CHAPTER 5: COASTAL HAZARDS

2022 PLAN UPDATE

Chapter 5: visual and thematic updates were included throughout the chapter, including updates to fonts, colors, and the addition of a cover page.
Page 5-4: Section 5.2 History, Table 5-2 has been updated with the Presidential Declaration related to Tropical Storm Isaias.
Page 5-4: Annualized events from combined hurricane, tropical storm, and coastal flooding events have been updated utilizing the most recent data from the NCEI Storm Events Database. Additionally, total estimated property damage from all three event types has been updated.
Page 5-5: Table 5-3 Hurricane Events, and Table 5-5 Tropical Storm Events have been updated with the latest data from the NCEI Storm Events Database. Annualized events for the County have been determined for both hurricane and tropical storm based on this data.
Page 5-7: Table 5-5 Coastal Flooding Events has been updated with the latest data from the NCEI. Annualized events for the County have been determined for coastal flooding.
Page 5-9: Map 5-1 Tropical Cyclone Tracks (1996-2022) has been updated with the latest track data from NOAA's IBTRaCS database.
Page 5-10: 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 5.3. The State ranks hurricane as "high" risk and Somerset County ranks hurricane as "high" risk.
Page 5-11: Map 5-2 SLOSH Model Storm Surge has been updated.
Page 5-12: Map 5-3 SLOSH Model Storm Surge of Communities has been updated. 2021 Census Designated Places have been added.
Page 5-15: Section 5.6 Essential Facilities At-Risk, Table 5-7, has been updated to reflect changes in the County's essential facility database and new improvement values from MdPropertyView.
Page 5-17: Section 5.8 Future Conditions has been added for this plan update.

Chapter 5: Coastal Hazards

5.1 Hazard Profile

Coastal hazards, for purposes of this hazard mitigation plan, include: Hurricane, Tropical Storm, Coastal Flooding, and Storm Surge. Hurricane and tropical storms are both examples of a tropical cyclone. The categories and associated characteristics of these events are as follows:

- **Hurricane:** maximum sustained surface wind speed exceeds 74 mph.
- **Tropical Storm:** maximum sustained surface wind speed from 39-73 mph.
- **Coastal Flooding:** normally occurs when dry and low-lying land is submerged by seawater. Coastal flooding is often driven by storm surge, but other influencing factors include high tides, sea level rise, and increased river flows.
- **Storm Surge**: is the abnormal rise in seawater level during a storm, measured as the height of the water above the normal predicted astronomical tide. Surge is primarily caused by a storm's winds pushing water onshore.

Tropical cyclones, a general term for tropical storms and hurricanes, are low pressure systems that usually form over the tropics, referred to as "cyclones" due to their rotation. Tropical cyclones are among the most powerful and destructive meteorological systems on earth. In terms of impact, high winds, heavy rain, lightning, tornados, hail, and storm surge are all associated with tropical cyclones. In addition, as tropical cyclones move inland, they can cause severe flooding, downed trees and power lines, and structural damage.

Hurricanes are rated for intensity by using the Saffir-Simpson Scale, which gives an estimate of the potential damage that a hurricane may cause. This scale is based upon both wind speed and surface pressure. Scale categories range from Category One to Five, with Category One having winds from 74-95 mph and pressure greater than 980 mb, while a Category Five hurricane can have winds in excess of 157 mph and pressure of less than 920 mb. Table 5-1 describes the five categories of hurricane strength based on sustained wind speeds.

Table 5-1: Saffir-Simpson Hurricane Wind Scale

Category	Sustained Winds	Damage Description
Category 1	74-95 MPH	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, and vinyl siding and gutters. Large branches of trees will snap, and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
Category 2	96-110 MPH	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
Category 3 (major)	111-129 MPH	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for

Table 5-1: Saffir-Simpson Hurricane Wind Scale		
Category	**Sustained Winds**	**Damage Description**
		several days to weeks after the storm passes.
Category 4 (major)	130-156 MPH	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted, and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possible months. Most of the area will be uninhabitable for weeks or months.
Category 5 (major)	157 MPH or higher	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months
Source: National Hurricane Center (NHC), National Oceanic and Atmospheric Administration (NOAA)		

According to the National Weather Service (NWS), the Atlantic Hurricane Season runs from June 1 to November 30 each year, with September being the peak month of activity in Maryland. Some notable hurricanes that have affected Maryland include Hazel in 1954; Donna in 1960; Camille in 1969; David in 1979; Fran in 1996; Floyd in 1999; Isabel in 2003; Hanna in 2008; Irene in 2011; and Sandy in 2012.

Although high winds and excessive amounts of precipitation are common and may cause tremendous damage, the most serious effect of hurricanes is coastal destruction caused by storm waves or storm surge. In India, more than 300,000 people died in 1737 as a result of a 40-foot storm surge accompanying a severe tropical cyclone in the Bay of Bengal. If a hurricane strikes at high tide, the storm surge can be devastating as was the case in Galveston, Texas in 1900 when more than 6,000 people drowned in a sudden hurricane generated storm surge. Damage estimates for the 1900 Galveston hurricane surpassed $54.5 million in 2022 dollars.

On Maryland's eastern shore, particularly on the Bay side, storm surge is also related to rising sea level and to shoreline subsidence. Counties fronting on the east side of the Bay are facing shoreline submergence that has been ongoing since the last glacial period when sea level was approximately 400 feet lower than today. While the process has been continuing for approximately 10,000 years, sea level is still rising. This rise in sea level will certainly affect the relative height of future storm surge events.

