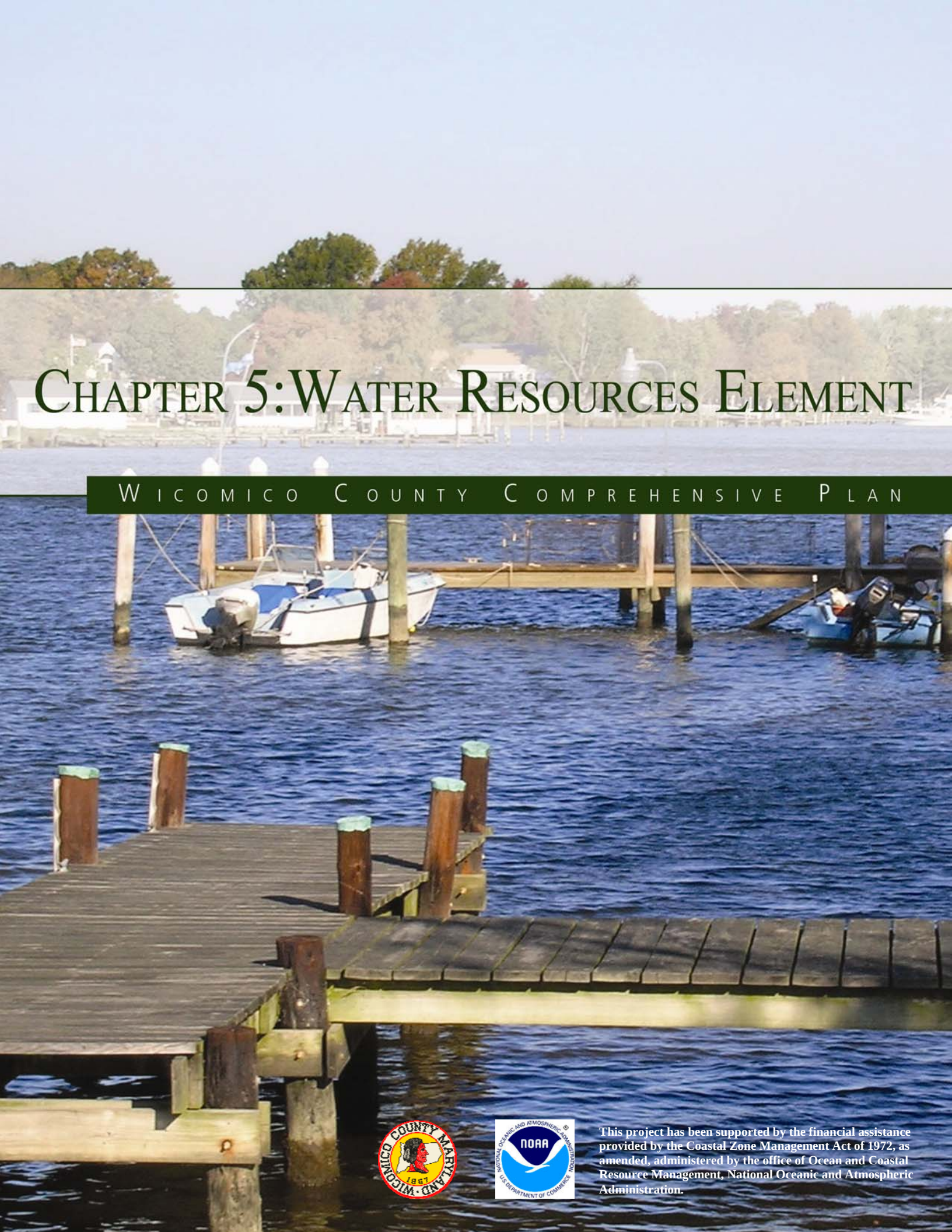
Chapter 5: Water Resources Element

Wicomico County Comprehensive Plan



This project has been supported by the financial assistance provided by the Coastal Zone Management Act of 1972, as amended, administered by the office of Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration.

WICOMICO COUNTY EXECUTIVE
Richard M. Pollitt, Jr.

WICOMICO COUNTY COUNCIL
John T. Cannon, (AL), President
William R. McCain, (AL), Vice President
Sheree Sample-Hughes, District 1
Stevie Prettyman, District 2
Gail M. Bartkovich, District 3
David MacLeod, District 4
Joe Holloway, District 5
Matthew E. Creamer, Administrative Director

SALISBURY-WICOMICO COUNTY PLANNING COMMISSION
Corinne Les Callette - Chair
Donald B. Bounds - Vice Chairman
Elder Glen Robinson
James W. Magill
Scott Rogers

City Council Representative - Gary A. Comegys
County Council Representative - Gail M. Bartkovich

SALISBURY-WICOMICO COUNTY DEPARTMENT OF PLANNING, ZONING, AND COMMUNITY DEVELOPMENT STAFF
John F. Lenox, Director
Lori A. Carter, Deputy Director

Keith D. Hall, Long-Range Planner
Gary R. Pusey, Long-Range/Transportation Planner
V. Frank McKenzie, Technical Services Coordinator
Gloria J. Smith, Planner
Pate Matthews, Code Enforcement Officer
Clark P. Meadows, Zoning Administrator
Robin Ayele, Community Development Planner
Greg Robinson, Nuisance Inspector
Artie Sharp, Planner
Dave Church, Planner
Melinda Lewis, Secretary
Ola K. Meadowcroft, Secretary
Beverly Tull, Secretary

WICOMICO COUNTY WATER RESOURCES ELEMENT
TABLE OF CONTENTS

Introduction **4**
Purpose 4
Coordination with Municipalities and Surrounding Counties 4
Watersheds 5
Citizen Concerns 6
Goals 6
Objectives 6
Drinking Water Assessment **7**
Aquifers 7
Manokin Aquifer 8
Salisbury Aquifer and the Paleochannel 8
Nanticoke Aquifer 9
Public Water Systems 9
Nanticoke River Watershed 9
Salisbury Water System 9
Wicomico River Head Watershed 9
Fruitland Water System 10
Upper Pocomoke River Watershed 10
Private Water Systems 13
Commercial and Industrial Uses 13
Agricultural Use 13
Wastewater Assessment **14**
Existing Conditions 14
Nanticoke River Watershed 15
Wicomico River Head Watershed 15
Lower Wicomico River Watershed 15
Upper Pocomoke River Watershed 15
Private Sewer Systems 18
Assimilative Capacity 19
Total Maximum Daily Loads 19
Point Source Caps 20
Tier II Waters 21
Non-Point Source Assessment **22**
Introduction 22
Non-Point Source Loadings 22
Stormwater Management Issues 26
Stormwater Management Ordinance 26
Analysis of Water Resource Issues **26**
Potential Changes to Land Use 27
Water Quality 27
Capital Improvements 28
Nutrient Trading 28
Saltwater Intrusion 28
Jurisdictional Issues 28
Policies **29**
Implementation Strategies **29**
Tributary Strategies **30**

