CHAPTER 4: FLOOD

2022 PLAN UPDATE

Chapter 4: visual and thematic updates were included throughout the chapter, including updates to fonts, colors, and the addition of a cover page.
Page 4-1: Added definitions for flood, flash flood, and heavy rain as included in the 2021 State Hazard Mitigation Plan. Updated the total number of flood events impacting the State since January 2016. Added nuisance flooding definition from the County's Nuisance Flooding Plan.
Page 4-2: Two examples of recent presidential declarations have been added to Section 4.1.
Page 4-2: Section 4.2 History, Tables 4-1, 4-2, 4-3 have been updated/added with the most recent flood events from the NCEI Storm Events Database.
Page 4-5: Risk rankings from the 2021 State Hazard Mitigation Plan and the Hazard Identification and Risk Assessment completed for this Plan Update were added to Section 4.3. The State ranks the flood hazard as "medium-high" risk and Somerset County ranks flood as "high" risk.
Page 4-6: Section 4.3.1 Flood Mitigation Plan has been added to reflect the County's development of its 2021 Flood Mitigation Plan.
Page 4-6: Section 4.3.2 Nuisance Flooding Plan has been added and provides an overview of the County's Nuisance Flooding Plan, including proposed mitigation activities and the repetitive flooded roadways database.
Page 4-10: Updated the number of total housing units in the County based on Decennial 2020 U.S. Census Data. The FEMA NFIP and the 2015 Hazard Mitigation Assistance Guidance definitions for repetitive loss properties and severe repetitive loss properties have been added.
Page 4-14: Updated Map 4-2 SFHA Map – Town of Princess Anne, added Map 4-3.
Page 4-16: Updated Map 4-4 SFHA Map – City of Crisfield, added Map 4-5.
Page 4-18: Updated Table 4-8: Essential Facilities At-Risk to the 1-Percent-Annual-Chance Flood with most recent data from the 2021 Flood Mitigation Plan.
Page 4-21: Section 4.7 Flood Risk Report Loss Estimations has been updated with loss estimate tables for the 1-percent-annual-chance flood event , including Table 4-10 Estimated Losses by Occupancy Type, Table 4-11 Essential Facilities Estimated Loss Summary, and Table 4-12 State Assets Estimated Loss Summary.
Page 4-25: Section 4.8 Dam Failure has been added for this plan update. No High Hazard Potential Dams (HHPD) were identified in Somerset County. Only one low hazard dam is located immediately adjacent to the County and is owned by Wicomico County. Table 4-13 has been added and lists includes information about this dam. Figure 4-2 depicts the location of this dam.
Page 4-26: Section 4.9 Social Vulnerability and Flood Risk has been added for this plan update. Map 4-8, page 4-29, depicts the results of the CDC's Social Vulnerability Index mapped alongside the 1-percent-annual-chance flood zone.
Page 4-30: Section 4.10 Mitigation Strategies has been updated to reflect current capabilities and endeavors. Additionally, results from the Deal Island Drainage Assessment have been incorporated into the section, as well as some highlights from the Public Survey.
Page 4-32: Section 4.11 Future Conditions has been added for this plan update.

Chapter 4: Flood

4.1 Hazard Profile

The Federal Emergency Management Agency (FEMA) definition for flooding is "a general and temporary condition of partial or complete inundation of normally dry land areas from the overflow of inland or tidal waters or the rapid accumulation of runoff of surface waters from any source." Floods can be caused by the passage of frontal storms, thunderstorms, hurricanes, snow melt or some combination of the above events.

There are various types of flooding, including: flash flooding, riverine flooding, and tidal flooding. Flash floods occur suddenly after a brief but intense downpour. Although the duration of these events is usually brief, the damages can be quite severe. Flash floods are more likely to occur in places with steep slopes and narrow stream valleys, and along small tributary streams. However, flash floods can be the result of improper stormwater drainage. Riverine flooding is defined as "run off from sustained rainfall or rapid snow melt exceeding the capacity of a river's channel."

The flood hazard within this plan chapter includes the following types of events, as defined by the National Weather Service:

Flood: "Any high flow, overflow, or inundation by water which causes damage. In general, this would mean the inundation of a normally dry area caused by an increased water level in an established watercourse, or ponding of water, that poses a threat to life or property."

Flash Flood: "A life-threatening, rapid rise of water into a normally dry area beginning within minutes to multiple hours of the causative event (e.g., intense rainfall, dam failure, ice jam). Ongoing flooding can intensify to the shorter -term flash flooding in cases where intense rainfall results in a rapid surge of rising flood waters."

Heavy Rain: "Unusually large amount of rain which does not cause a Flash Flood or Flood event, but causes damage, e.g., roof collapse or other human/economic impact."

In addition, both nuisance flooding and potential dam failure have been added to the scope of the flood hazard chapter. Dam failure is identified in section 4.8 at the end of this chapter. Nuisance flooding, also referred to as high tide flooding, is defined in the County's *Nuisance Flooding Plan* (December 2019) as follows:

Nuisance Flooding: "flooding that leads to public inconveniences such as road closures. It is increasingly common as coastal sea levels rise." Nuisance flooding is a more specific and commonplace phenomenon, which dictates a less significant response and threatens the community in less intrusive ways.

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According to the *2021 State Hazard Mitigation Plan*, Maryland has been affected by 1,051 flood events since January 2016; these events include flash flood, flood, and heavy rain events as recorded by the National Centers for Environmental Information (NCEI) Storm Events Database. This indicates that the State experiences about 175 flood events annually. These flood events have resulted in over $97 million in property damages. Historically, the greatest riverine flooding events remain the 1936 flood on the Potomac and the 1972 flood resulting from Hurricane Agnes.

In regard to Somerset County, the *2015 Flood Insurance Study (FIS)* states that the County has a total area of 611 square miles of which 320 square miles is land. Streams located within Somerset County include: Wicomico Creek, Monie Bay, Manokin River, Kings Creek, Back Creek, the Big Annemessex River, the Little Annemessex River, the Pocomoke River and Dividing Creek. The FIS reviewed the streams and determined that all of the streams previously studied in the FIS were controlled by tidal backwater except for Dividing Creek, which is controlled by riverine flooding.

Considering the State of Maryland is a coastal state with over twelve percent of its surface area in floodplains and having approximately 8,000 miles of shoreline, flooding is a major concern. Over 90% of the United States' Presidential Declarations involved flooding. Of the thirty-six (36) Declarations for the State of Maryland, eleven (11) Declarations were for flooding. The most recent declarations for flooding were "Maryland Severe Storm and Flooding (DR-4376-MD)" and "Maryland Severe Storms and Flooding (DR-4374-MD)"; both declarations occurred in the summer of 2018.

4.2 History

According to U.S. Geological Survey (USGS) data, the lower eastern shore has been affected by several 1-percent-annual-chance (100-year) flood events since the mid 1960's and by a number of 25-50 year storm events. While there are only a few gauging stations on the lower eastern shore, it is safe to say that Somerset County has been affected to some extent by these events. However, due to the County's low elevation and relief, riverine flooding does not cause the same type of problems that it does in areas on the western shore where relief is much more pronounced.

In terms of number of occurrences, the NCEI Storm Events Database listed a total of 35 flood events (including all three types) affecting Somerset County from 1998-2022. Therefore, the County experiences 1.46 flood events per year. Tables 4-1, 4-2, and 4-3 detail event narratives for each flood hazard type: flood, flash flood, and heavy rain.

Table 4-1: Flood Events

Location	Type	Date	Event Narrative
Countywide	Flood	August 27, 2011	Heavy rains associated with Hurricane Irene produced widespread low-land flooding across much of the county, including roadways which were washed out or closed. Storm total rainfall generally ranged from five to ten inches. Princess Anne reported 9.73 inches of rain. Deal Island reported 5.75 inches of rain.

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Table 4-1: Flood Events			
Location	**Type**	**Date**	**Event Narrative**
Countywide	Flood	October 29, 2012	Numerous roads were closed due to flooding produced by Hurricane Sandy. Storm total rainfall ranged from five to nine inches across the county.
Crisfield	Flood	September 28, 2016	Water was reported over Spruce and Myrtle Streets in Crisfield.
Princess Anne	Flood	October 9, 2016	Heavy rain caused an extended period of significant flooding across portions of the county. Several roads were impassable or closed for a couple of days, and some homes and businesses were impacted.
Princess Anne	Flood	May 18, 2018	Numerous roads remained closed due to ongoing flooding from heavy rainfall across portions of the county.
Eden	Flood	October 12, 2018	Several roads remained impassable or closed across northern portions of the county due to lingering flooding.
Crisfield	Flood	August 7, 2021	Spotter reported flooding along several roads within the town of Crisfield. County official reported some curbside flooding in spots, but no road closures.
Source: NWS, National Centers for Environmental information Storm Events Database.			

Table 4-2: Flash Flood Events			
Location	**Type**	**Date**	**Event Narrative**
Princess Anne	Flash Flood	July 5, 2006	Numerous flooded roads.
Crisfield	Flash Flood	September 29, 2016	Numerous roads were closed in and around Crisfield. Some areas were isolated due to flood waters.
Princess Anne	Flash Flood	September 29, 2016	Widespread flooding was reported around Princess Anne. Numerous roads were closed including several State Highways including Somerset Avenue. There was also flooding reported around the University of Maryland Eastern Shore.
Princess Anne	Flash Flood	June 2, 2018	Street flooding was reported at Antioch Avenue and Hampton, and at South Street and Somerset Avenue.
Princess Anne	Flash Flood	October 11, 2018	Several roads were impassable or closed across northern portions of the county due to flash flooding.
Princess Anne	Flash Flood	August 8, 2020	Flash flooding was reported on Pine Knoll Drive. One water rescue was performed from a vehicle in high water.
Crisfield	Flash Flood	August 8, 2020	Multiple roads were flooded in the Crisfield area.
Princess Anne	Flash Flood	August 29, 2020	Route 675 was closed at South Street in both directions due to high water.
Source: NWS, National Centers for Environmental information Storm Events Database.			

Table 4-3: Heavy Rain Events			
Location	**Type**	**Date**	**Event Narrative**
Princess Anne	Heavy Rain	January 27 to 28, 1998	A Nor'easter produced heavy rain and strong winds across the Lower Maryland Eastern Shore on Tuesday, January 27th and Wednesday, January 28th. Rainfall totals generally ranged from 3 to 5 inches. This rainfall caused street flooding and flooding of poor drainage areas throughout the region.

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Table 4-3: Heavy Rain Events			
Location	**Type**	**Date**	**Event Narrative**
Princess Anne	Heavy Rain	February 6, 1998	A Nor'easter produced heavy rain and strong winds across the Lower Maryland Eastern Shore from Tuesday, February 3rd through Thursday, February 5th. Rainfall totals generally ranged from 2 to 4 inches. Heavy rain caused some urban flood/poor drainage flood problems with a few roads closed due to high water.
Princess Anne	Heavy Rain	October 24 to 27, 2007	The combination of low pressure over the Southeast United States and a nearly stationary frontal boundary across the Middle Atlantic Region helped to produce heavy rain across portions of the Lower Maryland Eastern Shore. The storm system brought an average of two to three inches of rainfall to the area.
Countywide	Heavy Rain	December 10 to 12, 2008	Rainfall amounts between one and four inches occurred across the county. Rainfall amount of 2.99 inches was measured at Princess Anne.
Countywide	Heavy Rain	November 11 to 13, 2009	Rainfall amounts ranged between three and six inches across the county. Princess Anne recorded 4.69 inches of rain.
Countywide	Heavy Rain	March 29, 2010	Rainfall amounts of one to three inches occurred across the county. Princess Anne reported 2.65 inches of rain.
Princess Anne	Heavy Rain	November 9, 2015	Rainfall amounts generally ranged between 1.5 inches and 2.8 inches across the county. Deal Island (1 SSW) reported 2.78 inches of rain. Princess Anne (2 SSW) reported 2.50 inches of rain.
Princess Anne	Heavy Rain	June 28, 2016	Rainfall total of 2.40 inches was measured in Princess Anne.
Kings Creek	Heavy Rain	June 28, 2016	Rainfall total of 3.60 inches was measured at 3 miles south of Princess Anne.
Deal Is	Heavy Rain	July 29, 2016	Rainfall total of 2.21 inches was reported from July 28.
Princess Anne	Heavy Rain	September 19, 2016	Rainfall totals generally ranged from 1 inch to 3 inches across the county. Princess Anne (2 SSW) reported 1.77 inches of rain. Deal Island reported 1.77 inches of rain. Oriole (2 E) reported 1.02 inches of rain.
Princess Anne	Heavy Rain	September 28, 2016	Rainfall totals generally ranged from 2 to 8 inches across the county. Princess (2 SSW) reported 8.13 inches of rain. Oriole (2 E) reported 6.16 inches of rain. Manokin (1 NNE) reported 6.12 inches of rain. Deal Island reported 4.55 inches of rain.
Oriole	Heavy Rain	October 8, 2016, to October 9, 2016	Rainfall totals generally ranged from 3 to 5 inches across the county. Oriole (2 E) reported 3.50 inches of rain. Princess Anne (2 SSW) reported 3.44 inches of rain. Manokin (1 NNE) reported 3.08 inches of rain.
Venton	Heavy Rain	July 15, 2017	Rainfall total of 1.04 inches was measured at Oriole (2 E).
Kings Creek	Heavy Rain	July 29, 2017	Rainfall total of 5.27 inches was measured at Princess Anne (2 SSW).
Venton	Heavy Rain	July 29, 2017	Rainfall total of 3.49 inches was measured at Oriole (2 E).