5.2 History

A Guide to the Disaster Declaration Process and Federal Disaster Assistance from the Federal Emergency Management Agency (FEMA) states the following about presidential declarations:

> *"Local and State governments share the responsibility for protecting their citizens and for helping them recover when a disaster strikes. In some cases, a disaster is beyond the capabilities of the state and local government to respond. In 1988, the Robert T. Stafford Disaster Relief and Emergency Assistance Act was enacted to support state and local governments and their citizens when disasters overwhelm them and exhaust their resources. This law, as amended, established a process for requesting and obtaining a Presidential disaster declaration, defines the type and scope of assistance available from the Federal government, and sets the conditions for obtaining that assistance."*

Table 5-2 includes Presidential Disaster Declarations used for hurricanes that have been declared in Somerset County. It is important to note that the first Presidential Disaster Declaration signed for Maryland was in 1962 and that the FEMA database does not address what counties were affected by a particular event until 1971.

Table 5-2: Presidential Hurricane Disaster Declarations

Disaster Number	Date Declared	Incident Period	Description
341	June 23, 1972	June 23, 1972 to June 23, 1972	Tropical Storm Agnes
1303	September 24, 1999	September 16, 1999 to September 20, 1999	Hurricane Floyd
1492	September 19, 2003	September 18, 2003 to September 29, 2003	Hurricane Isabel
4034	September 16, 2011	August 24, 2011 to September 5, 2011	Hurricane Irene
4091	November 20, 2012	October 26, 2012 to November 4, 2012	Hurricane Sandy
4583	February 4, 2021	August 3, 2020 to August 4, 2020	Tropical Storm Isaias

Source: FEMA

Tables 5-3, 5-4, and 5-5 detail hurricane, tropical storm, and coastal flooding events as reported by the National Center for Environmental Information (NCEI) Storm Events Database. Map 5-1 (page 5-9) depicts past hurricane tracks (1996-2022) impacting Somerset County.

In terms of number of occurrences, the NCEI Storm Events Database listed a total of 21 hurricane, tropical storm, and coastal flooding events impacting Somerset County from 1996-2022. Therefore, Somerset County experiences, on average, approximately 0.78 events per year. The Storm Events Database indicates that hurricane, tropical storm, and coastal flooding events have cost the County over $9.8 million dollars in property damage. These events have caused road closings, accelerated erosion, infrastructure damage, and power outages from downed trees and power lines.

The NCEI defines a hurricane as "A tropical cyclone in which the maximum 1-minute sustained surface wind is 64 knots (74 mph) or greater." The NCEI reports three (3) hurricane events impacting Somerset County since 1996, which means the County experiences 0.11 hurricane events annually.

Table 5-3: Hurricane Events			
Date	**Type**	**Event Narrative**	**Property Damage**
July 13, 1996	Hurricane Bertha	Hurricane Bertha moved across the Lower Maryland Eastern Shore on July 13th. The highest sustained wind speed recorded was 23 mph at Salisbury, but the Fenwick Island Buoy, which is just offshore along the Delaware-Maryland border, recorded a sustained wind speed of 47 mph. The highest gusts recorded were 63 mph at Ocean City, and 55 mph at the Fenwick Island Buoy. Numerous trees and power lines blown down resulted in scattered property damage and power outages. Rainfall amounts generally ranged from 3.0 to 5.0 inches and caused some street flooding.	$100,000
September 6, 1996	Hurricane Fran	Spiral bands associated with Hurricane Fran affected the Lower Maryland Eastern Shore during Friday, September 6th. In some locations, nearly 10 feet of shore was lost due to surge effects. This was considered the worst storm surge flooding since Hurricane Hazel in October 1954. Some minor flooding also occurred in Somerset county in the towns of Crisfield and Wenona. Tides were 2 feet above normal. Also, a few trees and power lines were blown down.	$1 Million
September 15 to 16, 1999	Hurricane Floyd	Hurricane Floyd was a Category 1 hurricane as it crossed the Wakefield WFO county warning area. Tropical storm force wind gusts occurred over the northwest quadrant of the storm over portions of the Lower Maryland Eastern Shore. Few trees and power lines were blown down across the Lower Maryland Eastern Shore resulting in scattered power outages. Storm surge flooding of 5 to 7 feet occurred over central portions of the Chesapeake Bay inundating sections of Dorchester and Somerset counties. Five feet of water flooded portions of Crisfield in Somerset county. Rainfall amounts generally ranged from 3 to 6 inches across much of the Lower Maryland Eastern Shore and caused some crop damage and street flooding.	$278,000
Source: NWS, NCEI (NOAA) Storm Events Database, 1996 thru June 2022.			

The NCEI defines a tropical storm as “A tropical cyclone in which the 1-minute sustained surface wind ranges from 34 to 63 knots (39 to 73 mph).” The NCEI reports eight (8) tropical storm events impacting Somerset County since 1996, which means the County experiences 0.31 tropical storm events annually.

Table 5-4: Tropical Storm Events			
Date	**Type**	**Event Narrative**	**Property Damage**
October 8, 1996	Tropical Storm Josephine	Remnants of Tropical Storm Josephine moved quickly up the East Coast during Tuesday, October 8th, affecting the Lower Maryland Eastern Shore. The storm produced 1.5 to 3.5 inches of rain resulting in flooding of several roads. Several trees and power lines were blown down resulting in some minor structural damage and scattered power outages.	$100,000