WICOMICO COUNTY WATER RESOURCES ELEMENT
TABLE OF CONTENTS

Tables and Figures

Table 5 – 1 Municipal Water Systems 11
Table 5 – 2 Municipal Water Supply Systems – Population Served 12
Table 5 – 3 Private Wells in 2010 13
Table 5 – 4 2009 Agricultural Water Use 14
Table 5 – 5 Municipal Wastewater Treatment Systems in the County 16
Table 5 – 6 Municipal Wastewater Treatment Systems, Planned Capacity and Projected Sewer Demands 17
Table 5 – 7 Privately Owned and Operated Sewer Systems 18
Table 5 – 8 Private Septic Systems 19
Table 5 – 9 Water Bodies with TMDLs 20
Table 5 – 10 Point Source Analysis – Municipal WWTPs 21
Table 5 – 11 Growth Scenarios 22
Table 5 – 12 Growth Scenario: Household Distribution by Watershed (2030) 23
Table 5 – 13 Impervious Surfaces 23
Table 5 – 14 Wicomico County Non-Point Source Loading by Watershed (2030) 25
Table 5 – 15 Total Combined Nutrients Loads by Watershed (2030) 27

Chapter 5

Introduction

Purpose

The purpose of the Water Resources Element (WRE) is to ensure that future development plans in Wicomico County account for the opportunities and limitations of local water resources. This Plan Element evaluates new growth envisioned in the Comprehensive Plan and compares the pattern and pace of that growth to the availability of water supply sources, the capacity of water supply and sewage treatment infrastructure and the ability of surface waters to receive the waste generated by both point and non-point sources. The analysis of trends and the build-out analysis used in this effort were based on policies, land use distributions and development pattern information contained in the 1998 Wicomico County Comprehensive Plan, 2010 Draft Wicomico County Comprehensive Plan, Development Capacity Analysis prepared by the Maryland Department of Planning and the 2008 Wicomico County Subdivision Activity Report (1986 – 2008). This Element will serve to enhance protection of State water resources and public health while meeting State smart growth policies.

This Element has two functions:

- to identify potential constraints on supply, infrastructure, or receiving waters early in the planning process; and
- to identify options for addressing any constraints including a land use plan, which minimizes negative impacts on water resources.

Article 66B of the Annotated Code of Maryland requires that the County Comprehensive Plan include a Water Resources Element. This Element fully satisfies the requirements of Article 66B. Future amendments to the Comprehensive Plan will also be done in full compliance with the law.

As required, this element contains rudimentary analyses of Point-Source and Non-Point Source nutrient contributions. It is important to note, the watershed based analyses included in this section are not representative of engineering-grade studies or site specific investigations. The results should only be used to obtain a better understanding of the overall relative, not absolute, impacts of various future growth and land use scenarios on a County-wide basis, as well as the relative change in the volume of nutrient contributions from public waste water systems. In addition, the above mentioned analyses are at an appropriate level to assist in developing a County-wide land use plan, which minimizes the impacts associated with future population growth and development. As technological advances in public waste water treatment and individual septic systems continue, it can be anticipated that future nutrient loadings will decrease.

Coordination with Municipalities and Surrounding Counties

Any discussion of water resources should recognize that growth and development is planned for and regulated by different levels of government. Planned growth and development impacts water resources that are regional in nature because watersheds cross jurisdictional boundaries. The aquifers that are the source of private and public water supplies can be affected by local actions, but also receive water from areas far from Wicomico County.

There are seven municipalities within Wicomico County that own and operate public water supply and sewer systems including:

- Salisbury
- Delmar
- Fruitland
- Hebron
- Pittsville
- Willards
- Sharptown

The capacity and extent of those systems will be discussed in the Public Water Systems and Wastewater Assessment sections of this Element. Mardela Springs is the eighth municipality in the County. The residents of Mardela Springs are currently served by private well and septic systems. Wicomico County does not own or operate any water and sewer systems. Some municipal water and sewer services have been extended to County residents who do not reside within existing municipal limits. In those instances services have been provided within Urban Service Districts; however, it is no longer the policy of municipal governments in Wicomico County to extend public services to development in the absence of an annexation agreement.

The eight municipalities and Wicomico County share joint responsibilities of planning for water and sewer systems. The County is responsible for the preparation of a County Comprehensive Water and Sewerage Plan, which delineates planned system capacity and expansions over a 10-year time frame, as well as mapping the proposed service area expansions over the same time period. At the time of this publication, the County is in the final stages of updating the 1990 Wicomico County Comprehensive Water and Sewerage Plan, which includes the mapping of the service areas. Therefore, this element will not contain the service area maps. It is recommended that future amendments or revisions to this WRE include service area maps of Wicomico County in effect at the time of the WRE amendment. Upon completion of the County Comprehensive Water and Sewerage Plan, the document will require approvals by the County and the Maryland Department of the Environment (MDE).

As mandated by House Bill 1141-06, municipalities and counties are to prepare a water resources element for inclusion in their comprehensive plans. The purpose of the municipal water resources elements reflects that of this element in that they must consider the impact of development proposed in their individual comprehensive master plans on water supply availability, on existing and planned public systems, and on the capacity of receiving waters to assimilate any resultant pollutants.

Watersheds

Wicomico County is divided into seven watersheds. The Nanticoke, Wicomico, and Pocomoke Rivers account for five of the seven designated watersheds and the majority of land area in the County, and Nassawango and Dividing Creeks account for the remaining two watersheds. **Map 5-1** shows the watersheds in Wicomico County.

The 33-mile long Nanticoke River flows southwest from the central portion of Delaware through Maryland's Eastern Shore to Tangier Sound, and ultimately reaches the Chesapeake Bay. In the Wicomico County portion of the watershed there are three municipalities: Sharptown, Hebron, and Mardela Springs. The Dorchester County portion of the Nanticoke River watershed includes the municipalities of Vienna, Eldorado and Brookview. No major interjurisdictional water resources issues have been identified in these areas.

The Wicomico River originates near Delmar, Delaware, and flows from the heart of Salisbury to Tangier Sound. Several major tributaries contribute fresh water to the Wicomico River including, but not limited to, Tony Tank Creek, Walston Branch, Schumaker Pond, and Brewington Branch. On its lower portions, the Wicomico River and Wicomico Creek form a border with Somerset County. Limited development is proposed in the Somerset County portion of this watershed and no major interjurisdictional issues have been identified.

