

Commissioners of Bel Air
Agenda
August 20, 2018

Resolution No. 1115-18

RECOMMENDED MOTION:"...that Resolution No. 1115-18, updating the Town of Bel Air Flood Mitigation Assistance Plan (FMAP), be approved by the Bel Air Board of Town Commissioners."

I. BACKGROUND

The Town approved a Flood Mitigation Assistance Plan (FMAP) prepared by G. W. Stephens, Jr., and Associates, Inc. as part of grant funding provided by FEMA and the Maryland Emergency Management Administration on September 4, 2012. The Plan was designed to identify, evaluate and determine mitigation priorities in order to minimize probable flood damage within the community.

II. PRIMARY ISSUES

With a FEMA-approved Flood Mitigation Assistance Plan the Town is eligible for FEMA grant funding for flood mitigation projects. The Town participates in the Community Rating System (CRS), a program that establishes ratings based on flood prevention measures and awards flood premium reductions. The Town currently holds a Class 6 rating which provides property owners a 20% premium reduction. As a condition of the FMAP approval and CRS credit, the Plan must be reviewed and accepted annually and updated every 5 years.

III. DISCUSSION/EXPLANATION

The updated plan before the Town Board was prepared by the Directors of Planning and Public Works, the Deputy Director of Public Works, and the Senior Planner. A revised action matrix of proposed and planned flood prevention measures is included as part of the update.

IV. RECOMMENDATION

The staff recommends approval of Resolution No. 1115-18.

RESOLUTION NO. 1115-18

A RESOLUTION APPROVING AND ACCEPTING THE TOWN OF BEL AIR
FLOOD MITIGATION ASSISTANCE PLAN 2018 UPDATE

WHEREAS, there are locations within the Town of Bel Air that can be susceptible to flooding during significant rain events; and

WHEREAS, the Federal Emergency Management Administration in conjunction with the Maryland Emergency Management Administration provide grant funding to local governments to facilitate the development of Flood Mitigation Assistance Plans designed to identify, evaluate and determine mitigation priorities in order to minimize probable flood damage within the community; and

WHEREAS, the Federal Emergency Management Administration and the Maryland Emergency Management Administration approved the Town's Flood Mitigation Assistance Plan in September 2012; and

WHEREAS, the Departments of Planning and Public Works are required to evaluate and update the Plan to meet the minimum requirements for flood mitigation plan credit in the Community Rating System.

AND BE IT FURTHER RESOLVED by the Bel Air Board of Town Commissioners that this Resolution shall become effective upon the date of its passage.

PASSED AND APPROVED: _____

AYES:

NAYS:

ABSENT:

Susan U. Burdette
Board of Town Commissioners

Michael L. Krantz, Town Clerk

The Town of Bel Air is a small town located in the western part of the county. The town is situated on the western side of the county, and is one of the smallest towns in the county. The town is located in the western part of the county, and is one of the smallest towns in the county. The town is located in the western part of the county, and is one of the smallest towns in the county.

Town of Bel Air

2018 Flood Mitigation Plan

A revision to the 2012 Flood Mitigation Plan as required by the Town's participation in the Community Rating System

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CHAPTER 1 – PREPARING A FLOOD MITIGATION PLAN

Introduction

The NFIP (National Flood Insurance Program) encourages communities to take measures to address potential and known flooding issues. To assist in this effort, FEMA (Federal Emergency Management Agency) provides community funding for the development of a Flood Mitigation Plan. The Town of Bel Air initiated the process of preparing a Flood Mitigation Plan in early 2010. The objective of the Plan was to identify primary flood hazard areas, provide actions to alleviate or minimize future damages and losses, and to enhance public safety.

This Plan is an update of the original Town of Bel Air Flood Mitigation Plan. The Plan includes floodplain map changes, policy and ordinance revisions, and an accounting of flood-related projects and activities since the previous Plan's adoption. This Plan is intended to serve as the basis for the Town's action plan for flood mitigation.

The Planning Process

Town of Bel Air Flood Mitigation Committee

In March 2010, a Flood Mitigation Plan action committee was formed under the direction of Robert Syphard, Senior Planner for the Town. The Committee was organized as an initial step in the formation of a Flood Mitigation Plan for Bel Air and included Town employees from the Planning and Public Works Departments, a Town official, and several local residents and professionals interested and/or involved in flood-related mitigation practices. The Committee was recognized by the Town Board of Commissioners in April 2010 as the group responsible for preparing the Plan, and the Plan was formally adopted by the Town on September 4, 2012.

Once the action matrix became the working document for reducing flood hazards, Town administration determined review and update of the matrix was better served through a committee of staff. Therefore, the Committee membership was reduced to include the Town's Senior Planner, Director of Planning, Director of Public Works, and Deputy Director of Public Works. In their capacity as members of the Committee, these individuals review annual flood events and the impact those events have on Town residents and infrastructure. Together they itemize and update the action matrix of flood related projects.

The ongoing planning and update process for the Flood Mitigation Plan involves three primary phases carried out by the Plan Committee on an annual basis:

1. Assessment of flood hazards, risks and vulnerability
2. Development of an action plan matrix
3. Adoption and implementation of the action plan

As part of the assessment process, the Committee follows a set of six (6) goals established by the original Committee when reviewing possible mitigation activities:

- Preventive activities that minimize existing problems through zoning, floodplain and storm water management ordinances
- Property protection measures that address individual structures and properties such as location/relocation, flood proofing practices and flood insurance requirements
- Natural Resource protection activities such as wetlands protection, forest conservation easements, etc.
- Emergency services including evacuations, sandbagging and warnings
- Public information programs including technical assistance and brochures
- Structural projects such as channel improvements, storm drainage improvements, and construction of levees or retention/detention basins to reduce flooding downstream

The Committee uses the goals to develop an annual action matrix of prioritized projects aimed at reducing flood related hazards, both short and long term. The Town is required to prepare an annual progress report of Plan action items for Community Rating System (CRS) class rating credit. The Committee's annual reports for this process (2014 through 2017) are included in Appendix A.

Flood Mitigation Objectives

Flood Mitigation Plan requirements are listed in the Code of Federal Regulations (CFR) Title 44, Section 78.5. The Bel Air Flood Mitigation Plan includes the following:

- A description of the planning process
- Descriptions of flood hazards, identification of flood risks including estimates of the number and types of structures at risk, and the extent of flood depth and damage potential
- Itemized floodplain management goals
- Identification and consideration of technically feasible and cost effective mitigation actions
- Action items that will reduce the risk of property damage, injury potential and loss of life for the community due to flooding

By adopting and maintaining an up-to-date Plan, the Town is eligible for Federal funding for flood mitigation projects.

CHAPTER 2 –FLOOD POTENTIAL IN BEL AIR

Introduction

The Town of Bel Air is located in central Harford County, northeast Maryland. It lies approximately equidistant between Washington, D.C. and Philadelphia, near the busy I-95 corridor. Bel Air consists of approximately 3.1 square miles of land and is located within the Piedmont Plateau physiographic province. The Town – one of three municipalities in Harford County – has a population of 10,681 residents, its population density approaching 3,500 persons per square mile. The Town's largest

employers are Upper Chesapeake Medical Center, with approximately 1,800 employees, and Harford County Government, with approximately 1,600 employees.

