Nuisance Flood Plan

Anne Arundel County

2025

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Nuisance Flood Plan

During the 2025 Hazard Mitigation Plan Update, the County's Nuisance Flooding Plan (NFP) was also updated. The NFP has been integrated into this section of the hazard mitigation plan.

The purpose of nuisance flood planning is to enhance the resilience of every coastal jurisdiction in Maryland and to prepare for the future of increased flooding. The State of Maryland requires that every coastal municipality and county that experiences nuisance flooding submit a nuisance flood plan to be updated every five years. Pursuant to Maryland House Bill 1427 (2019), §3-1018(b) and (c), on or before Oct. 1, 2020, a local jurisdiction that experiences nuisance flooding (NF) shall develop a plan to address nuisance flooding. In addition, a local jurisdiction shall update the plan every five years; publish the plan on the local jurisdiction's website; and shall submit a copy of the plan to the Maryland Department of Planning (MDP).

This legislation is an update to Senate Bill 1006 and House Bill 1350 (2018). The definition of nuisance flooding in accordance with §3-1001 of the Natural Resource Article is "high tide flooding that causes a public inconvenience." Jurisdictions set flood thresholds at which different decisions are made for activating alerts, watches and warnings, and taking action.

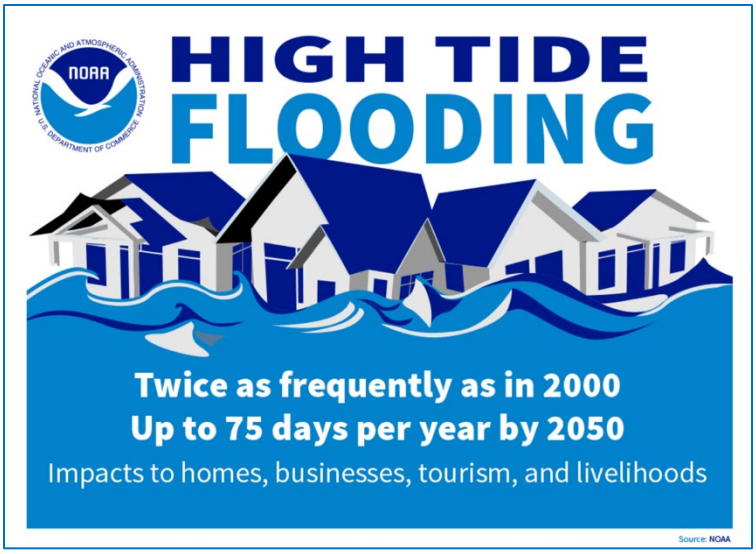
3.3.1.12 Purpose and Scope

Flooding is one of the most common natural hazards experienced in Anne Arundel County. Depending on the circumstances, flooding may be widespread or isolated, developing slowly or quickly. It may take the form of coastal, overland, or flash flooding. Floods may originate from ice jams, storm surges, or from the failure of dams or levees. Nuisance flooding is a more specific and commonplace phenomenon which dictates a slighter response and threatens the community in less intrusive ways.

The National Oceanic and Atmospheric Administration (NOAA) defines nuisance flooding, or high tide flooding, as "flooding that leads to public inconveniences such as road closures. It is increasingly common as coastal sea levels rise." The language of SB 1006 refers to nuisance flooding as "high-tide flooding that causes public inconvenience." Nuisance flooding is typically unrelated to storm events, though it may be exacerbated by long-duration wind events or passing storm systems. As such, it is frequently referred to as "sunny day flooding." In short, nuisance flooding is minor tidal flooding that can occur at high tide although it is not usually a major threat to structures or public safety. Examples include overtopping of sea walls, water on low-lying areas of roads, or storm-water systems in which water may come up outtake pipes.

Nuisance flooding, sometimes referred to as high tide flooding, sunny-day flooding, or king tide flooding, is occurring more frequently every year as sea levels continue to rise, and is increasingly disrupting coastal community life.

Nuisance flooding can disrupt daily activities through a variety of mechanisms, such as the closure of roads due to high water, the inundation of yards and parks, and the impairment of engineered and natural drainage systems. Currently, these disruptions typically occur for a period of several hours and then abate; however, as a changing climate drives sea levels higher, these repeated “nuisance” impacts will become significant stressors on the infrastructure, emergency response, public health, and fabric of the community.



In Anne Arundel County, nuisance flooding occurs in locations near or adjacent to tidal bodies of water. Anne Arundel County consists of many tidal rivers to include, but not limited to: Magothy River, Marley Creek, Patapsco River, Patuxent River, Rhode River, Severn River, South River, West River, and the Chesapeake Bay.

3.3.1.13 Sources of Flooding

Sources of flooding in Anne Arundel County include fluvial/riverine, pluvial, and coastal flooding. These types of flooding are exacerbated by both climate change and sea level rise. Definitions for these types of flooding are as follows:

Riverine/Fluvial: A fluvial flood, also known as a riverine flood, happens when a river, stream, or lake overflows onto the surrounding land. This can occur when the water level rises due to heavy rain or snowmelt.

Pluvial: Pluvial flooding is a type of flooding that occurs when heavy rainfall overwhelms the ground's ability to absorb water or a drainage system's capacity to manage it. Pluvial flooding can happen in any location, including urban and rural areas.

Coastal Flooding: Coastal flooding occurs when water from the ocean or other bodies of water covers normally dry land along the coast. It can be caused by high tides, storm surges, tsunamis, or a combination of these factors.

Anne Arundel County’s water resources play an important role in the county’s ability to flourish. Quality of life within the county is bolstered by its water resources providing a sense of place, recreation, tourism, and industry (Anne Arundel County, Public Works). However, these same resources make the county vulnerable to various sources of flooding.

In Anne Arundel County there is approximately 533 miles of shoreline (Anne Arundel County, About the County) including tidal tributaries, rivers, creeks, streams, and inlets that form peninsulas. The county is bordered by the Chesapeake Bay to the east, and the Upper Patuxent River to the west. Coastal Zones are considered highly susceptible to flooding caused by storm surges, high tides, and heavy rainfall.

Coastal Zone

The Maryland coastal zone extends from three miles out in the Atlantic Ocean to the inland boundaries of the 16 counties and Baltimore City that border the Atlantic Ocean, Chesapeake Bay, and the Potomac River up to the District of Columbia. This area encompasses two-thirds of the State's land area and is home to almost 70% of Maryland's residents.

The Patapsco River is a common source of flooding in Anne Arundel County. The river flows through steep, hilly terrain, which can lead to rapid runoff during heavy rain events. This topography allows rainwater to flow quickly into the river, increasing the likelihood of flooding. Urban development also increases the risk of runoff that may overwhelm the rivers capacity during storm events. Development often replaces natural vegetation with impervious surfaces, such as roads and buildings, which prevents water from soaking into the ground. A more recent flooding event involving the Patapsco River occurred on May 27. 2018. A series of heavy rainfall events caused the Patapsco River to rise to a record high of 24.36 feet in just over an hour. This flooding event cause significant damage to Ellicott City, including collapsed buildings, washed away cars, and the death of a National Guardsman (Climate.gov, May 2018).

Source: Office of Emergency Management.

The Severn River is another source of flooding that affects the county. The river's watershed has areas of steep terrain, which can lead to quick runoff during heavy rain events. This can rapidly increase water levels in the river. Along with storm events, the Severn River is highly affected by tidal fluctuations from the Chesapeake Bay. During high tides or storms, water can back up into the river contributing to flooding within low-lying areas. It is crucial to maintain effective stormwater management systems as ineffective systems can exacerbate flooding during storm events. All these factors make the Severn River susceptible to flooding, impacting nearby communities and infrastructure within the county.

The Upper and Little Patuxent Rivers are also prone to flooding for several reasons. One being the topography that the rivers flow through. Steep slopes can lead to rapid runoff during heavy rain events, quickly increasing water levels. Stream characteristics that play a role in these streams' vulnerability to flood such as narrow channels and limited floodplain areas cause excess water to accumulate with little room to spread out. According to residents, developments such as The Two Rivers is also contributing to the flooding issues for these bodies or water and their tributaries. Construction activities remove trees and vegetation that otherwise act as a barrier that absorbs floodwaters which significantly impact downstream and downhill neighbors (CWA Playbook). Residents affected by this formed a small organization, the Forks of the Patuxent Improvement Association (FPIA), and have worked to mitigate threats to this watershed.

3.3.1.14 Preparing for Nuisance Flooding

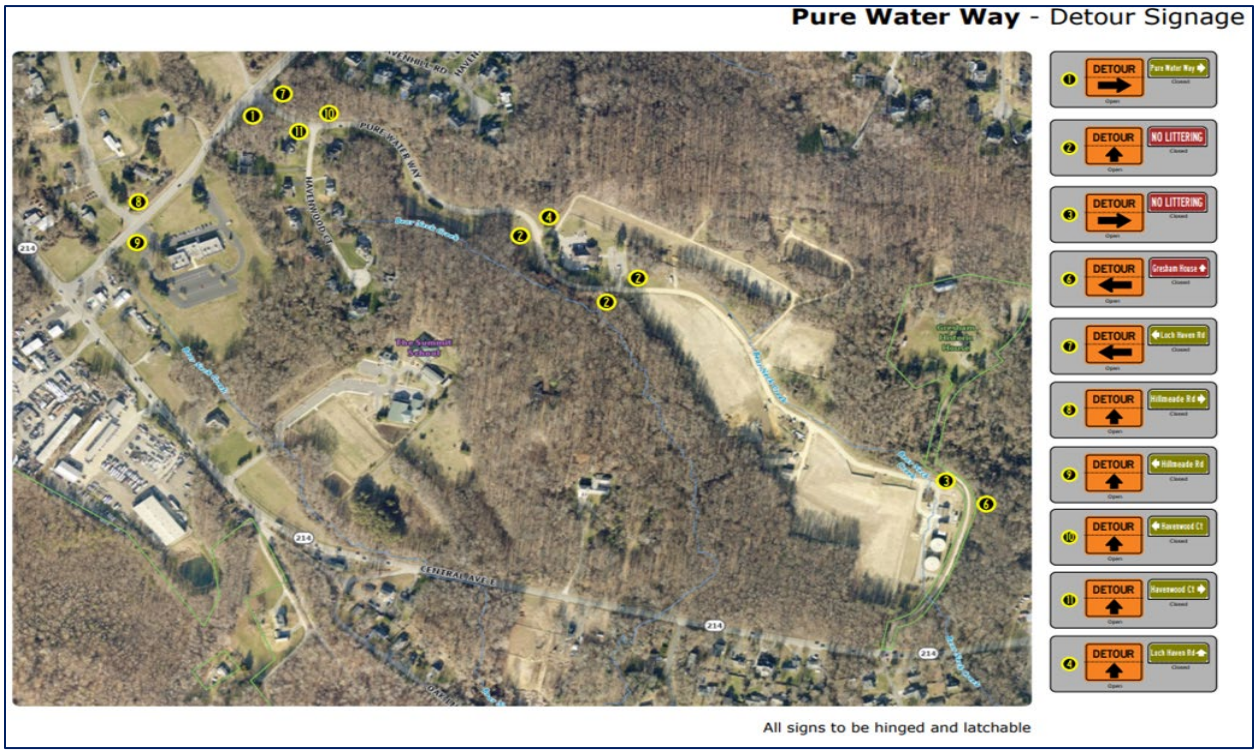
Nuisance flooding is a complex problem, therefore strong partnerships between planning and zoning, public works, emergency management, and geographic information systems (GIS) are necessary for Anne Arundel County to properly prepare for the inevitable impacts. It is important that departments collaborate to inventory and map chronically inundated areas.

The Anne Arundel County Office of Emergency Management (OEM) maintains a close relationship with NWS Forecast Office Baltimore/Washington, receiving notifications of special hazards and watches or warnings of severe weather before the community is impacted.

When significant nuisance flooding is expected, it is the responsibility of the Anne Arundel County OEM to disseminate information to key stakeholders to prepare for nuisance flooding impacts and respond accordingly. In extreme cases where nuisance flooding reaches such a severity that life safety, critical infrastructure, and key resources are threatened, Anne Arundel County OEM may disseminate public safety information via the Alert Anne Arundel Mass Notification System and through additional methods.

Flip sign along the identified route, OEM.

An example of disseminating information related to nuisance flooding is the Pure Water Way Detour Signage. The County utilizes a network of hinged signs to indicate the status of flooding on the roadway which lets motorists know if they need to follow a specific detour. The signs are located between Loch Haven Road and River Club Drive in Edgewater. The locations of these signs along the route are depicted below.



For this plan update, various sources of information were obtained including Maryland MyCoast data for Anne Arundel County and local 2021-2024 Emergency Service Requests (ESR) Road Closures dataset.

As part of the previous nuisance flood planning process for Anne Arundel County, a thorough inventory of known flood hazard areas was created: *Appendix I - Nuisance Flooding Location Inventory - Modeled* and *Appendix II - Nuisance Flooding Location Inventory - Observed*. The 2025 update cross-references this listing to identify sections of roadway that experience nuisance flooding which are not captured in the data sources utilized for the 2025 update.

MyCoast Maryland

MyCoast Maryland allows you to communicate flooding and storm damage in your community. It is a portal to collect and analyze photos which are linked to precipitation, riverine, and tidal data to create reports that help government agencies, business owners, and residents understand impacts in your community and encourage action to reduce localized flooding.

3.3.1.15 Responding to Nuisance Flooding

Response thresholds along with data resources and documentation have been reviewed and documented as part of this plan update.

Nuisance Flooding Response Thresholds

Thresholds are maintained for Anne Arundel County which direct a set of actions based on a particular inundation level or frequency of flooding. These thresholds are meant to supplement actions directed by the Anne Arundel County Emergency Operations Plan.

Table 3.3.1-10: Nuisance Flooding Response Thresholds for Anne Arundel County

Threshold	Response Level	Related Flooding Threshold	Required Action
Forecast data from the NWS or NOAA tide gauge indicates likely **nuisance flooding** impacts	**Level I Monitor**	**Minor** Threshold (begins at 2.6 feet)	The Office of Emergency Management (OEM) monitors forecast data and Department of Public Works (DPW) and State Highway Administration (SHA) personnel monitor flood levels as needed and place high water signs at impacted locations.

Table 3.3.1-10: Nuisance Flooding Response Thresholds for Anne Arundel County

Threshold	Response Level	Related Flooding Threshold	Required Action
Nuisance flood waters are present and are high enough to warrant temporary road closures	**Level II Notification and Response**	**Moderate** Threshold (begins at 3.3 feet) OR **Major** Threshold (5 feet and higher)	OEM provides internal notification; DPW and SHA personnel are on standby and close roads and reroute traffic as flooding reaches hazardous levels. Fire and Police will monitor potentially impacted areas and provide notification, as needed.

When flooding reaches such a severity that life safety, critical infrastructure, and key resources are threatened, “nuisance” flooding levels have been exceeded, and additional actions are required. Below are response concepts consistent with Anne Arundel County Emergency Operations Plan which may become necessary as flood waters rise beyond nuisance flood levels.

Response

- Lifesaving activities
- Incident containment
- Public health concerns
- Maintenance of transportation routes
- Maintenance of critical facilities
- Public information & warning
- Responder health & safety
- Control & Coordination of operations
- Provision of transport, shelter and documentation of displaced persons
- Restoration of normality

Recovery

- Continuation of life saving activities
- Facilitate the restoration of systems to normality
- Assess damage and return vital life support systems to minimum operating standards
- Collate financial cost of the event
- Legal implications, claim investigation
- Debrief & compilation of final report
- Community & restoration of services

3.3.1.16 Data Resources and Documentation

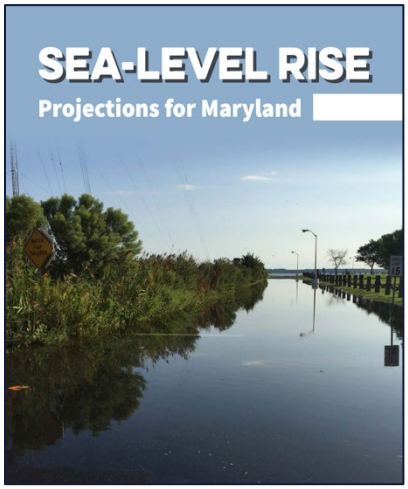
Documenting the extent and impacts of nuisance flooding is critical to maintaining infrastructure and the long-term resilience of Anne Arundel County. This information is documented and updated on a regular basis for emergency planning purposes. A review of flood documentation provides Anne Arundel County with a comprehensive view of trends in flooding over time. The following factors will be recorded by Anne Arundel County OEM on a semi-annual basis through contact and records provided by DPW. Date, time, and location of nuisance flooding.

- Impacts (e.g. “x amount of water on the roadway,” “ditch overflow,” “docks underwater,” etc.)
- Agency notified and action taken

Reference Appendix - Nuisance Flooding Documentation Tool for a sample version of the Anne Arundel County nuisance flooding documentation tool. Additional tools may be implemented to provide documentation and data management.

Additionally, the Office of Information Technology (OIT) maintains the SeeClickFix platform and allows users to submit information and concerns through the Anne Arundel County 311 application.