The Pocomoke River Basin includes areas of Wicomico, Worcester, and Somerset Counties in Maryland, part of Sussex County in Delaware, and part of Accomack County in Virginia. The Pocomoke River flows through 49 miles of Maryland before it reaches Pocomoke Sound. The largest developed areas on

the river are the Town of Snow Hill and Pocomoke City, which are located downstream from Wicomico County. The Towns of Pittsville and Willards are situated in the Upper Pocomoke River watershed. Limited growth in those communities reduces the downstream impacts on Worcester County.

Citizen Concerns

Through a series of four public meetings held in 2008, citizens of Wicomico County have voiced numerous concerns about water resources. While many issues, such as future growth patterns and community service availabilities are addressed in other chapters of this Plan, specific issues are addressed throughout this Chapter.

These issues include:

- Aquifer water levels;
- Package treatment plants;
- Nutrient problems in water bodies;
- Septic systems;
- Protection of water resources;
- Climate change on water availability; and
- Land uses and large water users.

Goals:

- To coordinate with the County's municipalities to maintain a safe and adequate water supply and sufficient wastewater treatment capacity that meets the demands of the projected growth.
- To determine constraints on growth based on water supply, sewer capacity, stormwater runoff and nutrient pollution.
- To protect, restore, and enhance the water quality of Wicomico County's tidal (i.e. Wicomico, Nanticoke and Pocomoke Rivers) and non-tidal water bodies.
- To advise the Land Use Plan on the pattern of growth that will have the least impact on water resources.

Objectives:

- Ensure a sustainable amount of potable water for the use of current and future residents of Wicomico County.
- Evaluate existing water and sewer infrastructure for maintenance and/or expansion.
- Assess future growth plans in terms of water supply and sewer capacity.
- Determine the future use of septic systems and the use of package treatment plants.
- Encourage advanced stormwater management to reduce erosion and nutrient pollution.
- Assure that the County's stormwater management policies reflect the most recent State requirements.
- Establish a preferred county-wide growth alternative for nutrient reduction.

Drinking Water Assessment

There are no impoundments used for water supply purposes in any of the Wicomico County watersheds. Because Wicomico County and its citizens rely exclusively on groundwater for water supply, much of the drinking water discussion centers upon the aquifer systems that provide all of the water. Currently, the majority of the housing units located in the unincorporated portion of the County utilize private wells, with the exception of those residences that are connected to public water systems through Urban Service agreements or are located in newer subdivisions with privately-owned and operated water treatment plant such as Steeplechase subdivision.

Aquifers

Groundwater is an important source of drinking water throughout Maryland. Most void spaces in rocks beneath the water table contain water, but these spaces only become an aquifer when water bearing rock readily carries water to wells and springs in significant volumes. On Maryland's Eastern Shore, aquifers are the source of both private wells and larger public water supply systems. Unlike the Piedmont and other areas of the Western Shore of Maryland, topography and the slow moving nature of surface streams alleviate the need to construct dams for storing and collecting large volume of water supplies. In addition, the aquifers under the Eastern Shore have a long history of providing high-quality water in substantial volumes.

Based on the estimates of growth as it relates to the future demand of drinking water provided by public water systems and private wells, Wicomico County has adequate water supply for its current and future residents. County-wide, the total water demand including public and private systems for residential, commercial, industrial and agricultural uses is estimated to be 28 MGD. The largest consumer being agriculture, which uses approximately 13.294 MGD as indicated in **Table 5-4**. The majority of the aquifers used for our water supply are relatively shallow, compared to other Maryland counties, allowing for reduced cost of wells. The Coastal Plain aquifer system provides the base flow for virtually all of the streams that originate in the Atlantic Coastal Plain. Groundwater from this aquifer system also discharges in the Chesapeake Bay.

To learn more about the aquifers in this region, the Wicomico County Health Department prepared the Groundwater Protection Report in 2004 in response to State regulations on the installation of private sewage disposal systems (COMAR 26.04.02). This Report is produced as a supplement to the County's Comprehensive Water and Sewerage Plan. The document describes the aquifers in Wicomico County and includes a discussion on the effect of septic systems on the aquifers and provides supplemental information that is incorporated into the County Comprehensive Water and Sewerage Plan, and the Comprehensive Plan, by identifying sewer management areas and solutions for groundwater protection. This Report was an extremely useful resource in the preparation of this element. To assist in future efforts to update the WRE, the County should continue to revise current County reports and plans (i.e. Wicomico County Comprehensive Water and Sewerage Plan and the Groundwater Protection Report) as well as research new reports and plans containing information about the aquifers in this region.

The United States Geological Survey (USGS), in conjunction with the Maryland Geological Survey (MGS) and the MDE, is currently completing a three-phase study of the groundwater resources in the Atlantic Coastal Plain of Maryland. Specifically, the USGS and MGS are in the process of developing a comprehensive regional database of aquifer information as part of Phase One of a three phase study. Phase Two consists of filling in any gaps in existing knowledge and building resource management tools, such as a groundwater flow model, to be finalized by 2012. Phase Three, slated to start in 2010 and to end in 2013, consists of implementation of the previously developed tools to manage and optimize resources. More information on this study can be found on the USGS website in a publication entitled,

"A Science Plan for a Comprehensive Regional Assessment of the Atlantic Coastal Plain Aquifer System in Maryland," http://pubs.usgs.gov/of/2007/1205.

Upon completion, this comprehensive assessment will contain five goals directed at improving the current information and tools used to understand the resource potential of the aquifer system. The goals include:

- Document the geologic and hydrologic characteristics of the aquifer system in the Maryland Coastal Plain and the appropriate area of adjacent states;
- Conduct detailed studies of the regional groundwater flow system and water budget for the aquifer system;
- Improve documentation of patterns of water quality in all Coastal Plain Aquifers, including the distribution of saltwater;
- Enhance groundwater level, stream flow, and water quality monitoring networks in the Maryland Coastal Plain; and
- Develop science-based tools to facilitate sound management of the groundwater resources in the Maryland Coastal Plain.

Manokin Aquifer

The Manokin aquifer is characterized as dark gray, clayey and silty, medium-grained sand mixed locally with fine gravel and shell material. The aquifer is 50 feet below sea level in the western part of the County, however, moving from west to east, the depth of the Manokin increases. For instance, in Willards, the Manokin is 200-feet below sea level. This aquifer is at risk for surficial contamination in the western portion of the County because of its shallow depth below sea level. Well yields from this aquifer are variable, ranging from small to moderate quantities of potable water acquired in different locations. The confining bed has low permeability and silty clay layers that separate the Manokin from the water table.

