internet, and artificial intelligence into systems and operations, there will be more opportunities for such systems to be impacted by cyberattacks. Over the baseline period, critical assets within the project area were estimated to have a 5% chance of experiencing a cyberattack annually. As the baseline period is 1961–1990, it is acknowledged that the use of the internet and cyber components have increased exponentially since the baseline period[18]. Therefore, through the mid- and end-of-century periods, a 20% annual cyberattack likelihood was assigned. While trends show cyberattacks are increasing in frequency, insufficient data was available to establish different probabilities for mid- and end-of-century scenarios, as probability is largely dependent on cybersecurity and enacted controls. Using Figure 5.6, these estimates translate to a likelihood of 2, 4, and 4 for baseline, mid-century, and end-of-century, respectively.

[16] Ransomware Attacks Straining Local US Governments and Public Services (2022). FBI. Retrieved from 220330.pdf (ic3.gov).
[17] Baseline Information on Malevolent Acts for Community Water Systems 1.0 (2019). US EPA.
[18] The Internet was developed in the 1960s, but was not widely available to the public until the 1990s.

HAZARDS | INFECTIOUS DISEASE

BASE	MID	END
3	5	5

An infectious disease outbreak is an acute manmade hazard. For this study, an infectious disease outbreak was an event in which operations must be modified, staff shortages occur, or community resources need to combat the outbreak are exceeded. Disease outbreaks could be caused by airborne viruses, such as Influenza or COVID-19, and may also be vector-borne, waterborne, or foodborne. Infectious disease outbreaks can be localized (e.g., an epidemic) or widely spread (e.g., a pandemic). Either have the potential to impact the planning area; however, a pandemic may have additional indirect impacts, such as widespread supply chain shortages and national or global economic impacts.

The ability to project local, climate-related health outcomes with precision remains limited and differs across health indicators and geographies, based on data availability. Therefore, this assessment is qualitative in nature, based on findings from national and statewide systematic reviews and assessments.

Nationwide, increases in vector-borne, waterborne, and foodborne diseases associated with climate change are expected with moderate confidence. Maryland is anticipated to experience increases in waterborne and foodborne illnesses as well as shifts in vectors and vector-borne diseases. A quantitative assessment of climate-related health outcomes in Maryland reveals that the projected change in infectious disease rate by 2040 is small (represented by salmonella infection and is less than 50%). Maryland is considered a lower-vulnerability state relative to other states. Specific to public health outcomes, increased risks due to heat stress and respiratory impairment are anticipated to be higher than those due to infectious diseases.

Given that future rates of disease outbreak occurrences are expected to increase, the annual probability increased from 10% baseline to 20% for both mid- and end-of-century periods. Using Figure 5.6, these estimates translate to a likelihood of 3, 4, and 4 for baseline, mid-century, and end-of-century, respectively.

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Non-Coastal Flood

Flood, specifically non-coastal flooding, was removed from consideration early in the risk assessment process. Riverine and pluvial (urban) flooding ranked 10th for hazards of concern in the survey. However, while non-coastal flooding was excluded as a formal component in the risk assessment, all identified critical assets were geolocated and displayed on maps layered with the regulatory floodplain to reveal assets at risk of flooding. While flood was not one of the priority hazards in this study, community officials recognized that flood risk is real and wanted to consider flood risk when relevant to the asset. The following maps display the 28 “high” critical assets and their proximity to the floodplain.

Figure 5.16: Maps of Non-coastal Flooding.

5.3 Consequence Scoring

Risk to an asset is a function of the consequences that would result if that asset were (negatively) impacted by a particular hazard. More specifically, consequences characterize the degree of severity of the outcome. Impact statements are used to constrain the consequence scoring exercise by providing a description of the way in which an asset is likely to be affected by a particular hazard. Consequence scores were assigned for each combination of critical asset and hazard from "none" to "catastrophic" (Figure 5.17).

Impact statements and consequence scores for each asset/hazard combination were initially developed by Stantec risk assessors, followed by review and modifications by the relevant asset owners or other knowledgeable community members. The statements consist of concise (one or two sentences) descriptions of the likely outcome if a specific asset were exposed to a specific hazard.

Score	Class	Consequence Description
0	Very low	• No effects
1	Low	• Measurable but cosmetic effects • Costs handled within normal budgeting for entity • Correctible using operations and maintenance practices
2	Minor	• Some extra costs to repair but can be covered within current operations and capital budgets • Routine operations for minor incidents; community and assets have capacity to meet demand • Asset or service is still operable and accessible, although minor service disruption may be possible • Slightly reduced ability to perform scheduled maintenance
3	Moderate	• Manageable asset or service damage but repair costs may be beyond current operations and maintenance and capital budgets • Asset or service still operable but some access limited • Brief service disruption may be possible; asset design capacity being reached
4	Major	• Heavy burden on internal resources of the entity to repair or service assets • Significant threat to installation mission critical readiness • Asset or service still operable but accessibility limited • Lengthy service disruption; assets or services operating below capacity for lengthy periods of time
5	Catastrophic	• Loss of life, property, mobility, access to emergency services, or power • Loss of installation mission critical readiness • Complete asset or service replacement due to hazard severity • Need for outside emergency funding (FEMA disaster declaration) • Significant service disruptions may be possible, requiring alternate service delivery • No access to assets

Figure 5.17: Consequence Classes

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5.4 Risk Assessment Results

This risk assessment is looking at:

28 assets x 4 hazards x 3 time frames = 336 Potential impacts/risk scores.

5.4.1 RISK CLASS DISTRIBUTION

Evaluation was carried out on all the risk scores from interactions across all assets, hazards, and time frames, and then initially focused on the 16 risks that were classified as either high, shock, or stress. During the ensuing discussion of risk, the exposure of a few assets was reconsidered following additional stakeholder outreach and are reflected in the final prioritization of assets and project development.

5.4.2 RISKS BY LIFELINE

Examining the high, shock, and stress risks, the below graphic depicts how those broke down by lifeline:

Each lifeline can be ranked by its total risk exposure. Cumulative risk takes the sum of all risk, low and high, for all assets in a lifeline category.

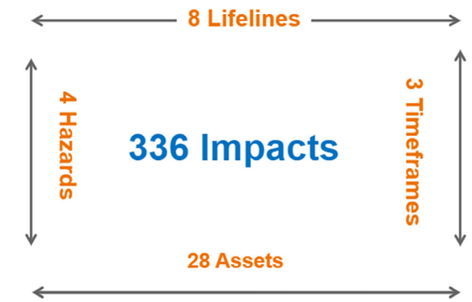


Figure 5.18: Risk Assessment totals.

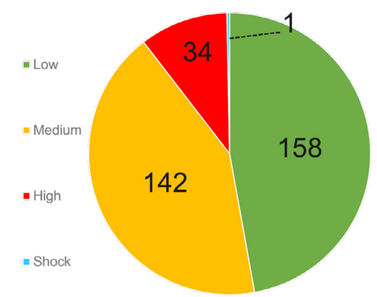


Figure 5.19: Distribution of risk scores across all assets, hazards, and time frames

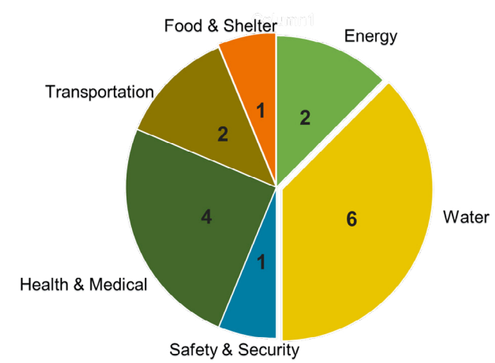
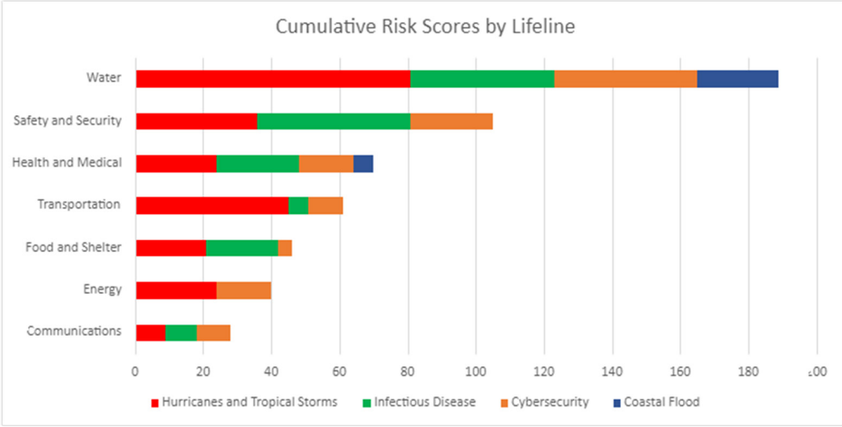
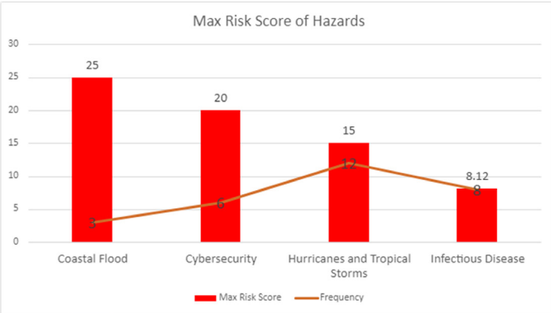


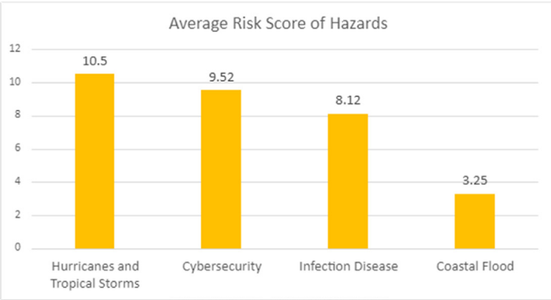
Figure 5.20: Number of high and shock/stress risks by lifeline



5.4.3 RISKS BY HAZARD

Some hazards were more impactful than others. The following graphs present information on the maximum and mean (average) risk scores per hazard. The average risk score for Coastal Flood was lower than expected.





5.4.4 HIGHEST RISKS

Asset Name	Hazard	Time Frame	Exposure	Likelihood	Consequence	Risk Score	Risk Class
KEY NSA ACCESS ROADS	Coastal Flood	2050	1	1	5	5	Shock
CITY SEWAGE TREATMENT PLANT	Coastal Flood	2022	1	3	5	15	High
CITY SEWAGE TREATMENT PLANT	Coastal Flood	2050	1	4	5	20	High
CITY SEWAGE TREATMENT PLANT	Coastal Flood	2100	1	5	5	25	High
CITY SPS 2ND STREET	Coastal Flood	2050	1	5	4	20	High
CITY SPS 2ND STREET	Coastal Flood	2100	1	5	4	20	High
CITY DOCK	Coastal Flood	2022	1	3	5	15	High
CITY DOCK	Coastal Flood	2050	1	5	5	25	High
CITY DOCK	Coastal Flood	2100	1	5	5	25	High
KEY NSA ACCESS ROADS	Hurricanes and Tropical Storms	2022	1	3	5	15	High
KEY NSA ACCESS ROADS	Hurricanes and Tropical Storms	2050	1	3	5	15	High
KEY NSA ACCESS ROADS	Hurricanes and Tropical Storms	2100	1	3	5	15	High
COUNTY WATER TREATMENT PLANT BROAD CREEK	Hurricanes and Tropical Storms	2022	1	3	5	15	High
COUNTY WATER TREATMENT PLANT BROAD CREEK	Hurricanes and Tropical Storms	2050	1	3	5	15	High
COUNTY WATER TREATMENT PLANT BROAD CREEK	Hurricanes and Tropical Storms	2100	1	3	5	15	High
COUNTY WATER TREATMENT PLANT ARNOLD	Hurricanes and Tropical Storms	2022	1	3	5	15	High
COUNTY WATER TREATMENT PLANT ARNOLD	Hurricanes and Tropical Storms	2050	1	3	5	15	High
COUNTY WATER TREATMENT PLANT ARNOLD	Hurricanes and Tropical Storms	2100	1	3	5	15	High

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CITY SEWAGE TREATMENT PLANT	Hurricanes and Tropical Storms	2022	1	3	5	15	High
CITY SEWAGE TREATMENT PLANT	Hurricanes and Tropical Storms	2050	1	3	5	15	High
CITY SEWAGE TREATMENT PLANT	Hurricanes and Tropical Storms	2100	1	3	5	15	High
MULTIPLE PHYSICAL ASSETS	Cybersecurity	2050 - 2100	1	4	4-5	16/20	High
DISPATCH CITY	Infectious Disease	2050	1	4	4	16	High
DISPATCH CITY	Infectious Disease	2100	1	4	4	16	High
EMERGENCY FOOD	Infectious Disease	2050	1	4	4	16	High
EMERGENCY FOOD	Infectious Disease	2100	1	4	4	16	High
ANNE ARUNDEL MEDICAL CENTER	Infectious Disease	2050	1	4	4	16	High
ANNE ARUNDEL MEDICAL CENTER	Infectious Disease	2100	1	4	4	16	High
ANNE ARUNDEL HEALTH DEPARTMENT	Infectious Disease	2050	1	4	4	16	High
ANNE ARUNDEL HEALTH DEPARTMENT	Infectious Disease	2100	1	4	4	16	High

5.4.5 SHOCK AND STRESS RISKS

Shocks refer to those events that have a low likelihood of occurrence; however, they have severe impacts of high consequence to communities; examples of shocks include earthquakes or terrorism. These are also referred to as acute hazards, occurring over short periods of time and causing catastrophic negative impacts.

Stresses refer to those events that have a high likelihood of occurrence; however, they have low or less severe impacts to communities; an example of a stress is drought. These are also referred to as chronic hazards, occurring over extended periods of time and causing gradual negative impacts.

Both shock and stress risk events were taken forward in the risk assessment due to their potentially disruptive nature and degradation of infrastructure.

The identified critical asset “Key NSA Access Roads” is susceptible to coastal flooding, with a low exposure and likelihood (1) and a high consequence (5), resulting in a low risk score. However, the potential for flooding to impact the access roads could have a catastrophic impact, and thus it was identified as a shock.

5.4.6 FROM HIGH RISK ASSETS TO RESILIENCE ACTIONS

The purpose of the risk assessment is to identify those assets most at risk to hazards and use this as a prioritization metric to position projects for adaptation planning to increase their resiliency to future events.

The outcome of the risk assessment is therefore to determine which assets would be taken forward for project development with the subject matter experts (SMEs), along with the identification of relevant funding sources to support further, more detailed project planning and development.

The next section of this report details those projects taken forward, along with implementation plans and scoring metrics to support potential future funding applications.

6.1 Establish A Memorandum of Understanding

The Resilience Action Plan provides the City Annapolis, Anne Arundel County, and NSA Annapolis a roadmap of recommended resilience actions and projects, including recommended funding sources. To support the implementation of the Resilience Action Plan recommendations, the City may consider establishment of a Memorandum of Understanding (MOU) to create a Partnership Committee as a more formal, permanent organizational structure to facilitate long-term communication, collaboration, and coordination among the City, County, NSA Annapolis, and the State of Maryland to support continued military operations, community growth, and economic development.

Many defense communities across the country have entered MOU's following compatible use and growth management planning projects to implement recommended actions and projects and address a variety of issues and concerns that may arise over time. The MOU serves to establish a more formal and permanent partnership that continues through leadership changes to installation command, community elected officials and senior staff.

The purpose of the MOU is to support the following.

- Create an ongoing structure for the implementation of the Resilience Action Plan recommended actions and projects, including development of a coordinated funding strategy.
- Enable the City, County, NSA Annapolis, and the State of Maryland to more efficiently and effectively communicate and coordinate.
- Create an organizational structure to support transition through changes in installation command and local community leadership.
- Identify and address additional issues and concerns that may arise over time that could have adverse impacts on continued military operations, community growth, and economic development.
- Help build new relationships.

6.2 Partnership Committee

As part of the MOU, the City may establish a Partnership Committee with specific goals, objectives, roles, and responsibilities to support continued communication and sharing of information to further implementation of both current and future resilience actions and projects.

At minimum, the MOU can support regularly scheduled quarterly meetings among Partnership Committee members and establishment of a Working Group or Technical Committee that includes key staff from Partnership Committee member organizations to identify and address detailed resilience project planning, design, and construction.

A sample Memorandum of Understanding for establishment of a Partnership Committee is provided in Appendix B.

6.3 The Resilience Authority of Annapolis and Anne Arundel County Inc.

The Resilience Authority of Annapolis and Anne Arundel County Inc. is a new, innovative organization that will develop, finance, and support infrastructure projects on behalf of Anne Arundel County and the City of Annapolis[19]. They can play an instrumental role in implementing the recommendations included in the Military Installation Resiliency Review Resilience Action Plan. The Resilience Authority consists of 12 members appointed by the Anne Arundel County Executive and City of Annapolis Mayor. The County Executive, with the consensus of the Mayor, appoints the Resilience Authority Director who serves at the pleasure of the County Executive. The Resilience Authority appoints a Chief Financial Officer who may not be a member of the Resilience Authority. The Resilience Authority has all powers necessary to undertake, finance, manage, acquire, own, convey, or support resilience infrastructure projects, including the authority to issue and sell bonds.

Recognizing the significant economic contribution of NSA Annapolis to the regional and state economy, the City, County and State of Maryland should consider expanding the Resilience Authority membership to include the NSA Annapolis Installation Commander as an ex officio member. This action can ensure collaboration and coordination to further installation resilience, and maintain mission assurance and mission-critical functions.

6.4 Update Hazard Mitigation Plans

Hazard Mitigation Plans are created to prevent or reduce loss of life and injury as well as limit damage costs from hazards through the development of mitigation strategies that lessen or eliminate future damage[20]. The Hazard Mitigation Planning process is like the process for the Military Installation Resiliency Review in that it assesses natural hazard vulnerabilities and proposes short- and long-term strategies that address risks. The intent behind the plan and the planning process is to prevent future damage and loss of life.

Both the City of Annapolis and Anne Arundel County have a Hazard Mitigation Plan, a required component by the Federal Emergency Management Agency (FEMA) to be eligible for specific types of federal hazard mitigation grants. FEMA requires Hazard Mitigation Plans to be updated every five years. The 2018 City of Annapolis Hazard Mitigation Plan is being revised and updated in 2023. The 2018 Anne Arundel Hazard Mitigation Plan was adopted by the Board of Supervisor in May 2020 and is scheduled to be updated in 2025. As both entities look to update their plans, a recommendation resulting from the Military Installation Resiliency Review is to integrate projects identified in the Resilience Action Plan into the Hazard Mitigation Plan updates. In order to be eligible for mitigation grants through FEMA, specifically Building Resilient Infrastructure and Communities and the Hazard Mitigation Grant Program following a federal disaster, the projects must be identified in a current Hazard Mitigation Plan.

The City of Annapolis is unique and visionary in that it has an additional hazard mitigation plan specific to protecting cultural resources. The plan Weather It Together: A Cultural Resource Hazard Mitigation for the City of Annapolis is also due for an update, and should include findings and recommendations from the Resilience Action Plan when relevant (e.g., Coastal Shoreline Boundaries). The City of Annapolis also has a Nuisance Flood Plan that is also updated every five years.

> "Hazard mitigation" is any sustainable action that reduces or eliminates long-term risk to people and property from future disasters. Mitigation planning breaks the cycle of disaster damage, reconstruction, and repeated damage. Hazard mitigation includes long-term solutions that reduce the impact of disaster in the future.

[19] The Resilience Authority of Annapolis and Anne Arundel County Website. Accessed January 24, 2023. https://resilienceauthority.org/

[20] City of Annapolis Hazard Mitigation Update Website. Office of Emergency Management. Accessed January 24, 2023. https://www.annapolishazards.org/

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APPENDIX A:
RESILIENCE ACTION PLAN

RESILIENCE ACTION PLAN

INTRODUCTION

Defense communities are deserving of specific attention because they are essential to supporting military installations that maintain our national security. The City of Annapolis and Anne Arundel County provide NSA Annapolis essential operations, services, and infrastructure necessary for the installation to maintain mission assurance and mission-critical functions. This infrastructure must not only protect and preserve military readiness and defense capabilities, but also provide safe places for service members and their families to live, work and play.

Stantec's Defense Community Resilience Planning Framework enabled the City of Annapolis, Anne Arundel County, and NSA Annapolis assess vulnerabilities and risks to natural and man-made hazards with special attention given to the unique resilience requirements for NSA Annapolis. The planning framework provided methods to assess vulnerabilities and risks not only independently but also in coordination with threats to installation resiliency that lie beyond the installation

Our multi-discipline, practitioner-based team provided a risk-informed, phased approach to identify and prioritize critical assets for investment to further resilience for both NSA Annapolis and the adjacent communities. The following priority critical assets were identified to include in the Resilience Action Plan.

- Coastal Shoreline Boundaries
- NSA Annapolis Access Roads
- Anne Arundel County and City of Annapolis Water Treatment Facilities
- Anne Arundel County Department of Health and Luminis Health Anne Arundel Medical Center
- Cybersecurity
- Energy
- Annapolis Wastewater Conveyance and Reclamation Facility

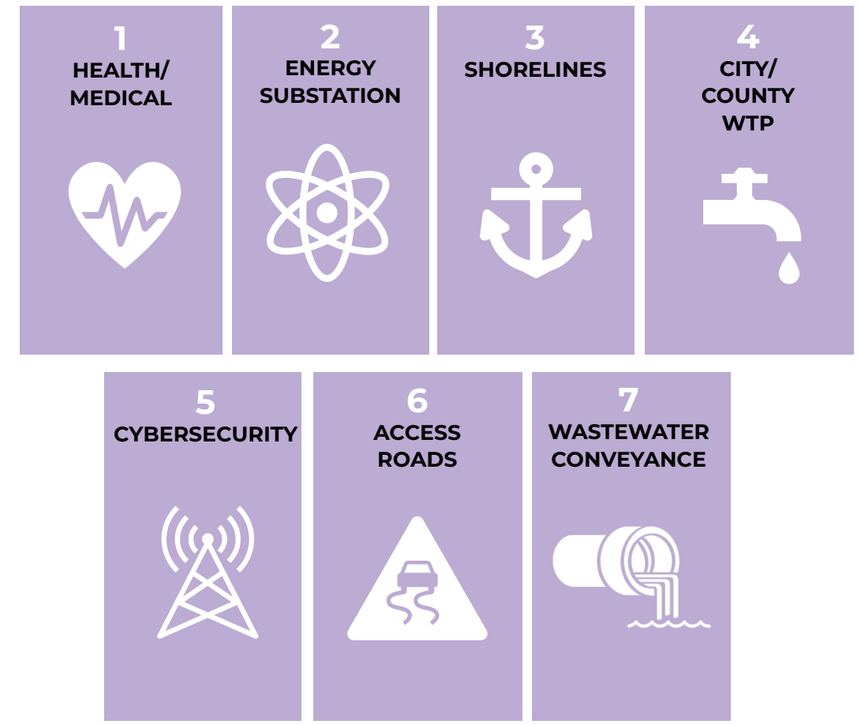
Each priority critical asset is identified in this results-oriented Resilience Action Plan with specific recommended resilience actions and projects focused on shared critical infrastructure, programs, or services.

The Resilience Action Plan includes input from Stantec's North America Funding team to provide a roadmap for the City of Annapolis, Anne Arundel County, State of Maryland and The Resilience Authority of Annapolis and Anne Arundel County Inc. to develop funding strategies to turn the recommended resilience actions and projects into reality. Implementation actions for each priority critical asset identified in the Resilience Action Plan are linked to priorities and timelines for recommended federal and state funding opportunities. In total, 50 funding opportunities are identified and ranked for their relevance to the Military Installation Resiliency Review. Bundled projects are recommended for submission in a single application for particularly competitive or large grant opportunities, including the Federal Emergency Management Agency (FEMA) Building Resilient Infrastructure and Communities Program (BRIC) and the DoD Office of Local Defense Community Installation Resilience program.

The goal for the City of Annapolis, Anne Arundel County, and NSA Annapolis is to plan, design, and finance a resilient future, together. Resilience is about making communities and military installations stronger, now and in the future, for everyone.

ASSET TASK SUMMARY

7 PRIORITY CRITICAL ASSETS



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Lifeline/ Topic	Projects	Project Description	Estimated Time to Complete	Estimated Cost (Planning Level)
Anne Arundel Medical Center and Health Department				
	Enhanced Health and Medical Services Communication and Information Sharing	Design and implement a programmatic approach to health and medical coordination and communications between UNA Annapolis and local health and medical partners.	30 months	$260,000
Energy - Baltimore Gas and Electric (BGE)				
	USNA Gate 10 Substation Flooding and Sea Level Rise Mitigation Study	Conduct analysis of future sea level rise projects and review of substation plans to determine feasibility of flood mitigation strategies such as flood walls or raising substation equipment and facilities, or if the substation should be relocated and the associated impacts and modifications to BGE and USNA installation systems.	63 months - 105 months	Varies Per Task - Overall $3.32 M to $31.84 M
Coastal Shoreline Boundaries				
	City Coastal Zone Resilience / Coastal Shoreline Boundaries	To identify, screen, and prioritize a network of perimeter coastal risk mitigation best management practices.	147-252 months	$203,460,000
City/County Water Treatment Plant				
	Severn River Crossing - Arnold Water Treatment Plant	Feasibility study of connecting the 220 and 210 zones via a water transmission pipeline under the Severn River.	72-102 months	$37.5M - $53M
	Interconnection between County and City Systems - Water Supply Connection	Combined the City and County's hydraulic model, test the interconnection, develop SOP for the interconnection.	72-102 months	$3.83M - $6.54M
Cybersecurity				
	Establish Statewide Cybersecurity Planning Committee and a Cybersecurity Plan	Interconnected network infrastructure improves mission effectiveness, but also increases vulnerability to cyber attacks as they create more potential to backdoor attacks. Cyber incident response time is a critical component to effectively neutralize a threat before it compromises assets, but without the appropriate processes, dedicated staff and visibility to monitor and respond, vulnerabilities are compounded. Coordination and collaboration between entities is thus critical to improve the cybersecurity posture. Defense community information sharing through a single pane of glass software* can help bridge the gap and provide dedicated staff the appropriate monitoring capabilities to rapidly detect and respond to a threat. For this to happen, a planning committee comprised of representatives from various community lifelines (education, healthcare, energy, water, military, etc.) needs to be formed in order to address cybersecurity in a coordinated manner.	19 mo.	$953,040

ASSET TASK SUMMARY

NSA Annapolis Access Roads				
	Replace Gate 1 Option 1 - would include improvements to nearby City streets to raise those streets to same elevation as the replacement gate 1. Option 2 - would include improvements to City street(s) between gate 3 and King George St.	Gate 1 is the main vehicular access to NSA Annapolis. Gate 1 will be under sea-level by approximately 1.6 feet (i.e. below average daily high tide) in 2100. Gate 1 will be 100-year flood tide surge will be approximately 7.5' above existing gate 1 due to SLR by 2100.	3-4 years	$500,000-$750,000
	Md 450 /King George St. bridge over College Creek Replacement bridge to be above the year 2100 tide surge elevation.	Rebuild bridge above the projected 100-year tide surge elevation as of 2100.	2-3 years	$500,000 - $800,000
	Prince George Street Current Flood Issues	Investigate the causes and evaluate potential solutions for the current flooding issues at Prince George Street adjacent to Gate 1 area.	1-2 years	$50,000 - $100,000
	Traffic Signal and ITS Upgrades	Additional infrastructure and/or communications are necessary to fully utilize up to 30 updated traffic signals and ITS equipment to coordinate and enhance emergency evacuation routes to support NSA Annapolis/US Naval Academy and surrounding region.	2-5 years	$12 million
Sewershed Annapolis Wastewater Reclamation				
	Installation Sewer Capacity Requirements	Installation and City to partner to complete inflow study to assess conveyance system capacity risk.	6 months	$100,000
	Randall and Compromise Street Sewer Scoping Study	1. Evaluate options to assess the condition of the Randall Street Sewer 2. Evaluate options to assess the condition of the Compromise Sewer condition from Randall street to the Shipwright Siphon 3. Provide a concept to refurbish or replace the Randall Street sewer, assessing disruption to the business and residences in the area. 4. Provide two concepts to deliver the sewage from the installation not using the existing Randall Street sewer	13 months	$375,000

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Sewershed Annapolis Wastewater Reclamation (cont'd)				
	Shipwright Siphon Condition Assessment Scoping Study	The City indicated that the Siphon may not be able to be inspected or repaired. A scoping study will identify the cause of this and provide a plan and budget to enable the inspection of the siphon.	6 months	$150,000
	Annapolis Water Reclamation Facility (AWRF) Final Effluent Filter Pumps Replacement - Preliminary Design	Develop a preliminary design to replace the final effluent filter pumps with pumps that will not be damaged if under water.	1 year	$500,000
	Replacement Road Map for the AWRF Primary Sludge Conveyance Infrastructure	Prepare a strategy and budget to either refurbish or replace the primary sludge conveyance from the settling tanks to sludge processing.	1 year	$250,000

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Background Information	
Aspect	**Response**
Asset Name(s)	Anne Arundel County Department of Health Luminis Health Anne Arundel Medical Center
Asset Description Anne Arundel County	**Anne Arundel County Department of Health** The Anne Arundel County Department of Health (Department of Health) has a mission to preserve, promote and protect the health of all people who live, work and play in Anne Arundel County. The Department of Health is headquartered at 3 Harry Truman Parkway, Annapolis, MD with additional services provided at various area service centers. Under the Anne Arundel County Emergency Operations Plan provision of public health (e.g., communicable disease surveillance, mass prophylaxis, public health information), behavioral health (e.g., crisis counseling), and environmental health (e.g., food services, vector control) services falls under Emergency Support Function (ESF) 8 – Health and Medical Services with primary responsibility for coordination of support assigned to Department of Health. **Anne Arundel County Fire Department** The Anne Arundel County Fire Department (Fire Department) responds to calls for service, fires, medical and other emergencies as well as promotes fire prevention strategies and life safety programs. Under the Anne Arundel County Emergency Operations Plan provision of Emergency Medical Services (EMS), including transport of victims to appropriate hospitals, falls under ESF 4 – Firefighting with primary responsibility for coordination of support assigned to Fire Department. EMS capabilities of the Fire Department include Basic Life Support (BLS) and Advanced Life Support (ALS-Paramedic).
Asset Description Luminis Health Anne Arundel Medical Center	**Luminis Health Anne Arundel Medical Center** Serving more than one million people a year, the Luminis Health Anne Arundel Medical Center (LHAAMC) is a critical healthcare resource for the community, including military service members and their families. LHAMC has over 400 beds available on its 57-acre campus.
Related US Naval Academy Asset Naval Health Clinic Annapolis	**Naval Health Clinic Annapolis** The health clinic at NSA Annapolis is administered by the Defense Health Agency (DHA) as part of the Department of Defense's Military Health System. The DHA supports provision of healthcare to ensure that uniformed service members are healthy and safe from potential health threats, and health care professionals who provide care for our forces, receive optimized training, education, and relevant clinical settings to build skills for deployment. Naval Health Clinic Annapolis is located at 695 Kinkaid Road, Annapolis, MD. Health and medical services Naval Health Clinic Annapolis are provided through TriCare and the clinic provides support to service members and their families including primary and preventative care, mental health and substance abuse, laboratory testing and radiology, case management, dental, pharmacy, and vision.

ASSET 1 HEALTH MEDICAL

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Step 1: Background Information	
Aspect	**Response**
Project Name	Enhanced Health and Medical Services Communication and Information Sharing
Project / Action Description	Design and implement a programmatic approach to health and medical coordination and communications between NSA Annapolis and local health and medical partners. This effort would include both initial and ongoing planning, coordination, and training and exercise activities to build and sustain the following capabilities: **Intelligence and Information Sharing:** Provide timely, accurate, and actionable information related to threats and hazards that may impact the health and medical system. ▪ Threats that may result in a mass casualty or mass fatality incident requiring coordination between NSA Annapolis and local health and medical cooperators. ▪ Threats that may impact public, behavioral, and environmental health. **Situational Assessment:** Provide public health and medical partners with decision-relevant information regarding the nature and extent of the hazard, any cascading effects, and the status of the public health and medical response. ▪ Operational status of health and medical facilities ▪ Number and condition of victims (casualties and fatalities) ▪ Availability of health and medical resources and equipment (e.g., Personal Protective Equipment, medical supplies, staff) **Operational Communications:** Ensure the capacity for timely communications in support of security, situational awareness, and operations by any and all means available, among and between affected communities in the impact area and all response forces. ▪ Emergency notification systems and other mechanisms for alert and warning for threats and hazards impacting the public health and medical system. ▪ Incident management software or other tools designed to support maintaining situational awareness including operational status and human and resource management. ▪ Public safety communications systems that support redundant and interoperable communications between NSA Annapolis and public health and medical cooperators.
Rationale for Project / Action	Health and medical services for NSA Annapolis are provided by a system of on-installation and community partners and the continuance of these services in the face of hazards and risk is critical to the health of the whole community. Importantly, effective communication and information sharing is critical between health and medical partners to be proactive in preparing for, responding to, and mitigating against hazards and threats that could impact the health and medical system.
Priority Level	Medium
Nature Based Solutions	Not applicable in the context of this project.

Step 2: Responsible Parties

Aspect	Response
Project Lead	*Anne Arundel County Department of Health*
Project Support	*Luminis Health Anne Arundel Medical Center* *Naval Health Clinic Annapolis*
Potential Partnerships or External Resources	*Anne Arundel County Fire Department* *Anne Arundel County Office of Emergency Management* *NSA Annapolis Emergency Management* *Maryland Institute of Emergency Medical Services Systems* *Maryland Department of Health* *Defense Health Agency*
Capacity	*Both the County and Luminis Health have designated emergency managers responsible for their respective emergency management programs.* *Naval Health Clinic Annapolis also has a designated staff member responsible for emergency management.* *NSA Annapolis, the City of Annapolis, and Anne Arundel County also maintain emergency management programs that can support health and medical coordination and communications efforts.*

Step 3: Timeline

Aspect	Response
Estimated Time to Complete	*3 years (scalable)*

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Step 4: Action Plan Tasks

Task(s)	Description	Estimated Time to Complete	Estimated Cost (Planning Level)	Funding Types Available To Support	Task Lead
Communciations and Information Sharing Capability Assessment	Conduct a comprehensive review of communications and information sharing capabilities for key health and medical partners. The review will focus on capabilities in key areas including planning, organization, equipment, training, and exercises. The results of the assessment will be used to inform subsequent planning and exercise activities.	**Year 1** 6-months	$30,000	Public Health Emergency Preparedness (PHEP) Cooperative Agreement ASPR Hospital Preparedness Program Cooperative Agreement	Anne Arundel County Department of Health Naval Health Clinic Annapolis
Quarterly Coordination Work Sessions	Hold regular work sessions between Naval Health Clinic Annapolis and key health and medical partners to focus on areas including plan integratin/ alignment, training and exercise coordination, and other opportunities for partnership.	**Years 1 - 3** Quarterly	$60,000	Public Health Emergency Preparedness (PHEP) Cooperative Agreement ASPR Hospital Preparedness Program Cooperative Agreement	Anne Arundel County Department of Health Naval Health Clinic Annapolis
Health and Medical Coordination and Communications Strategy	Building on the capability assessment, develop a strategy for coordination and communication between Naval Health Clinic Annapolis and key health and medical partners that addresses procedures before, during, and after an emergency that impacts the health and medical system. The strategy would be designed to be integrated into existing military, public health, and healthcare emergency plans.	**Year 1** Strategy Development: 6-months **Years 2-3** Review and update annually in conjunction with quarterly coordination work sessions	$50,000	Public Health Emergency Preparedness (PHEP) Cooperative Agreement ASPR Hospital Preparedness Program Cooperative Agreement	Anne Arundel County Department of Health Naval Health Clinic Annapolis

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Health and Medical Coordination Exercise Series	Test the newly developed coordination and communciation annex through a series of exercise activities designed to validate the procedures it contains as well as explore gaps that were identified in the capability assessment. The exercise series will consist of three exercises with two tableop exercises building up to a functional exercise to test coordinated health and medical operations.	**Year 1** Tabletop Exercise - 6-months **Year 2** Tabletop Exercise - 6-months **Year 3** Functional Exercise - 9-months	$120,000	Public Health Emergency Preparedness (PHEP) Cooperative Agreement ASPR Hospital Preparedness Program Cooperative Agreement	Anne Arundel County Department of Health Naval Health Clinic Annapolis
		30 months	$260,000		

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Step 5: Public Support / Co-Benefits	
Aspect	**Response**
Public Support	TBD
Co-Benefits:	
Mission Readiness	NSA Annapolis relies on the Anne Arundel County Department of Health and the Luminis Health Anne Arundel Medical Center for a range of services that are not available through the installation clinic.
Environmental	NSA Annapolis relies on the Anne Arundel County Department of Health to provide environmental health services
Social	TBD
Equity (Community Resilience)	Effective communication and information sharing is critical between health and medical partners to be proactive in preparing for, responding to, and mitigating against hazards and threats that could impact the health and medical system regionally.
Equity (Social Vulnerability)	Effective communication and information sharing is critical between health and medical partners to be proactive in preparing for, responding to, and mitigating against hazards and threats that could impact the health and medical system regionally.
Economic	Proactively managing infectious disease outbreaks mitigates against potential impacts to the workforce.