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Table 4-3: Heavy Rain Events			
Location	**Type**	**Date**	**Event Narrative**
Venton	Heavy Rain	May 17, 2018	Three day rainfall total was 5.32 inches at (2 E) Oriole.
Deal Island	Heavy Rain	October 11, 2018	Rainfall total of 6.54 inches was reported at Deal Island (1 SSW). Rainfall total of 5.20 inches was reported at Crisfield. Rainfall total of 4.20 inches was reported at Princess Anne (2 S).
Crisfield	Heavy Rain	October 20, 2019	Rainfall total of 1.69 inches was reported at Crisfield.
Princess Anne	Heavy Rain	October 20, 2019	Rainfall total of 2.56 inches was reported at Princess Anne
Princess Anne	Heavy Rain	September 17, 2020	Rainfall total of 2.01 inches was reported at (2.1 SSW) Princess Anne.
Deal Island	Heavy Rain	September 17, 2020	Rainfall total of 1.68 inches was reported at (0.5 SSW) Deal Island.
Princess Anne	Heavy Rain	October 29, 2020	Rainfall total of 1.68 inches was reported at (0.5 SSW) Deal Island.
Princess Anne	Heavy Rain	November 11, 2020	Rainfall totals generally ranged between two inches and four inches across the county. Rainfall total of 3.50 inches was reported at (1.9 WSW) Princess Anne. Rainfall total of 3.47 inches was reported at (1 NE) Princess Anne.
Princess Anne	Heavy Rain	December 4, 2020	Rainfall totals generally ranged between one inch and five inches across the county. Rainfall total of 4.78 inches was reported at Princess Anne. Rainfall total of 4.07 inches was reported at (2.1 SSW) Princess Anne. Rainfall total of 3.64 inches was reported at (0.5 SSW) Deal Island.
Princess Anne	Heavy Rain	July 9, 2021	Rainfall total of 2.85 inches was reported.
Deal Island	Heavy Rain	July 9, 2021	Rainfall total of 2.38 inches was reported.
Kings Creek	Heavy Rain	July 9, 2021	Rainfall total of 2.18 inches was reported.
Princess Anne	Heavy Rain	July 9, 2021	Rainfall total of 2.20 inches was reported.
Crisfield	Heavy Rain	July 9, 2021	Rainfall total of 2.56 inches was reported.
Source: NWS, National Centers for Environmental information Storm Events Database.			

Heavy rain events occur with the most frequency in Somerset County compared to flood and flash flood events. According to the NCEI database, thirty (30) documented heavy rain events have occurred since 1998, which means heavy rain events occur about 1.25 times per year.

The frequency of heavy rain events can also impact occurrences of flash flooding events. Flash flooding is commonly caused by extremely heavy rainfall from thunderstorms. Whether or not an area will actually experience is a flash flood is dependent upon such factors as rainfall identity, land use and topography, vegetation covering, and soil type.

In Somerset County, urban areas are especially prone to flash flooding due to the increased number of impervious surfaces. These surfaces do not allow water to infiltrate into the ground, thus causing the water to run off to lower elevations very quickly. Flash flooding occurs so fast that people are caught off guard – which can lead to dangerous situations when people encounter high, fast-moving water while traveling.

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4.3 County Perspective

The *2021 State Hazard Mitigation Plan* ranked flood as "Medium-High" risk for Somerset County. Based on local experience, the 2022 HMPC ranked flood as "High" risk due to the potential loss of life and possible severe property damage inherent with flooding of roadways and bridges. Man-made activities such as timbering, and road construction can cause increased runoff that makes downstream areas more susceptible to damage from natural occurring events.

Note: Full results of the Hazard Identification and Risk Assessment (HIRA) conducted for this hazard and all natural hazards included within this plan are included in Chapter 3.

Furthermore, local climatic conditions can produce large amounts of precipitation at any time of the year; the potential for flooding is not limited to any particular season. Historically, however, most major floods have occurred during heavy thunderstorm activity or in late summer or early fall during the hurricane season.

Responses to the Public Survey (see Appendix H for full results) conducted during this Plan Update indicate that residents are "very concerned" with issues related to flooding. Flood is the number one hazard of most concern to residents.

4.3.1 Flood Mitigation Plan

Somerset County developed a *2021 Flood Mitigation Plan* (FMP), which examined the risk and vulnerability from major sources of flooding across the County and its municipalities, including: hurricane storm surge, 1-percent-annual-chance flood, sea level rise, nuisance flooding, and flash flooding. Results from the risk analysis and vulnerability assessment conducted in the FMP for the 1-percent-annual-chance flood and flash flood hazards are incorporated into portions of this Plan Update.

4.3.2 Nuisance Flooding Plan

Somerset County developed its Nuisance Flooding Plan in response to Maryland HB 1427, which requires local jurisdictions to develop the plan if they experience nuisance flooding. The plan discusses how the County experiences nuisance flooding, and ways in which it prepares, responds, and mitigates for this type of flooding.

In terms of mitigation, the Nuisance Flooding Plan includes activities which the County will implement or consider implementing to help mitigate impacts from nuisance flooding. These activities support goals and objectives found both in this hazard mitigation plan as well as the County's Comprehensive Plan. Activities are divided into structural and non-structural projects (including public information, planning, and implementation strategies).

The plan includes a nuisance flooding location inventory, which identifies 119 roadways that are impacted by flooding. Of those 119 roadways, 74 experience repetitive flooding. The list includes the roadway name, its evacuation issue status, known stormwater management or

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elevation issues, the amount of flooding (occasional or repetitive), responsible entity (State, County, or Municipality), and other related hazards known to impact each roadway (e.g., heavy rain, stormwater, and/or drainage).

For purposes of this plan, "repetitive" indicates that the identified road or bridge floods on a daily basis at Mean High Water (MHW) or on a monthly basis during weather events or moon phases, or more simply, water is on the roadbed more days than not throughout the month or year. The Nuisance Flooding Plan is available in full, here.

4.3.3 Special Flood Hazard Areas

Since Somerset County is prone to various forms of flooding including riverine flooding and flash flooding, a Digital Flood Insurance Rate Map (DFIRM) published by the Federal Emergency Management Agency (FEMA) was utilized to depict flood risk areas. The DFIRM is the basis for floodplain management, mitigation, and insurance activities for the National Flood Insurance Program (NFIP). Changes since the last Flood Insurance Rate Map (FIRM) include:

- Special Flood Hazard Area (SFHA) boundaries within Somerset County were updated due to new engineering analysis performed within the Flood Risk Project. The updated modeling produced new flood zone areas and new base flood elevations in some areas and leveraged recently developed LiDAR-based topographic data. The previously effective FIRM, preliminary FIRM, and current effective FIRM dates are listed below:
    - Previous FIRM effective date: March 3, 2011
    - Preliminary FIRM date: March 21, 2013
    - Current FIRM effective date: February 4, 2015
- The Changes Since Last FIRM (CSLF) dataset includes the following information for areas within the Coastal Flood Risk Study:
    - Increase: new area in the current effective FIRM compared to the previous effective FIRM.
    - Decrease: loss of area in the current effective FIRM compared to the previous effective FIRM.
    - Net Change: calculated as "increase" minus "decrease."

Table 4-4 below summarizes the increases, decreases, and net change of SFHAs, Floodways, and Coastal High Hazard Areas (CHHAs) for the county.

Table 4-4: Changes Since Last FIRM

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	179.9	24.8	0.4	24.4
Within Floodway	0	0	0	0
Within CHHA (Zone VE or V)	28.4	< 0.1	0	< 0.1

Source: FEMA Flood Risk Report - Somerset County, Maryland Coastal Study, May 4, 2016.

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The DFIRM Database categorizes floodplains into flood zones, which are geographic areas that FEMA has defined according to their varying levels of flood risk, as shown on Table 4-5. Map 4-1 provides a visual representation of the flood zones in Somerset County.

