Chapter 9: Water Resources

During the 2006 legislative session, House Bill 1141 was codified into law requiring that a Water Resources Element (WRE) be included in local land use plans. The purpose of the WRE is to identify:

- "Drinking water and other water resources that will be adequate for the needs of existing and future development proposed in the land use element of the plan; and,
- Suitable receiving waters and land areas to meet stormwater (SW) management and wastewater treatment and disposal needs of existing and future development proposed in the land use element of the plan" (Land Use Article §1-410 and §3-106).[1]

The Water Resources chapter of the Somerset County Comprehensive Plan creates a policy framework for sustaining public drinking water supplies and protecting the County's waterways and riparian ecosystems by effectively managing point and nonpoint source water pollution. This chapter is an update to the 2010 Water Resources Element, which was an amendment to the 1996 Comprehensive Plan.

The Water Resources Element identifies opportunities to manage existing water supplies, wastewater effluent, and stormwater runoff, in a way that balances the needs of the natural environment with the County's projected growth, including the growth projected for the County's municipalities. In this way, the Water Resources chapter helps to protect the local and regional ecosystem while ensuring clean drinking water for future generations of Somerset County residents.

There are two incorporated municipalities in Somerset County: Princess Anne and Crisfield. Residents and businesses of six areas of the County (Princess Anne, Crisfield, Fairmount, and the communities of Rhodes Point, Ewell, and Tylerton on Smith Island) are served by community water and/or sewer service. The City of Crisfield manages its own, while the Somerset County Sanitary District (SCSD) operates the Princess Anne system.

In 2007, Maryland issued its first Water Resource Element Models and Guidelines to assist local governments with planning and zoning authority in developing their WREs.

In 2022, Maryland issued **Water Resources Element (WRE) Guidance Update**. The update to the state's WRE Guidance provides best practices regarding analyses and approaches for:

- Ensuring receiving waters are protected as the local land use plan is developed and implemented, reflecting changes to the Maryland Department of the Environment's (MDE) water resources programs over the past decade; and
- Integrating climate change considerations, particularly flooding risks, into the drinking water, wastewater and stormwater assessments of the WRE.

Source: Maryland Department of Planning - https://planning.maryland.gov/Pages/OurWork/envr-planning/water-resources-mg/2022/01/update-introduction.aspx

The County recognizes the importance of interjurisdictional water resources planning. This Countywide Water Resources Element compiles, to the greatest degree possible, up-to-date information from the municipalities, in order to coordinate water resources, growth, and land use planning. In particular, the Municipal Growth Elements (MGE) and WRE from the comprehensive plans for the County's two municipalities—Crisfield (2010) and Princess Anne (2009)—were reviewed in the preparation of this chapter. The future water and sewer system

[1] *Maryland Department of Planning, 2022 Water Resources Element Update, https://planning.maryland.gov/Pages/OurWork/envr-planning/water-resources-mg/2022/01/update-background.aspx*

boundaries reflect MGE boundaries. Where possible, the County has also obtained data and information on water resources from adjoining Counties, in order to create the fullest possible picture of future impacts to the Wicomico, Manokin, Big Annemessex, and other rivers and streams that drain the County. Additional data resources utilized for this element include, but are not limited to, the County's draft Water and Sewer Master Plan, Maryland Department of Planning, Maryland Department of the Environment, and the Environmental Protection Agency's "How's My Waterway?" mapping tool. Prior to the start of this comprehensive plan, Somerset County along with their contractor were engaged in the update of the 2024 Water and Sewer Master Plan. With that said, the 2024 draft Water and Sewer Master Plan was used for herein, as the update had not been completed as of February 2025. Updates to tables 9.3, 9.6, 9.8, 9.11, and 9.13 will be necessary once the Master Water and Sewer Plan is completed. Projections and proposed conditions in this plan, including designated growth areas, priority preservation areas, future land use and the Future Land Use Map Plan should be integrated, at a minimum, into the updated Master Water and Sewer Plan.

9.1 County Projections and Growth Scenarios

9.1.1 Watersheds

This Element takes a watershed-based approach in analyzing the impact of future growth on Somerset County's water resources—particularly in relation to nutrients discharged to the County's streams. Land in Somerset County drains to one of ten major watersheds (or "8-digit watersheds," referring to the numeric classification system used by the Maryland Department of the Environment). These watersheds are mapped in Chapter 8 Sensitive Areas and include: the Big Annemessex River, Dividing Creek, Lower Chesapeake Bay, Lower Pocomoke River, Lower Wicomico River, Manokin River, Monie Bay, Pocomoke Sound, Tangier Sound, and Wicomico Creek.

9.1.2 Population Projections

The Water Resources Element uses Countywide population projections developed by the Maryland Department of Planning (MDP), shown in Table 9-1. These projections indicate that the County's population will reach approximately 28,500 by the year 2045, which is an increase of 2,030 people total, or an average of 58 additional people annually.

Table 9-1.

Population Projections, 2010 through 2045										
Year								Change, 2010-2045		
2010	2015	2020	2025	2030	2035	2040	2045	Number	Percent	Annual Increase
26,470	25,710	25,760	26,750	27,450	28,100	28,310	28,500	2,030	+7.67%	58

Sources: Prepared by the Maryland Department of Planning, Projections and State Data Center, December 2020.

9.1.3 Future Development Scenarios

To gauge the impacts of alternative land use and water resources policies, this Water Resources Element uses three scenarios for the distribution of future growth. These scenarios are:

- **Trends:** Continues past trends whereby approximately half of all new residential and non-residential growth is directed to existing Priority Funding Areas (PFAs), or to areas identified for future public water and sewer service by the County's Water and Sewer Master Plan. Remaining development would occur in areas outside of public water and sewer service. This scenario represents the 1996 Comprehensive

Plan, as expressed through current zoning.

- **PFA Focus:** All new growth would be directed to existing PFAs, including Princess Anne, Crisfield, and areas surrounding the two municipalities that have been identified for future public water and sewer service by the County's Water and Sewer Master Plan.[1] A negligible amount of new development would occur in areas outside of public water and sewer service.
- **Hybrid:** This scenario is a middle ground between the Trends and PFA Focus scenarios. Approximately three-quarters of new development would be directed to existing PFAs, or to areas identified for future public water and sewer service by the County's Water and Sewer Master Plan. Remaining development would occur in areas outside of public water and sewer service.

Because water and sewer service are often measured in terms of Equivalent Dwelling Units (EDU)[2], the Water Resources Element uses housing units as the basis for its water, sewer, and nonpoint source pollution analyses. The Housing Needs Assessment conducted for Somerset County in Chapter 5 shows that average household size will remain the same at 2.37 people per household by 2030, which accounts for no increase from 2020. Total new housing units needed by 2030 is 563, which averages 56 new units needed per year over this period, based on the assessment. The rate of housing growth outpaces population growth due to projected declines in household size through 2030.

9.2 Drinking Water Assessment

This section describes existing conditions and projected future demand for drinking water in Somerset County.

9.2.1 Public Water Systems

In Somerset County, groundwater is the sole source of drinking water, and the source of virtually all domestic and industrially consumed water. Historically, some far outreaches in western and southern portions of the County may have somewhat marginal access to groundwater. Water supplies in the Princess Anne area may be exhibiting the early signs of aquifer stress. To protect the long-term availability of the County's drinking water resources, Somerset County has reserved the Manokin aquifer for meeting domestic drinking water demands.

Table 9-2 summarizes water sources and other characteristics of the public drinking water systems in the County. Figures 9-1 through 9-6, beginning on page 9-5, show the extent of water and sewer service areas in the County. More detailed information on existing and proposed future water service areas can be found in the County's Water and Sewer Master Plan, which has been updated as of 2024.

Approximately 5,223 dwelling units in Somerset County (slightly more than half of all dwelling units in the County) and a considerable share of businesses receive drinking water from municipal, County, or community water systems.

Table 9-2.

Public Drinking Water System Characteristics			
System Name	**Aquifer**	**Pumping Capacity/Day**	**Water Quality Issues**
Crisfield	Patapsco	600,000	Fluoride
Princess Anne	*Revell's Neck Patapsco* *Industrial Park Patapsco Manokin	564,000 51,840 624,200	Fluoride, TDS Fluoride Iron
Ewell Waterworks	Patapsco	15,000	Fluoride, Disinfection

[2] https://mde.maryland.gov/programs/water/BayRestorationFund/Documents/www.mde.state.md.us/assets/document/BRF-DraftRegulation.pdf

Table 9-2.

Public Drinking Water System Characteristics			
System Name	**Aquifer**	**Pumping Capacity/Day**	**Water Quality Issues**
Midtown Waterworks	Patapsco	3,500	Fluoride, Disinfection
Hill Waterworks	Patapsco	2,000	Fluoride, Disinfection
Field Waterworks	Patapsco	-	Fluoride, Disinfection
Rhodes Point South Waterworks	Patapsco	300	Fluoride, Disinfection
Tylerton Waterworks	Patapsco	7,500	Fluoride, Disinfection
Fairmount	Patapsco	60,000	Fluoride, Iron
Eastern Correctional Institution	Manokin & Patapsco	Manokin 10,000 Patapsco 567,000	Fluoride, Iron
Eden Mobile Home Park	Manokin	20,000	Iron

Source: Draft 2024 Somerset County Water and Sewer Master Plan

1: SCSD operates the systems in Princess Anne, Fairmount, and Rumbley/Frenchtown. The City of Crisfield operates its water system. The Maryland Environmental Service (MES) operates the Eastern Correctional Institution (ECI) water system. All other public or community water systems in Somerset County are privately operated.

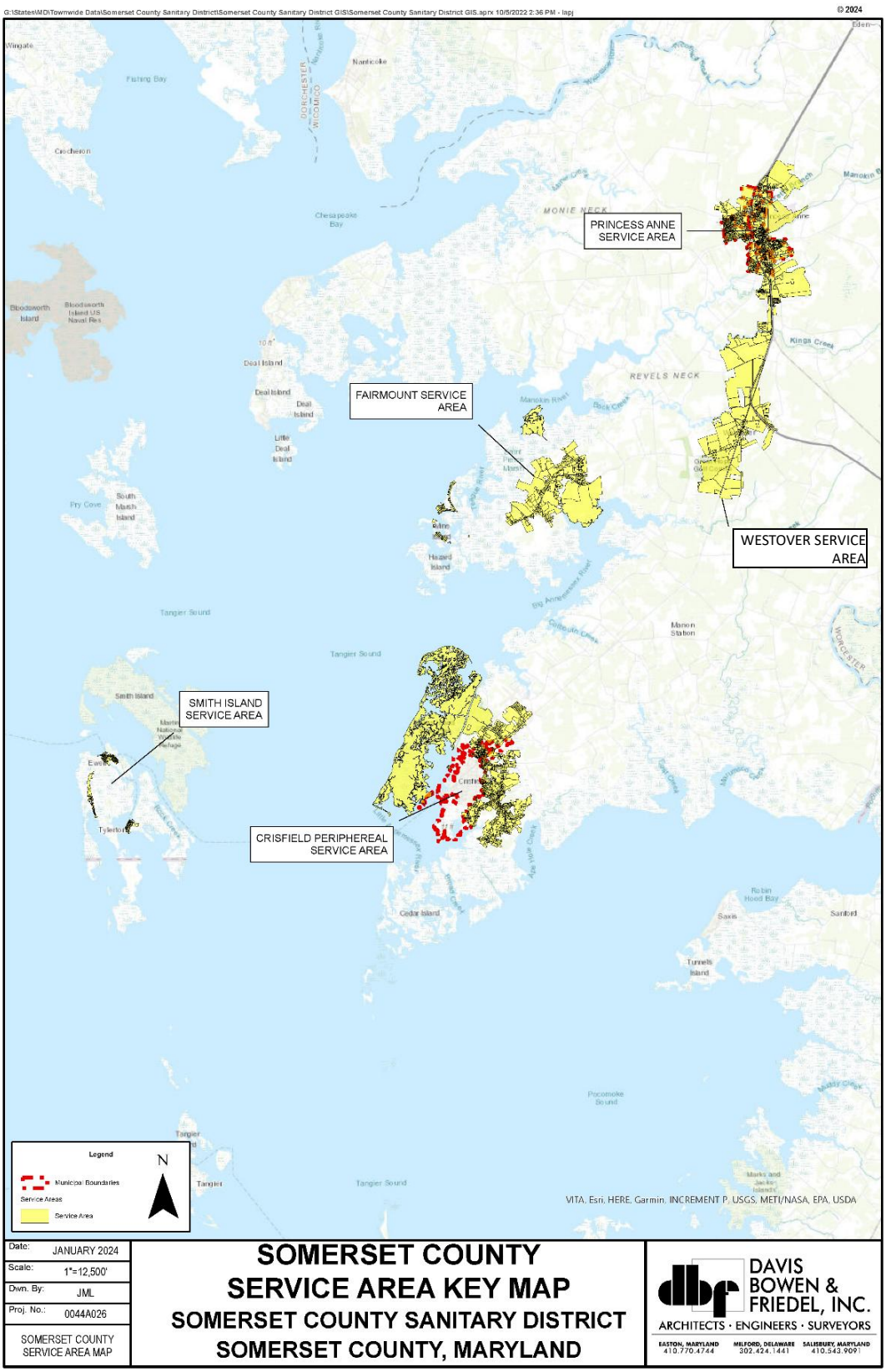


Figure 9-1: Somerset County Service Area Key Map. Source: Somerset County Water & Sewer Master Plan, 2024.

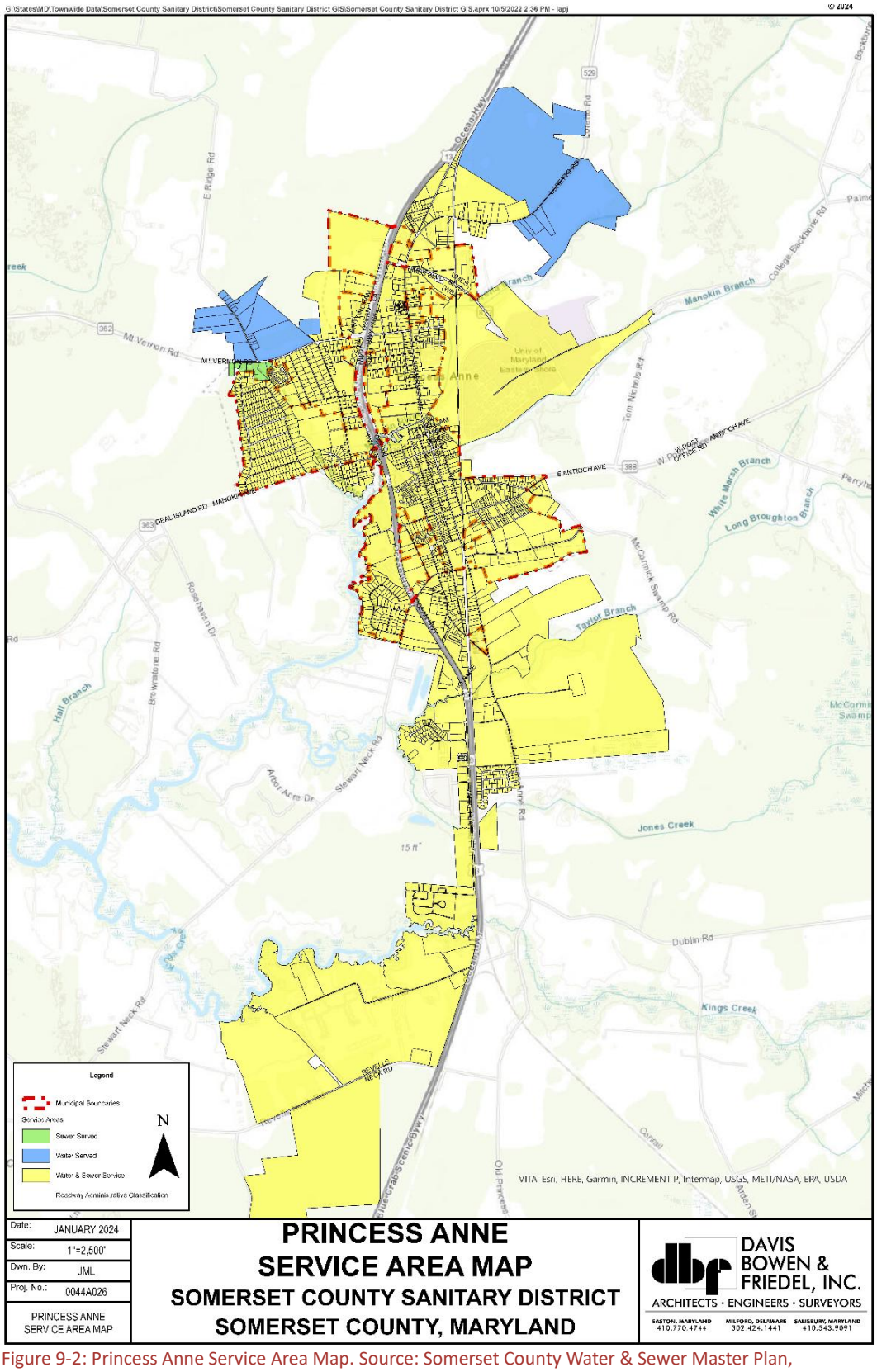


Figure 9-2: Princess Anne Service Area Map. Source: Somerset County Water & Sewer Master Plan, 2024.