The main concern for the Manokin aquifer is the amount of potable water available. From May 2007 to August 2007, approximately 120 wells in Somerset and Wicomico Counties had to be replaced, with the overwhelming majority located in the Manokin aquifer. The reason for this occurrence was a draw down in the Somerset County portion of the aquifer, use of two-inch wells, non-submersible pumps and severe drought conditions experienced in recent years. A study has shown water levels in some areas of the aquifer to be dropping by one foot per year, concentrated around Princess Anne. According to the MGS, this draw down is not necessarily occurring in Wicomico County; however, the County should take precautions to protect this resource. Further information can be found in the MGS Bulletin 35 (Werkheiser, W.H., 1990, Hydrogeology and ground-water resources of Somerset County, Maryland).

The Salisbury Aquifer and the Paleochannel

The Salisbury aquifer and the Paleochannel refer generally to the same aquifer, which the USGS refers to as the surficial aquifer. The Paleochannel in north-central Wicomico County is simply a feature within the Salisbury aquifer with a portion extending into the Manokin aquifer.

The majority of the water table is encountered below the surface anywhere from zero to 30 feet deep, while the Paleochannel, specifically, ranges from 100 to 200 feet below the surface. The surficial aquifer is susceptible to surface contamination and should be protected. Though the availability of water is not an issue with the water table, water from the Paleochannel should be protected, as it is the major water source for the region. It is important to note, the entire aquifer receives recharge from precipitation in topographically high areas and supplies many small streams, man-made ponds, wells, and the tidal portion of the Wicomico River with water.

In an effort to preserve and protect the water quality of the Paleochannel, Wicomico County has adopted a Paleochannel Overlay District that protects the buried riverbed from overuse and contamination (**See Map 5-1**). This overlay district largely follows the underlying zoning assigned to a property, but, in addition, has some use restrictions and development standards that must be followed. These measures should protect the water supply from surficial contamination from impaired water discharge/recharge.

Nanticoke Aquifer

This aquifer, also known as the Frederica aquifer, is described as the basal sands in western Wicomico County. The Nanticoke Aquifer is used in a limited area in northwestern and western portions of the County where it is penetrated at about 300-feet below sea level. It consists of about 50-feet of gray, fine to very fine grained sand with abundant shells.

Public Water Systems

There are seven public water systems located in the incorporated entities of Wicomico County (Salisbury, Fruitland, Delmar, Hebron, Sharptown, Willards, and Pittsville). With exception of the Town of Delmar, the analysis of the capacity of the public water systems to meet current and projected demand demonstrates that public water systems either have sufficient facility capacity to meet projected demand or expansions to increase capacity exist to meet the projected demand. It is important to note, a jurisdiction may have a facility capable of accommodating the future demand, but not be permitted to withdraw the water necessary to meet that demand. Actual withdraws of these municipal systems from the public wells must be consistent with the water appropriation permit issued by MDE. **Table 5-1** lists the municipal water systems in the County by watershed and **Table 5-2** represents the planned water capacity and projected water demands through 2030 by municipality. Based on 2010 residential demand estimates contained in **Table 5-2**, public water systems supply approximately 4.33 million gallons of water per day (MGD). In comparison, private water systems supply 4.65 MGD.

The Nanticoke River Watershed

There are two public water systems in the Nanticoke River Watershed: Sharptown and Hebron. Based on Sharptown's population projections contained in their 2009 Comprehensive Plan and the Maryland Department of Planning's municipal population projections for Hebron, both municipalities have facilities that have adequate treatment capacity in place to serve projected demands through 2030. This assessment does not take into account Hebron's pending municipal growth element, which is inconsistent with the County's Comprehensive Land Use Plan.

Salisbury Water System

The City of Salisbury lies in parts of two watersheds: the Wicomico River Head and the Lower Wicomico River Watersheds. The City of Salisbury Water System has two water treatment and pumping facilities that draw water from the Paleochannel and surficial aquifers. At current capacity levels the system has sufficient treatment capacity to provide water for projected demands through 2030.

The newly developed Paleochannel System, along with the older existing system, should be adequate enough for the next 10 years and beyond. If additional capacity is still needed, the Paleochannel System can be expanded in 6.48 MGD intervals, with the accompanying treatment facility additions.

The Wicomico River Head Watershed

In addition to a portion of Salisbury, the Town of Delmar lies within this Watershed. The Town of Delmar is served by a single public water system that draws water from two different aquifers, the Salisbury and the Manokin Aquifer, with one well drawing from each. The Town plans to increase planned capacity as needed to meet the demand for water in 2020 and 2030. Based on current

projections, the Town of Delmar will need to expand its system to a capacity of at least 1.0 MGD by 2030 to meet the projected demand.

Fruitland Water System

The City of Fruitland lies in parts of two watersheds, the Lower Wicomico River and the Wicomico Creek Watersheds. The City owns and operates its water system, which draws water from the Salisbury aquifer. Fruitland has an existing capacity of 1.5 MGD which is well above the projected demand of 0.82 in 2020 and 0.99 in 2030.

The Upper Pocomoke River Watershed

There are two public water systems in the Upper Pocomoke River Watershed: the Towns of Pittsville and Willards. Both municipalities have systems that have adequate treatment capacity in place to serve projected demands through 2030.

TABLE 5-1: MUNICIPAL WATER SYSTEMS

Water System	Source	Treatment Technology	Planned/Potential System Upgrades or Expansions	Water Quality Concerns
Nanticoke River Watershed				
Sharptown	Paleochannel and surficial aquifers and the Nanticoke Aquifer	Chlorination	None	None
Hebron	Nanticoke Aquifer	Chlorination	Hydromatic tank system	None
Wicomico River Head Watershed				
Delmar[1]	Salisbury and Manokin Aquifers	Chlorination and iron	New well to accommodate additional demand	None
Salisbury[2]	Paleochannel and surficial aquifer	Chlorination and iron	Additional elevated water storage, transmission mains and possible expansion of treatment facilities	None
Lower Wicomico River Watershed				
Salisbury[3]	Paleochannel and surficial aquifer	Chlorination	None	None
Fruitland[4]	Pleistocene-Pliocene/Salisbury aquifer	Chlorination and iron	New water tower	None
Wicomico Creek Watershed				
NO PUBLIC SYSTEMS	N/A	N/A	N/A	N/A
Dividing Creek Watershed				
NO PUBLIC SYSTEMS	N/A	N/A	N/A	N/A
Nassawango Creek Watershed				
NO PUBLIC SYSTEMS	N/A	N/A	N/A	N/A
Upper Pocomoke River Watershed				
Pittsville	Manokin aquifer	Chlorination and iron	None	None
Willards	Manokin aquifer	Chlorination and iron	None	Corrosive and high in iron

SOURCE: 2009 *Draft Wicomico County Comprehensive Water and Sewerage Plan*, 2009 *City of Fruitland Comprehensive Plan*, 2009 *Draft Town of Delmar, MD Comprehensive Plan*, 2009 *Draft Town of Willards Comprehensive Plan*, 2007 *Town of Hebron Comprehensive Plan*, 2008 *Town of Sharptown Comprehensive Plan and the* 2004 *Draft Wicomico County Groundwater Protection Report*

Notes:

[1] The Town of Delmar is an incorporated community located partially in Maryland and partially in Delaware. The two (2) wells that provide water to the Town are located in Delaware.