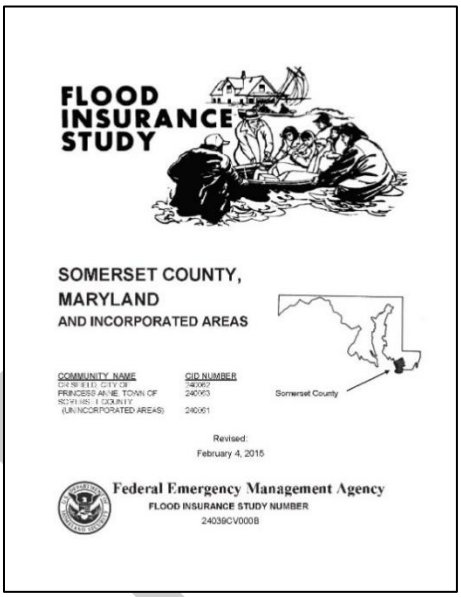


Figure 4-1: Flood Insurance Study

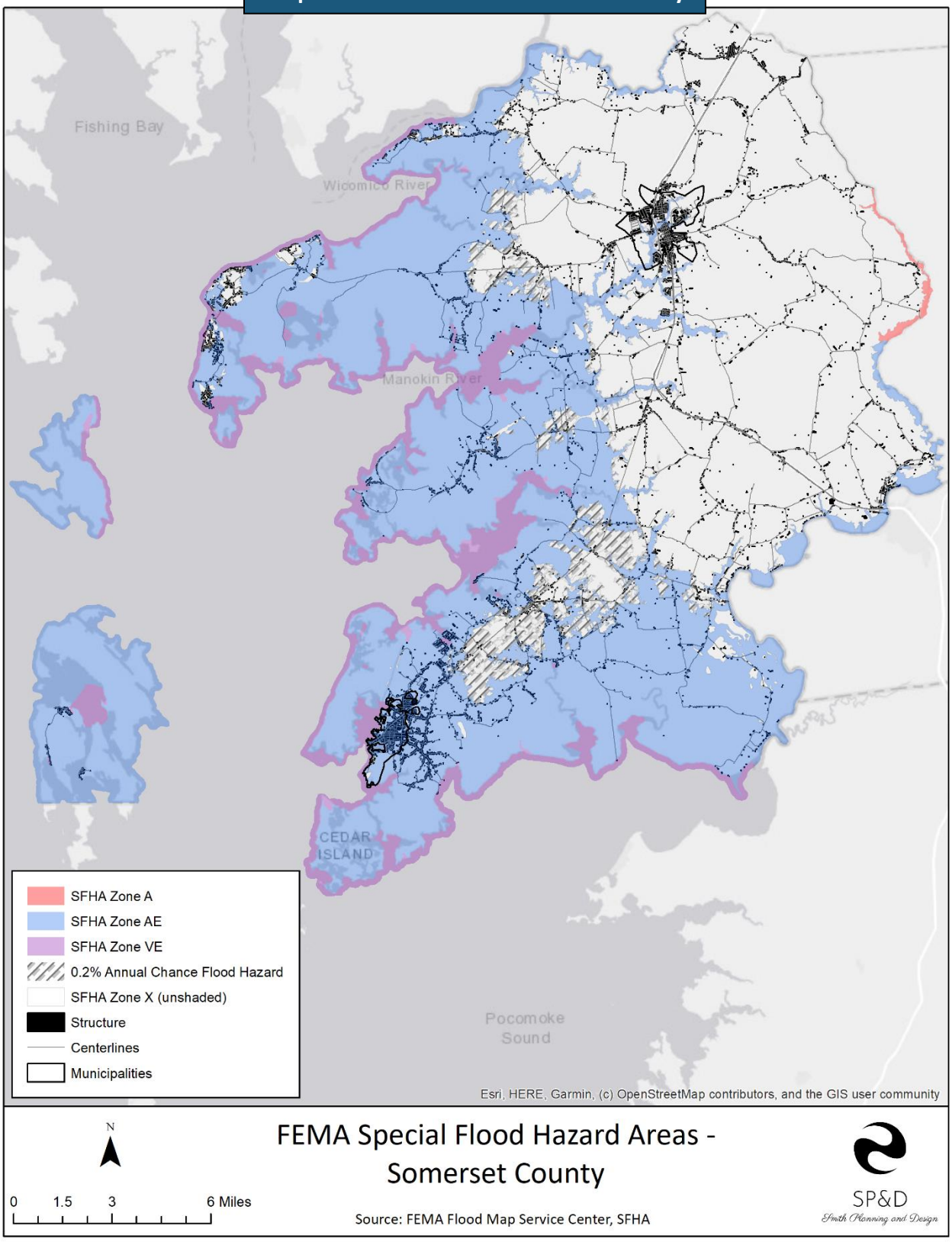
A **Flood Insurance Survey** (FIS) is a compilation and presentation of **flood** risk data for specific watercourses, lakes, and coastal **flood** hazard areas within a community. When a **flood study** is completed for the NFIP, the information and maps are assembled into an FIS.

Source: FEMA

Table 4-5: FEMA Flood Zones

Flood Zone	Description
SFHA - High Risk Areas	
A	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
AE	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analysis are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones.
VE	Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
Moderate Risk Areas	
0.2% Annual Chance Flood Hazard (Shaded)	Areas outside the 1% annual chance floodplain, areas of 1% annual chance sheet flow flooding where average depths are less than 1 foot, areas of 1% annual chance stream flooding where the contributing drainage area is less than 1 square mile, or areas protected from the 1% annual chance flood by levees. No Base Flood Elevations or depths are shown within this zone. Insurance purchase is not required in these zones.
Minimal Risk Areas	
X (Unshaded)	Area of minimal flood hazard, usually depicted on FIRMs as above the 500-year flood level. Zone X is the area determined to be outside the 500-year flood and/or protected by levee from 100-year flood.
Source: FEMA: Definitions of FEMA Flood Zone Designations.	

Map 4-1: FEMA SFHAs – Somerset County



4.3.4 National Flood Insurance Program and Repetitive Loss Properties

Table 4-6 below shows that as of August 26, 2022, the National Flood Insurance Program (NFIP) reported a total of 1,347 active flood insurance policies filed for Somerset County and its two municipalities. According to the U.S. Census Bureau, total housing units in the County was 10,895 in 2020. Therefore, 12.4 percent of housing units within the County are covered by flood insurance policies.

Table 4-6: NFIP Insurance Policies

Location	Number of Policies	Total Premium + Policy Fee
Crisfield	378	$997,817
Princess Anne	3	$244,161
Somerset County	954	$682,207
Total	**1,347**	**$1,924,185**

Source: Federal Emergency Management Agency NFIP Insurance Report, Maryland, August 26, 2022.

The NFIP report provided the total losses reported since 1978 as 1,209. The total amount paid since 1978 for the reported losses was $14,017,328.40, as shown below in Table 4-7.

Table 4-7: NFIP Total Losses Since 1978

Location	Number of Claims	Total Paid
Crisfield	465	$5,723,172.55
Princess Anne	5	$63,108.59
Somerset County (unincorporated)	739	$8,231,047.26
Total	**1,209**	**$14,017,328.40**

Source Federal Emergency Management Agency NFIP Insurance Report, Maryland, August 26, 2022.
Note: Flood insurance is available to anyone in the County and even those structures outside of the 100-year mapped floodplain area. Therefore, in some cases, the number of policies includes structures that are outside the 100-year mapped floodplain.

Considering the amount of flood insurance policies and the number of claims that have been reported, identifying areas of repetitive loss within a community is a good indicator to use in determining areas of high flood damage vulnerability. While flood damage is not necessarily limited to these areas, repetitive loss data provides location indicators for areas where structures are experiencing recurring and costly damage from flooding.

The FEMA NFIP defines a **repetitive loss property** as:

- Properties are those for which two or more losses of at least $1,000 each have been paid under the National Flood Insurance Program (NFIP) within any 10-year period since 1978."

The FEMA NFIP defines **severe repetitive loss properties** as:

- A property that has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or,

- A property for which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

The 2015 Hazard Mitigation Assistance Guidance (page 116) defines repetitive loss and severe repetitive loss properties differently, and these definitions are as follows:

A **repetitive loss property** is a structure covered by a contract for flood insurance made available under the NFIP that:

a) Has incurred flood-related damage on 2 occasions, in which the cost of the repair, on the average, equaled or exceeded 25 percent of the market value of the structure at the time of each such flood event and
b) At the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage.

A **severe repetitive loss property** is a structure that:

a) Is covered under a contract for flood insurance made available under the NFIP
b) Has incurred flood related damage –
    i. For which 4 or more separate claims payments (includes building and contents) have been made under flood insurance coverage with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000 or
    ii. For which at least 2 separate claims payments (includes only building) have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the insured structure.

Based on the FEMA NFIP and FMA definitions for repetitive loss properties and severe repetitive loss properties, Somerset County (not including municipalities) has 61 repetitive loss properties, which includes two (2) severe repetitive loss properties as of September 30, 2022. Of these properties, fifty-nine (59) are single family residential, one (1) is business non-residential, and one (1) is other non-residential. Five (5) structures are identified as “mitigated” and thirty-five (35) are NFIP insured. These structures are located on the following streets:

- Annie Hyland Rd
- Ape Hole Rd
- Boone Rd
- Byrd Rd
- Byrdtown Rd (4)
- Caleb Jones Rd
- Cassandra Dr
- Catlin Rd (2)
- Champ Rd (2)
- Coulbourn Creek Rd
- Daughertytown Rd
- Deal Island Rd (7)
- Drawbridge Rd
- Fair Island Ln
- Fairmount Rd
- Ford Rd
- Frenchtown Rd
- Harbor Rd

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- Hearts Dr
- Hotel Rd (2)
- Jacksonville Rd
- Johnson Creek Rd
- Locust Point Rd
- Log Cabin Ln
- Long Point Rd
- Manokin Ct
- Marina Dr
- Marsh Rd (2)
- Nevitte Muir Rd
- Old State Rd (3)
- Oriole Rd
- Riley Roberts Rd
- Roland Parks Rd
- S Pomfrett Rd (2)
- S Somerset Ave (2)
- Sackertown Rd (3)
- Tuff St
- Tylerton Rd
- W Pear St
- Walter Jones Rd
- William Maddox Rd

4.4 Municipal Perspective

Based on the FEMA NFIP and FMA definitions for repetitive loss properties, the City of Crisfield has 26 repetitive loss properties, including one (1) severe repetitive loss property as of September 30, 2022. Of these properties, twenty-two (22) are single family structures, one (1) is business non-residential, one (1) is other residential, and two (2) are other non-residential. One (1) structure is identified as "mitigated" and (twelve) 12 are NFIP insured. These structures are located on the following streets:

- 7th St
- Asbury Ave
- Calvary Rd
- Cove St (2)
- Fairmount Rd
- Hall Hwy (4)
- Maryland Ave (2)
- Myrtle St
- Poplar St
- Potomac St
- S Somerset Ave (2)
- Tawes Dr
- Tylerton Rd
- W Chesapeake Ave (3)
- W Main St (2)
- Wynfall Ave

The Town of Princess Anne has zero (0) repetitive loss properties as of September 30, 2022. Princess Anne is the only municipality in Somerset County located along the 1-percent-annual-chance floodplain of a major inland stream, the Manokin River. The Manokin River 1-percent-annual-chance floodplain is depicted on Map 4-2 in blue and is categorized as Zone AE; which indicated that base flood elevations (BFEs) for the 100-year floodplain event are determined. The AE Flood Zone indicates that over the life of a 30-year mortgage, properties within the zone have a 26% chance of flooding. Map 4-3 depicts the 1-percent-annual-chance floodplain in better detail for the Town's downtown area.

Tributaries leading into the Manokin River include: Wesley Branch, Manokin Branch, and the Loretta Branch. Each of the tributaries are, for the most part, surrounded by woodlands with limited amounts of development located on the fringes of the woodlands. However, there are

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several areas along these tributaries that border the 1-percent-annual-chance floodplain, such as Front Street, Manokin Avenue, and the small community developed around Daphne Lane. Furthermore, the Manokin River and its tributaries intersect with several roads including: Deal Island Road, Route 13, Broad Street and Somerset Avenue. These areas could be highly susceptible to flooding if proper stormwater management techniques are not utilized.

Crisfield is primarily within FEMA Flood Zone AE. Special Flood Hazard Areas for Crisfield are depicted on Map 4-4. The City of Crisfield is highly susceptible to coastal flooding due to tidal influences and storm surges, as discussed in *Chapter 5: Coastal Hazards*. Map 4-5 depicts the 1-percent-annual-chance floodplain in better detail for the City's downtown area.

The Special Flood Hazard Area (SFHA) in Crisfield is designated as Zone AE, which indicated that base flood elevations (BFEs) for the 1-percent-annual-chance flood event are determined. In the City of Crisfield, the Zone AE floodwater levels are controlled by tidal influences and storm surge levels. Considering the City of Crisfield is located entirely within the 1-percent-annual-chance floodplain, it is crucial that all evacuation routes are accessible, and warnings are issued in a timely manner.