Table 5-4: Tropical Storm Events			
Date	**Type**	**Event Narrative**	**Property Damage**
September 18 to 19, 2003	Tropical Storm Isabel	Hurricane Isabel was a Category 1 hurricane as it crossed the Wakefield WFO county warning area. Isabel produced tropical storm force sustained winds and wind gusts over the Lower Maryland Eastern Shore. Approximately several thousand persons were evacuated and housed in numerous shelters across the Lower Maryland Eastern Shore. The unusually large wind field uprooted many thousands of trees, downed many power lines, damaged hundreds of houses, and snapped thousands of telephone poles and cross arms. Hundreds of roads, including major highways, were blocked by fallen trees. Local power companies reported many thousands of customers were without power. Also, Isabel will be remembered for the extensive power outages across the Lower Maryland Eastern Shore, and permanent change to the landscape from all the fallen trees and storm surge. Rainfall amounts ranged from 1 to 3 inches across the Lower Maryland Eastern Shore. Inland flooding due to heavy rainfall occurred over parts of the Lower Maryland Eastern Shore. Eight deaths can be directly attributed to Isabel in the Wakefield area of responsibility, with 0 in Lower Maryland. There were more than 15 deaths indirectly attributed to the storm.	$2.5 Million
September 6, 2008	Tropical Storm Hanna	Tropical Storm Hanna affected much of the Lower Maryland Eastern Shore during Saturday, September 6th. Storm total rainfall ranged from around one inch to just below three inches. Coastal storm tides of 1 to 3 feet above astronomical tide levels were common, with only minor beach erosion reported. Near the coast, as well as inland, tropical storm winds knocked down several trees and power lines, as well as caused minor structural damage. No fatalities or injuries were attributed to the winds.	$5,000
August 27 to August 28, 2011	Tropical Storm Irene	Tropical storm force winds knocked down several trees and power lines, as well as caused some substantial property damage. In addition, heavy rains contributed to significant crop damage. Storm total rainfall generally ranged from five to ten inches.	$100,000
October 27 to November 2, 2012	Tropical Storm Sandy	On October 27, Hurricane Sandy impacted Maryland with tropical storm force sustained winds. Smith Island residents were evacuated with the assistance of the Maryland Natural Resources Police, Dorchester County opened two shelters for those in flood prone areas. Baltimore Gas and Electric Co. had been putting workers on standby and making plans to bring in crews from other states. On October 28, President Obama declared an emergency in Maryland and signed an order authorizing the Federal Emergency Management Agency to aid in disaster relief efforts. Also, numerous areas were ordered to be evacuated including part of Ocean City, Worcester County, Wicomico County, and Somerset County. As of October 27, 2012, there were serious possibilities that more than a hundred million tons of dirty sediment mixed with tree limbs and debris floating behind Conowingo Dam may be eventually poured into the Chesapeake Bay, posing a potential environmental threat.	$40 million
September 2 to	Tropical Storm Hermine	Rain bands associated with Tropical Storm Hermine produced generally 0.25 inch to 1 inch of rainfall across the county. Princess Anne (4.4	0

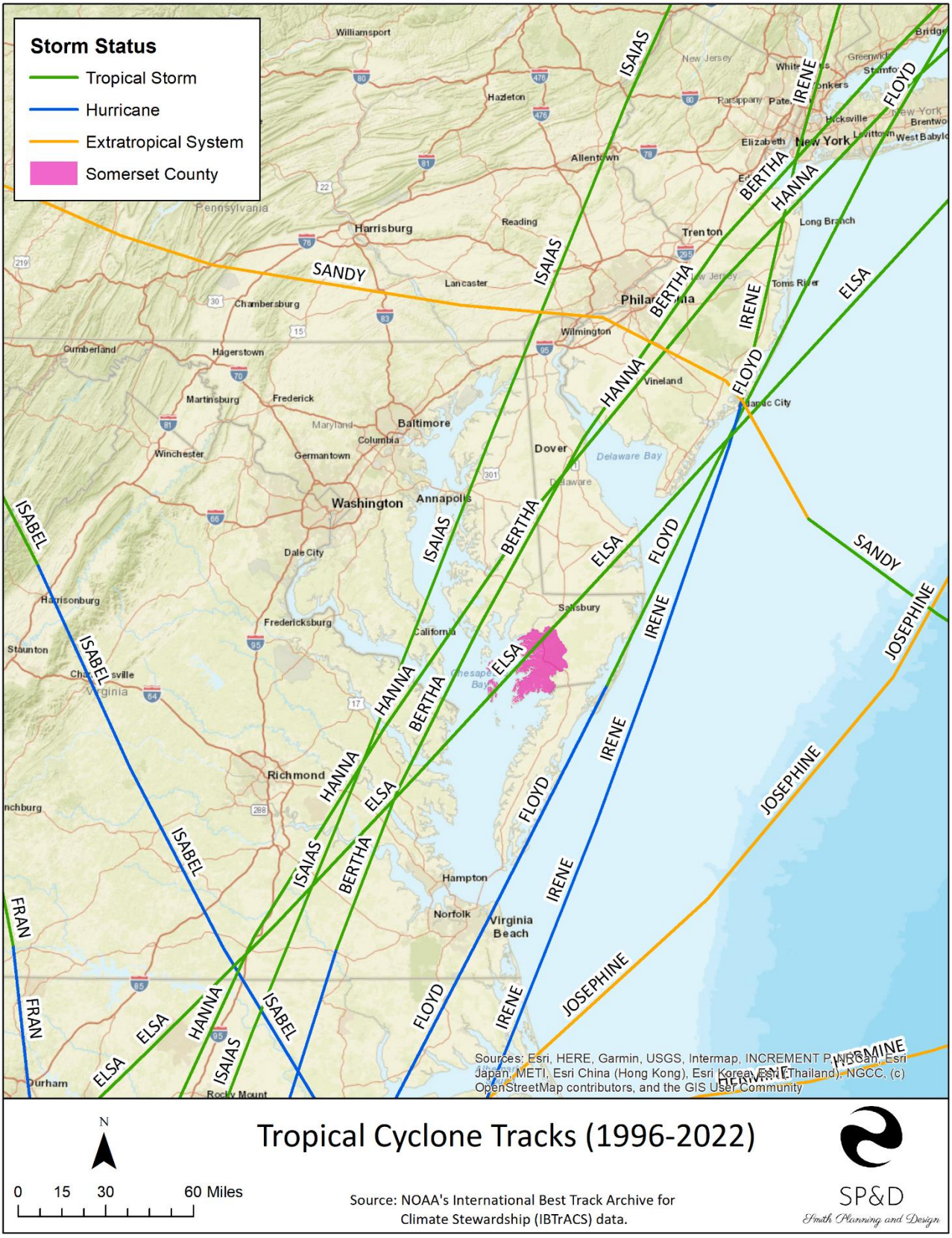
Table 5-4: Tropical Storm Events			
Date	**Type**	**Event Narrative**	**Property Damage**
September 5, 2016		WSW) reported 0.83 inch of rain. Princess Anne (2.1 SSW) reported 0.69 inch of rain. Deal Island (0.5 SSW) reported 0.43 inch of rain.	
August 4, 2020	Tropical Storm Isaias	Tropical storm winds downed and uprooted several trees and power lines, produced significant structural damage, and caused power outages across the county. Wind gust of 45 knots (52 mph) was measured at (2 W) Marion Station.	$250,000
July 8, 2021	Tropical Storm Elsa	Tropical storm winds downed several trees and power lines, produced minor structural damage, and caused scattered power outages across the county. Wind gusts averaged between 35 and 50 knots.	$20,000
Source: NWS, NCEI (NOAA) Storm Events Database, 1996 thru June 2022.			