Step 6: Alternatives Considered	
Aspect	**Response**
Alternative 1	Leverage activities managed out of NSA Annapolis and County emergency management to better incorporate health and medical considerations. We recommend this be done regardless of whether this project is advanced and should be considered as a baseline of activity.
Alternative 2	Though not specifically an alternative, the project is ultimately scalable based on resources available.

HEALTH/MEDICAL FUNDING SOURCES (Ranked):

- Public Health Emergency Preparedness (PHEP) Program
- ASPR Hospital Preparedness Program
- Congressionally Directed Spending
- FY 2023 EDA Planning and Local Technical Assistance

Public Health Emergency Preparedness Program (PHEP):

AGENCY: Centers for Disease Control and Prevention

PURPOSE/GOALS: To help departments build and strengthen their abilities to effectively respond to a range of public health threats, including infectious diseases, natural disasters, and biological, chemical, nuclear, and radiological events.

ELIGIBLE APPLICANTS: Current 62 PHEP recipients (State of Maryland is a PHEP recipient).

ELIGIBLE USE OF FUNDS: Public health preparedness planning through public health preparedness capabilities and activities such as information sharing, emergency operations coordination, community preparedness, public health surveillance and epidemiological investigation, laboratory testing, responder safety and health and medical material management and distribution.

TERMS/REQUIREMENTS/NOTES: Maryland's FY21 PHEP total funding was $11,510,060

TYPE: Loans. COOPERATIVE AGREEMENT

FUNDING AMOUNT AND CYCLE: Annual program, depending on appropriations; last cycle closed March 21, 2022.

LINK: https://www.cdc.gov/cpr/readiness/phep/index.htm

RANK AND REASONING: 4. Good fit as the proposed project helps build and strengthen the local emergency community to effectively respond to a range of public health threats.

HEALTH/MEDICAL FUNDING SOURCES (Ranked):

- Public Health Emergency Preparedness (PHEP) Program
- ASPR Hospital Preparedness Program
- Congressionally Directed Spending
- FY 2023 EDA Planning and Local Technical Assistance

ASPR Hospital Preparedness Program:

AGENCY: Administration for Strategic Preparedness & Response (ASPR)

PURPOSE/GOALS: To improve the ability of health care systems to plan for and respond to disasters and emergencies.

ELIGIBLE APPLICANTS: States, territories, freely associated states, eligible municipalities, and other recipients across the health care sector.

ELIGIBLE USE OF FUNDS: Maryland Department of Health receives ASPR funds and subawards to health care system partners across the state. These partners include hospitals and free-standing emergency departments, community health centers, state-managed facilities, poison control centers, emergency medical services, home care and hospice agencies, as well as regional health care preparedness coalitions. Funds can be used to enhance their ability to prepare for, respond to, and recover from disasters and other emergencies that pose a threat to the health and safety of the community.

TERMS/REQUIREMENTS/NOTES: Maryland has four Hospital Preparedness Program-funded coalitions, the Region III Health and Medical Coalition (HMC) covers Anne Arundel.

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Maryland receives ASPR funding on an annual basis.

LINK: https://health.maryland.gov/preparedness/Pages/programs_hpp.aspx

RANK AND REASONING: 4. Seems to be a good fit but would need to be vetted through the Region III HMC.

HEALTH/MEDICAL FUNDING SOURCES (Ranked):

- Public Health Emergency Preparedness (PHEP) Program
- ASPR Hospital Preparedness Program
- Congressionally Directed Spending
- FY 2023 EDA Planning and Local Technical Assistance

Congressionally Directed Spending:

AGENCY: US Congress

PURPOSE/GOALS: Provides federal lawmakers the ability to demonstrate priorities for their constituents.

ELIGIBLE APPLICANTS: States, local governments and eligible nonprofit entities.

ELIGIBLE USE OF FUNDS: Broad latitude in projects; however, some federal lawmakers narrow what kinds of projects they will endorse.

TERMS/REQUIREMENTS/NOTES: Senate: 1% cap on discretionary spending for congressionally directed spending items.

House: Each Representative may request funding for up to 15 projects in their community for fiscal year 2023 – although only a handful may actually be funded.

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Annual program, typically in March / April.

LINK: Work through congressional delegation.

RANK AND REASONING: 2. Broad latitude with projects it can fund; dependent on support from delegation. Most legislators focus on capital infrastructure investments rather than planning.

HEALTH/MEDICAL FUNDING SOURCES (Ranked):

- Public Health Emergency Preparedness (PHEP) Program
- ASPR Hospital Preparedness Program
- Congressionally Directed Spending
- FY 2023 EDA Planning and Local Technical Assistance

FY 2023 EDA Planning and Local Technical Assistance:

AGENCY: US Economic Development Administration

PURPOSE/GOALS: Provides grants to economically distressed areas for public works projects that: promote economic development; create long-term jobs; and/or benefit low-income persons or the long-term unemployed.

ELIGIBLE APPLICANTS: States, cities, counties; Indian tribes; the Federated States of Micronesia; the Republic of the Marshall Islands; commonwealths and territories of the United States; and private or public nonprofits representing a redevelopment area or a designated economic development center.

ELIGIBLE USE OF FUNDS: EDA makes planning and local technical assistance investments to support economic development, foster job creation, and attract private investment in economically distressed areas.

Partnership Planning, Short-Term Planning, and State Planning awards to create and implement regional economic development plans designed to build capacity and guide the economic prosperity and resiliency of an area or region.

EDA also makes Short-Term and State Planning awards for economic development planning activities that guide the eventual creation and retention of high-quality jobs, particularly for the unemployed and underemployed in the Nation's most economically distressed regions.

TERMS/REQUIREMENTS/NOTES: 50% of project costs, up to $300,000

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Year-round

LINK: https://www.grants.gov/web/grants/view-opportunity.html?oppId=332138

RANK AND REASONING: 3. Could be a good fit for the coordination and communication activities if project aligns with the regional planning authority's Comprehensive Economic Development Strategy.

Background Information	
Aspect	**Response**
Asset Name	BGE Substation at USNA Gate 10
Asset Description	Electric utility substation on Navy property

Step 1: Background Information	
Aspect	**Response**
Project Name	USNA Gate 10 Substation Flooding and Sea Level Rise Mitigation Study
Project / Action Description	Conduct analysis of future sea level rise projects and review of substation plans to determine feasibility of flood mitigation strategies such as flood walls or raising substation equipment and facilities, or if the substation should be relocated.
Rationale for Project / Action	Substation is located within projected areas of the 2100 day-to-day high tide and during a 1% annual chance storm (including storm surge).
Priority Level	TBD

Step 2: Responsible Parties	
Aspect	**Response**
Project Lead	BGE / US Navy
Project Support	Agencies or departments to support the implementation of the project / action
Potential Partnerships or External Resources	Unknown at this time but could include SME's.

Capacity	As the asset owner/operator, BGE would be responsible for maintaining and operating the facility. Funding would need to be determined.

Step 3: Timeline	
Aspect	**Response**
Estimated Time to Complete	3-5 years

Step 4: Action Plan Tasks

Task(s)	Description	Estimated Time to Complete	Estimated Cost (Planning Level)	Task Lead
Project Initiation	Project Lead prepares project initiation document and forms the project development team (PDT)	3-6 mo.	$10k - $20k	Task implementation will be determined through coordination with BGE and the Installation. The lead will likely be BGE with review from the Installation
Substation Initial Assessment	Prepare project study report to identify mitigation strategy alternatives, design concepts, preliminary cost estimates, environmental considerations, and right-of-way needs and costs.	6-9 mo.	$50k - $100k	
Project Report (PR)	Prepare alternatives analysis of reasonable and feasible alternatives considered. Perform value analysis and determine preferred alternative. Develop preferred alternative to 30% design as part of the Project Report.	9-12 mo.	$10k - $20k	
Programming and Funding	Programming and funding includes coordination with BGE Planning and Engineering.	9-12 mo.		
Detailed Engineering/ Design	Prepare final engineering design and construction documents based on selected alternative. Includes land surveying, geotech and related studies.	12-18 mo.	$200k - $1.5M	
Environmental Studies (CEQA/NEPA Clearances)	Perform applicable studies, prepare the environmental documents and submit to AHJ's. Note: If extensive public outreach and right-of-way is required, this could add 2-years to the planning and preliminary design phase.	12-24 mo.	$50k - $200k	
Bid and Construction Phase	Construct proposed mitigation and improvements (duration dependent on extent of modifications of selected alternative).	12-24 mo.	$5M - $30M	
TOTAL		63-105 mo.	$5.3M - $31.8M	

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Step 5: Public Support / Co-Benefits

Aspect	Response
Public Support	TBD
Co-Benefits:	
Mission Readiness	Flood mitigation and/or relocation of substation and related facilities have the goal of maintaining uninterrupted electric service through flooding and extreme weather events.
Environmental	Environmental benefit will be determined during project studies and incorporated into the design.
Social	TBD
Equity (Community Resilience)	TBD
Equity (Social Vulnerability)	TBD
Economic	TBD

ENERGY FUNDING SOURCES (Ranked):

- Preventing Outages and Enhancing the Resilience of the Electric Grid FORMULA Grants
- Grid Resilience and Innovation Partnerships (GRIP) Program
- FY23 Resilient Maryland Program

HEALTH/MEDICAL | ENERGY | SHORELINES | CITY/COUNTY WTP
CYBERSECURITY | ACCESS ROADS | SEWER | GENERAL

Preventing Outages and Enhancing the Resilience of the Electric Grid FORMULA Grants:

AGENCY: US Department of Energy

PURPOSE/GOALS: To improve the resilience of the electric grid against disruptive events by enhancing the capabilities of states and Indian tribes to address current and future resilience needs.

ELIGIBLE APPLICANTS: States and Indian tribes, who can then "subaward" to the following eligible entities for projects that implement resilience measures:

- Electric grid operators
- Electricity generators
- Distribution providers
- Electricity storage operators
- Transmission owners or operators
- Fuel suppliers

Any other relevant entity, as determined by the funding agency.

ELIGIBLE USE OF FUNDS: To implement a wide range of resilience measures intended to mitigate the impact of disruptive events, including:

- Weatherization technologies and equipment
- Fire-resistant technologies and fire prevention systems
- Monitoring and control technologies
- Undergrounding of electrical equipment
- Utility pole management
- Relocation of power lines or the reconductoring of power lines with low-sag, advanced conductors
- Vegetation and fuel-load management
- Use or construction of distributed energy resources for enhancing system adaptive capacity during disruptive events, including microgrids and battery-storage subcomponents
- Adaptive protection technologies
- Advanced modeling technologies
- Hardening of power lines, facilities, substations, or other systems
- Replacement of old overhead conductors and underground cables

TERMS/REQUIREMENTS/NOTES: Varies by sub-program

TYPE: FORMULA GRANTS

FUNDING AMOUNT AND CYCLE: Current round open with a deadline of 03/31/2023.
Will be an annual program with a total of $2.3 billion over five years.

LINK: https://www.energy.gov/gdo/grid-resilience-statetribal-formula-grant-program

RANK AND REASONING: 4. Good fit but will need to identify how Maryland will subaward.

ENERGY FUNDING SOURCES (Ranked):

- Preventing Outages and Enhancing the Resilience of the Electric Grid FORMULA Grants
- Grid Resilience and Innovation Partnerships (GRIP) Program
- FY23 Resilient Maryland Program

Grid Resilience and Innovation Partnerships (GRIP) Program:

AGENCY: US Department of Energy

PURPOSE/GOALS: To support the modernization of the electric grid to reduce impacts due to extreme weather and natural disasters.

ELIGIBLE APPLICANTS: Electricity storage operators, Electricity generators, Transmission owners or operators, Distribution providers, Fuel suppliers

ELIGIBLE USE OF FUNDS: Transmission and distribution technology solutions that will mitigate multiple hazards across a region or within a community, including wildfires, floods, hurricanes, extreme heat, extreme cold, storms, and any other event that can cause a disruption to the power system. The program will prioritize projects generating the greatest community benefit in reducing the likelihood and consequences of disruptive events.

TERMS/REQUIREMENTS/NOTES: The program will provide up to $2.5 billion over five years ($500 million/year FY 22-26). The first funding cycle will include FY22 and FY23, up to $1 billion. Funding is capped at the amount the eligible entity has spent in the previous three years on hardening efforts. There is a 100% cost match for this program. The program includes a small utility set aside for those entities selling no more than 4 million MWh of electricity per year.

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Annual program, current round has concept papers that were due December 2022 and full applications due April 6, 2023.

LINK: https://www.energy.gov/gdo/grid-resilience-utility-and-industry-grants

RANK AND REASONING: 4. Good fit for this program but need to monitor for next funding cycle. Project intent to harden or relocate the substation to reduce potential impacts due to extreme weather and natural disasters aligns well with the program's goals.

ENERGY FUNDING SOURCES (Ranked):

- Preventing Outages and Enhancing the Resilience of the Electric Grid FORMULA Grants
- Grid Resilience and Innovation Partnerships (GRIP) Program
- FY23 Resilient Maryland Program

FY23 Resilient Maryland Program:

AGENCY: Maryland Energy Administration (MEA)

PURPOSE/GOALS: To help Maryland communities and organizations identify optimal microgrid and other Distributed Energy Resource (DER) configurations to bolster the resilience, sustainability, energy affordability, and efficiency of their essential facilities and operations and safeguard them from the harmful effects of prolonged power outages.

ELIGIBLE APPLICANTS: MEA divides eligible applicants into three Areas of Interest (AOI):
AOI 1 & 2: public and private entities with facilities located in the State
AOI 3: Maryland businesses, nonprofits, state agencies, local governments, public universities, community colleges, and public schools.

ELIGIBLE USE OF FUNDS: Provides funding under three AOIs, which are briefly explained in the list below.

AOI 1: Feasibility and Planning: This AOI provides funds for feasibility analysis and other preconstruction activities for the planning and development of microgrids, resilient facility power systems, and resiliency hubs.
AOI 2: Microgrid Capital: This AOI provides capital for equipment and installation to help offset the costs of constructing microgrids and other DER systems.
AOI 3: Resiliency Hubs: This AOI provides capital for equipment and installation to help offset the costs of constructing solar photovoltaic (PV) and battery energy storage systems to provide essential power to facilities that serve as resiliency hubs for their surrounding communities.

TERMS/REQUIREMENTS/NOTES: A total of up to $2.7 million is expected to be available, split between each AOI.

Maximum grant for AOI 1: $400,000
Maximum grant for AOI 2: $1,500,000
Maximum grant for AOI 3: $800,000

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Has been an annual program since 2019 so would anticipate another round opening at the end of 2023.

LINK: https://energy.maryland.gov/business/pages/ResilientMaryland.aspx

RANK AND REASONING: 5. Good fit under "resilient facility power system" and could apply first for the planning and then the implementation.

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CYBERSECURITY | ACCESS ROADS | SEWER | GENERAL

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Step 1: Background Information	
Aspect	**Response**
Project Name	City Coastal Zone Resilience / Coastal Shoreline Boundaries
Project / Action Description	To identify, screen, and prioritize a network of perimeter coastal risk mitigation best management practices. These practices may include green-, grey-, and blue-infrastructure, temporary and permanent seawalls, living shorelines, and off shore breakwaters. These practices should be screened, prioritized and designed, in consultation with applicable stakeholders, with consideration of selected sea level rise and precipitation models. See Appendix G: Coastal Shoreline Boundaries – Resilient Action Assessment presentation.
Rationale for Project / Action	Currently this community is very vulnerable to coastal risks, with consideration of climate change (SLR Yr. 2100~ 5.35 ft.) without mitigation, future increases in coastal risks could threaten the long-term viability of the community.
Priority Level	High

Step 2: Responsible Parties	
Aspect	**Response**
Project Lead	City of Annapolis as lead, sponsored by NSA Annapolis
Project Support	Anne Arundel County Emergency Management and State of Maryland
Potential Partnerships or External Resources	DoD REPI Program, OLDCC, FEMA, Maryland Oyster Gardening Program
Capacity	TBD

ASSET 3 COASTAL SHORELINES

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Step 3: Timeline	
Aspect	**Response**
Estimated Time to Complete	Series of projects to be phased over the next 20-years

Additional Notes	
Aspect	**Response**
Potential Funding Model	Maximize federal partners, grant programs, leverage local funding to meet local match requirements.
Available Grants	IIFEJA funding, complimented by FEMA HMGP and BRIC; DoD DCIP and REPI, NFWF Coastal Resilience Funds
Grant Requirements	Community to draft an overall financing (incl. grant funding) strategy with integrated benefit-cost analysis for various coastal segments, to assist in prioritizing project sequencing, to ensure maximum grant eligibility and competitiveness. To ensure federal grant eligibility, City to comply with all 2CFR 200 procurement requirements related to securing related outside consulting servers related to grant writing, planning, design, and mitigation project implementation.

Step 4: Action Plan Tasks

Task(s)	Description	Estimated Time to Complete	Estimated Cost (Planning Level)	Task Lead
Task Name	*Annapolis Coastal Resilience Implementation*	*Estimated time to complete task (ranges are appropriate).*	*Planning level cost to implement task (general ranges are appropriate).*	*Agency or department tasked with leading implemen-tation of task.*
Project Initiation	Secure partnering agreement with key property owners and stakeholders, identifying roles, responsibilities and commitment to work together to enhance the overall resilience and sustainability of the community. Secure qualified outside resource (consultant MSA).	0-3 mo.	$10,000	City of Annapolis Public Works / Sponsor NSA Annapolis Commander
Project Initiation Document	Facilitate consensus defense community coastal resilience vision of best management practices. Prepare project report identifying mitigation strategies across all coastal reaches, perform initial field surveys and investigations.	3-9 mo.	$300,000	City of Annapolis / Anne Arunde / The Resiliency Authority of Annapolis and Ann Arundel Inc.
Programming and funding	Develop project financing strategy, apply for respective planning, scoping and implementation grant funds.	6-36 mo.	$150,000	The Resiliency Authority of Annapolis and Anne Arundel Inc.
Project Report (PR)	Develop coastal resilience comprehensive plan outlining and prioritizing mitigation projects per community geographic reach, develop detailed coastal resilient project segment estimates of costs, project phasing / funding strategy, and overall initiative implementation timeline. Specific project selection and segment prioritization to be based on conventional as well as triple bottom-line analyses.	12-24 mo.	1,500,000	The Resiliency Authority of Annapolis and Anne Arundel Inc.
Environmental Studies (CEQA/ NEPA Clearances)	Perform applicable environmental survey, studies and secure required environmental permits.	24-42 mo.	$500,000	Anne Arundel Co. / NSA / City of Annapolis Partnership

Final PS&E's	Prepare final engineering design plans, specification and bidding documents.	24-36 mo.	$25,000,000 (Reach C Pilot - $3.5)	Anne Arundel Co. / NSA / City of Annapolis Partnership
Bid and Construction Phase	Advertise, bid, award construction contracts.	36 - 42 mo.	$1,000,000	Anne Arundel Co. / NSA / City of Annapolis Partnership
Construction Phase		42 - 60 mo.	$175,000,000	Anne Arundel Co. / NSA / City of Annapolis Partnership
TOTAL		147-252 months	$203,460,000	
Note: The above timelines are framed around advancing single ideal bundle of projects				

Step 5: Public Support / Co-Benefits

Aspect	Response
Public Support	Project development through design will incorporate a comprehensive, key community stakeholder involvement process. This process will solidify public support as selected projects will be assessed against their ability to cost effectively reduce coastal risk, minimize associated periodic property damage, minimize community disruptions, while contributing to improvements in community sustainability, citizen and visitor quality of life, aesthetics, environment and water quality improvements, and overall economic and tax base stability.
Co-Benefits:	
Mission Readiness	Improvements associated with some coastal reaches are anticipated to directly contribute to installation resilience and mission readiness
Environmental	Target environmental benefits include creation and stabilization of coastal and aquatic habitat as well as improvements to local water quality.
Social	Target benefits to include protection of housing stock, and values, improved esthetics and overall improved quality of life
Equity (Community Resilience)	Project approach as well as resilient solutions to be designed to promote better community communications, transparency, respect and connectively.
Equity (Social Vulnerability)	TBD
Economic	Project to contribute to overall community sustainability, solidifying tax base, protecting commercial activities and expanded tourism. Reduces threats related to need to relocate / abandon naval academy; an historic and critical community asset and partner.

COASTAL SHORELINE BOUNDARIES FUNDING SOURCES (Ranked):

- National Coastal Resilience Fund
- DoD Defense Community Infrastructure Pilot (DCIP) Program
- DoD Installation Resilience Program
- Building Resilient Infrastructure and Communities (BRIC) Program
- Hazard Mitigation Grant Program
- Readiness and Environmental Integration (REPI) Program
- Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Revolving Fund Loan Program
- Flood Mitigation Assistance (FMA) Grant Program
- Resilience Authority of Annapolis and Anne Arundel County

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National Coastal Resilience Fund:

AGENCY: National Fish & Wildlife Foundation (NFWF)

PURPOSE/GOALS: Restores, increases and strengthens natural infrastructure to protect coastal communities while also enhancing habitats for fish and wildlife.

ELIGIBLE APPLICANTS: Non-profit 501(c) organizations, state and territorial government agencies, local governments, municipal governments, Native American tribal governments, educational institutions, or commercial (for-profit) organizations.

ELIGIBLE USE OF FUNDS: Conservation projects that restore/expand natural features, i.e. coastal marshes & wetlands, dune & beach systems, oyster & coral reefs, forests, coastal rivers & floodplains, and barrier islands that minimize the impacts of storms.

Four focus areas:

1. Community Capacity Building and Planning
2. Project Site Assessment and Preliminary Design
3. Project Final Design and Permitting
4. Restoration and Monitoring

Need to select one of the four focus areas under which to apply.

Proposed projects must address: Nature-Based Solutions, Community Resilience Benefit, and Fish and Wildlife Benefit. Further priority will be given to projects that demonstrate: Community Impact / Engagement and Innovation / Transferability / Sustainability.

TERMS/REQUIREMENTS/NOTES: $37 M total available; 1:1 non federal match; no maximum grant amounts, but average award/category:
1. $125,000
2. $125,000
3. $250,000
4. Bet. $1M - $5M; Projects proposed here expected to have been prioritized through planning processes that address coastal resilience, completed design & engineering plans for implementation, & readiness to obtain permits & approvals.

FUNDING AMOUNT AND CYCLE: Annual program with pre-proposal typically due in April and full proposal, if invited, due June.

TYPE: GRANT

LINK: Jessica Grannis - jessica.grannis@nfwf.org - 202-595-2464

RANK AND REASONING: 4. Good fit as long as project contains components of restoring or expanding natural features of wetland and/or floodplain to benefit habit for fish and wildlife.

COASTAL SHORELINE BOUNDARIES FUNDING SOURCES (Ranked):

- National Coastal Resilience Fund
- DoD Defense Community Infrastructure Pilot (DCIP) Program
- DoD Installation Resilience Program
- Building Resilient Infrastructure and Communities (BRIC) Program
- Hazard Mitigation Grant Program
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DoD Defense Community Infrastructure Pilot (DCIP) Program:

AGENCY: Department of Defense (DoD)

PURPOSE/GOALS: The Defense Community Infrastructure Pilot (DCIP) Program is designed to address deficiencies in community infrastructure, supportive of a military installation, in order to enhance military value, installation resilience, and military family quality of life.

ELIGIBLE APPLICANTS: Defense Communities Only. State and local governments.

ELIGIBLE USE OF FUNDS: Eligible community infrastructure projects are any complete and useable transportation project; community support facilities (e.g., school, hospital, police, fire, emergency response, or other community support facility); and utility infrastructure projects [e.g., water, waste-water, telecommunications, electric, gas, or other utility infrastructure (with necessary cyber safeguards)] that: are located off of a military installation; support a military installation; are owned by a state or local government or a not-for-profit, member-owned utility service; that will enhance military value, military installation resilience and/or military family quality of life at the supported military installation (definitions of these enhancements are provided in Section E., paragraph 1. of the Notice of Funding Opportunity); that are endorsed by the local installation commander representing the installation benefitting from the proposed project; are where ground-disturbing work has not yet commenced; and,

are construction-ready.

TERMS/REQUIREMENTS/NOTES: Previous cycles required 30% match, award floor was $250,000 and ceiling was $20,000,000.

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Cycle: Annual Pilot program launched in 2020; in . Congress appropriated $50 million in FY20, supporting 16 projects; $60 million in FY21, supporting 13 projects; and $90 million in FY22, supporting 19 projects. Uncertain timelines for enactment of Congressional authorization and appropriation acts, and uncertain timelines to update a final notice of funding opportunity in calendar year 2023.

LINK: https://oldcc.gov/defense-community-infrastructure-program-dcip#:~:text=The%20Defense%20Community%20Infrastructure%20Program%20%28DCIP%29%20is%20designed,is%20authorized%20under%20Public%20Law%20115-232%20Section%202861.

RANK AND REASONING: 5. DoD communities only means a limited applicant pool. Targets general infrastructure projects, but not only infrastructure resilience projects, so may have a larger applicant pool. Projects must be construction-ready.

COASTAL SHORELINE BOUNDARIES FUNDING SOURCES (Ranked):

- National Coastal Resilience Fund
- DoD Defense Community Infrastructure Pilot (DCIP) Program
- DoD Installation Resilience Program
- Building Resilient Infrastructure and Communities (BRIC) Program
- Hazard Mitigation Grant Program
- Readiness and Environmental Integration (REPI) Program
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DoD Installation Resilience Program:

AGENCY: Department of Defense (DoD) Office of Local Defense Community Cooperation

PURPOSE/GOALS: The Installation Resilience program of assistance is designed to provide technical and financial assistance to states and local governments to analyze and implement actions necessary to foster, protect, and enhance military installation sustainability. The program alleviates and prevents incompatible development and/or other man-made or natural installation resiliency activities likely to impair the continued operational utility of a Department of Defense installation, range, special use air space, military operations area, or military training route. The program enables states and local governments to assist installations to optimize their mission and sustain their installation, and enhances the long-term readiness and military value of the power projection platform.

ELIGIBLE APPLICANTS: Defense Communities Only.
States, counties, municipalities, other political subdivisions of a state; special purpose units of a state or local government; other instrumentalities of a state or local government; and tribal nations are eligible if:
(a) Office of Local Defense Community Cooperation determines there is existing or potential encroachment of a civilian origin on the local military mission and this encroachment of civilian origin is likely to impair the continued operational utility of a military installation, or (b) OLDCC determines there is a current, future, or potential threat to military installation resilience that involve, or may be significantly impacted by, resources or activities outside of the military installation and that this threat to military installation resilience is likely to impair the military installation's ability to maintain, improve, or rapidly reestablish installation mission assurance and mission-essential functions.

ELIGIBLE USE OF FUNDS: Projects that address sustainability factors such as: urban growth, noise, stormwater and flood management, energy and water security threats, extreme weather events, etc.

TERMS/REQUIREMENTS/NOTES: 10% minimum cost share requirement. A minimum of ten percent (10%) of the project's total proposed funding is to be comprised of non-Federal sources.

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Cycle: Communities may participate in Installation Resilience program activities in two ways. The Military Services may nominate installation(s) for assistance through annual requests or may also nominate out of cycle. State and local governments may self-nominate at any time.

LINK: https://oldcc.gov/our-programs/installation-resilience

RANK AND REASONING: 5. DoD communities only means a limited applicant pool. Specifically targets resilience projects in defense communities.

COASTAL SHORELINE BOUNDARIES FUNDING SOURCES (Ranked):

- National Coastal Resilience Fund
- DoD Defense Community Infrastructure Pilot (DCIP) Program
- DoD Installation Resilience Program
- Building Resilient Infrastructure and Communities (BRIC) Program
- Hazard Mitigation Grant Program
- Readiness and Environmental Integration (REPI) Program
- Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Revolving Fund Loan Program
- Flood Mitigation Assistance (FMA) Grant Program
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Building Resilient Infrastructure and Communities (BRIC) Program:

AGENCY: Federal Emergency Management Agency (FEMA) | Maryland Department of Emergency Management (MDEM)

PURPOSE/GOALS: To support states, local communities, tribes and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards.
For Annapolis, it is recommended that multiple projects are combined into one single BRIC application to be submitted to MDEM.

ELIGIBLE APPLICANTS: States, territories, or Federally recognized tribes with major disaster declaration under the Stafford Act in the seven years prior to the annual grant application period start date.
Cities and counties must go through their states to become a subrecipient. MDEM is applicant to FEMA.
Subapplicants can be State agencies; federally-recognized tribes; local governments / communities / special districts; private nonprofit organizations.

ELIGIBLE USE OF FUNDS: • Capability- and Capacity-Building (C&CB) Activities: activities that enhance the knowledge, skills, and expertise of the current workforce to expand or improve the administration of mitigation assistance.

- Mitigation Projects: cost-effective projects designed to increase resilience and public safety; reduce injuries and loss of life; and reduce damage and destruction to property, critical services, facilities, and infrastructure.
- Management Costs: to reimburse the recipient and subrecipient for eligible and reasonable indirect costs, direct administrative costs, and other administrative expenses associated with a specific mitigation project or C&CB activity. Project scoping and pre-award costs are now eligible.

TERMS/REQUIREMENTS/NOTES: $2.295 billion was available for FY22 nationally. Grants fund up to 75% (generally) of the project costs, up to $50 million.

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Cycle: Annual. Current cycle: Notice of Interests were due to MDEP in August 2022 with subapplications due November 2022. MDEM FY22 BRIC state submission due to FEMA.

LINK: https://mdem.maryland.gov/community/Pages/Mitigation.aspx

RANK AND REASONING: 4. Very competitive. Recommend that multiple (or all) Annapolis MIRR projects are combined into a single application.

COASTAL SHORELINE BOUNDARIES FUNDING SOURCES (Ranked):

- National Coastal Resilience Fund
- DoD Defense Community Infrastructure Pilot (DCIP) Program
- DoD Installation Resilience Program
- Building Resilient Infrastructure and Communities (BRIC) Program
- Hazard Mitigation Grant Program
- Readiness and Environmental Integration (REPI) Program
- Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Revolving Fund Loan Program
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Hazard Mitigation Grant Program:

AGENCY: Federal Emergency Management Agency (FEMA) | Maryland Department of Emergency Management (MDEM)

PURPOSE/GOALS: This opportunity provides funding for communities to implement mitigation activities to reduce risk to life and property from natural hazards.
HMGP funding can also support the development of Local Hazard Mitigation Plans (LHMP) and project scoping activities.

ELIGIBLE APPLICANTS: State and local governments; certain private nonprofit organizations or institutions; and Tribal Communities; all applicants must have or be covered under an approved Hazard Mitigation Plan. MDEM is applicant to FEMA.
Subapplicants can be State agencies; federally-recognized tribes; local governments / communities / special districts; private nonprofit organizations.

ELIGIBLE USE OF FUNDS: Projects that minimize natural disasters; examples include: Aquifer Storage and Recovery, Floodplain and Stream Restoration, Flood Diversion and Storage, and Green Infrastructure Methods, Property Acquisition and Structure Demolition, Safe Room Construction, Minor Localized Flood Reduction Projects, Soil Stabilization.

TERMS/REQUIREMENTS/NOTES: unds up to 75% of eligible costs (25% match required).

Amount: The amount of HMGP funds availability is based on a percent of Public Assistance provided by Federal Emergency Management Agency (FEMA).

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Cycle: Annual - Last cycle declared disasters (DR 4491 & DR 4583): Notice of Interest due to MDEP in March 2022 with subapplications due July 2022.

LINK: https://mdem.maryland.gov/community/Pages/Mitigation.aspx

RANK AND REASONING: 4. State-wide program, would have to submit each project individually. Only receives funding after a federally-declared disaster.

COASTAL SHORELINE BOUNDARIES FUNDING SOURCES (Ranked):

- National Coastal Resilience Fund
- DoD Defense Community Infrastructure Pilot (DCIP) Program
- DoD Installation Resilience Program
- Building Resilient Infrastructure and Communities (BRIC) Program
- Hazard Mitigation Grant Program
- Readiness and Environmental Integration (REPI) Program
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Readiness and Environmental Integration (REPI) Program:

AGENCY: Department of Defense (DoD) Office of the Secretary of Defense (OSD)

PURPOSE/GOALS: DoD initiated the Readiness and Environmental Protection Integration (REPI) program to combat encroachment that can limit or restrict military training and testing through the use of encroachment management partnerships, referred to as REPI projects, that Congress authorized within 10 USC 2684a. These cost-sharing partnerships between the Military Services, state and local governments, and private conservation organizations acquire easements or other interests in land from willing sellers that preserve critical buffer areas and habitat near military installations. In the FY2019 Congress expanded the REPI authority to address military installation resilience casting climate change as an encroachment threat and allowing DoD to enter into agreements for the purposes of preserving off base habitat in a manner that maintains or improves military installation resilience. 10 USC 2684a(e) also provides authority to enter into an agreement for acquisition of real property (or interest therein) to support the purchase of water rights when necessary to support or protect the mission of the military installation.

ELIGIBLE APPLICANTS: Military Services

ELIGIBLE USE OF FUNDS: Defense Communities Only. States, counties, municipalities, and other political subdivisions of a state; special purpose units of a state or local government; other instrumentalities of a state or local government; and tribal nations. Current REPI project with NSA Annapolis: 19 acres preserved and $7.8 million expended.

TERMS/REQUIREMENTS/NOTES: No cost share minimum requirements. A REPI application must include an eligible partner(s) and willing landowner(s). All REPI inquiries are directed to the NSA Annapolis Community Planning Liaison Officer. REPI fact sheet indicates that through FY2021 DoD and its partners have spent more than $86 million on REPI projects at six installations in Maryland.

TYPE: COST-SHARING PARTNERSHIP

FUNDING AMOUNT AND CYCLE: The REPI program does not provide funding to the Military Service partners through an open grants program; rather, each Military Service submits project proposals for funding through an online proposal tracker platform using authorized account access.

LINK: https://www.repi.mil

RANK AND REASONING: 5. Good fit if need for land acquisition / easements to buffer installation.