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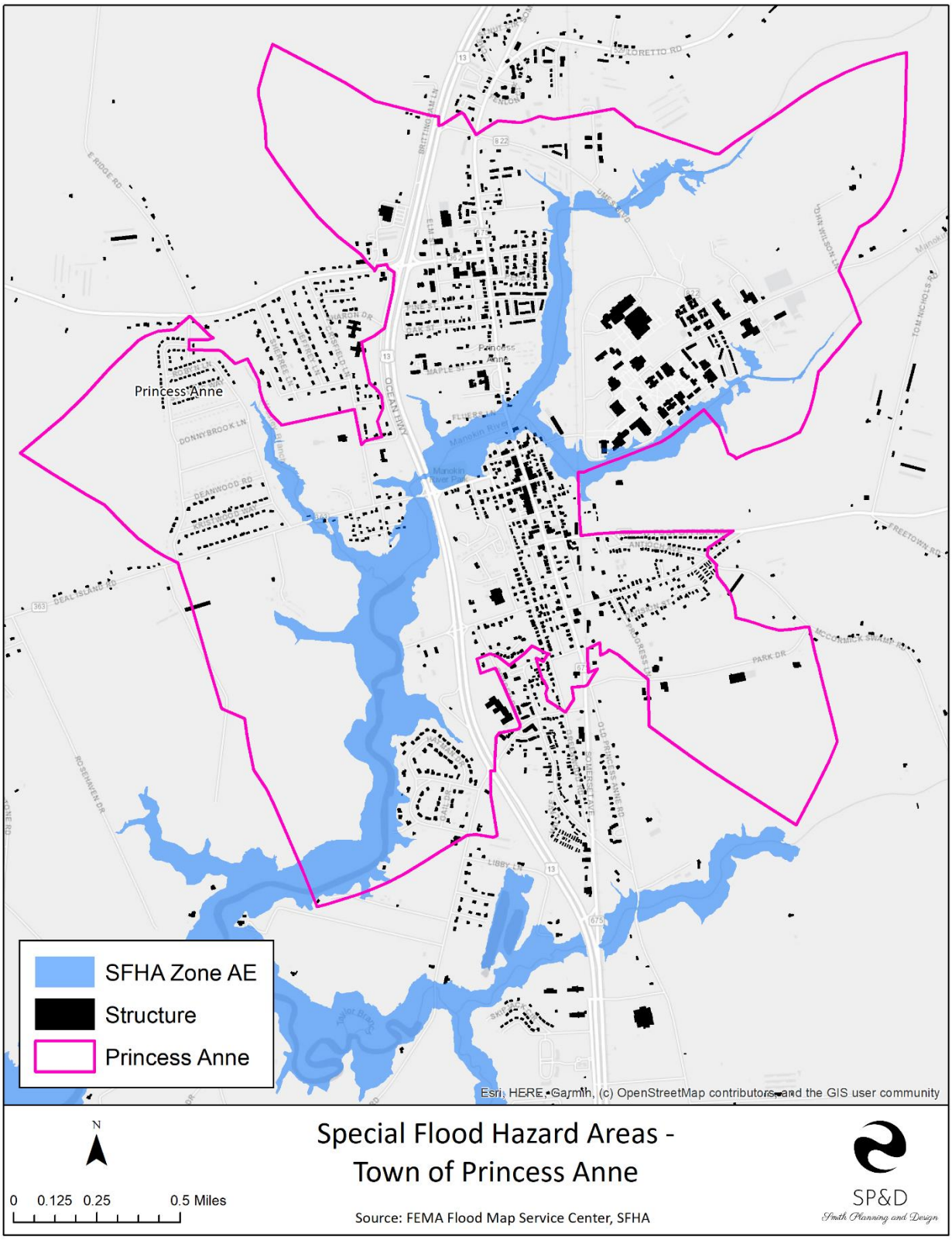
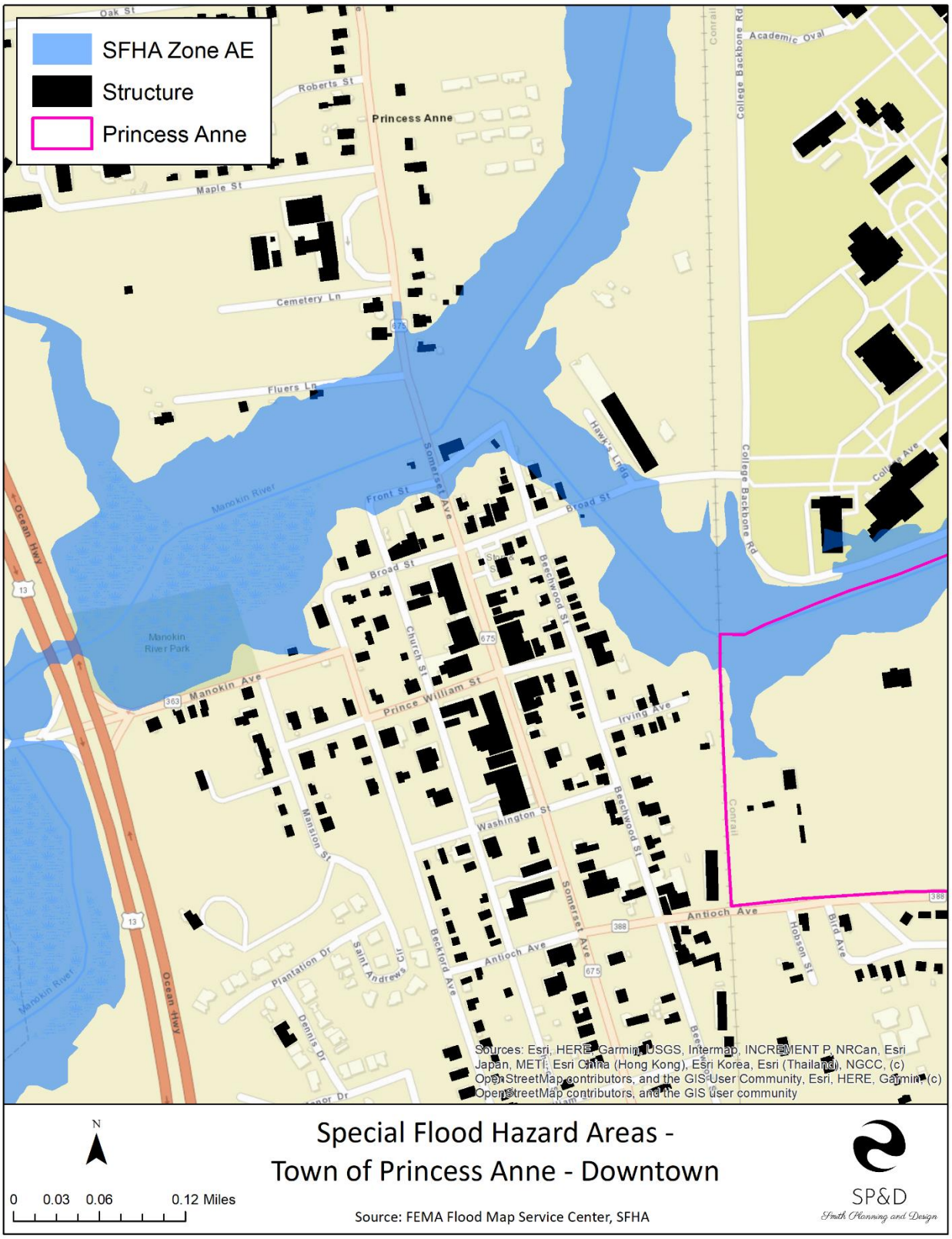
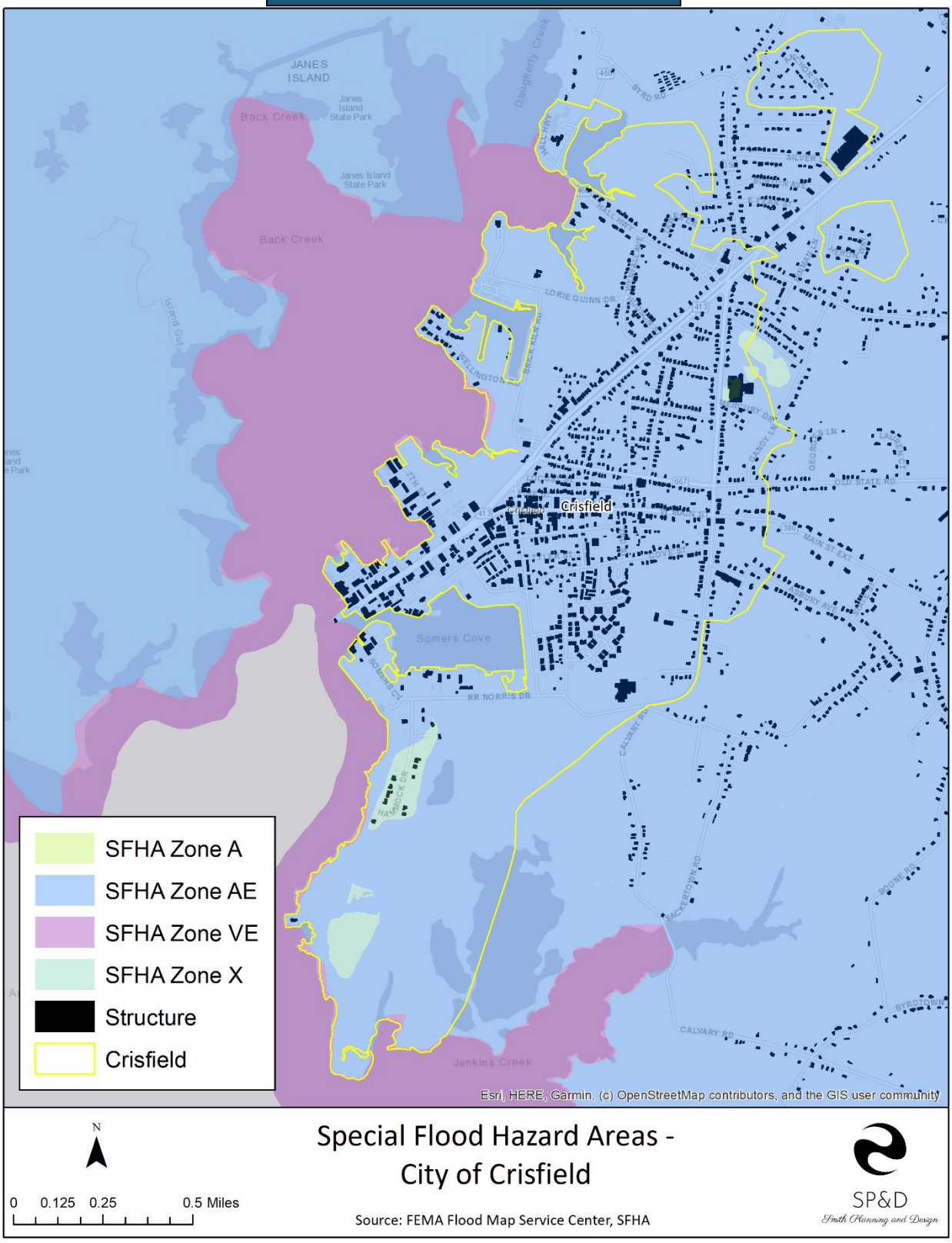
Map 4-2: SFHA Map – Town of Princess Anne



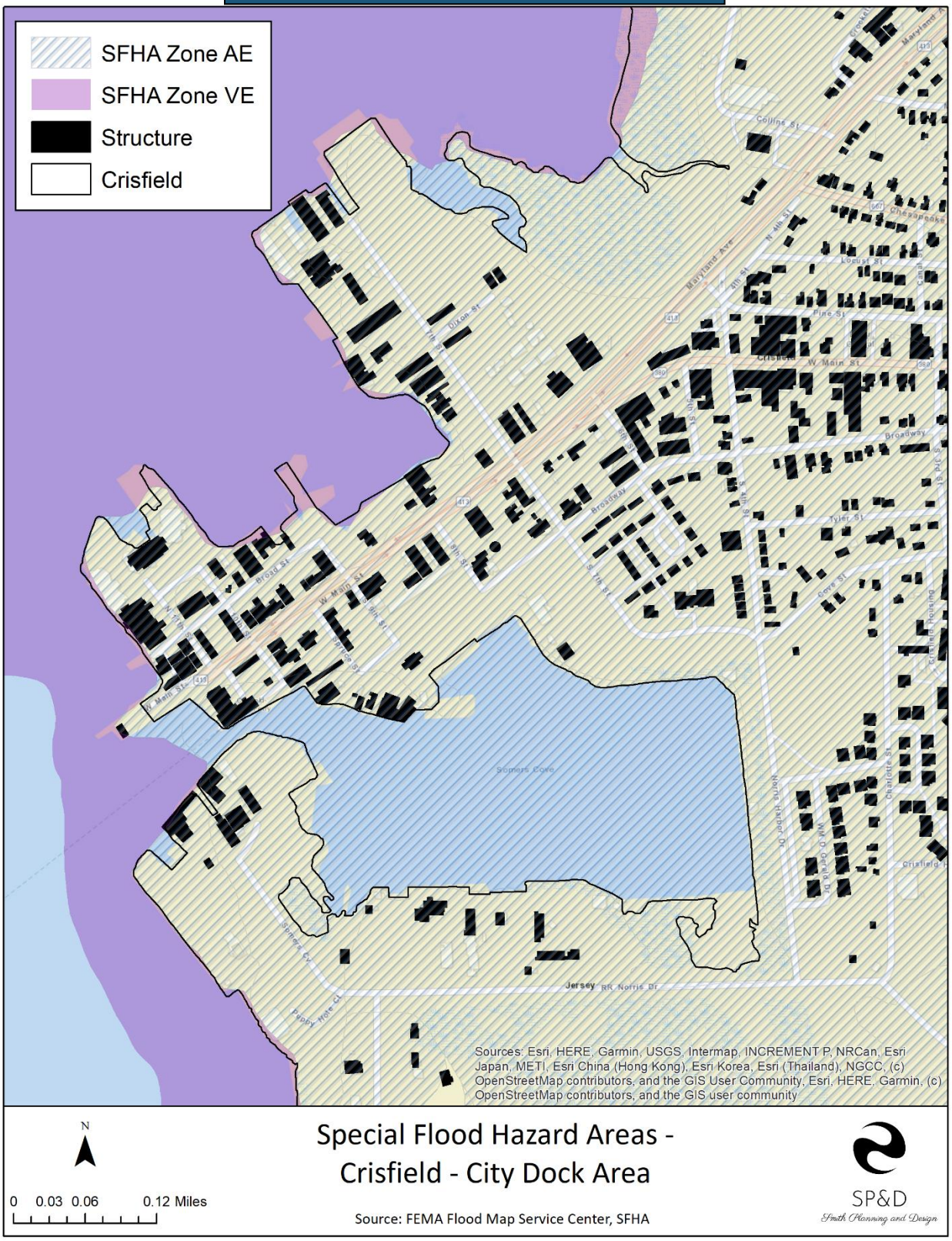
Map 4-3: SFHA Map – Downtown Princess Anne