Integrating Sea Level Rise Projections



According to NOAA, Climate.gov, as relative sea levels rise from land subsidence (sinking and settling of the soil) and rising global ocean levels (due to thermal expansion and ice melt), there is less of a gap between the ocean and our infrastructure. More common tides and storms today are causing impacts, whereas decades ago such impacts would have been more associated with more powerful and rare storms. Sea-level Rise Projections for Maryland 2023 continues to rely primarily on projected sea-level rise based on the IPCC scenarios that are derived from future pathways of global emissions of greenhouse gases. The 2023 projections rely on the latest probabilistic projections developed for the IPCC AR6 and published in 2021.

The statistical probability estimates for sea-level rise projections (Figure 5, Table 2) are useful reference points in planning and managing risks. Tolerance for flood risk, or the willingness of decision-makers and stakeholders to accept possible consequences of flooding, can help determine which quantile level should be used when selecting a relative sea-level rise estimate. In general, projects with low tolerance for flood risk should consider sea-level rise estimates that have a low likelihood to be exceeded during the project’s lifespan, whereas projects with medium or high tolerance for flood risk may consider lower sea-level rise estimates. Guidance on applications with different levels of risk tolerance and timeframes was provided for using the probabilistic estimates from Maryland’s 2018 sea-level rise projections and will be updated based on these 2023 projections.

The complete guidance is available here: Guidance for Using Maryland's 2023 Sea Level Rise Projections.

3.3.1.17 Plan Development Process

The first step in the 2025 Nuisance Flood Plan development process included a review of the State of Maryland Nuisance Flood Plan Development Guidance 2024 Update, which was an update to the 2019 Nuisance Flood Plan Development Guidance. The guidance suggests a six-step process for approaching the 2025 update.

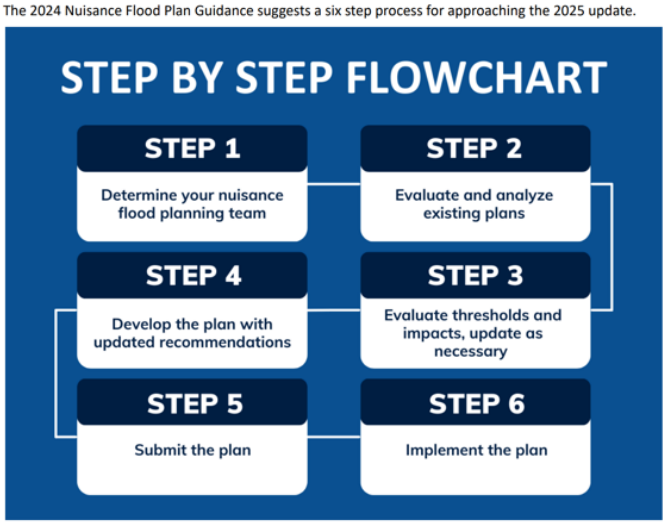
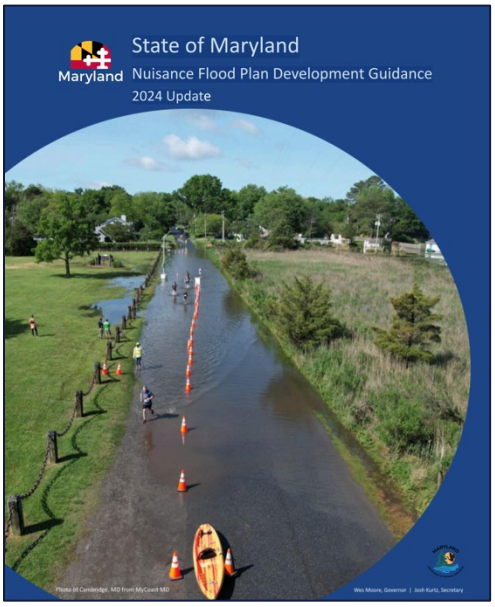


Figure 1: Steps to submitting a nuisance flood plan.



1. **Determine the Nuisance Flood Planning Team.**
   - Anne Arundel County used their Hazard Mitigation Planning Committee (HMPC) to serve as the nuisance flood planning committee, as both the Hazard Mitigation Plan and Nuisance Flood Plan Updates occurred during the same time. Members of the HMPC represent a cross-section of departments, agencies, and representatives. The Anne Arundel County Office of Emergency Management served as the lead agency for this plan update.
   - The HMPC includes representatives from the Office of Planning and Zoning (OPZ), the Department of Inspections and Permits (I&P), the Department of Public Works (DPW), the Office of Central Services (OCS), the Public Information Officer (PIO), the Office of Law, Office of Information Technology (OIT), and the Office of Emergency Management (OEM).
   - In addition, the Anne Arundel County Department of Health (DOH), Department of Aging & Disabilities (DAD), Department of Social Services (DSS), and the Department of Transportation (DOT) are represented on the HMPC. Finally, representatives from the Anne Arundel Fire Department (FD), and Police Department (PD), as well as Recreation and Parks (DRP), Economic Development Corporation (EDC), Resilience Authority (RA), Partnership for Children, Youth, & Families, and the Town of Highland Beach.
2. **Evaluate and Analyze Existing Plans.**
   - In addition to the review of the previous Nuisance Flood Plan, several other plans have been reviewed and have informed this document including, but not limited to:

- Anne Arundel County Hazard Mitigation Plan
- 2023 Sea Level Rise Projections for Maryland
- Anne Arundel County Emergency Response Plan
- Sea Level Rise Strategic Plan
- 2022 Land Preservation, Parks, & Recreation Plan
- Zoning Ordinance
- Building Codes
- Climate Resilience Action Strategy
- Green Infrastructure Master Plan
- Master Plan for Water Supply and Sewerage Systems
- Chesapeake Bay TMDL Phase II Watershed Implementation Plan
- Watershed Protection and Restoration Program (WPRP)
- National Flood Insurance Program (NFIP)
- Stormwater Management Ordinance
- Stormwater Management Practices and Procedures Manual
- Town of Highland Beach

3. **Evaluate Thresholds and Impacts, Update as Necessary.**
   - For this plan update, various sources of information were obtained including Maryland MyCoast Anne Arundel County data and 2021-2024 Emergency Service Requests (ESR) Road Closures dataset. *See Section 3.3.1.19 of this NFP.*
4. **Develop the Plan with Updated Recommendations.**
   - Using the information gathered in step 2 and the data analysis completed in step 3, new recommendations were developed.
   - Recommendations from the previous plan were reviewed. Those carried over for this plan update were modified, as necessary.
5. **Submit the Plan.**
   - The plan was submitted by the Anne Arundel Department Office of Emergency Management to the Maryland Department of Planning and shared with the Maryland Department of Natural Resources for review. Upon receipt of confirmation the plan was posted on the Anne Arundel Department Office of Emergency Management website, by statute.
6. **Implement the Plan.**
   - Anne Arundel County will use U.S. Climate Resilience Toolkit to prioritize planning and projects and utilize various grant funding sources to implement the recommendations within this plan.

3.3.1.18 Review/Evaluate Thresholds & Documented Flooding

Flooding thresholds along with previous nuisance flood events have been reviewed and documented as part of this plan update.

Flooding Thresholds

Flooding thresholds are categorized into four separate sectors named Action, Minor, Moderate, and Major. Thresholds (MLLW) at the Annapolis Tide Gauge include:

- Action Threshold: stands at a minimum of 2 feet.
- Minor Threshold: begins at 2.6 feet.
- Moderate Threshold: begins at 3.3 feet.
- Major Threshold: 5 feet and higher.

According to the National Weather Service, **minor flooding** is considered shallow flooding in the most vulnerable locations near waterfronts and shorelines resulting in small amounts of potential property damage. Minor flooding may result in slight beach erosion and shallow flooding of roadways and adjacent properties near shorelines.

Tide Gauge: A component of a modern water level monitoring station, fitted with sensors that continuously record the height of the surrounding water level

Mean Higher High Water (MHHW): the average of the higher high water height of each tidal day observed over the National Tidal Datum Epoch.

Mean Lower Low Water (MLLW): the average of the lower low water height of each tidal day observed over the National Tidal Datum Epoch.

NOAA: National Oceanic and Atmospheric Administration.

Flood Threshold: the values at which flooding occurs, often defined in terms of action, minor, moderate, and major.

Example of Minor Flooding .Source: National Weather Service.

Moderate flooding is considered widespread flooding of vulnerable areas which results in a heightened threat of property damage in vulnerable areas. Low lying property and roads near the waterfront are most vulnerable while flooding may also extend along tidal rivers and creeks which may result in various road closings. Vehicles and property within vulnerable areas are at risk during moderate flooding. Severe beach erosion and considerable damage to dunes, especially during strung out events, may occur.

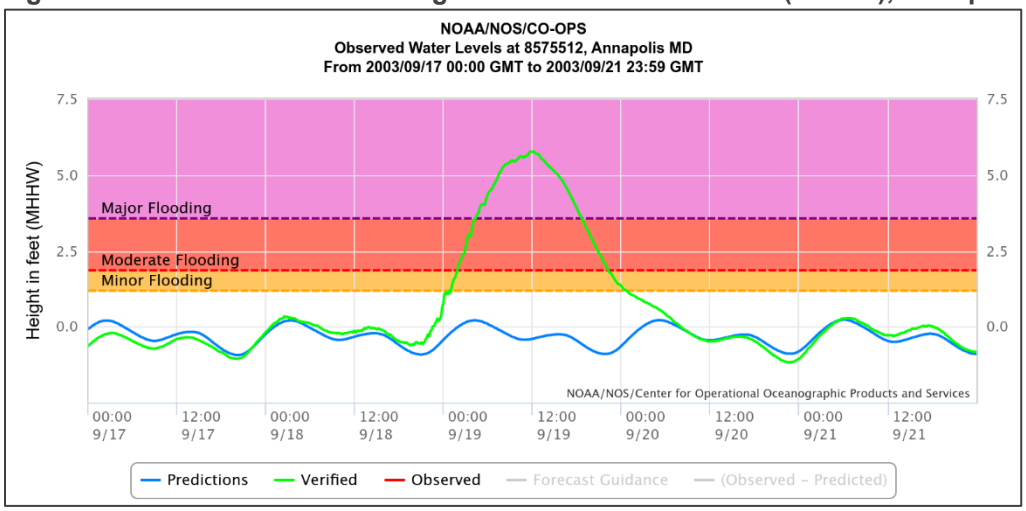
Example of Moderate flooding. Source: National Weather Service.

Major flooding is considered severe and will cause extensive inundation and flooding of numerous roads and buildings resulting in a significant threat to property and life. Roadways become impassable under several feet of water and cars are submerged. Evacuations will be necessary for the most vulnerable shoreline and coastal areas. Substantial coastal damage and severe erosion to dunes is expected.

Example of Major flooding. Source: National Weather Service.

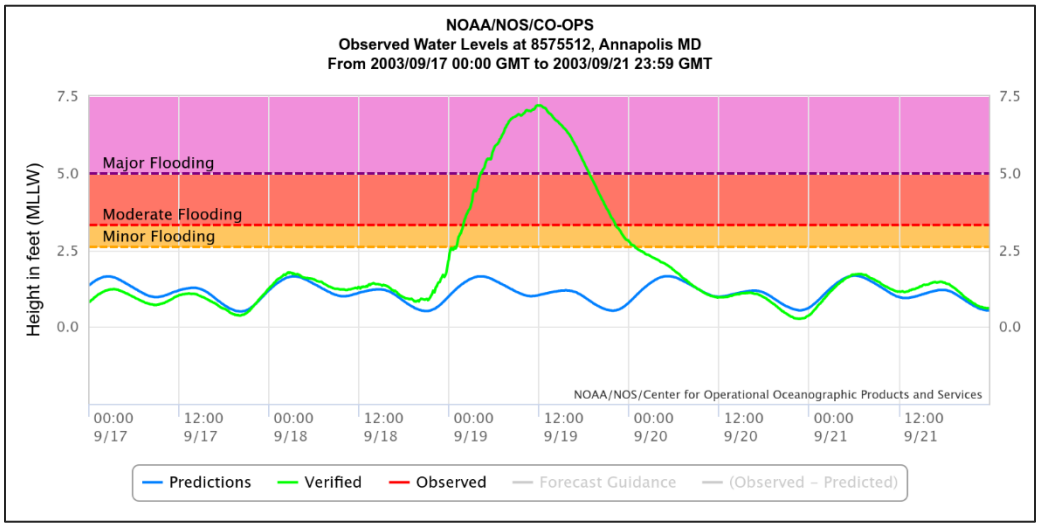
On September 19, 2003, because of Hurricane Isabel, water levels at the Annapolis Tide Gauge at the Severn River reached 5.76 ft, well beyond the Major flooding threshold. Figures 3.3.1-4 and 3.3.1-5 show examples (in MHHW and MLLW, respectively) of data at this tide gauge during Hurricane Isabel, the current highest reported water level for this tide gauge, and its respective thresholds.

Figure 3.3.1-4: Hurricane Isabel Highest Recorded Tide Event (MHHW), Annapolis MD



Source: NOAA Coastal Inundation Dashboard – Annapolis Tide Gauge.

Figure 3.3.1-5: Hurricane Isabel Highest Recorded Tide Event (MLLW), Annapolis MD



Source: NOAA Coastal Inundation Dashboard – Annapolis Tide Gauge.

Documented Flooding

Anne Arundel County operates under the Annapolis Tide Gauge located within the U.S. Naval Academy's grounds. To reach the tidal benchmarks from gate number 8 of the U.S. Naval Academy, proceed Southeast on Bowyer Road over a bridge to McNair Road, continue Northeast on McNair Road to Santee Road, proceed on Santee Road for 0.3 miles to Santee Basin.

Photo of the Annapolis Tide Gauge. Source: NOAA Tides and Currents.

The Tide Gauge was officially established on September 14, 1978; however, data has been collected on high tide events in this area since 1928. The highest ever documented water level happened on September 3, 2003, during Hurricane Isabel reaching 5.76 feet. The lowest documented water level for this tide gauge happened on December 31, 1962, recorded at -3.92 feet.

Table 3.3.1-11 lists the top five high tide events documented at the Annapolis Tide Gauge since its conception and the respective peak tide levels associated with these events.

Table 3.3.1-11: Top 5 High Tide by Peak – Coastal Storm Events (1928-2024) – Annapolis Tide Gauge MHHW, MLLW

Event	Date	Peak (MHHW)	Peak (MLLW)	Minor	Moderate	Major
Hurricane Isabel	9/19/2003	5.76 ft	7.20 ft			X
Chesapeake-Potomac Hurricane	8/23/1933	4.74 ft	6.18 ft			X
East Coast Winter Storm	1/10/2024	3.67 ft	5.11 ft			X
Coastal Low Pressure & Strong Winds	10/30/2021	3.46 ft	4.90 ft		X	
Hurricane Fran	9/7/1996	3.41 ft	4.85 ft		X	

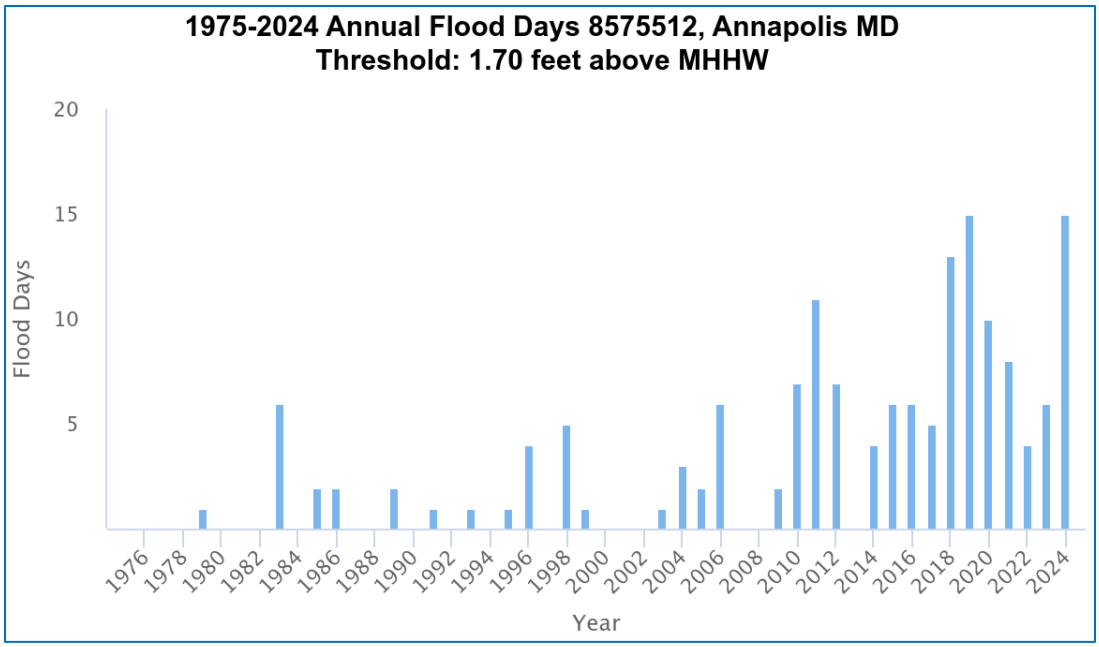
Source: NOAA Coastal Inundation Dashboard – Annapolis Tide Gauge.

As shown by Table 3.3.1-11, three of the top five high tide events have reached the major flooding threshold. The most recent event to reach the major flood threshold was a result of a winter storm on January 9 through 10, 2024. This was the third highest crest on record at the Annapolis Tide Gauge, only surpassed by the surge from Tropical Storm Isabel in 2003 and the Chesapeake - Potomac hurricane of 1933.