COASTAL SHORELINE BOUNDARIES FUNDING SOURCES (Ranked):

- National Coastal Resilience Fund
- DoD Defense Community Infrastructure Pilot (DCIP) Program
- DoD Installation Resilience Program
- Building Resilient Infrastructure and Communities (BRIC) Program
- Hazard Mitigation Grant Program
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Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Revolving Fund Loan Program:

AGENCY: Federal Emergency Management Agency (FEMA)

PURPOSE/GOALS: Revolving loan funds for mitigation projects and activities to increase resilience and mitigate the impacts of events such as drought, extreme heat, severe storms, wildfires, floods and earthquakes.

ELIGIBLE APPLICANTS: States, federally recognized tribes, Puerto Rico, District of Columbia for capitalization grants. Local communities cannot apply directly to FEMA for capitalization grants, but can apply for low-interest loans.

ELIGIBLE USE OF FUNDS: Prioritize low-impact development, projects that increase resilience and mitigate impacts of severe weather. Can be used for building code adopting and enforcement, land-use planning. Loans may be used to satisfy a local government's non-federal cost share for other FEMA Hazard Mitigation Assistance grant programs (BRIC, FMA, etc.)

TERMS/REQUIREMENTS/NOTES: To be announced in Spring 2023.

TYPE: LOAN

FUNDING AMOUNT AND CYCLE: FEMA provides funding to states and tribal governments via a capitalization grant. The participating state, territorial, or tribal government deposits an amount that is at least 10% of the capitalization grant into an established entity loan fund.

LINK: https://www.fema.gov/grants/mitigation/storm-rlf

RANK AND REASONING: 3. Appears to be a good fit but need the funding announcement (spring 2023) to fully rank this program.

COASTAL SHORELINE BOUNDARIES FUNDING SOURCES (Ranked):

- National Coastal Resilience Fund
- DoD Defense Community Infrastructure Pilot (DCIP) Program
- DoD Installation Resilience Program
- Building Resilient Infrastructure and Communities (BRIC) Program
- Hazard Mitigation Grant Program
- Readiness and Environmental Integration (REPI) Program
- Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Revolving Fund Loan Program
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Flood Mitigation Assistance (FMA) Grant Program:

AGENCY: Federal Emergency Management Agency (FEMA) | Maryland Department of Emergency Management (MDEM)

PURPOSE/GOALS: To implement measures to reduce/ eliminate risk of severe repetitive flood damage /repetitive flood damage to buildings insured by the National Flood Insurance Program (NFIP).

ELIGIBLE APPLICANTS: State Governments, Native American Tribal Governments (Federally recognized), D.C., US Territories. (Local government must apply through state.) Applicants must have a FEMA-approved Hazard Mitigation Plan. Cities and counties must go through their states to become a subrecipient. MDEM is applicant to FEMA.

ELIGIBLE USE OF FUNDS: Community flood mitigation activities (Flood mitigation design, development of community flood mitigation projects) to reduce NFIP flood claim payments; technical assistance/ mitigation planning/mitigation projects reducing risk to severe repetitive loss/ repetitive loss properties

TERMS/REQUIREMENTS/NOTES: First need to meet with State FEMA office; 25% match required from non-federal sources . $160M total available, no ceiling or floor listed, but 120 expected awards.

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Cycle: Annual - Current cycle: Notice of Interest due to MDEP in August 2022 with subapplications due November 2022. MDEM FY22 BRIC state submission due to FEMA.

LINK: https://www.fema.gov/grants/mitigation/floods

RANK AND REASONING: 2. Need severe and repetitive losses of properties in the NFIP program. If this is the case here, ranking would increase to a 4 / 5.

COASTAL SHORELINE BOUNDARIES FUNDING SOURCES (Ranked):

- National Coastal Resilience Fund
- DoD Defense Community Infrastructure Pilot (DCIP) Program
- DoD Installation Resilience Program
- Building Resilient Infrastructure and Communities (BRIC) Program
- Hazard Mitigation Grant Program
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Resilience Authority of Annapolis and Anne Arundel County:

AGENCY: Resilience Authority of Annapolis and Anne Arundel County

PURPOSE/GOALS: Authority created specifically to undertake and support resilience infrastructure projects in Anne Arundel County and the City of Annapolis.

ELIGIBLE APPLICANTS: N/A

ELIGIBLE USE OF FUNDS: The Authority may exercise powers necessary to undertake, finance, manage, acquire, own, convey, or support resilience infrastructure projects, some of these include the power to:

- Acquire by purchase, lease, or other legal means, but not by eminent domain, property for resilience infrastructure;
- Establish, construct, alter, improve, equip, repair, maintain, operate, and regulate resilience infrastructure owned by the County, the City of Annapolis, or the Resilience Authority;
- Receive money from the County, the City of Annapolis, the State, other governmental units, or private organizations;
- Charge and collect fees for its services; subject to the approval of the County Executive and by resolution of the County Council, and the City of Annapolis, charge and collect fees to support its bond issuances;
- Engage the services of other governmental units; act as necessary or convenient to carry out the powers granted by law.

TERMS/REQUIREMENTS/NOTES: N/A

TYPE: N/A

FUNDING AMOUNT AND CYCLE: N/A

LINK: https://resilienceauthority.org/

RANK AND REASONING: 5. Guidance not yet released. Will likely be a good fit once released

Step 1: Background Information

Aspect	PROJECT 1: Severn River Crossing	PROJECT 2: City and County Water Supply Interconnection
Project Name	Severn River Crossing	Interconnection between County and City systems
Project / Action Description	This project would involve an engineering feasibility study to evaluate connecting the 220 and 210 zones of the Arnold WTP and Broad Creek WTP via a water transmission pipeline under the Severn River.	Combine the City and County's hydraulic model, test the interconnection, develop SOP for the interconnection.
Rationale for Project / Action	The Arnold Water Treatment Plant provides water to the North Severn side of NSA Annapolis. Currently Arnold WTP (County) is the sole backup supply to the USNA. There is no connection between the County's Arnold and Broad Creek WTP due to the Severn River. This connection, if feasible, would provide the USNA with additional treatment plant sources if the Arnold WTP were lost for any reason.	Currently the City and County do not understand how the interconnection between the system operates Broad Creek (County) and the Annapolis (City) Water Treatment Plants were designed to provide redundancies. However, based on an accidental opening, this has been proved incorrect. In addition, there is currently no combined model to evaluate this interconnection and there is limited training on both the City and County side on how to operate the interconnection.
Priority Level	Medium	TBD
Nature Based Solutions	No nature based solution exists	No nature based solution exists

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Step 2: Responsible Parties

Aspect	PROJECT 1: Severn River Crossing	PROJECT 2: City and County Water Supply Interconnection
Project Lead	Anne Arundel County	City of Annapolis
Project Support	Navy as Arnold Water Treatment Plant is the sole backup to NSA	Anne Arundel County
Potential Partnerships or External Resources	City of Annapolis as they would benefit from the increased reliance of the water distribution system through the City/County interconnection	Navy
Capacity	The County has the Severn River connection on there long term capital improvement project but external funding would bring up the this project.	The City has a retired employee that has capacity to combine the models. The City and County have both expressed interest and availability to combined the hydraulic models and activate the interconnection.

Step 3: Timeline

Aspect	PROJECT 1	PROJECT 2
Estimated Time to Complete	Immediate to 3 years	45-69 months

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Step 4: Action Plan Tasks: Severn River Crossing

Task(s)	Description	Estimated Time to Complete	Estimated Cost (Planning Level)
Feasibility / Pre-design Report (10% Design)	Select a preferred alternative for the project Set project goals Develop design criteria Undertake modeling including alternatives analysis Identify potential risks Develop a planning/conceptual level cost estimate Identify stakeholders Identify regulatory requirements Determine permitting requirements	12 - 18-months	$800k - $950k
Engineering Design Report (30% Design)	Determine any fatal flaws. Further design of preferred alternative Develop a baseline cost estimate Finalize design criteria Determine land acquisition needs Undertake field work including geotechnical borings Compile geotechnical information including borings logs Apply for Permits (FEMA etc.) Submit funding application (if not already do so at 10%) Prepare the Environmental Documents (CEQA/ NEPA Clearances)	12 - 18-months	$800k - $950k
Draft Design Report (60% Design)	Finalize the expectations and objectives Confirm the constructability Determine and apply for construction permit requirements Implement acceptable value engineering requirements, if applicable. Identify preferred equipment and materials. Focused geotechnical investigations	9 - 12-months	$400k - $500k
Final Design Report (90% Design)	Final design drawing for construction bid Confirm the bid viability of the project. Prepare engineer's cost estimate for bid. Finalize permitting packages	6 - 12-months	$150k - $200k
Bid and Construction Phase	Advertise, bid, award construction contracts.	9 - 12-months	$350k - $450k
Construction Phase	Construct proposed improvements.	24 - 30-months	$35 - $50M
TOTAL		72 - 102-months	$37.5M - $53M

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Step 5: Action Plan Tasks City and County Water Supply Interconnection

Task(s)	Description	Estimated Time to Complete	Estimated Cost (Planning Level)
Combine WaterGEMS	- Combine the City and County WaterGEMS hydraulic models - Develop scenarios in order to test the interconnection. Scenarios included: City supplying County and County supplying City - Report findings to City and County - Identify any CIPs required, typically these would include control valve (pressure reducing valve or flow control valve) installation, booster pump station, operational controls (SCADA, PLC, Telemtry etc.) - Deliverables: Combined WaterGEMS model, report, City/ County meetings	9 - 12 months	$150k - $175k
Engineering Design Report (30% Design)	Begin design of booster pump station, pressure or flow control valves and SCADA Develop a baseline cost estimate Finalize design criteria Determine land acquisition needs Undertake field work including geotechnical borings Compile geotechnical information including borings logs Apply for Permits (FEMA etc.) Submit funding application (if not already do so at 10%) Prepare the Environmental Documents (CEQA/NEPA Clearances)	9 - 12 months	$200k - $350k
Draft Design Report (60% Design)	Finalize the expectations and objectives Confirm the constructability Determine and apply for construction permit requirements Implement acceptable value engineering requirements, if applicable. Identify preferred equipment and materials. Focused geotechnical investigations	3 - 6 months	$100k - $300k
Final Design Report (90% Design)	Final design drawing for construction bid Confirm the bid viability of the project. Prepare engineer's cost estimate for bid. Finalize permitting packages	6 - 9 months	$100k - $200k
Bid and Construction Phase	Advertise, bid, award construction contracts.	3 - 6 months	$100k - $200k
Construction Phase	Construct proposed improvements.	12 - 18 months	$3 - $5M

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Continued from previous page: Step 5: Action Plan Tasks. City and County Water Supply Interconnection

Startup and Testing	City and County staff will perform a test exercise of the interconnection. - Activate the interconnection so that water flows from the County to the City system - Activate the interconnection so that water flows from the City of the County system	1 - 2 months	$100k - $200k
Standard Operating Procedure Development	- Develop a standard operating proceedure for operating the interconnection - The procedure should apply for operation from both City and County personnel to open the connection and contain enough information that any City and County operations staff can implement the procedure and understand the conditions under which the interconnection operates	1 - 2 months	$50k - $75k
City and County Operations Staff Training	- Undertake training of both City and County operations staff on the SOP of the interconnection - This would be a combination of classroom and in person hands on operation of the interconnection - This training should be undertaken annually - the interconnection should be active annually to ensure it can be operated under an emergency situation	1 - 2 months	$25k - $35k
TOTAL		45 - 69 months	$3.83 - $6.54M

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Step 6: Public Support / Co-Benefits

Aspect	PROJECT 1: Severn River Crossing	PROJECT 2: CIty/County Interconnection
Public Support	*TBD*	*TBD*
Co-Benefits:	*Improves existing water supply security*	*Improves existing water supply security*
Mission Readiness	*Provide additional redundancy for the installations so that personnel can focus on the mission at hand as double redundancy has been provided.*	*Provide additional redundancy for the installations so that personnel can focus on the mission at hand as double redundancy has been provided.*
Environmental	*TBD*	*TBD*
Social	*TBD*	*TBD*
Equity (Community Resilience)	*With increased redundancy, this project improves the community resiliency to a number scenarios that could interrupt water production. A cyber security attack/ natural disaster would now need to knock out three water treatment plants instead of one.*	*With increased redundancy, this project improves the community resiliency to a number scenarios that could interrupt water production. A cyber security attack/ natural disaster would now need to knock out three water treatment plants instead of one.*
Equity (Social Vulnerability)	*TBD*	*TBD*
Economic	*TBD*	*TBD*

WATER TREATMENT PLANT FUNDING SOURCES (Ranked):

- Drinking Water Supply Assistance Program
- Drinking Water Revolving Loan Fund (DWRLF)
- Community Resilience Program: CoastSmart Communities
- Emergency Community Water Assistance Grants (EWAG)
- Water Infrastructure Finance and Innovation Act (WIFIA)
- Public Works & Economic Adjustment Assistance Programs
- Community Development Block (CDBG) Program

Drinking Water Supply Assistance Program:

AGENCY: Maryland Department of the Environment: Water Infrastructure Financing Administration

PURPOSE/GOALS: Provides financial assistance for the acquisition, construction, rehabilitation, and improvement of publicly owned water supply facilities throughout the State. This program helps to fund projects that address water supply related health problems, and to meet federal Safe Drinking Water Act requirements.

ELIGIBLE APPLICANTS: Publicly-owned facilities

ELIGIBLE USE OF FUNDS: Upgrade water treatment facilities; well development; water storage tanks; water distribution facilities up to private property lines; consolidation of smaller water systems.

TERMS/REQUIREMENTS/NOTES: Grantees may receive up to 100 percent of technical assistance project costs of up to $500,000 per local agency or tribe per fiscal year

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Funding Applications Accepted December thru January Annually

LINK: https://mde.maryland.gov/programs/water/WQFA/Pages/wqfa_ws.aspx

RANK AND REASONING: 5. Maryland specific, small size program and grant. Applicable for size of "study" cost. Could be a complement to larger implementation project.

WATER TREATMENT PLANT FUNDING SOURCES (Ranked):

- Drinking Water Supply Assistance Program
- Drinking Water Revolving Loan Fund (DWRLF)
- Community Resilience Program: CoastSmart Communities
- Emergency Community Water Assistance Grants (EWAG)
- Water Infrastructure Finance and Innovation Act (WIFIA)
- Public Works & Economic Adjustment Assistance Programs
- Community Development Block (CDBG) Program

Drinking Water Revolving Loan Fund (DWRLF):

AGENCY: Maryland Department of the Environment: Water Infrastructure Financing Administration

PURPOSE/GOALS: Financial assistance for a wide variety of projects to facilitate compliance with national primary drinking water standards that protect or improve the quality of Maryland's drinking water resources. The federal Safe Drinking Water Act requires that all community water systems demonstrate the managerial, technical and financial capacity to maintain the system prior receiving a Drinking Water loan.

ELIGIBLE APPLICANTS: Public or privately-owned drinking water projects.

ELIGIBLE USE OF FUNDS:
- Water Treatment Plant Construction and Upgrade of Existing Water Treatment Facilities
- Development, Coordination, and Implementation of Source Water Protection Plans
- Raw Water Intake and Conveyance Infrastructure and Finished Water Storage Facilities
- Water Distribution System Rehabilitation including Lead Service Line Replacement
- Consolidation of Water Systems to enhance Operational, Managerial and Financial Capacity
- Planning, Design and/or Construction phases of above listed eligible Drinking Water Projects

TERMS/REQUIREMENTS/NOTES: Work with MDWIFA; demonstrate the managerial, technical and financial capacity to maintain the system. Interest Rate = 50% of Market Rate, Loan Term = 30 years

TYPE: LOAN

FUNDING AMOUNT AND CYCLE: Funding Applications Accepted December thru January Annually

LINK: https://mde.maryland.gov/programs/water/WQFA/Pages/drinking_water_fund.aspx

RANK AND REASONING: 3. Good for implementation because a loan, but wouldn't recommend for studies.

WATER TREATMENT PLANT FUNDING SOURCES (Ranked):

- Drinking Water Supply Assistance Program
- Drinking Water Revolving Loan Fund (DWRLF)
- Community Resilience Program: CoastSmart Communities
- Emergency Community Water Assistance Grants (EWAG)
- Water Infrastructure Finance and Innovation Act (WIFIA)
- Public Works & Economic Adjustment Assistance Programs
- Community Development Block (CDBG) Program

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Community Resilience Program: CoastSmart Communities:

AGENCY: Maryland Department of Natural Resources

PURPOSE/GOALS: For projects that seek to achieve this reduced risk in whatever manner is most feasible for the local community. The damages and impacts resulting from flood events present a substantial threat to communities, infrastructure and natural resources throughout the state of Maryland. Ideal projects foster innovative adaptation strategies that ensure that Maryland communities are increasingly resilient to flood risks, work to ascertain that Bay and ocean waters meet living resource and human needs, and serve to enhance the protection and management of the state's resources. Projects should also help communities more clearly communicate the risks associated with hazards in order to better protect citizens, infrastructure, and natural resources.

ELIGIBLE APPLICANTS: Governments, academic institutions and non-governmental organizations.

ELIGIBLE USE OF FUNDS: Including, but not limited to, the payment of costs of debt issuance, obtaining credit enhancement, and establishing and funding of reserves for the payment of principal and interest on debt issued by fund participants.

TERMS/REQUIREMENTS/NOTES: For outcome 2, proposals may request up to $75,000 of funding for projects that will be a maximum of one year in duration.

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Year-round, apply through the Grants Gateway through Outcome 2. Current cycle applications due December 2022 with awards in June 2023; funding available in July 2023.

LINK: https://dnr.maryland.gov/ccs/coastsmart/Pages/default.aspx

RANK AND REASONING: 2. MD specific and good match from a "size" of funding needed. Focused mostly on stormwater/nature-based types of projects, but Outcome 2 is related to effects of sea level rise and flooding, infrastructure and planning. Interconnection to serve the Installation would need to be tied to if the Installation water supply shut down due to flooding. much more funding available. Requires a separate financing agreement from a private lender.

WATER TREATMENT PLANT FUNDING SOURCES (Ranked):

- Drinking Water Supply Assistance Program
- Drinking Water Revolving Loan Fund (DWRLF)
- Community Resilience Program: CoastSmart Communities
- Emergency Community Water Assistance Grants (EWAG)
- Water Infrastructure Finance and Innovation Act (WIFIA)
- Public Works & Economic Adjustment Assistance Programs
- Community Development Block (CDBG) Program

Emergency Community Water Assistance Grants (EWAG):

AGENCY: USDA Rural Development

PURPOSE/GOALS: This program helps eligible communities prepare, or recover from, an emergency that threatens the availability of safe, reliable drinking water.

ELIGIBLE APPLICANTS: Most state and local governmental entities; nonprofit organizations; federally recognized tribes; eligible areas; rural areas and towns with population <10k; The area to be served must also have a MHI less-than the states' median household income for non-metropolitan areas.

ELIGIBLE USE OF FUNDS: Water transmission line grants up to $150,000 to construct waterline extensions, repair breaks or leaks in existing water distribution lines, and address related maintenance necessary to replenish the water supply. Water source grants up to $1,000,000 are to construct a water source, intake or treatment facility. While a federal disaster declaration is note required, these funds prepare/respond to emergencies: Drought or flood, Earthquake, Tornado or hurricane, Disease outbreak, Chemical spill leak or seepage, Other disasters

TERMS/REQUIREMENTS/NOTES: A maximum grant of $1,000,000 to communities with a significant decline in quantity or quality of drinking water due to an emergency. A maximum grant of $150,000 to make emergency repairs and replacement of facilities on existing systems Matching funds encouraged, not required.

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: YEAR-ROUND

LINK: https://www.rd.usda.gov/programs-services/water-environmental-programs/emergency-community-water-assistance-grants

RANK AND REASONING: 3. Focus of requirements of recovery, but also has prevention, good if only for the "feasibility study" or hydraulic models.

WATER TREATMENT PLANT FUNDING SOURCES (Ranked):

- Drinking Water Supply Assistance Program
- Drinking Water Revolving Loan Fund (DWRLF)
- Community Resilience Program: CoastSmart Communities
- Emergency Community Water Assistance Grants (EWAG)
- Water Infrastructure Finance and Innovation Act (WIFIA)
- Public Works & Economic Adjustment Assistance Programs
- Community Development Block (CDBG) Program

Water Infrastructure Finance and Innovation Act (WIFIA):

AGENCY: ENVIROMENTAL PROTECTION AGENCY(EPA)

PURPOSE/GOALS: Accelerates investment in nation's water infrastructure by providing long-term, low-cost supplemental loans for regionally and nationally significant projects

ELIGIBLE APPLICANTS: Local, state, tribal, and federal government entities:
Partnerships and joint ventures. Corporations and trusts.

ELIGIBLE USE OF FUNDS: Construction of publicly owned treatment works, nonpoint source pollution management, national estuary program projects, decentralized wastewater treatment systems, stormwater management, water conservation/efficiency/reuse, watershed pilot projects, energy efficiency, security measures at publicly owned treatment works, and technical assistance.

TERMS/REQUIREMENTS/NOTES: Funds up to 49% of project costs (51% match required, can come from other sources such as the state SRF). s$20 million: Minimum project size for large communities.
s$5 million: Minimum project size for small communities (population of 25,000 or less).
s49 percent: Maximum portion of eligible project costs that WIFIA can fund.
sTotal federal assistance may not exceed 80 percent of a project's eligible costs.
s35 years: Maximum final maturity date from substantial completion.
s5 years: Maximum time that repayment may be deferred after substantial completion of the project.

Interest rate will be equal to or greater than the U.S. Treasury rate of a similar maturity at the date of closing.
Projects must be creditworthy and have a dedicated source of revenue.

TYPE: LOAN

FUNDING AMOUNT AND CYCLE: Annual cycle, rolling deadlines. EPA may announce multiple selection rounds in a single NOFA. NOFA will indicate deadline for required Letter of Interest.

LINK: https://www.epa.gov/wifia

RANK AND REASONING: 5. Very applicable, large effort and would be best suited for implementation or part of a package of projects; as opposed to just a single feasibility study. Well-suited to support all phases of WTP 1, and planning efforts bundled in.

WATER TREATMENT PLANT FUNDING SOURCES (Ranked):

- Drinking Water Supply Assistance Program
- Drinking Water Revolving Loan Fund (DWRLF)
- Community Resilience Program: CoastSmart Communities
- Emergency Community Water Assistance Grants (EWAG)
- Water Infrastructure Finance and Innovation Act (WIFIA)
- Public Works & Economic Adjustment Assistance Programs
- Community Development Block (CDBG) Program

Public Works & Economic Adjustment Assistance Programs:

AGENCY: US Economic Development Administration (EDA)

PURPOSE/GOALS: Assists state and local interests in designing and implementing strategies to adjust or bring about change to an economy. As the most flexible program, it will help hundreds of communities plan, build, and put people back to work through construction or non-construction projects designed to meet local needs.

ELIGIBLE APPLICANTS: States, cities, counties; Indian tribes; the Federated States of Micronesia; the Republic of the Marshall Islands; commonwealths and territories of the United States; and private or public nonprofits representing a redevelopment area or a designated economic development center. Applicants must provide third-party data that clearly indicate that the relevant region is subject to one (or more) of the following economic distress criteria: (i) an unemployment rate that is at least one percentage point greater than the national average unemployment rate; (ii) per capita income 80 percent or less of the national average per capita income; or (iii) a "Special Need," as determined by EDA.

ELIGIBLE USE OF FUNDS: "A wide range of technical, planning, and public works and infrastructure assistance through:

- Strategy Grants to support the development, updating or refinement of a Comprehensive Economic Development Strategy (CEDS).
- Implementation Grants to support the execution of activities identified in a CEDS, such as:
  1. Water and sewer improvements
  2. Industrial parks
  3. High-tech shipping and logistics facilities
  4. Business incubators and accelerators
  5. Brownfield redevelopment
  6. Technology-based facilities
  7. Wet labs
  8. Multi-tenant manufacturing facilities
  9. Science and research parks

TERMS/REQUIREMENTS/NOTES: Must align with regional Comprehensive Economic Development Strategy (CEDS) document or the creation of a CEDS. The EDA looks favorably upon projects that promote Equity, including communities with underserved populations, including racial minorities, Tribal Lands, Persistent Poverty Counties, and rural areas with demonstrated, historical underservice."

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: There are no application deadlines and the agency will accept proposals on a rolling basis until the publication of a new PWEAA NOFO, cancellation of the current NOFO, or all funds are obligated. Recommended to reach out to regional EDA office (for Maryland, the regional office is Philadelphia)

LINK: https://www.eda.gov/funding/programs/american-rescue-plan/economic-adjustment-assistance

RANK AND REASONING: 1. Flexible to be used for both studies and implementation, but need to make the tie to economic development, not as much resilience. Annapolis doesn't meet primary economic distress requirements, but still may qualify as Special Needs with the connection to defense.

WATER TREATMENT PLANT FUNDING SOURCES (Ranked):

- Drinking Water Supply Assistance Program
- Drinking Water Revolving Loan Fund (DWRLF)
- Community Resilience Program: CoastSmart Communities
- Emergency Community Water Assistance Grants (EWAG)
- Water Infrastructure Finance and Innovation Act (WIFIA)
- Public Works & Economic Adjustment Assistance Programs
- Community Development Block (CDBG) Program

Community Development Block (CDBG) Program:

AGENCY: Department of Housing & Urban Development

PURPOSE/GOALS: Provides annual grants on a formula basis to states, cities, and counties to develop viable urban communities by providing decent housing and a suitable living environment, and by expanding economic opportunities, principally for low- and moderate-income persons.

ELIGIBLE APPLICANTS: Cities < 50,000 residents and Counties < 200,000 residents.

ELIGIBLE USE OF FUNDS: CDBG funds may be used for activities that include, but are not limited to:
- Acquisition of real property
- Relocation and demolition
- Rehabilitation of residential and non-residential structures
- Construction of public facilities and improvements, such as water and sewer facilities, streets, neighborhood centers, and the conversion of school buildings for eligible purposes
- Public services, within certain limits
- Activities relating to energy conservation and renewable energy resources
- Provision of assistance to profit-motivated businesses to carry out economic development and job creation / retention activities

TERMS/REQUIREMENTS/NOTES: Varies by City/State

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Annual Allocation

LINK: https://www.hud.gov/program_offices/comm_planning/cdbg/

RANK AND REASONING: 2. While eligible for water/sewer infrastructure, not as strong of a tie to serving low/moderate income persons

Background Information	
Aspect	**Response**
Asset Name	Confidentiality, Integrity and Availability (CIA) of information security assets
Asset Description	Information security assets include any hardware, software and confidential information that are necessary to support an organization's operations, which, if compromised, would result in direct loss to the organization.

Step 1: Background Information	
Aspect	**Response**
Project Name	Establish a statewide Cybersecurity Planning Committee and prepare a Cybersecurity Plan
Project / Action Description	Interconnected network infrastructure improves mission effectiveness, but also increases vulnerability to cyber attacks as they create more potential to backdoor attacks. Cyber incident response time is a critical component to effectively neutralize a threat before it compromises assets, but without the appropriate processes, dedicated staff and visibility to monitor and respond, vulnerabilities are compounded. Coordination and collaboration between entities is thus critical to improve the cybersecurity posture. Defense community information sharing through a single pane of glass software* can help bridge the gap and provide dedicated staff the appropriate monitoring capabilities to rapidly detect and respond to a threat. For this to happen, a planning committee comprised of representatives from various community lifelines (education, healthcare, energy, water, military, etc.) needs to be formed in order to address cybersecurity in a coordinated manner.
Rationale for Project / Action	On September 16, 2022, the Department of Homeland Security (DHS) announced a first-of-its-kind cybersecurity grant program specifically for state, local, and territorial (SLT) governments across the country. These entities face unique challenges in defending against cyber threats such as ransomware, as they lack the resources to defend against constantly changing threats. The DHS, through the Cybersecurity and Infrastructure Security Agency (CISA), is taking steps to help stakeholders across the country understand the severity of their unique local cyber threats and cultivate partnerships to reduce related risks across the SLT enterprise. The Notice of Funding Opportunity (NOFO) issued in September 2022 includes all requirements and details, with the key requirement being the elaboration of a statewide Cybersecurity Planning Committee and a Cybersecurity Plan. While the application period for 2022 is already passed, the $1 billion grant program will fund SLT partners over the next four years, allowing the City of Annapolis to prepare for next year's application period. The designated State Administrative Agency (SAA) for each state and territory is the only entity eligible to apply for the grant program funding, which is the Maryland Department of Emergency Management (MDEM) in this case.
Priority Level	Very High

*Single pane of software : Single pane of glass is a type of software that merges multiple feature sets into a single solution with a unified display. It provides a central console where you can view data and manage all data sources with the click of a button.

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Step 2: Responsible Parties	
Aspect	**Response**
Project Lead	Maryland Department of Emergency Management
Project Support	City of Annapolis, Anne Arundel County Public Schools, Anne Arundel Medical Center, Annapolis Water Treatment plants, NSA Annapolis
Potential Partnerships or External Resources	State of Maryland (funding), CISA (SME), FEMA (funding)
Capacity	*To be determined*

Step 3: Timeline	
Aspect	**Response**
Estimated Time to Complete	Immediate to 3 years

Step 4: Action Plan Tasks

Task(s)	Description	Estimated Time to Complete	Estimated Cost (Planning Level)
Vision and Mission	Articulate the vision and mission for improving cybersecurity resilience interoperability over the next one-to-three-years	1 month	50,160
Organization, and Roles and Responsibilities	Describe the current roles and responsibilities, and any governance mechanisms for cybersecurity within the state of Maryland as well as successes, challenges, and priorities for improvement. This also includes a strategy for the cybersecurity program and the organization structure that identifies how the cybersecurity program is supported. In addition, this section includes governance that identifies authorities and requirements of the state of Maryland cybersecurity program.	4 month	200,640
Feedback and input from local governments and associations	Describe how inputs from local governments are used in order to reduce overall cybersecurity risk across the community. This is especially important in order to develop a holistic cybersecurity plan.	3 month	150,480
Cybersecurity Plan Elements	Outline technology and operations needed to maintain and enhance resilience across the cybersecurity landscape. Cybersecurity Plan Elements should help achieve the specific outcomes elaborated in the NIST Cybersecurity Framework (Identify, Protect, Detect, Respond, Recover)	6 month	300,960
Funding	Describe funding sources and allocations to build cybersecurity capabilities within the state of Maryland along with methods and strategies for funding sustainment and enhancement to meet long-term goals.	1 month	50,160
Implementation Plan	Describe the state's plan to implement, maintain, and update the Cybersecurity Plan to enable continued evolution of and progress toward the identified goals. The implementation plan must include the resources and timeline where practicable.	3 month	150,480
Metrics	Describe how the state of Maryland will measure the outputs and outcomes of the program across the state.	1 month	50,160
TOTAL		19 month	953,040

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Step 5: Public Support / Co-Benefits

Aspect	Response
Public Support	TBD
Co-Benefits:	
Mission Readiness	Will improve mission readiness of various community services (education, healthcare, energy, water, military, etc.) as defense community information sharing will allow faster response time to a threat and thus improve the overall security posture.
Environmental	TBD
Social	TBD
Equity (Community Resilience)	TBD
Equity (Social Vulnerability)	TBD
Economic	Lower insurance costs and reduced annual loss due to successful cyber attacks

CYBERSECURITY FUNDING SOURCES (Ranked):

- State and Local Cybersecurity Grant Program
- Department of Homeland Security State Homeland Security Program (SHSP)
- Department of Homeland Security Urban Area Security Initiative (UASI)
- Emergency Management Performance Grant (EMPG)

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State and Local Cybersecurity Grant Program:

AGENCY: Department of Homeland Security: FEMA and Cybersecurity and Infrastructure Security Agency (CISA)

PURPOSE/GOALS: To make targeted cybersecurity investments in state, local, and territorial (SLT) governments to improve security of critical infrastructure and improve the resilience of community services. Goals of the grant program include:
1) Implement cyber governance and planning;
2) Assess and evaluate systems and capabilities;
3) Mitigate prioritized issues; and
4) Build a cybersecurity workforce.

ELIGIBLE APPLICANTS: All 56 states and territories through the designated State Administrative Agency (SAA). The SAA may partner with local entities through a multi-entity group.

ELIGIBLE USE OF FUNDS: Planning, equipment, exercises, management & administration, organization, and training investments that will assist SLT governments with managing and reducing systemic cyber risk.
Recipients are required to: establish a Cybersecurity Planning Committee; develop or revise a statewide Cybersecurity Plan; conduct assessment and evaluations as the basis for individual projects throughout the life of the program; and adopt key cybersecurity best practices.

TERMS/REQUIREMENTS/NOTES: Total $1B over next four years;
$185M for FY2022; Maryland to receive $3.214M FY2022;
Amounts for each state/territory are based on population/rural formula;
10% match required unless a multi-entity application, which is not required to have a cost share.

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Cycle: Annual. Current cycle: Application deadline in June.

LINK: https://www.fema.gov/grants/preparedness/state-local-cybersecurity-grant-program

RANK AND REASONING: 5. For the project purpose, and directly mentioned.

CYBERSECURITY FUNDING SOURCES (Ranked):

- State and Local Cybersecurity Grant Program
- Department of Homeland Security State Homeland Security Program (SHSP)
- Department of Homeland Security Urban Area Security Initiative (UASI)
- Emergency Management Performance Grant (EMPG)

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Department of Homeland Security State Homeland Security Program (SHSP):

AGENCY: Department of Homeland Security (DHS) / FEMA

PURPOSE/GOALS: To assist state, local, tribal, and territorial efforts to build, sustain, and deliver the capabilities necessary to prevent, prepare for, protect against, and respond to acts of terrorism. Supports the implementation of risk-driven strategies, including continuity of operations; cybersecurity enhancements; law enforcement; and prevention. Priorities can shift annually with funding allocations.

ELIGIBLE APPLICANTS: All 56 states and territories through the designated State Administrative Agency (SAA). The designated SAA for Maryland is the Maryland Department of Emergency Management (MDEM), who distributes funding through the State to communities.

ELIGIBLE USE OF FUNDS:
Planning and Organization: Develop whole community partnerships, program management, and intelligence analysis.
Training/Exercises: Develop, deliver, attend, and evaluate training and exercises related to emergency communications and special events.
Equipment: Cybersecurity enhancements, interoperable communications, information technology (IT), maintenance and sustainment (e.g., upgrades, user fees, warranties), and emergency supplies.

TERMS/REQUIREMENTS/NOTES: Each state and territory receives a minimum 0.35% of total annual funds for grant program, with amounts further enhanced by population formula. This equates to approximately $7 million for Maryland annually. No cost share or match requirement.

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Cycle: Annual.

LINK: https://www.fema.gov/grants/preparedness/homeland-security

RANK AND REASONING: 5. Consistent formula funding aligned with project purpose. MDEM makes further distributions to City and County, which could direct their allotments for this purpose.

CYBERSECURITY FUNDING SOURCES (Ranked):

- State and Local Cybersecurity Grant Program
- Department of Homeland Security State Homeland Security Program (SHSP)
- Department of Homeland Security Urban Area Security Initiative (UASI)
- Emergency Management Performance Grant (EMPG)

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Department of Homeland Security Urban Area Security Initiative (UASI):

AGENCY: Department of Homeland Security (DHS) / FEMA

PURPOSE/GOALS: To enhance regional preparedness and assist high-threat, high-density Urban Area efforts to build, sustain, and deliver the capabilities necessary to prevent, prepare for, protect against, and respond to acts of terrorism.

ELIGIBLE APPLICANTS: Eligible urban areas determined through an analysis of relative risk of terrorism faced by the 100 most populous metropolitan statistical areas (MSA); and through the designated State Administrative Agency (SAA). Maryland Department of Emergency Management (MDEM) is the SAA, with the Baltimore urban area qualifying for funding.