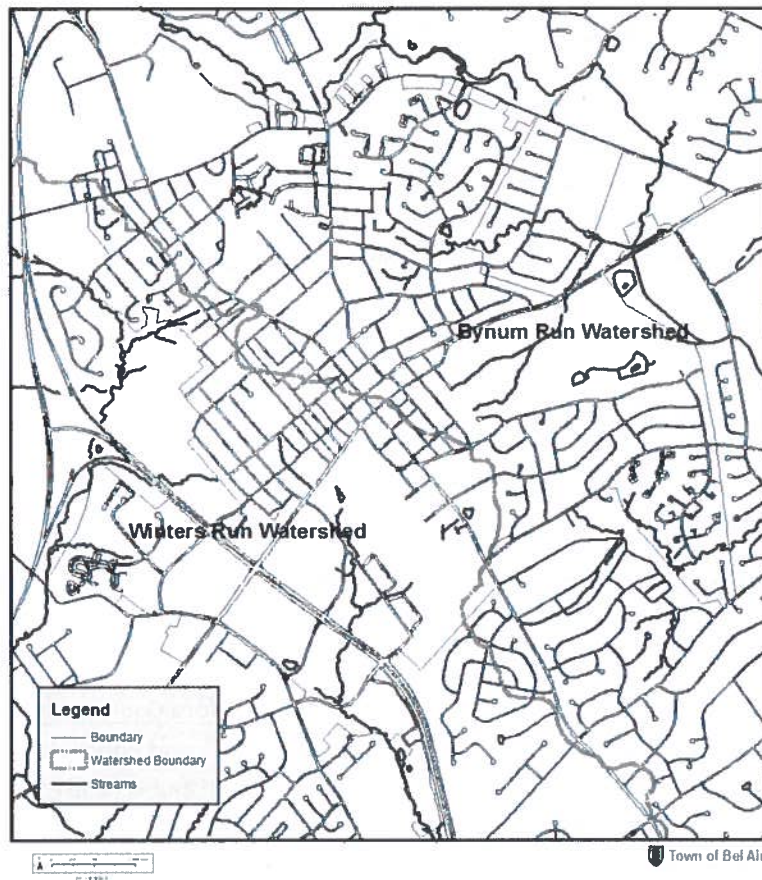
Land area in town is typified by rolling hills and unnavigable stream valleys. The Town is developed nearly to its fullest extent, with little land available for new development. Most development within Town boundaries now consists of redevelopment or through expansion of existing residential, commercial or institutional buildings.

Bel Air's location between the Appalachian Mountains and the Chesapeake Bay and Atlantic Ocean provides a more moderate and humid climate than those areas found further inland at a similar latitude. Riverine and flash flooding are the two major flood hazards that impact the Town's two major watersheds – Winters Run and Bynum Run – with Plumtree Run and Bynum Run the two major stream courses impacted. Riverine flooding is the result of increased runoff collected throughout a drainage basin with water accumulation causing flood level rise downstream. This process usually takes many hours, days or even weeks to fully materialize. By contrast, flash flooding occurs in a very short period of time and is caused by sudden localized torrential rains or dam breaches. This type of event is similar to riverine flooding but typically occurs more suddenly, over a smaller area, and with little warning. This is the type of flood event that devastated downtown Ellicott City, Maryland on July 30, 2016.

Recent Flood Events

The Town of Bel Air and surrounding communities in Harford County, Maryland have experienced several heavy precipitation events which have generated instances of flooding. Fortunately these occurrences are infrequent. None in recent memory were considered major as far as damages or losses are concerned. Most flooding events resulted in localized flash flooding.

Bel Air Watersheds



Review of existing records and archival data by the Department of Public Works, Department of Planning and the Police Department was done to determine significant storm events in the Town's recent past. As indicated below, no significant flooding events in or around the Town were recorded from 2010 to the present. Flood damage during localized events has occurred outside Town boundaries with only minor instances identified in Town.

August 2011 – Hurricane Irene did not make direct landfall, but due to its large size, hurricane conditions were felt to the east of the Chesapeake Bay, and tropical storm conditions were felt as far inland as Frederick, MD. In Central Maryland, sustained winds of 30-40 mph, gusts up to 65 mph, and 3-5 inches of rain fell. Most of the damage sustained was from falling trees which blocked roads, crushed power lines, and toppled onto houses.

September 2011 – Tropical Storm Lee brought heavy winds and rains to Maryland Counties. Rainfall totals between 10'-11" inches resulted in only minor damage to the Bel Air area.

October 2012 – Hurricane Sandy makes landfall north of the state. However, due to the tremendous size of the storm, its effects were felt all over Maryland. The peak of the storm brought 60 mph sustained winds. Heavy rain affected the state with totals between 7"-8" inches. Bel Air suffered only minor damage.

June 2013 – Rain bands from Tropical Storm Andrea caused minor flooding in the Baltimore-Washington area and parts of the Eastern Shore, with rainfall totals of just over 3" in Bel Air.

May 2014 – Heavy rain between 7" to 8" inches fell in the Bel Air area from severe thunderstorms.

June 2015 - A line of severe storms hit Harford shortly after 8 p.m. Heavy rain led the NWS to issue a flash flood warning. Some local flooding was reported: Route 7 at Route 136 in the Creswell area was closed because of high water from nearby Bynum and James Runs. Minor power outages from toppled trees were reported in the Bel Air area.

August 2015 – A severe thunderstorm brought heavy rain to Bel Air with minor flash flooding.

August 2017 – A severe thunderstorm brought heavy rain to Bel Air with minor flash flooding.

EVENT	DISCHARGE RATE (Bynum Run Stream Gage)	FLOOD FREQUENCY
August 2011	1950 cfs	2 year storm
September 2011	2230 cfs	5 year storm
October 2012	1020 cfs	1 year storm
June 2013	1840 cfs	2 year storm
May 2014	2340 cfs	5 Year storm
June 2015	2830 cfs	5 year storm
August 2015	5900 cfs	25 year storm
August 2017	3580 cfs	7 year storm

USGS 01581753 ATKISSON RESERVOIR NEAR BEL AIR, MD

CHAPTER 3 – HAZARD ASSESSMENT

Introduction

Flooding in the Town of Bel Air may occur primarily as a riverine flood propagated by localized heavy precipitation events or from large scale rainfall events such as hurricanes, tropical storms and Nor'easters. During these events streams receive runoff from overland and underground storm drain systems which overflow stream banks. Two other potential flood sources – dam breach and local street flooding -- have been identified as well.

Flood Mapping

The baseline storm event for jurisdictional control, mapping and flood insurance provisions is the one-hundred (100) year storm. This is a flood event that has a 1% chance of occurring in any given year. Since the 1970s, FEMA has contracted with consultants and local government agencies to produce maps of the one-hundred year floodplain based on hydrologic and hydraulic modeling or estimated levels. The process has been completed for over 3,000 U.S. counties and is continually under review and updated.