[2] The City of Salisbury is partially located in the Wicomico River Head and the Lower Wicomico River Watersheds. The Naylor Mill Road Water Treatment Plant and its two (2) wells are located in the Wicomico River Head Watershed.

[3] The City of Salisbury is partially located in the Lower Wicomico River and the Wicomico River Head Watersheds. The East Main Street Water Plant and its nine (9) active wells are located within the Lower Wicomico River Watershed.

[4] The City of Fruitland is partially located in the Lower Wicomico River and Wicomico Creek Watersheds. The City Water Treatment Plant and its two (2) wells are located in the Lower Wicomico River Watershed.

TABLE 5-2: MUNICIPAL WATER SUPPLY SYSTEMS – POPULATION SERVED

Service Area			Salisbury	Fruitland	Delmar**	Hebron	Sharptown	Willards	Pittsville
2010	Pop.		28,925	4,950	5,325	975	725	1,110	1,330
	GPCD***	Gals.	100	100	100	100	100	100	100
	Housing Units		11,710	1,930	2,200	370	300	450	550
	Demand*	Residential	2.89	0.50	0.53	0.10	0.07	0.11	0.13
		Com/Ind	4.01	0.17	0.19	0.01	0.01	0.01	0.01
		Total	6.90	0.67	0.72	0.11	0.08	0.12	0.15
	Capacity*	Planned	12.0	1.50	0.72	0.70	0.58	0.24	0.25
2020	Pop.		34,490	6,100	6,235	1,225	800	1,260	1,490
	GPCD***	Gals.	100	100	100	100	100	100	100
	Housing Units		13,965	2,380	2,625	470	335	510	645
	Demand*	Residential	3.45	0.61	0.62	0.12	0.08	0.13	0.15
		Com/Ind	4.21	0.21	0.22	0.01	0.01	0.01	0.01
		Total	7.66	0.82	0.84	0.13	0.09	0.14	0.16
	Capacity*	Planned	18.0	1.50	0.88	0.70	0.58	0.24	0.25
2030	Pop.		40,085	7,300	7,394	1,575	900	1,405	1,625
	GPCD***	Gals.	100	100	100	100	100	100	100
	Housing Units		16,230	2,850	3,055	620	375	570	700
	Demand*	Residential	4.01	0.73	0.74	0.16	0.09	0.14	0.16
		Com/Ind	4.40	0.26	0.26	0.02	0.01	0.01	0.02
		Total	8.41	0.99	1.0	0.18	0.10	0.15	0.18
	Capacity*	Planned	18.0	1.50	0.88	0.70	0.58	0.24	0.25

Source: 2009 *Draft Wicomico County Comprehensive Water and Sewerage Plan*, 2009 *City of Fruitland Comprehensive Plan*, 2009 *Draft Town of Delmar, MD Comprehensive Plan*, 2009 *Draft Town of Willards Comprehensive Plan*, 2008 *Town of Sharptown Comprehensive Plan*, 2004 *Draft Wicomico County Groundwater Protection Report*, *2006 TischlerBise Impact Fee Study for Salisbury MD, Maryland Department of Planning Municipal Population Projections and KCI Technologies*

Notes:
* The water demand and planned capacity figures are measured in millions of gallons per day.
** The Town of Delmar is an incorporated community located partially in Maryland and partially in Delaware. The population and housing unit projections include the Maryland and Delaware portions of the Town.
*** GPCD refers to gallons per person consumed daily

Private Water Systems

The seven public water supply systems serve over 17,500 housing units. There are other housing units in Wicomico County on community systems of various kinds. For example, approximately 1,300 housing units are served in Urban Services districts within the Metro Core. Additionally, in the Lower Wicomico River Watershed there are two large residential developments (Steeplechase and Nutters Crossing) served by private community systems. At the time of this publication the Nutters Crossing water treatment plant has been designed and permitted by MDE, but not yet constructed. Those systems serve about 300 housing units each with combined system capacities of nearly 200,000 GPD. Also, 18 mobile home park developments exist in the County. Of which, 15 are served by private community systems. The remaining three mobile home parks are being served by municipal/public systems.

According to the Maryland Department of Planning, 37,100 housing units are projected County-wide in 2010. Based on the population served in public water systems and the number of housing units on other smaller community water systems, we can estimate that roughly 50 percent of the housing units in Wicomico County are on private individual well systems. **Table 5-3** provides an estimate for the distribution of those wells and an estimate of the water consumption by watershed in 2010, which totals 4.65 MGD. In comparison, the municipal water treatment facilities provide approximately 4.33 MGD.

TABLE 5-3: PRIVATE WELLS in 2010

	Wells	Estimated Flow
Wicomico River Head	3,500	0.92 MGD
Wicomico Creek	300	0.08 MGD
Upper Pocomoke	1,300	0.34 MGD
Nassawango Creek	800	0.21 MGD
Nanticoke River	3,200	0.84 MGD
Lower Wicomico	8,500	2.23 MGD
Dividing Creek	100	0.03 MGD
TOTAL	*17,700*	*4.65 MGD*

SOURCE: KCI Technologies, 2009

Commercial and Industrial Uses

Most industrial and commercial water users are served by the municipal systems described in this section. Based on demand projections contained in the Draft 2009 Wicomico County Comprehensive Water and Sewerage Plan, industrial and commercial users account for approximately 5.96 MGD. Of this amount, public water systems provide approximately 4.41 MGD for commercial and industrial uses; whereas the remaining 1.55 MGD is supplied by private water systems. In contrast, the total residential demand of public and private water systems is approximately 9 MGD.

Assumptions made regarding water demands from those users vary depending on industry type and the history of water uses in each system. In addition to the users who are served by the public systems, the Draft Wicomico County Comprehensive Water and Sewerage Plan identifies privately-owned systems of major commercial and industrial users. For example, in the Wicomico River Head Watershed, the corporate headquarters of Perdue Farms, Inc. is served by two (2) wells producing up to 20,000 GPD mostly for irrigation purposes. Also in the Wicomico River Head Watershed is the feed mill complex of Perdue Farms located on Zion Church Road which is served by seven existing wells. These wells produce up to 1,000,000 GPD of which 80 percent is used for cooling water.