ELIGIBLE USE OF FUNDS:
Planning and Organization: Develop whole community partnerships, program management, and intelligence analysts.
Training/Exercises: Develop, deliver, attend, and evaluate training and exercises related to emergency communications and special events.
Equipment: Cybersecurity enhancements, interoperable communications, information technology (IT), maintenance and sustainment (e.g., upgrades, user fees, warranties), and emergency supplies.

TERMS/REQUIREMENTS/NOTES: Amounts for each state/territory for the qualifying urban areas are based on relative risk methodology developed by DHS/FEMA. No cost share or match requirement.

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Cycle: Annual.

LINK: https://www.fema.gov/grants/preparedness/homeland-security

RANK AND REASONING: 5. Consistent formula funding aligned with project purpose. MDEM makes further distributions to City and County, which could direct their allotments for this purpose.

CYBERSECURITY FUNDING SOURCES (Ranked):

- State and Local Cybersecurity Grant Program
- Department of Homeland Security State Homeland Security Program (SHSP)
- Department of Homeland Security Urban Area Security Initiative (UASI)
- Emergency Management Performance Grant (EMPG)

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Emergency Management Performance Grant (EMPG):

AGENCY: FEMA

PURPOSE/GOALS: To assist state emergency management agencies in obtaining the resources required to support the National Preparedness Goal of a secure and resilient nation. This includes addressing the increasing range and complexity of disasters, supporting the diversity of communities, and complementing the nation's growing expectations of the emergency management community: Equity; Climate Resilience; Readiness

ELIGIBLE APPLICANTS: All 56 states and territories are eligible to apply. Either the State Administrative Agency or the state's Emergency Management Agency is eligible to apply directly to FEMA for EMPG Program funds on behalf of each state or territory.
Only one application is accepted from each state or territory
Must ensure and maintain adoption of National Incident Management System (NIMS); as well as belong to Emergency Management Assistance Compact (EMAC)

ELIGIBLE USE OF FUNDS:
Planning and Organization: Developing/updating Statewide Communication Interoperability Plan, Tactical Interoperability Communications Plans, Threat and Hazard Identification and Risk Assessment, Stakeholder Preparedness Review, and Continuity of
Operations Training/Exercises: Develop, deliver, attend, and evaluate training and exercises
Equipment: Cybersecurity enhancements, interoperable communications; maintenance and sustainment (e.g., upgrades, user fees, warranties); construction/renovation of communication tower

TERMS/REQUIREMENTS/NOTES: Formula-based $350-400M annually; Maryland received $7.5M in FY2022. 50% cost share requirement

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Cycle: Annual. Current cycle: Application opened in April and deadline was June 2022.

LINK: https://www.fema.gov/grants/preparedness/emergency-management-performance

RANK AND REASONING: 3. Eligible, but given that one per state, not as strong as others.

Step 1: Background Information

Aspect	PROJECT 1	PROJECT 2	PROJECT 3	PROJECT 4
Project Name	Replace Gate 1 Option 1 - would include improvements of nearby City streets to raise those streets to the same elevation as the replacement gate 1. Option 2 would include improvements to City street(s) between gate 3 and King George St.	MD 450 /King George St. bridge over College Creek. Bridge will be flooded on regular basis by 2100	Prince George Street Current Flood Issues	Traffic Signal and ITS Upgrades
Project / Action Description	Conduct detailed Engineering feasibility analysis of the two options, develop preliminary budget cost estimates and time lines for the design and construction. Evaluate impacts to related NSAA facilities and nearby City streets. Start public involvement process.	Rebuild bridge above the projected 100-year tide surge elevation as of 2100.	Investigate the causes and evaluate potential solutions for the current flooding issues at Prince George Street adjacent to Gate 1 area.	Additional infra-structure and/or communications are necessary to fully utilize up to 30 updated traf-fic signals and ITS equipment to coordinate and enhance emer-gency evacuation routes to support NSA Annapolis/US Naval Academy and surrounding region.
Rationale for Project / Action	Project is required to maintain vehicular access to NSAA in the year 2100. Gate 1 is the main vehicular access to NSAA. Gate 1 will be under sea-level by approximately 1.6 feet (i.e. below average daily high tide) in 2100. Gate 1 will be 100-year flood tide surge will be approximately 7.5' above existing gate 1 due to SLR by 2100.	To maintain the current access to the City and NSAA as currently provided by King George St.	Current flooding on Prince George Street impacts access to the installation at Gate 1.	Traffic signals and ITS equipment will coordinate and enhance emer-gency evacuation routes.

Priority	High	High	High	High
Nature Based Solutions	Not applicable.	Not applicable	Not applicable	Not applicable

Step 2: Responsible Parties

Aspect	PROJECT 1: Gate 1	PROJECT 2: Bridge	PROJECT 3: Prince George Street	PROJECT 4: Traffic / ITS
Project Lead	Joint team including NSAA and City of Annapolis.	Maryland Department of Transportation	City of Annapolis	Maryland Department of Transportation and City of Annapolis
Project Support	Maryland Department of Transportation, Maryland Department of Environment and others to be determined.	NSAA, City of Annapolis and Anne Arundel County. FHWA Eastern Federal Lands	NSAA, FHWA Eastern Federal Lands	FHWA Eastern Federal Lands and others to be determined.
Potential Partnerships or External Resources	To Be Determined as part of feasibility analysis and early public engagement.	Maryland Department of Transportation, NSAA, City of Annapolis, Anne Arundel County and FHWA Eastern Federal Lands	To Be Determined as part of feasibility analysis and early public engagement.	Maryland Dept of Transportation and Anne Arundel County
Capacity	To be determined as part of the engineering feasibility analysis.	To be determined after feasibility studies	To be determined as part of the engineering feasibility analysis.	To be determined as part of the engineering feasibility analysis.

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Step 3: Timeline

Aspect	PROJECT 1	PROJECT 2	PROJECT 3	PROJECT 4
Estimated Time to Complete	3-5 years	10+ Years	1-2 years	2-5 years

Step 4: Action Plan Tasks

Task(s)	Description	Estimated Time to Complete	Estimated Cost (Planning Level)	Task Lead
Feasibility Study for Gate 1	Engineering Feasibility Study for both options including budget cost estimates and initial public outreach	3-4 years	$500K - $750K	NSAA, City of Annapolis, Anne Arundel County and FHWA Eastern Federal Lands
Feasibility Study MD 450 /King George St. bridge over College Creek	Engineering feasibility study for bridge replacement to include budget cost estimate. and initial public outreach	2-3 years	$500K - $800K.	Maryland Department of Transportation, NSAA, City of Annapolis, Anne Arundel County and Eastern Federal

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Step 5: Public Support / Co-Benefits

Aspect	PROJECT 1	PROJECT 2	PROJECT 3	PROJECT 4
Public Support	*None at this time. Public outreach during and after the feasibility studies determine level of public support*	*None at this time. Public outreach during and after the feasibility studies determine level of public support*	*None at this time. Public outreach during and after the feasibility studies determine level of public support*	*None at this time. Public outreach during and after the feasibility studies determine level of public support*
Co-Benefits:				
Mission Readiness	*Maintains current levels of mission readiness - rather then allowing sea level rise to cut off surface transpiration access to NSAA*	*Maintains current levels of mission readiness - rather then allowing sea level rise to cut off surface transportation access to NSAA*	*Addresses a current deficiency in installation access*	*Addresses a current deficiency in circulation and failing equipment currently in use*
Environmental	*TBD*	*TBD*	*TBD*	*TBD*
Social	*Maintains current level of use for public street - rather then allowing street to be under sea levels in year 2100.*	*Maintains current level of use for public street - rather then allowing street to be under sea levels in year 2100.*	*Addresses a current deficiency in access*	*Addresses a current deficiency in circulation and failing equipment currently in use*
Equity (Community Resilience)	*TBD*	*TBD*	*TBD*	*TBD*
Equity (Social Vulnerability)	*TBD*	*TBD*	*TBD*	*TBD*
Economic	*TBD*	*TBD*	*TBD*	*TBD*

ACCESS ROADS SOURCES (RANKED):

- Defense Access Road (DAR) Program
- Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Formula Program
- Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Discretionary Program
- Rebuilding American Infrastructure with Sustainability and Equity (RAISE)
- Consolidated Transportation Program (CTP)
- Bridge Investment Program

HEALTH/MEDICAL | ENERGY | SHORELINES | CITY/COUNTY WTP | CYBERSECURITY | ACCESS ROADS | SEWER | GENERAL

Defense Access Road (DAR) Program:

AGENCY: Department of Defense (DoD)

PURPOSE/GOALS: The Defense Access Road (DAR) Program provides a means for the military to pay their share of the cost of public highway improvements necessary to mitigate an unusual impact of a defense activity. An unusual impact could be a significant increase in personnel at a military installation, relocation of an access gate, or the deployment of an oversized or overweight military vehicle or transporter unit.

ELIGIBLE APPLICANTS: Defense Communities Only. To initiate a DAR project, the local military installation identifies the access or mobility needs and brings these deficiencies to the attention of the Military Surface Deployment and Distribution Command (SDDC).

ELIGIBLE USE OF FUNDS: If the project is determined to be eligible for financing either in whole or in part with defense access road funds, SDDC will certify the roadway as important to the national defense and will authorize expenditure of DoD funds. The Commander, SDDC, is the only representative of the DoD officially authorized to make the certification required by section 210, title 23, U.S.C., in behalf of the Secretary of Defense.

TERMS/REQUIREMENTS/NOTES: No match requirement listed.

TYPE: Congressionally approved DoD funds transferred to Federal Highway Administration (FHWA) to execute

FUNDING AMOUNT AND CYCLE: The SDDC will determine if the proposed work/ project/ improvements are eligible for DAR funds and certify the road/roads/intersection as important to the national defense if appropriate. Then the military service is responsible for requesting DoD funding for the project through their normal budgeting process. Once programmed by the military service, the funds must be authorized and appropriated by Congress. After Congressional approval, the funds are transferred to FHWA and allocated to the agency administering the project. Title 23 Federal-aid procedures are followed in the design and construction of the project.

LINK: https://highways.dot.gov/federal-lands/programs/defense

RANK AND REASONING: 4. Great fit if SDDC agrees that the access road projects are important to the national defense installation.

ACCESS ROADS SOURCES (RANKED):

- Defense Access Road (DAR) Program
- Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Formula Program
- Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Discretionary Program
- Rebuilding American Infrastructure with Sustainability and Equity (RAISE)
- Consolidated Transportation Program (CTP)
- Bridge Investment Program

HEALTH/MEDICAL | ENERGY | SHORELINES | CITY/COUNTY WTP
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Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Formula Program:

AGENCY: Federal Highway Administration (FHWA) | Maryland Department of Transportation (MDOT)

PURPOSE/GOALS: To make transportation infrastructure more resilient to future weather events and other natural disasters by focusing on resilience planning, making resilience improvements to existing transportation assets and evacuation routes, and addressing at-risk highway infrastructure.

ELIGIBLE APPLICANTS: States receive direct allocation from Federal Highway Administration on a formula basis. States are encouraged by FHWA to work with regional and local partner organizations (MPOs) to prioritize transportation and emergency response improvements, as well as address vulnerabilities.

ELIGIBLE USE OF FUNDS: In general, eligible projects include highway and transit projects, bicycle and pedestrian facilities, and port facilities including those that help improve evacuations or disaster relief.
A state may only use PROTECT funds on highway projects, public transportation facilities and port facilities including facilities that connect ports with other modes of transportation, improve efficiency of evacuations and disaster relief or aid transportation.
Projects must be included on the STIP to be eligible for funding.

TERMS/REQUIREMENTS/NOTES: $7.3 billion in formula funding.
Maryland is estimated to receive a total of $107,314,286 over the five-year period.

TYPE: FORMULA GRANTS

FUNDING AMOUNT AND CYCLE: No funding cycle; states receive annual allocation directly from FHWA.

LINK: https://highways.dot.gov/newsroom/biden-administration-announces-new-protect-formula-program-73-billion-bipartisan

RANK AND REASONING: 3. Ranking dependent first and foremost on MDOT's plan to use their PROTECT formula funding. And then:
1. Are the access roads part of an evacuation route?
2. Are they eligible to be listed in the STIP
Answers would increase or decrease ranking accordingly.

ACCESS ROADS SOURCES (RANKED):

- Defense Access Road (DAR) Program
- Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Formula Program
- Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Discretionary Program
- Rebuilding American Infrastructure with Sustainability and Equity (RAISE)
- Consolidated Transportation Program (CTP)
- Bridge Investment Program

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Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Discretionary Program:

AGENCY: Federal Highway Administration (FHWA)

PURPOSE/GOALS: To make transportation infrastructure more resilient to future weather events and other natural disasters by focusing on resilience planning, making resilience improvements to existing transportation assets and evacuation routes, and addressing at-risk highway infrastructure.

ELIGIBLE APPLICANTS: State (or political subdivision of a State), MPO, local government, special purpose district or public authority with a transportation function, Tribe, Federal land management agency (applying jointly with State(s)); Different eligibilities apply for at-risk coastal infrastructure grants.

ELIGIBLE USE OF FUNDS: Resilience planning, strengthen and protect evacuation routes, and increase the resilience of surface transportation infrastructure from the impacts of sea level rise, flooding, wildfires, extreme weather events, and other natural disasters. Highway, transit, and certain port projects are eligible. Projects must be included on the STIP to be eligible for funding.

TERMS/REQUIREMENTS/NOTES: $1.4 Billion total available for 5 years.

TYPE: GRANTS

FUNDING AMOUNT AND CYCLE: First funding cycle was released on April 21, 2023.

LINK: https://www.fhwa.dot.gov/environment/protect/discretionary/

RANK AND REASONING: 3. Need funding announcement (expected spring 2023) to fully rank this program.

ACCESS ROADS SOURCES (RANKED):

- Defense Access Road (DAR) Program
- Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Formula Program
- Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Discretionary Program
- **Rebuilding American Infrastructure with Sustainability and Equity (RAISE)**
- Consolidated Transportation Program (CTP)
- Bridge Investment Program

HEALTH/MEDICAL | ENERGY | SHORELINES | CITY/COUNTY WTP
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Rebuilding American Infrastructure with Sustainability and Equity (RAISE):

AGENCY: US Department of Transportation

PURPOSE/GOALS: For road, rail, transit and port projects to build and repair freight and passenger transportation networks.

ELIGIBLE APPLICANTS: State, local and tribal governments, including U.S. territories, transit agencies, port authorities, metropolitan planning organizations (MPOs), and other political subdivisions of State or local governments.

ELIGIBLE USE OF FUNDS:

- **Capital Projects** Eligible projects for RAISE grants are surface transportation capital projects within the United States or any territory or possession of the United States that include, but are not limited to:: highway, bridge, or other road projects eligible under title 23, USC; public transportation projects eligible under chapter 53 of title 49, USC; passenger and freight rail transportation projects; port infrastructure investments; intermodal projects; projects investing in surface transportation facilities that are located on Tribal land and for which title or maintenance responsibility is vested in the Federal Government. Research, demonstration, or pilot projects are eligible only if they will result in long-term, permanent surface transportation infrastructure that has independent utility
- **Planning Projects**: Planning, preparation, or design of eligible surface transportation capital projects. In addition, eligible activities related to multidisciplinary projects or regional planning may include: i. Development of master plans, comprehensive plans, or corridor plans; ii. Planning activities related to the development of a multimodal freight corridor, including those that seek to reduce conflicts with residential areas and with passenger and non-motorized traffic.

The primary selection criteria are Safety, Environmental Sustainability, Quality of Life, Economic Competitiveness, and State of Good Repair.

TERMS/REQUIREMENTS/NOTES: Grants not less than $5 million and not greater than $25 million, except that for projects located in rural areas (as defined in Section C.4.(a)) the minimum award size is $1 million. Must provide 20% non-federal match. There is no minimum award size, regardless of location, for RAISE planning grants. Total available is $1.5 Billion.

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Annual program, current round closes February 28, 2023.

LINK: https://www.transportation.gov/RAISEgrants; Howard Hill, 202-366-0301, RAISEgrants@dot.gov

RANK AND REASONING: 4. Ties from project to solving a transportation problem, safety, and climate change make it competitive. Need to clarify the benefit to historically disadvantaged census tracts to increase rank to a 5.

ACCESS ROADS SOURCES (RANKED):

- Defense Access Road (DAR) Program
- Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Formula Program
- Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Discretionary Program
- Rebuilding American Infrastructure with Sustainability and Equity (RAISE)
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Consolidated Transportation Program (CTP):

AGENCY: Maryland Department of Transportation (MDOT)

PURPOSE/GOALS: 6- year capital budget for transportation projects.

ELIGIBLE APPLICANTS: Local jurisdictions, counties, metropolitan planning organizations.

ELIGIBLE USE OF FUNDS: MDOT uses the following criteria to identify transportation projects and programs that align with the state's transportation priorities.
These criteria include:

- Meets all federal and other legal mandates (e.g. Total Maximum Daily Load (TMDL) compliance, Positive Train Control (PTC), Federal Aviation Administration (FAA) regulations to maintain airport permits);
- Supports the Department's mission, program priorities and Maryland Transportation Plan (MTP) goals (safety, system preservation, economic development, etc.);
- Meets all federal match requirements to maximize federal revenue sources;
- Supports state plans and objectives;
- Supports existing project commitments and upholds intergovernmental agreements;
- Is the single top priority within a local priority letter;
- Is consistent with local plans; and
- Is included in the regional Metropolitan Planning Organization (MPO) long-range plan (if the project is located within an MPO boundary).

TERMS/REQUIREMENTS/NOTES: Appears to require 20% non-federal match so that MDOT can utilize federal formula funding for projects in the CTP.

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Annual program, in April.
CTP is updated every 5 years; next update begins this year, 2023.

LINK: https://www.mdot.maryland.gov/tso/pages/Index.aspx?PageId=27

RANK AND REASONING: N/A

ACCESS ROADS SOURCES (RANKED):

- Defense Access Road (DAR) Program
- Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Formula Program
- Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Discretionary Program
- Rebuilding American Infrastructure with Sustainability and Equity (RAISE)
- Consolidated Transportation Program (CTP)
- Bridge Investment Program

Bridge Investment Program:

AGENCY: Federal Highway Administration

PURPOSE/GOALS: To improve bridge condition and the safety, efficiency, and reliability of the movement of people and freight over bridges.

ELIGIBLE APPLICANTS: States or group of States, metropolitan planning organizations, units of local governments, political subdivisions of a State or local government, special purpose districts or public authorities with a transportation function, Tribal governments or a consortium of Tribal governments, multistate or multijurisdictional groups of entities described.

ELIGIBLE USE OF FUNDS: A project (or bundle of projects) to replace, rehabilitate, preserve, or protect a bridge on the National Bridge Inventory (NBI); and a project to replace or rehabilitate culverts on the NBI for the purpose of improving flood control and improved habitat connectivity for aquatic species.
Three types of projects:

1. Large Bridge Projects, with total eligible project costs >$100 million);
2. Bridge Projects, with total eligible project costs ≤ $100 million); and
3. Planning Grants for planning, feasibility analysis, and revenue forecasting of a project that would subsequently be eligible to apply for BIP funding.

TERMS/REQUIREMENTS/NOTES: No minimum size for planning grants, but large projects have minimum award size of $50M, and Bridge projects have minimum award size of $2.5M.

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Annual program; last round had the following due dates for applications:
Planning Project: July 25, 2022
Large Bridge Project: August 9, 2022
Bridge Project: September 8, 2022

LINK: https://www.fhwa.dot.gov/bridge/bip/

RANK AND REASONING: 5. The Planning grant would be a great fit for the engineering feasibility study for the bridge replacement, "Access Road 2", project.

Step 1: Background Information

Aspect	PROJECT 1	PROJECT 2	PROJECT 3	PROJECT 4	PROJECT 5
Project Name	Installation Sewer Capacity and Risk Assessment Current flows and future flows to be conveyed from Facility via City Sewerage System.	Randall and Compromise Street Sewer Scoping Study The Randall Street Sewer conveys the sewage from the installation	Shipwright Siphon Condition Assessment Scoping Study The Shipwright Siphon passes sewage from the City across Spa Creek and ultimately to the Annapolis Water Reclamation Facility	AWRF Final Effluent Filter Pumps Replacement - Preliminary Design	Annapolis Water Reclamation Facility - Primary Sludge Conveyance and Replacement Roadmap
Project / Action Description	Installation and City to partner to complete inflow study to assess conveyance system capacity risk.	1. Evaluate options to assess the condition of the Randall Street Sewer 2. Evaluate options to assess the condition of the Compromise Sewer condition from Randall street to the Shipwright Siphon 3. Provide a concept to refurbish or replace the Randall Street sewer, assessing disruption to the business and residences in the area. 4. Provide two concepts to deliver the sewage from the installation not using the existing Randall Street sewer	The City indicated that the Siphon may not be able to be inspected or repaired. A scoping study will identify the cause of this and provide a plan and budget to enable the inspection of the siphon.	Develop a preliminary design to replace the final effluent filter pumps with pumps that will not be damaged if under water. The final effluent filter pumps are required to discharge effluent from the AWRF to the river during high flow events.	Agree a strategy and budget to either refurbish or replace the primary sludge conveyance from the settling tanks to sludge processing The pipework that conveys the primary sludge from the settling tanks needs to be either refurbished or replaced.
Rationale for Project / Action	Installation and City partner to complete inflow study to assess conveyance system capacity risk	If the Randall Street sewer fails, the sewage from the installation cannot be conveyed to the Annapolis Water Reclamation Facility for treatment and will results in sewage discharges in the nearby water bodies.	The sewage from the installation is conveyed to the Annapolis Water Reclamation Facility via the Shipwright Siphon. Failure of siphon may require the installation to be evacuated to reduce the sewage discharged into Spa Creek.	The AWRF can only treat sewage if the AWRF can discharge the final effluent.	The AWRF will take longer to recover after an event or be unable to operate if the primary sludge conveyance fails.
Priority Level	TBD	High	High	Very High	Moderate

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Step 2: Responsible Parties

Aspect	PROJECT 1	PROJECT 2	PROJECT 3	PROJECT 4	PROJECT 5
Project Lead	NSA Annapolis	City of Annapolis	City of Annapolis	Anne Arundel County	Anne Arundel County
Project Support	City of Annapolis	Naval Installation	Naval Installation	City of Annapolis	City of Annapolis
Potential Partnerships or External Resources	NSA Annapolis and City of Annapolis	NSA Annapolis and City of Annapolis	NSA Annapolis and City of Annapolis	NSA Annapolis and City of Annapolis	NSA Annapolis and City of Annapolis
Capacity	The City of Annapolis will hire a contractor to complete the repairs. NSA Annapolis will be responsible for the interface between the installation and the city conveyance systems.	The City of Annapolis will hire a contractor to complete the repairs. NSA Annapolis will be responsible for the interface between the installation and the city conveyance systems.	The City of Annapolis will hire a contractor to complete the repairs. NSA Annapolis will be responsible for the interface between the installation and the city conveyance systems.	Anne Arundel County will hire a contractor to complete the repairs. NSA Annapolis will be responsible for the interface between the installation and the city conveyance systems.	Anne Arundel County will hire a contractor to complete the repairs. NSA Annapolis will be responsible for the interface between the installation and the city conveyance systems.

Note: Nature Based Solutions Not Applicable for Sewer Projects

Step 3: Timeline

Aspect	PROJECT 1	PROJECT 2	PROJECT 3	PROJECT 4	PROJECT 5
Estimated Time to Complete	Immediate to 3 years	Immediate to 3 years	Immediate to 3 years	Immediate to 3 years	Immediate to 3 years

Step 4: Action Plan Tasks

PROJECT 1: Installation Sewer Capacity and Risk Assessment

Task(s)	Description	Estimated Time to Complete	Estimated Cost	Task Lead
Identify and agree upon flows from the installation	Prepare a document that defines the capacity in the City sewers that must be reserved to service the Installation, now and in the future, accounting for sea level rise.	6 months	$100K	
TOTAL			$100K	

PROJECT 2: Randall Street Sewer Scoping Study

Task(s)	Description	Estimated Time to Complete	Estimated Cost	Task Lead
City of Annapolis Randall Street Sewer Flow Capacity Assessment	Agree upon the capacity of the existing City of Annapolis sewers and compare the capacity to the expected sewer flows from the Installation.	1 month	$25K	City of Annapolis
Assess options to inspect the City of Annapolis Randall Street Sewer	Conduct a desktop and field study to determine how the sewers can be inspected and the impact of the inspection on the community	3 months	$75K	City of Annapolis
Assess options to refurbish or replace sewers	Conduct a desktop study to determine how the sewers can be repaired or replaced and the impact on the community and the installation.	3 months	$75K	City of Annapolis
Identify two alternatives to convey sewage from the installation	Identify and cost two alternatives to route the sewage from the installation not using the Randall Street sewer	3 months	$150K	City of Annapolis
Develop implementation roadmap	Recommend a roadmap to increase the resilience of sewage conveyance from the installation	3 months	$50K	City of Annapolis
TOTAL			$375K	

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PROJECT 3: Shipwright Siphon Condition Assessment Scoping Study

Task(s)	Description	Estimated Time to Complete	Estimated Cost	Task Lead
Construct Roadmap	Construct Roadmap to Assess and Repair Siphon	6 months	$150K	City of Annapolis
TOTAL			$150K	

PROJECT 4: Effluent Filter Pumps, Preliminary Design

Task(s)	Description	Estimated Time to Complete	Estimated Cost	Task Lead
Preliminary Design Report	Prepare a preliminary design report with a roadmap and budget to replace the final effluent filter pumps with a climate resilient solution	1 year	$500K	Anne Arundel County
TOTAL			$500K	

PROJECT 5: Sludge Conveyance Replacement Roadmap

Task(s)	Description	Estimated Time to Complete	Estimated Cost	Task Lead
Roadmap Report	Provide roadmap for the refurbishment or replacement of the primary sludge conveyance, including budget, schedule, and facility interruptions.	1 Year	$250K	Anne Arundel County
TOTAL			$250K	

Step 5: Public Support / Co-Benefits

Aspect	PROJECT 1:	PROJECT 2:	PROJECT 3:	PROJECT 4:	PROJECT 5:
Public Support	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*
Co-Benefits:					
Mission Readiness	*Critical function for NSA Annapolis to operate.*	*Critical function for NSA Annapolis to operate.*	*Critical function for NSA Annapolis to operate.*	*Critical function for NSA Annapolis to operate.*	*Critical function for NSA Annapolis to operate.*
Environmental	*Benefit to the community and NSA Annapolis as both rely on this sewer system.*	*Benefit to the community and NSA Annapolis as both rely on this sewer system.*	*Benefit to the community and NSA Annapolis as both rely on this sewer system.*	*Benefit to the community and NSA Annapolis as both rely on the AWRF. Prevents flooding within the AWRF.*	*Benefit to the community and NSA Annapolis as both rely on the AWRF. Prevents flooding within the Annapolis Water Reclamation Facility - Primary Sludge Conveyance.*
Social	*Maintain historical nature of the community by properly maintaining sewer system.*	*Maintain historical nature of the community by properly maintaining sewer system.*	*Maintain historical nature of the community by properly maintaining sewer system.*	*Maintain historical nature of the community by properly maintaining sewer system.*	*Maintain historical nature of the community by properly maintaining sewer system.*
Equity (Community Resilience)	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*
Equity (Social Vulnerability)	*TBD*	*TBD*	*TBD*	*TBD*	*TBD*
Economic	*Maintain the historic tourist destination aesthetics and economy.*	*Maintain the historic tourist destination aesthetics and economy.*	*Maintain the historic tourist desintation aesthetics and economy.*	*Maintain the integrity of the current system to protect economic activity and public health.*	*Maintain the integrity of the current system to protect economic activity and public health.*

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SEWER PROJECTS (RANKED):

- Water Quality Revolving Loan Fund (WQRLF)
- Water Infrastructure Finance and Innovation Act (WIFIA)
- Bay Restoration Fund - Wastewater Program
- Sewerage Facilities Supplemental Assistance Grant
- Community Development Block Grant (CDBG) Program
- Community Resilience Program CoastSmart Communities
- Sewer Overflow and Stormwater Reuse Municipal Grant

HEALTH/MEDICAL | ENERGY | SHORELINES | CITY/COUNTY WTP | CYBERSECURITY | ACCESS ROADS | SEWER | GENERAL

Water Quality Revolving Loan Fund (WQRLF):

AGENCY: Maryland Department of the Environment: Water Infrastructure Financing Administration

PURPOSE/GOALS: Provides financial assistance for a wide variety of projects to protect or improve the quality of Maryland's rivers, streams, lakes, the Chesapeake Bay and other water resources. Includes low-interest loans to local governments to finance wastewater treatment plant upgrades, nonpoint source pollution control projects, and other water quality and public health improvement projects.

ELIGIBLE APPLICANTS: Point source pollution prevention is available to public entities/local governments only; Non-point source pollution prevention available to public and private entities. Projects must be in a Maryland Smart Growth/Priority Funding Area (PFA). NSA and the City of Annapolis are PFAs

ELIGIBLE USE OF FUNDS: Point source pollution prevention projects including: Wastewater Treatment Plant Improvements/Expansion; Sewerage Collection/Conveyance Systems including New/Replacement Sewers; Correction of Excess Sewerage Infiltration/Inflow (I/I) and/or Combined Sewer Overflow; Sludge Handling Facilities at Wastewater Treatment Plants; Landfill Leachate Pretreatment Facilities; Back Wash Facilities at Drinking Water Treatment Plants

Non-point source pollution prevention projects such as: Stormwater Best Management Practices related to MS4 permits or other requirements; Wellhead Protection (Drinking Water Source); Landfill Closure; Stream Corridor Restoration/Protection; Hazardous Waste Clean-up (Brownfields); Shoreline Erosion Control; Agricultural Nutrient Management Plans and Water Soil Conservation Plan

TERMS/REQUIREMENTS/NOTES: Work with MDWIFA; demonstrate the managerial, technical and financial capacity to maintain the system

TYPE: LOAN

FUNDING AMOUNT AND CYCLE: Funding Applications Accepted December Thru January Annually

LINK: https://mde.maryland.gov/programs/water/WQFA/Pages/water_quality_fund.aspx

RANK AND REASONING: 3. Good for implementation because a loan, but wouldn't recommend for studies.

SEWER PROJECTS (RANKED):

- Water Quality Revolving Loan Fund (WQRLF)
- Water Infrastructure Finance and Innovation Act (WIFIA)
- Bay Restoration Fund - Wastewater Program
- Sewerage Facilities Supplemental Assistance Grant
- Community Development Block Grant (CDBG) Program
- Community Resilience Program CoastSmart Communities
- Sewer Overflow and Stormwater Reuse Municipal Grant

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Water Infrastructure Finance and Innovation Act (WIFIA):

AGENCY: EPA

PURPOSE/GOALS: Accelerates investment in nation's water infrastructure by providing long-term, low-cost supplemental loans for regionally and nationally significant projects

ELIGIBLE APPLICANTS: Local, state, tribal, and federal government entities; Partnerships and joint ventures; Corporations and trusts;Clean Water and Drinking Water State Revolving Fund (SRF) programs

ELIGIBLE USE OF FUNDS: Construction of publicly owned treatment works, nonpoint source pollution management, national estuary program projects, decentralized wastewater treatment systems, stormwater management, water conservation/efficiency/reuse, watershed pilot projects, energy efficiency, security measures at publicly owned treatment works, and technical assistance.
No on-going maintenance activities.

TERMS/REQUIREMENTS/NOTES: Funds up to 49% of project costs (51% match required, can come from other sources such as the state SRF).

- $20 million: Minimum project size for large communities.
- $5 million: Minimum project size for small communities (population of 25,000 or less).
- 49 percent: Maximum portion of eligible project costs that WIFIA can fund.
- Total federal assistance may not exceed 80 percent of a project's eligible costs.
- 35 years: Maximum final maturity date from substantial completion.
- 5 years: Maximum time that repayment may be deferred after substantial completion of the project.

Interest rate will be equal to or greater than the U.S. Treasury rate of a similar maturity at the date of closing. Projects must be creditworthy and have a dedicated source of revenue.

TYPE: LOAN

FUNDING AMOUNT AND CYCLE: Annual cycle, rolling deadlines. EPA may announce multiple selection rounds in a single NOFA. NOFA will indicate deadline for required Letter of Interest. The current application cycle opened September 6, 2022 and will remain open until all funds are committed.

LINK: https://www.epa.gov/wifia

RANK AND REASONING: 3. Very applicable, but best suited for implementation or part of a package of projects; as opposed to just a single feasibility study. AWRF 1-4 projects alone wouldn't be eligible, as WIFIA has a project minimum of $20M. Could potentially bundle with the water projects into one larger WIFIA request.

SEWER PROJECTS (RANKED):

- Water Quality Revolving Loan Fund (WQRLF)
- Water Infrastructure Finance and Innovation Act (WIFIA)
- Bay Restoration Fund – Wastewater Program
- Sewerage Facilities Supplemental Assistance Grant
- Community Development Block Grant (CDBG) Program
- Community Resilience Program CoastSmart Communities
- Sewer Overflow and Stormwater Reuse Municipal Grant

HEALTH/MEDICAL | ENERGY | SHORELINES | CITY/COUNTY WTP | CYBERSECURITY | ACCESS ROADS | SEWER | GENERAL

Bay Restoration Fund – Wastewater Program:

AGENCY: Maryland Department of the Environment: Water Infrastructure Financing Administration

PURPOSE/GOALS: Executive Order 01.01.2002.24, issued in 2002, establishes a policy to ensure Maryland will achieve the nutrient reductions necessary to restore the Chesapeake Bay.
The policy calls for Enhanced Nutrient Removal (ENR) at wastewater treatment plants in Maryland.

ELIGIBLE APPLICANTS: Maryland Wastewater Treatment Systems; 67 publicly owned wastewater treatment plants with design flow of 500,000 gallons per day or greater and discharge to the Chesapeake Bay have the priority for funding. Projects must be in a Maryland Smart Growth/Priority Funding Area (PFA). NSA and the City of Annapolis are PFAs

ELIGIBLE USE OF FUNDS: Improvements to existing wastewater systems, such as wastewater treatment plants, combined sewer overflow abatement, rehabilitation of existing sewers, and upgrading conveyance systems, including pumping stations
Eligible costs may include planning, design, and construction costs.

TERMS/REQUIREMENTS/NOTES: No cost share/match requirement.

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Funding Applications Accepted December thru January Annually

LINK: https://mde.maryland.gov/programs/water/WQFA/Pages/wqfa_enr.aspx

RANK AND REASONING: 3. Projects are eligible activities, would need to make strong tie to bay restoration.

SEWER PROJECTS (RANKED):

- Water Quality Revolving Loan Fund (WQRLF)
- Water Infrastructure Finance and Innovation Act (WIFIA)
- Bay Restoration Fund - Wastewater Program
- Sewerage Facilities Supplemental Assistance Grant
- Community Development Block Grant (CDBG) Program
- Community Resilience Program CoastSmart Communities
- Sewer Overflow and Stormwater Reuse Municipal Grant

HEALTH/MEDICAL | ENERGY | SHORELINES | CITY/COUNTY WTP
CYBERSECURITY | ACCESS ROADS | SEWER | GENERAL

Sewerage Facilities Supplemental Assistance Grant:

AGENCY: Maryland Department of the Environment: Water Infrastructure Financing Administration

PURPOSE/GOALS: Provides financial assistance to local governmental entities in the form of grants, supplementing the Water Quality Loan funds, where affordability is a problem and to correct public health or water quality problems.

ELIGIBLE APPLICANTS: Publicly-owned wastewater facilities in Maryland. Projects must be in a Maryland Smart Growth/Priority Funding Area (PFA). NSA and the City of Annapolis are PFAs

ELIGIBLE USE OF FUNDS: Planning, design and construction of wastewater projects at publicly-owned facilities, based on system size, compliance, and affordability.