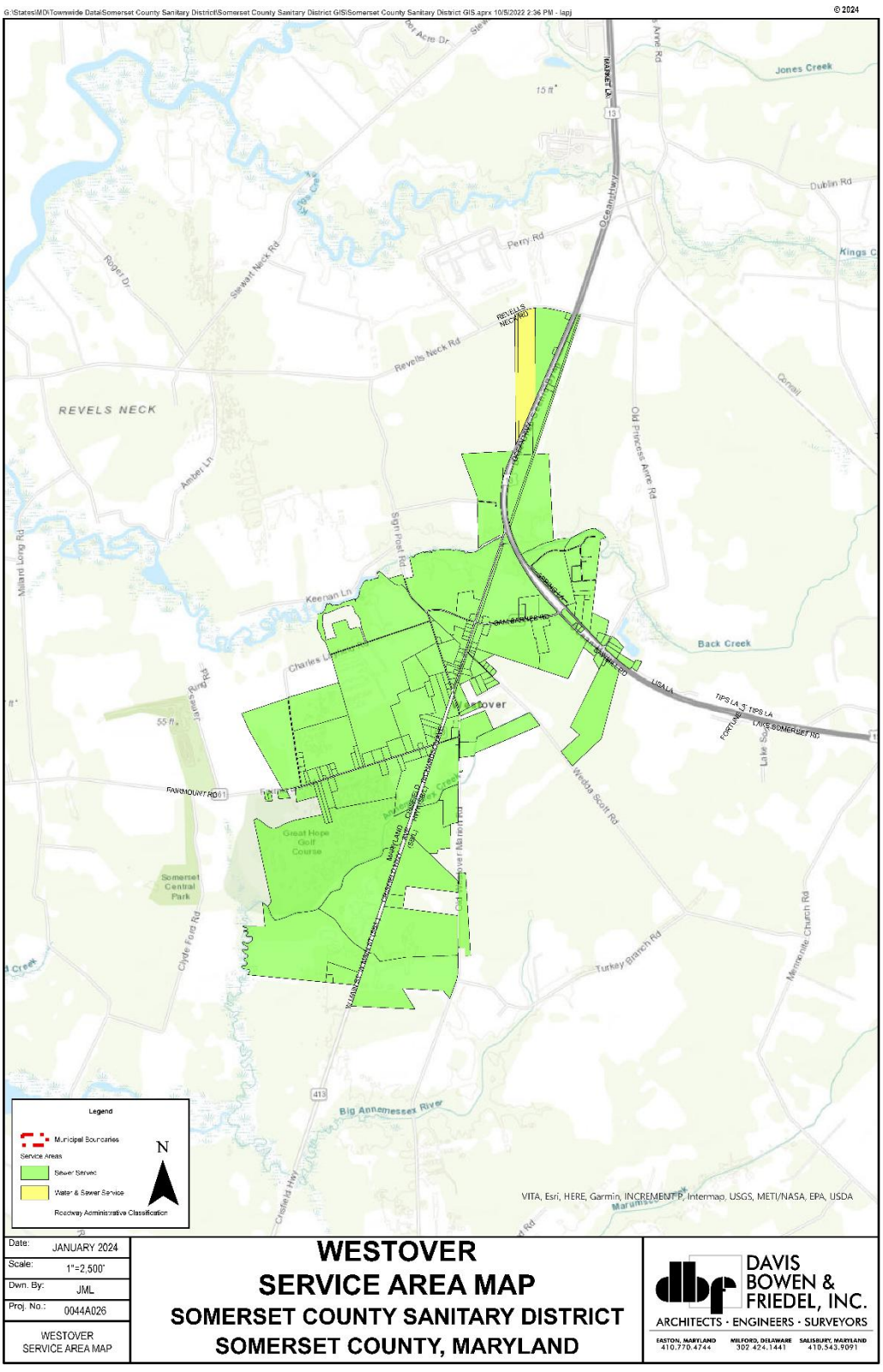


Figure 9-3: Westover Service Area Map. Source: Somerset County Water & Sewer Master Plan, 2024.

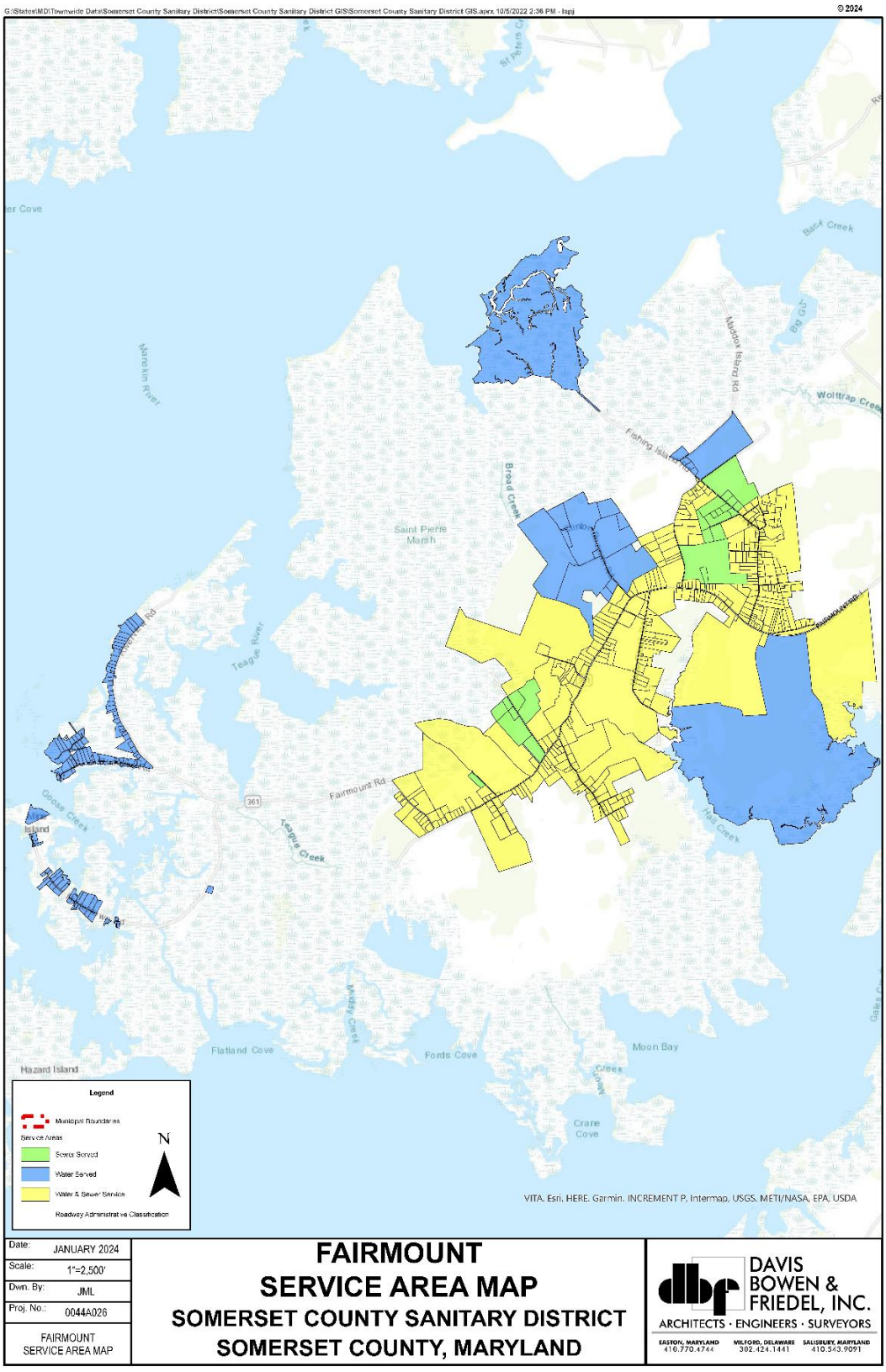


Figure 9-4: Fairmount Service Area Map. Source: Somerset County Water & Sewer Master Plan, 2024.

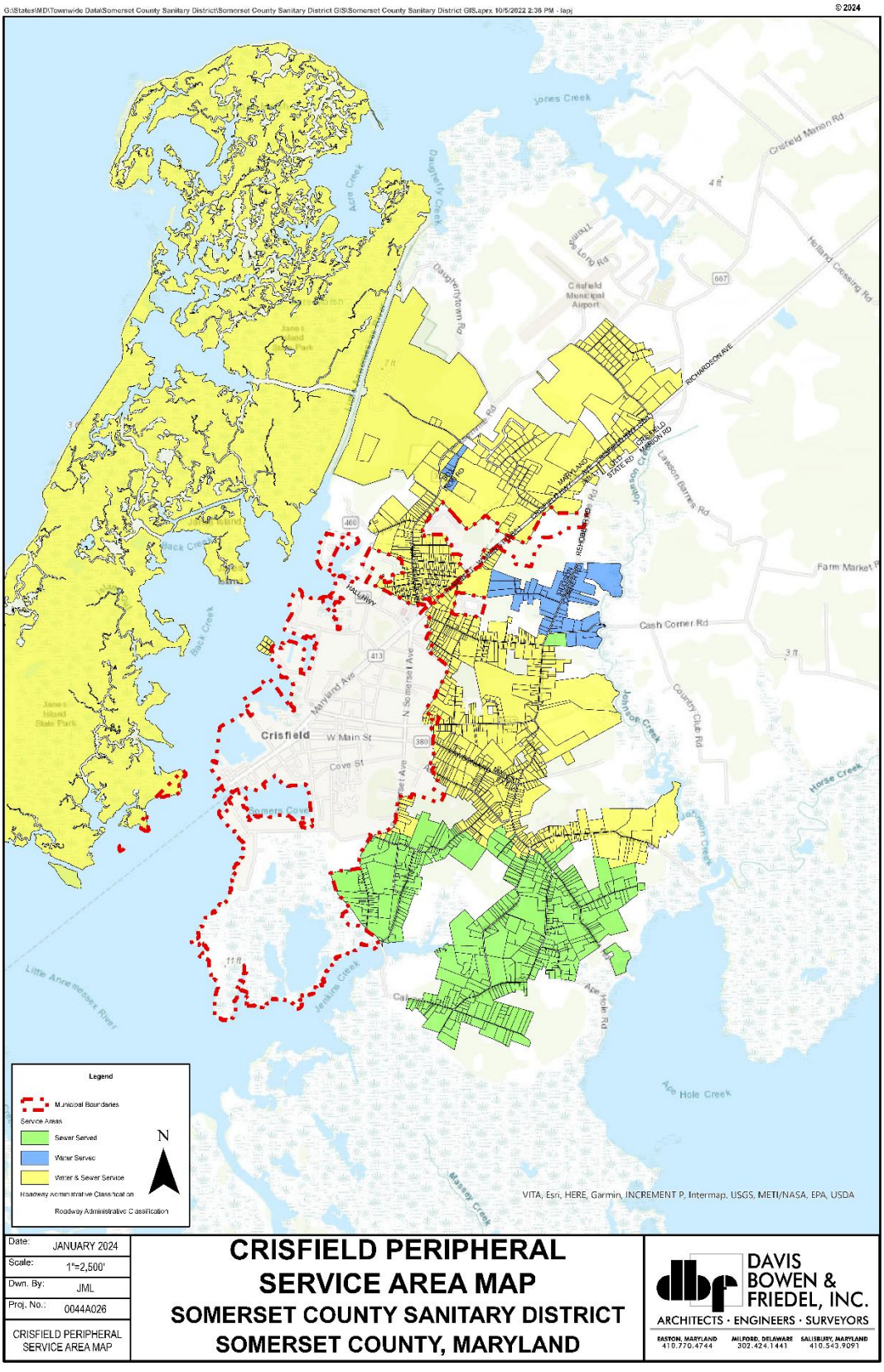


Figure 9-5: Crisfield Service Area Map. Source: Somerset County Water & Sewer Master Plan, 2024.

Figure 9-6: Smith Island Service Area Map. Source: Somerset County Water & Sewer Master Plan, 2024.

Table 9-3 shows existing and projected future drinking water supplies, demands, surpluses, and deficits for major public water systems under each of the three scenarios described above.[3] Crisfield and Princess Anne will have adequate capacity to support growth and development through 2030 (and beyond), regardless of scenario.

The Princess Anne Subdistrict Expansion (PASE) project was created with the goal of servicing the potential industrial area in the vicinity of the Eastern Correctional Institution (ECI) and U.S. Route 13 and to supplement the Princess Anne Sub-district existing water supply and storage capabilities. A secondary objective was to increase the ability to provide water service to the Westover area in the future. The water from the PASE project wells is treated by the reverse osmosis system at ECI by an agreement between Maryland Environmental Service, the operator, and the Sanitary District. The agreement was reached as a result of the Maryland Department of the Environment (MDE) requirement for reverse osmosis treatment to remove fluoride from drinking water in the Patapsco aquifer. The PASE project was completed in May 2015.

9.2.2 Other Water Use

All residential units and businesses in Somerset County outside of the above public water systems (Table 9-2) rely on individual or community wells. These wells are drilled in a variety of water-bearing formations, particularly the Pleistocene (surficial aquifer), Manokin, Piney Point, and Pocomoke aquifers.

Table 9-4 shows the distribution of Countywide fresh water use from 2000 versus 2015. Although not a precise representation of current water use, Table 9-4 does highlight the County's major water users: public systems, private residential users, commercial users, and livestock. The remainder of this section discusses those major categories of non-public water users in greater detail.

Table 9-3.

Public Water System Demand, Capacity, and Projections[9]														
		Crisfield[5]			Princess Anne			Fairmount/Rumbley/ Frenchtown[6, 7]			Smith Island (Combined)[6]			ECI[8]
		Trend	PFA	Hybrid	Trend	PFA	Hybrid	Trend	PFA	Hybrid	Trend	PFA	Hybrid	
Existing Water Production [1]	gpd[2]	1,500,000			896,000			60,000			191,000			500,000
	EDU[2]	5,415			3,584			240			764			2,000
Demand, 2007	gpd	800,000			733,000			61,000			199,250			500,000
	EDU	2,888			2,932			244			797			2,000
Net Available Capacity, 2007	gpd	700,000			163,000			(1,000)			-8,250			0
	EDU	2,527			652			(4)			-33			0
Total New Projected Demand [3]	gpd	190,337	311,702	251,020	195,873	282,747	239,310	23,212	2,750	9,741	1,922	0	961	210,000
	EDU	687	1,125	906	783	1,131	957	93	11	39	8	0	4	0
Grand Total Demand, 2030	**gpd**	**990,337**	**1,111,702**	**1,051,020**	**928,873**	**1,015,747**	**972,310**	**84,212**	**63,750**	**70,741**	**201,203**	**199,250**	**200,227**	**710,000**
	EDU	**3,575**	**4,013**	**3,794**	**3,707**	**4,055**	**3,881**	**337**	**255**	**283**	**805**	**797**	**801**	**2,840**
Future Capacity, 2030[4]	gpd	1,481,540			1,346,000			60,000			191,000			710,000
	EDU	5,349			5,384			240			764			2,840
Net Available Projected Capacity, 2030	gpd	491,203	369,838	430,520	417,127	330,253	373,690	(24,212)	(3,750)	(10,741)	(10,172)	(8,250)	(9,211)	0
	EDU	1,773	1,335	1,554	1,669	1,321	1,495	(97)	(15)	(43)	(41)	(33)	(37)	0

Notes:

1: Indicates the more restrictive of either the district's permitted withdrawal or the water treatment plant's treatment capacity. Sources: SCSD, City of Crisfield, Town of Princess Anne.

2: gpd = gallons per day; EDU = An Equivalent Dwelling Unit (EDU), equal to 250 gpd. This figure represents the average amount of water used by one household and is also used to calculate residential and non-residential (e.g., businesses) water demand. For Crisfield, one EDU equals 277 gpd.

3: Includes all existing and projected new residential and nonresidential demand, as well as new demand from system extensions. Assumes that new nonresidential development is 10% of residential development, based on existing ratios of nonresidential EDUs to residential EDUs.