Recorded property damage from the January 2024 event was $80,000 according to the National Centers for Environmental Information (NCEI) Storm Event Database. Recorded locations of damage included the Annapolis Maritime Museum and the Storm Brother's Ice Cream Factory. The Annapolis Maritime Museum took 18 inches of water into their building. The museum remained closed until February 3 after a three-week recovery period. The Storm Brother's Ice Cream Factory indicated that they would be closed a month or two and damage cost around $60k. Lead time for this event was 22.7 hours.

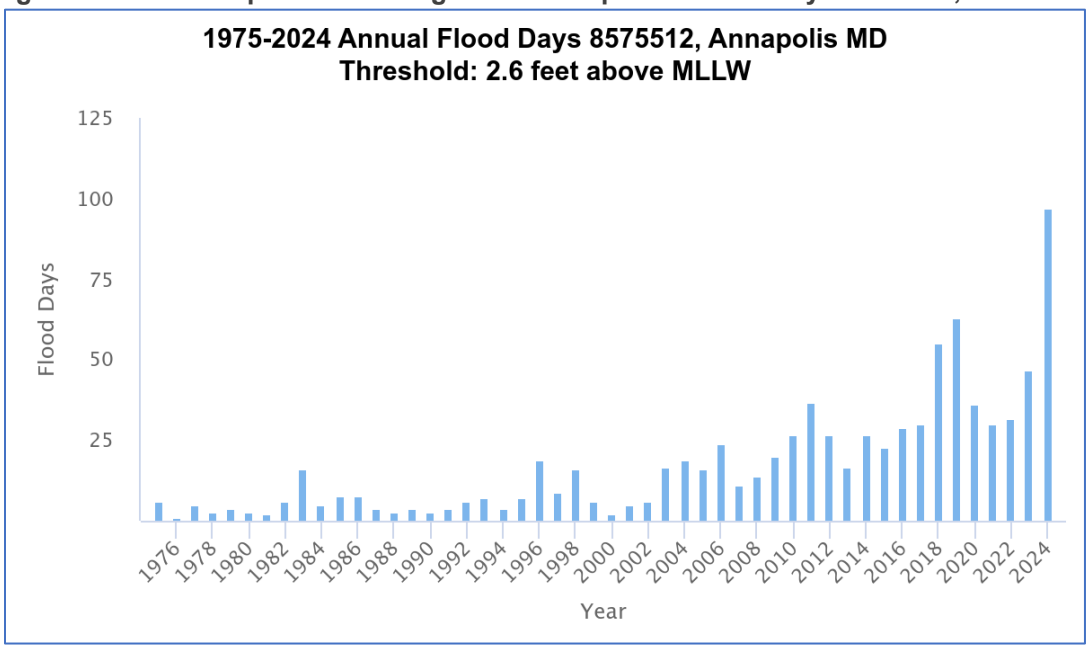
Figures 3.3.1-6 and 3.3.1-7 depict the frequency of annual flood days reported for the Annapolis Tide Gauge from 1975-2024 at Mean Higher-High Water MHHW and Mean Lower-Low Water MLLW, respectively. According to the reported data below, flood events for this tide gauge have increased in frequency since its conception. The threshold for an event to be documented as a 'flood day' is 1.7 feet. Climate change and rising sea levels play a critical role in the increasing frequency of reported flood events at this tide gauge as since 1970, sea levels have risen 9 inches in Annapolis and are slated to rise another 11 inches by 2050 (U.S. Sea Level Change).

Figure 3.3.1-6: Annapolis Tide Gauge Annual Reported Flood Days in MHHW, 1975-2024



Source: NOAA Coastal Inundation Dashboard – Annapolis Tide Gauge.

Figure 3.3.1-7: Annapolis Tide Gauge Annual Reported Flood Days in MLLW, 1975-2024



*Source: *--3 – Annapolis Tide Gauge.*

3.3.1.19 Identified High Risk Areas

Identified high risk areas include those identified in the Maryland MyCoast data for Anne Arundel County, October 29, 2024, and/or the 911 Emergency Services Request (ESR) data obtained November 7, 2024. ESR data includes a description of issue(s) reported at each location as well as number of events and observed peak tide gauge readings. These high risk areas are included in detail on Tables 3.3.1-12 and 3.3.1-13. Those roadways that are identified in both the MyCoast and ESR dataset are identified with an asterisk (***).

The Tables include the documented location of flooding, cause of flooding (high tide or storm), distance from tide gauge, the total number of recorded events and the range of dates which they occurred, and the range of observed peak (lowest and highest).

Note: several of the locations included in Table 3.3.1-12 were identified in the previous 2020 Nuisance Flooding Plan.

Table 3.3.1-12: Identified Nuisance Flood Risk Areas in Anne Arundel County

Location - Street Name	High Tide and/or Storm	Distance From Tide Gauge	# Of Events & Date Range*	Range of Observed Peak**
1st Ave	High Tide	5.8 Miles	5 total events between 11/22/23 & 1/9/24	3.5 ft – 5.1 ft
1st St ***	High Tide	14.5 Miles	1 event on 8/15/24	4.54 ft
Al Jones Dr	High Tide/Storm	11.6 Miles	2 events between 5/12/24 & 8/9/24	3.49 ft – 4.54 ft
Arundel Ave	High Tide	5.7 Miles	1 event on 1/9/24	5.1 ft
Arundel Beach Rd ***	High Tide	7.2 Miles	1 event on 1/9/24	5.1 ft
Arundel on the Bay Rd	High Tide	3.8 Miles	1 event on 5/1/20	3.74 ft
Bauman Ln	Coastal Storm	11.2 Miles	1 event on 8/11/24	4.54 ft
Bay Dr	High Tide	12 Miles	1 event on 9/21/24	3.75 ft
Bay St ***	High Tide	10.0 Miles	4 events between 10/29/21 & 5/12/24	3.08 ft – 4.81 ft
Bayfields Rd	High Tide	9.5 Miles	1 event on 10/29/21	4.89 ft
Baywood Rd	Coastal Storm/High Tide	8.3 Miles	1 event on 4/12/24	3.99 ft
Beach Rd	High Tide	6.9 Miles	1 event on 8/09/24	4.47 ft
Beachview Rd	High Tide/ Storm	4.5 Miles	4 events between 1/09/24 & 4/24/24	2.97 ft – 5.1 ft
Beachwood Rd	High Tide	8.9 Miles	1 event on 10/29/21	4.9 ft
Bishop Rd ***	High Tide	4.8 Miles	1 event on 8/10/24	4.54 ft
Bodkin View Dr	High Tide	11.0 Miles	1 event on 4/12/24	3.99 ft
Broadwater Creek Rd	High Tide	13.8 Miles	3 events between 5/4/2024 & 10/1/2024	2.84 ft – 4.47 ft
Broadwater Rd	High Tide	13.9 Miles	1 event on 5/12/24	3.49 ft
Broadwater Point Rd	High Tide/Storm	14.3 Miles	9 events between 9/24/23 & 11/15/24	2.98 ft – 5.1 ft
Carrs Wharf Rd ***	High Tide/Storm	7.0 Miles	2 events on 1/9/2024 & 8/9/2024	4.54 ft – 5.1 ft

Table 3.3.1-12: Identified Nuisance Flood Risk Areas in Anne Arundel County

Location - Street Name	High Tide and/or Storm	Distance From Tide Gauge	# Of Events & Date Range*	Range of Observed Peak**
Chesapeake Ave ***	High Tide/Storm	3.9 Miles	2 events on 8/9/24 & 1/10/24	4.54 ft – 5.1 ft
Chesapeake Dr ***	High Tide/Storm/ Coastal Storm	13.3 Miles	3 total events between 10/29/21 & 8/9/24	4.54 ft – 5.1 ft
Columbia Beach Rd	High Tide/Storm	12.1 Miles	5 events between 10/29/21 & 8/9//24	3.4 ft – 5.1 ft
Columbia Cove Ct ***	High Tide	11.5 Miles	1 event on 4/12/24	3.99 ft
Compromise St	High Tide	0.5 Miles	5 events between 10/12/19 & 1/10/24	2.75 ft – 5.1 ft
Douglass Ave	High Tide	3.9 Miles	1 event on 8/9/24	4.54 ft
Edgewater Rd	High Tide/Coastal Storm	7.4 Miles	2 total events on 6/21/23 & 1/9/24	2.82 ft – 5.1 ft
Fairleigh Ct	High Tide/Storm	16.7 Miles	1 event on 10/29/21	4.88 ft
Franklin Blvd	Coastal Storm	13.2 Miles	1 event on 1/10/24	5.1 ft
Fullerton Rd ***	High Tide	4.8 Miles	1 event on 6/23/24	2.87 ft
Gunner Run Rd	High Tide/Storm/ Coastal Storm	13.7 Miles	3 events between 5/5/24 &10/1/24	2.86 ft – 4.54 ft
Harbor Rd ***	High Tide	11.2 Miles	1 event on 10/29/21	4.88 ft
Hilltop Rd ***	High Tide/Storm	9.9 Miles	3 events between 10/29/21 & 1/28/24	2.78 ft – 5.1 ft
Holly Dr	Coastal Storm	11.6 Miles	1 event on 10/29/21	4.88 ft
Honeysuckle Dr	High Tide/Storm	6.4 Miles	3 events between 12/18/23 & 8/9/24	2.65 ft - 5.1 ft
Ilchester St	High Tide	12.8 Miles	1 event on 8/9/24	4.54 ft
Irvin Ave	High Tide/Storm	15.7 Miles	3 events between 2/18/23 & 9/21/24	2.11 ft – 4.54 ft
Joyce Ln	Storm	4.1 Miles	1 event on 6/24/23	2.87 ft
Kleis Rd	High Tide	8.0 Miles	1 event on 1/9/24	5.1 ft
Lake Dr ***	Coastal Storm	11.2 Miles	2 events on 1/9/24 & 8/9/24	4.54 ft – 5.1 ft
Lee Way Ct	High Tide	13.6 Miles	1 event on 5/11/24	3.49 ft
Lerch Dr	High Tide	10.5 Miles	3 events between 10/29/21 & 9/25/24	3.76 ft – 4.88 ft
Magothy Ave	Coastal Storm	5.4 Miles	1 event on 10/29/21	4.88 ft
Mayfield Rd	High Tide	5.0 Miles	1 event on 1/9/24	5.1 ft
Mayo Rd	Storm	5.7 Miles	1 event on 7/16/22	2.16 ft
Melbourne Ave	High Tide	15.7 Miles	1 event on 8/9/24	4.54 ft
Milton Ave	High Tide	14.7 Miles	6 events between 1/31/24 & 10/1/24	2.89 ft – 3.49 ft
Milvale Rd	High Tide	2.3 Miles	1 event on 10/29/21	4.88 ft
N Camp Meade Rd	Storm	5.6 Miles	1 event on 7/9/24	3.2 ft
Oak Rd	Coastal Storm	9.8 Miles	1 event on 10/29/21	4.88 ft
Ogleton Rd	High Tide/Storm	2.6 Miles	1 event on 10/29/21	4.88 ft
Park Dr	High Tide	10.6 Miles	2 events on 10/29/21 & 1/17/22	3.24 ft - 4.88 ft
Pat Ln	High Tide	5.9 Miles	1 event on 4/12/24	3.99 ft

Table 3.3.1-12: Identified Nuisance Flood Risk Areas in Anne Arundel County

Location - Street Name	High Tide and/or Storm	Distance From Tide Gauge	# Of Events & Date Range*	Range of Observed Peak**
Patuxent Fishery Rd	High Tide	19.4 Miles	1 event on 1/14/24	3.23 ft
Plummer Ln	Storm	17.4 Miles	1 event on 3/23/24	1.92 ft
Pine Whiff Ave	High Tide	5.0 Miles	1 event on 1/10/2024	5.1 ft
Ponder Dr	High Tide	6.1 Miles	1 event on 1/10/2024	5.1 ft
Riggs Ave	Storm	7.3 Miles	1 event on 6/24/23	2.87 ft
Ritchie Hwy	Storm	6.2 Miles	1 event on 6/24/23	2.87 ft
River Bay Rd	High Tide/Storm	5.3 Miles	2 total events on 4/30/2020 & 8/9/2024	3.82 ft – 4.54 ft
River Dr ***	High Tide	3.3 Miles	1 event on 9/23/2023	3.74 ft
River Farm Rd	Storm	19 Miles	1 event on 3/23/24	1.91 ft
Riverside Dr	High Tide/Storm	10.5 Miles	3 events between 9/24/23 – 8/9/24	3.74 ft - 5.1 ft
Riverside Rd	High Tide	4.9 Miles	1 event on 10/29/2021	4.88 ft
Rossburg Ct	High Tide	7.9 Miles	1 event on 10/29/2021	4.88 ft
Ruxton Rd	High Tide	5.1 Miles	1 event on 1/9/2024	5.1 ft
S River Terr	High Tide	5 Miles	1 event on 4/12/2024	3.99 ft
Salford Ct	Storm	10.3 Miles	1 event on 6/23/23	2.4 ft
Severn Rd	High Tide	3.6 Miles	1 event on 4/30/2020	3.82 ft
Shady Oaks Rd	High Tide	11.8 Miles	1 event on 4/12/2024	3.99 ft
Shady Side Rd	High Tide	10.7 Miles	1 event on 10/29/2021	4.88 ft
Shore Dr ***	High Tide	4.9 Miles	2 events on 10/29/2021 & 1/9/2024	4.88 ft – 5.1 ft
Silver Run Rd ***	High Tide	5 Miles	1 event on 10/29/2021	4.88 ft
Sycamore Rd	High Tide/Storm	6.1 Miles	3 events between 3/9/24 & 9/23/2024	3.19 ft - 3.75 ft
Sylview Dr	High Tide	7.7 Miles	1 event on 1/9/2024	5.1 ft
St Margarets Rd	Storm	1.7 Miles	1 event on 5/15/2024	2.71 ft
Terrell Rd	High Tide/Storm	11.8 Miles	2 events between 1/9/2024 & 4/12/24	3.99 ft - 5.1 ft
Thomas Dr	High Tide/Storm	10.6 Miles	2 events between 5/17/24 & 9/22/2024	2.93 ft - 3.75 ft
Thomas Point Rd	High Tide	5 Miles	2 events on 10/29/2021 & 3/13/2023	3.26 ft – 4.9 ft
Turkey Point Rd ***	High Tide	6.1 Miles	1 event on 10/29/2021	4.88 ft
Valentine View	High Tide	7.7 Miles	1 event on 1/10/2024	5.1 ft
Venton Rd	High Tide	4.9 Miles	1 event on 1/9/2024	5.1 ft
W End Ave	High Tide	10.5 Miles	1 event on 10/3/2015	3.43 ft
Wayman Ave	High Tide	4 Miles	5 events between 9/24/2023 & 1/10/2024	3.44 ft – 5.1 ft
Westminister Rd	Storm	5.3 Miles	1 event on 8/9/24	4.54 ft

Source: https://mycoast.org/search-reports?state=md&fwp_categories=nuisance&fwp_county=anne-arundel-county

** Data collection ranges from 2012-2024.*

*** Lowest and highest observed peak for identified date range.*

**** Location-Street Name was identified in MyCoast Reports and ESR dataset.*

There are a total of 85 locations that have experienced reported high tide or storm flooding between 2012 and 2024 included on Table 3.3.1-12. Of these locations, several have experienced more than one recorded high tide or storm event. Locations that have experienced two or more recorded high tide or storm events are included on Table 3.3.1-13. The table is sorted in descending order of total events.