TERMS/REQUIREMENTS/NOTES: Funds up to 100% of eligible project cost, with participation by the grantee at a level determined to be affordable, Not to exceed $1.5 million in FY2023/25

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Funding Applications Accepted December thru January Annually

LINK: https://mde.maryland.gov/Pages/GrantsandFinancialAssistance.aspx

RANK AND REASONING: 5. Maryland specific, small size program and grant. Applicable for size of "study" cost. Could be a complement to larger implementation project.

SEWER PROJECTS (RANKED):

- Water Quality Revolving Loan Fund (WQRLF)
- Water Infrastructure Finance and Innovation Act (WIFIA)
- Bay Restoration Fund - Wastewater Program
- Sewerage Facilities Supplemental Assistance Grant
- Community Development Block Grant (CDBG) Program
- Community Resilience Program CoastSmart Communities
- Sewer Overflow and Stormwater Reuse Municipal Grant

HEALTH/MEDICAL | ENERGY | SHORELINES | CITY/COUNTY WTP | CYBERSECURITY | ACCESS ROADS | SEWER | GENERAL

Community Development Block Grant (CDBG) Program:

AGENCY: Department of Housing & Urban Development

PURPOSE/GOALS: Provides annual grants on a formula basis to states, cities, and counties to develop viable urban communities by providing decent housing and a suitable living environment, and by expanding economic opportunities, principally for low- and moderate-income persons.

ELIGIBLE APPLICANTS: Cities < 50,000 residents and Counties < 200,000 residents

ELIGIBLE USE OF FUNDS: CDBG funds may be used for activities which include, but are not limited to:

- Acquisition of real property
- Relocation and demolition
- Rehabilitation of residential and non-residential structures
- Construction of public facilities and improvements, such as water and sewer facilities, streets, neighborhood centers, and the conversion of school buildings for eligible purposes
- Public services, within certain limits
- Activities relating to energy conservation and renewable energy resources
- Provision of assistance to profit-motivated businesses to carry out economic development and job creation/retention activities

TERMS/REQUIREMENTS/NOTES: Varies by City/State

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Annual Allocation

LINK: https://www.hud.gov/program_offices/comm_planning/cdbg/

RANK AND REASONING: 2. While eligible for water/sewer infrastructure, not as strong of a tie to serving low/moderate income persons

SEWER PROJECTS (RANKED):

- Water Quality Revolving Loan Fund (WQRLF)
- Water Infrastructure Finance and Innovation Act (WIFIA)
- Bay Restoration Fund - Wastewater Program
- Sewerage Facilities Supplemental Assistance Grant
- Community Development Block Grant (CDBG) Program
- Community Resilience Program CoastSmart Communities
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HEALTH/MEDICAL | ENERGY | SHORELINES | CITY/COUNTY WTP | CYBERSECURITY | ACCESS ROADS | SEWER | GENERAL

Community Resilience Program CoastSmart Communities:

AGENCY: Maryland Department of Natural Resources

PURPOSE/GOALS: For projects that seek to achieve this reduced risk in whatever manner is most feasible for the local community. The damages and impacts resulting from flood events present a substantial threat to communities, infrastructure and natural resources throughout the state of Maryland. Ideal projects foster innovative adaptation strategies that ensure that Maryland communities are increasingly resilient to flood risks, work to ascertain that Bay and ocean waters meet living resource and human needs, and serve to enhance the protection and management of the state's resources. Projects should also help communities more clearly communicate the risks associated with hazards in order to better protect citizens, infrastructure, and natural resources.

ELIGIBLE APPLICANTS: Governments, academic institutions and non-governmental organizations.

ELIGIBLE USE OF FUNDS: Eligible projects across five outcomes will improve water quality, restore local waterways, increase resilience to climate impacts, improve navigation and boating access sites for the benefit of the boating public and develop the next generation of environmental stewards. Outcome 2 - Outcome 2 - Enhance capacity to understand and effectively plan to address flood risks associated with a changing climate.

TERMS/REQUIREMENTS/NOTES: For outcome 2, proposals may request up to $75,000 of funding for projects that will be a maximum of one year in duration

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Year-round, apply through the Grants Gateway through Outcome 2. Current cycle applications due December 2022 with awards in June 2023. Future rounds of funding may follow similar deadlines

LINK: https://dnr.maryland.gov/ccs/coastsmart/Pages/default.aspx

RANK AND REASONING: 4. Focused mostly on stormwater/nature-based types of projects, but Outcome 2 is related to effects of sea level rise, infrastructure and planning. Also, MD specific and good match from a "size" of funding needed.

SEWER PROJECTS (RANKED):

- Water Quality Revolving Loan Fund (WQRLF)
- Water Infrastructure Finance and Innovation Act (WIFIA)
- Bay Restoration Fund - Wastewater Program
- Sewerage Facilities Supplemental Assistance Grant
- Community Development Block Grant (CDBG) Program
- Community Resilience Program CoastSmart Communities
- Sewer Overflow and Stormwater Reuse Municipal Grant

HEALTH/MEDICAL | ENERGY | SHORELINES | CITY/COUNTY WTP | CYBERSECURITY | ACCESS ROADS | SEWER | GENERAL

Sewer Overflow and Stormwater Reuse Municipal Grant:

AGENCY: Environmental Protection Agency

PURPOSE/GOALS: To support public health and environmental protections by helping states and cities improve stormwater management to address sewer overflows and reduce pollution that can flow into local waterways.

ELIGIBLE APPLICANTS: States, U.S. territories, and the District of Columbia; once awarded, these funds will be provided as sub-awards to municipal entities.

ELIGIBLE USE OF FUNDS: Planning, design, repair, or construction of—(A) treatment works to intercept, transport, control, treat, or reuse municipal combined sewer overflows, sanitary sewer overflows, or stormwater; and (B) any other measures to manage, reduce, treat, or recapture stormwater or subsurface drainage water. States required to prioritize funding projects for communities that are financially distressed, have a long-term municipal CSO or SSO control plan, or for projects that have requested a grant on their Clean Water State Revolving Fund (CWSRF) Intended Use Plan. Increasing the resilience of treatment works is an eligible expense. Will have many of the same requirements as the CWSRF and at least 20% of a state's allocation must be used for green infrastructure, water and energy efficiency improvements, and other environmentally innovative activities.

TERMS/REQUIREMENTS/NOTES: Maryland received 2.7% of the federal authorization in 2022 appropriations. Maryland will need to apply for the funding and then administer through a grant program. FY22 funding for Maryland was $1,135,000 total.

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Information forthcoming, pending Maryland receipt of award.

LINK: Information forthcoming, pending Maryland receipt of award.

RANK AND REASONING: 3. Relevant funding, however, the program mostly prioritizes rural and economically disadvantaged areas. Smaller award amounts, but still enough for planning efforts identified

GENERAL FUNDING SOURCES (APPLY TO MULTIPLE ASSETS):

- DoD Defense Community Infrastructure Pilot (DCIP) Program
- DoD Installation Resilience Program
- Building Resilient Infrastructure and Communities (BRIC) Program
- Hazard Mitigation Grant Program
- Readiness and Environmental Integration (REPI) Program
- Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Revolving Fund Loan Program
- Flood Mitigation Assistance (FMA) Grant Program
- Congressionally Directed Spending
- Resilience Authority of Annapolis and Anne Arundel County

HEALTH/MEDICAL | ENERGY | SHORELINES | CITY/COUNTY WTP
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DoD Defense Community Infrastructure Pilot (DCIP) Program:

AGENCY: Department of Defense (DoD)

PURPOSE/GOALS: The Defense Community Infrastructure Pilot (DCIP) Program is designed to address deficiencies in community infrastructure, supportive of a military installation, in order to enhance military value, installation resilience, and military family quality of life.

ELIGIBLE APPLICANTS: Defense Communities Only. State and local governments.

ELIGIBLE USE OF FUNDS: Eligible community infrastructure projects are any complete and useable transportation project; community support facilities (e.g., school, hospital, police, fire, emergency response, or other community support facility); and utility infrastructure projects [e.g., water, waste-water, telecommunications, electric, gas, or other utility infrastructure (with necessary cyber safeguards)] that: are located off of a military installation; support a military installation; are owned by a state or local government or a not-for-profit, member-owned utility service; that will enhance military value, military installation resilience and/or military family quality of life at the supported military installation (definitions of these enhancements are provided in Section E., paragraph 1. of the Notice of Funding Opportunity); that are endorsed by the local installation commander representing the installation benefitting from the proposed project; are where ground-disturbing work has not yet commenced; and,
are construction-ready.

TERMS/REQUIREMENTS/NOTES: Previous cycles required 30% match, award floor was $250,000 and ceiling was $20,000,000.

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Cycle: Annual
Pilot program launched in 2020; in . Congress appropriated $50 million in FY20, supporting 16 projects; $60 million in FY21, supporting 13 projects; and $90 million in FY22, supporting 19 projects.
Uncertain timelines for enactment of Congressional authorization and appropriation acts, and uncertain timelines to update a final notice of funding opportunity in calendar year 2023.

LINK: https://oldcc.gov/defense-community-infrastructure-program-dcip#:~:text=The%20Defense%20Community%20Infrastructure%20Program%20%28DCIP%29%20is%20designed,is%20authorized%20under%20Public%20Law%20115-232%20Section%202861.

RANK AND REASONING: 5. DoD communities only means a limited applicant pool. Targets general infrastructure projects, but not only infrastructure resilience projects, so may have a larger applicant pool. Projects must be construction-ready.

GENERAL FUNDING SOURCES (APPLY TO MULTIPLE ASSETS):

- DoD Defense Community Infrastructure Pilot (DCIP) Program
- DoD Installation Resilience Program
- Building Resilient Infrastructure and Communities (BRIC) Program
- Hazard Mitigation Grant Program
- Readiness and Environmental Integration (REPI) Program
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DoD Installation Resilience Program:

AGENCY: Department of Defense (DoD) Office of Local Defense Community Cooperation

PURPOSE/GOALS: The Installation Resilience program of assistance is designed to provide technical and financial assistance to states and local governments to analyze and implement actions necessary to foster, protect, and enhance military installation sustainability. The program alleviates and prevents incompatible development and/or other man-made or natural installation resiliency activities likely to impair the continued operational utility of a Department of Defense installation, range, special use air space, military operations area, or military training route. The program enables states and local governments to assist installations to optimize their mission and sustain their installation, and enhances the long-term readiness and military value of the power projection platform.

ELIGIBLE APPLICANTS: Defense Communities Only.
States, counties, municipalities, other political subdivisions of a state; special purpose units of a state or local government; other instrumentalities of a state or local government; and tribal nations are eligible if:
(a) Office of Local Defense Community Cooperation determines there is existing or potential encroachment of a civilian origin on the local military mission and this encroachment of civilian origin is likely to impair the continued operational utility of a military installation, or (b) OLDCC determines there is a current, future, or potential threat to military installation resilience that involve, or may be significantly impacted by, resources or activities outside of the military installation and that this threat to military installation resilience is likely to impair the military installation's ability to maintain, improve, or rapidly reestablish installation mission assurance and mission-essential functions.

ELIGIBLE USE OF FUNDS: Projects that address sustainability factors such as: urban growth, noise, stormwater and flood management, energy and water security threats, extreme weather events, etc.

TERMS/REQUIREMENTS/NOTES: 10% minimum cost share requirement. A minimum of ten percent (10%) of the project's total proposed funding is to be comprised of non-Federal sources.

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Cycle: Annual
Each year, typically in March, the Office of Local Defense Community Corporation puts out annual call to the Military Services for nominations for installation commanders. Military services may nominate installations through this annual process or nominate installations out of cycle. State and local governments can respond to NOFOs through the community nomination process through grants.gov.

LINK: https://oldcc.gov/our-programs/installation-resilience

RANK AND REASONING: 5. DoD communities only means a limited applicant pool. Specifically targets resilience projects in defense communities.

GENERAL FUNDING SOURCES (APPLY TO MULTIPLE ASSETS):

- DoD Defense Community Infrastructure Pilot (DCIP) Program
- DoD Installation Resilience Program
- Building Resilient Infrastructure and Communities (BRIC) Program
- Hazard Mitigation Grant Program
- Readiness and Environmental Integration (REPI) Program
- Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Revolving Fund Loan Program
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Building Resilient Infrastructure and Communities (BRIC) Program:

AGENCY: Federal Emergency Management Agency (FEMA) | Maryland Department of Emergency Management (MDEM)

PURPOSE/GOALS: To support states, local communities, tribes and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards.
For Annapolis, it is recommended that multiple projects are combined into one single BRIC application to be submitted to MDEM.

ELIGIBLE APPLICANTS: States, territories, or Federally recognized tribes with major disaster declaration under the Stafford Act in the seven years prior to the annual grant application period start date.
Cities and counties must go through their states to become a subrecipient. MDEM is applicant to FEMA.
Subapplicants can be State agencies; federally-recognized tribes; local governments / communities / special districts; private nonprofit organizations.

ELIGIBLE USE OF FUNDS:
- Capability- and Capacity-Building (C&CB) Activities: activities that enhance the knowledge, skills, and expertise of the current workforce to expand or improve the administration of mitigation assistance.
- Mitigation Projects: cost-effective projects designed to increase resilience and public safety; reduce injuries and loss of life; and reduce damage and destruction to property, critical services, facilities, and infrastructure.
- Management Costs: to reimburse the recipient and subrecipient for eligible and reasonable indirect costs, direct administrative costs, and other administrative expenses associated with a specific mitigation project or C&CB activity. Project scoping and pre-award costs are now eligible.

TERMS/REQUIREMENTS/NOTES: $2.295 billion was available for FY22 nationally. Grants fund up to 75% (generally) of the project costs, up to $50 million.

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Cycle: Annual. Current cycle: Notice of Interests were due to MDEP in August 2022 with subapplications due November 2022. MDEM FY22 BRIC state submission due to FEMA.

LINK: https://mdem.maryland.gov/community/Pages/Mitigation.aspx

RANK AND REASONING: 4. Very competitive. Recommend that multiple (or all) Annapolis MIRR projects are combined into a single application.

GENERAL FUNDING SOURCES (APPLY TO MULTIPLE ASSETS):

- DoD Defense Community Infrastructure Pilot (DCIP) Program
- DoD Installation Resilience Program
- Building Resilient Infrastructure and Communities (BRIC) Program
- Hazard Mitigation Grant Program
- Readiness and Environmental Integration (REPI) Program
- Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Revolving Fund Loan Program
- Flood Mitigation Assistance (FMA) Grant Program
- Congressionally Directed Spending
- Resilience Authority of Annapolis and Anne Arundel County

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Hazard Mitigation Grant Program:

AGENCY: Federal Emergency Management Agency (FEMA) | Maryland Department of Emergency Management (MDEM)

PURPOSE/GOALS: This opportunity provides funding for communities to implement mitigation activities to reduce risk to life and property from natural hazards. HMGP funding can also support the development of Local Hazard Mitigation Plans (LHMP) and project scoping activities.

ELIGIBLE APPLICANTS: State and local governments; certain private nonprofit organizations or institutions; and Tribal Communities; all applicants must have or be covered under an approved Hazard Mitigation Plan. MDEM is applicant to FEMA.
Subapplicants can be State agencies; federally-recognized tribes; local governments / communities / special districts; private nonprofit organizations.

ELIGIBLE USE OF FUNDS: Projects that minimize natural disasters; examples include: Aquifer Storage and Recovery, Floodplain and Stream Restoration, Flood Diversion and Storage, and Green Infrastructure Methods, Property Acquisition and Structure Demolition, Safe Room Construction, Minor Localized Flood Reduction Projects, Soil Stabilization.

TERMS/REQUIREMENTS/NOTES: Funds up to 75% of eligible costs (25% match required). Amount: The amount of HMGP funds availability is based on a percent of Public Assistance provided by Federal Emergency Management Agency (FEMA).

TYPE: GRANT

FUNDING AMOUNT AND CYCLE: Cycle: Annual
Last cycle declared disasters (DR 4491 & DR 4583): Notice of Interest due to MDEP in March 2022 with subapplications due July 2022.

LINK: https://mdem.maryland.gov/community/Pages/Mitigation.aspx

RANK AND REASONING: 4. State-wide program, would have to submit each project individually. Only receives funding after a federally-declared disaster.

GENERAL FUNDING SOURCES (APPLY TO MULTIPLE ASSETS):

- DoD Defense Community Infrastructure Pilot (DCIP) Program
- DoD Installation Resilience Program
- Building Resilient Infrastructure and Communities (BRIC) Program
- Hazard Mitigation Grant Program
- Readiness and Environmental Integration (REPI) Program
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Readiness and Environmental Integration (REPI) Program:

AGENCY: Department of Defense (DoD) Office of the Secretary of Defense (OSD)

PURPOSE/GOALS: DoD initiated the Readiness and Environmental Protection Integration (REPI) program to combat encroachment that can limit or restrict military training and testing through the use of encroachment management partnerships, referred to as REPI projects, that Congress authorized within 10 USC 2684a. These cost-sharing partnerships between the Military Services, state and local governments, and private conservation organizations acquire easements or other interests in land from willing sellers that preserve critical buffer areas and habitat near military installations. In the FY2019 Congress expanded the REPI authority to address military installation resilience casting climate change as an encroachment threat and allowing DoD to enter into agreements for the purposes of preserving off base habitat in a manner that maintains or improves military installation resilience. 10 USC 2684a(e) also provides authority to enter into an agreement for acquisition of real property (or interest therein) to support the purchase of water rights when necessary to support or protect the mission of the military installation.

ELIGIBLE APPLICANTS: Military Services

ELIGIBLE USE OF FUNDS: Defense Communities Only. States, counties, municipalities, and other political subdivisions of a state; special purpose units of a state or local government; other instrumentalities of a state or local government; and tribal nations. Current REPI project with NSA Annapolis: 19 acres preserved and $7.8 million expended.

TERMS/REQUIREMENTS/NOTES: No cost share minimum requirements. A REPI application must include an eligible partner(s) and willing landowner(s). All REPI inquiries are directed to the NSA Annapolis Community Planning Liaison Officer. REPI fact sheet indicates that through FY2021 DoD and its partners have spent more than $86 million on REPI projects at six installations in Maryland.

TYPE: COST-SHARING PARTNERSHIP

FUNDING AMOUNT AND CYCLE: The REPI program does not provide funding to the Military Service partners through an open grants program; rather, each Military Service submits project proposals for funding through an online proposal tracker platform using authorized account access.

LINK: https://www.repi.mil

RANK AND REASONING: 4. Good fit if need for land acquisition / easements to buffer installation.

GENERAL FUNDING SOURCES (APPLY TO MULTIPLE ASSETS):

- DoD Defense Community Infrastructure Pilot (DCIP) Program
- DoD Installation Resilience Program
- Building Resilient Infrastructure and Communities (BRIC) Program
- Hazard Mitigation Grant Program
- Readiness and Environmental Integration (REPI) Program
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Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Revolving Fund Loan Program:

AGENCY: Federal Emergency Management Agency (FEMA)

PURPOSE/GOALS: Revolving loan funds for mitigation projects and activities to increase resilience and mitigate the impacts of events such as drought, extreme heat, severe storms, wildfires, floods and earthquakes.

ELIGIBLE APPLICANTS: States, federally recognized tribes, Puerto Rico, District of Columbia for capitalization grants. Local communities cannot apply directly to FEMA for capitalization grants, but can apply for low-interest loans.

ELIGIBLE USE OF FUNDS: Prioritize low-impact development, projects that increase resilience and mitigate impacts of severe weather. Can be used for building code adopting and enforcement, land-use planning. Loans may be used to satisfy a local government's non-federal cost share for other FEMA Hazard Mitigation Assistance grant programs (BRIC, FMA, etc.)

TERMS/REQUIREMENTS/NOTES: To be announced in Spring 2023.

TYPE: Loan

FUNDING AMOUNT AND CYCLE: FEMA provides funding to states and tribal governments via a capitalization grant. The participating state, territorial, or tribal government deposits an amount that is at least 10% of the capitalization grant into an established entity loan fund.

LINK: https://www.fema.gov/grants/mitigation/storm-rlf

RANK AND REASONING: 3. Appears to be a good fit but need the funding announcement (spring 2023) to fully rank this program.

GENERAL FUNDING SOURCES (APPLY TO MULTIPLE ASSETS):

- DoD Defense Community Infrastructure Pilot (DCIP) Program
- DoD Installation Resilience Program
- Building Resilient Infrastructure and Communities (BRIC) Program
- Hazard Mitigation Grant Program
- Readiness and Environmental Integration (REPI) Program
- Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Revolving Fund Loan Program
- Flood Mitigation Assistance (FMA) Grant Program
- Congressionally Directed Spending
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HEALTH/MEDICAL | ENERGY | SHORELINES | CITY/COUNTY WTP
CYBERSECURITY | ACCESS ROADS | SEWER | GENERAL

Flood Mitigation Assistance (FMA) Grant Program:

AGENCY: Federal Emergency Management Agency (FEMA) | Maryland Department of Emergency Management (MDEM)

PURPOSE/GOALS: To implement measures to reduce/ eliminate risk of severe repetitive flood damage / repetitive flood damage to buildings insured by the National Flood Insurance Program (NFIP).

ELIGIBLE APPLICANTS: State Governments, Native American Tribal Governments (Federally recognized), D.C., US Territories. (Local government must apply through state.) Applicants must have a FEMA-approved Hazard Mitigation Plan.
Cities and counties must go through their states to become a subrecipient. MDEM is applicant to FEMA.

ELIGIBLE USE OF FUNDS: Community flood mitigation activities (Flood mitigation design, development of community flood mitigation projects) to reduce NFIP flood claim payments; technical assistance/ mitigation planning/mitigation projects reducing risk to severe repetitive loss/ repetitive loss properties

TERMS/REQUIREMENTS/NOTES: First need to meet with State FEMA office; 25% match required from non-federal sources .
$160M total available, no ceiling or floor listed, but 120 expected awards.

TYPE: Grant

FUNDING AMOUNT AND CYCLE: Cycle: Annual
Current cycle: Notice of Interest due to MDEP in August 2022 with subapplications due November 2022.
MDEM FY22 BRIC state submission due to FEMA.

LINK: https://www.fema.gov/grants/mitigation/floods

RANK AND REASONING: 2. Need severe and repetitive losses of properties in the NFIP program. If this is the case here, ranking would increase to a 4 / 5.

GENERAL FUNDING SOURCES (APPLY TO MULTIPLE ASSETS):

- DoD Defense Community Infrastructure Pilot (DCIP) Program
- DoD Installation Resilience Program
- Building Resilient Infrastructure and Communities (BRIC) Program
- Hazard Mitigation Grant Program
- Readiness and Environmental Integration (REPI) Program
- Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Revolving Fund Loan Program
- Flood Mitigation Assistance (FMA) Grant Program
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Congressionally Directed Spending:

AGENCY: US Congress

PURPOSE/GOALS: Provides federal lawmakers the ability to demonstrate priorities for their constituents.

ELIGIBLE APPLICANTS: States, local governments and eligible nonprofit entities.

ELIGIBLE USE OF FUNDS: Broad latitude in projects; however, some federal lawmakers narrow what kinds of projects they will endorse.

TERMS/REQUIREMENTS/NOTES:

The US Senate has a one percent cap on discretionary spending for congressionally directed spending items.

In the US House of Representatives, each representative may request Community Project Funding for up to 15 projects in a given fiscal year. However, Congress may only approve funding for a handful of requested projects through the appropriations process.

TYPE: Grant

FUNDING AMOUNT AND CYCLE: Annual appropriation process. Coordinate through congressional delegation.

LINK: N/A

RANK AND REASONING: 5. Broad latitude with projects it can fund; dependent on support from delegation.

GENERAL FUNDING SOURCES (APPLY TO MULTIPLE ASSETS):

- DoD Defense Community Infrastructure Pilot (DCIP) Program
- DoD Installation Resilience Program
- Building Resilient Infrastructure and Communities (BRIC) Program
- Hazard Mitigation Grant Program
- Readiness and Environmental Integration (REPI) Program
- Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Revolving Fund Loan Program
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Resilience Authority of Annapolis and Anne Arundel County:

AGENCY: Resilience Authority of Annapolis and Anne Arundel County

PURPOSE/GOALS: Authority created specifically to undertake and support resilience infrastructure projects in Anne Arundel County and the City of Annapolis.

ELIGIBLE APPLICANTS: N/A

ELIGIBLE USE OF FUNDS: The Authority may exercise powers necessary to undertake, finance, manage, acquire, own, convey, or support resilience infrastructure projects, some of these include the power to:

- Acquire by purchase, lease, or other legal means, but not by eminent domain, property for resilience infrastructure;
- Establish, construct, alter, improve, equip, repair, maintain, operate, and regulate resilience infrastructure owned by the County, the City of Annapolis, or the Resilience Authority;
- Receive money from the County, the City of Annapolis, the State, other governmental units, or private organizations;
- Charge and collect fees for its services; subject to the approval of the County Executive and by resolution of the County Council, and the City of Annapolis, charge and collect fees to support its bond issuances;
- Engage the services of other governmental units; and
- Act as necessary or convenient to carry out the powers granted by law.

TERMS/REQUIREMENTS/NOTES: N/A

TYPE: N/A

FUNDING AMOUNT AND CYCLE: N/A

LINK: https://resilienceauthority.org/

RANK AND REASONING: 5. Not a funding program but a new governmental authority created specifically to undertake resilience infrastructure projects to benefit the City and County.

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APPENDIX B:
SAMPLE MEMORANDUM OF UNDERSTANDING

SAMPLE

City of Annapolis | Anne Arundel County | Naval Support Activity Annapolis Partnership

MEMORANDUM OF UNDERSTANDING

WHEREAS the City of Annapolis and Anne Arundel County, Maryland recognize defense communities are essential to supporting military installations that maintain national security; and

WHEREAS the City of Annapolis and Anne Arundel County provide essential operations, services, and infrastructure necessary for Naval Support Activity (NSA) Annapolis to maintain mission assurance and mission-essential functions; and

WHEREAS the City of Annapolis and Anne Arundel County recognize community infrastructure and services must not only protect and preserve military readiness and defense capabilities, but also provide safe places for service members their families to live, work, and play; and

WHEREAS the *Military Installation Resiliency Review for City of Annapolis, Anne Arundel County and Naval Support Activity Annapolis, Maryland* (April 2023), hereinafter *Military Installation Resiliency Review*, provided the opportunity for the City of Annapolis, Anne Arundel County and NSA Annapolis to strengthen their existing partnerships; assess shared vulnerabilities and risks to natural and man-made hazards not only independently but also in coordination with threats to installation resiliency; and

WHEREAS the *Military Installation Resiliency Review Resilience Action Plan* includes identified priority critical assets and specific recommended resilience actions and projects focused on shared critical infrastructure, programs, and services; and

WHEREAS the City of Annapolis, Anne Arundel County and NSA Annapolis want to protect the health, safety, and welfare of residents across the region; enhance and maintain the local and regional quality of life; guide compatible community development in support of continued military operations; maintain local and regional economic vitality; and provide for sustainable and resilient growth; and

WHEREAS the City of Annapolis, Anne Arundel County and NSA Annapolis recognize the need to plan, design, and finance a resilient future, together, to create a thriving community while maintaining support for the NSA Annapolis mission making the region stronger, now and in the future; and

WHEREAS the City of Annapolis, Anne Arundel County and NSA Annapolis recognize where open communication and coordination among all parties is recognized as paramount to provide for continued military operations and sustainable and resilient growth for all;

NOW, THEREFORE, BE IT AGREED AMONG THE CITY OF ANNAPOLIS, ANNE ARUNDEL COUNTY AND NSA ANNAPOLIS THAT:

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City of Annapolis | Anne Arundel County | Naval Support Activity Annapolis Partnership

The undersigned parties and hereto it is agreed as follows.

Section 1 - Establishment of Partnership

This Memorandum of Understanding (MOU) establishes the structure, roles and responsibilities of the City of Annapolis, Anne Arundel County and Naval Support Activity Annapolis Partnership (Partnership).

Section 2 – Purpose of Partnership

This Partnership provides a framework for collaboration among the City of Annapolis; Anne Arundel County; NSA Annapolis; residents, businesses, and organizations; state agencies; and federal agencies to better coordinate efforts in areas such as: military relations; sustainability and resilience; transportation and land use planning; housing; environmental protection; emergency preparedness; data coordination; funding requests (e.g., grant applications); health care coordination; population forecasting; workforce development; education; community development; economic development; and other issues that may arise. The Partnership will provide actionable recommendations to local, regional, state, and federal leaders on initiatives, programs, and topics that strengthen the resilience and sustainability of the City of Annapolis, Anne Arundel County and NSA Annapolis; and the economic health and vitality of the greater region and State of Maryland.

Section 3 – Membership

The following organizations/entities are participating in the Partnership and will work together to achieve its objectives.

- City of Annapolis
- Anne Arundel County
- NSA Annapolis
- The Resilience Authority of Annapolis and Anne Arundel County Inc.
- Anne Arundel Economic Development Corporation
- Baltimore Metropolitan Council
- Maryland Department of Transportation
- Maryland Department of Emergency Management
- Maryland Office of Military & Federal Affairs
- Baltimore Gas & Electric
- Luminis Health Anne Arundel Medical Center

Section 4 – Meetings

1) Partnership meeting will be held, at minimum, quarterly, of which one will be the Command Overview.

2) The Chairperson and responsible party for convening and facilitating the meetings will be the City of Annapolis Deputy City Manager, Resilience & Sustainability

3) Agenda for the meetings shall be provided by the Chairperson one calendar week prior to the date of the meeting.

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City of Annapolis | Anne Arundel County | Naval Support Activity Annapolis Partnership

4) The Chairperson shall also be responsible for ensuring meeting minutes are produced and distributed within two weeks after the date of the meeting.

5) Individual commitments for members and goals of the Partnership will be tracked in each meeting's agendas.

6) Establishment of Working Groups may focus on and support Partnership goals and priorities.

Section 5 – Resources

Nothing in this MOU shall obligate members to expend financial resources, other monies, or enter any contract or other obligations.

Section 6 – Other

This MOU is an internal agreement and does not confer any rights upon any individual or other entity. This MOU sets forth mutual goals and approaches. The MOU is not intended to create any rights, benefits, or other responsibilities, either substantive or procedural, nor is it enforceable as law or equity by a party against the U.S., its agencies, its officers, or any other person.

Nothing in this MOU shall be interpreted as limiting, superseding, or otherwise affecting the Parties' normal operations or decisions in carrying out their statutory or regulatory duties. This MOU does not limit or restrict members from participating in similar activities or arrangements with other agencies.

Section 7 – Amendments to MOU

The signatories (or their successors) will review this MOU periodically. Proposed changes will be in writing and subject to approval by the signatories or their successors.

Section 8 – Terms and Conditions

This MOU will remain in effect until a majority of the Partnership membership votes to terminate. Any member may terminate its membership in the Partnership by providing written notice to the Partnership of the desired termination date.

Section 9 – Points of Contact

To facilitate implementation of this MOU, Partnership membership shall provide a single point of contact.

- City of Annapolis
- Anne Arundel County
- NSA Annapolis
- The Resilience Authority of Annapolis and Anne Arundel County Inc.
- Anne Arundel Economic Development Corporation
- Baltimore Metropolitan Council
- Maryland Department of Transportation
- Maryland Department of Emergency Management
- Maryland Office of Military & Federal Affairs
- Baltimore Gas & Electric
- Luminis Health Anne Arundel Medical Center

SAMPLE

APPENDIX B: SAMPLE MOU

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City of Annapolis | Anne Arundel County | Naval Support Activity Annapolis Partnership

Section 10 – IN WITNESS THEREOF

The Parties hereto have caused this MOU to be executed by their duly authorized representatives.

SIGNATORY:
City of Annapolis

_____

SIGNATORY:
Anne Arundel County

_____

SIGNATORY:
NSA Annapolis

_____

SIGNATORY:
The Resilience Authority of Annapolis and Anne Arundel County Inc.

_____

SIGNATORY:
Anne Arundel Economic Development Corporation

_____

SIGNATORY:
Baltimore Metropolitan Council

_____

SIGNATORY:
Maryland Department of Transportation

_____

SIGNATORY:
Maryland Department of Emergency Management

_____

SAMPLE

City of Annapolis | Anne Arundel County | Naval Support Activity Annapolis Partnership

SIGNATORY:
Maryland Office of Military & Federal Affairs

_____

SIGNATORY:
Baltimore Gas & Electric

_____

SIGNATORY:
Luminis Health Anne Arundel Medical Center

_____

SAMPLE

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APPENDIX C:
NOAA 2022 SLR MODEL AND PLANNING HORIZONS

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Stantec

Memo

To:	Jacqueline Guild, Esq. Deputy City Manager Resilience & Sustainability City of Annapolis, MD	From:	Cyrena Chiles Eitler, AICP Fairfax, VA
Project/File:	Annapolis MIRR Stantec Project #215616693	Date:	June 10, 2022 (Updated June 17, 2022)

Reference: NOAA 2022 SLR Model and Planning Horizons

Paul Carroll, PE, Stantec Coastal Engineering Practice Team Manager, has provided the following summary of the future hazard scenarios selected for the Annapolis Military Installation Resilience Review (MIRR) project. This June 17 update provides additional guidance in response to questions Anne Arundel Department of Planning staff raised regarding application of the NOAA 2022 five Global Mean Sea Level (GMSL) scenarios.

For the MIRR Stantec will consider primary hazards, such as coastal flooding, to identify risks to critical infrastructure, assets, systems, and services identified through the Community Lifeline Interview process with key stakeholders. With climate change, it is understood that the probability of risk will change over time, so Stantec will consider a variety of time horizons for the MIRR. Both storm surge and rates of Sea Level Rise (SLR) will determine extreme inundation levels. Storm driven inundation information is typically obtained from FEMA Flood Insurance Studies (FIS) or other regional sources. Estimates of SLR can come from a variety of federal, state, and regional reports. Understanding and modeling SLR is an evolving science and estimates are continuously updated. Typically, a range of SLR estimates, or curves, are provided, each making differing assumptions with respect to model inputs (e.g., future rates of emissions) and system responses (global temperature change, rates of glacial melt, thermal expansion of ocean water, etc.) to arrive at their estimate.

For the Annapolis MIRR, understanding both near-term and long-term inundation levels is important. Stantec will use the near-term inundation levels to identify and prioritize critical asset mitigation/adaption projects, while the long-term inundation levels can guide future planning. Stantec, in consultation with the City of Annapolis, Anne Arundel County, and NSA Annapolis, has selected three time horizons - 2050, 2065, and 2100. The 2065 time horizon was included specifically for consistency with the DoD requirement for military installations.

Stantec reviewed and considered several sources for estimating SLR, including reports from the State of Maryland, USACE, NOAA, and DoD (SERDP). Predictions from all sources are very similar in the relative near-term (2050 and 2065 time horizons) but begin to deviate at 2100. Source consistency with other local studies (NSA Annapolis and Annapolis City Dock Project) was considered, but ultimately, Stantec, in consultation with the City of Annapolis, elected to use the most recent publicly available information, which is the NOAA 2022 report titled *Global and Regional Sea Level Rise Scenarios for the United States* (2022 Sea Level Rise Technical Report (noaa.gov)). The 2022 report provides five GMSL scenarios: Low, Intermediate-low, Intermediate, Intermediate-high, and High, each predicated on different future emissions

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Reference: NOAA 2022 SLR Mode and Planning Horizons

pathways and global warming trends. For the MIRR project, we selected the Intermediate-high curve. The NOAA Intermediate-high curve is conservative but not the most extreme projection.