Agricultural Use

Agricultural water use has been growing steadily in recent years, particularly for irrigation on Maryland's Eastern Shore, and is the largest consumer of water, which is estimated at 13.294 MGD. In general, the MDE directs large irrigators to use the unconfined aquifers, reserving the more protected confined aquifers for individual potable and municipal uses. In some areas, however, the unconfined aquifer

produces low yields, or is nonexistent, compelling an increasing number of farmers to seek water appropriation permits for confined aquifers. MDE requires an appropriation permit for any withdraw greater than 10,000 GPD regardless of the source (confined or unconfined aquifers). **Table 5-4** represents the estimated flow of agricultural usage by watershed based on the groundwater appropriation permits. Based on information obtained from MDEs groundwater appropriation permits, the Nanticoke River Watershed draws the largest volume of water for agricultural uses, 5.74 MGD or 43 percent of the total estimated flow, which is 13.294 MGD.

While public drinking water systems and withdrawals located in ground water management strategy areas must still obtain a permit for water withdrawals, some exemptions include temporary construction dewatering (up to 30 days and 10,000 GPD), creation of small subdivisions (10 lots or fewer), individual domestic use, and agricultural uses under 10,000 GPD. (**Table 5-4**)

TABLE 5-4: 2009 AGRICULTURAL WATER USE

	Estimated Flow
Wicomico River Head	2.52 MGD
Wicomico Creek	1.07 MGD
Upper Pocomoke	1.52 MGD
Nassawango Creek	0.01 MGD
Nanticoke River	5.74 MGD
Lower Wicomico	2.43 MGD
Dividing Creek	0.004 MGD
TOTAL	*13.294 MGD*

SOURCE: Maryland Department of the Environment, 2009

Each permit application is evaluated for the reasonableness of the amount of water planned for a particular use and the impact of that use on the resource and other users of the resource. Aquifer testing, fracture trace analysis, water level monitoring, the development of a water balance and other investigation techniques are part of the evaluation. Through the permit review process, MDE - Water Supply Program attempts to avoid impacts to other water users and assures that ground water withdrawals do not exceed the sustained yield of the State's aquifers.

Wastewater Assessment

Existing Conditions

There are seven public sewer systems located in the incorporated entities of Wicomico County (Salisbury, Fruitland, Delmar, Hebron, Sharptown, Willards, and Pittsville) currently serving over 17,500 housing units. With the exception of the Towns of Hebron and Pittsville, the analysis demonstrates that public sewer systems either have sufficient capacity to meet projected demand or that expansions to increase capacity are planned to meet the projected demand. **Table 5-5** lists the municipal wastewater treatment systems in the County by watershed and **Table 5-6** represents the planned wastewater treatment capacity and projected sewer demands through 2030 by municipality.

In addition to the previously mentioned seven municipal public sewer systems, there are an additional 26 privately-owned and operated systems located in the County (**Table 5-7).** Aside from sewer demand and capacity, there are roughly 17,700 residential septic systems in use in Wicomico County, as well as 1,600 acres of commercial land that use private septic systems.

The demand and planned capacity numbers through 2030 are derived from a variety of sources including, but not limited to, recently completed municipal comprehensive plans (Sharptown, Willards, Fruitland & Delmar), Maryland Department of Planning population projections (Hebron & Pittsville) and a recently completed Impact Fee Study prepared by TischlerBise for the City of Salisbury.

Nanticoke River Watershed

The Town of Hebron has an existing sewer capacity at 0.1 MGD, which is enough to sustain the 2010 demand; however, this falls short of the projected 2020 and 2030 sewer demands of 0.12 MGD for 2020 and 0.15 MGD for 2030. These numbers are based on current municipal population projections from the Maryland Department of Planning (MDP) as well as the 2009 Draft Wicomico County Comprehensive Water and Sewerage Plan, which is consistent with MDPs projections. However, based on the Town of Hebron's desired growth, which is inconsistent with this Comprehensive Plan, the Town could potentially have a demand for sewer capacity that far exceeds the planned sewer system capacity. The Town of Hebron is currently studying its capital needs for the proposed growth along with funding and phasing possibilities.

Sharptown's system is expected to keep pace with demand, despite needing repairs. Because the system is old, there is considerable infiltration that occurs within the system's joints and piping. The combination of infiltration and a high water table prompted the Environmental Protection Agency (EPA) and the State of Maryland to provide the Town funding in the early 1980's to repair major infiltration areas.

Wicomico River Head Watershed

Delmar, which straddles the Maryland-Delaware state line, utilizes a single sewage collection system that transports sewage to a treatment facility on Connelly Mill Road in Maryland. Although the system is over 50 years old rehabilitation efforts need to continue. Based on the municipal growth projections the planned expansion to 1.1 MGD will be required by 2030 to accommodate the sewer demand of 1.0 MGD.

Lower Wicomico River Watershed

The City of Salisbury has the largest concentration of population within Wicomico County and is served by an extensive sewer collection system and a secondary wastewater treatment facility. The system includes two pumping stations along with 34 lift stations. In addition to serving the entire Salisbury area, adjacent Urban Service Districts are also served by the Salisbury public system. The first phase of planned expansions of the City's Wastewater Treatment Plant (WWTP) capacity has been completed for 8.5 MGD of daily flow, with a peak flow of 25 MGD. The second phase of capacity expansion will increase the daily capacity to 10.2 MGD and a peak flow increase to 30 MGD. Population growth is expected to reach 40,000 by 2030 and the capacity of the system is expected to meet that demand.

With planned expansions, sewer capacity for Fruitland is expected to meet and exceed demand from now and into the foreseeable future. The WWTP is owned and operated by the City of Fruitland. The facility is an advanced secondary Biological Nutrient Removal (BNR) plant. Currently, the average daily flow in the Fruitland service area is approximately 0.65 MGD, while peak flow can reach up to 0.80 MGD.

Upper Pocomoke River Watershed

The Town of Willards owns and operates its own wastewater and sewer system. The service area encompasses the entire town and additional properties beyond the corporate limits. In 2008, the Town completed its upgrade from the 0.08 MGD lagoon system to a 0.20 MGD activated sludge plant. This upgrade enables the sewer system to accommodate demand in the foreseeable future.

The Pittsville sewer system is composed of a treatment plant and collection system. Planned sewer service is adequate through 2000, but in 2010 the demand will exceed the capacity. Expansion of the Pittsville sewer system will be required to accommodate any future growth.