Table 3.3.1-13: Identified Nuisance Flood Risk Areas with Two or More Reported Events

Location - Street Name	High Tide and/or Storm	Distance From Tide Gauge	# Of Events & Date Range*	Range of Observed Peak**
Broadwater Point Rd	High Tide/Storm	14.3 Miles	9 events between 9/24/23 & 11/15/24	2.98 ft – 5.1 ft
Milton Ave	High Tide	14.7 Miles	6 events between 1/31/24 & 10/1/24	2.89 ft – 3.49 ft
1st Ave	High Tide	5.8 Miles	5 total events between 11/22/23 & 1/9/24	3.5 ft – 5.1 ft
Wayman Ave	High Tide	4 Miles	5 events between 9/24/2023 & 1/10/2024	3.44 ft – 5.1 ft
Columbia Beach Rd	High Tide/Storm	12.1 Miles	5 events between 10/29/21 & 8/9/24	3.4 ft – 5.1 ft
Compromise St	High Tide	0.5 Miles	5 events between 10/12/19 & 1/10/24	2.75 ft – 5.1 ft
Bay St	High Tide	10.0 Miles	4 events between 10/29/21 & 5/12/24	3.08 ft – 4.81 ft
Beachview Rd	High Tide/ Storm	4.5 Miles	4 events between 1/09/24 & 4/24/24	2.97 ft – 5.1 ft
Chesapeake Dr	High Tide/Storm/ Coastal Storm	13.3 Miles	3 total events between 10/29/21 & 8/9/24	4.54 ft – 5.1 ft
Riverside Dr	High Tide/Storm	10.5 Miles	3 events between 9/24/23 – 8/9/24	3.74 ft - 5.1 ft
Gunner Run Rd	High Tide/Storm/ Coastal Storm	13.7 Miles	3 events between 5/5/24 &10/1/24	2.86 ft – 4.54 ft
Broadwater Creek Rd	High Tide	13.8 Miles	3 events between 5/4/2024 & 10/1/2024	2.84 ft – 4.47 ft
Scyamore Rd	High Tide/Storm	6.1 miles	3 events between 3/9/24 & 9/23/2024	3.19 ft - 3.75 ft
Irvin Ave	High Tide/Storm	15.7 Miles	3 events between 2/18/23 & 9/21/24	2.11 ft – 4.54 ft
Honeysuckle Dr	High Tide/Storm	6.4 Miles	3 events between 12/18/23 & 8/9/24	2.65 ft - 5.1 ft
Lerch Dr	High Tide	10.5 Miles	3 events between 10/29/21 & 9/25/24	3.76 ft – 4.88 ft
Hilltop Rd	High Tide/Storm	9.9 Miles	3 events between 10/29/21 & 1/28/24	2.78 ft – 5.1 ft
Edgewater Rd	High Tide/Coastal Storm	7.4 Miles	2 total events on 6/21/23 & 1/9/24	2.82 ft – 5.1 ft

Table 3.3.1-13: Identified Nuisance Flood Risk Areas with Two or More Reported Events

Location - Street Name	High Tide and/or Storm	Distance From Tide Gauge	# Of Events & Date Range*	Range of Observed Peak**
River Bay Rd	High Tide/Storm	5.3 Miles	2 total events on 4/30/2020 & 8/9/2024	3.82 ft – 4.54 ft
Chesapeake Ave	High Tide/Storm	3.9 Miles	2 events on 8/9/24 & 1/10/24	4.54 ft – 5.1 ft
Park Dr	High Tide	10.6 Miles	2 events on 10/29/21 & 1/17/22	3.24 ft - 4.88 ft
Thomas Point Rd	High Tide	5 Miles	2 events on 10/29/2021 & 3/13/2023	3.26 ft – 4.9 ft
Shore Dr	High Tide	4.9 miles	2 events on 10/2/2021 & 1/9/2024	4.88 ft – 5.1 ft
Lake Dr	Coastal Storm	11.2 Miles	2 events on 1/9/24 & 8/9/24	4.54 ft – 5.1 ft
Carrs Wharf Rd	High Tide/Storm	7.0 Miles	2 events on 1/9/2024 & 8/9/2024	4.54 ft – 5.1 ft
Thomas Dr	High Tide/Storm	10.6 miles	2 events between 5/17/24 & 9/22/2024	2.93 ft - 3.75 ft
Al Jones Dr	High Tide/Storm	11.6 Miles	2 events between 5/12/24 & 8/9/24	3.49 ft – 4.54 ft
Terrell Rd	High Tide/Storm	11.8 miles	2 events between 1/9/2024 & 4/12/24	3.99 ft - 5.1 ft

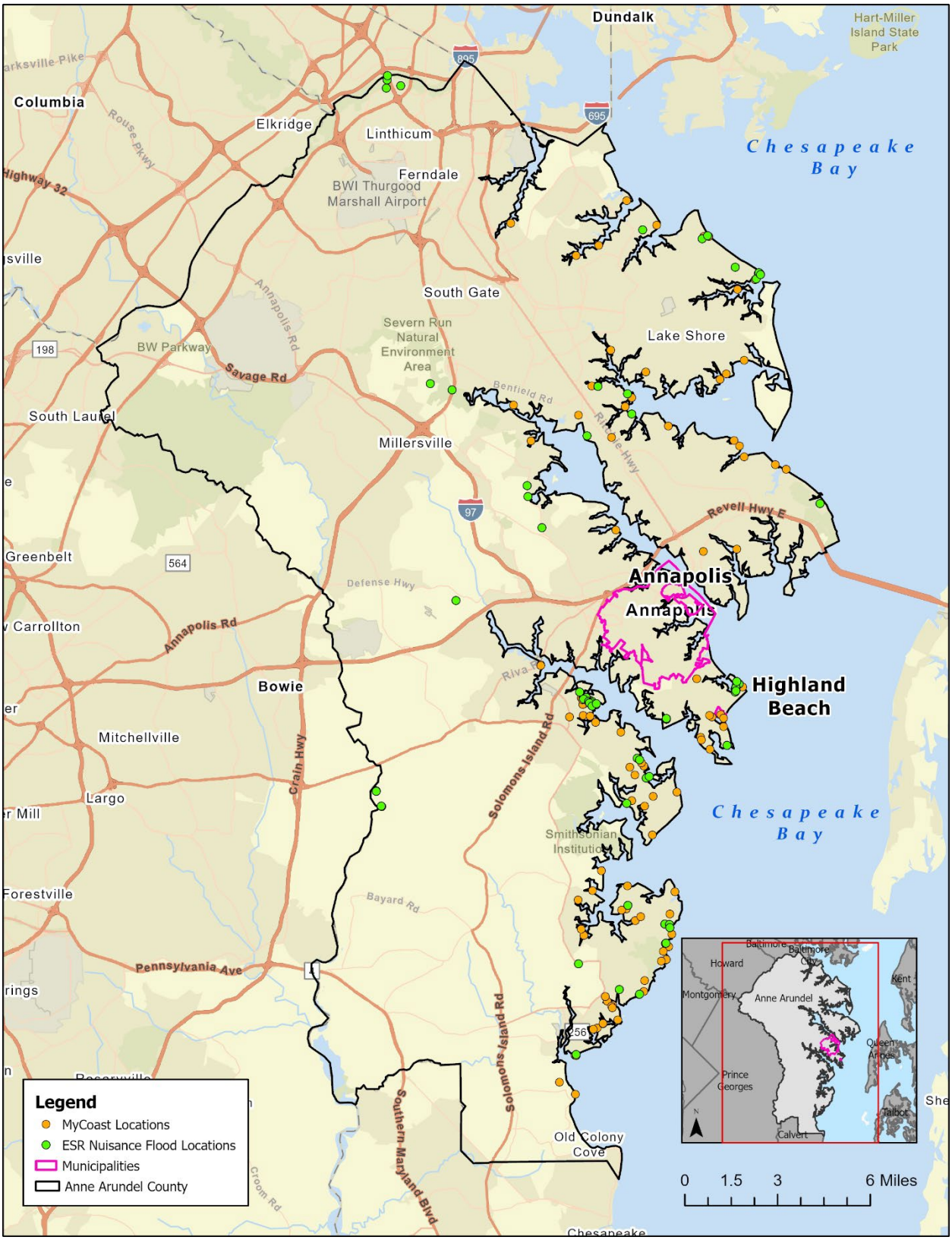
Source: https://mycoast.org/search-reports?state=md&fwp_categories=nuisance&fwp_county=anne-arundel-county
**Data collection ranges from 2012-2024*
***Lowest and highest observed peak for identified date range*

Highlights from Table 3.3.1-13 include locations with the most reported events, as listed below.

- Broadwater Point Rd (9 events)
- Milton Ave (6 events)
- 1st Ave (5 events)
- Wayman Ave (5 events)
- Columbia Beach Rd (5 events)
- Compromise St (5 events) *Note: City of Annapolis*
- Bay St (4 events)
- Beachview Rd (4 events)

Locations included in Table 3.3.1-12 and 3.3.1-13 are depicted on **Map 3.3.1-8 Nuisance Flooding Locations, Anne Arundel County** on the next page.

Map 3.3.1-8
Nuisance Flooding Locations, Anne Arundel County
Source: Anne Arundel County OEM ESR Data & MyCoast Reports



The Nuisance Flood Plan Committee had the opportunity to review mapped locations of MyCoast flood reports (from the previous 5-year period) for coastal Anne Arundel County. During this in-person exercise, additional roadways that experience nuisance flooding were identified by committee members. These roadways, listed below, were not included in the MyCoast reports or ESR dataset but were determined to experience nuisance flooding.

- Auds Ln
- Bainbridge Rd
- Bay Rd
- Bay Highlands Dr
- Beech St
- Bonniewood Dr
- Booker Rd
- Bruce Ave
- Calloway Dr
- Cedar Grove Ave
- Chestnut St
- Circle Rd
- Columbia Dr
- Cove Dr
- Crowner Rd
- Dogwood St
- Doris Dr
- Ellington Dr
- Fetter Ln
- Grays Creek Rd
- Grove Ave
- Hickory Point Rd
- Hine Dr
- JJ Hamm Cir
- Langstone Ave
- Long Cove Rd
- Longmore Rd
- Main St
- Mallard Dr
- Mimosa Cove Rd
- Maple Ave
- Oak Ave
- Oakwood Rd
- Plum Creek Dr
- Poplar Rd
- Porter Path
- River Drive Rd
- Scenic Pl
- Shelby Blvd
- Shore Rd
- Shoreside Trail
- Southwest Rd
- Spruce Ave
- Stoney Ln
- Summit Rd
- Sylvan Way
- Thies Dr
- Walnut Dr
- Washington Rd
- Wells Ln
- Westover Ln
- W Lake Dr
- Wren Ct
- Wrenn Cir
- Wright Rd

Finally, additional flood locations were identified in the previous nuisance flood plan. These locations were not included in either data source used in this Nuisance Flood Plan Update – Maryland MyCoast data or 911 ESR data. Often these locations are located adjacent to or nearby to locations included in Table 3.3.1-12 and Table 3.3.1-13.

- 5th St
- 7th St
- Admiral Melville Cir
- Annapolis Ave
- Baker Rd
- Bay Ave
- Bay Front Dr
- Bay Park Way
- Bay View Ave
- Beach Drive Blvd
- Branhum Rd
- Brewers Island Rd
- Broadview Ter
- Broadwater Way
- Cadle Ave
- Calhoun St
- California Ave
- Carrollton Rd
- Carrs Creek Rd
- Cedar Ave
- Cherry Tree Ln
- Chichester Rd
- Claibourne Rd
- Cotter Dr
- Country Club Dr
- Cover View Trl
- Creek Dr
- Creeks End Ln
- Cross Rd
- Deale Beach Rd
- Deep Cove Ct
- Defense Hwy
- Dent Rd
- Depriest Dr
- Dock Rd
- Dover St
- Drum Point Rd
- Dutchship Island Rd
- E Chalk Point Rd
- E End Rd
- E Lake Dr

- Exeter St
- Fairfax Ave
- Fishing Creek Rd
- Forest Dr
- Garst Rd
- Georges Ln
- Gladstone Ave
- Gloucester St
- Goddard Dr
- Goose Dr
- Grandview Rd
- Greenlee Rd
- Griner Ln
- Harford St
- Henry Rd
- Hillside Ave
- Holly Ave
- Holly Beach Farm Rd
- Holly Rd
- Hollywood Ave
- Howard Rd
- Innovation Dr
- Jordan Dr
- Kurtz Ave
- Lake Ave
- Lake View Dr
- Lakeview Ave
- Leritz Ln
- Lincoln Rd
- Little John HI
- Maid Marion HI
- Maine Ave
- Manistique Ct
- Manor Rd
- Maywood Rd
- McGready Rd
- Narragansett Ave
- Newport Ave
- Niagara Rd
- North Ave
- Owings Beach Rd
- Paca Dr
- Parkers Creek Rd
- Pine St
- Poplar Ave
- Purdy Point Rd
- Redwood Ave
- Rio Ln
- Riverview Rd
- Robinson Rd
- Round Bay Rd
- Sands Ave
- Saratoga Ave
- Shipley Rd
- Skippers Row
- Stallings Rd
- W Chalk Point Rd
- W Shady Side Rd
- Waeschie Ave
- Walnut Ave
- Warehouse Rd
- Whipple Way
- Wildwood Ln
- Williams St
- Woods Wharf Rd

3.3.1.20 Vulnerable Resources and Communities

Anne Arundel County has undertaken flood risk management efforts, such as improving stormwater infrastructure, promoting floodplain management, and building sea walls in some vulnerable areas. However, as sea levels rise and weather events intensify, more proactive mitigation and community preparedness strategies are needed to protect these resources. Critical infrastructure that is vulnerable to nuisance flooding has been identified and detailed in Table 3.3.1-14.

Table 3.3.1-14: Vulnerable Public Schools in Anne Arundel County

Name	Address	Students	Grades Served
Annapolis Elementary School	180 Green St, Annapolis, MD	200	PK-5
Arnold Elementary School	95 E Joyce Ln, Arnold, MD	503	K-5
Belvedere Elementary School	360 Broadwater Rd, MD	515	ECI/PK-5

Social vulnerability refers to a community's capacity to prepare for and respond to the stress of hazardous events ranging from natural disasters, such as tornadoes or disease outbreaks, to human-caused threats, such as toxic chemical spills.

Underserved and Overburdened Communities used to describe the minority, low-income, tribals and indigenous populations or communities in the United States that potentially experience disproportionate environments harms and risks due to exposures or cumulative impacts or greater vulnerability to environmental hazards.

Vulnerable communities often lack the resources to prepare for and recover from flooding events. Vulnerable groups may include low-income households, the elderly, and individuals with disabilities. They often live in areas more susceptible to flooding, where housing may be less resilient to water damage. Underserved communities typically have limited access to services, such as emergency response, healthcare, and infrastructure improvements. This lack of access can exacerbate the effects of nuisance flooding. For example, inadequate drainage systems or poor maintenance of existing infrastructure can lead to more frequent and severe flooding, impacting residents' quality of life.

The Deale-Shady Side Peninsula is an approximately 13 square mile peninsula and is a high-risk area for flooding according to the 2025 Hazard Mitigation Plan. The mean elevation within the benefitting area is 7.68 feet above sea level and is fragmented by creeks and wetlands. Property damage and safety of residents during flood events is of main concern. Over time, floodwaters are expected to persist longer and threaten transportation between communities along with threatening essential community lifeline services.

The Town of Highland Beach is located along the bay, making it susceptible to tidal influences and storm surges. Its low-lying coastal areas can easily flood during high tides or heavy rainfall. Changing weather patterns, including more intense storms and increased precipitation, contribute to the frequency and severity of flooding events in Highland Beach. This along with sea level rise makes Highland Beach a vulnerable community.

Brooklyn Park has a significantly low-income population and faces challenges related to access to services, healthcare, and transportation. Brooklyn Park has experienced various flooding events often because of heavy rainfall, storm surges, or nearby waterway overflow. Regions closest to the Patapsco River experience the brunt of storm surge events during severe weather.

Parts of Glen Burnie, particularly in areas with older housing, are vulnerable to flooding and have lower socioeconomic indicators. Several roads within Glen Burnie have a history of flooding during heavy rain or severe weather events. For example, Crain Highway (MD-3) experiences flooding in certain areas, especially near intersections and low-lying spots. Baltimore Annapolis Boulevard (MD-648) can become partially inundated during heavy rain events, leading to significant water accumulation. Also, Ritchie Highway (MD-2) experiences flooding in areas near the Patapsco River.

Certain sectors of Severn experience challenges related to housing quality and economic disparities. Access to emergency services can be limited in some areas, creating vulnerabilities during flood events.

3.3.1.21 Identifying Opportunities

The key purpose of the Nuisance Flooding Plan is to augment and support the information and recommended actions found in other planning documents. Both the Emergency Operations Plan (EOP) and the Hazard Mitigation Plan (HMP) for Anne Arundel County address measures by which the impacts of flooding can be mitigated, or lessened, by structural and nonstructural means. According to the Anne Arundel County, Maryland 2025 Hazard Mitigation Plan Update:

The EOP addresses the County's accelerated erosion means and high tides, overland flow, and shoreline cliff sluffing and identifies strategies to reduce erosion along Anne Arundel's 533 linear miles of tidal shoreline. The EOP and the HMP identify shoreline control/stabilization measures and both residential and agricultural best management practices as viable means of reducing accretion/erosion of Anne Arundel's highly erodible soils. Both plans also emphasize the maintenance, enforcement, and strengthening of floodplain regulations and participation in the Community Rating System. Recommendations in this nuisance flood plan are consistent with strategies and actions identified in the EOP and HMP.

The principles of floodplain management are fundamental to the proper mitigation of nuisance flooding in Anne Arundel County. Higher standards – such as freeboard, development restrictions in the floodplain, etc. – can be effective in mitigating the effects of both nuisance flooding and other major flooding events.

Anne Arundel County's HMP identifies four general areas in which focus is directed toward mitigation activity. These four areas include:

- Ensure that existing structures are resistant to flood-related damage,
- Create awareness of floodplain hazards and protective measures,
- Protect critical facilities, and
- Prepare/update stormwater management plans for various areas in the County.

In addition to actions specified in the HMP, the NFP includes activities which Anne Arundel County will implement or consider implementing to mitigate the impacts of nuisance flooding. These activities support the four areas of focus found in the Hazard Mitigation Plan. They also support recommendations and actions from Anne Arundel County's National Flood Insurance Program (NFIP) Flood Risk query provided by the Federal Emergency Management Agency (FEMA) and goals and strategies of the Anne Arundel County Emergency Operations Plan.

Action Item Recommendations

Recommended strategies to reduce nuisance flooding are divided into structural and non-structural (public information, planning, and implementation) categories. There are general recommendations specific to the nuisance flooding plan, as well recommendations with identified performance measures, targets, and associated action items.