Regional rates of SLR deviate from global trends as a function of regional factors such as vertical land movement, changes in ocean currents, and changes in gravitational forces from ice mass loss. NOAA 2022 projections provide a range of regional SLR values for each of the five global scenarios; the report provides a low, medium, and high value representing the 17th, 50th, and 83rd percentile. For the current effort we selected the medium value for all cases and selected the values from the NOAA tidal gauge located at Annapolis, MD (station ID 8575512). All future SLR values are relative to a base year of 1992 (representing the middle of the current tidal epoch). Table 1 provides the water surface elevations at Mean Higher High Water as well as during an extreme event representing the 1-percent-annual chance storm, relative to the NAVD88 vertical datum.

Table 1. Water Surface Elevation Relative to NAVD88 (Feet)

Timeframe	Elevation of MHHW	Elevation of 1% Annual Chance Storm Surge
2050	2.31	8.11
2065	3.21	9.01
2100	6.02	11.82

NOAA 2022 Data for Annapolis, MD
Base Year for SLR Projections = 1992

Cc: Eric Leshinsky, AICP, Chief of Comprehensive Planning, City of Annapolis
Michael Stringer, AICP, Senior Planner, Anne Arundel County
Zoe Johnson, Community Planning Liaison Officer, NSA Annapolis
Paul Carroll, PE, Stantec
Rebecca Leitschuh, AICP, Stantec

Respectfully yours,

STANTEC CONSULTING SERVICES INC.

Cyrena Chiles Eitler AICP
Project Manager
Strategic Planning Advisor

Phone: 703-674-5778
Mobile: 571-595-9162
cyrena.eitler@stantec.com

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APPENDIX D:
MAPS

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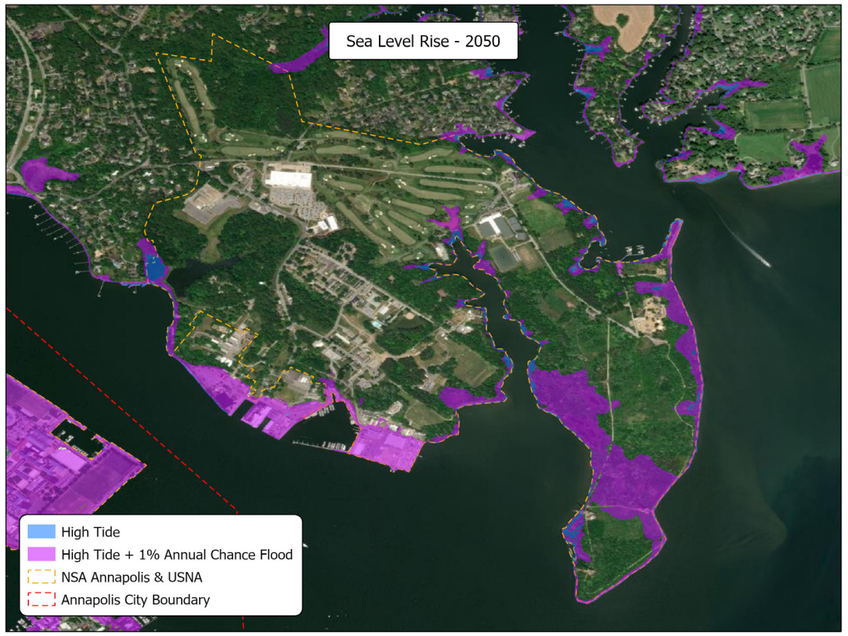
MAP SUMMARY

This appendix includes maps showing the results of the risk assessment completed for the City of Annapolis' MIRR project. The risk assessment included hazards that could be addressed from a geospatial perspective; these hazards were: coastal flooding, hurricanes and tropical storms, and riverine flooding. Each of these hazards were analyzed using appropriate geospatial hazard data and comparing this data with the location of the identified high priority critical facilities. The coastal flooding hazard assessment included modeling projected sea level rise based on NOAA's 2022 Sea Level Rise Technical Report and LiDAR data available for Anne Arundel County from the State of Maryland.[1,2]

The modeling was completed in the study area for three approximate timeframes: 2050, 2065, and 2100. The results of the modeling are shown in Figures 1-12. This sea level rise analysis, along with an analysis of available data for shoreline erosion, were used to assess the coastal flooding hazard. Hurricanes and tropical storms data, along with tornado data, was used to assess the hurricanes and tropical storms hazard. The results of this analysis are shown in Figures 13-15. The flooding hazard was analyzed using FEMA's National Flood Hazard Layer. The special flood hazard layers included in this analysis were the coastal zones (Zone VE), the 1.0% annual chance of flooding (Zones A, AE, and AO), and the 0.2% annual chance of flooding zones. The results of this analysis are shown in Figures 16-19.

Following the initial hazard analysis, more detailed analysis was conducted by subject matter experts to provide insights into potential projects and resolutions that would protect identified high priority critical assets. Maps used during this process are shown in Figures 20-29. Subject matter experts used the hazard analysis results, as well as their experience and knowledge, to guide clients towards beneficial solutions.

1. Sweet, W. V. (2022). 2022 Sea Level Rise Technical Report. NOAA Technical Report. Retrieved on June 3, 2022 from Sea Level Rise Technical Report: Download and FAQs (noaa.gov)
2. Maryland Geographic Information Office. (2020). Anne Arundel LiDAR Data. State of Maryland. Retrieved on June 8, 2022 from LiDAR Overview | MD iMAP Portal (maryland.gov).



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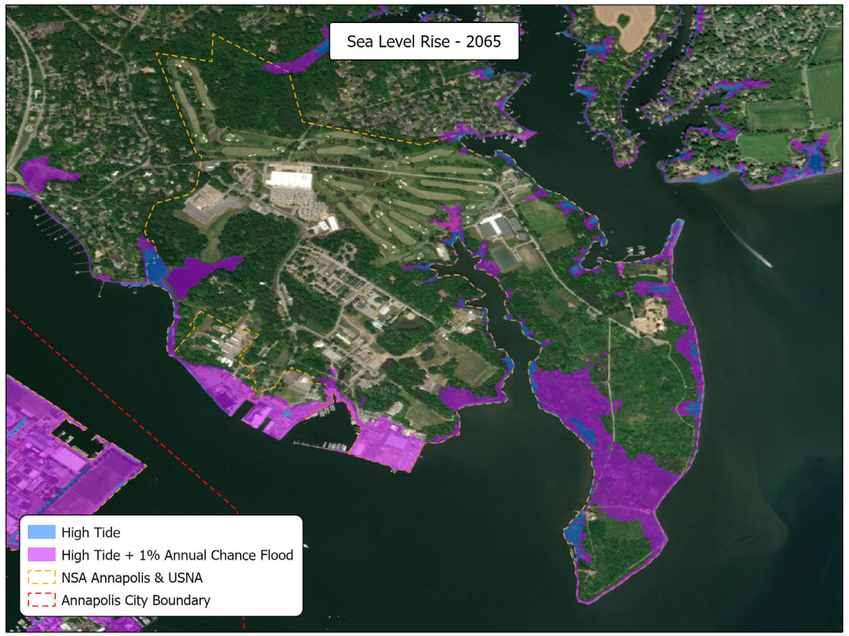

NSA Annapolis

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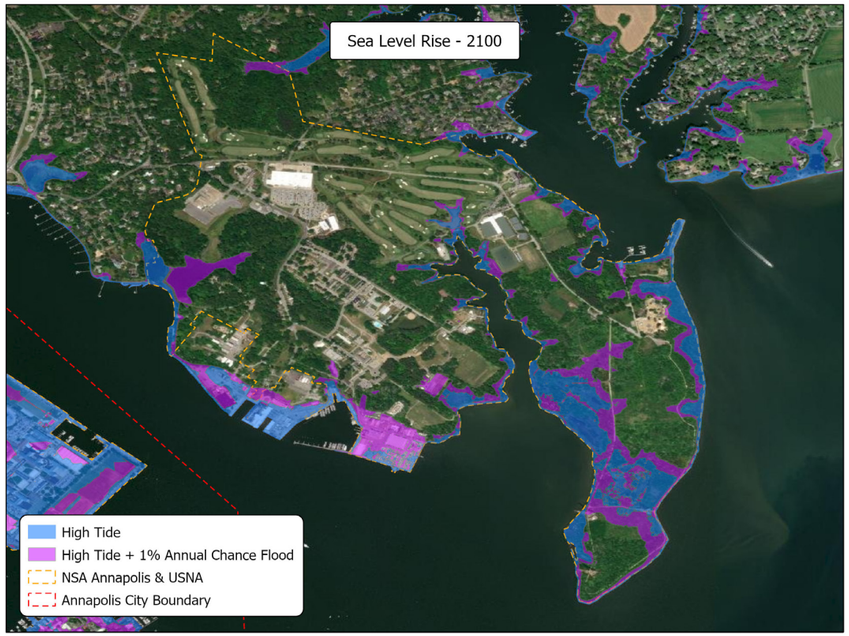
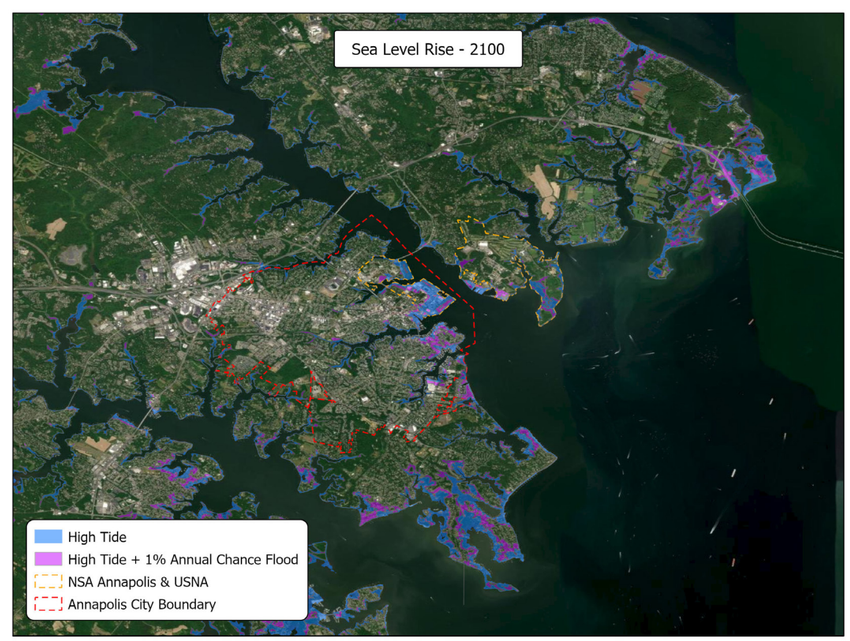


NSA Annapolis

Regional

Regional



Regional

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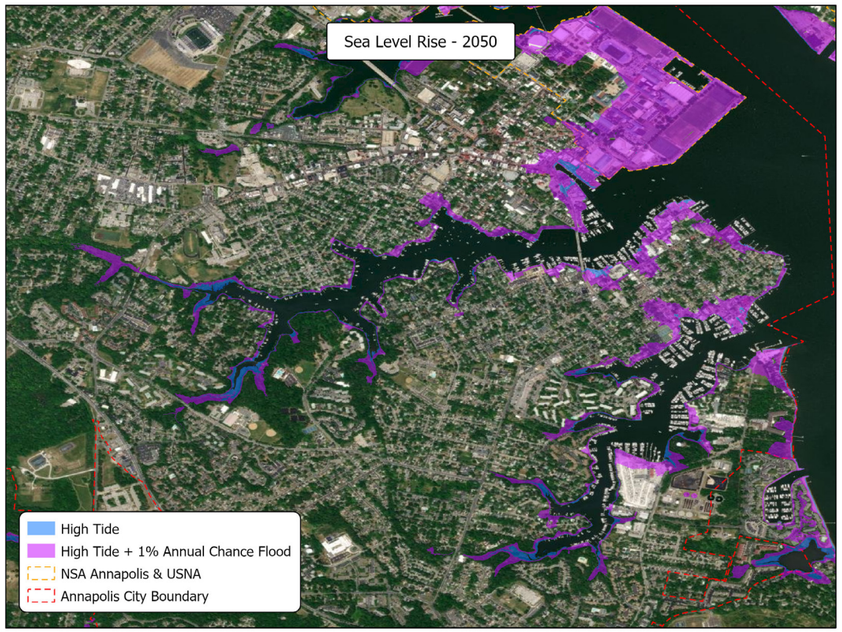

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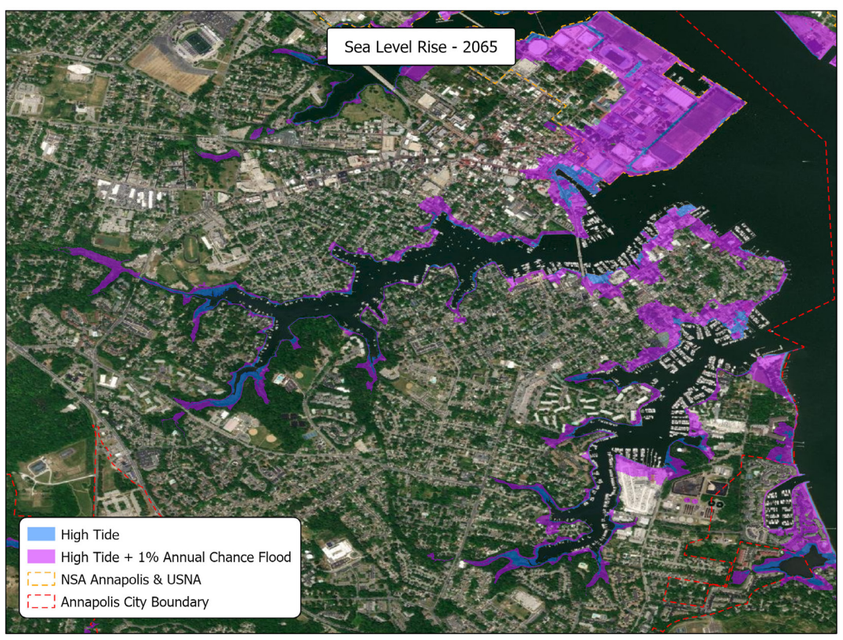
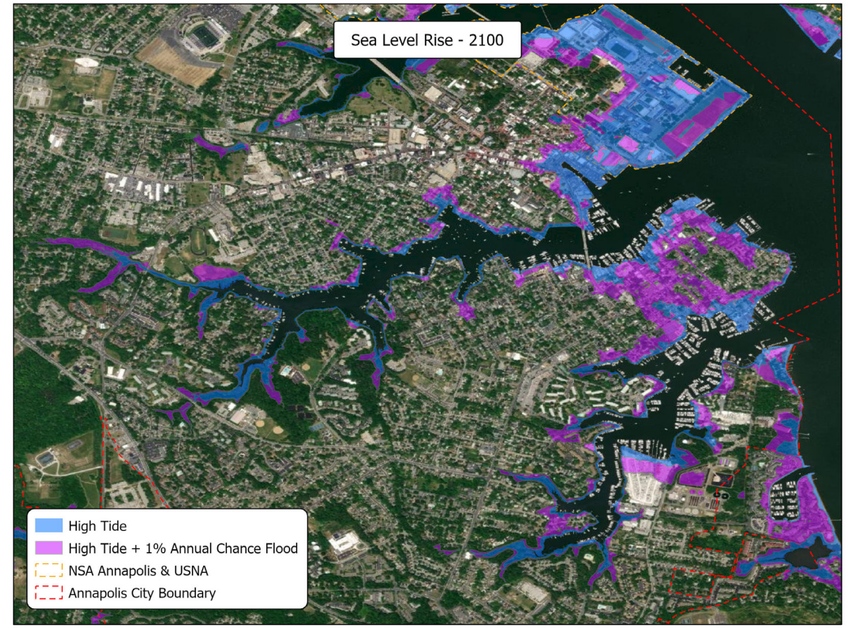


SPA CREEK

APPENDIX D



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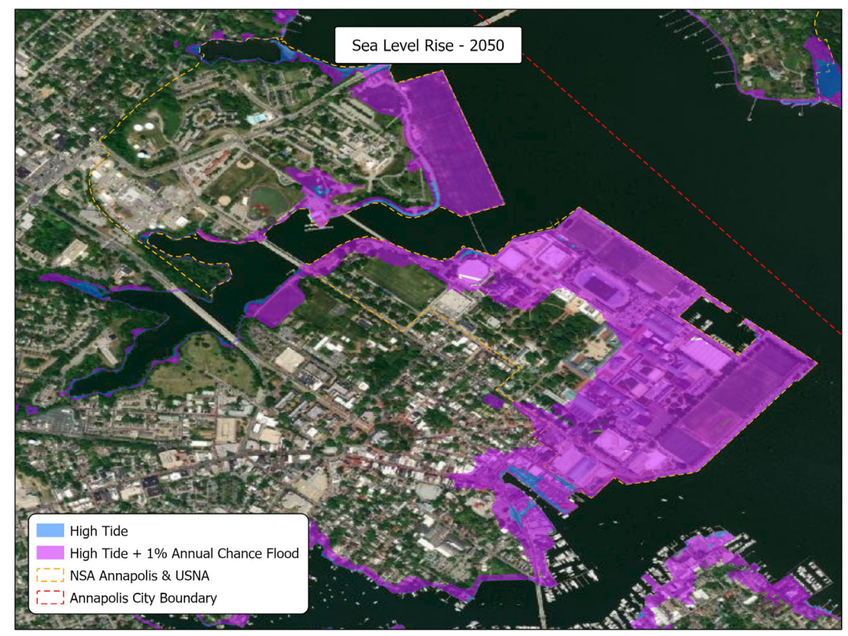

US NAVAL ACADEMY

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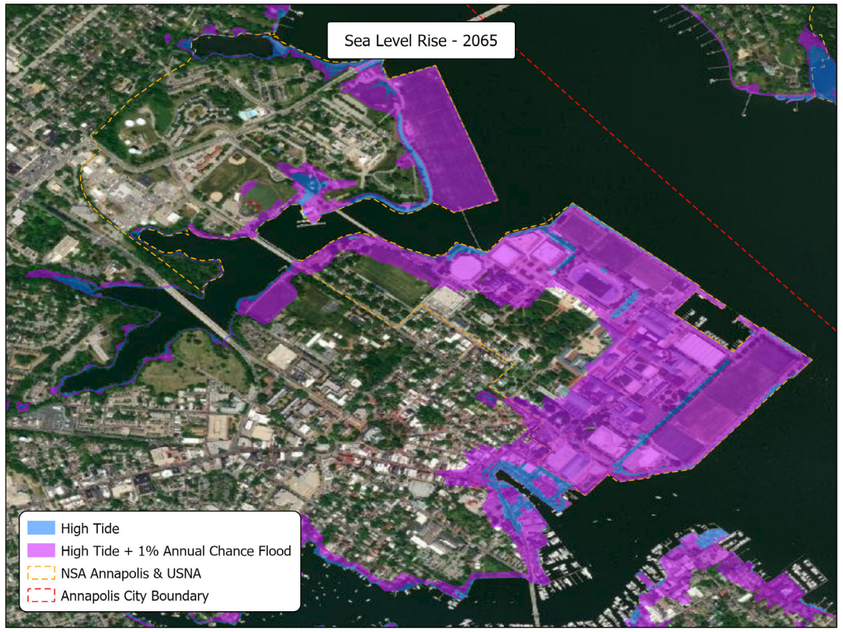

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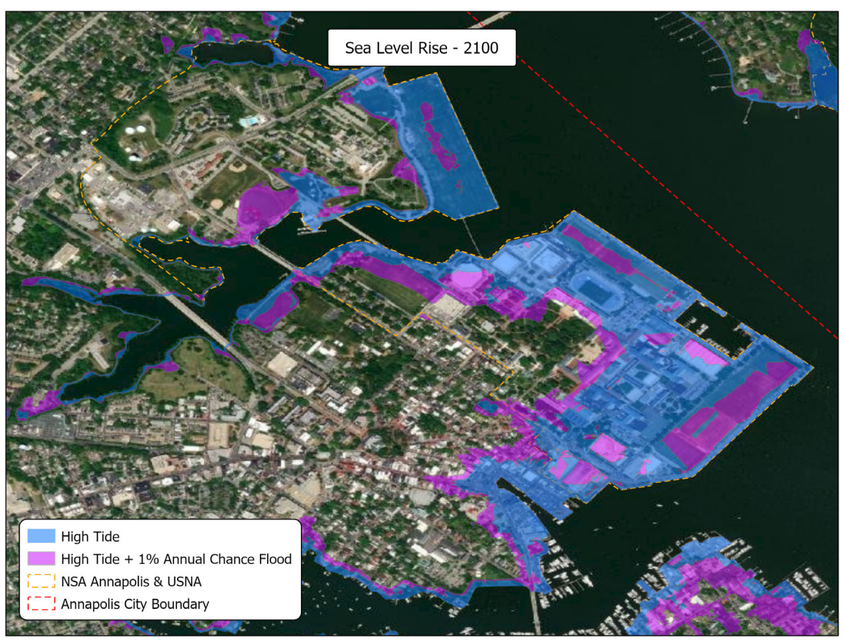
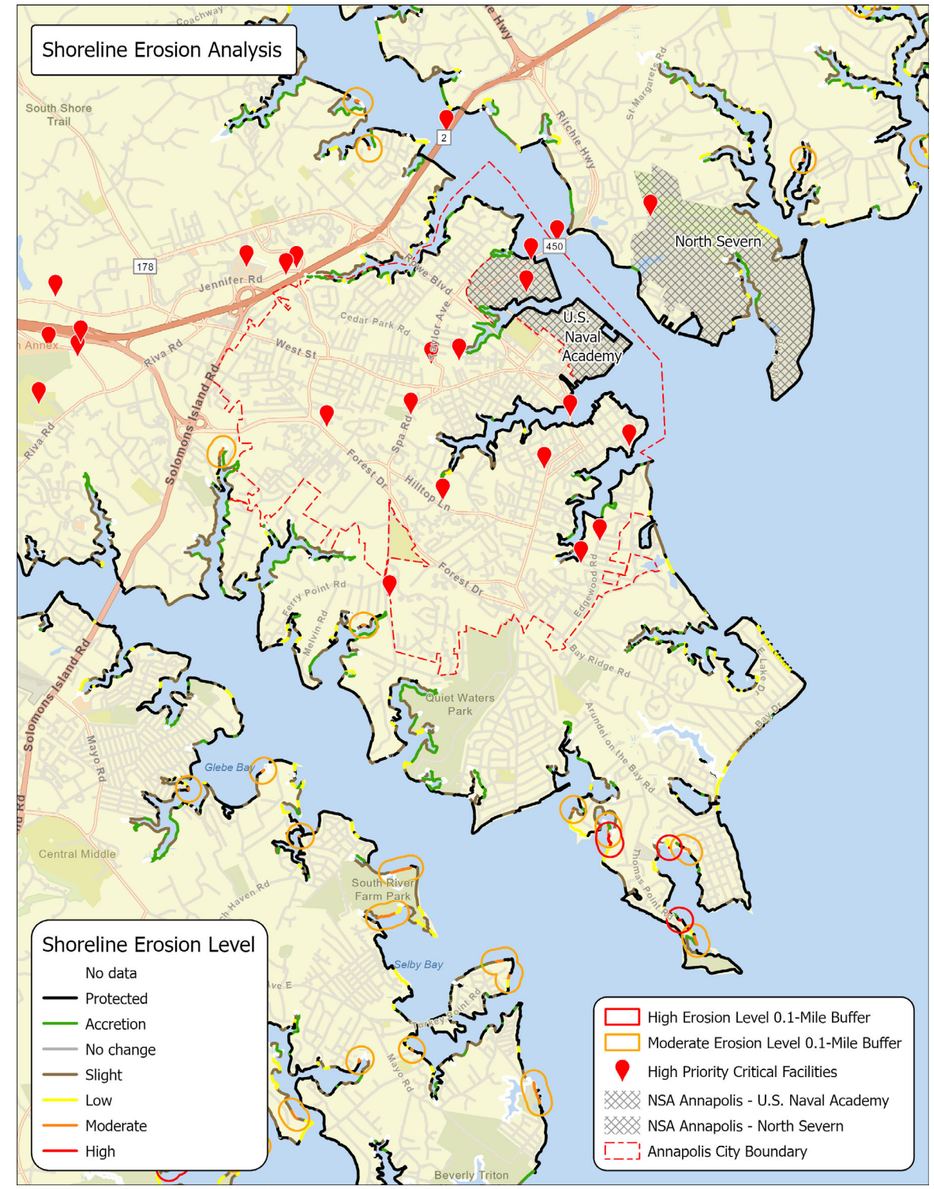


US NAVAL ACADEMY

APPENDIX D



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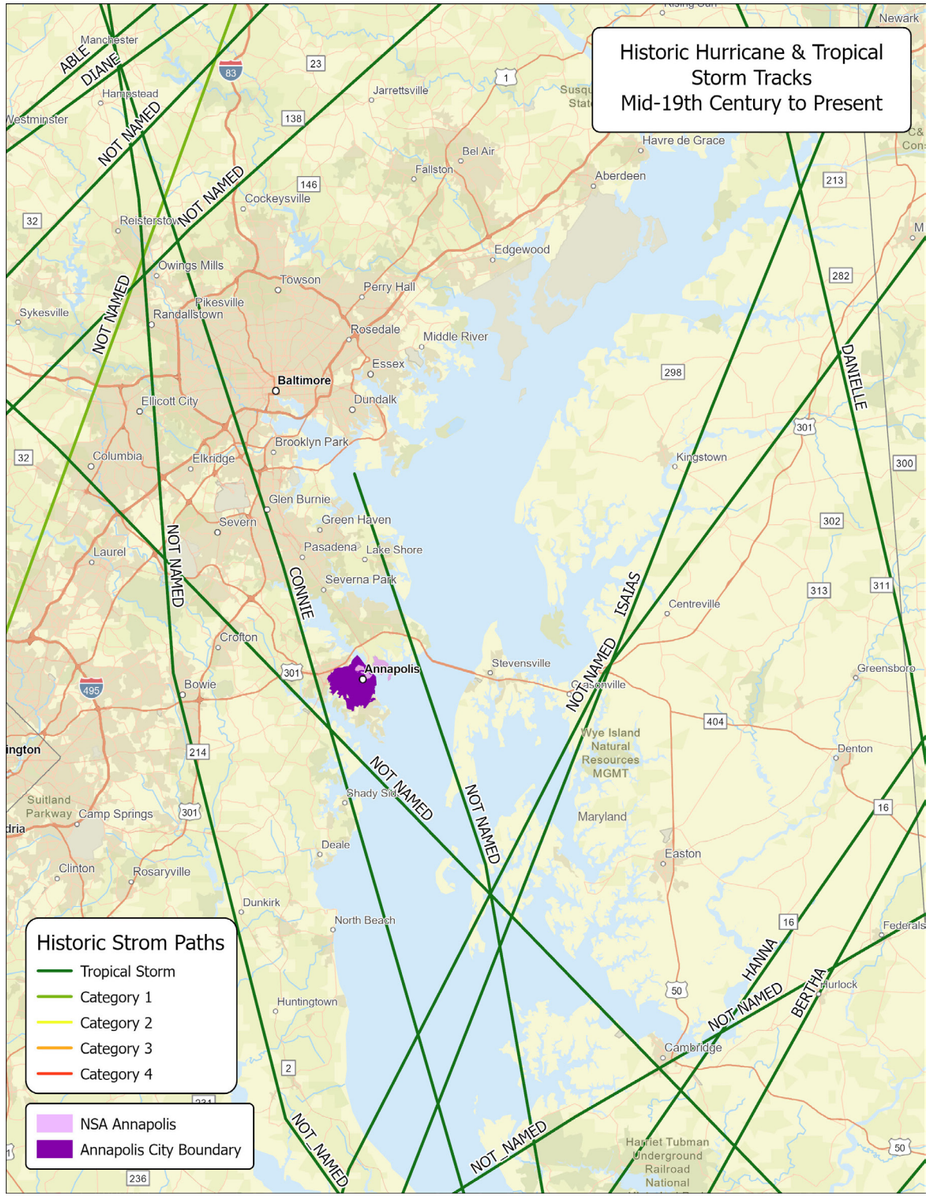

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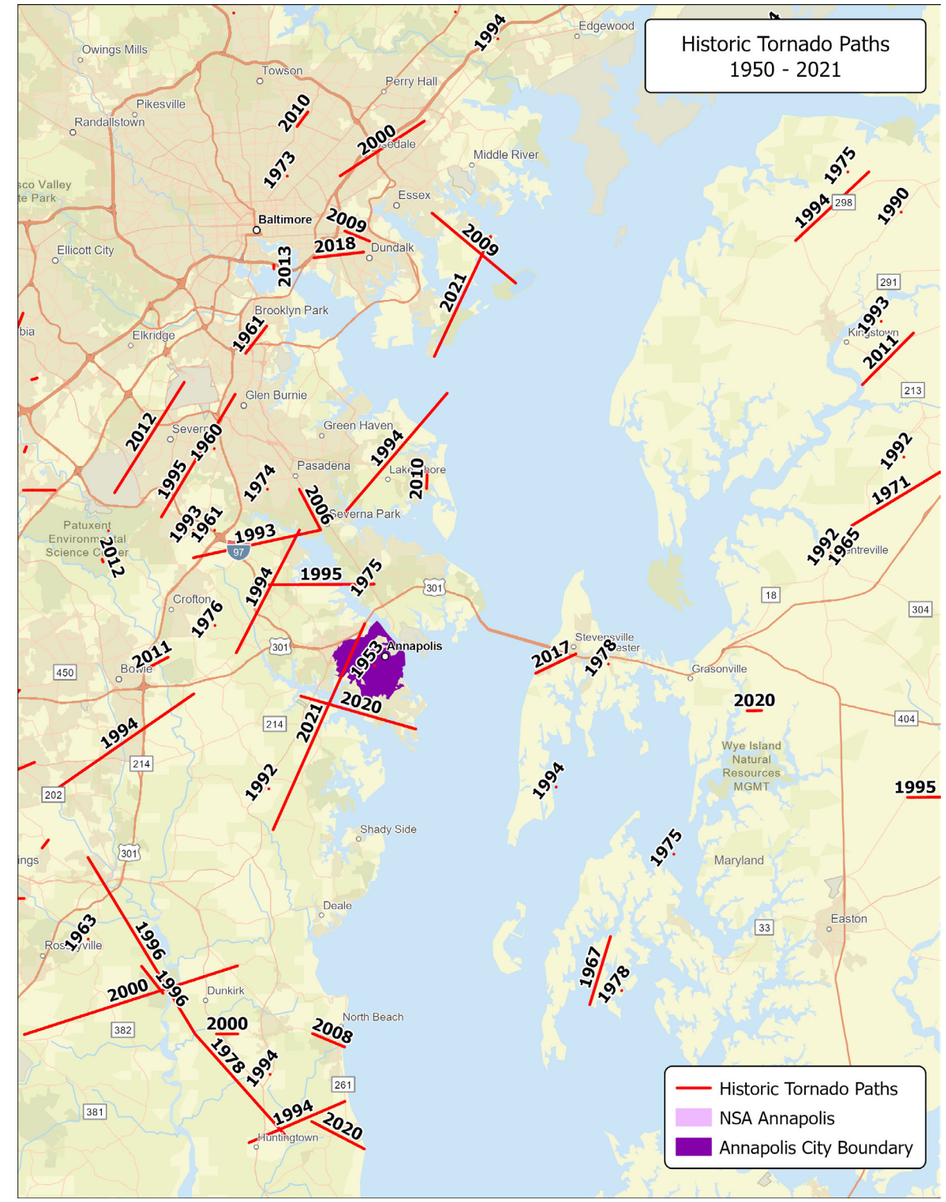

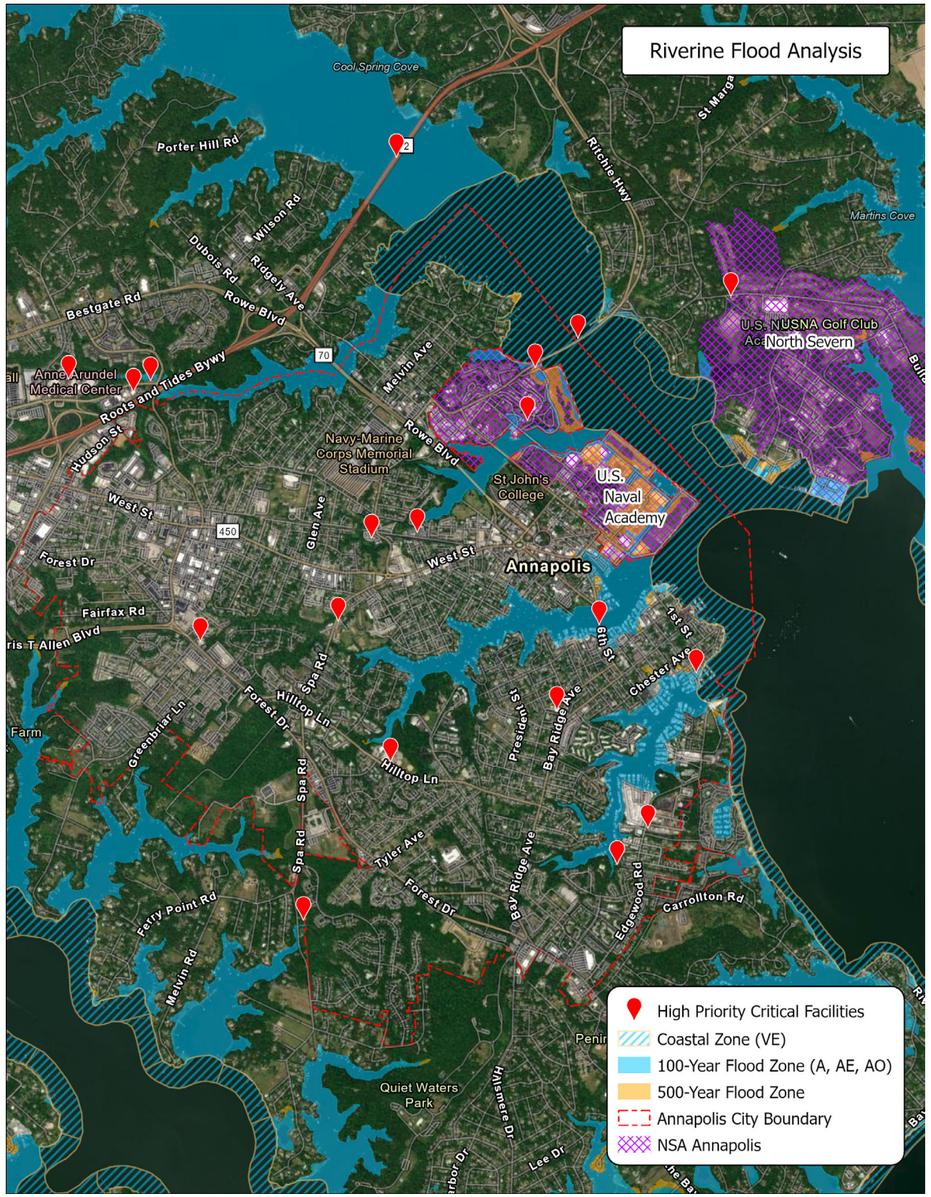

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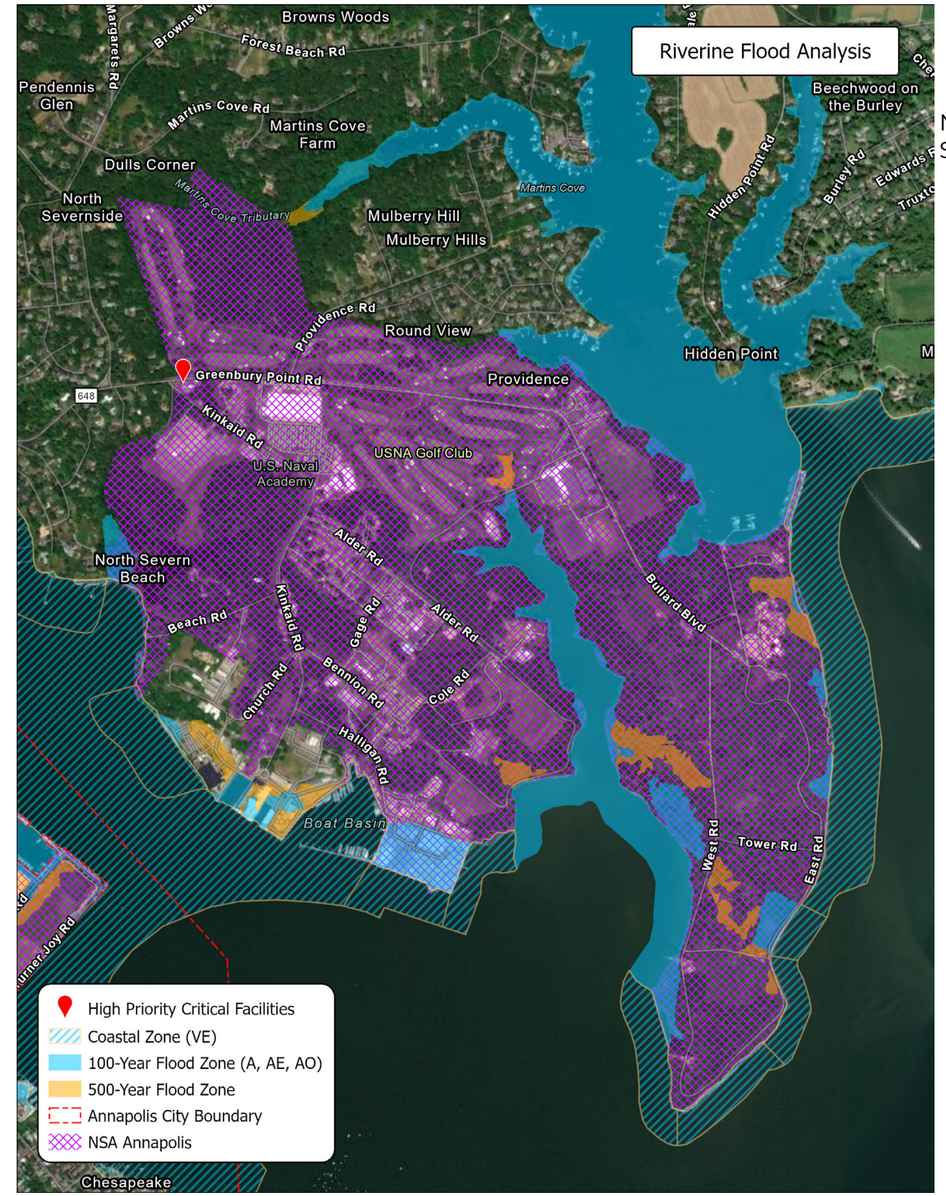