FEMA most recently updated the Harford County Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) on April 19, 2016 (the previous flood study and associated maps were approved in 2000). Referenced floodplain areas for the Town are depicted on FEMA FIRMs 24025C0161E-0164E. The boundaries are geographically referenced in digital format by FEMA and presented as digital FIRMs (DFIRMS). The updated 2016 FIRMS are more detailed; the mapping process included the conversion of existing HEC-2 studies to HEC-RAS with updated structure data (where available) from the Maryland Department of the Environment (MDE) structure inventory (HEC, 2010). Models included: channel data from the effective data and new overbank geometry and streamlines from the new terrain; updated Manning's "n" values; and the new discharges. The hydraulic analyses for the FIS are based on unobstructed flow. The flood elevations shown on the Flood Profiles in the Study are considered valid only if the hydraulic structures remain unobstructed, operate properly, and do not fail.

FEMA has mapped three main streams within the Town that have large enough drainage areas and associated flood risks to warrant mapping for flood insurance purposes. The streams are: (1) Plumtree Run in central Bel Air; (2) Bynum Run and an unnamed tributary on the north and east sides of Town and near the Department of Public Works facility on Churchville Road; and (3) Farnandis Branch (a tributary to Bynum Run) on the east side of Town. Plumtree Run and Farnandis Branch are located in headwater areas of each respective stream system. The total drainage area within the Town for Plumtree Run is approximately 30 acres at the Thomas Street cross section location of the approved FIRM, 60 acres at the George Street cross section, 80 acres at the Business Route 1 (Baltimore Like) cross section, and 880 acres at the Route 24 cross section. Farnandis Branch has a total drainage area of approximately 500 acres at the Incorporated Town Limits. The one hundred year peak discharge at that point is 1,800 cubic feet per second (CFS). Bynum Run possesses a much larger drainage area as it

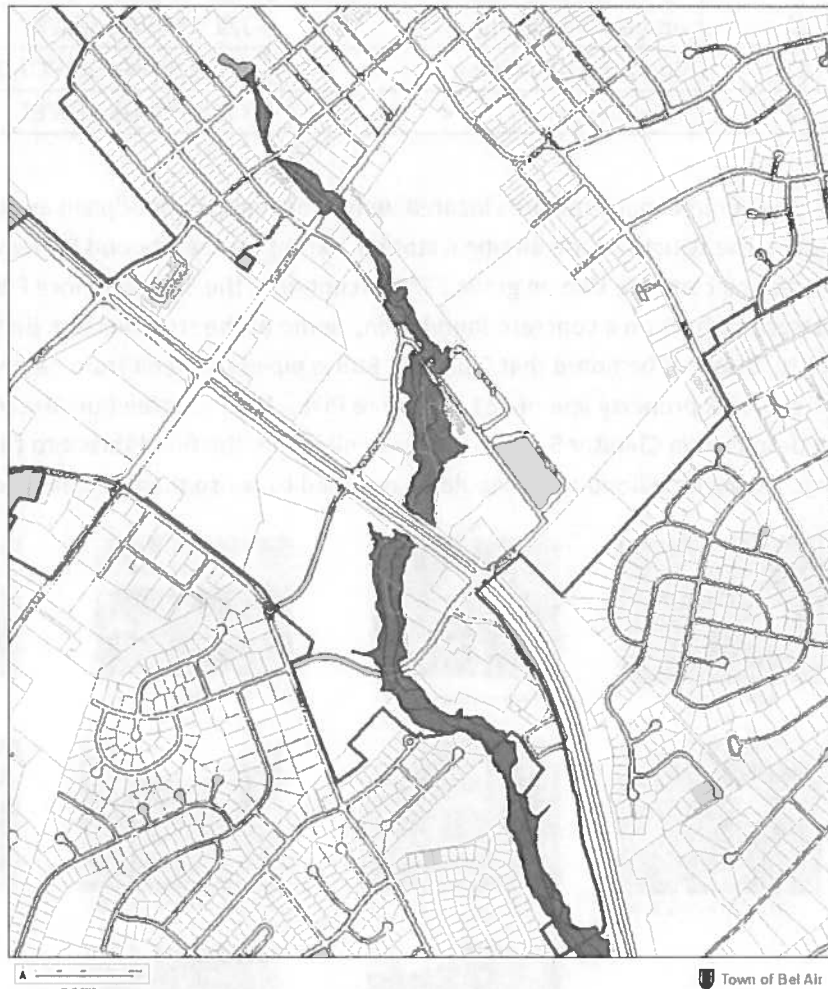
transects the Town. The drainage area to Route 1 is approximately 1150 acres, while the drainage area to Route 22 – also known as Churchville Road – is 5,400 acres.

Town staff is able to use a Geographic Information System (GIS) to project the digital flood boundaries onto orthophotography to determine what structures and infrastructure are most subject to flooding. Using this method approximately nineteen (19) structures appear to be potentially impacted by riverine flooding during a 100-year storm event. In addition to structures, several local and arterial roads are potentially impacted by high flows overtopping roadways, including Business Route 1 and Maryland Route 22. These two roads carry high traffic volumes on weekdays and are primary arteries leading into and out of Bel Air.

Plumtree Run

Floodplain maps of Plumtree Run indicate the most significant possible impacts to structures and infrastructure in the Town. This stream begins in an existing residential community north of Thomas Street and flows in a southeasterly direction through a community park and then through a commercial district. The FIRMs indicate floods may overflow Baltimore Pike (Business Route 1), a vital road link through the Town. In addition, four other roads appear to have the potential to flood during heavy storms. These roads are itemized in Table 2.

Plumtree Run in Bel Air



The mapped floodplain boundaries include twelve (12) structures impacted by flooding: Eight (8) commercial structures; two (2) residential structures; and two (2) accessory units. The following table lists the structures at risk to flooding along Plumtree Run.

Structure ID	Description	Location	Flood Depth (approx.)
1	Commercial building (vacant)	332 BALTIMORE PIKE	2'
2	Commercial building (vacant)	334 BALTIMORE PIKE	1'
3	Commercial building	307 S. ATWOOD ROAD	2'
4	Commercial building	305 S. ATWOOD ROAD	2'
5&6	Car wash and accessory building	328 BALTIMORE PIKE	1'
7	Commercial building	303 S ATWOOD ROAD	2'
8&9	Residential townhouses	699 RED OAK DRIVE	<1'
10	Accessory building	321 GEORGE STREET	<1'
11	Commercial building	602 S. ATWOOD ROAD	2'
12	Townhouse	345 GEORGE STREET	2'

Table 1

The commercial structures located within the mapped floodplain are primarily masonry structures. The structures are all single storied, except for the Atwood Professional Center, and are constructed on concrete slab on grade. The exception is the 332 Baltimore Pike building which is a wood structure built on a concrete foundation. Some of the structures on Baltimore Pike date back to the 1920s. It should be noted that Plumtree Run is piped between from Baltimore Pike to a point beyond the back property line of 331 Baltimore Pike. The Plumtree Run Stream Corridor Restoration Project described in Chapter 5 of the Plan may eliminate the flood threat to the 602 South Atwood Road building. However, a flood study would be required to revise the floodplain boundary.