Structural

- Enact floodplain ordinance or codes which mandate the use of freeboard beyond current requirements.
- Improve stormwater management infrastructure to more effectively convey water from flood-prone areas.
- Conduct regular maintenance of drainage and stormwater control systems.
- Consider green infrastructure options rather than conventional stormwater solutions.
- Mitigate repetitive roadway flooding in communities throughout the Deale Shady Side peninsula by elevating roadways and installing tide flaps on drainage outlets. Appropriate locations in need are identified by the *Sea Level Rise on the Deale-Shady Side Peninsula Feasibility Study*.

Nonstructural

Public Information

- Communicate the risk of nuisance flooding in non-emergency times to residents and businesses via mass mailings, social media, or press releases.
- Disseminate flood preparedness information to enable a safer and more aware public in the face of flooding.
- Integrate nuisance flooding-related public messaging in Anne Arundel County's existing public information plan and materials.
- Support the continued use and expansion in use of MyCoast in identified flood prone communities to continuously document high tide flooding events as they occur.

Planning

- Ensure Anne Arundel County's NFP is kept up to date and referenced in the Hazard Mitigation Plan and other pertinent locations.
    - Update the listing of roadways identified as high risk for or vulnerable to nuisance flooding after completion of successful mitigation strategies.
- Schedule meetings of the nuisance flooding planning committee on an as-needed basis to address flood-related issues and review plans. The planning committee consists of subject matter experts who collectively designed the NFP. *Note: Nuisance Flood Plan Committee Members are included in the Hazard Mitigation Plan.*
- Improve stormwater management planning and strengthen policies to reduce runoff.
- Continue to support partnerships between local communities and the Resilience Authority to complete projects that address nuisance flooding of roadways and shoreline erosion. The Resilience Authority has ongoing and proposed projects to address flooding and repetitive flooded roadways: some of these communities are identified in the HMP and include Galesville Peninsula, Columbia Beach, Shady Side Peninsula, Linthicum Hills, Conway Road.
- Work with the Resilience Authority to complete a flood reduction design study for the Columbia Beach area. This area experiences nuisance flooding and is also identified in the HMP (i.e., project FL-10)
- Update the NFP to reflect adaptation recommendations identified by the *Sea Level Rise on the Deale-Shady Side Peninsula Feasibility Study*.
- Economic impact analysis for waterfront business that experience nuisance flooding in the Deale Shady Side Peninsula.

Implementation

- Educate and train County staff on responsibilities under the NFP.
- Preserve floodplains as open spaces through the use of legal protection status.
- Protect and restore natural coastal features (forests, marshes, dunes, underwater grasses, and oysters) that can reduce the impacts of flooding.

Project Recommendations

1. **Mitigate roads for current and future flood predictions.**

Strategy: Coordinate investments to mitigate roads for future climate conditions.

Performance Measure: The number of roads that have been protected against future flooding events.

Performance Target: Provide mitigation for one flooded road location per fiscal year.

Possible actions include the following:

- Target coordination with the Maryland State Highways Administration to work collaboratively on a plan to harden roads to withstand flood events using the Urban & Nuisance Flooding Plan as the guide to prioritizing actions.
- Prioritize drainage (stormwater management) projects through a planned analysis of Countywide projects & prioritization.
- Add flood gauges, for safety, to areas prone to flooding.
- Post-pandemic review remote teleworking policies.

2. **Maintain operation of County-owned roadways that are susceptible to sea level rise or flooding (nuisance or otherwise).**

Strategy: Fortify vulnerable roadways against flooding and sea level rise by raising the roadbed; improving drainage/stormwater management in the public right-of-way; and improving drainage/stormwater management in flood-prone areas.

Performance Measure: A certain percentage of flood and sea level rise prone roads hardened and mitigated; a certain number of gallons of stormwater managed by new projects.

Performance Target: Set target of 10% of flood and sea level rise prone roads fortified by 2030; 50% by 2040; 100% by 2050; and 50% of all stormwater managed on-site by 2030, 100% by 2050.

Possible actions include the following:

- Identify sea level rise and flood prone roads.
- Develop priority list for road mitigation.
- Develop priority list for stormwater management improvements. This list should be available soon from work underway with the Maryland Environmental Service.
- Construct improvements beginning with the highest priority.

3. **Improve SWM features (repair, maintain, and upgrade as needed).**

Strategy: Improve SWM structure resiliency by prioritizing structures in flood prone areas and taking appropriate action to include upgrades, retrofits, and repairs.

Performance Measure: Percent of SWM structures improved.

Performance Target: 10% of prioritized SWM structures improved by 2030, 25% by 2040, 50% by 2050.

Possible actions include the following:

- Identify stormwater structures that require retrofit (per 2010 regulations) and develop a priority list.
- Research known areas of flooding and add to priority list for retrofit/upgrade/repair.
- Develop a public outreach plan to educate Homeowner Associations (HOAs) and stormwater structures owners about maintenance and repair procedures.
- Determine which stormwater feature projects could utilize watershed funding and benefit County's MS4 goals.

4. **Enact mitigation strategies that reduce nuisance flooding and related hazards flooding, coastal hazards, and erosion.**

   Strategy: Expand upon mitigation strategies identified in the hazard mitigation plan that already address flooding, coastal hazards, and/or erosion to further include a nuisance flooding component.

   Performance Measure: The number of mitigation strategies in the hazard mitigation plan that have been completed.

   Performance Target: Complete, or make ongoing progress towards, one mitigation action item per year related to flooding, coastal hazards, or erosion.

   Possible actions include the following (from the HMP)

   - CH-3: Continue to implement construction standards that protect private wells from the hazards and impacts from saltwater intrusion and flooding. Implement outreach and planning to connect households and businesses to public sewer in communities identified as an on-site wastewater problem area. Implement outreach and planning to connect households and businesses to public water in communities identified as a water quality problem area.
   - CH-4: Continue outreach to coastal flood prone communities.
   - CH-5: Additional placement of signage and activation of flood warning devices on roadways where coastal flooding has occurred.
   - ER-1: Continue working with partners (e.g., Chesapeake Bay Trust, City of Annapolis, Department of Natural Resources, and local watershed groups) to prioritize identified riparian and shoreline buffers in need of restoration. Identify potential new partners as needed.
   - FL-1: Determine the feasibility of hiring a dedicated member of staff to administer the Community Rating System in order to advance the County's CRS status.
   - FL-2: Conduct targeted public outreach (including mailers) to the current Repetitive Loss Property listing. Also consider outreach to adjacent properties in these areas. Highly impacted areas include Spit Neck along Back Creek and Main Creek, Selby on the Bay, and Shadyside-Deale Peninsula.
   - FL-7: Prioritize and support flood mitigation structure and infrastructure projects in Shady Side Peninsula.
   - FL-10: Implement community-wide stormwater infrastructure improvements in Columbia Beach community.

- FL-11: Support, to the extent possible, additional exploration for projects related to the following roadways with repetitive flooding issues: MD 450, MD 468 (Shady Side Peninsula), 685/295 Interchange, and H586800 Conway Road.

5. **Improve Anne Arundel County's flood and extreme weather prediction capability.**

   Strategy: Work with MDEM to determine potential host location(s) for Mesonet in Anne Arundel County. Mesonet can significantly enhance flood prediction by providing real-time, localized weather data, including soil moisture, which helps in issuing more accurate and timely flood alerts.

   Performance Measure: Identification of suitable locations for Mesonet sites.

   Performance Target: It is the goal of Mesonet to have at least 3 sites in all Maryland County, therefore: identify suitable locations within Anne Arundel County for Mesonet sites within 1 to 2 years.

   Possible actions include the following:

   - Work with MDEM, University Maryland Mesonet, and local stakeholders to kick off the process of identifying potential suitable locations in Anne Arundel County.
   - Review general site requirements for Mesonet towers. General guidelines for how to choose an appropriate tower site in Maryland are available here.
   - Review mapping of existing potential siting recommendations based on county-level precipitation intensity and occurrence.
   - Identify and reach consensus on the best potential Mesonet host location(s) in Anne Arundel County based on the needs of the system and local conditions.

Communicating Future Flood Risk

Communicating future flood risks effectively involves using clear, accessible language, incorporating visuals like maps and simulations, focusing on potential impacts rather than just probabilities, tailoring messages to specific audiences, and actively engaging communities to build understanding and preparedness for potential flood events, all while acknowledging the uncertainties involved in climate change predictions; essentially, making the risks relatable and actionable for individuals and communities at risk.

Key Points About Communicating Nuisance Flooding Risks:

- Focus on the "new normal":
  - Explain that what might be considered a nuisance flood now could become more frequent and disruptive in the future due to climate change and sea level rise.
- Understand your audience:
  - Tailor your message to the specific knowledge level and concerns of the community you are communicating with, avoiding technical jargon and using relatable language.
- Use accessible language:
  - Avoid technical jargon and clearly explain the potential impacts of nuisance flooding, like inundated roadways, basement flooding, and disruption to daily routines.
- Highlight adaptation strategies:

    - Educate residents on steps they can take to prepare for nuisance flooding, such as elevating belongings, installing flood barriers, and understanding evacuation routes.
- Focus on impacts, not just probabilities:
    - While providing the likelihood of a flood event is important, emphasize the potential consequences like property damage, disruption to daily life, and potential loss of life to drive action.
- Provide localized data:
    - Share specific information about projected flood frequency and depth for different areas within the community using maps and visuals
- Scenario-based communication:
    - Present different flood scenarios, including worst-case scenarios, to illustrate the range of potential impacts and encourage proactive planning.
- Climate change context:
    - Explain how climate change is contributing to increased flood risk, including rising sea levels and more extreme weather events.
- Community engagement:
    - Foster open dialogue with residents through public meetings, workshops, and online platforms to address concerns and build trust in communication efforts.
- Visual aids:
    - Utilize interactive maps, simulations, and imagery to clearly demonstrate flood-prone areas and potential impacts on property and infrastructure.
- Actionable steps:
    - Provide clear and practical steps individuals and communities can take to mitigate flood risk, such as elevating belongings, purchasing flood insurance, and participating in flood preparedness planning.
- Credible sources:
    - Ensure information is sourced from reliable organizations like government agencies, environmental research institutions, and established experts.

Communication Channels for Nuisance Flooding Risks:

- Local media:
    - Utilize newspapers, radio, and television broadcasts to reach a broad audience.
- Community meetings:
    - Hold public forums to discuss flood risks and answer questions from residents.
- Social media:
    - Leverage platforms like Facebook, Twitter, and Instagram to disseminate information quickly and engage with residents
- Website and online portals:
    - Create a dedicated webpage with information about flood risks, preparedness guides, and contact details. Provide regular updates and accessible information.
- Direct mailings:
    - Send informational brochures to residents in high-risk areas.

Challenges in Communicating Future Flood Risks:

- Perception of uncertainty:
    - Conveying the uncertainties associated with climate change predictions can be challenging, potentially leading to public skepticism.

- Emotional response:
    - Discussing potential catastrophic events can trigger anxiety and resistance to take action.
- Information overload:
    - Presenting too much complex data can overwhelm audiences and hinder understanding.

Important Considerations:

- Community engagement:
    - Encourage active participation from residents to understand their concerns and tailor communication accordingly.
- Collaboration with authorities:
    - Partner with local government agencies, emergency management teams, and planning departments to ensure consistent messaging.
- Long-term perspective:
    - Communicate not just immediate risks, but also potential future impacts of rising sea levels and increasing nuisance flooding events.

Engaging with community stakeholders and the public is likely only one part of your job. Collaborating with decision makers in your department and other municipal departments also requires much of your time. The messages in this table can be tailored to support conversations with colleagues across municipal government to generate buy-in. Examples of messages for different departments include:

Table 3.3.1-15: Examples of Community Outreach Messaging

Audience	Message
Local Officials	Investing in mitigation can also improve property values and enhance public spaces to enjoy now and protect for tomorrow.
Building Inspection	Implementing and enforcing strong building codes in our community is vitally important for protecting health, safety, and economic well-being. Stronger building codes can save our residents money on homeowners and flood insurance and can make a major difference in helping us bounce back faster as a community should disaster strike.
Economic Development	The flood mapping process is designed to help our residents — as well as business owners and community leaders — understand flood risk and make smart decisions. Planning with flood risk in mind allows our community to continue to function or come back quickly after a disaster. Plus, designing new buildings to exceed certain codes promotes the creation of new, long-term jobs.
Emergency Management/ Health and Human Services	Sharing information about our community's flood risk and helping our residents to feel informed and prepared is vital, not only to individual safety, but to the long-term health of our community. Using flood risk data can help us prepare by identifying what roads might be overtopped, what facilities might flood, or what parts of the community might be inaccessible during a flood. Investing in mitigation also reduces the response burden because people are in safer places to begin with.
Engineering	It's important we continually ask ourselves: how can we be stronger, safer, and more adaptable? Factoring flood risk into the equation can help our community anticipate and cope with what could be overwhelming challenges resulting from damaged infrastructure assets such as municipal buildings, roads, bridges, and culverts.

All Departments	As public servants, every one of us is responsible for working to make our community stronger and safer. We owe it to our residents and businesses to work together to take actions that will help keep us safer now and move towards resilience in a powerful way.

3.3.1.22 Evaluation of Existing Policies and Ordinances

General Development Plan – Plan2040

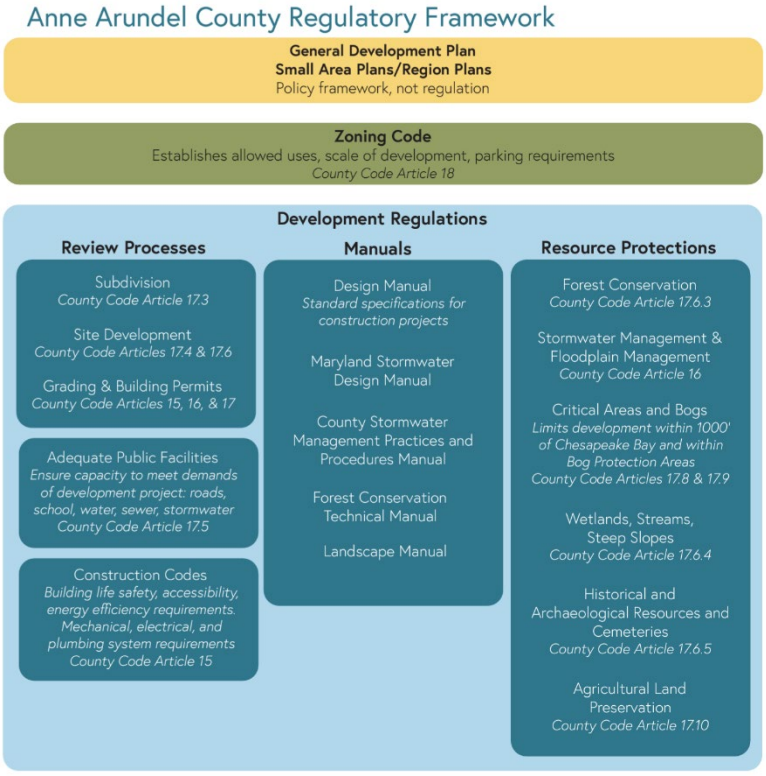
Plan2040 establishes a vision, goals, policies, and strategies to guide development of Anne Arundel County over the next twenty years. It reflects the voices of thousands of residents and addresses their priorities for the future of the County. The plan builds on the foundation of the previous General Development Plans and Small Area Plans. It values, promotes, and protects what makes Anne Arundel County "the best place for all," including the Chesapeake Bay and its tributary rivers, forests, farms, quiet suburban neighborhoods, rural landscapes, and thriving economic centers.

Plan2040 lays out a policy framework that informs many of the County's future decisions on land use, environmental protection, transportation, open space, agriculture, community facilities, historic preservation, housing, economic development, and quality of life. Plan2 040 will be implemented through Region Plans, functional plans, design manuals, regulations, the capital budget, and the work programs of County departments.

Plan2040 is based on a vision and five themes that are integrated into a comprehensive set of goals and policies. The plan is based on an integrated approach to sustainable development that considers the interaction of the environment, economy, and social equity. To emphasize those connections, the plan is organized in four chapters:

- Natural Environment
- Built Environment
- Health Community
- Healthy Economy

The Office of Planning and Zoning (OPZ) have developed climate change policies and strategies that are used as a framework for discussion purposes and inclusion in the Anne Arundel County General Development Plan update, Plan2040. The policies and strategies were developed based on three County reports and initiatives including the Sea Level Rise Strategic Plan (2011), Energy Efficiency and Conservation Plans (2009 and 2013), and the Climate Resilience Action Strategy.



Source: Anne Arundel County Plan2040, General Development Plan

Land development is regulated by an interrelated set of Federal, State, and local laws. Maryland law requires local governments to prepare growth management plans, like Plan2040. The Plan is implemented through investments in public infrastructure and through local ordinances, including the zoning ordinance (Title 18 of Anne Arundel County Code) and the subdivision and development ordinance (Title 17). There are multiple Federal, State, and local laws designed to protect natural resources from adverse impacts from land development. These include the Critical Areas ordinance that protects shoreline areas, the Forest Conservation Ordinance, and stormwater runoff management requirements.

Goal BE4: Support quality of life and economic vitality in County Peninsula Policy Areas, while preserving the environmentally sensitive areas.