4: Reflects all potential or planned system upgrades and expansions. Sources: 2008 Somerset County Water and Sewer Master Plan, County Staff, Crisfield and Princess Anne WREs, and Maryland Environmental Service (MES) for ECI.

5: For Crisfield, the Trends Scenario reflects the City's Draft WRE (28 July 2009)

6: For systems other than Princess Anne and Crisfield, it is assumed that the public system growth rate in system equals growth rate in underlying watershed.

7: The withdrawal permit for the combined Fairmount system is 60,000 gpd. However, the County believes that this limit was issued in error, given the permitted capacities of the previously separate Frenchtown, Rumbley, and Fairmount systems. The pumping capacity of the Fairmount well alone is in excess of 122,400 gpd, and other wells are available.

8: MES did not report ECI's future water demand; this figure is presumed to match the system's future capacity.

9. The data in this table used the 2008 Somerset County Water and Sewer Master Plan, which was the best available information as the 2024 Draft Water & Sewer Plan was still under development as of February 2025, and did not include updated data specific to Public Water System Demand, Capacity, and Projections.

Table 9-4.

Freshwater Withdrawals in Somerset County, 2000 vs. 2015						
Type of Withdrawal	**2000**			**2015**		
	Surface Water (MGD)	Groundwater (MGD)	% of County Withdrawals	Surface Water (MGD)	Groundwater (MGD)	% of County Withdrawals
Commercial	0.00	0.78	16.5%	-	-	-
Industrial	0.00	0.02	0.4%	0.78	0.01	14.16%
Mining	0.00	0	0.0%	0.00	0.27	4.84%
Livestock Watering	0.02	0.64	14.0%	0.03	0.88	16.31%
Aquaculture	0.00	0	0.0%	0.00	0.00	0.00%
Irrigation	0.00	0.4	8.5%	0.09	0.33	7.53%
Domestic Self-supplied	0.00	1.16	24.5%	0.00	1.11	19.89%
Public Supply	0.00	1.71	36.2%	0.99	1.09	37.28%
Total	**0.02**	**4.71**	**100.00%**	**1.89**	**3.69**	**100.00%**

Source: USGS National Water Information System, 2015, most recent data available as of February 2025, https://waterdata.usgs.gov/md/nwis/water_use

Private Residential Wells

Approximately 5,555 residential units in Somerset County (more than half of the County total) rely on individual wells (or, in a few cases such as mobile home parks, community wells) for drinking water supply, as do most businesses in rural portions of the County. These residential and small commercial uses accounted for approximately 1.11 MGD of groundwater withdrawal in 2015. The Piney Point aquifer is frequently used in the western and southern portions of the County, while the Manokin and Piney Point aquifers are most frequently used in the central portion of the County. Residents in the southern and southeastern portions of the County draw a limited amount of water from the Pocomoke aquifer. Individual wells near Crisfield, Rumbley, Frenchtown, and on Smith Island also use the Pocomoke aquifer.

Major Commercial, Industrial, and Institutional Users

As shown in Table 9-4, commercial and industrial activities outside of public systems account for approximately one-third (30.6%) of all water withdrawals in Somerset County. Industry has greatly increased its use of water since 2000. Commercial water withdrawal data was not available for 2015, but the 2000 data indicates it comprises 15.5% of water withdrawals in the County. The largest concentrations of commercial water use are found in the Princess Anne and Crisfield areas, as well as along the western coast. The majority of industrial users are located in the Princess Anne and Pocomoke City areas, including the Smurfit, Lankford Sysco, and Perdue, which currently use approximately 77,000 GPD.

Agricultural Water Users

As is the case throughout the Eastern Shore, Somerset County's farmers use surface water and primarily groundwater for crop irrigation and livestock (primarily poultry) watering. One concentrated area of irrigation is the southeastern corner of the County, along Shelltown Road, where drip irrigation supports crops such as tomatoes and peppers. Groundwater for irrigation is generally drawn from the surficial aquifer. Irrigation accounts for 7.53% of total water withdrawals, and livestock watering accounts for 16.31% of total water withdrawals.

9.2.3 Water Issues

Water Supply Concerns

The Manokin aquifer, which is by far the most commonly used aquifer in the County, has seen substantial drawdowns in the past few years. A fairly large drawdown of the aquifer (referred to as a "cone of depression") recently formed in the Princess Anne area and the area surrounding the Eastern Correctional Institution (ECI). This resulted in problems for some domestic and commercial wells in the Manokin and has made it difficult to attract new businesses to the area, particularly around ECI. Some individual wells have also had to be replaced. A similar cone of depression has also been observed in northern Somerset County, in the vicinity of Allen, MD.

To address water supply concerns in the Manokin, two new Patapsco aquifer wells will produce a total of 800 GPM to supplement the Princess Anne Manokin wells. Due to the alternating nature of the wells, only 510 GPM will be available at a given time. Because the reverse osmosis system has 15% waste, the instantaneous capacity into the distribution system will be 433 GPM, which equates to 415,000 GPD. The well facility is located on Revells Neck Road on a property adjacent to ECI.

Beyond the Manokin's capacity concerns, the Smith Island water systems (which rely on the heavily used Patapsco aquifer) still have inadequate capacity to support potential growth through 2030. The County should work with MDE to determine whether additional withdrawals to support these communities could be obtained. Expanded withdrawals, along with concerted water conservation efforts (see below), may be the only options for serving populations on Smith Island.

Groundwater Recharge

The capacity of the County's confined aquifers is increasingly strained by new development throughout the Delmarva Peninsula and the larger Atlantic Coastal Plain geographic area. The U.S. Geological Society (USGS) reports that "withdrawals from Maryland Coastal Plain aquifers have caused ground-water levels in confined aquifers to decline by tens to hundreds of feet from their original levels. Continued water-level declines could affect the long-term sustainability of ground-water resources in agricultural areas of the Eastern Shore."[3] In most cases, the recharge areas for these aquifers (particularly the Piney Point), are not necessarily found on the Eastern Shore.

Groundwater Recharge

Groundwater recharge, or aquifer recharge, is a hydrologic process, where water moves downward from surface water to groundwater. Recharge is the primary method through which water enters an aquifer.

Source: USGS.

Groundwater and surface water resources are also linked. Water from surficial aquifers can comprise a significant amount of the base flow of streams and rivers. While groundwater withdrawn through wells is typically returned to the ground or surface via point source discharges, septic systems, and absorption of runoff from outdoor water uses (such as watering of lawns), large withdrawals can potentially impact the quality and quantity of flows in nearby surface water bodies.

[3] https://mde.maryland.gov/programs/water/water_supply/Documents/Coastal_Plain_Aquifer_Study_Fact_Sheet.pdf

MDE, the Maryland Geological Survey (MGS), and the US Geological Survey (USGS) have completed a Coastal Plain Aquifer Study, 2016 (completed in 2013). The County should use the data and recommendations of the Coastal Plain Aquifer Study to shape its own water use policies and ordinances—particularly those that relate to groundwater appropriations and protection of aquifer recharge areas. However, the County also recognizes the need for and supports the development of broader regional water policies to protect already scarce resources.

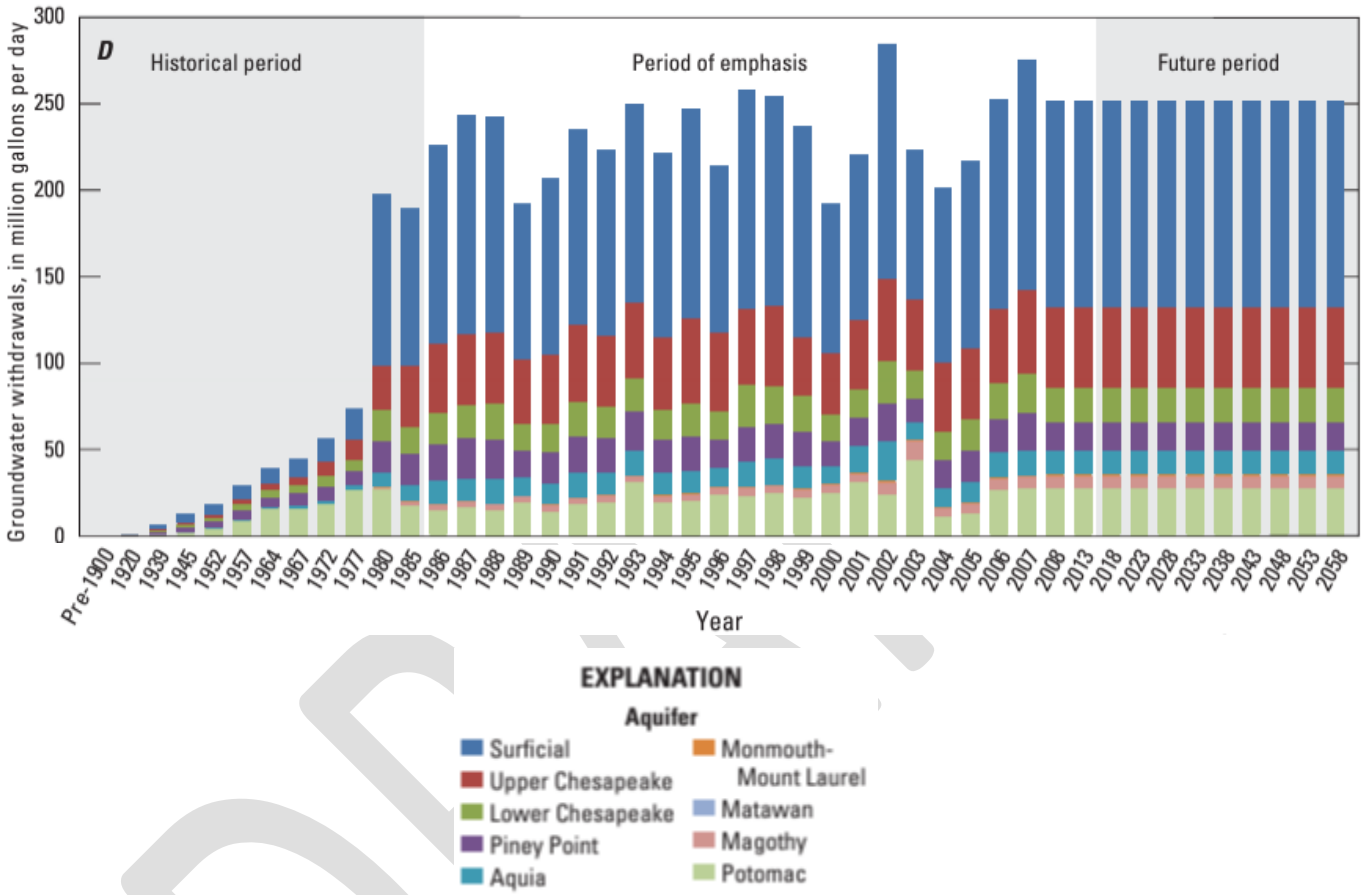


Figure 9-7: Groundwater Withdrawals for the Delmarva regional aquifer. Source: Coastal Plain Aquifer Study, 2016.

Figure 9-7 depicts groundwater withdrawals for the Delmarva regional aquifer, which includes Somerset County, during the historical period (1900–1985), the period of emphasis (1986–2013), and a future period (2014–2058). Withdrawals for the Upper Chesapeake, which includes the County, are shown in dark red. Groundwater withdrawal is projected to stay relatively constant in the future period, 2014-2058. Groundwater withdrawals in this figure are for the Delmarva region, which includes Somerset County. The Delmarva region is projected to have a higher groundwater withdrawal rate per day than both Maryland and Virginia through 2058.

For purposes of this Water Resources Element, it is presumed that the MDE groundwater permit issued for each public drinking water system reflects the safe yield of the aquifer(s) used by that system. However, given the status of groundwater resources on the Delmarva Peninsula, the County should take a more proactive approach to managing water supplies by establishing a water supply allocation system. Such systems are used in other jurisdictions with water supply concerns.

It should be noted that the 2016 aquifer study was completed at a regional level, therefore not all conclusions made by the study may be relevant or true for Somerset County at a local level.

Climate Change Impacts to Groundwater Recharge

According to the Coastal Plain Aquifer Study, 2016, *"most climate models (Coulson and others, 2010) forecast warmer future temperatures with more variable and less predictable precipitation patterns. Therefore, predictions of potential changes in the amount of aquifer recharge are very uncertain. However, increases in temperatures potentially may have several effects, including increasingly more severe drought conditions that could act as drivers to increase summertime water demand. Increased evapotranspiration coupled with more highly variable precipitation patterns during the growing season months will likely prompt agricultural producers to rely more heavily on irrigation from groundwater sources to minimize the effects of droughts. Livestock producers will likely demand more water for consumption and stock cooling. Increased demand for domestic and commercial cooling is likely to require increased electricity production and commensurate water use by thermoelectric powerplants (Legesse and others, 2003). Coastal communities in the northern Atlantic Coastal Plain province also are faced with the potential consequences of sea-level rise on coastal aquifer systems."*

The study further states *"groundwater levels are affected by droughts both from the decrease in recharging precipitation and from increased pumping to meet irrigation needs. Water levels in the surficial aquifer would be most affected by drought in the Delmarva geographic area because the unconfined, surficial aquifer is the most susceptible of all the aquifers in the NACP aquifer system to changes in recharge and nearly 75 percent of the increase in water withdrawn for irrigation in the Delmarva geographic area is from the surficial aquifer, Figure 9-8*.

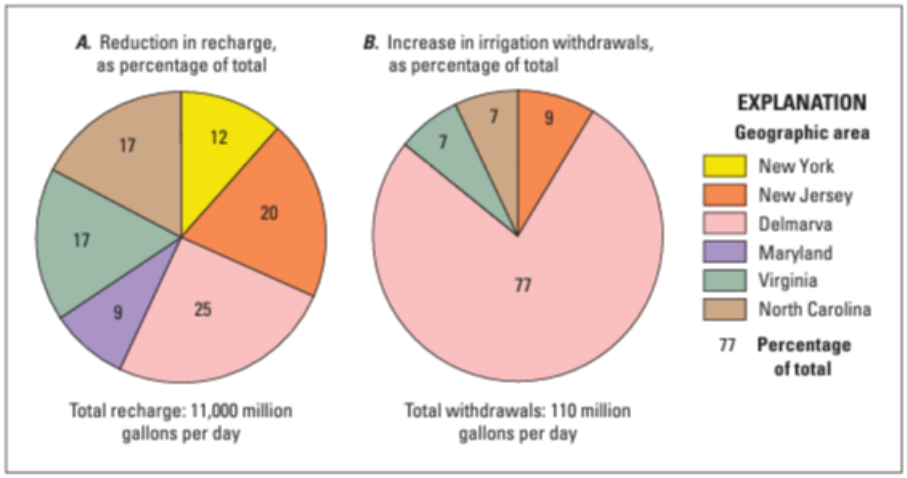


Figure 9-8: Reduction in Groundwater Recharge versus Increase in Irrigation Withdrawal. Source: Coastal Plain Aquifer Study, 2016 Source: Assessment of groundwater availability in the Northern Atlantic Coastal Plain aquifer system From Long Island, New York, to North Carolina. https://doi.org/10.3133/pp1829.

Groundwater Protection

The primary water quality concern for some public systems in Somerset County is elevated fluoride levels, particularly in systems that draw water from the Patapsco aquifer, but fluoride concentrations do not exceed US EPA safety thresholds. However, MDE requires the County to remove fluoride via reverse-osmosis (a requirement that will apply to the upgraded ECI WTP). A Source Water Assessment completed in March of 2005 found that due to the protected nature of confined aquifers the water systems were not susceptible to

contaminants originating at the land surface. In addition, three public systems are susceptible to iron (Eden mobile home park, Princess Anne, and ECI).

High concentrations of chloride and sodium are common problems for individual wells in the western and southern neck areas of the County. In other areas, high iron concentrations limit water use. High nitrate concentrations are a problem in a few isolated areas where shallow unconfined aquifers have become contaminated from septic effluent, chicken manure stockpiles, or the over-application of fertilizer.

The SCSD and Somerset County Health Department administer the County's Groundwater Management program, which governs the protection of the County's aquifers. The program's regulations are based on the Groundwater Protection Report, which defines these Management Areas and associated requirements. The Groundwater Management program establishes criteria for septic tank location in three Management Zones, which were created based on the ability of the soil to accept and filter septic effluent without polluting the underlying aquifer.

To the north and east of Princess Anne in Management Area A, current regulations require a two-acre minimum area for a septic field and an adequate treatment zone of 2 to 4 feet between septic field and aquifer unless development is on a central sewer system. Management Area B1, surrounding Princess Anne to the west and extending towards Pocomoke City, requires soil borings and specially designed septic systems as a condition of development approval. The remainder of the County, Management Area B2, is subject to normal septic field testing.