TABLE 5-5: MUNICIPAL WASTEWATER TREATMENT SYSTEMS IN THE COUNTY

Wastewater Treatment Plant	Discharge Location	Treatment Technology	Planned/Potential WWTP Upgrades or Expansions
Nanticoke River Watershed			
Sharptown	Nanticoke River, Little Water Street	Activated sludge	Surge tank, need to correct infiltration problems of sewer mains
Hebron	Rewastico Creek, south of Rewastico Pond	Facultative lagoon	N/A
Wicomico River Head Watershed			
Delmar[1]	Wood Creek	Activated sludge	Denitrifying, continuous flow sand filters, influent screen and a new grit removal system
Salisbury[2]	N/A	N/A	N/A
Lower Wicomico River Watershed			
Salisbury[2]	Wicomico River, north of Tony Tank Creek	BNR/ENR Plant	None
Fruitland[3]	Wicomico River, south of Tony Tank Creek	Advanced secondary Biological Nutrient Removal (BNR) plant	Enhanced nutrient reduction plant upgrade and a new water tower
Wicomico Creek Watershed			
NO PUBLIC SYSTEMS	N/A	N/A	N/A
Dividing Creek Watershed			
NO PUBLIC SYSTEMS	N/A	N/A	N/A
Nassawango Creek Watershed			
NO PUBLIC SYSTEMS	N/A	N/A	N/A
Upper Pocomoke River Watershed			
Pittsville	Aydelotte Branch	Oxidation ditch activated sludge system	Expansion of the existing plant contingent of availability of State and Federal funds
Willards	Burnt Mill Branch	Activated sludge	None

SOURCE: 2009 *Draft Wicomico County Comprehensive Water and Sewerage Plan*, 2009*City of Fruitland Comprehensive Plan*, 2009 *Draft Town of Delmar, MD Comprehensive Plan*, 2009 *Draft Town of Willards Comprehensive Plan*, 2009 *Draft Town of Hebron Comprehensive Plan*, 2008 T*own of Sharptown Comprehensive Plan*, 2004 *Draft Wicomico County Groundwater Protection Report*

Notes:
[1] The Town of Delmar is an incorporated community located partially in Maryland and partially in Delaware. The WWTP is located in Delaware.
[2] The City of Salisbury is partially located in the Wicomico River Head and the Lower Wicomico River Watersheds. The City has one WWTP, which is located in the Lower Wicomico River Watershed.
[3] The City of Fruitland is partially located in the Lower Wicomico River and Wicomico Ceek Watersheds. The City WWTP is located in the Lower Wicomico River Watershed.

TABLE 5-6: MUNICIPAL WASTEWATER TREATMENT SYSTEMS, PLANNED CAPACITY AND PROJECTED SEWER DEMANDS

Service Area			Salisbury	Fruitland	Delmar**	Hebron	Sharptown	Willards	Pittsville
2010	Pop.		28,925	4,950	5,325	975	725	1,110	1,330
	GPCD***	Gals.	90	90	90	90	90	90	90
	Housing Units		11,710	1,930	2,200	370	300	450	550
	Demand*	Residential	2.60	0.45	0.48	0.09	0.07	0.10	0.12
		Com/Ind	3.26	0.22	0.24	0.01	0.01	0.01	0.01
		Total	5.86	0.67	0.72	0.10	0.08	0.11	0.13
	Capacity*	Planned	8.50	1.00	0.85	0.10	0.15	0.20	0.12
2020	Pop.		34,490	6,100	6,235	1,225	800	1,260	1,490
	GPCD***	Gals.	90	90	90	90	90	90	90
	Housing Units		13,965	2,380	2,625	470	335	510	645
	Demand*	Residential	3.10	0.55	0.56	0.11	0.07	0.11	0.13
		Com/Ind	3.31	0.26	0.28	0.01	0.01	0.01	0.01
		Total	6.41	0.81	0.84	0.12	0.08	0.12	0.14
	Capacity*	Planned	8.50	2.00	1.10	0.10	0.15	0.20	0.12
2030	Pop.		40,085	7,300	7,394	1,575	900	1,405	1,625
	GPCD***	Gals.	90	90	90	90	90	90	90
	Housing Units		16,230	2,850	3,055	620	375	570	700
	Demand*	Residential	3.61	0.66	0.67	0.14	0.08	0.13	0.15
		Com/Ind	3.36	0.35	0.33	0.01	0.01	0.01	0.01
		Total	6.97	1.01	1.00	0.15	0.09	0.14	0.16
	Capacity*	Planned	10.20	2.00	1.10	0.10	0.15	0.20	0.12

Source: 2009 *Draft Wicomico County Comprehensive Water and Sewerage Plan*, 2009 *City of Fruitland Comprehensive Plan*, 2009 *Draft Town of Delmar, MD Comprehensive Plan*, 2009 *Draft Town of Willards Comprehensive Plan*, 2008 *Town of Sharptown Comprehensive Plan*, 2004 *Draft Wicomico County Groundwater Protection Report*, 2006 *TischlerBise Impact Fee Study for Salisbury MD, Maryland Department of Planning Municipal Population Projections and KCI Technologies*

Notes:

* The water demand and planned capacity figures are measured in millions of gallons per day.

** The Town of Delmar is an incorporated community located partially in Maryland and partially in Delaware. The population and housing unit projections include the Maryland and Delaware portions of the Town.

*** GPCD refers to gallons per person consumed daily

TABLE 5-7: PRIVATELY OWNED AND OPERATED SEWER SYSTEMS

Private Sewer Plant	Use	Estimated Flow (Gallons per Day)
Nutters Crossing	Kitchen	6,800 GPD
Nutters Crossing	Residential	80,000 GPD
Village Down River	Residential	34,200 GPD
Cherry Hill Condominiums	Residential	6,000 GPD
Crown Sports Complex	Sports Complex	5,000 GPD
Perdue Farms, Inc.	Industrial	285,000 GPD
Beaver Run Elementary	School	12,800 GPD
Mardela Springs Middle & High School and Northwest Elementary School	School	14,000 GPD
Nanticoke Seafood	Commercial	6,300 GPD
Westside Primary	School	6,000 GPD
Poplar Hill Pre-Release Unit	Jail	25,000 GPD
MaTech Engineering	Industrial	4,050 GPD
Bennett Mobile Home Park	Residential	11,100 GPD
Bohnak Trailer Park	Residential	24,300 GPD
Charles Boyer Trailer Park	Residential	2,100 GPD
Cedarhurst Village	Residential	27,300 GPD
Country Village Mobile Home Park	Residential	7,200 GPD
Eastwood Village I Trailer Park	Residential	16,500 GPD
Eastwood Village II Trailer Park	Residential	3,600 GPD
John Walston Mobile Home Park	Residential	27,000 GPD
Naylor Mill Village Mobile Home Park	Residential	15,600 GPD
Hebron Woods Mobile Home Park	Residential	37,500 GPD
Oak Ridge Trailer Park	Residential	18,900 GPD
Oak Terrace Trailer Court	Residential	5,400 GPD
Parkway Mobile Estates	Residential	2,700 GPD
Pine Tree Mobile Estates	Residential	12,900 GPD
West Side Mobile Park	Residential	28,200 GPD
Salisbury Christian School	School	5,000 GPD
TOTAL		*730,450 GPD*

SOURCE: 2009 *Draft Wicomico County Comprehensive Water and Sewerage Plan*

Private Sewer Systems

In addition to the municipal systems, there are several privately owned and operated sewer systems in Wicomico County.