Structure #1



Structure #2



Structure #3



Structure #4



Structures #5 & #6



Structure #7



Structures #8 & #9



Structure #10



Structure #11



Structure #12

The residential structures potentially affected by flood waters consist of wood framing construction with vinyl and/or brick siding. The George Street townhouse was built with a basement and is therefore most at risk. The Red Oak Drive townhouse units are built slab on grade. No repetitive losses have been identified in in this floodplain area.

Plumtree Run Infrastructure at Risk

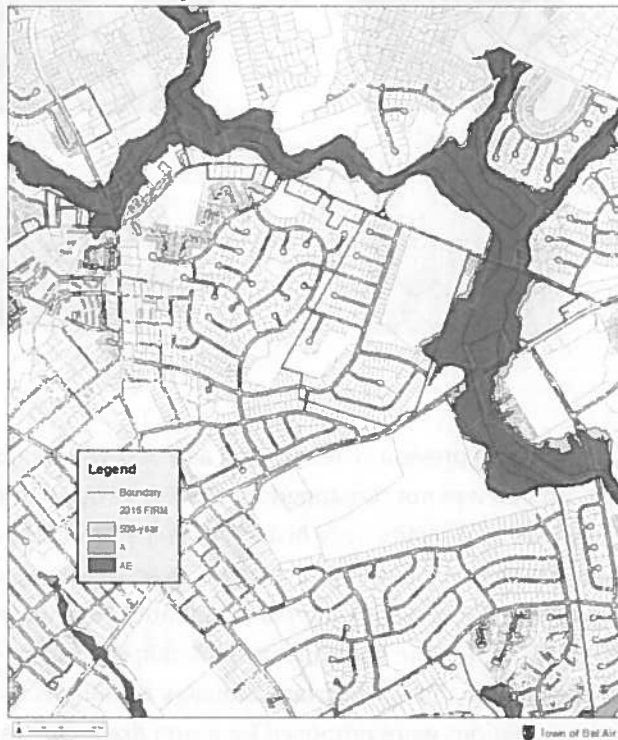
Road ID	Description	Location	Flood Depth
A	Thomas Street	Between Western Alley & Atwood Road	1 ft. +/-
B	George Street	Between Western Alley & Atwood Road	NA
C	Baltimore Pike	Between Atwood Road & Archer Street	2 ft.
D	Atwood Road	Between Red Oak Drive & Marketplace Drive	<2 ft.
E	West MacPhail Road	Between Atwood Road & Route 24	NA

Table 2

Bynum Run

The Bynum Run floodplain area is the second largest watershed in the County, running through the center of the County from Forest Hill north of Bel Air to the Bush River, a tidal finger of the Chesapeake Bay. The watershed north of the Town is partly developed, primarily residential. Several apartment buildings and seven (7) townhouse units in the Heritage Woods Apartment complex are impacted by the 100-year floodplain, as well as several commercial buildings and the Town’s Departments of Public Works and Planning building.

Bynum Run in Bel Air



Structure ID	Description	Location	Flood Depth
1	Commercial shed	Moores Mill Road	1 ft. +/-
2	Auto Service Center	NE corner of Moores Mill Road and Route 1	1 ft. +/-
3	Apt. building	Almond Court	< 1 ft.
4	Apt. building & maintenance building	Cashew Court	< 1 ft.
5	Apartment townhouses	Cashew Court	<2 ft.
6	Office and maintenance building	TBA Public Works & Planning	< 1 ft.

Table 3

Structures 1 and 2 (a commercial shed and an auto detail service building, respectively) are wood framed structures built on concrete slab on grade. Structures 3, 4 and 5 are two/three story masonry buildings built on concrete slab on grade (no basements). The DPW/Planning building is slab on grade. Ancillary structures (a storage shed and a maintenance building) are also located in the floodplain. Parking areas serving the apartment complex and the DPW building are partly located within the mapped floodplain. No repetitive losses have been identified in in this floodplain area, although roadway and parking lot flooding is common.



Structure #1



Structure #2



Structure #3



Structure #4



Structure #5



Structure #6

An area previously recognized as a 500-year floodplain along an unmapped first order tributary to Bynum Run was not remapped for the 2016 FIRM. Units abutting the stream in this section of the Hickory Hills community have historically experienced minor flood damage during severe storm events. As noted in the previous Plan, the Town hired a civil engineering consultant to perform a flood study of a section of the Hickory Hills complex to identify potential retrofit remedial drainage improvements to alleviate flooding. The study identified localized flooding caused by an undersized underground storm drainage system and poor surface drainage conditions. In order to remediate the potential flood risk, recommendations were proposed for storm drain pipe replacement and foundation regrading.

There is also ongoing stream degradation through the Moores Mill Manor Condominium complex that impacts the entrance road and parking area for the complex.

An extensive area of the floodplain is located east of two recently approved townhouse developments. Both developments were reviewed following extensive mapping of the floodplain limits, and modifications to unit locations were made due to potential flood risk. All units are located outside the special flood hazard area boundaries, and all units are elevated above base flood elevation. Some lots do contain area within the 100-year floodplain.

The Town Public Works and Planning Departments building is located south of this area and is also impacted by the floodplain. Although the building is elevated, the roadway is relatively flat and does experience minor flooding. Minor road flooding has also been documented at several other locations along the stream course.

Bynum Run Infrastructure at Risk

Road ID	Description	Location	Flood Depth
A	Moores Mill Road	West of Route 1	1.5 ft. +/-
B	Almond Court	End	<1 ft.
C	Cashew Court	End	<1 ft.
D	Town DPW access drive	Between DPW and Churchville Road	<1 ft.

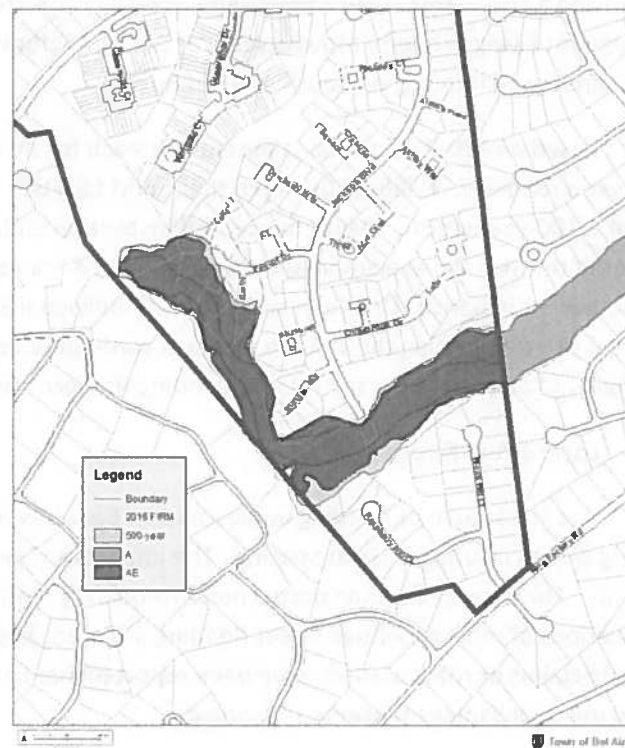
Table 4

Farnandis Branch

The Farnandis Branch is a named tributary to Bynum Run. The stream flows in a southern direction along the western edge of the Bradford Village subdivision and then easterly, dividing Bradford Village from the Brookhill Manor subdivision, before entering Bynum Run. The total drainage area within Town limits is approximately 510 acres. The floodplain area is largely protected by established forested area, most of which is platted as forest conservation and open space. The stream is slightly eroded with some bank degradation.