NORTH SEVERN

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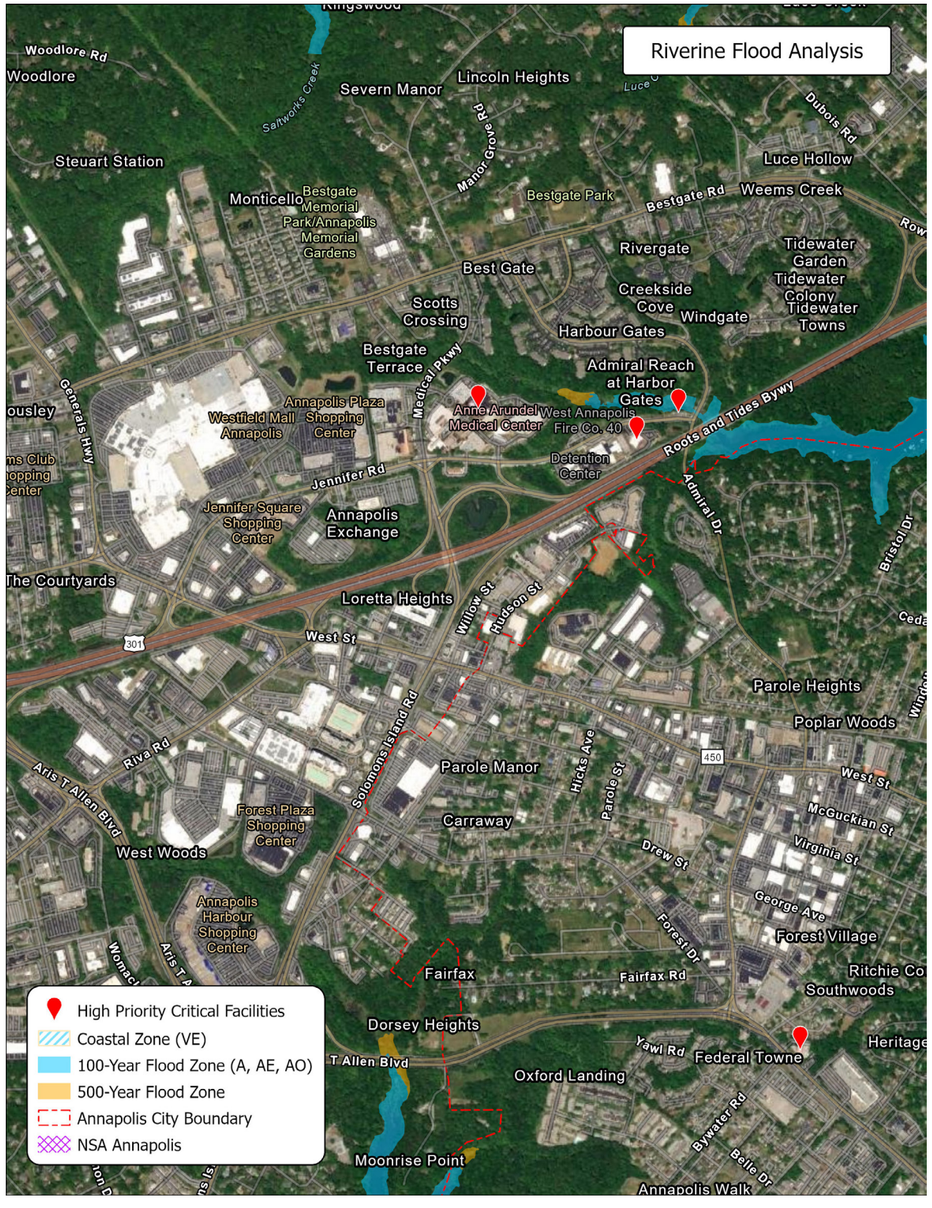

NORTHWEST ANNAPOLIS

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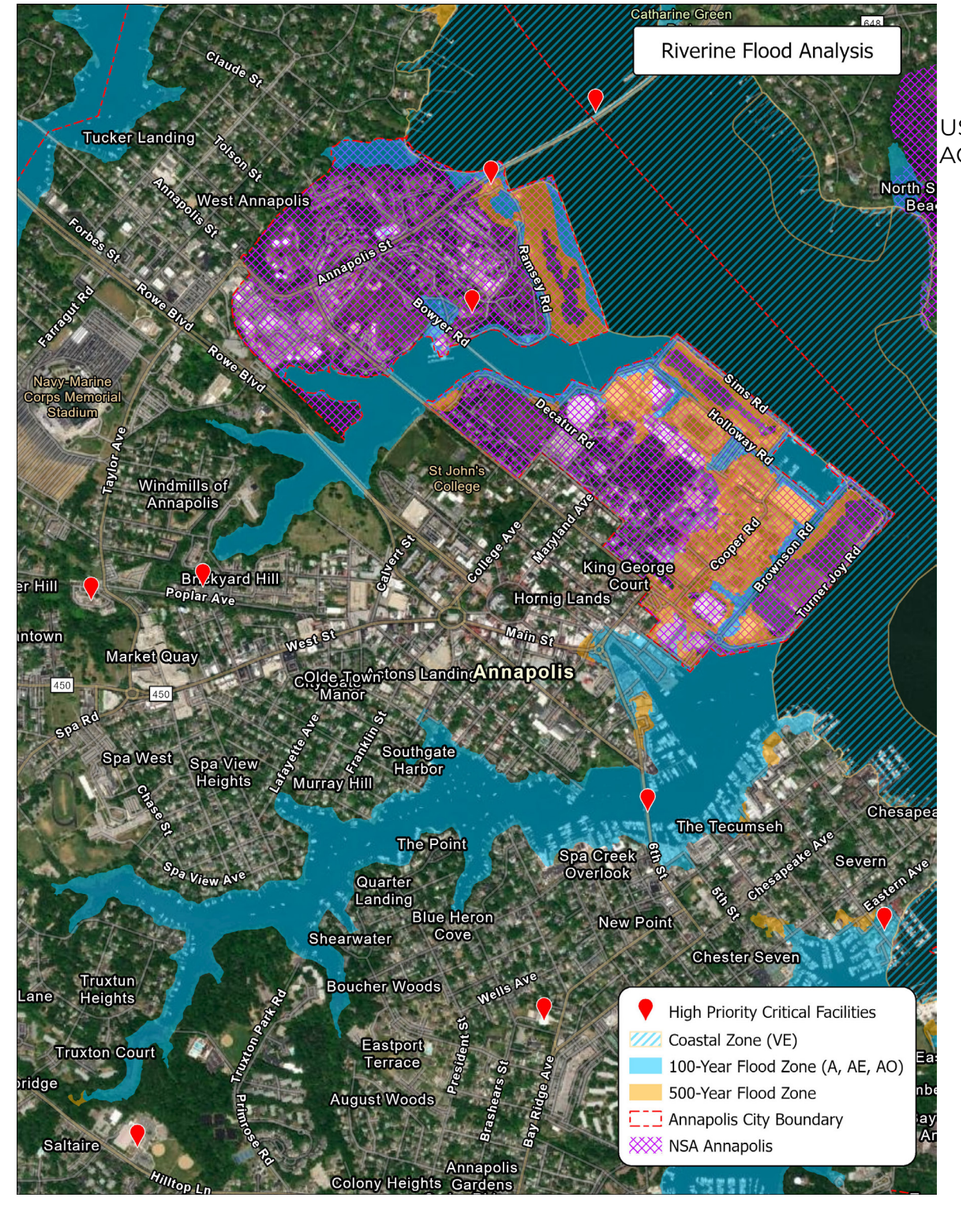

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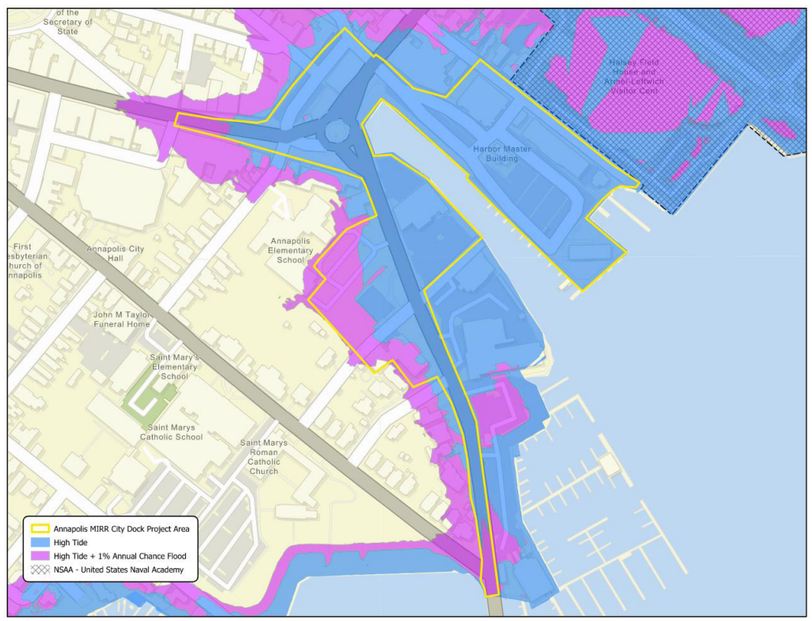
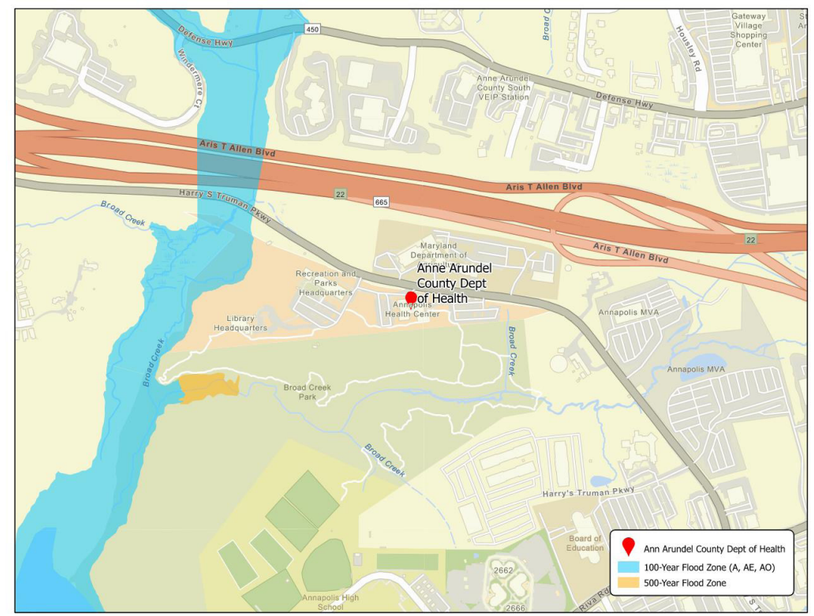


CITY DOCK
TIDES

APPENDIX D



ANNE ARUNDEL
COUNTY
DEPARTMENT OF
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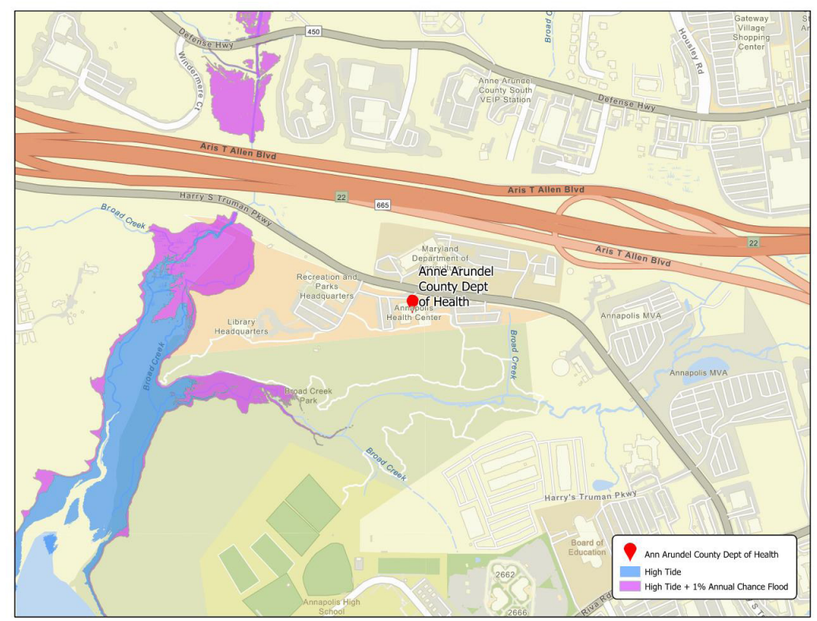

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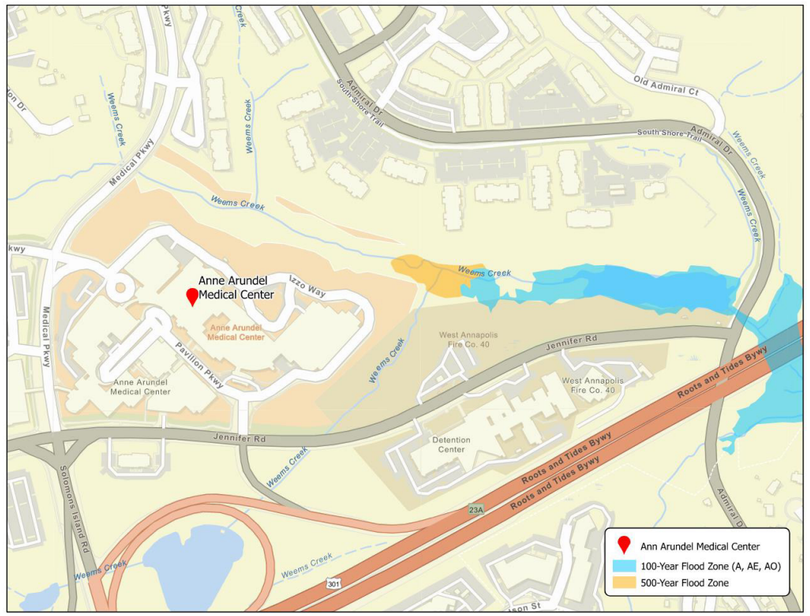
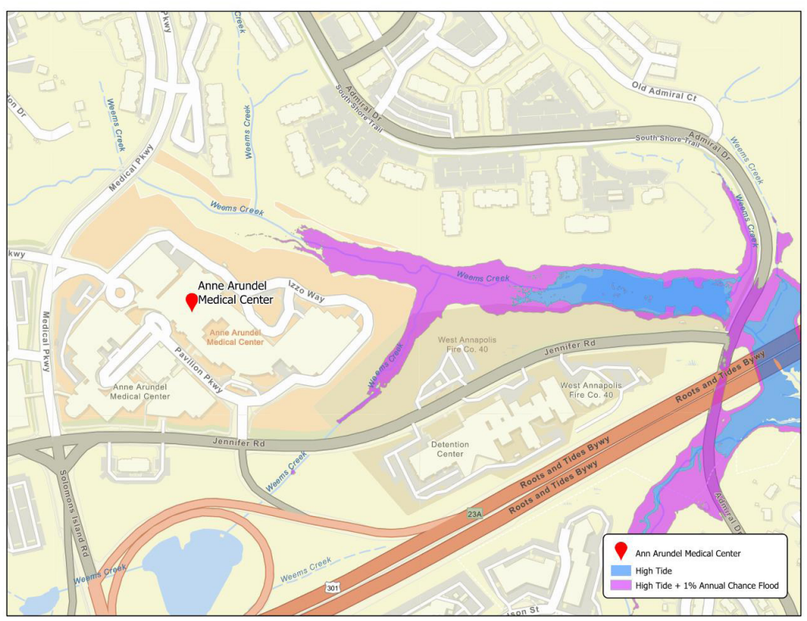


LUMINIS HEALTH ANNE ARUNDEL COUNTY MEDICAL CENTER FLOOD ZONES



LUMINIS HEALTH ANNE ARUNDEL COUNTY MEDICAL CENTER TIDES

APPENDIX E:
CLIMATE RISK DISCLOSURE STATEMENT

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APPENDIX E

CLIMATE RISK DISCLOSURE STATEMENT

The conclusions in the Report titled Military Installation Resiliency Review: City of Annapolis, Anne Arundel County, and Naval Support Activity Annapolis are Stantec's professional opinion, as of the time of the Military Installation Resiliency Review, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes.

Information and reference data that is subject to change includes, but is not limited to, downscaled climate projections from applicable Intergovernmental Panel on Climate Change (IPCC) Assessment Reports available at the time of project execution. These climate change projections are typically reviewed and renewed approximately every five years. **It is advised that the client review the latest climate change projections at regular (5-year) intervals, engaging the support of a climate scientist.** The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

As noted more specifically in this Report, Stantec's services rely upon existing models, research and data regarding historical and projected climate patterns combined with information provided by the City of Annapolis (Client) and Anne Arundel County. The generated conclusions and recommendations in our deliverables will be estimates based on these inputs, and we cannot guarantee actual results. Stantec has assumed all information received from the Client and other parties in the preparation of the Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

This Report is intended solely for use by the Client in accordance with Stantec's contract with the Client. While the Report may be provided to applicable authorities having jurisdiction and others for whom the Client is responsible, Stantec does not warrant the services to any third party. The Report may not be relied upon by any other party without the express written consent of Stantec, which may be withheld at Stantec's discretion.

APPENDIX F:
TRAFFIC SIGNAL AND ITS DEVICE REVIEW

Stantec

TRAFFIC SIGNAL AND ITS DEVICE REVIEW

March 22, 2023

Prepared for:
Military Installation Resiliency Review | City of Annapolis | Anne Arundel County | Naval Support Activity Annapolis, Maryland

Prepared by:
Larry Overn & Robert Milstead

Design with community in mind

APPENDIX F

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Design with community in mind

1 Introduction

The City of Annapolis, in partnership with Anne Arundel County, State of Maryland, and Naval Support Activity (NSA) Annapolis, is undertaking a Military Installation Resiliency Review (MIRR) for NSA Annapolis. Review and preliminary design for up to 30 traffic signals and Intelligent Transportation System (ITS) devices is included as a task activity for the MIRR in support of emergency evacuation for the installation, specifically the US Naval Academy, and adjacent community. The purpose of this memorandum is to provide an explanation of the various traffic signal control options and ITS devices for the area surrounding NSA Annapolis. As part of this memorandum, a list of devices and their possible uses are included. We have also included approximate costs and infrastructure needs. Finally, we will discuss operational scenarios to manage and operate the traffic signals and ITS devices.

2 Traffic Signal Control

2.1 Existing Conditions

The City of Annapolis provided Stantec a list of 53 traffic signals that are within the City of Annapolis limits and who maintains these signals. Two (2) of these signals have been removed and an additional eight (8) traffic signals were included as part of the analysis to determine preliminary upgrades for 30 signals. As we understand many of the existing signals are reaching the end of their service life and will require upgrades. Three (3) different agencies in the region own and maintain the signals. The City of Annapolis maintains 23 signals, Maryland Department of Transportation State Highway Administration (MDOT SHA) maintains 24 signals and Anne Arundel County maintains 12 signals. The 59 signals within or adjacent to the City of Annapolis are shown in Table 1 – Traffic Signals. The top 30 traffic signals are under consideration for preliminary upgrades.

MDOT SHA indicated that they have a couple of signal systems connected via cellular or hard wired. MDOT SHA did not indicate which signals are included in the signal system. Anne Arundel County has a signal system along Forest Drive that is connected via fiber optic cable. Anne Arundel County is upgrading all controllers along Forest Drive to Econolite Cobalt controllers. They are also transitioning to a new Advance Transportation Management System (ATMS) (Centracs). Both the controllers and ATMS are similar to the controllers and ATMS used by SHA and will now be able to establish communication with MDOT-SHA CHART (Coordinated Highways Action Response Team).

Since multiple agencies own and operate the signals surrounding NSA Annapolis, coordination is required among the agencies to better control the signals in the event of an evacuation. Coordination between agencies will also help with daily operations as drivers are not concerned with who owns/maintains the signal as much as how they operate.

Table 1 - Traffic Signals

Intersection	Maintaining Agency	TS #
King George Street at Maryland Avenue	City of Annapolis	1
King George Street at College Avenue (MD450)	City of Annapolis	2
King George Street (MD 450) at Taylor Avenue (MD 435)/Baltimore Boulevard (MD 450)	MDOT SHA D5	3
MD 450 (Baltimore-Annapolis Boulevard) at Gate 8 (Bowyer Road)	MDOT SHA	4
MD 450 at MD 648	MDOT SHA D5	5
Bladen Street at Calvert Street	MDOT SHA D5	6
Roscoe Rowe Boulevard (MD 70) at Taylor Avenue (MD 435)	MDOT SHA D5	7
Roscoe Rowe Boulevard (MD 70) at Farragut Road/Melvin Avenue	MDOT SHA D5	8
Main Street at Conduit Street	City of Annapolis	9
Duke of Gloucester Street at Conduit Street	City of Annapolis	10
MD 70 (Roscoe Rowe Boulevard) at To US 50 EB Ramp	MDOT SHA	11
MD 70 (Roscoe Rowe Boulevard) at From US 50 EB Ramp	MDOT SHA	12
MD 70 (Roscoe Rowe Boulevard) at To US 50 WB Ramp	MDOT SHA	13
MD 450 (West Street) at Calvert Street/Cathedral Street	City of Annapolis	14
MD 450 (West Street) at Lafayette Avenue	City of Annapolis	15
MD 450 (West Street) at Madison Street/ Southgate Avenue	City of Annapolis	16
MD 450 (West Street) at Monticello Avenue/Jefferson Street	City of Annapolis	17
MD 450 (West Street) at Russell Street	MDOT SHA D5	18
MD 450 (West Street) at Admiral Drive	MDOT SHA D5	19
MD 450 (West Street) at Chinquapin Round Road	MDOT SHA D5	20
West Street (MD 450) at Solomons Island Road (MD 2)	MDOT SHA D5	21
Sixth Street at Severn Avenue	City of Annapolis	22
Sixth Street at Chesapeake Avenue	City of Annapolis	23
Bay Ridge Avenue at Madison Avenue	City of Annapolis	24
Bay Ridge Avenue at Tyler Avenue	City of Annapolis	25
Hilltop Lane at Primrose Lane	City of Annapolis	26
Hilltop Lane at Spa Road	City of Annapolis	27
Ridgely Avenue (MD 436) at Melvin Avenue	MDOT SHA D5	28
Chinquapin Round Road at Drew Street/George Avenue	City of Annapolis	29
Calvert Street at Northwest Street	City of Annapolis	30
Bay Ridge Road at Edgewood Road	Anne Arundel County	31
Bay Ridge Road at Georgetown Road	Anne Arundel County	32
Forest Drive at Bay Ridge Avenue/Hillsmere Drive	Anne Arundel County	33
Forest Drive at Tyler Avenue	Anne Arundel County	34
Forest Drive at Youngs Farm Road/Annapolis Middle School	Anne Arundel County	35
Forest Drive at Gemini Road	Anne Arundel County	36

Traffic Signal and ITS Device Review
2 Traffic Signal Control

Intersection	Maintaining Agency	TS #
Forest Drive at Spa Road	Anne Arundel County	37
Forest Drive at Hilltop Lane	Anne Arundel County	38
Forest Drive at Newtowne Drive	Anne Arundel County	39
Forest Drive at S. Cherry Grove Road	Anne Arundel County	40
Forest Drive at Bywater Road	Anne Arundel County	41
Forest Drive at Aris T Allen Blvd (MD 665)/Chinquapin Round Road	Anne Arundel County	42
Forest Drive at Old Solomons Island Road (MD 393)	MDOT SHA	43
Sixth Street at Spa Creek Bridge	MDOT SHA	44
Duke of Gloucester Street at St. Mary's Exit (Flashing)	City of Annapolis	45
Ridgely Avenue (MD 436) at Melvin Avenue	MDOT SHA	46
Spa Road at Spa Trail	City of Annapolis	47
Taylor Avenue (MD 435) at Ridgely Avenue (MD 436)	MDOT SHA	48
West Street (MD 450) at Riva Road	MDOT SHA	49
Randall Street at Prince George Street	City of Annapolis	50
Church Circle at Main Street	City of Annapolis	51
Church Circle at Northwest Street	City of Annapolis	52
Church Circle at West Street (MD 450)	City of Annapolis	53
Church Circle at Duke of Gloucester Street	City of Annapolis	54
MD 450 (West Street) at Holly Road	MDOT SHA	55
MD 450 (West Street) at Somerville Road	MDOT SHA	56
MD 450 (West Street) at Jennifer Road/US 50 Ramps	MDOT SHA	57
MD 2 (Solomons Island Road) at Somerville Road	MDOT SHA	58
MD 2 (Solomons Island Road) at Forest Drive	MDOT SHA	59

Traffic Signal and ITS Device Review
2 Traffic Signal Control

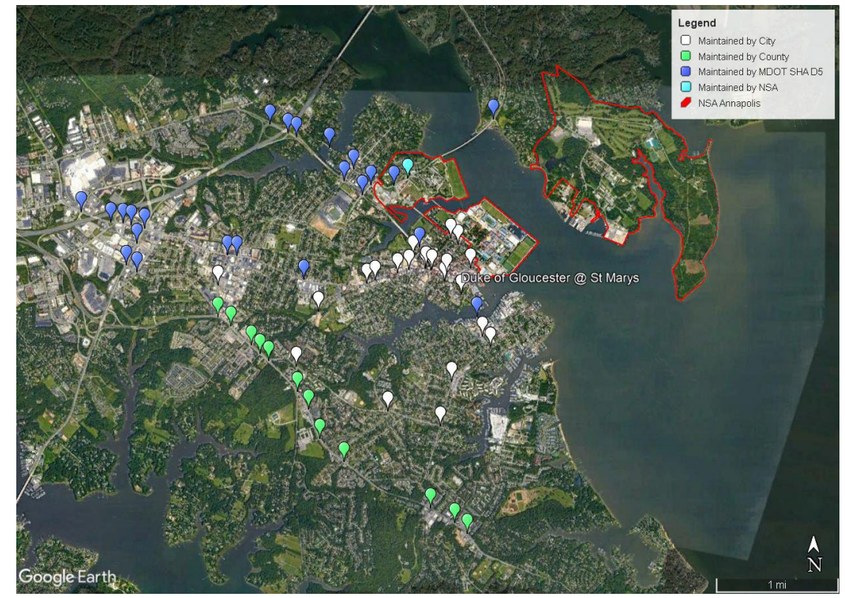

Figure 1 - Traffic Signal Locations

2.2 Traffic Signal Control Strategies

There are different levels of control strategies for traffic signal operations. As the control strategy is increased additional infrastructure and/or communications may be necessary to fully utilize the upgraded system. The information provided here is a quick overview of the available types of signal control strategies. Additional information can be found in the Transportation Research Board publication National Cooperative Highway Research Program (NCHRP) *Report 812: Signal Timing Manual, Second Edition.*

2.2.1 Isolated Signal

Most of the intersections within the City of Annapolis currently operate as isolated signals. Isolated traffic signals can be pre-timed, semi-actuated, or fully actuated. Pre-timed signals operate based on predetermined values and are not impacted by detection. Semi-actuated traffic signals provide detection

and can influence the timing values for some of the lanes at the signal. Fully-actuated traffic signals provide detection and can influence the timing values for all lanes at a traffic signal. However, the signals do not provide coordination with nearby traffic signals or communicate back to a central location.

2.2.2 Coordinated Signal System

A coordinated signal system provides defined signal plans and enable nearby signals to operate as a group and synchronize movements. Coordinated signal systems help to provide better daily operations by using pre-defined coordinated signal plans based on a programmed time-of-day schedule. The time-of-day schedules are based on the traffic expected based on the historical daily volumes. Coordinated signal systems are generally updated every 2-3 years to reflect changes in daily traffic volumes. However, a coordinated signal system cannot respond to changing traffic volumes on the fly.

Coordinated signal systems operate using consistent cycle lengths at all the included intersections in the signal system. In addition to consistent cycle lengths, coordinated signal systems require defined splits and offsets at all intersections. Splits control the amount of time provided to each phase of a signal cycle and the offset is the relationship of each intersection to the others in the system.

Coordinated signal systems require a method to synchronize the traffic signals. This can be done by installing a GPS clock at each intersection to synchronize the controller clocks. Beyond the use of GPS clocks, communications can be used to develop a closed loop signal system, such as wireless communications or fiber optic communications.

Closed loop signal systems have traditionally been controlled by an on-street master. An on-street master is a controller in the field that maintains all the controller clocks to keep the signals synchronized. If there are communications to a central system for remote monitoring, the central system can be used to manage the signal system and the controller clocks.

The key requirements for a coordinated signal system are **signal controllers operating on similar software** and **synchronized time clocks**. Optional items that will help to maximize the benefits of a coordinated signal system are **communication between intersections, semi-actuated signal control**, and **central control**.

2.2.3 Traffic Responsive Signal System

A more advanced traffic control strategy to a coordinated signal system is a Traffic Responsive (TR) signal system. TR signal control can choose a coordinated signal timing plan based on the traffic volumes along the corridor rather than a pre-programmed schedule. Coordinated signal systems can provide better progression and synchronized movements within a signal system, but a traffic responsive system can react and choose a timing plan based on real-time traffic information.

TR signal systems operate by ingesting detector data from signalized intersections within the system and select a pre-configured coordinated timing plan. There is a background time-of-day schedule that is programmed just as in a coordinated signal system. However, data from the detectors can choose a more appropriate timing plan if necessary.

Once a new plan is selected it will be implemented to all signals in the group and will run for a minimum amount of time. After a new plan is selected it will not change for a set period. This means that a TR signal system can adjust the programmed time-of-day schedule but is not as reactive as an adaptive signal system.

It is also important to note that TR signal systems only can choose from predefined and preprogrammed signal timing plans. TR systems cannot calculate new plans, cycle lengths, splits, or offsets on the fly.

In addition, to the requirements for a coordinated signal system, **central control** is needed for most modern-day TR systems and **additional detection in areas that do not experience queuing along the corridor**. The additional detection could be advanced detection at multiple intersections along the corridor if they do not experience standing queues. The better approach would be the installation of dedicated detectors along the corridor to inform the TR algorithms. Maintenance becomes more important in a traffic responsive system because malfunctioning detectors providing incorrect data will not operate as intended.

2.2.4 Adaptive Signal System

The most advanced signal system available is an adaptive signal system (ASCT). ASCT systems use detection data and algorithms to adjust signal timing plans for current traffic conditions. While TR systems can choose a predefined signal timing plan, ASCT systems can adjust cycle length, splits, and/or offsets. This allows ASCT systems to adjust to current traffic conditions in real time and with no minimum on how long the adjusted timing should be run. In concept, an ASCT systems ability to adjust signal timing values can provide incremental benefits over coordinated signal plans.

It is important to note that ASCT is not a “set and forget” system. ASCT systems are even more reliant on working detection providing good data and communications to operate correctly. Maintenance becomes extremely important to ensure effective operation, so ASCT systems generally require increased maintenance.

ASCT systems can be beneficial in certain situations. They react very well to variable traffic that is not consistent day to day. A TR signal system can account for predictable variability in day-to-day traffic volumes, but ASCT systems are able to accommodate less predictable variations. These less predictable variations could include incidents, special events, or short-term traffic flow changes.

ASCT systems can operate in a couple of ways. The first is to add additional equipment in the signal cabinet that ingests all of the detector data and then passes onto the controller how to change the signal timing values. This is often referred to as black box. A black box system could allow an agency to maintain a standard signal controller within their system and add an additional piece of equipment to provide ASCT. The other option is to replace signal controllers with new equipment that can provide the ASCT algorithms within the controller.

ASCT systems are similar to TR systems in that they require **more robust communications** and **detection**. The additional detection required is dependent upon the ASCT system chosen and the requirements of it. All systems differ in their detection requirements slightly.

2.3 Traffic Signal Operations

As noted above, drivers do not understand the nuances of signal maintenance and who is responsible for each, not realizing different agencies may maintain adjacent traffic signals. However, drivers do understand and realize the blockages encountered when traffic signal control strategies change. For this reason, many other states and jurisdictions have entered into agreements to operate traffic signals as a group regardless of who is responsible for the maintenance of each individual intersection. This helps to get drivers moving and removes obstacles to progression of traffic within a region.

Central control or a Traffic Operations Center (TOC) are not required for this approach but can help to make operations more centralized and efficient. Many local agencies have developed and installed TOCs that allow for surveillance and operation of intersections from a remote location. There are varying levels of investment to allow for this. To start, the TOC could just be a couple of workstations with access to the signal timing databases and remote access to the intersections. However, as operations build and additional ITS devices are installed, the TOC can be expanded with additional workstations, video walls, and more robust facilities for unified command.

3 ITS Devices

In addition to updates in traffic signals, Intelligent Transportation Systems (ITS) devices can be deployed by the maintaining agency. ITS devices can provide detection, surveillance, and/or traveler information.