Water Conservation

The MDE requires a Water Conservation Plan from jurisdictions that provide public water to populations of greater than 10,000 and produce more than 100 gallons of water per capita per day. These plans are also required for systems that have received financial assistance from the State for infrastructure improvements. The County does not currently have a Water Conservation Plan, as it does not meet the population requirements. Somerset County has established as a goal the development of an official water conservation program to formalize its current conservation policies.

Somerset County currently has no policy for ensuring compliance with the Maryland Water Conservation Plumbing Fixtures Act (MWCPFA), which requires that new plumbing fixtures sold or installed as part of new construction are designed to conserve water. The Water and Sewer Master Plan identifies the need to establish such a policy, a recommendation that this Water Resources Element endorses.

The Eastern Correctional Institute has installed water meters to monitor water usage and implemented its own water conservation procedure. The County should follow suit by making a concerted effort to understand water usage in major public systems, and to educate citizens about water conservation. In particular, the County should contact UMES to investigate opportunities to develop a public information campaign on water conservation, or to develop a broader Water Resources curriculum at the college.

Potential New Water Supplies

To accommodate long term growth, the County and its municipalities should begin to investigate the feasibility of other new and expanded sources of drinking water, including different aquifers and surface water bodies.

Surface water cannot be ruled out as a potential new source of drinking water and should be included in any

comprehensive study of new drinking water sources. However, many factors discourage the use of surface water as a potable water source. In particular, the County's flat topography makes the construction of surface impoundments impractical. Contamination of surface waters (particularly with bacteria and biological materials), intrusion of salt water from the Chesapeake Bay, and long-distance conveyance are also impediments to the use of surface water impoundments.

To address concerns about water supplies, many Maryland counties have begun to investigate the feasibility of withdrawing and treating brackish tidal waters for public water supplies. While the desalinization technology necessary for such systems is extremely expensive and energy-intensive, it should not be ruled out over the very long term. In particular, Somerset County should examine opportunities to participate in regional consortiums (perhaps with neighboring counties) intended to promote desalinization.

9.3 Wastewater Assessment

This section describes existing conditions and projected future demand for public wastewater treatment capacity in Somerset County.

9.3.1 Public Sewer Systems

Approximately 5,297 dwelling units in Somerset County (slightly less than half of all dwelling units in the County) and a considerable share of businesses discharge wastewater to one of the seven County, municipal, or private (community) wastewater treatment plants (WWTP) described in Table 9-5. Maps 9-1 through 9-6 show the location of public sewer service areas as of 2024, as well as the areas that are expected to be served within this planning period.

Table 9-5.

Sewer System Characteristics			
Wastewater Treatment Plant	**Discharge Location (Watershed)**	**Treatment Technology**	**Planned/Potential Upgrades or Expansions**
Crisfield	Little Annemessex River	Biological Nutrient Removal (BNR) & Enhanced Nutrient Removal	Extend to Annemessex Ridge area
Princess Anne	Manokin River	BNR	ENR upgrade
Ewell/Rhodes Point	Francis Gut	Advanced-Extended Aeration	Planned to be an Enhanced Nutrient Removal (ENR) facility with a proposed discharge of 40,000 GPD
Tylerton	Merlin Gut	Extended Aeration	Upgrade planned, awaiting funds
ECI	Manokin River	BNR	Expand to 0.72 MGD
Eden MAP	Wicomico Creek	Spray Irrigation	None planned

Somerset County owns and/or operates the Princess Anne, Ewell/Rhodes Point, and Tylerton plants. The County previously operated the Fairmount WWTP. However, the County decommissioned the existing Fairmount WWTP in 2019 and installed a duplex sewage pumping station to pump to the Westover sewer collection system, constructed in 2009. The Westover sewer system conveys sewage to the Princess Anne WWTP, which has sufficient capacity to accept the wastewater from Fairmount. This course of action was a recommendation in the previous iteration of the Water Resources Element adopted in 2010.

Note: The Fairmount Sanitary Sub-district includes the Fairmount Election District.

Table 9-6 shows the projected public sewer supplies, demands, surpluses, and deficits for public wastewater systems in 2030. All public systems will have enough capacity to support growth through 2030. Both the Princess Anne and Crisfield systems have infiltration/inflow (I/I) problems which, if minimized, would reduce the hydraulic flows to these wastewater treatment plants and make more capacity available. Once I/I is addressed, a plan to connect failing septic systems to these systems could be implemented.

The City of Crisfield owns and operates their wastewater treatment plant. ECI is operated by the Maryland Environmental Service (MES). Approximately two-thirds of the County population on community sewer systems is served by the Crisfield and Princess Anne systems. All of the County's major sewer systems have available capacity to support some additional growth and development.

Table 9-6.

Sewer System Demand, Capacity, and Projections[7]											
		Crisfield[5]			Princess Anne			Smith Island (Combined)[6]			ECI
		Trend	PFA	Hybrid	Trend	PFA	Hybrid	Trend	PFA	Hybrid	
Existing Treatment Capacity[1]	gpd[2]			1,000,000			1,260,000			85,000	480,000
	EDU[2]			3,610			5,040			340	1,920
Average Daily Flow, 2007	gpd			680,000			480,000			40,000	480,000
	EDU			2,455			1,920			160	1,920
Net Available Capacity, 2007	gpd			320,000			780,000			45,000	0
	EDU			1,155			3,120			180	0
Total Projected Demand, 2030[3]	**gpd**	**870,337**	**991,702**	**931,020**	**675,873**	**762,747**	**719,310**	**41,922**	**40,000**	**40,961**	**720,000**
	EDU	**3,142**	**3,580**	**3,361**	**2,703**	**3,051**	**2,877**	**168**	**160**	**164**	**2,880**
Future Capacity[4]	gpd		1,000,000			1,260,000				85,000	720,000
	EDU			3,610			5,040			340	2,880
Net Available Projected Capacity, 2030	**gpd**	**129,663**	**8,298**	**68,980**	**584,127**	**497,253**	**540,690**	**43,078**	**45,000**	**44,039**	**0**
	EDU	**468**	**52**	**271**	**2,337**	**1,989**	**2,163**	**172**	**180**	**176**	**0**

Notes:

1: Indicates the more restrictive of either the facility's permitted discharge or its treatment capacity.

2: gpd = gallons per day; EDU = An Equivalent Dwelling Unit (EDU), equal to 250 gpd. This figure represents the average amount of water used by one household and is also used to calculate residential and non-residential (e.g., businesses) water demand. For Crisfield, one EDU equals 277 gpd.

3: Includes all existing and projected new residential and non-residential demand, as well as new demand from system extensions. New nonresidential demand is assumed to be 10 percent of new residential demand.

4: Reflects all potential or planned system upgrades and expansions. Sources: 2008 Somerset County Water and Sewer Master Plan, County Staff, Crisfield and Princess Anne WREs, and Maryland Environmental Service (MES) for ECI.

5: For Crisfield, the Trends Scenario reflects the City's WRE (28 July 2009)

6: For systems other than Princess Anne, Crisfield, it is assumed that the public system growth rate in system equals growth rate in underlying watershed.

7. The data in this table used the 2008 Somerset County Water and Sewer Master Plan, which was the best available information as the 2024 Draft Water & Sewer Plan was still under development as of February 2025, and did not include updated data specific to Sewer Demand, Capacity, and Projections.

9.3.2 Nutrient Discharges and Assimilative Capacity

Nitrogen and phosphorus (more generally referred to as "nutrients") from WWTPs and from stormwater and other "non-point sources" are the primary contributors to degraded water quality in the Chesapeake Bay and its tributaries. As a result of Maryland's participation in the Chesapeake Bay 2000 Agreement and resulting state policies designed to help restore the Bay, water and sewer planning must consider the "assimilative capacity" of a receiving body of water—the mass of nutrients that the stream can receive while still maintaining acceptable water quality. This section describes the key limits on assimilative capacity as they apply to the County's WWTPs.

Table 9-7 examines identified issues by watershed and lists the total amount of permitted dischargers per watershed. Permitted discharges are industrial facilities that have been issued a permit by MDE to discharge to State surface waters.

Table 9-7.

Watersheds – Identified Issues		
Watershed	**Issue (Percentage of Assessed Area)**	**# of Permitted Dischargers**
Big Annemessex R.	Bacteria and Other Microbes (63%), Murky Water (27%)	1
Dividing Creek	Bacteria and Other Microbes (86%), Salts (14%), Abnormal Flow (14%), Degraded Habitat (14%)	15
Lower Chesapeake Bay	-	-
Lower Pocomoke R.	Salts (99%), Abnormal Flow (99%), Degraded Habitat (99%), Murky water (32%), Nitrogen and/or Phosphorus (32%), Bacteria and Other Microbes (<1%), PCBs (<1%), Low Oxygen (<1%)	38
Lower Wicomico R.	Polychlorinated Biphenyls (PCBs) (55%), Low Oxygen (55%), Nitrogen and/or Phosphorus (44%), Bacteria and Other Microbes (42%), Murky Water (4%)	3
Manokin R.*	-	-
Taylor Branch	Bacteria and Other Microbes (30%), Murky Water (29%)	25
Broad Creek	Murky Water (88%), Bacteria and Other Microbes (26%)	2
Monie Bay	Bacteria and Other Microbes (51%)	4
Pocomoke Sound*	-	-
East Creek	Murky Water (46%), PCBs (29%), Aquatic Weeds (29%), Bacteria and Other Microbes (8%), Low Oxygen (2%)	10
The Prong	PCBs (89%), Low Oxygen (89%), Aquatic Weeds (89%), Murky Water (11%)	0
Marumsco Creek	Bacteria and Other Microbes (28%, Murky Water (26%), PCBs (17%), Aquatic Weeds (13%), Low Oxygen (4%)	8
Tangier Sound	-	-
Upper Tangier Sound	None	0
Lower Tangier Sound	PCBs (100%), Low Oxygen (100%), Aquatic Weeds (100%)	0
Little Annemessex River	Murky Water (87%), PCBs (13%), Low Oxygen (13%), Aquatic Weeds (13%)	5
Wicomico Creek	PCBs (2%), Low Oxygen (2%)	17
	Total Permitted Discharges Across all Watersheds	**128**

Source: U.S. Environmental Protection Agency "How's My Waterway" mapping and data tool.
**Watershed is comprised of two or more sub-watersheds that are within and adjacent to Somerset County.*

Point Source Caps and Discharges

To address nutrient loads from point sources such as WWTPs, the state has established Chesapeake Bay Tributary Strategy point source caps. These caps are numerical limits on the amount of nitrogen and phosphorus that WWTPs can discharge to the Bay and its tributaries (expressed as pounds per year of nitrogen and phosphorus). Nitrogen and phosphorus point source caps have been established for the Crisfield and Princess Anne WWTPs. Caps have also been calculated for the Smith Island WWTP but will only be formally established upon expansion of those facilities. Table 9-8 compares these nutrient caps against existing and projected nutrient discharges at the County's largest WWTPs.

Total Maximum Daily Load

One measure of assimilative capacity is the Total Maximum Daily Load (TMDL), a series of calculations required by the Clean Water Act. A TMDL is the maximum amount of pollutant that a water body, such as a river or a lake, can receive without impairing water quality. Water bodies are classified as "impaired" when they are too polluted or otherwise degraded to support their designated and existing uses. The TMDL is typically expressed as separate discharge limits from point sources such as WWTPs, as well as non-point sources such as stormwater or agricultural runoff.

The impaired waters list is called the 303(d) list, named after the section in the Act that establishes TMDLs. All of Somerset County's 8-digit watersheds are impaired for either nutrients (nitrogen and/or phosphorus) or bacteria. The Manokin River TMDL is the only such limit that impacts significant point sources (e.g., public WWTPs) in Somerset County. However, as is shown in Table 9-9, the nitrogen TMDL for the Manokin River does not appear to be as restrictive as the existing point source cap for the Princess Anne WWTP (although the TMDL also applies to discharges from the ECI WWTP). As the more restrictive limit, the point source cap therefore governs the Princess Anne system. Table 9-10 shows the approved nutrient TMDLs for the County's watersheds.

Antidegradation

Maryland's antidegradation policy significantly limits new discharge permits and expansions of existing discharges that would degrade water quality in Tier II (high quality) waters, as defined by the US Environmental Protection Agency (EPA). In these areas, new nutrient discharges can be permitted, as long as they do not degrade existing water quality. Somerset County has one stretch of Tier II waters – a segment of Dividing Creek in the northeastern portion of the County along the border with Worcester County. None of the WWTPs listed in Table 9-5 discharge to this Tier II stream.

9.3.3 Alternative Wastewater Disposal Options

A number of other opportunities exist to protect and improve water quality while still accommodating projected growth and development. This section summarizes key concepts that the County and its municipalities may wish to consider.

Nutrient Trading

Under the state's Policy for Nutrient Cap Management and Trading (updated in April of 2017), an ENR-enabled WWTP on the Eastern Shore can agree to forego a certain amount of development in exchange for payment, and then send or "trade" that excess treatment capacity to another WWTP on the Eastern Shore in need of capacity. The receiving WWTP would then be allowed to expand beyond its current permitted capacity, provided that such expansion does not exacerbate existing water quality impairments or violate TMDLs.

With a large existing and projected capacity surplus, the Princess Anne WWTP (which has received an ENR upgrade recently) may be in a position to sell excess capacity to another WWTP. However, given the County's and Princess Anne's emphasis on concentrating growth in and around existing public services, the County may not wish to sell this capacity.

WWTPs with ENR technology may also be able to expand their facilities by accepting effluent from other WWTPs without BNR or ENR technology, and then by retiring those WWTPs and their outfalls; the Fairmount WWTP was retired in 2019. Although the cost of sewer infrastructure (specifically new wastewater collection lines) is considerable, such an arrangement may be the most preferable way to address potential nutrient cap overages in areas.

Table 9-8.

Nutrient Caps and Projected Nutrient Discharges[4]											
		Crisfield			Princess Anne			Smith Island			ECI
		Trends	PFA	Hybrid	Trends	PFA	Hybrid	Trends	PFA	Hybrid	
Projected Capacity, 2030	MGD			1.00			1.26			0.09	0.72
Existing Nutrient Loads[2]	TN[1]			6,151			11,681			803	11,681
	TP[1]			615			2,920			37	2,920
Likely Nutrient Caps, 2030[3]	TN			12,182			15,350			1,538	23,268
	TP			914			1,151			257	3,878
Projected ADF, 2030	MGD	0.86	0.99	0.93	0.67	0.76	0.72	0.04	0.04	0.04	0.72
Assumed Treatment Technology, 2030	-	ENR			ENR			Secondary			BNR
Estimated Nutrient Discharges, 2030, lbs/year[3]	TN	7,888	8,995	8,441	6,150	6,942	6,546	2,295	2,190	2,243	11,681
	TP	789	900	844	615	694	655	765	730	748	2,920
Remaining Discharge Capacity (overage)	**TN**	**4,294**	**3,187**	**3,741**	**9,200**	**8,408**	**8,804**	**(757)**	**(652)**	**(705)**	**11,587**
	TP	**125**	**14**	**70**	**536**	**457**	**496**	**(508)**	**(473)**	**(491)**	**958**

Notes:

1: TN = Total Nitrogen (lbs/year); TP = Total Phosphorus (lbs/year)

2: Source: SCSD. Crisfield (ENR) assumes 3 mg/L TN and 0.3 mg/L TP.

3: Sources: MDE's ENR Fact Sheets for Crisfield and Princess Anne (http://www.mde.state.md.us/Water/CBWRF/pop_up/enr_status_map.asp); other systems: MDE (2009). Caps for systems other than Crisfield and Princess Anne will only become effective upon expansion of the WWTP.

4. The data in this table used projection and scenarios from 2008 Somerset County Water and Sewer Master Plan, which was the best available information as the 2024 Draft Water & Sewer Plan was still under development as of February 2025, and did not include updated data specific to projections.

Table 9-9.

Approved TMDLs In Somerset County			
BASIN NAME	**SUB-BASIN**	**TMDL**	**VALUE**
Tangier Sound	Laws Thorofare & Upper Thorofare	Median Fecal Coliform	3.434 X 10^{11} counts/day
		90th Percentile Fecal Coliform	1.202 x 10^{12} counts/day
Manokin River	Manokin River	Median Fecal Coliform	6.21 x 10^{11} counts/day
		90th Percentile Fecal Coliform	2.17 x 10^{12} counts/day
		Total Nitrogen (low flow) (5/1-10/31)	1,610 LB/month
		BOD (low flow) (5/1-10/31)	4,420 LB/month
		Total Nitrogen (Average Annual)	353,680 LB/year
	St. Peters Creek	Medial Fecal Coliform	4.11 x 10^{10} counts/day
		90th Percentile Fecal Coliform	1.44 x 10^{11} counts/day

Table 9-9.