The NCEI defines coastal flooding as "flooding of coastal areas due to the vertical rise above normal water level caused by strong, persistent onshore wind, high astronomical tide, and/or low atmospheric pressure, resulting in damage, erosion, flooding, fatalities, or injuries. Coastal areas are defined as those portions of coastal land zones adjacent to the waters, bays, and estuaries of the oceans." The NCEI reports eleven (11) tropical storm events impacting Somerset County since 1996, which means the County experiences approximately 0.41 tropical storm events annually.

Table 5-5: Coastal Flooding Events		
Date	**Event Narrative**	**Property Damage**
May 12 to 13, 2008	Coastal flooding at times of high tide contributed to several roads being closed. Police closed the Inlet parking lot due to flooding.	$5,000
November 12 to 14, 2009	Several streets, homes and businesses were flooded in low lying areas of the county close or directly exposed to the Chesapeake Bay.	$100,000
October 29 to October 30, 2012	Water levels reached 3.0 feet to 4.5 feet above normal adjacent to the Chesapeake Bay resulting in moderate to severe coastal flooding. The Town of Crisfield experienced severe flooding, with some areas inundated with 5 feet of water. Numerous homes and business were flooded. Water levels were above those experienced in 1999 with the remnants of Hurricane Floyd and were likely enhanced by runoff from the very heavy rainfall associated with Sandy. The bulk of the damage in Somerset county occurred in Crisfield, and the nearby town of Fairmount.	$5 Million
December 21, 2012	Water levels reached 3.0 feet to 4.0 feet above normal adjacent to the Chesapeake Bay resulting in moderate to severe coastal flooding. Most roads in Crisfield were flooded and impassable to small vehicles.	$100,000
October 4 to October 5, 2015	A tidal departure of 2 to 2.5 feet resulted in moderate flooding along the Chesapeake Bay.	0
February 9, 2016	Minor to Moderate coastal flooding occurred across western portions of Somerset county. Water levels reached 4.3 feet MLLW at Bishops Head MD. No property damage was reported, but some minor inundation of property resulted from the high tide.	0
January 20, 2019	Tidal flooding occurred on roadways around the town of Crisfield.	0

Table 5-5: Coastal Flooding Events		
Date	**Event Narrative**	**Property Damage**
October 11, 2019	Persistent north or northeast winds, along with high waves, produced tidal anomalies between 2.0 and 3.0 feet over the upper Chesapeake Bay. This caused moderate coastal flooding over portions of Somerset county. Crisfield reached 4.57 feet MLLW on October 12th.	0
August 4, 2020	Strong south to southeast winds associated with Tropical Storm Isaias allowed some water to pile up in the mid to upper Chesapeake Bay early Tuesday morning. Then, when winds shifted to more of a west or northwest direction on the southern flank of Isaias during the mid to late morning on Tuesday, water quickly got pushed into areas on the bay side of the Lower Eastern Shore (and water levels in these locations rose very rapidly). This caused moderate (tidal) coastal flooding over portions of Somerset county. Crisfield reached 4.54 feet MLLW late Tuesday morning on August 4.	0
October 28, 2021	Strong low pressure tracked from the Middle Mississippi Valley east northeast toward the Northeast United States from Thursday, October 28th into Saturday, October 30th. This system produced very strong east southeast winds, then strong south to southwest winds through the period. This caused moderate to major (tidal) coastal flooding across portions of Somerset county adjacent to the Chesapeake Bay. Water levels were the highest they have been since Hurricane Sandy in 2012. Crisfield reached 5.12 feet MLLW at 724 pm on Friday, October 29. Only 3 residents were displaced from their homes. The hardest hit location was Crisfield. Most homes and businesses had been elevated since Sandy and only those that weren't experienced damage with this event. Still, a lot of detached sheds and carports had water in them. Maximum inundation was right around 3 feet which is equivalent to our major flood stage at the Crisfield gauge. At the height of the event on Friday (October 29), all roads in Crisfield were basically impassable. Smith Island and Deal Island also experienced significant flooding with inundation of around 3 feet. This put most of both islands under at least some water. On Smith Island, the Cultural Center had one foot of standing water inside it. A Smith Island school and church also had water inside them.	$250,000
January 16, 2022	Low pressure lifting northward from the Southeast United States across the Mid-Atlantic region produced strong south to southwest winds which caused minor to moderate (tidal) coastal flooding over portions of Somerset county adjacent to the Chesapeake Bay. Crisfield reached 4.07 feet MLLW at 1242 am on Monday, January 17.	0
Source: NWS, NCEI (NOAA) Storm Events Database., 1996 thru June 2022.		