> *Under **Policy BE4.1:** *Consider vulnerability to sea level rise, coastal flooding and nuisance flooding during land use, development and zoning processes. Consider expansion of the Critical Area to include these areas.*
>
> * Consistent with Policy BE4.1 of the Land Preservation, Parks & Recreation Plan.
>
> Under ***Policy BE4.2:*** *Review Maritime use requirements to ensure environmental protection, adaptability to sea level rise, and adequacy of transportation infrastructure.*

Goal BE 16: Increase the County's resilience to future changes in climate and reduce emissions of greenhouse gases.

> *Under ***Policy BE16.1:*** *Incorporate considerations of climate change, including sea level rise, into the County's adopted plans as necessary to ensure implementation.*

* Consistent with Policy BE16.1 of the Land Preservation, Parks & Recreation Plan.

Goal HC10: Provide a high-level of emergency medical care, fire protection, police protection, emergency management and an all hazards response to all residents and visitors of the County, including a comprehensive evacuation plan with adequate evacuation shelters.

> Under ***Policy HC 10.4:*** *Work with the local community network to assist vulnerable communities in developing action plans and improving emergency preparedness at the community level. In addition to planning for catastrophic events, promote awareness and preparedness for the longer term or more permanent impacts of sea level rise.*

***Goal NE1:** Preserve, enhance, and restore sensitive areas, including habitats of rare, threatened, and endangered species, streams, floodplains, tidal and non-tidal wetlands, bogs, shorelines, steep slopes, and all applicable buffers.

* Consistent with Goal NE1 of the Land Preservation, Parks & Recreation Plan.

> *Under ***Policy NE1.3:*** *Require all shoreline restoration projects on County-owned properties to utilize living shoreline restoration techniques where feasible. Require designs take into account projections for sea level rise.*

* Consistent with Policy NE1.3 of the Land Preservation, Parks & Recreation Plan.

Goal NE3: Expand, enhance and continue to protect the County's greenways, open space, rural areas and the Priority Preservation Area.

> *Under ***Policy NE3.1****Target flood-prone properties, including non-tidal wetlands, and areas at risk from sea level rise as priorities for easement or fee simple acquisition.*

* Consistent with Policy NE3.1 of the Land Preservation, Parks & Recreation Plan.

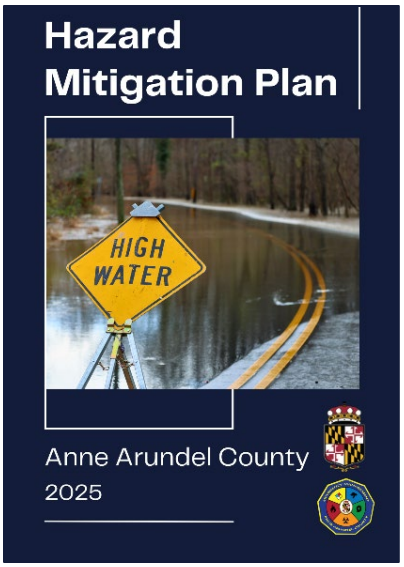
Goal NE4: Improve and protect surface water quality by reducing impacts from stormwater runoff, wastewater discharge, and septic systems.

> Under ***Policy NE4.3:*** *Evaluate the impact of increasing precipitation events and sea level rise on septic system function and develop strategies to ensure adequate percolation and functionality.*

Goal NE5: Ensure the safe and adequate supply of groundwater resources and wastewater treatment services for current and future generations.

> Under ***Policy NE5.3:*** *Evaluate and address the impacts of sea level rise and climate variability on the County's water and sewer infrastructure and future needs.*

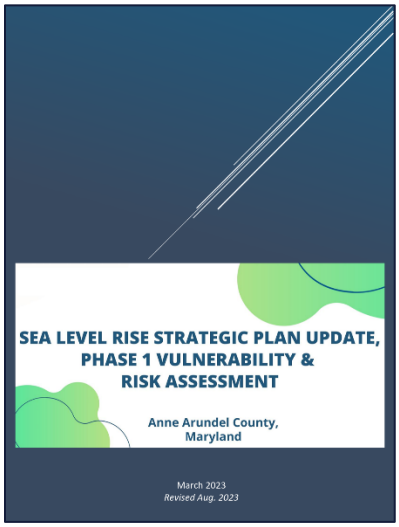
Hazard Mitigation Plan



The HMP focuses on mitigation strategies and actions that assess the vulnerability of coastal communities to sea-level rise, coastal flooding, and nuisance flooding; incorporates the Climate Resilience Action strategies and actions into comprehensive local plans; improves resilience of critical infrastructure to flooding and the impacts of climate change; and identifies protective measures for cultural and historic resources to flooding, erosion, and sea level rise impacts.

Section 1.0 (Community Profile) of the plan specifically addresses Resiliency, Climate Change and Sea Level Rise Considerations and cross reference strategies and actions that are presented in county and state policies and plans. The HMP cross references the results and recommendations of the 2023 the Sea Level Rise Strategic Plan to provide context for the County's ongoing and emerging efforts to address climate change and sea level rise.

Sea Level Rise Strategic Plan



The County recognizes that strategic planning for sea level rise impacts will be an ongoing and evolving process as more research, analysis and guidance becomes available from State and Federal agencies and the scientific and academic communities. While the intent of this strategic plan is to identify steps that can be initiated by the County in both the near and long term, it is anticipated that this plan will build upon and be revised in future years as the topic evolves. The County is taking a phased approach to building coastal resilience to anticipated sea level rise risks.

- Phase 1: Vulnerability and Risk Assessment and Case
- Phase 2: Feasibility Study of Potential Actions
- Phase 3: Implementation of Priority Actions

This report presents the results of Phase I, which provides a 2023 update to the RSLR vulnerability and a risk assessment for the entire County and presents more detailed analysis for Region 9 as a case example. Region 9 includes the southern portion of the County along Chesapeake Bay.

In addition to the detailed vulnerability assessment and overall analysis, the Strategic Plan incorporates a series of goals and recommendations related to sea level rise. The goals are by definition general and focus on the need to incorporate sea level rise considerations into County policies and activities, and to further study the issue going forward. The recommendations include a very detailed series of actions and policy updates that are aimed at increasing the level of technical knowledge about sea level rise and its effects, and in mitigating such effects on existing and future development. The goals are listed below, and the recommendations may be reviewed in the Strategic Plan.

- Incorporate sea level rise planning into all related County functions.

- Protect coastal ecosystems to reduce the impacts of sea level rise, coastal flooding and shoreline erosion.
- Reduce sea level rise impacts to existing and future development.
- Reduce potential impacts to public infrastructure serving existing communities and future development.
- Protect significant cultural resources from loss or damage due to sea level rise impacts. Develop a schedule to complete investigations of all priority sites that have had little or no previous investigation.
- Ensure safe and adequate water supply and wastewater management for communities vulnerable to sea level rise impacts.
- Ensure that citizens in the County are educated and informed about sea level rise and have access to current information and resources.

Climate Resilience Action Strategy

University of Maryland launched the Local Resilience Financing Initiative (LRFI) which works in partnership with local leaders to develop, implement, and finance robust resilience plans, with a specific focus on linking natural resource restoration and protection to community infrastructure and economic development.

The goal of the strategy is to accelerate resilience planning and financing in three Chesapeake Bay communities: Anne Arundel, and Queen Anne's counties. The approach identifies and leverages the linkages between water quality restoration and protection and climate change resilience. In addition, our strategy was to create linkages between public financings of resilience and water quality restoration with market-based investments by:

- Developing and implementing actionable, scalable, and innovative resilience and natural infrastructure planning and financing strategies.
- Incentivizing the implementation of new and innovative technologies and policies; and,
- Incentivizing efficiency, thereby ensuring that every dollar invested achieves the maximum level of water quality restoration and resilience possible.

This approach will enable communities to focus on identifying the co-benefits and connections between water quality restoration and protection and local resilience. Creating a robust and actionable resilience plan and implementation strategies creates a unique opportunity to expand investments in water quality and water resource management. Step 2 of the strategy assesses risk and climate impacts under 4 categories: catastrophic/major storm events; sea level rise; Tidal (Nuisance) Flooding; and temperature.

The County's resilience Imitative is being implemented in three core phases, each designed to bring our partner communities closer to long-term resilience through action and aggressive implementation and financing. The first of the three phases resulted in the creation of Climate Resilience Action Strategies. Phases 2 and 3 will result in the development and implementation of comprehensive financing systems and processes. The action strategy identifies high, medium, and low priority actions that are presented with a goal, performance measure, performance target, and possible actions. Priority actions that address nuisance flooding include

Public Roads/Flooding

Strategy: Reduce flooding and make sure all roads of a certain size are able to pass a 25- year storm.

Possible Actions: Identify and prioritize at-risk roads; target a percentage of roads to improve; limit the number of modifications approved; adhere to and update the design manual/no design manual modifications; develop a mitigation plan and monitor improvements; acquire sensitive properties adjacent to existing infrastructure/flooded roadways.

Stormwater Regulations

Strategy: Evaluate the sufficiency, from a flooding perspective, of existing stormwater regulations.
Possible Actions: Review MDE regulations, address high frequency and high intensity events, storms, construction and maintenance review, inspections; Evaluate effectiveness of existing regulations. Identify & prioritize regulation changes; Have the county initiate a conversation with MDE about the inadequacy of volume/get all the climate resilient counties to work together/phase 1

Sediment Controls

Strategy: Implement and enforce sediment and erosion control standards that promote onsite stabilization and reduce offsite mobilization of sediment.
Possible Actions: Update standards/regulations/policies; Enforcement needs to address temporary stormwater management; provide additional training to inspection staff on state-of-the-art practices.

Private Property Preparedness

Strategy: Through public education, achieve behavior change.
Possible Actions: Create and implement a county-wide climate awareness raising strategy that aims to raise awareness about climate predictions and how they will affect County residents, and know what County residents can do to be prepared; create an outreach and engagement plan for businesses and organizations; identify specific communities and population sectors that are most effected by climate change; identify behaviors that these communities need to do to be more prepared; through a participatory process, develop strategies to help those targeted populations take actions that are identified. These strategies should address threshold barriers and include a suite of interventions.

Private Shorelines

Strategy: Incentivize the maintenance and installation of "living shorelines."
Possible Actions: Create a tax credit for living shorelines; provide additional educational outreach to the public on the benefits of living shorelines; Conduct a risk analysis.

Land Use

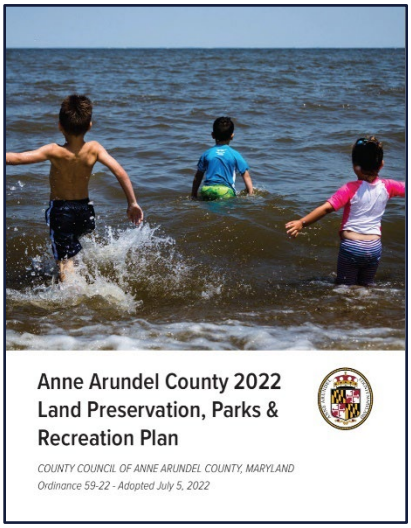
Strategy: Regulatory, Coordinate with General Development Plan.
Possible Actions: Identify areas where flood prone communities and businesses may relocate. Create a plan to incentivize re-development in these areas; identify areas that should be protected from new development pressure caused by relocation efforts (prime farmland, forests); create a plan to incentivize or codify this protection; engage agriculture, development and environmental groups, as well as residents from flood prone areas in these actions; Review the General Development Plan for Climate Priorities. Enforce the general development plan.

Development

Strategy: Align zoning, general development plan.

Possible Actions: Identify "off limits" development areas and create a plan to eliminate development in these areas; identify a threshold or metric for evaluating how new development (even with latest stormwater management) will affect downhill properties and create a plan to minimize this damage; enforce regulations; limit modifications; incorporate climate concerns in the General Development Plan and any follow-on Regional Plans and comprehensive rezoning.

Land Preservation, Parks, & Recreation Plan



An updated Land Preservation, Parks and Recreation Plan (LPPRP) is required to be submitted by each County to the State of Maryland every five years. The LPPRP serves as a guide for park development, program improvements, and land preservation in Anne Arundel County. The 2022 round of LPPRPs is intended to provide a common benchmark to assist the State's evaluation of County land preservation and recreation programs, to ensure good return on public investment. LPPRPs qualify local governments for State Program Open Space (POS) grants, and include three elements:

- Parks, Recreation, and Open Space
- Agricultural Land Preservation
- Natural Resource Conservation

In April 2022 County Council adopted the LPPRP and it became an amendment to the Anne Arundel County General Development Plan.

Plan2040 includes four sections: Planning for the Natural Environment, Planning for the Built Environmental, Planning for Healthy Communities, and Planning for a Healthy Economy. The plan makes several key policy recommendations in different plan chapters with respect to recreation, growth and land preservation, and conservation that are mirrored in the LPPRP. Plan2040 includes the following goals and policies relevant to Parks and Recreation Planning:

Policy BE4.1: *Consider vulnerability to sea level rise, coastal flooding and nuisance flooding during land use, development and zoning processes. Consider expansion of the Critical Area to include these areas.*

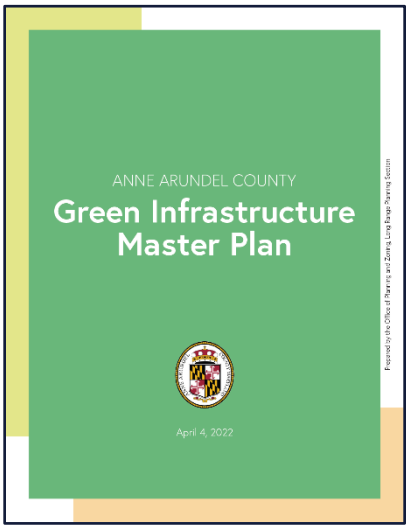
Policy BE16.1: *Incorporate considerations of climate change, including sea level rise, into the County's adopted plans as necessary to ensure implementation.*

Goal NE1: Preserve, enhance, and restore sensitive areas, including habitats of rare, threatened, and endangered species, streams, floodplains, tidal and non-tidal wetlands, bogs, shorelines, steep slopes, and all applicable buffers.

Policy NE1.3: *Require all shoreline restoration projects on County-owned properties to utilize living shoreline restoration techniques where feasible. Require designs take into account projections for sea level rise.*

Policy NE3.1*Target flood-prone properties, including non-tidal wetlands, and areas at risk from sea level rise as priorities for easement or fee simple acquisition.*

Green Infrastructure Master Plan



The Green Infrastructure Master Plan is a guide to conserving an interconnected network of the most significant remaining natural lands in Anne Arundel County through voluntary actions. The lands identified in the Green Infrastructure Network (Network) help protect water quality and air quality, provide habitat for plants and wildlife, create opportunities for recreation, and support mitigation of, and adaptation to, climate change. The Green Infrastructure Network supports the land use policies of the County's General Development Plan (GDP) by prioritizing areas for natural resource conservation, providing open space, and maintaining rural character.

This Plan establishes a goal to conserve an additional 5,000 acres of land in the Network by 2030 (using 2020 as a baseline), representing 30% of the County land area. In comparison, approximately 5,075 acres of land in the Network were conserved through public acquisition and voluntary conservation easements from 2010-2020.

Green Infrastructure plays an important role in mitigating and adapting to the effects of flood hazards and climate change. Forests and wetlands capture and store carbon, acting as a sink for greenhouse gases. Shading from tree canopy reduces heat at a local scale. This is especially important in more developed areas of the County where high amounts of concrete and asphalt reflect heat from the sun. Floodplains, wetlands, and low-lying natural areas also provide storage of stormwater runoff and floodwater, reducing impacts to developed areas. Protection of natural shorelines also can reduce risk of inundation from sea level rise.

A broader set of policies to address climate change are included in Plan2040 to reduce greenhouse gas emissions, promote green building design, transition to electric vehicles, and invest in resilient infrastructure.

Plan2040, together with the Green Infrastructure Master Plan and the Region Plans that are being prepared, establish the countywide framework and foundation for integrating natural resources conservation and land use:

- Direct Development to Designated Growth Areas
- Designated Areas for Conservation
- Green Infrastructure Conservation
- Watershed Management
- Regulatory Protection

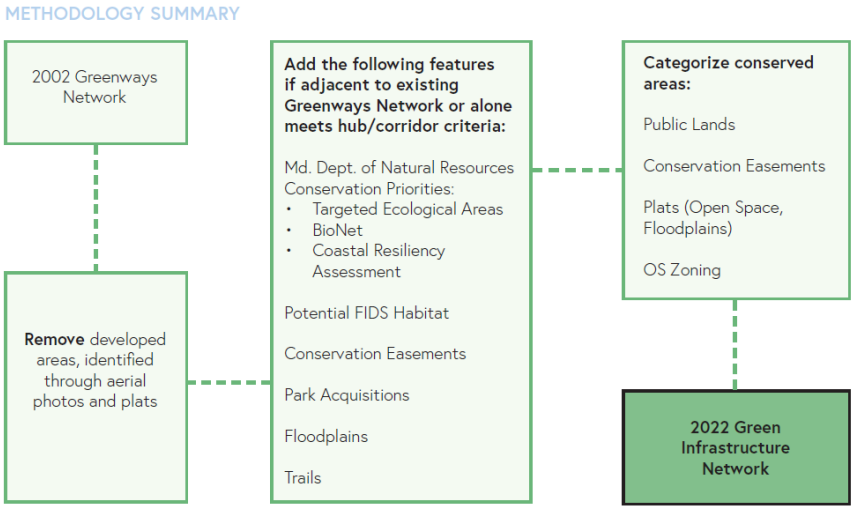
The Plan outlines five key strategies for implementing the Green Infrastructure Network. Each strategy involves a number of activities that collectively form a comprehensive green infrastructure program. This program envisions a strong public-private partnership that will take advantage of a wide variety of implementation strategies. Therefore, the actions recommended are not limited to activities of the public sector but include a variety of recommendations for non-profit organizations as well.