Map 4-4: SFHA Map – City of Crisfield



Map 4-5: SFHA Map – Crisfield City Dock Area



4.5 Essential Facilities At-Risk

Essential Facilities

Essential facilities are those facilities that provide services to the community and should be functional after a disaster event. Essential facilities include hospitals, police stations, fire stations, and schools.

Source: FEMA HAZUS Technical Manual.

The *2021 Flood Mitigation Plan* includes a risk assessment conducted for essential facilities within the FEMA 1-percent-annual-chance flood.

The County's unincorporated areas include six (6) essential facilities within the 1-percent-annual-chance flood zone. These facilities have a modeled flood depth ranging from 0.5 feet to 2.9 feet of flooding. The City of Crisfield contains nine (9) essential facilities within the 1-percent-annual-chance flood zone. These facilities have a modeled flood depth ranging from 0.2 feet to 3.8 feet of flooding. Princess Anne contains zero (0) essential facilities within the 1-percent-annual-chance flood zone. Essential facilities, including high risk essential facilities are fully mapped in the County's 2021 Flood Mitigation Plan.

Table 4-8: Essential Facilities At-Risk to the 1-Percent-Annual-Chance Flood

Location	Facility Type	Facility Name	Flood Zone	Flood Depth (feet)
County	Fire	Mt. Vernon Fire Dept.	AE	0.5
County	Fire	Fairmount Fire Dept.	AE	1.3
County	Fire	Ewell Fire Dept.	AE	2.8
County	School	Ewell Elementary School	AE	2.9
County	Fire	Tylerton Fire Dept.	AE	2.3
County	School	Living Hope Christian School	AE	0.5
Crisfield	Medical	Marion Pharmacy	AE	0.2
Crisfield	School	Woodson Elementary School	AE	0.5
Crisfield	Fire	Lower Somerset Ambulance Squad	AE	1.5
Crisfield	Police	DNR Police	AE	1.6
Crisfield	Fire	Crisfield Fire Dept.	AE	2.9
Crisfield	Police	Crisfield Police	AE	1.7
Crisfield	Medical	Crisfield Pharmacy	AE	3.1
Crisfield	Medical	TidalHealth & Alice Byrd Tawes Nursing Home	AE	2.3
Crisfield	School	Crisfield High School	AE	3.8

Source: 2022 Somerset County Critical and Public Database.

4.6 Critical & Public Facilities At-Risk

In addition to essential facilities, other critical and public facilities have been assessed for flood vulnerability. Table 4-9 lists the essential facilities within the County and its municipalities vulnerable to the 1-percent-annual-chance flood. The County contains sixty-seven (67) facilities within the FEMA AE Flood Zone, ranging from a modeled flood depth of 0.5 feet to 8.5 feet of flooding. Two facilities are located within the FEMA VE Flood Zone and have modeled flood depths of 2.6 and 11.1. The City of Crisfield has seventeen (17) facilities located within the FEMA AE Flood Zone, with modeled flood depths between 0.5 feet to 4.3 feet of flooding.

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Furthermore, a total of two (2) public facilities located in the Town of Princess Anne are within the FEMA AE Flood Zone. Modeled flood depths for these facilities are up to 0.5 feet of flooding.

Table 4-9: Critical & Public Facilities At-Risk to the 1-Percent-Annual-Chance-Flood

Location	Facility Type	Facility Name	Flood Zone	Food Depth (Feet)
County	Transportation	Bridge @ Deal Island Road/Upper Thorofare	VE	11.1
County	Miscellaneous	Shelltown Boat Ramp	AE	8.5
County	Miscellaneous	Webster Cove Marina	AE	8.0
County	Transportation	Bridge @ Whitehaven Ferry Road/Waukaki Creek	AE	7.6
County	Transportation	Bridge @ Marumsco Road/Marumsco Creek	AE	7.1
County	Transportation	Bridge @ Millard Long Road/Back Creek	AE	6.3
County	Miscellaneous	Rhodes Point Dock	AE	6.2
County	Miscellaneous	Rumbly Point Boat Ramp	AE	6.2
County	Transportation	Bridge @ Lq Powell Road/East Creek	AE	6.0
County	Miscellaneous	St. Peters Creek Marina	AE	5.8
County	Miscellaneous	Deal Island Wma (3)	AE	5.7
County	Transportation	Bridge @ Stewart Neck Road/Kings Creek	AE	5.1
County	Utility	Ewell WWTP	AE	5.0
County	Miscellaneous	Fairmount Academy	AE	5.0
County	Transportation	Bridge @ Marsh Road/Shanks Creek	AE	5.0
County	Transportation	Bridge @ Smith Island Road/Ewell	AE	5.0
County	Utility	Pumping Station	AE	4.9
County	Utility	WWTP	AE	4.9
County	Transportation	Smith Island Heliport	AE	4.8
County	Transportation	Bridge @ Frenchtown Road/Mine Creek	AE	4.7
County	Transportation	Bridge @ Ape Hole Road/Little Ape Hole Creek	AE	4.6
County	Transportation	Bridge @ Coventry Parish Road/Rehobeth Branch	AE	4.6
County	Miscellaneous	Ewell Ramp/Wharf	AE	4.6
County	Transportation	Bridge @ Bryan Hall Road/Marumsco Creek	AE	4.5
County	Utility	Telecom Tower	AE	4.5
County	Transportation	Bridge @ Frenchtown Road/Goose Creek	AE	4.3
County	Miscellaneous	Coulbourn Creek Boat Ramp	AE	4.1
County	Miscellaneous	Dames Quarter Dock & Ramp	AE	4.0
County	Utility	Tylerton Transfer Station	AE	4.0
County	Transportation	Bridge @ River Road/Big Annemessex River	AE	3.8
County	Miscellaneous	Tylerton Marina	AE	3.6
County	Utility	Chance Transfer Station	AE	3.5
County	Miscellaneous	Glen Ward Ballfield	AE	3.5
County	Transportation	Fairmount Heliport	AE	3.4
County	Miscellaneous	Rehobeth Boat Ramp	AE	3.4
County	Miscellaneous	Tylerton Wharf	AE	3.4
County	Transportation	Bridge @ Calvary Road/Jenkins Creek	AE	3.3
County	Transportation	Crisfield Airport	AE	3.3
County	Miscellaneous	Raccoon Point Rec. Area	AE	3.1
County	Miscellaneous	Smith Island Cultural Center	AE	3.1
County	Miscellaneous	Smith Island Library	AE	3.1

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Table 4-9: Critical & Public Facilities At-Risk to the 1-Percent-Annual-Chance-Flood				
Location	**Facility Type**	**Facility Name**	**Flood Zone**	**Food Depth (Feet)**
County	Utility	Well House	AE	3.0
County	Utility	Well House	AE	3.0
County	Utility	WWTP	AE	3.0
County	Transportation	Bridge @ Cash Corner Rd/Johnson Creek	AE	2.9
County	Utility	Halls Creek Road Wtp	AE	2.8
County	Utility	Well House	AE	2.7
County	Miscellaneous	Jenkins Creek Dock & Boat Ramp	VE	2.6
County	Utility	Pumping Station	AE	2.6
County	Miscellaneous	Rumbley Marina	AE	2.6
County	Miscellaneous	Upper Fairmount P.O.	AE	2.6
County	Transportation	Bridge @ Sign Post Road/Back Creek	AE	2.4
County	Transportation	Bridge @ Hanes Point Road/Scotts Cove	AE	2.3
County	Miscellaneous	Wenona Marina	AE	2.3
County	Utility	Smith Island Incinerator	AE	2.2
County	Transportation	Bridge @ Stewart Neck Road/Jones Creek	AE	2.2
County	Transportation	Bridge @ Rumbley Road/Teague Creek	AE	1.8
County	Miscellaneous	Deal Island/Last Chance Marina	AE	1.7
County	Utility	Telephone	AE	1.7
County	Miscellaneous	Tylerton P.O.	AE	1.7
County	Utility	Well House	AE	1.6
County	Miscellaneous	Eddie Evans Ball Field	AE	1.4
County	Miscellaneous	Ewell P.O.	AE	1.3
County	Miscellaneous	Mt. Vernon Park	AE	1.3
County	Miscellaneous	Upper Hill Playground	AE	0.8
County	Transportation	Bridge @ Hall Highway/Trib Little Annemessex River	AE	0.5
County	Transportation	Bridge @ Old Princess Anne Rd/Kings Creek	AE	0.5
County	Utility	Pumping Station	AE	0.5
Crisfield	Miscellaneous	Crisfield Library	AE	4.3
Crisfield	Transportation	TidalHealth Heliport	AE	4.3
Crisfield	Utility	Telephone	AE	3.5
Crisfield	Miscellaneous	City Dock	AE	3.3
Crisfield	Miscellaneous	Crisfield P.O.	AE	3.2
Crisfield	Government	City Hall	AE	3.0
Crisfield	Miscellaneous	American Legion	AE	2.9
Crisfield	Utility	Pumping Station	AE	2.4
Crisfield	Utility	Pumping Station	AE	2.4
Crisfield	Utility	Telephone & Wireless Tower	AE	2.1
Crisfield	Utility	WWTP	AE	2.0
Crisfield	Miscellaneous	Janes Island Boat Ramp	AE	1.8
Crisfield	Miscellaneous	Somers Cove	AE	1.8
Crisfield	Utility	Water Tower	AE	1.2
Crisfield	Utility	Well House	AE	0.8
Crisfield	Government	Coast Guard	AE	0.5
Crisfield	Utility	Crisfield Electric Substation	AE	0.5
Princess Anne	Utility	Communication	AE	0.5

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Table 4-9: Critical & Public Facilities At-Risk to the 1-Percent-Annual-Chance-Flood				
Location	**Facility Type**	**Facility Name**	**Flood Zone**	**Food Depth (Feet)**
Princess Anne	Miscellaneous	Manokin River Park	AE	0.5
Source: 2022 Somerset County Critical and Public Database.				

4.7 Flood Risk Report Loss Estimations

The Maryland Department of Emergency Management (MDEM), with grant funding from FEMA, created a Maryland-centric flood risk report. The Flood Risk Report (2019) utilized the FEMA Flood Risk Reports (FRR) template as a guide to create an expanded report for Somerset County. The report provides potential flood losses for the 1-percent-annual-chance flood event, which were calculated using FEMA's loss estimation application, Hazus-3.1. Hazus is a GIS-based risk assessment methodology and software application created by FEMA and the National Institute of Building Sciences for analyzing potential losses from floods. Refined loss data provided within the standard FEMA FRR has been expanded to include additional facility types.