Map 5-1: Tropical Cyclone Tracks (1996 – 2022)



5.3 County Perspective

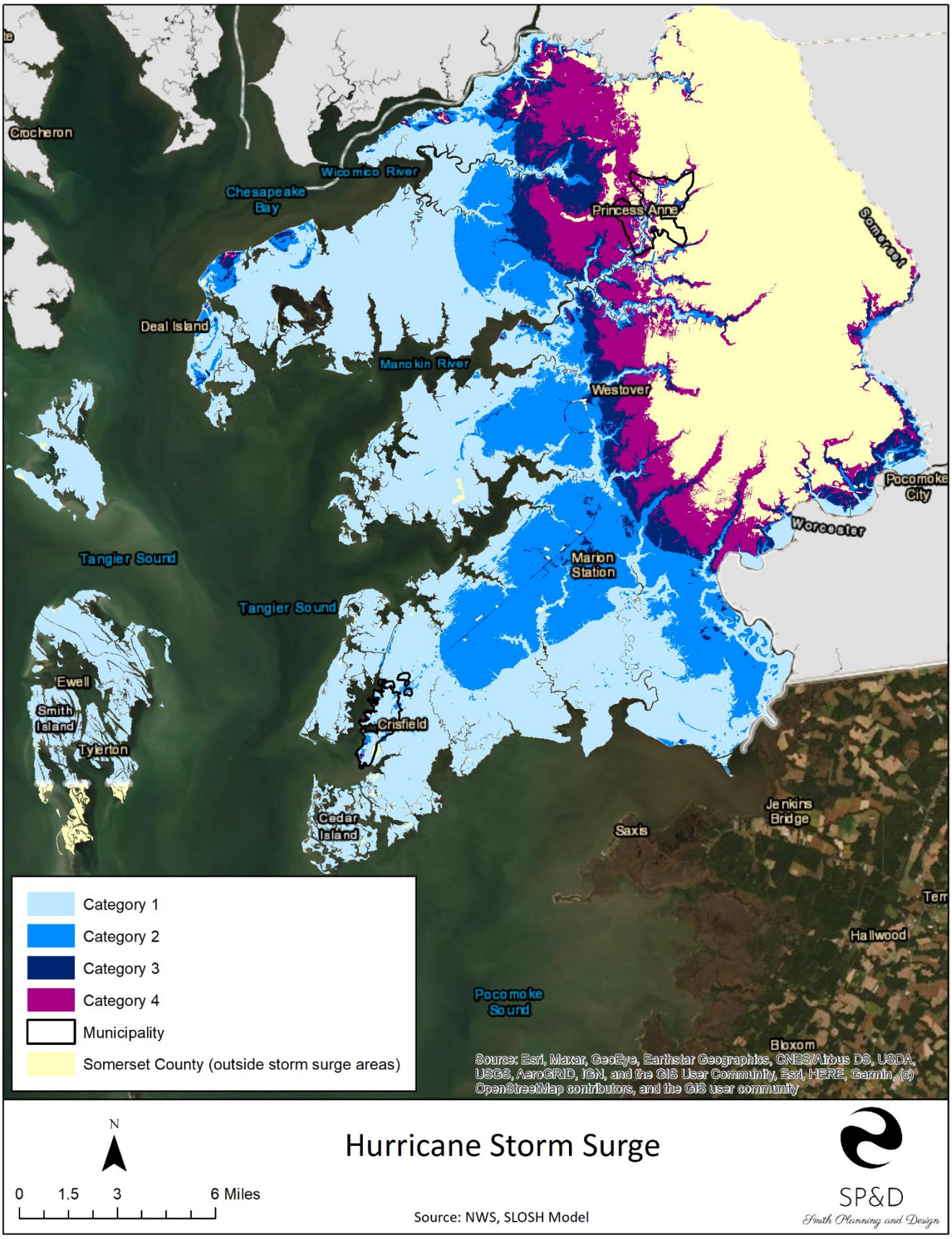
The *2021 State Hazard Mitigation Plan* ranks Somerset County's risk for coastal flooding as "High." The County's Hazard Mitigation Planning Committee (HMPC) agrees with this risk ranking. Somerset County has been affected over the years by the passage of hurricanes as shown on Table 5-3 (page 5-4), including an unnamed hurricane in 1933, Hurricane Hazel in 1954, Hurricane Floyd in 1999, Hurricane Isabel in 2003, Hurricane Irene in 2011, and most recently, Hurricane Sandy in 2012 (which impacted Maryland as a tropical storm). As depicted on Map 5-1 (page 5-8), data provided by the National Oceanic Atmospheric Administration (NOAA) indicates that hurricanes and tropical storms can impact Somerset County from either the Gulf of Mexico or the Atlantic. Normally the greatest damage results from hurricanes that come ashore in the Tidewater area of Virginia, or the Carolina Capes as was the case with Isabel.

The most common coastal storms that impact Somerset County are category one hurricanes and tropical storms. Map 5-1 illustrates that the County has experienced multiple tropical cyclone events since 1996. These events are typically downgraded to a hurricane category one or tropical storm by the time they make landfall in Somerset County. Most of the County is mainly concerned with the flooding aspect of a coastal storm brought on by storm surge and/or high tide. Coastal erosion may also occur from coastal storms. Due to population growth and increased development along shoreline areas in Maryland, the risk of human injury and property loss will most likely continue to increase.

Somerset County is the southernmost county on Maryland's Eastern Shore. The western half of the county, as well as the Lower Pocomoke River region in the southeastern portion, is most vulnerable to storm surge inundation. Both municipalities face danger from storm surge associated with the passage of a hurricane.

The storm surge zones data was generated using the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model. SLOSH is a computerized model run by the National Weather Service to estimate storm surge heights resulting from historical, hypothetical, or predicted hurricanes. The model creates its storm surge zones by analyzing the pressure, size, forward speed, track, and wind data from a hurricane. The method used for this data was a "worst case scenario" for the entire Slosh basin. These storm surge zones are depicted on Map 5-2, following.