Strategy 3: Land Conservation and Enhancement pulls together recommendations of the LPPRP that can also be implemented in the Nuisance Flood Plan.

- Action 3.1 Invest in conservation priorities consistent with the GDP, Region Plans, LPPRP and the Watershed Restoration Program.

  The Green Infrastructure Network intersects with priorities to invest in land protection and stream restoration identified in the LPPRP and the Bureau of Watershed Protection and Restoration's watershed assessments and work program. Investments in land protection in the Green Infrastructure Network should align with the priorities of those programs to maximize benefits and most efficiently use public funds.

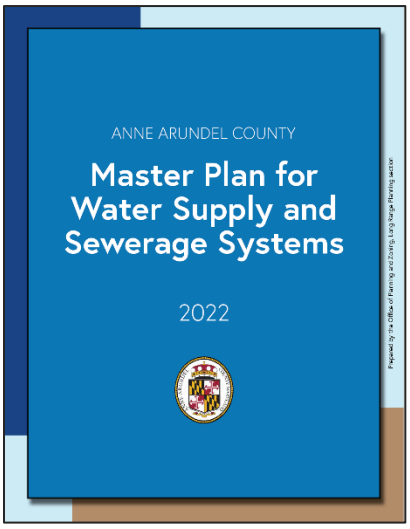
  The 2017 LPPRP priorities for land acquisition includes a goal of 1,065 acres with 750 acres needed to address local or State greenways objectives by 2027. The LPPRP also identifies a need for recreational lands in the County's northern and southern quadrants. The exact locations of these parcels have not been identified and may or may not be in the Green Infrastructure Network. As noted previously, the Bureau of Watershed Protection and Restoration has established a pilot program to acquire flood-prone properties.



Other relevant actions that make up Strategy 3 include:

- Action 3.2 Integrate the Green Infrastructure Network into County planning programs and procedures.
- Action 3.3 Encourage private landowners to conserve lands through conservation easements and tax incentives.
- Action 3.4 Facilitate the creation of forest mitigation banks.
- Action 3.5 Invest in conservation of Green Infrastructure across all watersheds in the County.
- Action 3.6 Document County properties providing high levels of ecosystem services.
- Action 3.7 Explore the potential for voluntary transfer of development rights.

Master Plan for Water Supply and Sewerage Systems



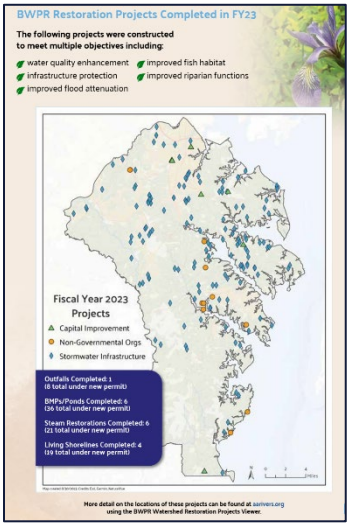
Water and Sewer Master Plan (WSMP) designates where public water and sewer facilities are planned or available. The WSMP can be used as a tool to implement the County's growth management policies and can assure that the rate of growth does not outstrip the County's ability to provide essential public services. The WSMP and the County's Zoning Ordinance work in conjunction to fulfill many of the goals and objectives of the Comprehensive Plan and is particularly useful in relation to its policies on growth management and the provision of public facilities. The Plan has a 25-year outlook and is updated every 3 years; however, the County amends the text and maps of the Water and Sewer Plan every year, or as is deemed appropriate.

The 2022 update to the WSMP reflects the land use policies of Plan2040, the County's most recently updated General Development Plan that was adopted in May 2021. This update to the WSMP reflects the most recent data for population, land use, flow projections, non-County water systems, water quality problem areas, financial data and other data. As planning policies increasingly focus on protection of water resources, the focus of public utility planning will continue to shift toward enhanced treatment, established TMDL requirements, and watershed planning.

Chesapeake Bay TMDL Phase II Watershed Implementation Plan

Anne Arundel County's Phase II Watershed Implementation Plan (WIP) identifies programs, policies and practices and establishes a commitment to implementation that ensures achievement of the nitrogen, phosphorus, and sediment load reductions assigned to the County by the Maryland Department of the Environment (MDE) in compliance with the Chesapeake Bay TMDL. The County's Phase II WIP sets forth a strategy for implementation that identifies statutory authority, capital projects, funding mechanisms and timelines for achieving its

Watershed Protection and Restoration Program (WPRP)



In 2002, the Anne Arundel County Watershed Protection and Restoration Program (WPRP) conducted systematic and comprehensive assessments of the County's watersheds. These assessments are conducted to assess current water quality conditions and prioritize the County's streams and sub watersheds for restoration and preservation to improve the conditions of the County's watersheds. The studies partially fulfill the watershed assessment and restoration requirements of the County's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer (MS4) permit. Conditions of this permit, administered by the Maryland Department of the Environment, are required to be met by the County.

Assessment of County watersheds were initiated in 2016 to complete the comprehensive assessments of the County's twelve major watersheds. The assessment included field investigations

and characterization of the stream and watershed conditions. This full-scale assessment was designed to catalog infrastructure, assess stream habitat for fish and aquatic insects, characterize stream channel stability and stream bank erosion, and assess water quality conditions of watershed streams.

Data were used to prioritize the watershed's individual stream reaches and sub watersheds for restoration and preservation measures to ultimately improve the conditions of the watershed. In addition to the stream assessments, indicators of watershed condition related to land use, stormwater best management practices (BMPs), and pollutant loading models were compiled in prioritization models that rank and prioritize the watersheds at the stream reach and sub watershed scales for restoration and preservation priorities.

National Flood Insurance Program (NFIP)

Anne Arundel County is a participant in the National Flood Insurance Program (NFIP) and has adopted a local ordinance to manage development and minimize risk from future damage and losses on properties within the 100- year floodplain from floods. The County has adopted a local Floodplain Ordinance in Article 16, Title 2 of the Anne Arundel County Code. The program enables properties in the floodplain district with the ability to obtain flood insurance. The Floodplain Ordinance establishes areas within the County subject to inundation of waters of a 100-year flood as the floodplain district. The floodplain district consists of the following subdistricts: Zone A, Zone AE and Zone A1-30, Zone AH and Zone AO, Zone B and Zone X (shaded), Zone C and Zone X (unshaded), and Zone VE and Zone V1-30. Floodplain identification and mapping risks are determined by the Flood Insurance Study for Anne Arundel County, Maryland and Incorporated Areas and accompanying flood insurance rate and floodway maps, and all subsequent revisions, as developed by FEMA. The general provisions of Floodplain Ordinance applies to all development, construction and substantial improvements to existing structures in the floodplain, and includes applications for subdivision development, and building and grading permits.

In addition to the County Floodplain Ordinance, the County has adopted the 2015 International Building Code and 2021 International Residential Code and the administrative changes of each supplement, as the local Building and Construction Code of the County. The Building and Construction Code and the local Floodplain Ordinance are used in conjunction with the FEMA Floodplain maps to determine compliance for development, new construction, and substantial improvements to existing structures on properties located in the floodplain. The Department of Inspections and Permits is the agency responsible for administering and enforcing the Building and Construction Code and the local Floodplain Ordinance for the County and is required to maintain all records associated with floodplain district permit actions.

The floodplain ordinance applies to all development, construction and substantial improvements to existing structures in the floodplain, and includes applications for subdivision development, and building and grading permits. The following is a summary of the local floodplain ordinance in the review and approval of applications by the Department of Inspections and Permits within the 100-year floodplain:

A. The local floodplain ordinance limits development in the floodplain if an alternative location exists. The local floodplain ordinance also limits encroachment inside the floodplain for structures when a disturbance of the 100-year floodplain is unavoidable.

B. The local floodplain ordinance provides authority to repair or rehabilitate existing dwellings in flood hazard areas. The applications are initially reviewed to determine whether the

proposed cost of work meets the definition of a substantial improvement. If the proposed cost of work equals or exceeds 50 percent of the current market value before the damage occurred, full compliance with Building and Construction Codes including raising the lowest habitable level of the structure to an elevation of one foot above the flood protection elevation level for the property is required.

C. The local floodplain ordinance provides authority to issue permits for new construction or substantial improvements to nonresidential structures when the following conditions are met:

    - A floodproofing design is submitted to ensure areas below the flood protection elevation are watertight with walls substantially impermeable to the passage of water and with structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy for flooding to the flood protection elevation; and
    - A FEMA floodproofing certificate is provided.

D. The local floodplain ordinance requires new construction, substantial improvements, and habitable space applications within the 100-year floodplain to elevate the lowest floor to one foot above the flood protection elevation level of the property unless the construction, reconstruction, and rehabilitation involves:

    - An expansion to address a violation of State or County health, safety, or sanitary codes; or
    - The construction consists of an accessory structure, attached garage, or non-substantial improvement to an existing dwelling that meets the following criteria:
        - The structure is constructed so as to minimize flood damage;
        - The structure is firmly anchored to prevent flotation;
        - The structure is used for parking, storage, or building access;
        - The floor elevation of the structure is at or above existing grade and does not qualify as a basement; and
        - The structure is equipped with flood equalization vents in accordance with the Building and Construction Code.

Applications for building and grading permits must include the following information to ensure the Construction and Building Code and the local Floodplain Ordinance are capable of being met:

- The elevation of the 100-year flood; high-velocity water and wave action including its relation to a stream channel, shoreline, floodplain district, and floodplain subdistrict; elevations of the existing ground contour and proposed final grade of the property; and the elevations of the lowest floor level(s) and the floor area below the lowest floor;
- The methods used to elevate a proposed structure, including details of proposed fill, pile structures, retaining walls, foundations, and erosion protection measures;
- The methods used to protect electrical, plumbing, and mechanical systems and utilities from flooding;
- The assessed value of existing structures or an “as is” appraisal of the market value of the existing structure, excluding land value; and
- A statement on the building plans for accessory structures indicating there will be no conversion of the area to habitable space unless the lowest floor is elevated to one foot above the 100-year flood elevation.

A substantial improvement is defined as any reconstruction, rehabilitation, addition, or other improvement of a building, the cost of which equals or exceeds 50 percent of the market value

of the building before the start of construction of the improvement. The term includes buildings that have incurred substantial damage, regardless of the actual repair work performed.

A non-conversion agreement is required before an accessory structure, attached garage, and non-substantial improvement of an existing dwelling may be constructed within the 100-year floodplain. The non-conversion agreement prohibits conversion of the accessory structure, garage, and non-substantial improvement unless the structure is raised to the flood protection elevation. The County requires the non-conversion agreement to be recorded in land records to assure future property owners are notified of the use and occupancy limitations.

When the County undergoes an update its local Floodplain Ordinance, Building and Construction, and Development Codes, the mitigation strategies and actions identified from the 2025 Nuisance Flood Plan update and future updates will be requested to be reviewed and incorporated in the appropriate sections of the Anne Arundel County Code as well as integrated into programs, policies and other documents. The County follows the International Building Code guidelines, and maintains a General Development Plan, a Capital Improvement program, and Site Development Regulations. Anne Arundel County periodically reviews and updates its standards and guidelines. As part of these future reviews and updates, the County will explore opportunities on how to integrate and adopt hazard mitigation strategies and actions into existing ordinances, regulations, policies and standard practices. The County intends to use the actions and projects described in this plan as the local process for prioritizing and recommending hazard mitigation and risk reduction projects for consideration in the County Capital Improvement program.

Zoning Ordinances and Subdivision Regulations

Anne Arundel County's zoning ordinance is the primary mechanism for implementing its comprehensive plan. The ordinance establishes a series of zoning districts and defines the goals, permitted uses, and design standards for each district. Anne Arundel County's zoning ordinance has many provisions that support hazard mitigation, mostly by designating where residential, commercial, and industrial development is allowed and delineating where natural resources are protected.

Land development is regulated by an interrelated set of Federal, State, and local laws. Maryland law requires local governments to prepare growth management plans, like Plan2040. The Plan is implemented through investments in public infrastructure and through local ordinances, including the zoning ordinance (Title 18 of Anne Arundel County Code) and the subdivision and development ordinance (Title 17). There are multiple Federal, State, and local laws designed to protect natural resources from adverse impacts from land development. These include the Critical Areas ordinance that protects shoreline areas, the Forest Conservation Ordinance, and stormwater runoff management requirements.

Maryland's growth management law created 12 Visions which reflect the State's ongoing aspiration to develop and implement sound growth and development policy. Anne Arundel County is required to include the Visions in the local comprehensive plan and implement them through zoning ordinances and regulations

Anne Arundel County's subdivision regulations guide the division and development of the County's land through a series of requirements for the preparation, submission, and review of subdivision and land development plans. Subdivision regulations are intended to provide adequate sites for development and public use, to maintain reasonable design standards, and to coordinate public improvements with private development interests.

Among the Anne Arundel County subdivision regulations supporting hazard mitigation are the general site design standards and the subdivision application criteria. Site design standards require a site design and environmental feature analysis and require that sensitive natural features be preserved as open space to the extent practicable. To implement this requirement, a list of criteria is provided for all subdivision application. At all stages of development (pre-application concept, minor subdivision plat, major subdivision preliminary plat, and major subdivision final plat), extensive environmental information must be included in the plans.

The County has determined that its immediate focus for sea level rise planning efforts will be more on reducing impacts and future losses to existing development and resources. Consideration for limiting or restricting the extent of future development in areas subject to flooding and to sea level rise will be completed during the comprehensive planning process of the General Development Plan update and as better estimates are obtained by the County on sea level rise projections. The existence of low- density zoning and development regulations currently in place are expected to limit the future development potential in areas vulnerable to flooding and to sea level rise. While a number of infill parcels or lots still exist in these areas, the County does not anticipate a surge of new subdivisions or major development applications within these areas. The County will consider legislation and other mitigation strategies and actions in areas prone to flooding and sea level rise that reduces potential losses and damages to life and property.

The County's subdivision code, zoning ordinance, and the General Development Plan govern land use and development in areas subject to flooding and to sea level rise. The State Critical Area regulations as well as FEMA floodplain regulations provide additional controls on future construction and development in vulnerable areas. Article 17, Title 8 establishes a 100-foot buffer for development and redevelopment on properties within the Critical Area from the mean high-water line of tidal waters, tributary streams, and tidal wetlands. An expanded buffer is required if there are contiguous slopes of 15% or greater; nontidal wetlands, nontidal wetlands of special State concern, and hydric soils or highly erodible soils. The establishment of these buffers along the shoreline serves as an on-going hazard mitigation action by the County that maintains the natural environment of a stream; protects riparian wildlife; establishes and maintains an area of transitional habitat between aquatic and terrestrial communities; minimizes adverse effects on wetlands, shorelines, stream banks, tidal water and aquatic resources; and provides for the removal or reduction of sediments, nutrients, and potentially harmful or toxic substances. The County will continue to explore scientific studies and implement best management practices to enhance local mitigation efforts and reduce potential damages and losses from future disasters.

The County solicited an economic and real estate consultant to conduct a land use market analysis which was completed in 2019. The analysis assessed demographic and development trends, the real estate market, and land demand and capacity. The assessment was based on ten submarket areas that were identified as having similar real estate market and land use characteristics. Some of the key conclusions related to future development are summarized below.

- The County's average annual growth rate is slowing. During the period from 1970 - 2010 the annual growth rate averaged 2%. Between 2000 and 2010, the rate slowed to 1% annually.
- Between 2010 and 2018, growth averaged roughly 0.7%. This is in part due to the decreasing land development capacity.
- The County is still well positioned to capture its fair share of regional growth in the future, as it continues to urbanize its targeted growth areas.

- The urbanizing regional growth patterns are showing a preference for urban mixed-use and higher density developments near important transportation routes and transit lines linking residential communities to employment centers.
- Under current zoning, the County does not have sufficient land development capacity in several of the submarkets to accommodate.
- A substantial amount of undeveloped land in the County is concentrated in rural areas that are not planned or zoned for future development. This preservation of rural areas will continue to be reflected in the land use policies of the new GDP to be completed in 2020.

These conclusions have several positive implications related to hazard mitigation. First, targeted growth areas are not located along or near the County's shoreline and therefore are not in areas most vulnerable to sea level rise impacts.

Secondly, the policy focus on redevelopment and revitalization will serve to protect more greenfield areas from new development, preserving natural features, tree canopy, and other environmental features that help to reduce climate change impacts. Redevelopment also provides opportunities to provide improved stormwater management techniques and facilities in older developed areas that may have outdated or minimal stormwater management currently, which will help mitigate stream erosion, water quality impacts, and other negative consequences of stormwater runoff. Focusing on redevelopment and infill in currently developed areas also allows more opportunity for infrastructure upgrades and lessens the need for infrastructure expansions into new undeveloped areas.

Anne Arundel County recognizes the importance of assuring development within the 100-year floodplain is conducted in a manner that minimizes future risk to human life and potential damage and losses to property. To minimize current and future risk, Anne Arundel County has adopted a local floodplain ordinance and local Building and Construction Codes that ensures building standards are met for development within the 100-year floodplain. Future updates to the HMP will more closely evaluate the vulnerability of structures including historical and archaeological assets and critical infrastructure.