One single family residential structure is located within the floodplain boundaries (another unit is in close

Farnandis Branch in Bel Air



proximity to the floodplain). Both units are located on Spindle Hill. Both structures are wood framed with vinyl or aluminum siding, and both have basements.

In addition to these units eight vacant lots of record located on Pequot Drive are fully or partially within the 100-year floodplain. These undeveloped lots are scheduled to be rerecorded as open space and forest conservation. This area of the floodplain also includes mapped 500-year floodplain area. No repetitive flood losses have been documented in the Farnandis Branch.

Additional Sources of Flooding

Dam Breach

Dams are man-made earthen, concrete or other artificial barricades constructed to retain water in a reservoir. They are typically intended to control flooding, provide water supply for consumption or irrigation, or as a source of power when combined with electric and mechanical equipment to provide hydroelectric power. The only dams in the Town of Bel Air are earthen storm water management (SWM) facilities built after 1984 to provide flood control and/or water quality control for runoff from newly developed properties. All such dams were required to be constructed to meet USDA Natural Resource Conservation District – Maryland Pond Code MD-378 design and construction specifications.

No storm water management dam breaches would create a significant downstream flood threat in the Town of Bel Air. Minor localized roadway flooding may occur downstream of two dam facilities: an earthen dam located on the John Carroll School property on Churchville Road, immediately adjacent to the Town DPW facility, may impact Brierhill Drive at the Bynum Run bridge crossing during a dam breach; and a small storm water management facility constructed on the Parkview at Bel Air Senior Independent Living property (downstream of the 331 Baltimore Pike building) on Plumtree Run, may cause minor road flooding on South Atwood Road.

Based on MD-378 criteria, a potential breach for these dams would not exceed a flow of one foot over a roadway. It should be noted that SWM facilities are designed with a freeboard of one to two feet for a 100-year storm. Maintenance, self-inspection and Town inspection requirements are mandated through the execution and recordation of a Maintenance Agreement with the Town of Bel Air prior to permit issuance. Drainage areas to each individual SWM pond area are always small (less than 20 acres) thereby limiting the volume of storm water impounded. All of these considerations make the probability of a dam breach and related flooding risk inconsequential.

Local Street Flooding

The last source of flooding in the Town of Bel Air is storm drain system overflow or road surface flooding due to insufficient inlet spacing. The impacts are generally local and cause minimum impact to residents. This type of flooding occurs more frequently than riverine flooding or dam breach flooding. The locations of most repetitive street flooding areas are known to the Town Public Works officials and staff. No claims or road closures have been reported due to this type of flooding but recent events have caused minimal damage (basement flooding).

Other threats to the public can occur during a flood. Downed trees and power lines can threaten structures and public safety, respectively. Sparks from flooded breakers or downed power lines can cause fires. Leaking household containers and commercial drums can pollute floodwaters to unhealthy levels.

Vulnerability Assessment

The main objective of flood hazard mitigation is to increase the resistance of the potential for flood damage within a community so that residents and businesses experience less potential flood impacts in the future. Paramount to reaching this goal is a solid understanding of what the current threats are and what possible losses may occur if flooding does occur. The previous section identified nineteen (19) structures, additional ancillary portable structures and roadway infrastructure within mapped 100-year floodplain zones. This data is used to broadly evaluate the vulnerability of the Town and its residents to flooding.

The primary factors in determining the value of possible flood damages within a community is the depth of flooding, the frequency of flooding, and the impact flooding has on property values. These three components go hand in hand in determining total losses. When flow depths rise, the potential for property damage and personal injury or loss of life increases. Property value may be assessed on two levels: real estate value and importance of the facility to the community. The first category tags higher flood damage losses to buildings with higher replacement or repair costs. The latter emphasizes the critical nature of the building or facility to stay in operation during an extreme flood event. Higher water levels will induce higher inherent risk to property and personal safety.

FIRMs and topographic maps were analyzed to determine the depth and frequency of flooding for the at-risk structures and roadways (the Tables list approximate flow depths within the Town). All 100-year flood depths are generally less than two (2) feet. In almost every case, flood levels are one foot or less. Without a detailed topographic survey it is difficult to determine exact flood elevations at each structure. Actual field topography may determine that actual flood depths in structures are lower. It is unlikely that flood depths are much higher than indicated in the aforementioned tables.

Roadway overtopping listed in the tables was determined from HEC-2 model information from Plumtree Run and FEMA Flood Insurance Study cross sections. It is apparent that, although no road closures have been recorded within the Town's mapped floodplains, the threat of closures and pedestrian or vehicle safety risks are present. (Riverine flooding at a depth of 6 inches at a road crossing is enough to topple an adult. Flow depths of 18 inches can float a car.)

Given the level of flood depths it appears the Plumtree Run corridor and private roads within Hickory Hills are most vulnerable to potential property damage and life safety. The main road flood hazards on the Bynum Run floodplain – Route 1 and Moores Mill Road and Churchville Road – are not within Town limits.

CHAPTER 4 – PROPERTY PROTECTION MEASURES

Introduction

Property protection measures come in different forms, some more expensive than others. Each measure can be implemented by a property owner or with some assistance from public agencies. The decision to implement a property protection strategy is based on the level of impact of flood hazard, cost effectiveness, structural feasibility, and land use. Emergency Services and education are also forms of protection measures implemented by local, state and federal agencies.