Map 5-2: Hurricane Storm Surge (Cat 1-4)



5.4 Municipal Perspective

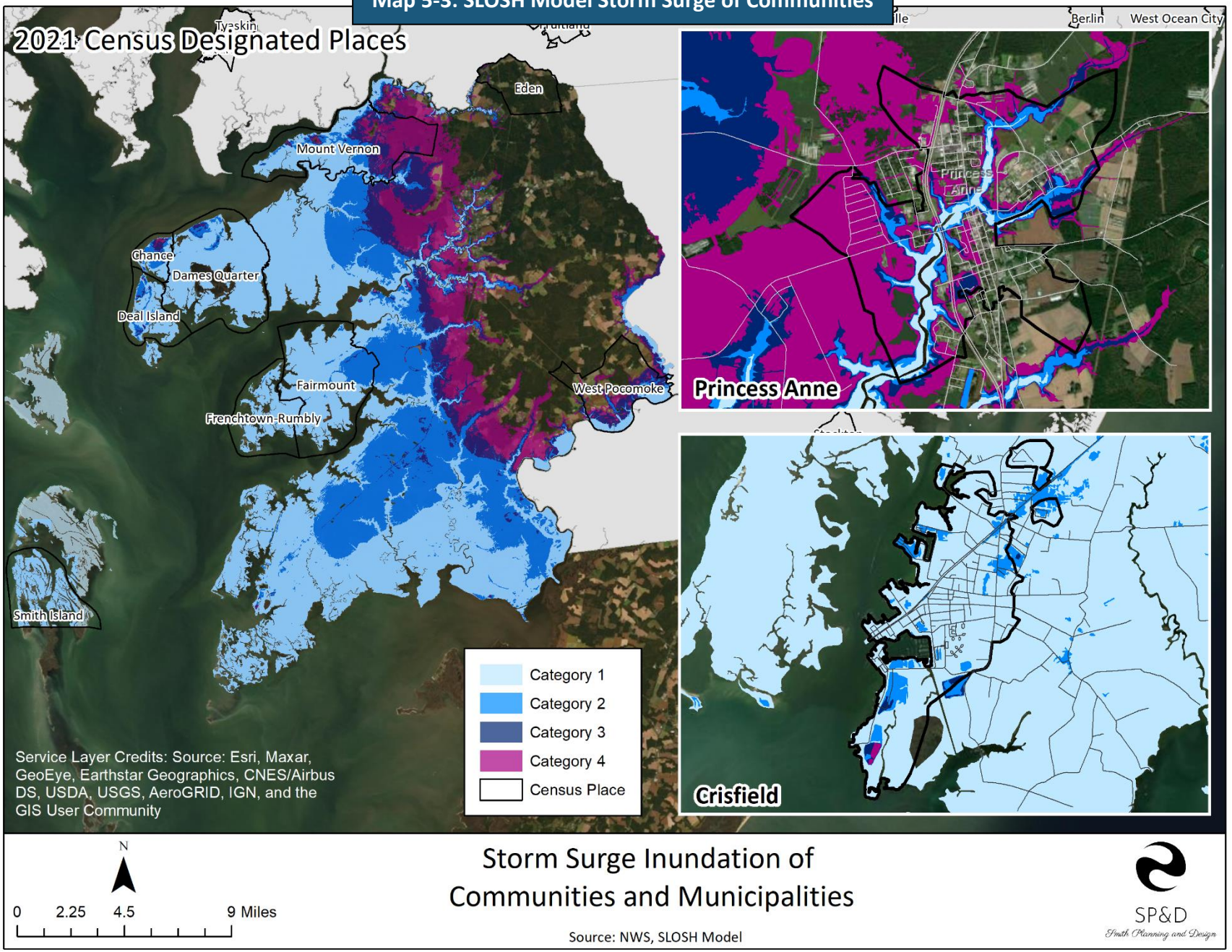
As with other weather phenomenon, Somerset County's municipalities share the same concerns as the County. The City of Crisfield faces more danger from flooding associated with the passage of a hurricane because of its location in the storm surge area, but the Town of Princess Anne is not completely immune to storm surge since low lying sections of the Town are within the storm surge area as shown on Map 5-3 on the following page.

Crisfield was most affected by the passage of Hurricane Isabel and Hurricane Sandy due to its location just off Tangier Sound and its near sea level elevation and location. 2021 Census Designated Places are also displayed on Map 5-3, due to the limited number of incorporated areas in the County. All communities in the County except for Eden would be impacted by storm surge.

Vulnerability to Category 1 Storm Surge:

The communities in the County that would be most impacted by a Category 1 Hurricane (the most likely to occur) are Chance, Deal Island, Frenchtown-Rumbly, Crisfield, Smith Island, Dames Quarter, Fairmount, and Mount Vernon.

Map 5-3: SLOSH Model Storm Surge of Communities



5.5 Critical & Public Facilities At-Risk

Critical and/or public facilities have been assessed for hurricane storm surge inundation vulnerability. These facilities and their details are included on Table 5-6. The County contains eighty-seven (87) critical and/or public facilities within one or more hurricane storm surge inundation areas. The City of Crisfield contains eighteen (18) facilities, while Princess Anne contains eleven (11) critical and/or public facilities within one or more hurricane storm surge inundation areas.