3.1 CCTV Cameras

Closed Circuit Television (CCTV) cameras are used for surveillance and can be used to visually confirm incidents, congestion, signal operations, and messages on Dynamic Message Signs (DMS). CCTV cameras must be connected back to a central location for observation. The CCTV cameras in most use today are IP dome style cameras that can pan, tilt, and zoom. These cameras require communications to the TOC. The cameras can be mounted on existing signal poles or new dedicated poles. The higher the camera is mounted, the more the camera can see.

3.2 DMS

Dynamic Message Signs (DMS) are used to provide information to drivers on the road. The DMS are strategically placed to provide the most useful information to drivers. The DMS are placed in advance of decision points so that drivers can alter their route, if necessary, based on the information relayed on the DMS. DMS generally include a full matrix, full LED message board that can display text and graphics.

DMS require structures to mount the signs and the signs must be placed 19.5' above the roadway. The structure can be a structural support pole with the DMS placed over the shoulder, on a cantilever sign structure with the DMS over the roadway, or on a full-span sign structure if the roadway is large enough.

DMS also need to be connected back to a TOC for control and information dissemination.

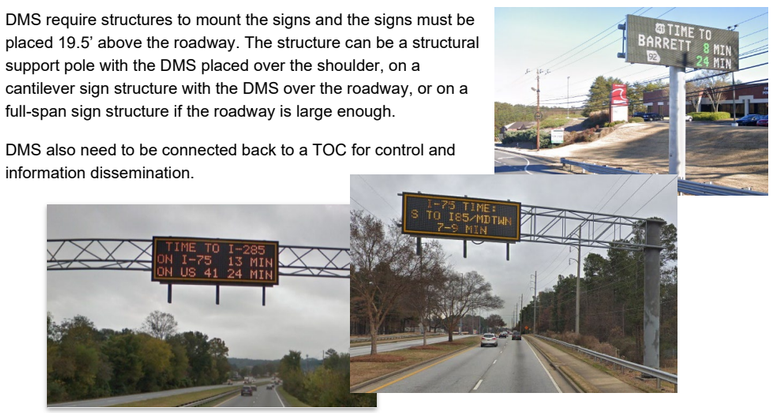

Figure 2 - DMS

3.3 Portable VMS

A portable Variable Message Sign (VMS) is commonly used for relaying traffic information in work zones and for special events. Typically, because this style is portable, it is not meant to be used at a permanent location. This style of message sign can be programmed to relay word messages and can cycle through multiple phases of messages. While some portable message signs can display illustrations and color, in addition to worded messages, these are not typical applications. Portable message signs are generally mounted on a trailer. Power is usually provided by generator and the connection to the TMC can be accomplished with cellular communications.

Figure 3 - PVMS

3.4 Trailblazer Signs

Trailblazer signs are similar to DMS, but on a smaller scale. They are generally in the range of 3'x4' and provide smaller messages. These can help direct drivers to alternate routes when necessary. They are mounted on the shoulder of the roadway and not over the roadway but are connected to a TOC for control and dissemination.

3.5 Blank Out Signs

Blank out signs provide fixed messages that can be turned on and off based on activation. These are often connected and controlled by controllers at signalized intersections. They can be controlled directly by the signal controller or through a web relay housed within the signal cabinet. Blank out signs do not have to be connected to the TOC to operate.

Figure 4 - Blankout Signs

3.6 Travel Time

Travel times can be calculated and disseminated through several methods. Microwave Vehicle Detection Systems (MVDS) can be placed at intermediate locations or signalized locations to measure travel times, speeds, and lane occupancy. This can be saved within a database and analyzed at a TOC. Bluetooth or Wi-Fi readers can be deployed at strategic locations that measure the travel times of passing vehicles by matching their distinct Bluetooth and/or Wi-Fi addresses.

Dedicated Short Range Communications (DSRC) is a technology that is being deployed for Connected and Autonomous Vehicle (CAV) communications. In addition to CAV operations, DSRC can also provide similar information to MVDS, Bluetooth, and/or Wi-Fi. However, the number of vehicles on the roadway that can communicate with DSRC is currently very limited.

3.7 Communications

3.7.1 Fiber Optic

To make all the upgraded traffic signal control and ITS devices communicate, a robust communications network is needed. There are several different communications technologies available to provide this network. The typical form of communication that is used in the public sector for these types of networks is fiber optic cable. Fiber optic provides for a robust network with the necessary bandwidth to connect all the devices in use in the field. The fiber optic can be designed with redundant rings to provide additional resiliency and multiple paths to reach each device.

Fiber optic cable can be installed aerially on existing utility poles or underground in dedicated conduits. Aerial fiber optic cable is generally more cost effective to install depending on the amount of make ready work needed on the existing utility poles. Aerial installations also require joint use permits from the utility owners. When connecting many devices over shorter distances, fiber optic installations have a good cost/benefit ratio. Additionally, because of the reliability, there is usually a low maintenance cost. Other, “last mile” solutions should be considered when there are fewer devices located over longer distances as the cost/benefit of fiber optics can drop significantly.

3.7.2 Wireless

Radio or wireless communications is another option to provide communications for traffic signal control and ITS devices. Wireless radios that use the 900 MHz band work at longer distances and can be setup to work without line-of-sight, but they experience reduced bandwidth potential when compared to shorter wavelength communications. Other popular bands are the 2.4 GHz and 5GHz. These communication bands are capable of a greater transfer of data but are not considered “line-of-sight” and can experience problems due to interference due to the prevalence of other wireless devices.

Wireless radio communication requires that at least two access points be setup, one at the end of an existing network and the other access point at the device. While it is possible to use additional wireless radios as repeaters to access points even further from the network, each additional radio is only be capable of half of the bandwidth as the previous.

Radio can be used to provide interim communications, bridge gaps in fiber optic, or extend the fiber optic network. Radio antennae can be easily deployed at signalized intersections as part of a complete signal upgrade to provide the communications. Radio communication is susceptible to weather-related interference.

3.7.3 Cellular

A third method for connecting a device to the network is cellular communications. This is the same type that we utilize when making call on a mobile phone and can be a very economical choice when connecting a device over long distances, connecting a mobile operation, or connecting many different devices quickly. Because of the prevalence of cellular phones, coverage of cellular communications in the United States is nearly ubiquitous. There are a couple of disadvantages using this method as the data travels over a network outside of any City-owned network. Cellular connections also have a recurring, generally monthly, fee associated with their use. As the number of devices connected via cellular communications increases, so do recurring costs. Additionally, cellular bandwidth may not be sufficient for full HD CCTV camera feeds.

4 Central Control

A major item to make the upgraded traffic signal control and ITS devices seamlessly work together is centralized control. This requires a location that can be connected to all devices using one or more of the communications technologies noted above. This allows for monitoring and control of all devices. Central control will allow for a location for all agencies to monitor and respond to incidents, congestion, and special events.

The City of Annapolis does not currently have an area specified as a Traffic Management Center (TMC) or TOC. MDOT SHA has the CHART facility in nearby Hanover, MD. Anne Arundel County also has a TOC facility. Stantec has completed a peer-city review of the TMCs operated by other municipalities with

similar populations and transportation networks as a part of a Needs Analysis. The peer-city TMC review is designed to inform City personnel of industry benchmarks to consider for implementation.

4.1 Coordination Between Agencies

Within the City of Annapolis there are currently four (4) agencies that maintain and operate traffic signals. The first major item of central control will be to develop a mechanism to operate all the signals within the system regardless of who is responsible for maintenance. This will require a Memorandum of Understanding between the agencies and an understanding of how the signals and ITS devices will be constructed, maintained, and operated.

4.2 TMC Staffing

If a TMC were to be funded, it is recommended that a traffic information technician/officer also be considered as the operator. This additional employee would be responsible for disseminating recurring and non-recurring traffic events as well as aiding emergency services personnel, when necessary. Most cities with a dedicated TMC staff the facility for normal operations during the morning and evening rush hours, with reduced, part-time or on-call staffing during off-peak hours. Some larger cities staff the TMC for 24 hours/day. Suggested TMC staffing hours would be 6:30-16:30 or similar hours.

4.3 Location

A TOC will require dedicated space and workstations for the use of operators. Most statewide TMCs are operated 24/7, but many local TOCs do not require this type of operation. The operation of the TOC can begin during the peak hours and special events before expanding to a 14-hour operation and then ultimately 24/7 operation. This would be determined based on user needs and a full Concept of Operations for the development of a signal system upgrade, ITS device construction, and TOC deployment. There are several options available for the location of a TMC/TOC.

4.3.1 Co-Location at CHART

MDOT SHA D5 has a TMC facility in Hanover that provides full control of many ITS devices. This TMC is currently connected to many of the devices via a large fiber optic network that extends to Annapolis. Updated traffic signals and ITS devices could be connected to this existing fiber optic network and integrated into the Hanover TMC. Once the devices are connected back to the TMC, Annapolis could co-locate staff at the TMC for control of the system and easier coordination with other stakeholders. This option would require space to be provided within the TMC for City staff. The City could also be responsible for the cost of new hardware within the TMC for their use.

4.3.2 Co-Location at Anne Arundel County TOC

The county has communication to all signals along Forest Drive. However, they do not have a defined space for a TOC. The County is requesting the creation of a TOC; however, it is early in the process. Currently, we only have funding for a study. Similar to co-location at CHART, the connection of updated

traffic signals and new ITS devices can be investigated. Once connected, devices could be controlled by City of Annapolis staff co-located at the Anne Arundel County TOC and facilitate coordination between agencies. This option would require space to be provided within the TOC for City of Annapolis staff. The County could also be responsible for the cost of new hardware within the TOC for their use.

4.3.3 New City TOC Facility

This option would incur the highest capital cost for the City of Annapolis and would limit the amount of on-the-fly coordination between agencies when necessary. However, there are options that could more easily be deployed with less space requirements that are useful for one (1) to two (2) operators for peak hours and/or special events. Stantec has designed an option for two (2) workstations with a video wall as shown in the illustration to the right.

Figure 5 - TOC Facility

5 Recommendations

To improve the transportation network within the study area and to be able to manage the transportation network during an event/evacuation the City of Annapolis should upgrade their traffic signals due to their condition and age. The type of upgrades that are to be installed to the signal equipment needs to be taken under consideration as the City of Annapolis will end up having to maintain this equipment, which could become quite costly. A long-term improvement could be a TMC or TOC if there is a need for one. The signals could then be connected by fiber optic to the TMC. When connecting many devices over shorter distances, fiber optic installations have a good cost/benefit ratio.

If the City of Annapolis were to develop such infrastructure for a TMC, it would go unused except for only a few occurrences throughout the year. Therefore, upgrading the signals to be controlled remotely would be the first step and then if the need is there a TMC could be staffed. Because it would only be used a few times a year, it would not be beneficial for the City of Annapolis to have someone on staff who would be able to make the adjustments necessary to the various devices.

The City should coordinate with the County and/or MDOT-SHA to determine who should operate the signals within the system regardless of who is responsible for maintenance. This will require a Memorandum of Understanding between the agencies and an understanding of how the signals and ITS devices will be constructed, maintained, and operated. The Memorandum of Understanding could also cover the use of MDOT-SHA furnished portable VMS or other ITS devices needed for an emergency evacuation. The Memorandum of Understanding should be referenced in the City's evacuation plan.

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APPENDIX G:
COASTAL SHORELINE BOUNDARIES RESILIENT ACTION ASSESSMENT

TOC
RAP
B
C
D
E
F
G

Coastal Shoreline Boundaries

Military Installation Resiliency Review

Critical Asset Resilient Action Assessment

Presentation to Staff
City of Annapolis and NSA Annapolis

December 14, 2022

1

AGENDA

Critical Asset Resilient Action Assessment

Military Installation Resiliency Review

I. Meeting Purpose
II. Critical Elevations
III. Flood Inundation Reference Reaches
IV. Brainstorm – Resilience / Adaptation Actions / Best Management Practices
V. Resilience / Adaptation Discussion
   I. Criteria - Screening / Prioritization
   II. Action - Preliminary Section
VI. Next Steps

2

TOC
RAP
B
C
D
E
F
G

For Consideration

Critical Asset Resilient Action Assessment

Military Installation Resiliency Review

A. Nature-based Solutions
Current Coastal Risk Mitigation BMP of Choice
- USACE's coastal risk mitigation framed around grey-infrastructure are being re-envisioned
  - Incorporating blue- and green-infrastructure
  - Achieves broader benefits across social, environmental and economic metrics
  - **New Orleans LA; Charleston, SC; Norfolk, VA; Boston, MA; New York City, NY; Miami, FL; Honolulu, HI**

B. FEMA's BRIC and DoD's REPI Grant Programs
- **Are two (2) viable grant funding sources**
  - BRIC ~ $2.3 billion (2022-23)
  - REPI ~ $146 million incl. $40 million REPI Challenge (2023)
- Promote nature-based resilient solutions
- Are looking for:
  - **Defense community showcase**
  - Opportunity to leverage programs
  - Case Study: NAS Pensacola REPI Award w/ Coastal Resilience
- REPI funding can:
  - ONLY be used outside the installation boundary
  - **CAN be used to meet federal grant match requirements**
- FEMA BRIC benefit-cost analysis allows consideration of future conditions

3

For Consideration

Critical Asset Resilient Action Assessment

Military Installation Resiliency Review

Military Installation Resilience Study
Tyndall AFB - Base of the Future

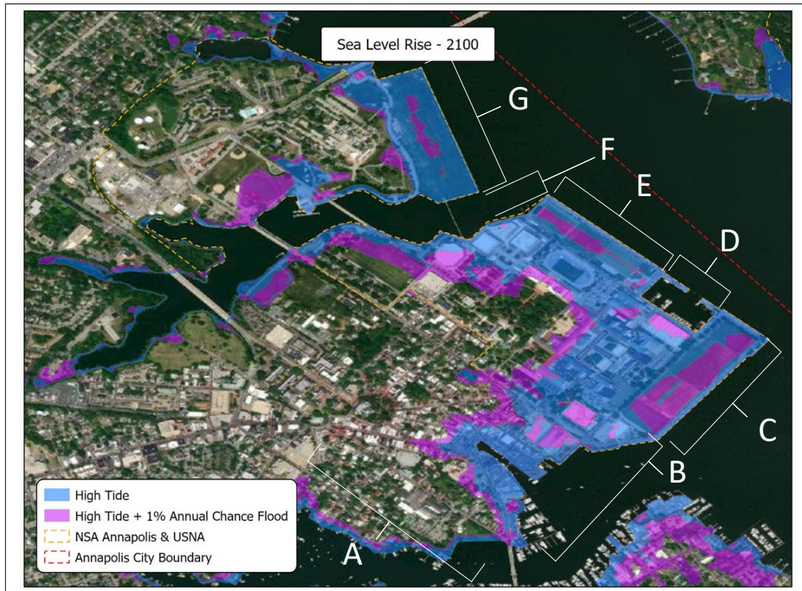
The **Defense Train** for **Mission Assurance** and Security

4) THE INCREASED WIND LOAD REQUIREMENT IS THE FINAL LINE OF DEFENSE
3) THE DESIGN FLOOD ELEVATION IS THE THIRD LINE OF DEFENSE
2) NATURE-BASED INFRASTRUCTURE IS THE SECOND LINE OF DEFENSE
1) COASTAL IS FIRST LINE OF DEFENSE AGAINST SURGE

Coastal Resilience | Tyndall Air Force Base

INSTALLATION OF THE FUTURE

4



Coastal Inundation Reference Reaches

5

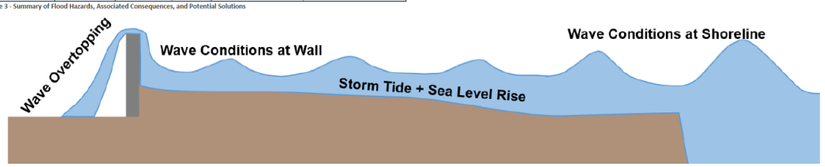
Military Installation Resiliency Review
Critical Elevations

Feasibility Report

Hazard	Water Level (Current)	Water Level[3] (2050)	Water Level (2100)	Consequence	Solution
FEMA 100-year storm event	5 ft	6.7 ft	9.3 ft	Inundation of assets in floodplain	Elevate assets in floodplain; elevate bulkhead/ boardwalk
NACCS 100-year storm event incl. wave, wind, and storm surge	6.6 ft	8.3 ft	10.9 ft	Overtopping of barrier Inundation of assets in floodplain	Elevate barrier; floodproof assets in floodplain
Long-range sea level rise	-0.05 ft (mean sea level in NAVD 88) 0.66 ft (MHHW) (NAVD88)	1.65 ft 2.36 ft	4.25 ft 4.99 ft	Higher risk of overtopping at high tide Permanent inundation	Elevate/ floodproof assets; expand retention

Table 3 - Summary of Flood Hazards, Associated Consequences, and Potential Solutions

Annapolis SLR Projections		
Timeframe	SLR Increment (FT)	MHHW (FT relative to MSL)
2050	1.64	2.36
2065	2.54	3.26
2100	5.35	6.07



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APPENDIX G

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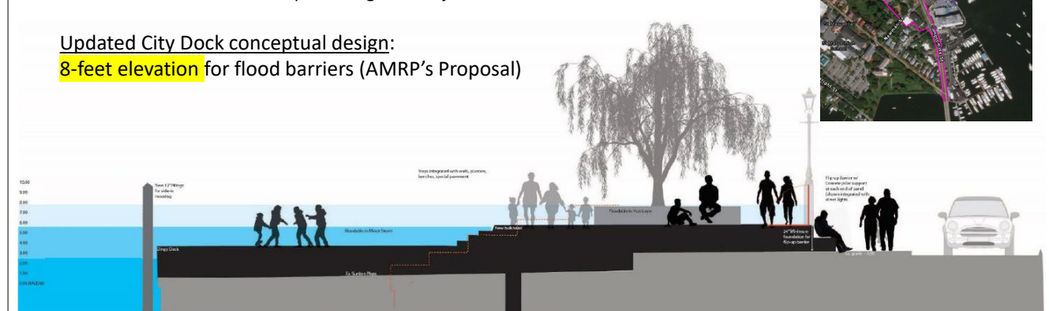
City Dock – Basis for Design Solution

A Beautiful Green Park Highlights Robust Resiliency Plan

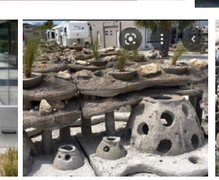
- Needs a solution for the next 50-years (minimum)
- Data suggests 6-feet above sea level will protect against tidal flooding and minor storms
- 8-feet above sea level will protect against major storms

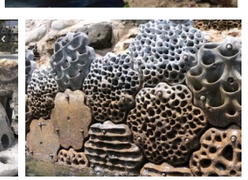
Updated City Dock conceptual design:
8-feet elevation for flood barriers (AMRP's Proposal)



Coastal Shoreline Boundaries – Reference Reach B

- To address variances in SLR models / design year
  - Plexiglass floodwall extensions
  - Alum. stop logs (temp.) floodwall extensions
- To enhance grant eligibility
  - Living seawalls
  - Create aquatic habitat
  - Improve water quality





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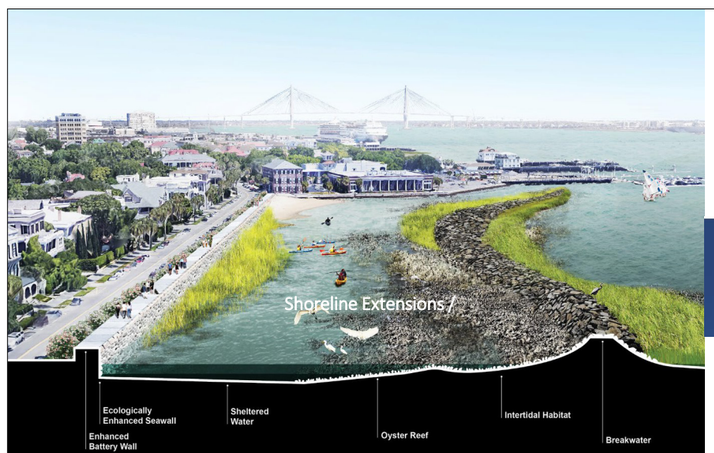
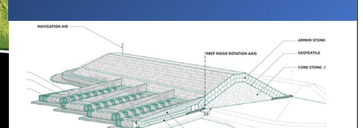


Integrated Self-rising Flood Barrier



Living Reef Cross-section

Coastal Shoreline Boundaries – Reference Reach C and E

To address variances in SLR models and enhance grant eligibility

- Off-shore Living Barriers
- Integrated self-rising flood barriers

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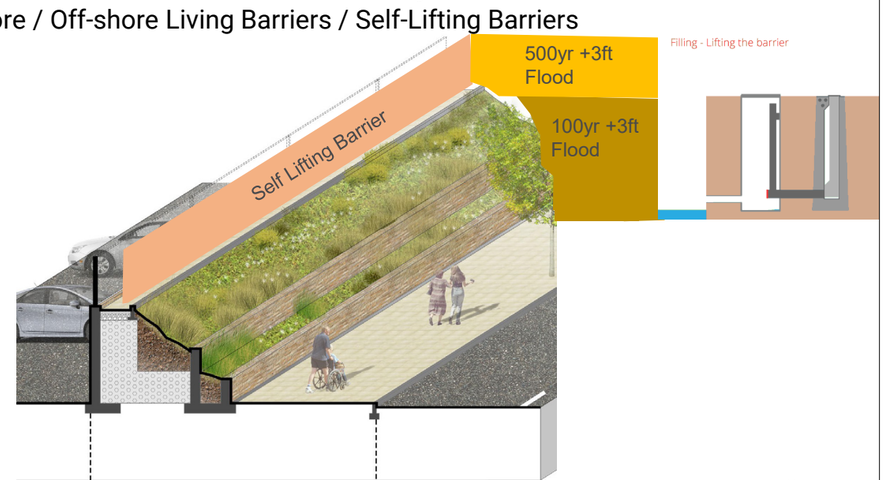
Coastal Shoreline Boundaries –
Reference Reach C and E – Naval Academy Fields

On-shore / Off-shore Living Barriers / Self-Lifting Barriers



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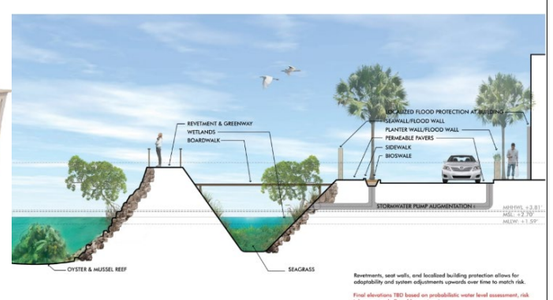
Coastal Shoreline Boundaries –
Reference Reach C and E – Naval Academy Fields

Shoreline Extension / Off-shore Living Barriers



City of Miami, FL
https://sd.swireproperties.com/2021/en/performance-environment/climate-change/taking-action-to-preserve-the-miami-coastline

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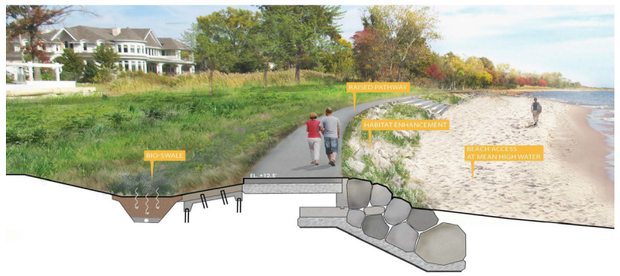
Coastal Shoreline Boundaries –
Reference Reach C and E – Naval Academy Fields



Raised Pathways / Roadway

Earthen Berm / Levee

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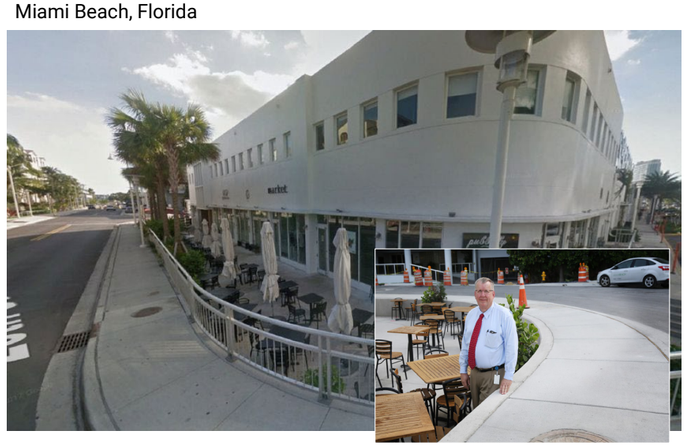
Coastal Shoreline Boundaries - Reference Reach C and E
On-shore Elevated Roadways / Walkways (Complimented by Living Shorelines)

Miami Beach, Florida



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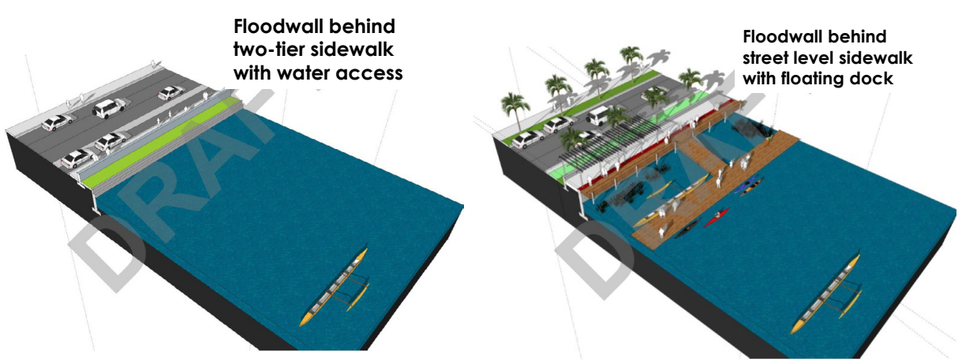
Coastal Shoreline Boundaries – Reference Reach D – Naval Academy Marina
Flood Barriers / Floating Docks



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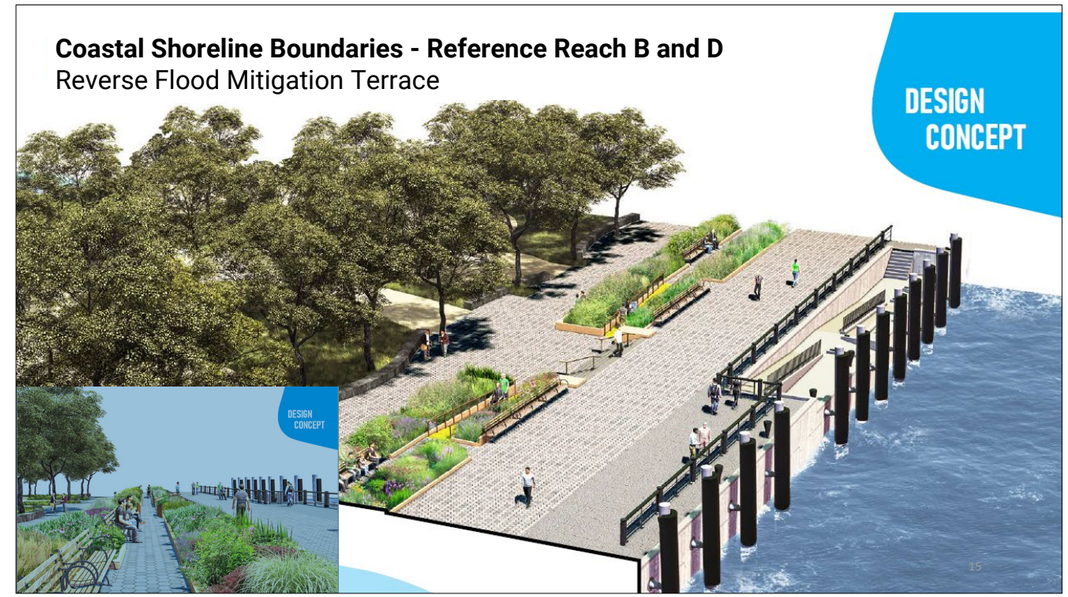
Coastal Shoreline Boundaries - Reference Reach B and D
Reverse Flood Mitigation Terrace



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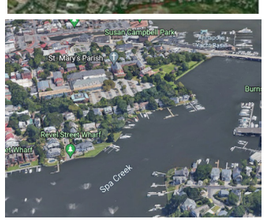
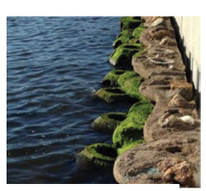
Coastal Shoreline Boundaries - Reference Reach D and F – Lagoon Protection Gates

Lagoon Protection Gates – Venice, Italy

LASCIATE OGNI SPERANZA O VOI CHE ENTRATE
designboom (divine comedy, dante alighieri)

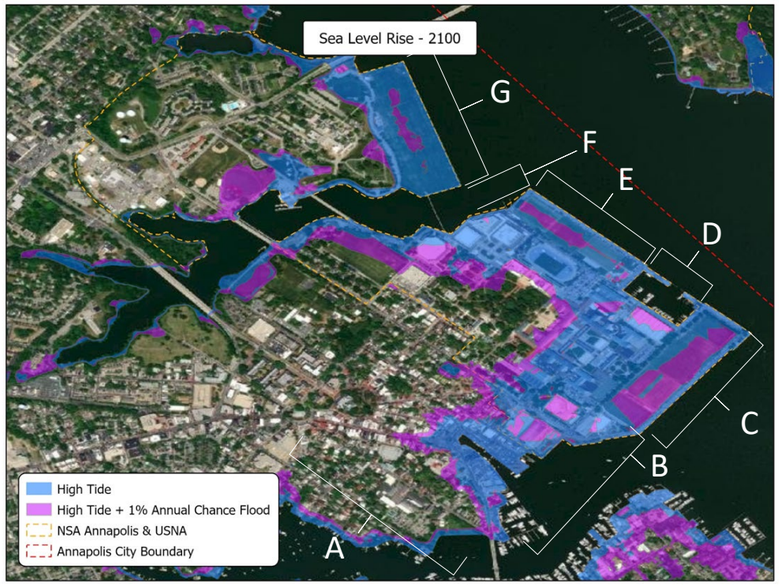
Coastal Shoreline Boundaries - Reference Reach A
Seawalls / Living Shorelines / Green Infrastructure





Living Seawall

Coastal Reach A



Coastal Shoreline Boundaries

Consensus

Resilience /Adaptation Action

Discussion

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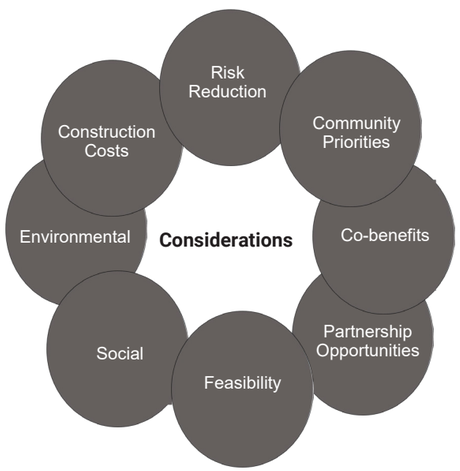
Resilience / Adaptation Actions Discussion

Project Types

- Infrastructure
- Nature-based Solutions
- Asset-specific
- Systems
- Programs & Services
- Policies & Regulations



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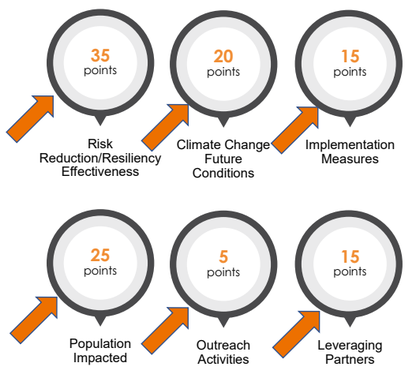
2022 BRIC - It's a competition!

Qualitative Criteria



Scoring Option	Degree of Meeting Criterion
Not at all	Not addressed
Minimally	Weak
Partially	Mediocre
Mostly	Acceptable
Entirely	Excellent
Exceeds	Beyond Excellent

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BRIC Selection Technical Criteria

Miami Beach, Florida

- 20 points — Infrastructure project
- 15 points — Mitigating risk to one or more lifelines
- 10 points — Incorporation of nature-based solutions
- 20 points — Application has mandatory building code adoption requirement
- 15 points — Building Code Effectiveness Grading Schedule Rating of 1 to 5
- 10 points — Application generated from a previous FEMA Hazard Mitigation Assistance Advance award
- 5 points — Increased non-federal cost share ~ 30%
- 5 points — Designation as an Economically Disadvantaged Rural Community

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Resilient / Adaptation Actions - Preliminary Selection

Reach A – Spa Creek

Reach B – Includes City Dock

Reach C – Naval Academy Fields

Reach D – Santee Basin (Marina)

Reach E – Naval Academy Fields

Reach F – College Creek

Reach G – Naval Academy Fields

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Resilient / Adaptation Action Prioritization Metrics

Criteria	Weighing Factor	Scoring Criteria
1. Feasibility	20%	5 - Funding Identified, easily impremented within 5 years 3 - Funding identified, implemented with only moderate complexity or delays 1 - Funding identified, implementation is complex and faces certain delays for implementation 0 - Not feasible, no funding identified and/or not able to be implemented
2. Climate Resilience/Adaptation	20%	5 - Very High (action provides multiple benefits for climate resilience and adaption) 3 - High (action provides at least one benefit for climate resilience 1 - Moderate (action provides limited benefits for climate resilience 0 - Low (action des not provide benefits for climate resilience)
3. Equity (Social Vulnerability)	10%	5 - High social vulnerability (susceptibility of social groups to adverse impacts from natural hazards relative to the rest of the US, by census tract from National Risk Index) 3 - Moderate social vulnerability 1 - Low social vulnerability
4. Project Type	10%	5 - Human Hazard Prevention 5 - Public Emergency Services 3 - Public Natural Resources Protection/Environmental Quality and Health 3 - Public Education and Awareness/Community Cohesion and Resilience 3 - Public Structural Projects 1 - Private/Commercial Property Protection
5. Degree of Public Concern	10%	5 - Action addresses one or more hazards identified for the public as of greatest concern (energy security/groundwater supplies) 3 - Action addresses one or more hazards identified for the public as of lesser concern (flood/storm, air quality, drought) 1 - Action addresses one or more hazards identified for the public as of least concern
6. Risk Reduction/Benefits	10%	5 - Very High (significant losses avoided and/or significant benefits with consideration to economic, social, and environmental factors) 3 - High (numerous losses avoided and/or significant benefits with consideration to economic, social, and environmental factors) 1 - Moderate (some losses avoided and/or significant benefits with consideration to economic, social, and environmental factors) 0 - Low (no losses avoided and/or significant benefits with consideration to economic, social, and environmental factors)
7. Costs	10%	5 - Project costs are predominantly staff time 3 - Project costs are estimated between $0-$100,000 1 - Project costs are estimated between $$100,001-$500,000 0 - Project costs are estimated above $500,001
8. Equity (Community Resilience)	5%	5 - Low community resilience (ability to respond and recover form natural hazards relative to the rest of the US, by census tract from National Risk Index) 3 - Moderate community resilience 1 - High community resilience
9. Community Capacity	5%	5 - Community has sufficient dedicated staff an/or experience to oversee project and funding requirements. Project can be maintained with local oversigh/resources. 3 - Community has nominally sufficient dedicated staff an/or experience to oversee project and funding requirements. Project can be maintained with local oversigh/resources supported by external resources 1 - Community has no dedicated staff an/or experience to oversee project and funding requirements. Project canonly be maintained with external resources

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Coastal Shoreline Boundaries

Military Installation Resiliency Review

Critical Asset Resilient Action Assessment

Next Steps

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MILITARY INSTALLATION RESILIENCY REVIEW

CITY OF ANNAPOLIS

ANNE ARUNDEL COUNTY

NAVAL SUPPORT ACTIVITY ANNAPOLIS

APRIL 2023