Property protection forms of flood mitigation include the following:

- **Barriers**
A constructed wall or earthen levees built to deflect or prevent flood waters from inundating a property or structure. These structures are typically built on properties with excess land. Flood walls are more expensive but require less land area. Walls have been used on several properties in Town to reduce flood risk. The main drawback of a barrier is that it may create a drainage problem or raise flood levels on an adjoining property. Any barrier to be constructed in close proximity to a flood hazard area must be reviewed to assure no change to the flood profile. Otherwise compensatory storage must be provided.
- **Building elevation or relocation**
Elevation involves physically raising a structure to or above the Town's freeboard requirement (two (2) feet). Raising a structure above the flood protection elevation (FPE) is more cost effective than relocation. However, the structure must be of size and have been built in a manner that permits elevation (raised foundation). Residential wood framed construction typically permits elevation and/or relocation of the structure.
- **Dry and wet flood proofing**
Dry flood proofing is a method of flood proofing that involves waterproofing walls and floors to prevent water intrusion. Sealing doors and windows and other openings can be adequate to prevent limited floodwaters from entering a structure. Walls can be sealed with a waterproofing material or membranes on largely impermeable surfaces. Sealants can be applied to masonry surfaces. Installation of backflow preventers on sewer laterals prevents floodwater from entering a basement. The Town's Flood Ordinance does not permit dry proofing of residential structures. Wet flood proofing measures allow water to enter and exit a structure. Elevation of a structure on a system of piers permits the free flow of floodwaters without damage to the livable area. Structures have to be built or raised to the FPE for this to be an effective measure.
- **Land acquisition**
Properties subject to frequent flooding may be acquired by a local or State agency, the goal being to remove the structure and utilize the property for open space. Acquisitions can be funded by FEMA but normally only after a flood disaster occurs. The Town has

no record of land purchases involving flood hazard mitigation, and there limited opportunities to pursue this measure.

- **Mandates**

Mandates are induced incentives created by local ordinances when voluntary or assisted measures such as those previously listed are inadequate. An example of this is the substantial improvement limitation in the Town's Flood Ordinance for flood-prone structures. Insured buildings that experience damage at 50% or greater value of the structure must comply with Flood Ordinance construction and location requirements. This implies that elevation, demolition or relocation become necessary should an existing structure experiences substantial damage.

Emergency Services

Government agencies assist during natural disaster events by warning, responding, and assisting the public. Some implementation efforts include:

- Threat recognition such as an early warning system. In Maryland, County Emergency Operation Centers (EOC) are alerted by the Maryland Emergency management Agency (MEMA) of pending emergencies such as flooding. The National Weather Service provides warnings through radio, television, and social media. The County and Town have the ability to mass voice message hazard threats, and radio systems are used for communication between local and State Police agencies. Warnings include activating the Emergency Operation Center, opening evacuation shelters, closing streets, closing public facilities (schools, libraries, etc.), and evacuation orders.
- Flood gauges operated by the United States Geological Survey (USGS) monitor water surface elevations and flow rates.
- Protection of critical facilities and infrastructure. The Public Works Department's access road has been threatened by floodwaters on several occasions, but the water depth has never impeded traffic flow.
- Post disaster relief – clearing streets, unclogging storm drains, cleaning up felled trees in public areas – are Town Public Works Department responsibilities. Power outages due to downed lines (and associated material clean up) is handled by Baltimore Gas & Electric contractors, while Harford County agencies provide shelters, safe drinking water and post-storm monitoring of necessary services.

Public Education

Educating people on the hazards of flooding helps reduce risk and damage. The Town provides the Harford County library with informational brochures, pamphlets and books on flood hazards and preparation. The Town web site provides floodplain maps and documents (such as this Plan) for review. The Planning Department routinely provides flood map determinations and insurance information by request

CHAPTER 5 – STRUCTURAL PROJECTS & NATURAL RESOURCE PROTECTION

Introduction

Structural projects are intended to prevent floodwaters from causing damage to property and/or structures, and to reduce erosion. These projects usually require land or easement acquisition and considerable planning. Some projects are small and can be provided at minimal cost where other, large scale projects may require coordination and funding from several sources. Examples of structural projects include channel improvements, storm water management, culvert or storm drain modifications, roadway or bridge improvements, and diversion of floodwaters.

Channel Improvements

One form of channel improvement that is cost effective involves removing debris – fallen trees, garbage, etc. – from stream courses. Removing blockages reduces upstream flooding and erosion near the blockage. Blocked storm drain systems cause local flooding and require maintenance cleaning to improve flow characteristics. Dumping is illegal by Code and is subject to fines. The Town has a volunteer stream clean-up program for parts of Plumtree Run, primarily for garbage removal. The Department of Public Works monitors problem storm drain systems and removes silt and debris on an as-needed basis.

Channel improvements that revise natural or man-made channels to handle greater flows require MDE and U.S. Army Corps of Engineers approval. An example is the Town's Upper Plumtree Run project, completed in 2008. Design and construction services were provided by a private contractor and focused on the removal of an existing piped section of Plumtree Run through Plumtree Park as part of an aquatic restoration/storm water management project. The headwater restoration project removed 670 linear feet of an existing concrete culvert, through which the headwaters of Plumtree Run flowed, and restored a narrow single-thread channel that meanders through a mosaic of wetlands of varying hydrology, floodplain and upland habitats. The project restored approximately 720 feet of stream channel, 0.16 acres of nontidal wetlands, 0.45 acres of floodplain, and 0.80 acres of upland riparian buffer.



Before



After

The Town, in partnership with our design/build consultant Ecotone Inc., using funds from the Chesapeake and Atlantic Coastal Bays Trust Fund FY17, completed Section II of the Plumtree Run Channel Improvements in 2017. Phase II of the project will improve water quality and habitat by incorporating

stream restoration, wetland creation, and floodplain connectivity. This project re-aligned approximately 1,240 linear feet of stream channel to create a stable planform geometry. The stream restoration has a drainage area of 0.37 square miles (236.8 acres), which is characterized as 56.5% impervious. This project was designed to remove 93 lbs. of Nitrogen, 84.32 lbs. of Phosphorous, and 55,651.20 lbs. of suspended solids per year. This is the equivalent of solids generated by 12.40 acres of impervious surfaces.



Additionally, the Town of Bel Air, in partnership with Ecotone, is applying for project construction funding under the Chesapeake & Atlantic Coastal Bays Trust Fund FY19 Solicitation. The Town intends to use this money to fund the Phase III, Section IV Plumtree Run Stream Corridor Restoration Project, which will improve water quality and habitat by incorporating stream restoration and floodplain connectivity. This project will re-align 1,935 linear feet of stream. The restoration project has a drainage area of 0.87 square miles (556.8 acres), which is characterized as 61.2% impervious. We calculate that the proposed project will remove 315.20 lbs. of Nitrogen, 209.90 lbs. of Phosphorous, and 236,040 lbs. of suspended solids per year (the equivalent of 19.35 acres of impervious surfaces). The Phase III, Section IV Plumtree Run Stream Corridor Restoration Project is currently in the permitting phase and will incorporate urban stream restoration best management practices (BMP).

Roadway Improvements

Roadway improvements include modifications to existing roads or bridges so that floodwaters do not exceed the height of the roadway. Modifications could include road or bridge widening, improvement to approach hydraulics to a structure, or raising the road surface. Some of these methods offer a higher success rate but in many cases are cost-prohibitive. The Town has not identified any bridge modification projects to date, and no chronic street closures due to flooding have been recorded.

Diversions

A diversion consists of a constructed berm or pipe that intercepts floodwater and conveys it to another location to reduce the primary flood hazard. The Town is essentially built-out and lacks land area for diversion-type projects making this form of project unlikely.