Stormwater Management Ordinance

The purpose of stormwater management in Anne Arundel County is to protect and promote the public health, safety, and general welfare through the management of stormwater, to protect public and private property from damage, to reduce the effects of land use changes on stream channel erosion, to assist in the maintenance and attainment of water quality improvement, to preserve and enhance the environmental quality of streams and stream valleys, to minimize adverse impacts on water quality and conserve plant, fish, and wildlife habitat, to reduce flooding, to maintain as near as possible predevelopment runoff characteristics, and to establish the minimum requirements and procedures to control the adverse impacts associated with increased stormwater runoff.

The primary goal of the Anne Arundel County Stormwater Management Program is to maintain after development, as nearly as possible, the pre-development runoff characteristics and to reduce stream channel erosion, pollution, siltation and sedimentation, and local flooding which would otherwise have adverse impacts on the water and land resources of this County and State.

Stormwater Management Practices and Procedures Manual

The Environment Article, Title 4, Subtitle 2 requires the Maryland Department of the Environment (MDE) to implement a statewide stormwater management program to control new development runoff. MDE is obligated to perform many duties to meet this mandate. The most significant of these is adopting regulations that establish criteria and procedures for stormwater management throughout Maryland.

The purpose of this manual is to provide developers, consultants and County staff with guidance regarding the procedures, processes, policies, and regulations that apply to stormwater management for proposed developments within Anne Arundel County. The manual addresses criteria specific to Anne Arundel County that are not addressed within the Maryland Stormwater Design Manual

- 100 Year Flood Delineation
- FEMA Base Flood Elevation and previously platted Base Flood Elevation
- Floodplain Study – Simplified / Detailed Studies
- For both Stormwater Management Regulations

To ensure that stormwater facilities continue to function, a stormwater design will need to include a determination of a future wet-season water table. The future wet-season water table will be assumed to be increased by the difference in sea level in the year that the wet-season water table determination was made and the projected sea level 30 to 50 years after permitting. The estimated sea level rise projections adopted by the County would be used for this determination. A newer approach to stormwater management is called Low Impact Development or Design (LID). This approach seeks to replicate a more natural hydrologic function on the landscape and uses a combination of stormwater management practices to meet stormwater management objective. Some of these practices include pervious pavement, vegetated swales, vegetated filter strips, bioretention systems, cisterns, and green roofs.

Building Codes

The County's building code establishes regulations for the design, construction, alteration, and maintenance of structures. These regulations ensure both that new construction uses sound methods and materials, and that existing buildings are kept in a state of good repair. The use of strong building codes supports hazard mitigation by limiting the loss of life and property when disaster strikes.

Anne Arundel County has adopted model building codes maintained by the International Building Code 2021, FEMA has developed recommendations for making building codes more hazard resistant, largely through FEMA's Mitigation Assessment Teams (MATs). For more than 30 years, MATs have been working with state and local officials to investigate the performance of buildings and infrastructure after disasters, down to the types of nails that are used to join wood framing members and the spacing of the nails. The investigations have shown that strengthening buildings reduces losses (FEMA). MAT reports develop recommendations for changes in construction methods based on field investigations and building science research. Priority recommendations are then adapted into building code amendment proposals.

FEMA's advocacy of building codes extends to code adoption by states and communities. For example, the Community Rating System, which is part of FEMA's National Flood Insurance Program (NFIP), is a voluntary incentive program that encourages community adoption of

hazard-resistant building codes to exceed the minimum NFIP requirements. The incentive is that the community's flood insurance premiums are discounted.

Town of Highland Beach

The Town of Highland Beach Comprehensive Plan was prepared in 2020, and formally adopted by way of resolution on December 19, 2020, split into two sections. The first section concentrates on background and contemporary character and the second section concentrates on external factors impacting life in Highland Beach. The second section mirrors the results of the 2020 County HMP and provides a local perspective on the following hazards:

- Coastal Flood
- Nuisance Flood
- Groundwater and Flooding – precipitation, stormwater runoff, and subsidence
- Hurricane, Tropical Storm, and Nor'easter
- Drought
- Earthquake
- Extreme Heat
- Thunderstorm
- Severe Winter Storm
- Tornado
- Wildfire
- Erosion

Through the completion and adoption of the 2020 Town of Highland Beach Comprehensive Plan, that includes hazard mitigation profiles, related goals, policies, and implementation strategies, the Town's capabilities have been enhanced since the previous planning cycle.

Sensitive Areas

Highland Beach enacted a Sensitive Areas Element in December 1998 to protect four sensitive areas of our town. This was particularly to recognize the Town's proximity to the Chesapeake Bay as well as to Black Walnut and Oyster Creeks, and to acknowledge our continuing commitment to environmental protection. The four areas include: creeks and their buffers; the 100-year floodplain; steep slopes; and habitats of rare, threatened, and endangered species.

Emergency Operations Plan

The Town of Highland Beach Emergency Operations Plan provides a framework for use in performing emergency functions during a major emergency or disaster. The Town Hall is available to provide temporary protection from the effects of a disaster or impending disaster, is suitable for a temporary (2 day) shelter and is equipped with power generator, AED, first aid supplies, and water.

The Mayor and Commissioners have the responsibility for assuring that the Town Hall is physically opened. The Town Hall will be opened on demand during power outages by contacting the Mayor or any Commissioner. The Town Hall will be opened when there is the need for shelter during an emergency. If an evacuation is ordered by the State or County the Town Hall will not be available for shelter. Notice of a recommended or ordered evacuation is accomplished by Anne Arundel County Police and Fire Department personnel.

3.3.1.23 Potential Funding Sources

Funding Plan

The funding plan aligns the 2025 Anne Arundel County Nuisance Flood Plan with appropriate funding mechanisms and an implementation program. The funding plan also considers other influential factors affecting the timing of investments and provides a recommended approach to fund mitigation measures identified in the 2025 Nuisance Flood Plan. Figure 3.3.1-5 presents the process used to develop the funding plan.

Analyze the categories and costs of capital and ongoing management actions within the 2025 Nuisance Flood Plan to develop investment priorities. The process included the following steps within the financial analysis:

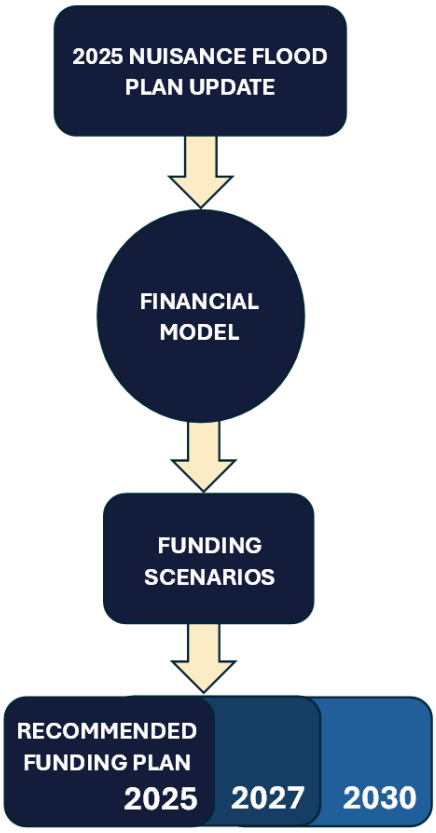


Figure 3.3.1-5: Funding Plan Process.

Financial Model

- Apply existing and potential new funding mechanisms
- Apply other influential factors, such as ability to pay and cost-share agreements
- Align local & state implementation programs with potential funding mechanisms

Funding Scenarios

- The financial model analyzed several possible funding scenarios ranging from partial to full funding
- Funding scenarios provide insight on mechanisms required and contribution from cost-share partners

Recommended Funding Plan

- The timing of investments results from an optimal funding scenario that would fund the 2025 Nuisance Flood Plan recommendations
- Investments over the next 10 years (short term – 2027 and long term 2030)
- Research new funding mechanisms
- Increase cost-shares for federal, State, and local partners

Applying Funding Mechanisms

Many uncertainties will affect future flood management investments. The financial model should build in these uncertainties as prescribed constraints: prioritized management actions, existing and potential new funding mechanisms, and other influential factors such as ability to pay or cost-share agreements.

Prioritized management action should be matched with the state flood management implementation programs and then matched to existing and new funding mechanisms. The financial model should also include multiple scenarios that vary revenues of existing and potential new funding mechanisms, contributions from cost-share partners, and other constraints. The multitude of scenarios included in the investment strategy should range across

(1) decreased investment in all activities
(2) current level of investment for all activities
(3) funding only ongoing investments and no capital investments
(4) fully funding ongoing investments and partially funding capital investments
(5) fully funding ongoing and capital investments

This range of scenarios helps identify solutions as future funding constraints and political conditions change. The financial model will make recommendations to fund ongoing and capital investments, with flexibility to adjust over time in future plan updates as implementation proceeds.

A variety of potential funding mechanisms are summarized in Table 3.3.1-16. The table briefly describes local, State, and federal funding mechanisms by providing a summary description of each mechanism, what management actions it best applies to, and the role the mechanism could play in the investment strategy. Assessment-based funding mechanisms are designed to have a clear nexus between the benefits received and the costs allocated to the user or property.

The recommended timing of investments results from a funding scenario that would fund the recommendations of the 2025 Nuisance Flood Plan over 5 years, can be divided into three phases described below.

Phase 1: Reactively address the highest levels of risk to lives and assets concentrated in the densely populated areas. Funding comes from increasing revenue from existing sources. Phase 1 also leverages the most promising and readily viable opportunities for ecosystem restoration that exist in the County.

Phase 2: is aimed at actively transitioning to more balanced flood management. Funding would require sustaining Phase 1 revenues and adding new state and federal revenue sources. Ongoing Phase 2 actions should emphasize increasing state operations, planning, and performance tracking activities; studies and analysis; reservoir operations; and more floodproofing and land use planning activities.

Phase 3: is aimed at proactively balancing flood management system investments for both capital and ongoing activities in a sustainable manner. Funding is based on sustaining revenue levels as established in Phases 1 and 2.

Table 3.3.1-16: Summary of Funding and Financing Mechanisms

Funding Source	Description	Applicable Actions	Level of Applicability	Reliability	Recommendations
State					
State General Fund	The General Fund has traditionally funded some flood management. The funding plan recommends increasing General Fund appropriations.	All capital and ongoing management actions	Applicability is high. There is a nexus between lowering the risk of flooding and benefits to the State economy.	Moderate	Key part of short term strategy
State Flood Insurance Program	The State would augment/replace the NFIP program with a State-led program. Beyond providing risk coverage, the program would be set up to invest in infrastructure and other floodplain management activities that reduce flood risk. Another version of this could be a local basin-wide insurance program. A local basin-wide insurance program could potentially be a companion program with the Statewide Flood Insurance Program. Any new program could also consider insurance for agricultural properties.	small-scale floodplain storage, land acquisitions and easements	Applicability is high (anticipated to generate $5 to $20M/year; however, this would require significant effort to determine feasibility). There is a strong nexus between insurance and the benefits received as rates could fluctuate depending on benefit level.	High	Target long term project
General Obligation Bonds (GO Bonds)	Issuance of new State general obligation bonds would require a statewide vote. This mechanism would require time to prepare language for the bond measure for the statewide vote, as well as a 2-year lag before funds would be available after passage.	Systemwide capital actions, levee improvements, small-scale levee setbacks and floodplain storage, land acquisitions and easements, habitat restoration/reconnection	Applicability is high. The benefits of reducing the flood risk and benefits to the State economy create a nexus with this mechanism.	High for bonds that have passed, low over the long term	Could continue to play a significant role in capital investments

Table 3.3.1-16: Summary of Funding and Financing Mechanisms

Funding Source	Description	Applicable Actions	Level of Applicability	Reliability	Recommendations
Federal					
USACE	The Water Resource Development Act (WRDA) authorizes the Secretary of the Army to study and/or implement various projects and programs for improvements and other purposes to rivers and harbors of the United States. Federal authorized funds would require appropriation by Congress.	Systemwide capital actions; urban levee improvements; small-scale levee setbacks and floodplain storage; rural land acquisitions and easements; habitat restoration/ reconnection; risk awareness, floodproofing, and land use planning; urban and small community studies and analysis	Applicability is high. Projects qualifying for USACE funding have to demonstrate that they provide national benefits to receive funding.	Moderate	Key part of Federal contribution
FEMA	FEMA is the disaster response agency of the federal government. As such, FEMA provides State and local governments with funding for emergency preparedness programs in the form of non-disaster Grants.	Risk awareness, floodproofing, and land use planning; rural and small community studies and analysis	Applicability is high (expected to generate no more than $10M/year). The limited uses of the funds maintain the nexus between the funds and benefits received.	High	Provides smaller percentage of overall funding
Ecosystem Programs	There are several federal programs that provide grants for ecosystem purposes. For example, voluntary Farm Bill conservation programs are offered through Natural Resources Conservation Service (NRCS).	Habitat restoration/ reconnection, rural land acquisitions and easements	Applicability is high. The application process for these funds would require a nexus to be shown.	Moderate	Programs should be explored to augment funding

3.3.1.24 Plan Implementation

The proposed tracking, reporting, and response to be utilized by County agencies to collect information on high tide flooding incidents is the same that is used to report and track other flooding or service concerns. High tide flooding incidents are expected to increase in frequency and severity over the next decades. The County anticipates that many of the systems for collecting data from residents will remain the same, but how that information is cataloged once in the system will be modified to allow the County to better track these incidents over time.

Members of the HMPC will be responsible for tracking high tide flood events over time. This will require a coordinated effort between County agencies and departments such as the Office of Emergency Management, the Department of Public Works, the Fire Department. Regional, state, and federal agencies such as the Maryland State Highways Administration, Maryland Department of Natural Resources, Maryland Department of Emergency Management, and NOAA and FEMA may also be asked to participate or otherwise provide input into the process.

Another key source for tracking and logging information is the Anne Arundel County's 311 service. This service is a one-stop call center that County residents may call to get answers to questions and receive assistance with non-emergency issues. Residents may ask questions, report problems, request a service, or check on the status of a previously submitted service request via a live agent-assisted phone call, in person during regular business hours, or through the self-service web or mobile portal at any time. Issues stemming from high tide flood events may be logged under several different service types, such as:

- Drainage Ditch
- Flooding (Yard/Private Property)
- Flooding and Drainage Issue (Public Right-of-Way)
- Storm Drain Maintenance
- Storm Drain Pipes – Repair/Replace
- Sewage Overflow

Information from County departments and agencies and 311 will be collected on a bi yearly basis, and flooding or service request data received will be reviewed based on the event's location and whether the incident occurred during a high tide event. Information will be collected and an internal dataset maintained of nuisance flood events. This will allow the County to analyze data to validate known high tide flood areas of concern, identify new ones, identify appropriate responses, and prioritize areas for future action.

MyCoast Application

The projected extent of nuisance flooding through modeling alone is limited because of the influence of local conditions (e.g. wind direction, local topography, etc.) which are at too small of a scale that the model cannot account for. The County will also evaluate the use of the MyCoast: Maryland mobile app to help manage and monitor nuisance flooding impacts at the local level. The MyCoast app was developed by NOAA and the NWS and tailored to fit the needs of Maryland in partnership with the Maryland Department of Natural Resources. It is a citizen-based data collection app to document the effect and impact of high tides flooding on the state's coastline. Users take photographs of flooding and submit them through MyCoast. These submissions are called "reports." The application captures the time and location of the photograph, as well as the weather and tidal conditions. They can be downloaded to inform decisions on how to address nuisance flooding. The app has been tailored for Maryland to also collect information on precipitation-caused flood events.

Next Steps and Future Considerations

Anne Arundel County, like most communities that have coastal exposure, is experiencing flooding outside mapped floodplains with increasing frequency. This is only expected to increase in duration, depth, and frequency (NOAA, 2020). This includes high tide flooding as described in this nuisance flood plan.

Anne Arundel County Office of Emergency Management, will establish and convene a steering committee to expand the scope of this nuisance flood plan to ensure cross-departmental interaction, further refine the plan's development, and lay out a strategy for public engagement. Future enhancement to the plan may incorporate additional information on sea level rise, equity and vulnerability assessments, and additional information and studies to ensure that public safety, current and future infrastructure, comprehensive planning, and hazard mitigation planning are appropriately addressed.

Responsibility for implementing this plan and future phases of the plan will be shared by County departments and agencies. Approval of the plan by County Council will allow elements and actions to be incorporated in the Hazard Mitigation Plan update in 2025 and the next Comprehensive Plan update. The Council may similarly approve the plan by incorporating it as an appendix to the 2025 Hazard Mitigation Plan update. Projects identified under this plan may be incorporated into the Capital Improvement Plan or proposed for grant funding.

REFERENCE APPENDIX

Nuisance Flooding Documentation

DocuSign Envelope ID: 80BE8758-480E-4621-9A62-89FBF36B4532

Nuisance Flooding Documentation Tool

Nuisance Flood Log									
Date	**Time**	**Reporter Name**	**Reporter Phone**	**Dispatcher (if applicable)**	**Street Name / Cross Street**	**Impacts**	**Agency Notified**	**Agency Staff Notified (Name)**	**Action Taken (if known)/ Notes**