BASIN NAME	SUB-BASIN	TMDL	VALUE
Wicomico Creek	Wicomico Creek	Total Nitrogen (low flow) (5/1–10/31)	1,017 LB/month
		Total Phosphorus (low flow) (5/1-10/31)	38 LB/month
		Total Nitrogen (Average Annual)	104,584 LB/year
		Total Phosphorus (Average Annual)	6,008 LB/year
Lower Wicomico River	Main Stream	Median Fecal Coliform	1.513 X 10^{12} counts/day
		90th Percentile Fecal Coliform	4.821 X 10^{12} counts/day
		Total Nitrogen (low flow) (5/1-10/31)	22,900 LB/month
		Total Phosphorus (low flow) (5/1-10/31)	5,764 LB/month
		BOD (low flow) (5/1-10/31)	80,114 LB/month
		Total Nitrogen (Average Annual)	1,266,530 LB/year
		Total Phosphorus (Average Annual)	103,480 LB/year
Monie Bay	Monie Bay	Median Fecal Coliform	3.889 x 10^{12} counts/day
		90th Percentile Fecal Coliform	1.753 X 10^{13} counts/day

Notes:

1: The Lower Wicomico River watershed includes substantial portions of Wicomico County, including the entire City of Salisbury, MD, as well as a small portion of Sussex County, Delaware. Approximately 94 percent of the Lower Wicomico River watershed is outside of Somerset County, as are all major nutrient point sources.

2: The Wicomico Creek watershed includes portions of Wicomico County. Approximately 40 percent of the Wicomico Creek watershed is outside of Somerset County.

Table 9-10.

Approved Nutrient TMDLs for Somerset County Watersheds			
Watershed	**Impairing Nutrient**	**Nonpoint Source TMDL (lbs/year)**	**Point Source TMDL (lbs/year)**
Lower Wicomico River[1]	Nitrogen	832,460	409,130
	Phosphorus	33,850	68,190
Manokin River	Nitrogen	301,890	42,730
Wicomico Creek[2]	Nitrogen	101,538	0
	Phosphorus	5,833	0

Source: Approved TMDLs - Maryland Department of the Environment.

Notes:

1: The Lower Wicomico River watershed includes substantial portions of Wicomico County, including the entire City of Salisbury, MD, as well as a small portion of Sussex County, Delaware. Approximately 94 percent of the Lower Wicomico River watershed is outside of Somerset County, as are all major nutrient point sources.

2: The Wicomico Creek watershed includes portions of Wicomico County. Approximately 40 percent of the Wicomico Creek watershed is outside of Somerset County.

The connection of houses and businesses on septic systems to sewer systems (and the subsequent retirement of those septic systems) can also generate nutrient credits. The amount of credit depends on the location of these septic systems. Under the state policy, Princess Anne or any other WWTP could receive permanent nitrogen credits by converting on-site septic systems to a permanent hookup to an ENR wastewater treatment plant, as follows:

a) 9.28 pound per year in Critical Area;
b) 5.8 pound per year within 1,000 feet of any perennial surface water; or
c) 3.48 pound per year in all other areas of the Chesapeake Bay watershed.

In addition, MDE and the Maryland Department of Agriculture (MDA) have released a Trading and Offset Policy and Guidance Manual (2017) that addresses trading between nonpoint sources (such as agriculture) and point sources (wastewater and stormwater).

Land Application of Treated Wastewater

The application of treated wastewater effluent directly to the soil can allow pollutants to be absorbed before the effluent reaches receiving streams. Spray irrigation is the most common form of land application, although other options (such as drip irrigation or subsurface discharge) can also be considered. Spray irrigation is already used as a disposal method for the Eden Mobile Home Park. Any future land application system would likely be paired with an existing surface discharge to maximize system capacity without exceeding nutrient caps or TMDLs.

Factors such as slope, soil depth and granularity, water table depth and behavior, and buffers from streams and developed areas are important in determining true suitability.[4] Other important considerations for land application include storage and seasonal restrictions. Land application systems typically require large storage lagoons capable of holding several months' worth of effluent. Land application may not be permitted during winter months, when frozen soil cannot accept effluent, or during other months when water tables rise. Based on County discussions with MDE, the amount of land in Somerset County that is suitable for spray irrigation is extremely limited.[5]

Tertiary Treatment Wetlands

In this system, effluent is treated at a WWTP (either BNR or ENR) and then discharged into a series of constructed, vegetated (typically, forested) wetlands. These wetlands purify the effluent to the point where the eventual discharge is essentially free of nutrients and other pollutants. An excellent example of the application of this technology occurs in Clayton County, Georgia. In this system (which can treat up to 38.4 million gallons of wastewater per day), the wetland-treated effluent is pure enough to be used for drinking water.[6]

Other smaller applications of tertiary treatment wetlands can be found throughout Maryland. These facilities are typically used at schools and other institutional uses. Implementation of such a facility would depend heavily on soil characteristics and other conditions. The Tylerton WWTP uses constructed wetlands that are

4 https://msa.maryland.gov/megafile/msa/speccol/sc5300/sc5339/000113/020000/020259/unrestricted/20141354e-008.pdf
5 The Preliminary Spray Irrigation Site Capacity Estimate for Somerset County, included in the 2010 Water Resources Element Appendix, likely overestimates the amount of land that is suitable for spray irrigation.
6 https://www.ccwa.us/what-we-do/#:~:text=After%20the%20initial%20phase%20of,man%2Dmade%20constructed%20treatment%20wetlands.

equivalent to secondary treatment (higher per-liter nutrient loads than BNR).

Wastewater Reuse

In some cases, treated wastewater effluent can be used to recharge groundwater aquifers. As with tertiary treatment wetlands, effluent is treated to potable (or better) standards before being injected into the aquifer. One such large-scale system is in place in Orange County, California. In that system, treated effluent is used not only to recharge the aquifer (and to provide some drinking water as a result), but also to halt and even reverse saltwater intrusion from the Pacific Ocean into the aquifer. Given the documented drops in aquifer levels on the Eastern Shore, and the presence of saltwater intrusion in some areas, this approach may have merit in Somerset County, and particularly for the Manokin aquifer which has documented well failures. The County should work with MDE in future investigations of the feasibility of such a system.

Additional Issues

In the Deal Island/Wenona area, population densities average 340 persons per square mile, which exceeds the currently required County health standard of two acres per septic tank. However, due to a lack of community interest, Deal Island is not listed as a recommended service area for sewerage in the Water and Sewer Plan. In light of nutrient impairments and an eventual nutrient TMDL for the Tangier Sound watershed, which includes Deal Island, it may be necessary to revisit this recommendation.

9.4 Programmatic Assessment of Nonpoint Source Policies

Nonpoint sources of nutrient pollution include agricultural runoff, erosion and sediment from development, stormwater runoff from roads, atmospheric deposition, and any other source other than an outfall pipe. These sources are called nonpoint because they involve widely dispersed activities, and hence are difficult to measure. All non-point sources of pollution eventually reach the waters of the Chesapeake Bay unless filtered or retained by some structural or nonstructural technique.

Various technologies reduce nutrients from agricultural and developed lands. Nutrient reduction technologies for nonpoint source pollution are generally referred to as "Best Management Practices" (BMPs). Examples of these technologies include animal waste storage, agricultural nutrient management planning, stormwater settling ponds, and erosion controls. Natural controls or “low-impact development” techniques are extremely effective in reducing the number of pollutants that reach waterways. Woodlands and wetlands release fewer nutrients into the Bay than any other land use. For these reasons, forests, grasslands, and wetlands are critical to restoring and maintaining the health of the aquatic environment.

This section characterizes the policies and procedures in place to manage nonpoint source pollution in Somerset County.

9.4.1 Stormwater Management in Somerset County

The Maryland Stormwater Design Manual, Volumes I & II (October 2000, Revised May 2009) is incorporated by reference into the Somerset County Code, and serves as the official guide for stormwater methods, principles, and practices.

The 2007 Maryland Stormwater Management Act mandated substantial revision of the Stormwater Design Manual. The most notable provision of the 2007 Act was the requirement that new development use

Environmentally Sensitive Design (ESD) techniques, which are intended to "maintain pre-development runoff characteristics" on the site. ESD emphasizes the minimization and treatment of stormwater on each parcel through a variety of small-scale techniques that mimic natural stormwater absorption and dispersal processes.

Stormwater management in Somerset County is guided by the County's Stormwater Management Ordinance, last adopted in September of 2020. The ordinance is coordinated and enforced by the Office of County Engineer.

The County's Roadside Drainage Program, administered by the Roads and Waterways Department, is responsible for the County's ~350 miles of roadway, which often have drainage ditches on both sides. These ditches help carry stormwater away from the roadways and into drainage bodies nearby. Many of these drainage systems fall within environmentally sensitive areas and are subject to additional regulations such as critical area, floodplain, stormwater management, sediment control, tidal wetlands and non-tidal wetlands. Maintenance often requires permitting and also partnering with other agencies.

In parts of the County that experience regular stormwater management issues or flooding, drainage assessments are conducted to help identify the causes of the stormwater. Drainage assessments have recently been completed for the Deal Island Peninsula, the Princess Anne neighborhood of Somerset Landing, and Smith Island; the City of Crisfield is in the process of completing an assessment.

9.4.2 Land Preservation, Parks, and Recreation Plan

Somerset County's 2022 Land Preservation, Parks, and Recreation Plan (LPPRP) contains goals and recommendations, many of which address issues similar to those analyzed as part of this WRE. The LPPRP supports land use goals that are compatible with protecting water resources in the following ways:

- Continued protection and preservation of green infrastructure.
- Zoning will continue to be supportive of natural resource land conservation and protect the County's rural character.
- Continued efforts to promote watershed protection as part of the State's Tributary Strategies program.
- Increase tourism and eco-tourism opportunities that are true to the County's rural character. New tourism should be consistent with recommendations from the Lower Eastern Shore Heritage Area Management Plan.

9.4.3 Other Nonpoint Source Management Policies and Considerations

Failing Septic Systems

The Somerset County Health Department estimates that there are approximately 5,072 homes with individual septic systems installed throughout the County, of which approximately 1.5% annually apply for replacement systems. Based on the rate of applications, the County assumes that nearly 3% of all septic systems may not be operating properly. Areas with noticeably higher rates of septic failures include Annemessex Road (near Crisfield-Somerset Airport), Manokin (northeast of Crisfield), and the Oriole area.

The County should work with the municipalities to evaluate ways to address these areas of failing septic systems, either by connection to public sewer systems, or through the alternative wastewater disposal options discussed above. The Water and Sewer Plan suggests that collection systems be installed to eliminate these septic systems, with pump stations and denied access force mains used to convey wastewater to one of the County's existing wastewater treatment plants.

Septic Denitrification

Denitrification units can reduce the nitrogen loading from septic systems by approximately 50% A negligible number of Somerset County's existing septic systems currently utilize denitrification units, and the County does not currently require denitrification units for new septic systems.

Maryland regulation requires all new development on septic systems in the Chesapeake Bay Critical Area to include Best Available Technology (BAT) for nitrogen removal, as defined by MDE. The County may wish to consider similar requirements in other areas, such as near perennial waterways, or in watersheds that are impaired by nitrogen. Indeed, septic denitrification can be one approach to meeting TMDL requirements.

The nonpoint source analysis (section 9.5) assumes that one-quarter of all new residential and non-residential development outside of public sewer systems will utilize denitrification units; this level of implementation is reasonably foreseeable during this planning period.

Agriculture

Agriculture is important to the aesthetic and economic value of Somerset County and is one of Maryland's largest and most important industries. Agriculture represents nearly one-third of all land area in the County. According to the most recent Census of Agriculture (2022), Somerset County has 244 farms which comprise 63,019 acres of land, for an average of 258 acres per farm. Since 2012, the county's total number of farms has decreased by 15, but the average size of farms has increased by 27 acres. These agricultural lands produce runoff which can carry nutrients, sediments, and pollutants from manure, fertilizers, and other sources into waterways. On Maryland's Eastern Shore as a whole, agriculture is the largest contributor of nitrogen and phosphorus to the Bay and its tributaries.

In Somerset County the agricultural community has always recognized the economic and historical importance of the jobs and products provided by the local seafood industry. As a result, farmers in Somerset County have historically led local efforts to restore the Bay and its tributaries—particularly Tangier Sound. Throughout the years, the agricultural community has proactively used federal, state, and local funds to implement Best Management Practices to minimize or eliminate runoff and pollution from cropland and livestock production.

For several years, the County's agricultural community has participated in research into the proper application of fertilizer, chemicals, and poultry manure handling and storage, in cooperation with the Somerset County Soil Conservation District, the University of Maryland, and the University of Delaware. Every agricultural producer in Somerset County has a nutrient management plan, monitored by MDA.

Agriculture continues to be a substantial source of nutrients throughout the Bay watershed, and Somerset County should continue to work with MDE and MDA to reduce nonpoint source nutrient loads from all sources. However, Somerset County's agricultural community has demonstrated that productive agriculture and a healthy Bay can go hand in hand.

Stormwater Retrofits

Stormwater retrofits can help to reduce nonpoint source pollution, particularly in more densely developed areas. The County should identify locations where such retrofits could address concentrations of nonpoint source pollution ("hot spots"), or where retrofits can help to protect environmentally sensitive areas. Future

retrofit funds and implementation activities should be targeted to these priority areas. This recommendation is in addition to ESD requirements for new development, as required by the 2007 Maryland Stormwater Management Act.

Sedimentation and Erosion

Sedimentation and other impacts resulting from construction activity, and increased stormwater flows to streams and rivers from development are also a potential threat to water quality. Most new non-agricultural development in Somerset County requires a sedimentation and erosion control plan.

Marina Sewage Pumpout Stations

Boats pumping human sewage directly overboard also contribute to the nutrient problem and can be a significant source of bacteria in areas where they gather and where there is little flushing of the waters. To combat this, the DNR has developed a sewage disposal program through which sewage disposal stations for boats are installed at marinas. This program also provides information that boaters need in order to help, regardless of the size of their boat. A list of pumpout station locations is available on DNR's website. Lower eastern shore locations include:

- Goose Creek Marina
- Cedar Hill Park and Marina
- Nanticoke Harbor Marina
- Deal Island Marina
- Janes Island State Park
- Somers Cove Marina
- Port of Salisbury Marina
- Webster's Cove Boat Ramp
- Wicomico Yacht Club
- Wikander's Marine Services

9.5 Total Nutrient Loads and Assimilative Capacity

Nutrient loads from point sources (WWTPs), stormwater, and other nonpoint sources are major contributors to degraded water quality in the Chesapeake Bay and its tributaries. This section evaluates existing and projected point and nonpoint source pollution loads.

9.5.1 Nonpoint Source Nutrient Loading

Nonpoint source nutrient loads (including septic systems) were estimated using methodology developed by the Maryland Department of the Environment, as modified by the County to reflect revised nutrient loading rates. Table 9-11 shows total nonpoint source discharge versus TMDLs of shared watersheds in Somerset County. Table 9-12 provides current and projected future nonpoint source loading for each of the County's 8-digit watersheds.

Future nutrient loads would decrease significantly in all watersheds, compared to current levels. This is due largely to the nonpoint source model's assumption that nutrient-reducing Best Management Practices (BMPs) for urban stormwater and agricultural runoff would be more widely implemented by 2030. The PFA scenario would result in the lowest nonpoint source discharges, but the differences between the scenarios are relatively minor (varying by less than of existing discharges).

All three future land use scenarios would achieve the nutrient reductions required by the completed TMDLs for the Lower Wicomico River, Manokin River, and Wicomico Creek watersheds. Because the Manokin River

watershed is entirely within Somerset County, the available assimilative capacity reflects all discharges within the watershed. The Lower Wicomico River and Wicomico Creek watersheds are shared with Wicomico County.

Table 9-11.

Total Nonpoint Source Discharge and TMDLs, Shared Watersheds[2]					
(all data in lbs/year)		Lower Wicomico River		Wicomico Creek	
		TN	***TP***	***TN***	***TP***
TMDL		832,460	33,850	101,538	5,833
Nutrient Discharges					
Somerset County	*Existing*	27,805	2,043	76,868	5,816
	Trends	19,667	1,337	50,648	3,744
	PFA	19,265	1,328	50,818	3,708
	Hybrid	19,498	1,333	50,184	3,726
Wicomico County	*Existing*	390,997	25,096	35,975	3,021
	Future[1]	356,344	22,172	36,742	2,840
Total	*Existing*	418,802	27,139	112,843	8,837
	Trends	376,011	23,509	87,390	6,584
	PFA	375,609	23,501	87,560	6,547
	Hybrid	375,842	24,833	86,926	6,565
Available Assimilative Capacity (Overage) vs. TMDL					
Total Nonpoint Source Discharges	***Existing***	**413,658**	**6,711**	**(11,305)**	**(3,004)**
	Trends	**456,449**	**10,341**	**14,148**	**(751)**
	PFA	**456,851**	**10,349**	**13,978**	**(714)**
	Hybrid	**456,618**	**9,017**	**14,612**	**(732)**

Notes:

1: Future discharges for Wicomico County represent the average of the three scenarios evaluated as part of the August 20, 2009, draft of the Wicomico County Water Resources Element.