Natural Resource Protection

Natural Resource Protection practices that reduce runoff and improve the quality of life for local residents are numerous. They include the following:

- Best management practices
- Erosion and sediment control
- Wetlands creation and mitigation
- Stream bank restoration
- Forest Conservation

Best Management Practices (BMP) incorporate practices that reduce the impact of development by reducing runoff volumes and peak discharge values. These practices are now mandated by the new Maryland 2007 Storm Water Act throughout the State, which requires that Environmental Site Design (ESD) be utilized to the Maximum Extent Practicable (MEP). The Town adopted its version of the new ESD criteria in May 2010. ESD practices include the design and installation of:

- rain barrels
- dry wells
- micro-bio retention
- landscape infiltration
- submerged gravel wetlands
- enhanced filters
- rain gardens
- bio-swales, wet swales or dry swales
- infiltration berms

BMPs include the use of alternate constructed surfaces such as green roofs, porous pavers and reinforced turf. The essential point of ESD is to mitigate pollutant loads – and by default flooding – with the use of micro scale practices so that natural hydrology is mimicked. Treatment is provided at the point of contact in small areas in lieu of treating it a downstream location, such as a SWM facility.

The use of ESD practices is monitored by the Town of Bel Air in the SWM review process for new developments, as well as for redevelopment projects. Generally projects may be granted waivers of ESD on a case by case basis if a watershed management plan is in place, or if ESD practices are infeasible due to existing site constraints.

Erosion and sediment control practices during construction activities are required by Town Code and in accordance with the 1994 Maryland Standards and Specifications for Soil Erosion and Sediment Control. Properties that disturb more than 5,000 square feet of land area require a grading permit. Grading permits require that an Erosion and Sediment Control Plan be reviewed and approved by the Town and Harford Soil Conservation District. In addition, SWM design must be approved and permitted for projects with disturbed areas over 5,000 square feet.

Wetlands creation is normally implemented when development projects disturb existing wetlands areas and new wetlands are required to mitigate the loss. Wetlands provide a valuable natural protective barrier to stream valleys and act as a sponge to reduce pollutant loads running off impervious surfaces upslope. A wetland provides a natural habitat for a number of plants and animals. The Town has adopted wetlands regulations in compliance with Federal and State requirements. Design of new developments is required to protect wetlands and mitigate impacts. An undisturbed buffer of at least 25 feet is required for areas adjacent to all non-tidal wetlands.

Stream restoration involves the rehabilitation of eroded stream banks in degraded channels. The main reason for stream bank restoration is to protect banks from further erosion and undermining paved surfaces or structures in areas where bank slopes are very steep and immediately adjacent to developed land. They include structural devices such as gabions and imbricated riprap, as well as vegetative stabilization measures. Normally, these projects are prompted by Capital Projects funded by local County or Town agencies. As previously mentioned, parts of Plumtree Run downstream of Route 1 and upstream of Route 24 are severely eroded. Although stream bank restoration does not directly improve flood hazard conditions, if banks remain unprotected, property damage may result in extreme cases. No serious or immediate threat to improved properties due to stream bank instability has been identified in Bel Air. Therefore, no Town stream bank restoration projects are currently planned.

CHAPTER 6 – PREVENTIVE MITIGATION MEASURES

Introduction

Preventive flood mitigation measures include regulations in the form of ordinances such as zoning restrictions, floodplain ordinances, storm water management ordinances, and building codes. The Town of Bel Air administers all of these regulations through the Department of Planning and Department of Public Works. Preventive measures are regulations adopted to mitigate adverse impacts from future development and assure that new construction does not exacerbate the flood threat, thereby reducing the community's vulnerability to flooding.

National Flood Insurance Program

The National Flood Insurance Program is a Federal program established to give property owners in participating communities the opportunity to purchase flood insurance for their property. The insurance is designed to protect property owners against flood damage losses as long as the State and local government enforce floodplain ordinances to reduce flood claims. The Town has consistently met requirements mandated by the Maryland Department of the Environment for continued participation in the NFIP since inception into the program in 1983.

Community Rating System

The Community Rating System (CRS) is a voluntary program which recognizes and awards communities that endeavor to promote policies that exceed NFIP standards. As an incentive

participating CRS communities are offered discounted flood insurance rates for residents. The amount discounted corresponds to a sliding scale based on class rating (9 through 1 with 1 being the highest) with a discount of 5% to 45%, respectively. The class rating is based on levels of credit (500 point increments) achieved through community flood area standards that exceed the NFIP requirements. The Town of Bel Air currently holds a Class 6 rating (which translates to a 20% reduction in flood insurance premiums) making it one of the highest ranked jurisdictions in the State.

Town Staffing, Ordinances & Programs

The Town government structure consists of an elected Town Board of Commissioners and an appointed Town Administrator. Departments include Public Works, Planning, Economic Development, Finance, Human Resources and Police. The Town maintains storm water management review, site and subdivision plan review authority, and permit authority for all land use and development.

The Director of Public Works serves as the Building Official and the Floodplain Administrator. Staff members from the Public Works and Planning Departments review maps to determine whether projects are located within the floodplain. The Town coordinates collection of data necessary for Letters of Map Revision and Elevation Certificates when necessary. Digital Flood Insurance Rate Maps (DFIRMS) are maintained in the Town's Geographic Information System (GIS). Variances from floodplain ordinance regulations require approval from the Town's Board of Appeals.

The Town of Bel Air adopted the 2016 Comprehensive Plan and revised its Development Regulations (Ordinance 778-16), since adoption of the previous Flood Mitigation Plan. The Town's Development Regulations are drafted to restrict development from occurring in flood hazard areas. The Town's Floodplain Management Regulations (Bel Air Town Code Chapter 210, Ordinance 747-11), provide a set of special standards for land uses in floodplain areas based on specific minimum flood elevations. Minimum setbacks from the floodplain are also required. These standards are designed to protect existing roads, buildings and properties from damage during a flood event (the Regulations are based on the Maryland State Model Floodplain Ordinance). The Storm Water Management Ordinance (Ordinance 732-10) provides management regulations that dictate maximum permitted runoff from new development, thereby limiting additional flood risks downstream.

The Town revised its floodplain regulations in May 2017 to include additional flood protection for units within 50 feet of a special flood hazard area and units with floor area below base flood elevation but located outside a special flood hazard area.

Storm Water Management & Erosion /Sediment Control Ordinance Highlights

In 2010 revised Storm Water Management Regulations were adopted by the Town. The goal of the new regulations is to manage by using environmental site design to the maximum extent practicable to maintain before-development conditions as closely as possible (the predevelopment runoff characteristics), and to reduce stream channel erosion, pollution, siltation and sedimentation. New development projects shall be designed using ESD sizing criteria, recharge volume, water quality volume, and channel protection storage volume criteria according to the Design Manual. In addition,

control of the 2-year and 10-year frequency storm event is required. Additional storm water management is necessary because historical flooding problems exist, and downstream floodplain development and conveyance systems design cannot be controlled.