Table 5-6: Critical & Public Facilities within Storm Surge Areas

Location	Facility Type	Facility Name	Storm Surge Category
County	Transportation	Bridge @ N. Ocean Highway/Kings Creek	1
County	Transportation	Bridge @ S. Ocean Highway/Kings Creek	1
County	Transportation	Bridge @ Old Princess Anne Rd/Kings Creek	1
County	Miscellaneous	Ewell P.O.	1
County	Miscellaneous	Eddie Evans Ball Field	1
County	Miscellaneous	Deal Island/Last Chance Marina	1
County	Miscellaneous	Tylerton P.O.	1
County	Utility	Telephone	1
County	Transportation	Bridge @ Rumbley Road/Teague Creek	1
County	Transportation	Bridge @ Stewart Neck Road/Jones Creek	1
County	Utility	Smith Island Incinerator	1
County	Miscellaneous	Wenona Marina	1
County	Transportation	Bridge @ Hanes Point Road/Scotts Cove	1
County	Transportation	Bridge @ Sign Post Road/Back Creek	1
County	Miscellaneous	Rumbley Marina	1
County	Miscellaneous	Upper Fairmount P.O.	1
County	Utility	Pumping Station	1
County	Utility	Well House	1
County	Utility	Halls Creek Road WTP	1
County	Utility	Well House	1
County	Utility	Well House	1
County	Utility	WWTP	1
County	Miscellaneous	Raccoon Point Rec. Area	1
County	Miscellaneous	Smith Island Cultural Center	1
County	Miscellaneous	Smith Island Library	1
County	Miscellaneous	Rehobeth Boat Ramp	1
County	Miscellaneous	Tylerton Wharf	1
County	Transportation	Fairmount Heliport	1
County	Utility	Chance Transfer Station	1
County	Miscellaneous	Tylerton Marina	1
County	Miscellaneous	Dames Quarter Dock & Ramp	1
County	Utility	Tylerton Transfer Station	1
County	Miscellaneous	Coulbourn Creek Boat Ramp	1
County	Transportation	Bridge @ Bryan Hall Road/Marumsco Creek	1
County	Utility	Telecom Tower	1
County	Miscellaneous	Ewell Ramp/Wharf	1
County	Transportation	Bridge @ Ape Hole Road/Little Ape Hole Creek	1

Table 5-6: Critical & Public Facilities within Storm Surge Areas			
Location	**Facility Type**	**Facility Name**	**Storm Surge Category**
County	Transportation	Bridge @ Coventry Parish Road/Rehobeth Branch	1
County	Transportation	Smith Island Heliport	1
County	Utility	Pumping Station	1
County	Utility	WWTP	1
County	Miscellaneous	Fairmount Academy	1
County	Transportation	Bridge @ Marsh Road/Shanks Creek	1
County	Transportation	Bridge @ Smith Island Road/Ewell	1
County	Utility	Ewell WWTP	1
County	Miscellaneous	Deal Island WMA (3)	1
County	Miscellaneous	Glen Ward Ballfield	1
County	Miscellaneous	Jenkins Creek Dock & Boat Ramp	1
County	Miscellaneous	Mt. Vernon Park	1
County	Miscellaneous	St. Peters Creek Marina	1
County	Transportation	Bridge @ Lq Powell Road/East Creek	1
County	Miscellaneous	Rhodes Point Dock	1
County	Miscellaneous	Rumbly Point Boat Ramp	1
County	Transportation	Bridge @ Marumsco Road/Marumsco Creek	1
County	Transportation	Bridge @ Whitehaven Ferry Road/Waukaki Creek	1
County	Transportation	Crisfield Airport	1
County	Miscellaneous	Shelltown Boat Ramp	1
County	Government	Great Hope Golf Course	2
County	Miscellaneous	Deal Island P.O.	2
County	Miscellaneous	Marion Station P.O.	2
County	Utility	Communication	2
County	Utility	Marion 911 Tower	2
County	Utility	Telecom Verizon Tower	2
County	Utility	Telecom Verizon Tower	2
County	Utility	Telephone	2
County	Utility	Verizon Telephone	2
County	Utility	Pumping Station	2
County	Miscellaneous	Upper Hill Playground	2
County	Utility	Well House	2
County	Government	Dog Shelter	3
County	Transportation	Bridge @ Cathell Road/Passerdyke Creek	3
County	Utility	Crisfield Transfer Station	3
County	Utility	Marion Electric Substation	3
County	Utility	Mt. Vernon Transfer Station	3
County	Government	Cat Shelter	4
County	Government	Centralized Athletic Facility	4
County	Government	Health Dept. Main Office	4
County	Government	Mosquito Control	4
County	Government	Recreation & Parks Complex	4
County	Government	Roads & Waterways Complex	4
County	Miscellaneous	Westover P.O.	4
County	Utility	Pumping Station	4
County	Utility	Pumping Station	4
County	Utility	Somerset Co. Landfill	4

Table 5-6: Critical & Public Facilities within Storm Surge Areas			
Location	**Facility Type**	**Facility Name**	**Storm Surge Category**
County	Utility	Water Tower	4
County	Utility	Westover Transfer Station	4
Crisfield	Government	Coast Guard	1
Crisfield	Utility	Well House	1
Crisfield	Utility	Water Tower	1
Crisfield	Miscellaneous	Janes Island Boat Ramp	1
Crisfield	Miscellaneous	Somers Cove	1
Crisfield	Utility	WWTP	1
Crisfield	Utility	Telephone & Wireless Tower	1
Crisfield	Utility	Pumping Station	1
Crisfield	Utility	Pumping Station	1
Crisfield	Miscellaneous	American Legion	1
Crisfield	Government	City Hall	1
Crisfield	Miscellaneous	Crisfield P.O.	1
Crisfield	Miscellaneous	City Dock	1
Crisfield	Utility	Telephone	1
Crisfield	Miscellaneous	Crisfield Library	1
Crisfield	Transportation	TidalHealth Heliport	1
Crisfield	Utility	Communications Tower at CFD	1
Crisfield	Utility	Crisfield Electric Substation	2
Princess Anne	Utility	Communication	1
Princess Anne	Government	Tourism Center	2
Princess Anne	Utility	Communication	2
Princess Anne	Utility	Well House	2
Princess Anne	Miscellaneous	Manokin River Park	2
Princess Anne	Transportation	Rr Crossing @ Dr. William P Hytche Blvd	4
Princess Anne	Utility	Princess Anne WWTP	4
Princess Anne	Utility	Pumping Station	4
Princess Anne	Utility	Pumping Station	4
Princess Anne	Utility	Telephone	4
Princess Anne	Utility	Well House	4
Source: 2022 Somerset County Critical and Public Database.			