Within Somerset County and incorporated areas, user defined facilities (UDFs) for riverine areas were analyzed, but no associated losses were identified. As a result, only coastal flood losses are presented, based on the leveraged UDFs from the May 2016 coastal flood risk products for Somerset County. Table 4-10 includes refined flood loss estimates for the 1-percent-annual-chance-flood event and are summarized by occupancy type. Including residential, commercial, and other buildings and contents. These results are presented in Table 4-11. These structures (those within the 1-percent-annual-chance flood zone) are depicted on Map 4-6 on page 4-24.

Map 4-7, on page 4-25, represents "riverine flood risk" for the entire County based on flood loss estimations by census block. This map, along with individual maps for High-Risk Areas 1-6 including estimated losses by occupancy type, are viewed at their highest quality beginning on page 1850 of the 2021 State Hazard Mitigation Plan – Appendix L.

Table 4-10: Estimated Losses by Occupancy Type – 1-Percent-Annual-Chance Flood			
Type	**Inventory Estimated Value**	**% Of Total**	**1% (100-yr) Dollar Losses**
Residential Building & Contents	$424,400,000	71%	$57,600,000
Commercial Building & Contents	$104,400,000	18%	$13,400,000
Other Building & Contents	$65,600,000	11%	$11,800,000
Total Building & Contents	$594,400,000	100%	$82,800,000
Business Disruption	N/A	N/A	$5,700,000
Total	**$594,400,000**	**N/A**	**$88,500,00**
Source: MDEM Flood Risk Report - Somerset County, December 31, 2019. Flood Risk Project Refined Losses calculated using HAZUS Version 2.2. -Losses shown are rounded to nearest $10,000 for values under $100,000 and to the nearest $100,000 for values over -$100,000. -Percent Loss = Dollar Losses ÷ Estimated Value. Percentages are rounded to the nearest integer.			

-Total Building and Contents = Residential Building and Contents + Commercial Building and Contents + Other Building and Contents.
-Business Disruption = Inventory Loss + Relocation Cost + Income Loss + Rental Income Loss + Wage Loss + Direct Output Loss.
-Total = Total Building and Contents + Business Disruption.

Results from the analysis concluded thirteen (13) essential facilities in Somerset County are at-risk to the 1-percent-annual-chance flood event (facilities are identified in Table 4-8). Potential losses were computed using state-level tax data (parcel centroids from the Maryland Department of Planning) and local building footprints provided by Somerset County to estimate loss ratios for the 1-percent-annual-chance flood scenario.

Table 4-11: Essential Facilities Estimated Loss Summary for the 1-Percent-Annual-Chance-Flood (Riverine and Coastal Areas)

Type	Total 1% (100-yr) Dollar Losses (Building & Contents)	Total Building Loss	Building Loss Percentage of Total	Total Content Loss	Content Loss Percentage of Total
Fire Station	$332,533	$82,011	25%	$250,523	75%
Hospital	$2,688,797	$1,499,573	56%	$1,189,224	44%
Police Station	$8,413	$3,100	37%	$5,314	63%
School	$361,810	$56,308	16%	$305,502	85%
Total	**$3,391,554**	**$1,640,992**	**N/A**	**$1,750,562**	**N/A**

Source: MDEM Flood Risk Report - Somerset County, December 31, 2019.
Disclaimer: Hazus does compute loss estimates for structures exposed to the minimum flood depths of 0.1 feet. However, structural and content loss are dependent upon foundation type and/or the First Flood Elevations (FFE). Therefore, structures exposed to the minimum flood depths of 0.1 feet may have content loss only or both structural or content loss or neither.

The FRR also includes two (2) State-owned and/or operated facilities. Loss estimations for state-owned facilities were completed separately via Hazus-3.1 and are included in Table 4-12, below.

Table 4-12: State Assets Estimated Loss Summary for the 1-Percent-Annual-Chance-Flood (State Assets in Riverine and Coastal Areas)

Type	Total 1% (100-yr) Dollar Losses (Building & Contents)	Total Building Loss	Building Loss Percentage of Total	Total Content Loss	Content Loss Percentage of Total
MD Institute for Emergency Medical Services – Communications Engineering Services Facility	$3,387,018	$1,859,642	55%	$1,527,376	45%
Department of Natural Resources Facility	$3,209,004	$693,037	22%	$2,515,967	78%
Total	**$6,596,022**	**$2,522,679**	**N/A**	**$4,043,344**	**N/A**

Table 4-12: State Assets Estimated Loss Summary for the 1-Percent-Annual-Chance-Flood (State Assets in Riverine and Coastal Areas)					
Type	**Total 1% (100-yr) Dollar Losses (Building & Contents)**	**Total Building Loss**	**Building Loss Percentage of Total**	**Total Content Loss**	**Content Loss Percentage of Total**
Source: MDEM Flood Risk Report - Somerset County, December 31, 2019. Disclaimer: Hazus does compute loss estimates for structures exposed to the minimum flood depths of 0.1 feet. However, structural and content loss are dependent upon foundation type and/or the First Flood Elevations (FFE). Therefore, structures exposed to the minimum flood depths of 0.1 feet may have content loss only or both structural or content loss or neither.					

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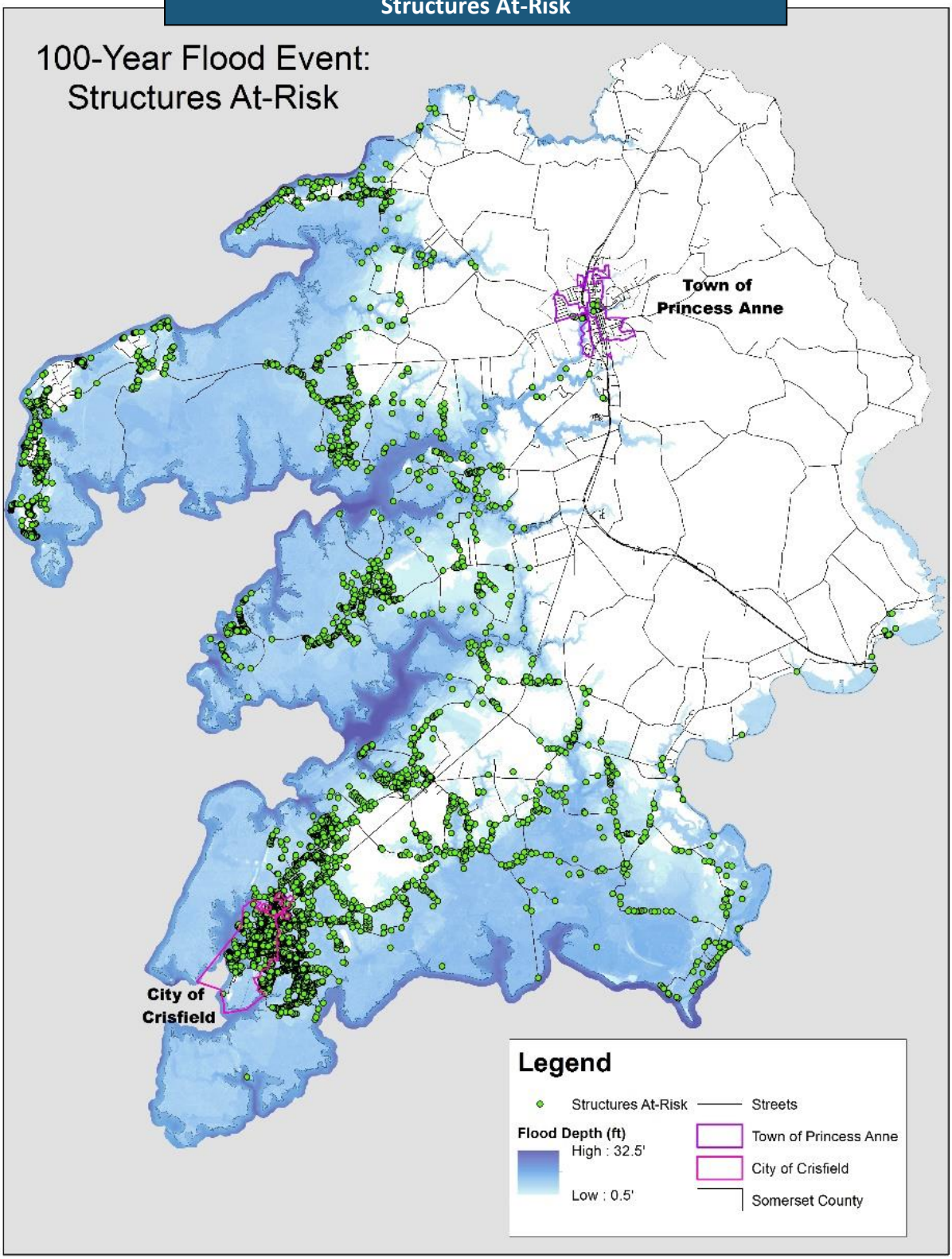
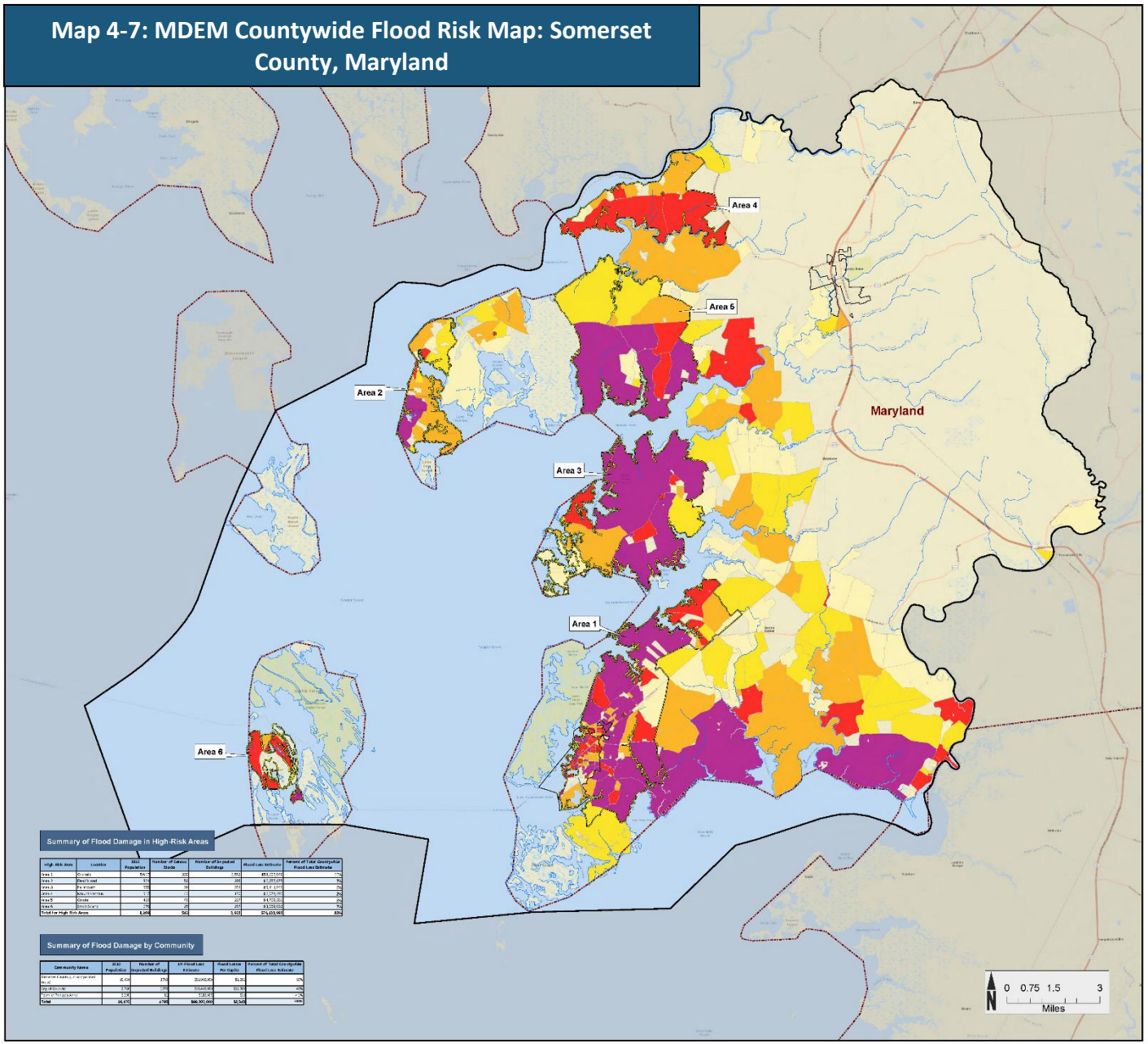
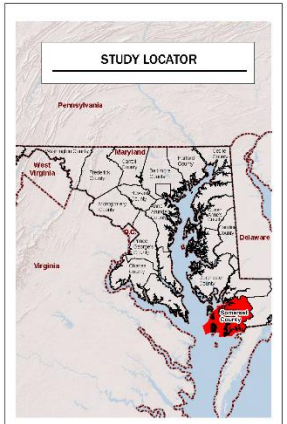
Map 4-6: 1-Percent-Annual-Chance Flood Event: Structures At-Risk