2. The projected capacity data in this table was obtained from the Draft 2024 Water & Sewer Plan and is the best available as of February 2025.

Table 9-12.

Current and Projected Future Nonpoint Source Loading[1]													
(all data in lbs/year)			Big Annemessex River	Dividing Creek	Lower Chesapeake Bay	Lower Pocomoke River	Lower Wicomico River	Manokin River	Monie Bay	Pocomoke Sound	Tangier Sound	Wicomico Creek	Total
Existing	Nonpoint Source Discharge	TN	127,659	60,974	52,695	144,105	27,805	369,955	99,300	192,907	129,876	76,868	**1,282,142**
		TP	8,970	4,530	1,051	11,185	2,043	27,219	6,440	13,510	4,882	5,816	**85,645**
	Nonpoint Source TMDL	TN					832,460	301,890				101,538	
		TP					33,850					5,833	
	Available Assimilative Capacity (Overage) vs. TMDL[2]	TN					See Table 9-11	(68,065)				See Table 9-11	
		TP											
Trends	Nonpoint	TN	124,529	40,793	51,356	93,809	19,667	251,798	72,693	135,416	119,450	50,648	**960,158**
		TP	9,065	2,922	995	7,050	1,337	17,641	4,266	8,879	3,835	3,744	**59,735**
	Available Assimilative Capacity (Overage) vs. TMDL[2]	TN					See Table 9-11	50,092				See Table 9-11	
		TP											
PFA	Nonpoint	TN	123,154	39,932	51,348	91,188	19,265	248,691	71,459	133,954	118,602	50,818	**948,410**
		TP	8,967	2,856	994	7,026	1,328	17,512	4,206	8,796	3,849	3,708	**59,242**
	Available Assimilative Capacity (Overage) vs. TMDL[2]	TN					See Table 9-11	53,199				See Table 9-11	
		TP											
Hybrid	Nonpoint	TN	138,985	40,314	51,352	93,305	19,498	249,794	72,133	134,568	118,677	50,184	**953,502**
		TP	9,016	2,889	995	7,038	1,333	17,577	4,236	8,838	3,842	3,726	**59,488**
	Available Assimilative Capacity (Overage) vs. TMDL[2]	TN					See Table 9- 11	52,096				See Table 9-11	
		TP											

Notes:

1: Includes septic systems

2: Reflects Load Allocation (LA) limits set by adopted TMDLs for each watershed. Where no TMDL has been adopted, or where the watershed is not impaired, no numerical standards are shown.

Based on these data, TMDLs would be met in all cases except for phosphorus in the Wicomico Creek watershed. In this case, the per-acre phosphorus contributions from Wicomico and Somerset Counties are approximately equal, implying that both jurisdictions should make concentrated efforts to implement phosphorus-reducing nonpoint source BMPs in this watershed.

9.5.2 Total Nutrient Loading

Table 9-13 shows the total combined point and nonpoint source discharge in each 8-digit watershed in Somerset County. As with the nonpoint source loadings alone, all three scenarios would considerably reduce nutrient loading compared to existing levels. The PFA growth scenario results in the lowest levels of nonpoint source nitrogen and phosphorus discharges, but the differences between scenarios are minimal.

9.5.3 Impervious Surface

Impervious surfaces are primarily human-made surfaces that do not allow rainwater to enter the ground. Impervious cover creates runoff that can cause stream bank erosion, sedimentation of streams, and adverse effects on water quality and aquatic life. The amount of impervious surface in a watershed is a key indicator of water quality. Water quality in streams tends to decline as watersheds approach 10% impervious coverage and drops sharply when the watershed approaches 25% impervious coverage. Table 9-14 summarizes existing and potential impervious coverage in Somerset County by watershed.

According to land use data gathered from the Chesapeake Bay Conservancy Land Use/Land Cover Data Project, just 2.15% of all land area in Somerset County is impervious[7]. Even in Somerset County's most developed watersheds—Tangier Sound and Manokin River—impervious surface coverage is under 5%. Under the land use and development scenarios considered in this Element, countywide impervious coverage would increase slightly by 2030, with most 8-digit watersheds experiencing some increase in impervious coverage.

While none of the County's major watersheds would approach 10% impervious—the first tipping point with regard to water quality—some smaller sub-watersheds (particularly those in and around municipalities) may already approach or exceed such thresholds. In these cases, stormwater management retrofits can help to reduce the impact of large amounts of impervious surface.

[7] *https://www.chesapeakeconservancy.org/conservation-innovation-center/high-resolution-data/lulc-data-project-2022/*

Table 9-13.

Total Nutrient Loading, All Scenarios													
(all data in lbs/year)			Big Annemessex River	Dividing Creek	Lower Chesapeake Bay	Lower Pocomoke River	Lower Wicomico River	Manokin River	Monie Bay	Pocomoke Sound	Tangier Sound	Wicomico Creek	Total
Existing	*Nonpoint*	*TN*	127,659	60,974	52,695	144,105	27,805	369,955	99,300	192,907	129,876	76,868	**1,282,142**
		TP	8,970	4,530	1,051	11,185	2,043	27,219	6,440	13,510	4,882	5,816	**85,645**
	Point	*TN*	642		803			23,362			6,205		**31,013**
		TP	29		37			5,840			621		**6,527**
	Total	*TN*	**128,301**	**60,974**	**53,498**	**144,105**	**27,805**	**393,317**	**99,300**	**192,907**	**136,081**	**76,868**	**1,313,155**
		TP	**8,999**	**4,530**	**1,088**	**11,185**	**2,043**	**33,059**	**6,440**	**13,510**	**5,503**	**5,816**	**92,172**
Trends	*Nonpoint*	*TN*	124,529	40,793	51,356	93,809	19,667	251,798	72,693	135,416	119,450	50,648	**960,158**
		TP	9,065	2,922	995	7,050	1,337	17,641	4,266	8,879	3,835	3,744	**59,735**
	Point	*TN*	2,520		2,295			17,849			7,942		**30,589**
		TP	840		765			3,537			794		**5,935**
	Total	*TN*	**127,049**	**40,793**	**53,651**	**93,809**	**19,667**	**269,647**	**72,693**	**135,416**	**127,392**	**50,648**	**990,747**
		TP	**9,905**	**2,922**	**1,760**	**7,050**	**1,337**	**21,178**	**4,266**	**8,879**	**4,629**	**3,744**	**65,670**
tPFA	*Nonpoint*	*TN*	123,154	39,932	51,348	91,188	19,265	248,691	71,459	133,954	118,602	50,818	**948,410**
		TP	8,967	2,856	994	7,026	1,328	17,512	4,206	8,796	3,849	3,708	**59,242**
	Point	*TN*	1,752		2,190			18,642			9,050		**31,616**
		TP	584		730			3,616			905		**5,834**
	Total	*TN*	**124,906**	**39,932**	**53,538**	**91,188**	**19,265**	**267,333**	**71,459**	**133,954**	**127,652**	**50,818**	**980,026**
		TP	**9,551**	**2,856**	**1,724**	**7,026**	**1,328**	**21,128**	**4,206**	**8,796**	**4,754**	**3,708**	**65,076**
Hybrid	*Nonpoint*	*TN*	138,985	40,314	51,352	93,305	19,498	249,794	72,133	134,568	118,677	50,184	**953,502**
		TP	9,016	2,889	995	7,038	1,333	17,577	4,236	8,838	3,842	3,726	**59,488**
	Point	*TN*	2,136		2,243			18,245			8,496		**31,102**
		TP	712		748			3,577			850		**5,884**
	Total	*TN*	**141,121**	**40,314**	**53,595**	**93,305**	**19,498**	**268,039**	**72,133**	**134,568**	**127,173**	**50,184**	**984,604**
		TP	**9,728**	**2,889**	**1,743**	**7,038**	**1,333**	**21,154**	**4,236**	**8,838**	**4,692**	**3,726**	**65,372**

Source: Draft 2024 Water & Sewer Plan and is the best available as of February 2025

Table 9-14.

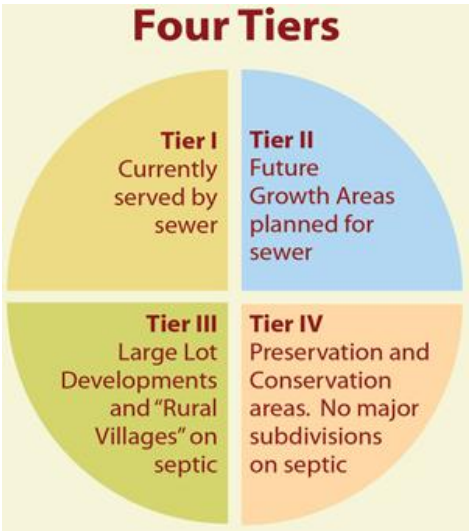
Land Cover – Impervious Surfaces									
Watershed	**Total Acreage[1]**	**Existing Conditions**		**Trends**		**PFA**		**Hybrid**	
		Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Big Annemessex R.	22,206	360	1.6%	380	1.7%	365	1.6%	372	1.7%
Dividing Creek	10,497	55	0.5%	66	0.6%	55	0.5%	60	0.6%
Lower Chesapeake Bay	9,472	45	0.5%	45	0.5%	45	0.5%	45	0.5%
Lower Pocomoke R.	19,048	301	1.6%	324	1.7%	301	1.6%	312	1.6%
Lower Wicomico R.	3,704	82	2.2%	83	2.2%	82	2.2%	82	2.2%
Manokin R.	59,388	1,182	2.0%	1,264	2.1%	1,234	2.1%	1,249	2.1%
Monie Bay	21,480	151	0.7%	160	0.7%	151	0.7%	156	0.7%
Pocomoke Sound	34,198	389	1.1%	415	1.2%	408	1.2%	412	1.2%
Tangier Sound	15,217	609	4.0%	621	4.1%	633	4.2%	627	4.1%
Wicomico Creek	11,780	263	2.2%	276	2.3%	263	2.2%	270	2.3%
Total	**206,988**	**3,438**	**1.7%**	**3,634**	**1.8%**	**3,537**	**1.7%**	**3,585**	**1.7%**

Notes: 1: Excludes areas of open water within County boundaries.

Because implementation of the Tributary Strategies (refer to Section 9.3.2 Nutrient Discharges and Assimilative Capacity) will be challenging, the County should pursue a future land use plan that minimizes the nutrient impacts of development. The PFA Focus scenario has consistently lower nutrient loads than other scenarios. However, the PFA Focus scenario—in which essentially no new development occurs outside of PFAs— could not realistically be implemented in Somerset County, even with robust growth controls outside of PFAs. While also ambitious, the Hybrid Scenario represents a more feasible approach. It acknowledges the likelihood of some development in rural areas, while focusing the majority of growth (i.e., significantly more than past trends) into PFAs, where investments in sewer and stormwater management infrastructure are more cost-effective and can help to minimize impacts on the County's waters.

9.5.4 Growth Tiers

The Sustainable Growth & Agricultural Preservation Act of 2012 (i.e., the septic law) limits the spread of septic systems on large-lot residential development to reduce the last unchecked major source of nitrogen pollution into Chesapeake Bay and other waterways. By mapping future growth in "tiers," the law seeks greater accountability and predictability. "The goal of the law is to limit the disproportionate impacts of large subdivisions on septic systems on our farm and forest land, streams, rivers and Chesapeake and Coastal Bays."



Growth Tiers. Source: Maryland Department of Planning.

Growth Tiers in Somerset County meet one of the following criteria:

1. **Tier I:** Areas already served by public sewerage systems and mapped as a locally designated growth area or is a municipality that is a Priority Funding Area served by public sewerage systems. In Tier I, a residential subdivision plat may not be approved unless all lots are to be served by public sewer.

2. **Tier II:** Areas proposed to be served by public sewerage systems or mapped as locally designated growth areas.
3. **Tier III:** Areas planned and zoned for large lot or rural development. They are not planned for sewerage service and are not dominated by agricultural or forest land. They are also not planned or zoned for land, agricultural, or resource protection, preservation, or conservation.
4. **Tier IV:** Areas not planned for sewerage service and which are planned or zoned for land, agricultural, or resource protection, preservation or conservation; areas dominated by agricultural lands, forest lands or other natural areas; Rural Legacy Areas, Priority Preservation Areas or areas subject to covenants, restrictions, conditions or conservation easements for the benefit of, or held by a state agency or a local jurisdiction for the purpose of conserving natural resources or agricultural land.

The locations of Growth Tiers were considered during the analysis and selection of proposed water and sewer extension areas. Growth Tier mapping for Somerset County is available here.

9.6 Proposed Water and Sewer Extension Areas & Land Use

9.6.1 Relationship to Local Land Use Goals

In 2009, the Senate Bill 276 (i.e., SB 276/HB 295) was signed into law. The law amended Article 66B, and established a statewide goal for increasing the amount of development within PFAs and decreasing development outside of PFAs. As part of this law, jurisdictions must also establish local land use goals that increase development inside of PFAs. Each of the three scenarios evaluated in this Element would impact Somerset County's ability to address these state and local goals. Any growth scenario must also consider the amount of public land in Somerset County. Public lands are discussed and mapped in the County's LPPRP; these lands are mostly comprised of forest and agriculture, such as protected agricultural land. The LPPRP recommends an agricultural land preservation goal of 25,000 acres – the County currently has over 14,000 acres. Chapter 10 Land Use maps these public lands.

Future growth scenarios considered within this element include the Trends Scenario, PFA Scenario, and the Hybrid Scenario; these scenarios are defined in Section 9.1.3 Future Development Scenarios. The Trend Scenario would continue existing development patterns, in which approximately half of all new development would occur outside of the PFAs. The PFA Scenario would significantly increase the amount of development within the PFA. The Hybrid Scenario would act as a compromise between the Trends and PFA Scenarios and would direct about 75% of new development to the PFAs while the remaining development would be outside the PFA. Compared to the Trend Scenario, the Hybrid Scenario directs significantly more development within the PFA, which supports both State and local goals.

Therefore, it is recommended that the Hybrid Scenario be utilized to achieve the future land use recommendations and strategies included in this Comprehensive Plan.

9.6.2 Evaluation of Proposed Water and Sewer Extensions

During the Comprehensive Plan Update, the Technical Committee reviewed four existing water and sewer service areas as included in the (draft) Water & Sewer Master Plan; these areas are included in this chapter on Figures 9-1 through 9-6. Service areas included: Greater Crisfield, Greater Princess Anne, Fairmount, and Westover. These maps include areas of present water service, sewer service, or both water and sewer service.

In addition to present service areas, proposed water and/or sewer extension areas were mapped based upon recommendations within the draft W&S Plan (provided April 29, 2024). These proposed areas are depicted in Figures 9-9 through 9-12, at the end of this section. Supplementary mapping was provided to TC members for this mapping exercise, including current and proposed extension areas mapped alongside:

- PFA Areas
- Growth Areas
- Special Flood Hazard Areas
- Development Density
- Critical Areas
- Wetlands
- Sea Level Rise
- Existing Land Use
- Zoning

The goal of this review was to identify locations in the County where additional water and/or sewer service might be needed due to planned future growth and development. While reviewing current and proposed water and/or sewer extension service, the following questions were considered for each service area:

1. Do you agree with the proposed water and/or sewer extension areas?
2. If not, what are your suggestions?
3. Do you see other connections or areas for water and/or sewer expansion, if any?
4. What are your thoughts on future growth in these areas?

Key findings by Technical Committee members were included below for each of the four mapped and reviewed service areas. Areas the Technical Committee have recommended for water and/or sewer service extension are numbered 1 through 8 (bolded in the text and shown on Figures 9-9 through 9-12 beginning on page 9-39).

Greater Crisfield Service Area

Water and/or sewer service expansion into the Greater Crisfield area would be primarily driven by the City's desire to expand through annexation. There are some developments in this area which are experiencing septic failure, combined with an aging population, which might incentivize the need for expanding these services in the future to these areas, as identified below. As shown on Tables 9-3 and 9-7, the Crisfield service area has sufficient public water and public sewer capacity for future growth, respectively. In terms of Growth Areas, the proposed water extension area (i.e., #1) is primarily within growth Tier 2, which are areas proposed to be served by public sewerage or mapped as locally designated growth areas.