5.6 Essential Facilities At-Risk

Essential facilities are those facilities that must continue to operate for a community to effectively respond to, and recover from, a hazard incident. Essential facilities include: Emergency Operation Center(s), Fire and Rescue Stations, Police, Schools, and Medical facilities. In most cases, hurricanes that have historically impacted Somerset County are a Category 1 Hurricane or tropical storm. Essential facilities most likely to be impacted by a hurricane and/or tropical storm are those facilities located in the storm surge category 1 inundation area. As shown on Table 5-7, five (5) essential facilities within the unincorporated areas of the County and five (5) facilities within the City of Crisfield are located within the storm surge category 1 inundation area, with a combined tax property improvement value of $21,006,600.

Table 5-7: Essential Facilities within Storm Surge Areas				
Location	**Facility Type**	**Facility Name**	**Storm Surge Category**	**Improvement Value**
County	Fire	Fairmount Fire Dept.	1	$487,700
County	Fire	Ewell Fire Dept.	1	$350,600
County	School	Ewell E.S.	1	$220,000
County	Fire	Tylerton Fire Dept.	1	$85,000
County	Fire	Mt. Vernon Fire Dept.	1	$202,900
County	Fire	Deal Island/Chance Fire Dept.	2	$149,600
County	School	Deal Island E.S.	2	$916,900
County	School	Somerset Community Services	2	$1,289,900
County	Fire	Marion Fire Dept.	3	$301,700
County	School	J.M. Tawes Tech and Career	3	$17,124,900
County	School	Somerset Intermediate School	3	-
County	EOC	Back up EOC	4	$2,189,600
County	Medical	Health Department	4	$2,189,600
County	Police	Eastern Correctional Facility	4	$95,000,000
Crisfield	School	Woodson E.S.	1	$4,240,000
Crisfield	Fire	Crisfield Fire Dept.	1	$262,100
Crisfield	Police	Crisfield Police	1	$125,200
Crisfield	Medical	Crisfield Pharmacy	1	$98,900
Crisfield	Medical	TidalHealth	1	$14,934,200
Crisfield	Medical	Marion Pharmacy	2	$153,300
Crisfield	Fire	Lower Somerset Ambulance and Rescue Squad	2	$110,600
Crisfield	Police	DNR Police	2	$77,800
Crisfield	School	Crisfield H.S.	2	$3,992,500
Princess Anne	Police	UMES Police	2	-
Princess Anne	Police	Princess Anne Police	3	$239,100
Princess Anne	Medical	Lower Shore Immediate Care LLC	4	$1,539,700
			Total Value:	**$146,281,800**
Source: 2022 Somerset County Critical and Public Database and Improvement Values from 2017 Maryland Property View (last updated July 2020).				

5.7 Mitigation Efforts

In addition to the mitigation efforts and the floodplain ordinance referenced in *Chapter 4: Flood*, the County's Building Code contains requirements for wind loading of new structures and has tie down requirements for mobile homes. The County also participates in the Chesapeake Bay Critical Area, with the purpose of establishing a Resource Protection Program for the bay and its tributaries and encouraging more environmentally sensitive development in areas near the shoreline. This law created a statewide Critical Area Commission to oversee the development and implementation of local land use programs directed towards the Critical Area. The Critical Area law provides for a 100-foot 200-foot Buffer (in some circumstances) from the shoreline. This Buffer is measured inland from mean high water, the landward extent of tidal

wetlands, and the edge of tributary streams. The Buffer also refers to areas that have been expanded beyond 100 feet to include hydric soils.

The County's Solid Waste and Drainage is responsible for landfilling, recycling and mulching operations, as well as improving drainage. This department is responsible for emergency operations that are beneficial after a coastal hazard event, such as the operation of two landfills, mulching operations, waste hauling, and waste transfer system operations. The department partially contracts services for ditching and flood control. The County Roads and Waterways is also responsible for emergency response, as well as mitigative measures such as storm drain maintenance, driveway culvert installation, traffic control, and limbing and ditching.

Maps depicting the locations of County Roads and Waterways facilities as well as Solid Waste and Drainage Facilities are available here: www.somersetmd.us/services/maps.php#outer-625 (*See: Public Facilities dropdown menu*).

5.8 Future Conditions

Based on the frequency of historic occurrences, the future probability of coastal hazards in Somerset County is highly likely. Additionally, according to the Fourth National Climate Assessment (NCA4), climate change will impact and exacerbate coastal hazards.

NCA4 projects various major trends over the next 25 to 100 years relevant to coastal hazard impacts and future event probability. The strongest hurricanes are expected to "become both more frequent and more intense," and result in more rainfall. Additionally, coastal hazard events interacting with sea level rise amplify many hazard impacts.

According to *Sea-level Rise Projections for Maryland 2018*, in the Northeast region of the United States, including Somerset County, sea level rise is anticipated to exceed global mean sea rise with an increase of 1.2 feet by 2050 (Central Estimate, 50% probability SLR meets or exceeds) or up to 1.6 feet by 2050 (Likely Range, 67% probability SLR is between 0.8 and 1.6 feet). The most extreme sea level rise scenario within the 2018 report estimates 6.9 feet of sea level rise by 2100 under the "growing" emissions pathway. By 2150, under the same pathway, the highest estimate is 12.4 feet of sea level rise.

Storm surges are higher as a result of sea level rise. Coastal flooding is also exacerbated, among other phenomena such as shoreline erosion.[i] According to the *2021 State Hazard Mitigation Plan*, as sea levels rise due to changing climate conditions, the impacts on tidal levels can be noted. Nuisance flooding, profiled in *Chapter 4: Flood*, is expected to increase through 2022, and by 2050, on a national scale, nuisance flooding is expected to occur about 45-70 days/year on average according to NOAA's *State of High Tide Flooding and Annual Outlook*.

[i] Fourth National Climate Assessment. Volume II, Impacts, Risks, and Adaptation in the United States , Chapter 8:

"Coastal Effects." U.S. Global Change Research Program. 2018; revised February 2020. Available at: https://nca2018.globalchange.gov/chapter/8/.