Redevelopment projects are also required to meet COMAR ESD regulations. This largely requires that redevelopment provide pollutant control mechanisms for 50% of the existing impervious area on site prior to redevelopment. This can be achieved by reducing impervious area by 50% or a combination of pollutant control and impervious area reduction that would equal the 50% requirement.

In addition, the Town adopted a revised Sediment & Erosion Control Ordinance in 2013. The goal is to minimize soil erosion and prevent off-site sedimentation by using soil erosion and sediment control practices designed in accordance with the Code of Maryland Regulations (COMAR) 26.17.01, and the 2011 Maryland Standards and Specifications (Standards and Specifications). At a minimum, the revised ordinance requires the mapping of natural resources and sensitive areas, including highly erodible soils and slopes greater than 15 percent, as well as information required under the Town's storm water chapter. These areas are to remain undisturbed or an explanation must be included with either the concept or site development plan describing enhanced protection strategies for these areas during construction.

CHAPTER 7 – PLAN ASSESSMENT AND IMPLEMENTATION

Introduction

The Plan Committee has many strategies at its disposal when considering flood potential and impact to Town buildings, facilities and infrastructure. Redevelopment can potentially alter flood-prone areas or potentially alter water flow or area capacity. The Committee reviews and updates mitigation strategies and uses a priority assessment process for flood mitigation to best utilize staff time, money and resources.

Mitigation Strategies & Priority Assessment

The Mitigation Strategy is designed to fulfill the long term goal of reducing flood hazards in the Town. The Plan Committee considers the flooding criteria in determining appropriate action items:

- Social Considerations – Protection of public health and the environment including minimizing the interruption to commerce and business
- Economic Considerations – Cost Effectiveness
- Technical feasibility including whether staffing is sufficient
- Legal and administrative considerations

As stated previously, mitigation strategies include preventive measures, property protection measures, structural projects and natural resource protection projects. On a yearly basis the Plan Committee considers the past years' flood events (if any), the impact those events had on Town

residents, business owners and infrastructure, and whether any mitigation strategies exist that could limit the impact future flood events could have on those impacted. Those items are listed and added to the annual Mitigation Actions Matrix for review and approval by the Committee as part of the annual Plan update.

After finalizing the list of mitigation activities the Committee rates the actions on three key elements: Life Safety; Legal and Administrative Impacts; and Economic Value. Priority ratings are assigned to each proposed action as follows:

Assessment Criteria	Low Priority Value (1 point)	Medium Priority Value (2 points)	High Priority Value (3 points)
Life Safety Impact	Minimum positive impact on businesses, residents or properties (i.e. stakeholders)	Direct positive impact on stakeholders	Significant positive impact on stakeholders
Legal/ Administrative Impacts	Additional staff and/or training needed to accomplish goal and does not satisfy Code obligation or property issues	Additional staff, outsourcing or training may be needed; improves data collection	Adequate staff and funding on place to implement project; Satisfies a Code requirement
Economic Feasibility	Over \$250,000.00	\$100,000.00 to \$250,000.00	Under \$100,000.00

Plan Implementation

The Plan Committee reviews the mitigation strategies and updates the Plan on an annual basis. Updates are adopted by the Board of Town Commissioners, and the Plan functions as the Town’s flood hazard strategy to improve flood-related issues.

In the five years since Plan inception the Town has been able to complete a number of action items listed on the matrix including:

1. Enhance the CRS Rating – Town received a Class 6 Rating in May 2017. The change from Class 7 to Class 6 was primarily due to the creation and adoption of this Plan.
2. George Street Culvert replacement – This project reduced backflow due to an undersized culvert and reduced the limits of the 100-year floodplain for properties north of the Baltimore Pike road crossing.
3. Daylight Plumtree Run – The undersized storm drain running the length of the park was removed and a new stream channel constructed. The channel can overflow with enough holding capacity in the park to limit additional flood issues downstream.
4. Plumtree Run Restudy -- Revised engineered flood data was used by FEMA as part of the 2016 FIS to remap the headwaters of Plumtree Run.

5. Plumtree Storm Water Feasibility Study – The study was completed, with money allocated to the project and construction about to commence.
6. Revised Floodplain Management Regulations – The revised ordinance creates additional stream buffer area and increased freeboard.
7. The Town--using funds from the Chesapeake and Atlantic Coastal Bays Trust Fund FY17—completed Section II of the Plumtree Run Chanel Improvements in 2017. This project re-aligned approximately 1,240 linear feet of stream channel to create stable planform geometry.

In addition, the completion and acceptance of the 2016 Flood Insurance Study provided updated flood maps for the Town, the boundaries of which have been modified from the previous 2000 FIS (which was the approved study under the 2012 Flood Mitigation Assistance Plan). The figure following this section identifies the difference between the 2000 FIRM panel floodplain limits and the 2016 floodplain limits. In some instances changes were made by FEMA based on revised mapping criteria. In other cases, construction projects designed to change floodway characteristics helped to reduce floodplain boundaries.

Based on completed action matrix projects and the Committee’s ongoing evaluation of flood-related issues, following is Town’s the current action matrix and an explanation of each action item.

Action Number	Project Summary	Life Safety Impact	Legal and Admin. Impact	Economic Feasibility	Total	Time Frame	Responsible Department
1	Encourage Green Practices	2	2	2	6	Ongoing	Planning
2	Sump pump/ backflow retrofit education	2	2	2	6	Ongoing	Public Works
3	Acquire 332 Baltimore Pike	1	1	1	3	TBD	TBA Administration
4	Streambank stabilization measures	2	2	2	6	Ongoing	Public Works
5	SWM Retrofit Study per WIP	1	2	1	4	2018	Public Works/ Harford Co.
6	Plumtree Phase III Section IV Streambank Revitalization	1	3	2	6	2019	Public Works/ Harford Co.
7	Flash flood impacts	2	2	3	7	Ongoing	Public Works

Item 1: Encourage Green Practices. As part of this ongoing process, the Town Board recently approved changes to the Development Regulations landscape requirements and limits to impervious surface area created during development to limit surface runoff.

Item 2: Sump pump/ backflow retro-fit incentives. The Public Works Department continues to provide education on an ongoing basis to encourage residents to retrofit existing facilities when possible.

Item 3: Acquire 322 Baltimore Pike. The property remains vacant and for lease/sale, but no funding source is available for land purchase at this time. Acquisition could provide additional storm water capacity, stream restoration, and recreational benefits.

Item 4: Stream bank stabilization measures. This is an ongoing line item with additional projects pending.

Item 5: SWM Retrofit Study. This study has been completed. No funding source currently exists, but the line item will remain open for funding opportunities through 2018.

Item 6: Section IV Plumtree Run Chanel Improvement Project. This project will improve water quality and habitat by incorporating stream restoration and floodplain connectivity. The project will re-align 1,935 linear feet of stream.

Item 7: Flash flooding impacts. Flash flooding is creating the largest impact on Town residents. The Public Works Department will begin investigating areas of repetitive flash damage to determine what structural changes may be required and the costs associated with redesign.