Findings from the analysis of the Greater Crisfield service area include:

- **Proposed Extension Area #1 (Figure 9-9)**: Extend water service to areas north of MD 413, extending to Daughterytown Road and properties along the Jones Creek Area.
    a. Expand PFA along MD 413 up to Marion Station, and Enterprise Zone to Holland Crossing Road
        i. Expand Water and Sewer Service into this area as well.
    b. Failing septic system issue has been identified by the Health Department in the Annemessex Ridge and Hearts Ease areas. Existing lot sizes are ¼ acres or less.

Greater Princess Anne Service Area

Future water and/or sewer service areas in the Greater Princess Anne area will ideally be adjacent to existing development which already follows major transportation corridors as identified in Chapter 7 of this plan. As

shown on Tables 9-3 and 9-7, the Princess Anne service area has sufficient public water and public sewer capacity for future growth, respectively. In terms of Growth Areas, the mapped proposed sewer extension area (i.e., #2) is primarily within growth Tier 3 and 4. These tiers are associated with large lot growth that is not planned for future sewerage. Expansion into proposed sewer extension area #2 would require changes to these growth tiers.

Findings from the analysis of the Greater Princess Anne service area include:

- Proposed Extension Area: Extend sewer service to the south side of MD-363, from Brownstone Road to Goose Creek.
    a. This proposed extension area is not feasible due to current zoning, lack of demand, and critical area. Chapter 8 Sensitive Areas identifies sensitive areas in this proposed region and Chapter 10 identifies existing land use.
- **Alternate Extension Area #2 (Figure 9-10)**: Extend sewer service along U.S. Route 13 from existing service area near Old Princess Anne Road to West Pocomoke.
    a. Chapter 4 Economic Vitality and Chapter 7 Transportation both recommend future development, thus water and/or sewer extension, primarily remain along the County's main transportation corridors.

Fairmount Service Area

Generally, this area is not ideal for future water or sewer extensions within the planning horizon of this comprehensive plan due to the presence of sensitive areas and the lack of interest in development. However, extending services to the proposed areas would fill existing "doughnut holes" within the service area. As shown on Tables 9-3 and 9-7, the Fairmount service area has sufficient public water and public sewer capacity for future growth, respectively. In terms of Growth Areas, the mapped proposed water extension area (i.e., #3) is primarily within growth Tier 2, which makes it suitable to receive both water and sewer service.

Findings from the analysis of the Fairmount service area include:

- Proposed Extension Area: Extend water service to the Landonville Road Area.
    a. This area is less suitable for extension due to existing sensitive areas, such as wetlands, the SFHA, and critical areas. The lack of demand for development in this area also makes it less suitable.
- **Proposed Extension Area #3 (Figure 9-11):** Extend water service to the Upper Hill Road area.
    a. Agricultural land could be developed if demand increases in the area. The area is also less impacted by sensitive areas than Landonville Road Area.

Westover Service Area

The Westover area is ideal for expansion of water service, as it includes major transportation corridors and much of the proposed extension area is currently zoned industrial. Findings indicate that the service areas should generally be expanded to the east and south, as described in more detail below. As shown on Tables 9-3 and 9-7, the Westover service area has sufficient public water and public sewer capacity for future growth, respectively. In terms of Growth Areas, the mapped proposed extension areas are within the following growth tiers:

- Proposed Water and Sewer Service Extension #4 – Tier 4

- Proposed Water Service Extension #5 – Tier 1 & Tier 2
- Proposed Water Service Extension #6 – Tier 1
- Proposed Water Service Extension #7 – Tier 1
- Proposed Water Service Extension #8 – Tier 4

The growth tier corresponding with proposed water and sewer service extension #4 would need to be modified to accommodate the proposed extension.

Findings from the analysis of the Westover service area include:

- Proposed Extension Area: Proposed sewer extension in the area south of ECI.
    a. Not recommended due to the area being State owned and due to Resource Conservation Area status.
    b. Proposed Extension Area: Water extension to the Somerset County landfill area.
        i. This area is not recommended for expansion by the technical committee.
- **Alternate Extension Area #4 (Figure 9-12):** Area North of Revells Neck Road next to ECI is County-owned and needs water and sewer service.
    a. Intensely Developed Area
    b. Proposed future industrial park
- **Proposed Extension Area #5 (Figure 9-12):** Extend water service to the areas along U.S. 13 to connect Westover to Princess Anne.
    a. This area is recommended for extension and should include more areas to the east and south of the proposed area (to follow the industrial zoning line), along Old Princess Anne Road.
- **Proposed Extension Area #6 (Figure 9-12):** Water main extension to the County Complex on Route 413.
    a. This extension would fill a need and a "doughnut" hole in service.
- **Additional Proposed Extension Area #7 (Figure 9-12):** The County-owned Park and Rec Field (Somerset County Recreation and Parks) needs water service and presently has sewer service. The park location encompasses the triangular area between Sam Barnes Road, Route 13, and Route 413.
- **Additional Proposed Extension Area #8 (Figure 9-12):** Expand water service to the Tawes Campus Drive area to include the Sheriff's Office, JM Tawes Career and Technical School, Somerset Intermediate School, and Somerset County Technical High School.

Conclusion

The Hybrid Scenario as described in this chapter acknowledges the likelihood of some development in rural areas, while focusing the majority of growth (significantly more than past trends) into PFAs, where investments in sewer and stormwater management infrastructure are more cost-effective and can help to minimize impacts on the County's water resources and sensitive areas.

With this in mind, all of the proposed extension areas, including those outside of the PFA, were selected with the intention of avoiding environmentally sensitive areas, hazard prone areas, areas with known stormwater management issues, as well as geographic locations with identified septic failures. The Technical Committee's recommendations focus on balancing growth needs, infrastructure capacity, and environmental considerations. Strategic extension of water and sewer services is essential for sustainable development in Somerset County. The Hybrid Scenario is still the best future growth option based on the Technical Committee's recommendations.

Findings from the evaluation of proposed water and sewer extensions will be utilized for recommendations for future development made in Chapter 10 Land Use.

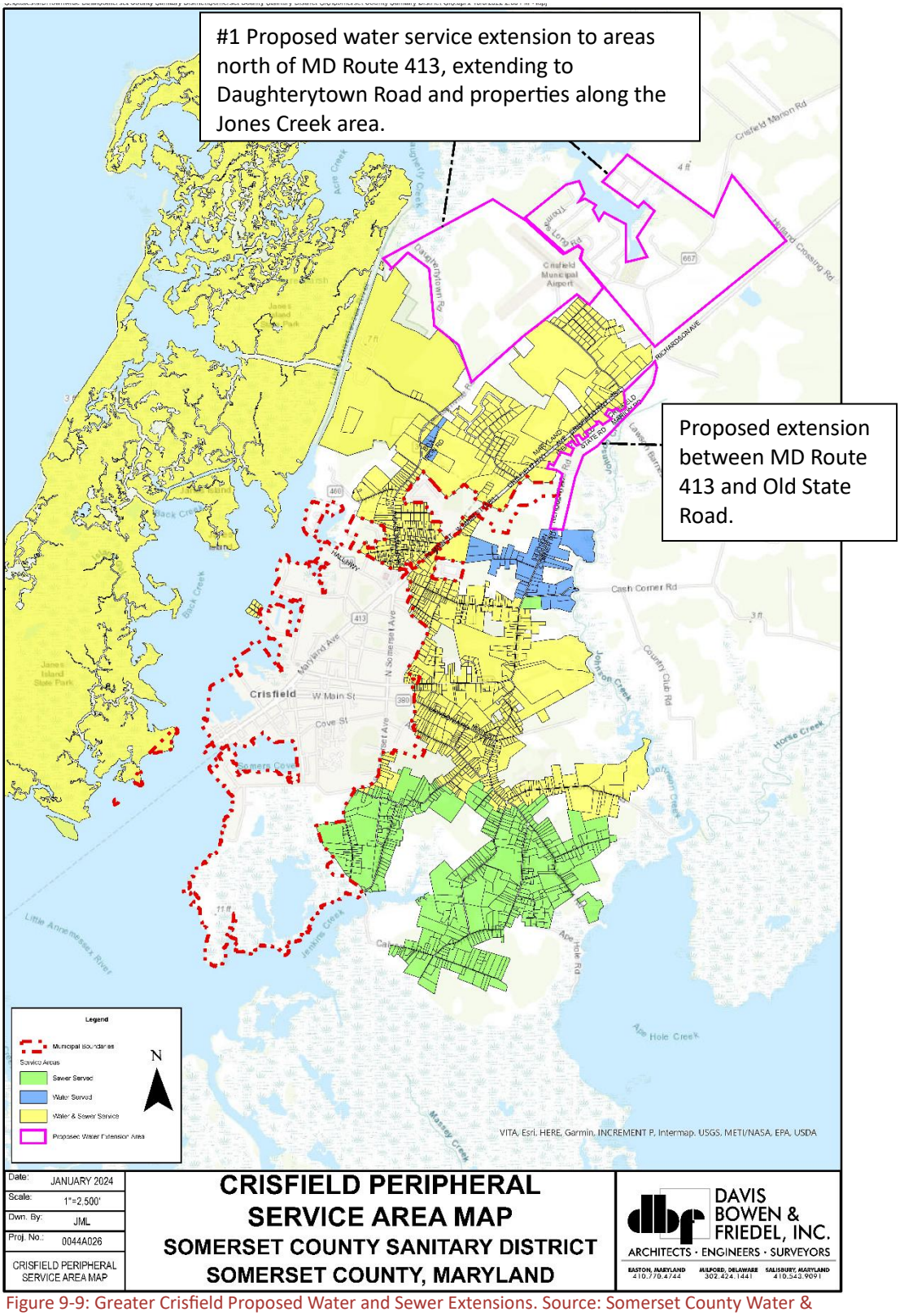


Figure 9-9: Greater Crisfield Proposed Water and Sewer Extensions. Source: Somerset County Water & Sewer Master Plan, 2024 & Somerset County Comprehensive Plan Technical Committee.

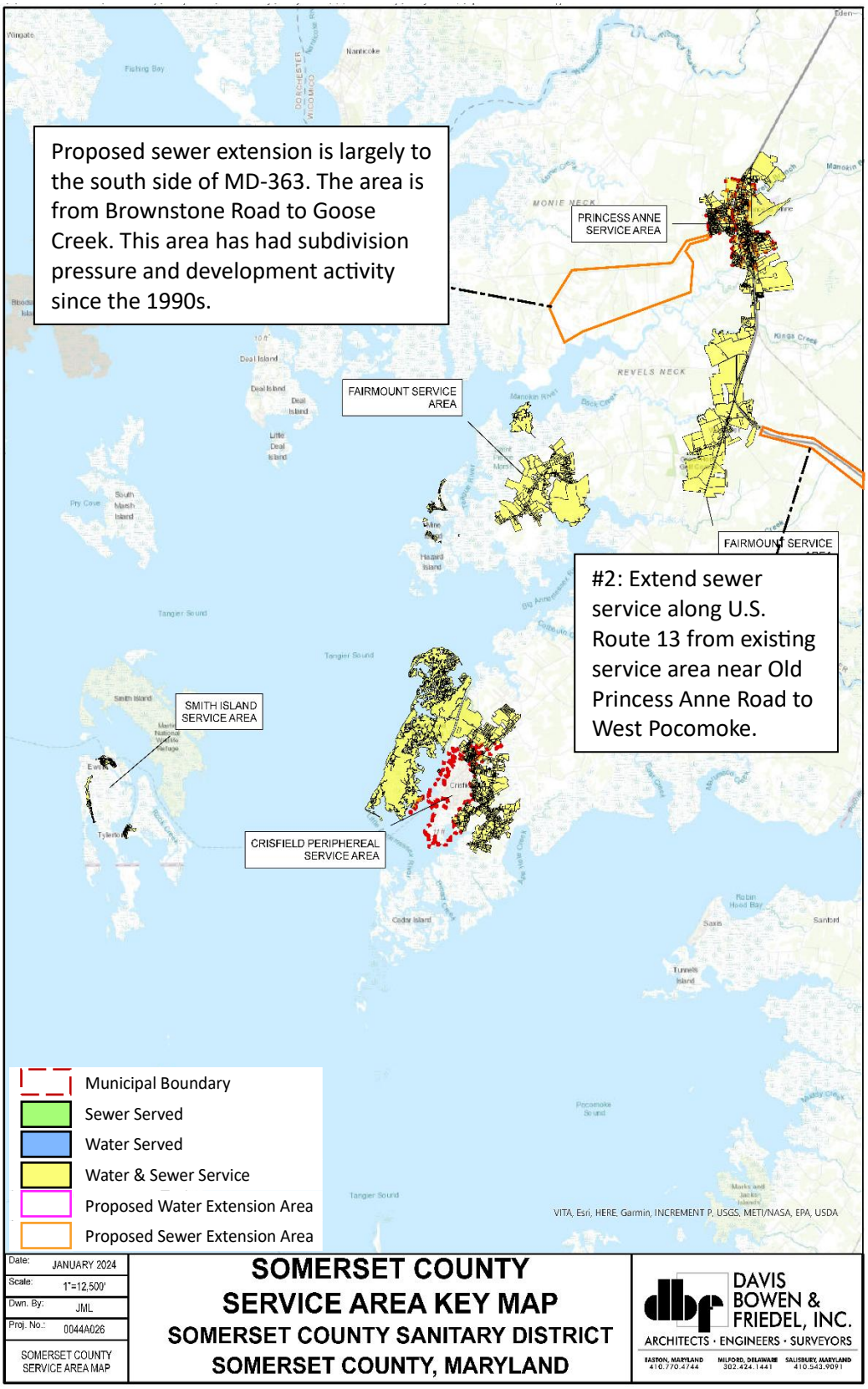


Figure 9-10: Greater Princess Anne Proposed Water and Sewer Extensions. Source: Somerset County Water & Sewer Master Plan, 2024 & Somerset County Comprehensive Plan Technical Committee.

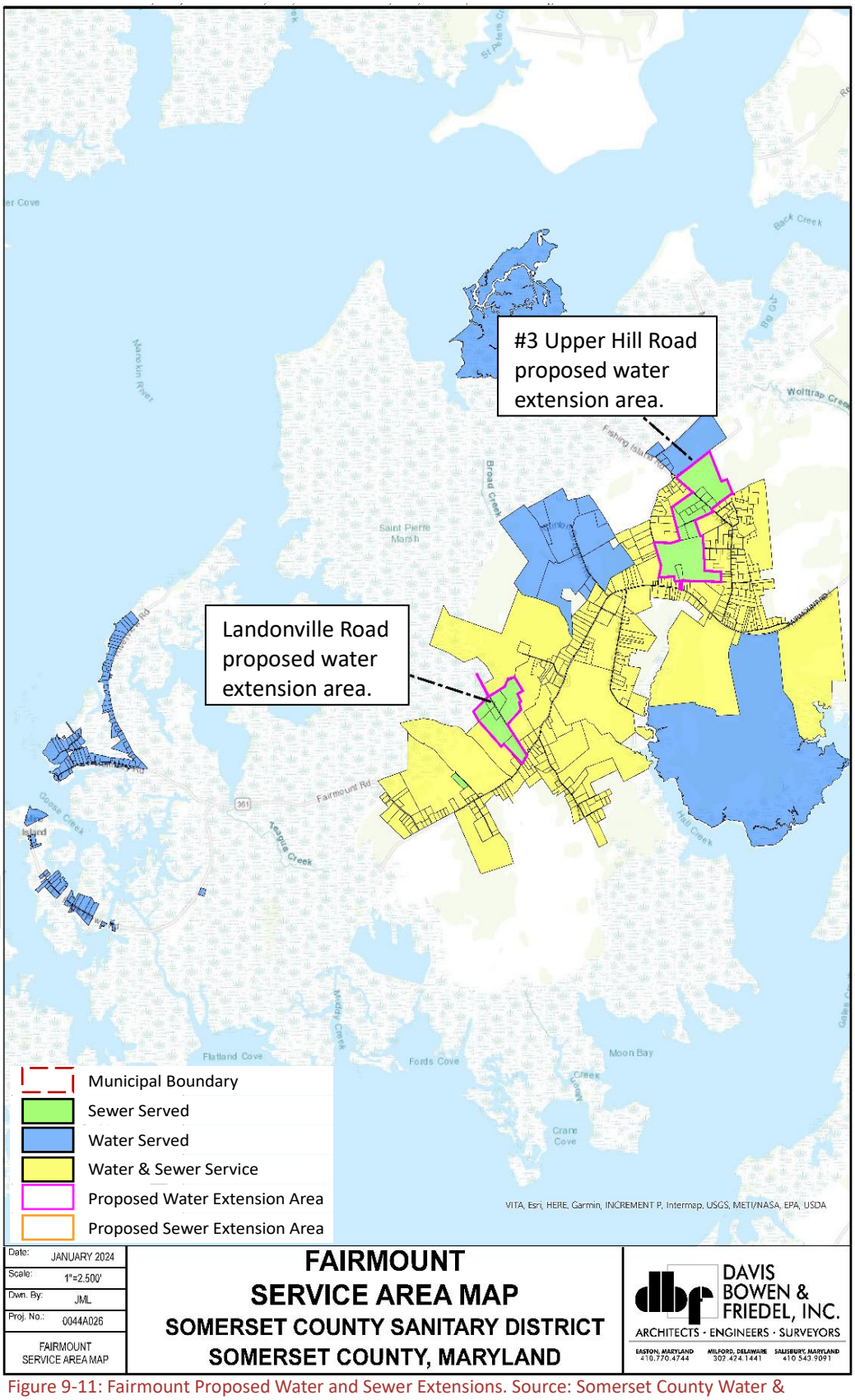


Figure 9-11: Fairmount Proposed Water and Sewer Extensions. Source: Somerset County Water & Sewer Master Plan, 2024 & Somerset County Comprehensive Plan Technical Committee.