Map 4-7: MDEM Countywide Flood Risk Map: Somerset County, Maryland





MAP SYMBOLOGY

Base and Flood Data

- State Boundary
- Corporate Limits
- Rivers and Streams
- Coastal Surge Influenced Area

Riverine Flood Risk

Flood Loss Estimates by Census Block

- Very Low (<$50,000 damage)
- Low ($50,000-$100,000 damage)
- Medium ($100,000-$250,000 damage)
- High ($250,000-$500,000 damage)
- Very High (>$500,000 damage)
- High-Risk Area* (Area 1)

*High-Risk Areas are places in the county that have a large amount of flood damage in a small area. They are created by grouping together adjacent Census Blocks with high flood loss estimations. Please note that significant flood damages can occur outside of the identified high-risk areas.

- At-Risk State Asset or Essential Facility

Risk Mapping, Assessment, and Planning (Risk MAP)

Countywide Flood Risk Map (FRM)

Somerset County and Incorporated Areas, MD

MARYLAND

FEMA

This Flood Risk Map has been prepared in conjunction with the Flood Risk Report and Flood Risk Database for Somerset County, MD.

RELEASE DATE 12/31/2019

4.8 Dam Failure

Dams present flood risks, but they also provide many benefits, including irrigation, flood control, and recreation. Dams have been identified as a key resource of our national infrastructure that is vulnerable to terrorist attack. States have the primary responsibility for protecting their populations from dam failure. Of the approximately 94,400 dams in the United States, State governments regulate about 70 percent. About 27,000 dams throughout the U.S. could incur damage or fail, resulting in significant property damage, lifeline disruption (utilities), business disruption, displacement of families from their homes, and environmental damage.[1]

According to FEMA, dams can fail for several reasons, including: overtopping caused by floods, acts of sabotage, upstream dam failure (i.e., the failure of another nearby dam), structural failure of materials used in dam construction, or earthquakes.[2] FEMA acknowledges three primary types of risk associated with high hazard potential dams, which include the following:

Incremental Risk: The risk (likelihood and consequences) to the pool area and downstream floodplain occupants that can be attributed to the presence of the dam should the dam breach prior or after overtopping, or undergo component malfunction or misoperation, where the consequences considered are over and above those that would occur without dam breach. The consequences typically are due to downstream inundation, but loss of the pool can result in significant consequences in the pool area upstream of the dam.

Non-Breach Risk: The risk in the reservoir pool area and affected downstream floodplain due to 'normal' dam operation of the dam (e.g., large spillway flows within the design capacity that exceed channel capacity) or 'overtopping of the dam without breaching' scenarios.

Residual Risk: The risk that remains after all mitigation actions and risk reduction actions have been completed. With respect to dams, FEMA defines residual risk as "risk remaining at any time" (FEMA, 2015, p A-2). It is the risk that remains after decisions related to a specific dam safety issue are made and prudent actions have been taken to address the risk. It is the remote risk associated with a condition that was judged to not be a credible dam safety issue.

According to Somerset County's responses to FEMA's Region 3 "Checking in On The NFIP" worksheets (refer to *Chapter 17: Community Capabilities*), the County has no major or high hazard potential dams (HHPD) or levees. The County may be affected by the failure of one (1) low hazard potential dam located along the northern border with Wicomico County. More information about this dam is included in Table 4-13, below. The location of the dam is identified in Figure 4-2, following.

Table 4-13. Dams Near Somerset County, Maryland

Dam Name	Dam Type	Primary Purpose	Emergency Action Plan	Owner Name	Hazard Potential Classification
Allen Town Pond	Earth	Recreation	Not Required	Wicomico County Government	Low

Source: National Inventory of Dams, https://nid.sec.usace.army.mil/#/

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Figure 4-2: Low Hazard Dam Location

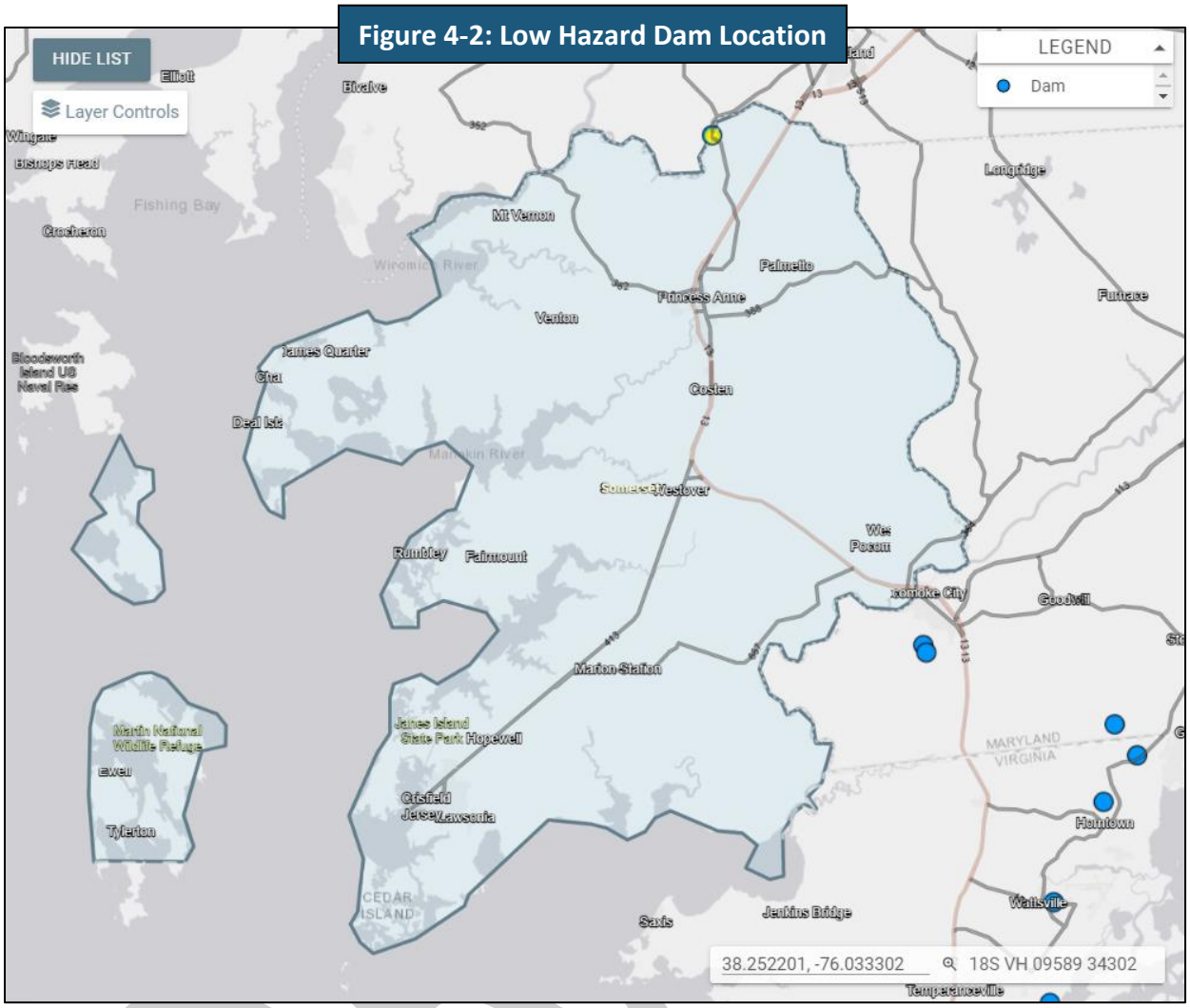

Figure 4-2: The location of Allen Town Pond Dam is identified by the yellow circle. This low hazard dam is located in the small community of Allen, near the border of Wicomico County and Somerset County. Source: National Inventory of Dams.

If this dam were to fail, no essential, critical or public facilities are expected to be impacted. The location of the dam is highly rural, with farmland immediately downstream, and as such, minimal impacts to people or development are expected.

Additional information regarding dams across Maryland and the United States may be accessed by members of the community and business owners via the National Inventory of Dams. This is an online resource that can aid in determining the location of dams and includes important information such as such as hazard classification, owner, and Emergency Action Plan (EAP) status. Additionally, contact information for the Maryland Department of the Environment's Dam Safety Division is available here.

4.9 Social Vulnerability and Flood Risk

An important aspect relating to the overall health and safety of Somerset County's communities is social vulnerability. Somerset County recognizes that identifying socially vulnerable populations is an important step in mitigating for flood events. According to the Centers for

Disease Control and Prevention (CDC), social vulnerability refers to "the negative effects on communities caused by external stresses on human health. Such stresses include natural or human-caused disasters, or disease outbreak." Reducing social vulnerability can decrease both human suffering and economic loss.[3]

The CDC developed a Social Vulnerability Index (SVI) to help local jurisdictions determine their level of vulnerability based on fifteen (15) indicators that are routinely utilized to measure social vulnerability. These indicators are as follows:

- Socioeconomic Status
    1. Below Poverty
    2. Unemployed
    3. Income
    4. No High School Diploma
- Household Composition & Disability
    1. Aged 65 or Older
    2. Aged 17 or Younger
    3. Civilian with a Disability
    4. Single-Parent Households
- Minority Status & Language
    1. Minority
    2. Speaks English "Less than Well"
- Housing Type & Transportation
    1. Multi-Unit Structures
    2. Mobile Homes
    3. Crowding
    4. No Vehicle
    5. Group Quarters

The SVI has been conducted for Somerset County at the census tract level and is mapped on the following page, Map 4-8. The SVI utilizes ACS 5-year estimates. The darker census tracts indicate areas of higher social vulnerability while the lightest tracts indicate relatively low social vulnerability.

The SVI results have also been mapped alongside the 1-percent-annual-chance flood hazard area to aid in determining areas of concern where flood mitigation activities might make the most sense due to increased social vulnerability. Areas of concern are locations where high social vulnerability and extensive flood hazard areas overlap. Measuring social vulnerability at the census tract level is meant to help guide further planning. Investigation at the neighborhood level is required to fully identify vulnerable populations.