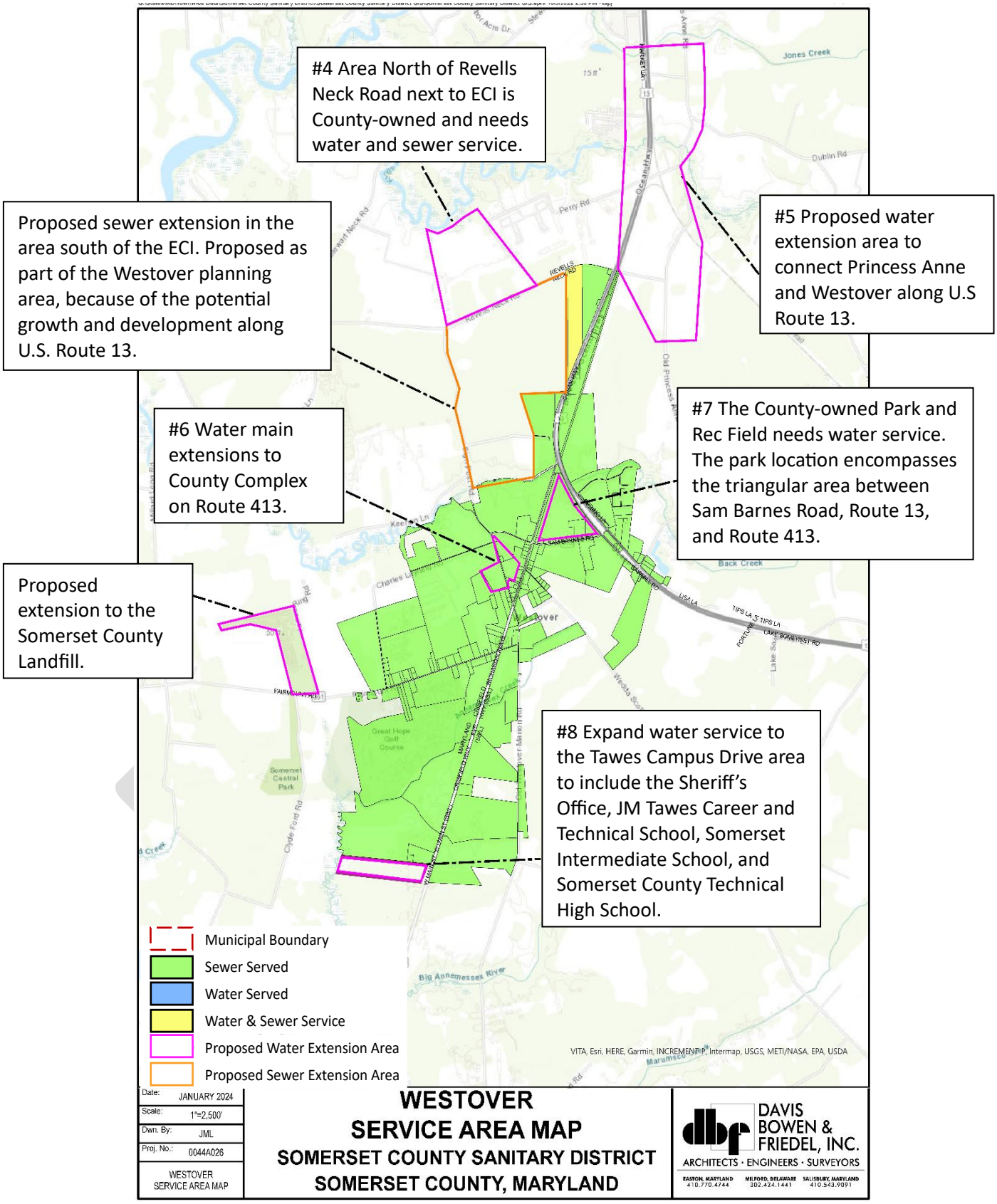


Figure 9-12: Westover Proposed Water and Sewer Extensions. Source: Somerset County Water & Sewer Master Plan, 2024 & Somerset County Comprehensive Plan Technical Committee.

9.7 Future Conditions

9.7.1 Climate Change and Flooding

According to the County's Multi-Hazard Mitigation Plan (HMP), climate change will increase the frequency and intensity of storms, thus leading to more issues related to flooding. Flooding creates a host of water quality and management issues, including: well/drinking water contamination, failure of wastewater infrastructure, and increased stormwater.

Areas experiencing nuisance and repetitive 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.

The 2021 Flood Mitigation Plan identifies and describes the risk and vulnerability associated with hurricane storm surge, 1-percent annual chance flood, projected sea level rise, nuisance flooding, and flash flooding. The plan identifies at-risk essential infrastructure for each of these flood hazards as well as repetitive flood roadways within Somerset County by type of flooding. Repetitive flooded roadways are included on Table 2-8: Repetitive Flooded Roadways and indicates if each identified roadway experiences stormwater management issues as a result of repetitive flooding.

The 2022 Multi-Hazard Mitigation Plan identifies additional infrastructure at risk of flooding, including critical and public facilities. A complete listing of these facilities as identified in the County's HMP is available as Appendix B: Essential and Critical & Public Facilities Databases of the HMP. Water resources-related infrastructure assessed in the hazard mitigation plan includes Wastewater Treatment Plants (WWTP), pumping stations, and well houses. The full list of impacted infrastructure begins on page 4-19 of the HMP, Table 4-9: Critical & Public Facilities At-Risk to the 1-Percent-Annual-Chance Flood. County infrastructure identified as at-risk to the 1-percent annual chance flood includes 3 WWTPs, 3 pumping stations, and 4 well houses.

9.7.2 Floodplain Management and Comprehensive Flood Control

Floodplain Management Capabilities

The County regulates development within the floodplain in an attempt to minimize future flood losses via its Floodplain Management Ordinance, Subdivision Regulations, and Building Codes. Somerset County's Floodplain Management Ordinance (Ordinance 1193) was last updated and adopted on December 19, 2023. Ordinance 1193 establishes a flood protection elevation of base flood elevation (BFE) plus one foot.

The County also participates in the Chesapeake Bay Critical Area Program, 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.

Regarding shoreline erosion, Somerset County utilizes the State Critical Area Law and has adopted a Local Critical Area Program which provides for a 100-foot Buffer from the shoreline. This Buffer is measured 100 feet 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 Critical Area Program also

requires the first 100-300 feet from tidal wetlands be managed to protect aquatic and shoreline environments from man-made disturbances. Finally, the program requires that existing vegetation be protected, and planting of un-vegetated areas is strongly encouraged.

The local program explains the requirements and protection measures in place and provides Critical Area Maps that visually show the boundaries, 100-foot buffer, land classifications, resources and other resource information and portions of the Subdivision Regulations and Zoning Ordinance that implement the Critical Area requirements. Additional portions of the Critical Area Legislation include Water-Dependent Facilities Program, Shore Erosion Protection Program, Forest and Developed Woodland Program, and Buffer Protection Program. The County Planning and Zoning Office's Department of Technical and Community Services provides printed brochures and information on the 100-foot buffer and tree plantings. Maps may also be reviewed with local planning staff.

Furthermore, the County participates in the National Flood Insurance Program (NFIP) to allow property owners to purchase insurance through this federally sponsored program. As of June 2024, Somerset County has earned a Class 7 Community Rating System (CRS) rating, which means homeowners receive a 15% discount on their national flood insurance premiums. The CRS rating is earned through participating in one of four types of activities: public information outreach, mapping and regulations, flood damage reduction, and warning and response.

9.7.3 Additional Local Planning Efforts

The County has taken the effort to identify and map areas of known and repetitive flood issues in an effort to mitigate and control flooding. The Hazard Mitigation Plan, Flood Mitigation Plan, and Nuisance Flooding Plan have mapped areas of flood risk and identified critical infrastructure that are at-risk and vulnerable to flooding. Combined, these plans provide a comprehensive view of flooding issues in Somerset County.

Dam Failure and Flooding

In the most recent HMP update, an assessment of dam failure and associated impacts was completed. Dam failure can most commonly be caused by overtopping (associated with flooding), foundation defects, cracking, inadequate maintenance and upkeep, and pumping. According to the Association of State Dam Safety Officials (ASDSO), flooding was the number one driver of dam failure incidents between 2010 and 2019 by a very large margin (according to the ASDSO Dam Incident Database – this is not an all-inclusive list of dam incidents). Dam failure risk is measured by potential by hazard potential and based on information from the HMP, the County has no major or high hazard potential dams (HHPD) or levees. One low hazard potential dam exists in northern Somerset County, very near the border of Wicomico County – Allen Town Pond. Therefore, unlike repetitive flooding caused by nuisance flooding and sometimes made worse by stormwater management issues, the County is not very likely to be impacted negatively by flooding associated with dam failure.

Repetitive Loss Properties

Additionally, repetitive loss properties and repetitive loss areas were included in the HMP Update. According to FEMA, repetitive loss and severe repetitive loss properties meets the following criteria:

Repetitive Loss:

- 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.

Severe Repetitive Loss:

- 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 County has 61 repetitive loss properties and 2 severe repetitive loss properties; the vast majority of these properties (i.e., 59) are residential. The plan also identifies repetitive loss areas, which are locations with a higher concentration of repetitive loss properties compared to others. Properties and water resources infrastructure located in these areas might be more at risk to the negative impacts of flooding worsened by climate change, including more frequent and intense flooding. Repetitive loss areas include the following:

- Crisfield Surrounding Area – North (7 properties)
- Crisfield Surrounding Area – South (17 properties)
- Deal Island, Chance, Dames Quarter (11 properties)
- Oriole, Champ (8 properties)
- Frenchtown-Rumbly, Fairmount (4 properties)
- Mount Vernon (2 properties)
- Pocomoke River (1 property)
- Smith Island (6 properties)

Note: Due to the sensitive nature of the data, the RLP listing and RLP areas mapping are not available to the public. These locations are available to the County as an appendix labeled Official Use Only.

Proposed Strategies to Protect Water Resources

Finally, in addition to identifying and mapping known hazard areas, these plans include strategies to lessen risk and vulnerability to flooding in the face of future climate change. Strategies identified within these plans that are related to protecting water resources include the following:

Strategies From the Hazard Mitigation Plan

- Project A: Maintain Current FEMA CRS Rating
- Project F: Mitigation of Repetitive Roadway Flooding
- Project I: Essential Facility Flood Mitigation
- Project J: Repetitive Loss Outreach
- Project K: Somerset County Water and Sewer Plan Update
- Project V: Fuel Oil and Propane Tank Maintenance Education
- Project Z1: Protect Wells from Contamination by Flooding

Note: Detailed project sheets are available for review in Chapter 18: Mitigation Strategies of the HMP Update beginning on page 18-8.

Strategies From the Flood Mitigation Plan

- Project 3: High Priority Flood-Prone Land Acquisition
- Project 7: Repetitive Roadways Impacting Essential Facilities Ingress/Egress
- Project 10: Stormwater Vulnerability Assessment and Green Infrastructure Identification

Note: Detailed project sheets are available for review in Section 4: Flood Mitigation Action Plan of the Flood Mitigation Plan, beginning on page 4-1.

Goal 9.1

Integrate 2025 Somerset County Comprehensive Plan into the Master Water and Sewer Plan

Strategies

A. Integrate, projections and proposed conditions in this plan, including designated growth areas, priority preservation areas, future land use and the Future Land Use Map Plan, at a minimum, into the updated Master Water and Sewer Plan.

Goal 9.2

Assess water supply comprehensively from both a county and regional perspective.

Strategies

A. Conduct comprehensive study of water-bearing formations used by Somerset County. *Note- Water Balance Methodology recommended by Models and Guidelines #26 (the state's official guidance for preparation of the Water Resources Element) is not applicable for the Coastal Plain.*
B. Support the development of broader regional water policies to protect water resources, particularly those that relate to groundwater appropriations and protection of aquifer recharge areas.
C. Establish watershed or wellhead protection strategies for water supply sources.

Goal 9.3

Enhance water conservation efforts and address capacity concerns.

Strategies

A. Work with MDE to determine whether additional withdrawals to support the Smith Island water systems (which rely on the heavily used Patapsco aquifer) and have adequate capacity to support potential growth.
B. Continue to manage water supplies using the water supply allocation system (i.e., 80%/20% Capacity Rule) to manage groundwater resources. Review and integrate 2016 Coastal Plain Aquifer Study to shape water use policies and ordinances—particularly those that relate to groundwater appropriations and protection of aquifer recharge areas.
C. Develop an official water conservation program to formalize the current conservation policies.
D. Partner with UMES and municipalities to investigate opportunities to develop a public information campaign on water conservation.
E. Coordinate with UMES to broaden the Natural Sciences Program to include Water Resources curriculum at the college.

Goal 9.4

Enhance water quality using best practices and adaptive measures.

Strategies

A. Continue to address water quality issues identified in *Table 9-2, Public Drinking Water System Characteristics*, including Fluoride, Disinfection, Iron, and Total Dissolved Solids (TDS).
B. Continue to implement existing regulations that limit saltwater contamination of freshwater supplies by ensuring that wells do not become a conduit for saltwater.
C. Continue to encourage community buy-in for establishing forested buffers where none exist.
D. Continue compliance with state and federal requirements with respect to permitting and reaching nitrogen reduction standards (use of Enhanced Nutrient Reduction (ENR) technologies) for the purpose of contributing to maintaining acceptable levels of water quality.

Goal 9.5

Assess and meet, to the extent feasible, the existing and future needs of public and private wastewater facilities.

Strategies

A. Address Crisfield Sewer System have infiltration/inflow (I/I) problems which, if minimized, would reduce the hydraulic flows to these wastewater treatment plants and make more capacity available.
B. Address Princess Anne Sewer System have infiltration/inflow (I/I) problems which, if minimized, would reduce the hydraulic flows to these wastewater treatment plants and make more capacity available.
C. Prioritize areas for connection to public sewer systems following completion of projects that address infiltration/inflow (I/I) problems, both Princess Anne and Crisfield sewer systems.
D. Extend public sewer service to address failing septic systems in the Annemessex Ridge Area, north of Crisfield Municipal Airport.
E. Continue to work closely with the Town of Princess Anne and the City of Crisfield in the review of existing and future growth areas, in relation to growth tiers under Title 1, Subtitle 5 of the Land Use Article of the Annotated Code of Maryland.
F. Use of innovative methods including Best Available Technology (BAT) for on-site treatment and disposal of wastewater to address public health concerns by reducing nitrogen discharge levels.

Goal 9.6

Provide adequate treatment for the quality, volume, and rate of stormwater runoff.

Strategies

A. Focus future development within Priority Funding Areas and continue to implement Tributary Strategy BMPs to further reduce total nutrient loads to the Chesapeake Bay and its tributaries.
B. Continue to implement and update as needed the County's stormwater management practices and procedures and Environmental Sensitive Design Manual practices and procedures.
C. Update 2012 Watershed Implementation Plan (WIP), dependent on increasing development in the future.
D. Utilize open space and land preservation programs to provide water protection measures.
E. Partner with regional localities, non-governmental organizations, and others to target high value restoration opportunities and increase implementation efficiency.
F. Use information technology to strategically locate and install restoration projects that maximize results of the County's stormwater management efforts.
G. Identify locations where stormwater retrofits could address concentrations of nonpoint source pollution ("hot spots"), or where retrofits can help to protect environmentally sensitive areas.