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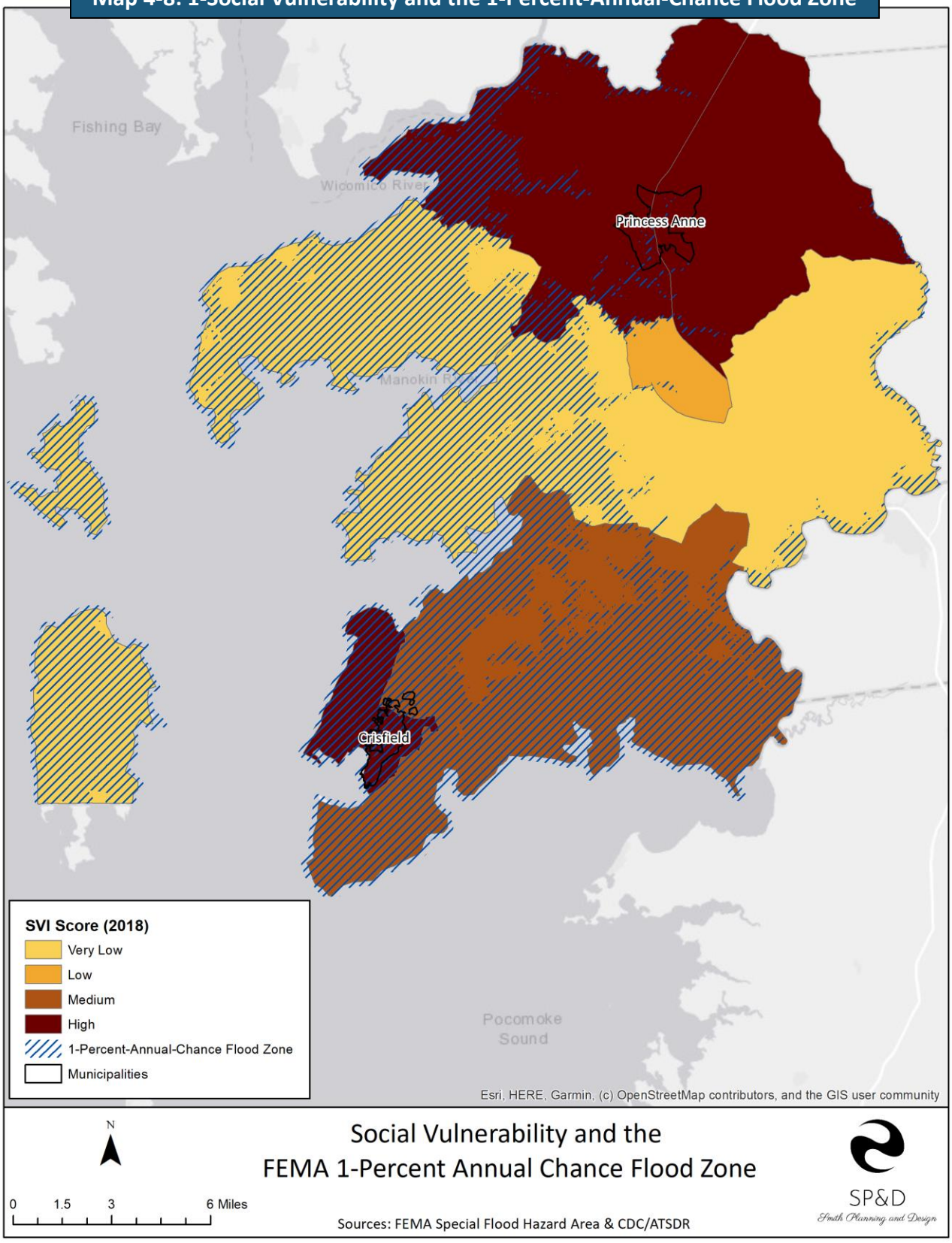
Map 4-8: 1-Social Vulnerability and the 1-Percent-Annual-Chance Flood Zone



4.10 Mitigation Strategies

The information below provides an overview of Somerset County's community capabilities according to the FEMA Flood Risk Report.

Table 4-14: Community Overview

Community Name	Population	Total Community Land Area (sq. mi)	Participation NFIP?	CRS Rating?	Mitigation Plan?
Somerset County (Unincorporated Areas)	20,454	605.14	Yes	10*	Yes
City of Crisfield	2,726	3.17	Yes	10*	Yes
Town of Princess Anne	3,290	1.69	Yes	10*	Yes

Source: MDEM Flood Risk Report - Somerset County, December 31, 2019.
*Subject to change once CRS points have been assessed. Refer to the text immediately following this table.

In addition to these capabilities, the County has recently developed and adopted a Flood Mitigation Plan (2021) as well as a Nuisance Flooding Plan (2019). The County has recently completed FEMA Region 3 "Checking In On The NFIP" Worksheets for the categories "Floodplain Identification & Mapping", "Floodplain Management", and "Flood Insurance."

The County is compliant with the NFIP, and a letter of intent was submitted to for the Community Rating System (CRS) in 2017. A Community Assistance Visit (CAV) was conducted in 2019 and the County is presently working through the last of the issues identified during the CAV. Once these issues are corrected, a letter of good standing can be issued, and CRS activity points may be assessed. The goal for completion is Fall or December of 2022.

The 2015 Somerset County Floodplain Ordinance 1084 was made effective February 4, 2015, in conjunction with the adoption of new FEMA DFIRM maps. While the new Somerset County Floodplain Ordinance does not use the word "Freeboard" specifically, the code does adopt a higher standard by two references:

- The ordinance requires the lowest horizontal structural member to be at or above BFE (Ordinance 1084 see Section 5.3A(1). This would be the bottom of the floor joist, which makes the first floor elevation approximately 10.5-11" BFE.

- The ordinance also references the Building code (Ordinance 1084 see Sec 4.4A. In Somerset County's case the 2015 International Building Code requires a 12" freeboard which is the more restrictive of the two ordinances. By enforcing the International Building Code requirement, we automatically comply with our floodplain ordinance.

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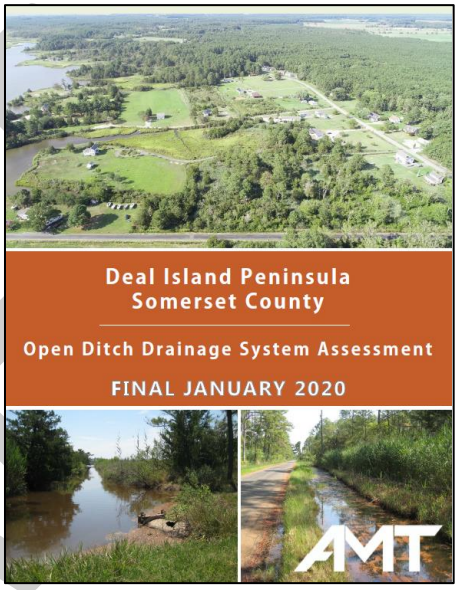
In addition, both Princess Anne and Crisfield have adopted floodplain ordinances which requires all new development to be built at two feet above BFE.

The 2015 Floodplain Ordinance includes Coastal A Zone using the Limit of Wave Action (LiMWA). However, the FEMA Flood Insurance Rate Maps (FIRMs) have been found to be incorrect by the County, specifically the lines denoting the LiMWA. As such, the County has requested that FEMA correct the LiMWA on the effective FIRMs, which will enable the County to successfully manage the floodplain based on reasonable mapping products.

The Open Ditch Drainage System Assessment completed in 2020 for Deal Island Peninsula addressed the existing conditions of the open ditch drainage system on the peninsula and provided both short and long term recommendations for maintenance improvements and conceptual mitigation measures with accompanying cost evaluations to improve the drainage system conditions on the Island.

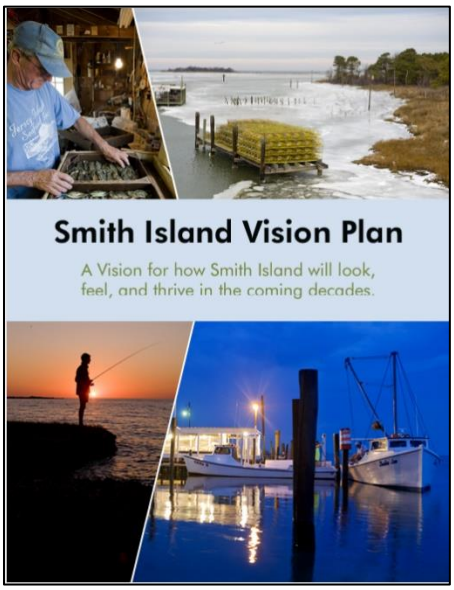


Cover: Deal Island Peninsula Open Ditch Drainage System Assessment.

Fifteen recommendations were provided based on existing conditions for multiple study areas throughout the areas of Dames Quarter and Oriole. The assessment concluded that if the open ditch drainage system is left unattended, standing water and flooding conditions will continue to escalate within the Deal Island Peninsula communities of Dames Quarter and Oriole.

This area, with the addition of Oriole, was also identified as an area of concern within the Flood Mitigation Plan. This area has been identified to be susceptible to multiple flood hazards, such as hurricane storm surge, the 1-percent-annual-chance flood, and sea level rise.

Currently, the MDOT-SHA does not report any projects occurring within this area, specifically Deal Island Road, which is state-owned. It was noted in the assessment that the MDOT-SHA was scheduled to clean this drainage ditch, which would need to occur prior to or alongside other suggested projects.



Cover: Smith Island Drainage Plan.

The Smith Island Vision Plan was developed to create a vision for the island that consisted of goals such as (1) growing a sustainable watermen's culture, (2) creating a diverse local economy, (3) developing and maintaining infrastructure (4) providing reliable and sustainable transportation, and (5) growing year-round population.

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In relation to go three (3) developing and maintaining infrastructure on the island, the vision plan recommended projects related to shoreline protection, wastewater disposal, stormwater management, drainage ditch maintenance, potable water supply, increasing communication access, and mitigating repetitively flooded roadways and bridges from heavy storms. Local capabilities are established in terms of strengths and weaknesses for each of the goals outlined within the plan.

The City of Crisfield is also in the process of developing a drainage assessment of the City's system to help identify and address the stormwater and flooding issues within the City.

Finally, the Public Survey conducted during this plan update asked respondents the following: "Which of the following mitigation project types do you believe that local government agencies should focus on to reduce disruptions of services and strengthen the community (check all that apply)?"

The top three mitigation categories selected by survey respondents include:

1. Retrofit infrastructure, such as elevating roadways and improving drainage systems.
2. Retrofit and strengthen essential facilities such as police, fire, emergency medical services, hospitals, schools, etc.
3. Inform property owners of ways they can mitigate damage to their property.

Other choices selected included the following, in order of most preferred to least preferred:

4. Work on improving the damage resistance of utilities (electricity, communications, water/sewer, etc.)
5. Assist vulnerable property owners with securing funding to mitigate impacts to their property.
6. Replace inadequate or vulnerable bridges and causeways.
7. Provide better information about hazard risk and high-hazard areas.
8. Strengthen codes, ordinances, and plans to require higher hazard risk management standards.
9. Elevate structures.
10. Buyout flood prone properties and maintain as open space.

The community is most interested in retrofitting existing infrastructure and essential facilities and reaching out to properties about potential mitigation options.

4.11 Future Conditions

The frequency of flooding, flash flooding, and heavy rain events are likely to increase due to climate change and associated projected sea level rise. Some areas will become permanently inundated, making them uninhabitable in the long term. Areas that currently experience regular flooding are likely to see conditions change or worsen due to sea level rise. And some new land areas that historically flood very little or not at all are likely to start flooding.

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According to a 2021 study published in Nature "when it comes to riverine flooding, climate change is likely exacerbating the frequency and intensity of extreme flood events but decreasing the number of moderate floods."[4] Flash flooding will continue to increase as there are more extreme precipitation events. Warmer temperatures increase evaporation, putting more moisture into the atmosphere that then gets released as rain or snowfall.

Finally, the Nuisance Flooding Plan indicates that areas currently experiencing nuisance flooding issues will gradually see an increase in these issues as the changing climate elevates water levels and drives precipitation patterns to new extremes. However, this shift will likely occur gradually over time. New areas will also become impacted, leading to an increased number of businesses, residents, and critical infrastructure at risk. Public services will also be more frequently impaired as flooding increases.

[1] www.fema.gov/sites/default/files/2020-08/fema_dam-safety_aware-community_fact-sheet_2016.pdf
[2] www.fema.gov/sites/default/files/2020-08/fema_dam-safety_aware-community_fact-sheet_2016.pdf
[3] www.atsdr.cdc.gov/placeandhealth/svi/index.html
[4] Brunner, M.I., Swain, D.L., Wood, R.R. *et al.* An extremeness threshold determines the regional response of floods to changes in rainfall extremes. *Commun Earth Environ* **2,** 173 (2021). https://doi.org/10.1038/s43247-021-00248-x

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