As of 2009, two large communities have received approval from the Maryland Department of Environment to construct private Package Treatment Plants in the Lower Wicomico River Watershed. Nutters Crossing Subdivision private sewer system, which will discharge in Tony Tank Creek, includes approximately 325 units and will produce an average flow of 80,000 GPD and a maximum flow of 280,000 GPD. At the time of this publication the Nutters Crossing package treatment plant has been designed and permitted by MDE, but not yet constructed. Village Down River is a subdivision consisting of 49 residential units and will discharge into the Wicomico River. The system will have an average wastewater flow of 17,100 GPD with a maximum flow of 34,200 GPD. This package treatment plant has been constructed, but is not in operation at the time of this publication.

The vast majority of homes located in the areas of Wicomico County that are not served by municipal or private package treatment plants are served by traditional individual septic systems. Based on flow figures of the municipal systems and the number of housing units on smaller systems in the County we can estimate that roughly one half of the housing units in Wicomico County are on private individual septic systems. The following table (**Table 5-8**) provides an estimate of the distribution of those systems by watershed in 2010.

TABLE 5-8: PRIVATE SEPTIC SYSTEMS

	Septic Systems	Estimated Flow
Wicomico River Head	3,500	0.83 MGD
Wicomico Creek	300	0.07 MGD
Upper Pocomoke	1,300	0.31 MGD
Nassawango Creek	800	0.19 MGD
Nanticoke River	3,200	0.75 MGD
Lower Wicomico	8,500	2.00 MGD
Dividing Creek	100	0.02 MGD
TOTAL	*17,700*	*4.17 MGD*

SOURCE: KCI Technologies, 2009

Assimilative Capacity

Assimilative capacity refers to the ability of a natural body of water to receive wastewater or toxic materials without harmful human effects and damage to aquatic life of a water body. In basic terms, the total contribution of pollutants to the waters of Maryland (point and non-point combined) should not exceed the capacity of those waters to assimilate pollutants.

Water pollution comes from two sources, non-point source pollution and point source pollution. Non-point source (NPS) pollution is the major reason water quality remains impaired in Maryland. NPS is caused by stormwater (rainfall or snowmelt) or irrigation water moving over and through the ground. In contrast point source pollution refers to pollution resulting from a specific point of discharge (e.g. municipal wastewater plant or industrial use).

Total Maximum Daily Loads (TMDLs)

A TMDL is a calculation of the maximum level of a pollutant that a body of water can receive, yet still meet water quality standards. As a result of the Clean Water Act, Section 303(d), States and their jurisdictions are required to compile a list of their impaired waters. These water bodies are either degraded or polluted to the point they do not meet the State's water quality standards. The Clean Water Act requires jurisdictions develop priority rankings for the impaired water and develop TMDLs for each water body.

The presence of a nutrient TMDL is an indicator that pollution control efforts must outweigh additional pollution impacts from future land use change, septic tanks, and WWTP flows to prevent further degradation of the water body. For the receiving waters in Wicomico County without a nutrient TMDL, a determination of the suitability of receiving waters cannot be made. However, for the Lower Wicomico River and Wicomico Creek watersheds, which both have nutrient TMDLs, a preliminary assessment can be made. The pollution forecasts, although capable of comparing the relative benefits of different land use plans, are not precise enough to allow for a direct comparison to nutrient TMDLs. Wicomico County recognizes though that the Lower Wicomico River and Wicomico Creek, because of the presence of nutrient TMDLs, can only be considered suitable receiving waters if future nutrient impacts are offset. This WRE includes recommendations for pollution control efforts to help achieve that goal. In addition, this WRE recommends refining the pollution forecast in the future as information becomes available.

Within Wicomico County, six bodies of water have been identified as impaired and have calculated TMDLs: (**See Table 5-9**)

TABLE 5-9: WATER BODIES WITH TMDLS

Water Body Name	Impairment	Location
Adkins Pond/Pocomoke River	Phosphorus and Sediment	Upper Pocomoke Watershed in Wicomico County
Lower Wicomico River	Bacteria and Nutrients	Lower Wicomico River Watershed in Wicomico and Somerset County, MD, and Sussex County, DE
Wicomico Creek	Nutrients	Wicomico Creek Watershed in Somerset and Wicomico County
Johnson Pond	Phosphorus and Sediments	Wicomico River Headwaters Watershed
Tony Tank Lake	Phosphorus and Sediments	Lower Wicomico River Watershed
Wicomico River Headwaters	Fecal Bacteria	Wicomico River Headwaters Watershed

SOURCE: Maryland Department of the Environment, 2008

Water quality impairments trigger numerous issues within these water bodies. Adkins Pond has low dissolved oxygen levels and nuisance levels of algae, which in turn, create eutrophication and excessive sedimentation. The Lower Wicomico River, with significant nutrient and biochemical oxygen demand point and non-point sources, has high algae levels and low dissolved oxygen concentration. During the summer, only a limited input of freshwater is available to the Lower Wicomico River, which elevates the impairment of the water body. Wicomico Creek shows evidence of eutrophication, low dissolved oxygen levels, and excessive algae blooms. The EPA notes that concentrated feeding operations of beef cattle and poultry have played a major role in the accumulation of non-point source loads of waste in Wicomico Creek. The EPA suggests that these operations may need to be considered for permitting in order to be reclassified as point sources. High sedimentation rates have been noted in Johnson Pond. Tony Tank Lake, which possesses significant phosphorus and sediment non-point sources of impairment, is used for recreation purposes, yet is classified as highly eutrophic. The Wicomico River Headwaters possess high levels of fecal bacteria and is located just upstream of U.S. Route 50.

One additional water body of interest is Schumaker Pond, which has been listed by the State as an impaired water body. A TMDL has not been calculated for the pond at this time.

Point Source Caps

The State of Maryland has adopted a point source strategy to address nutrient loadings from publicly owned and operated wastewater treatment plants. The strategy has two components. For 'significant' Waste Water Treatment Plants (WWTPs), which have a design capacity of 500,000 GPD or greater, the State has adopted a schedule of programmed improvements designed to upgrade those facilities to achieve Enhanced Nutrient Reduction (ENR) technologies and to operate the ENR facility in a manner that optimizes nutrient removal capacity.

Delmar, Fruitland and Salisbury are either in the process or have completed upgrades of their WWTPs to ENR technology. The Salisbury WWTP recently completed upgrades to achieve ENR levels. Upgrades in Delmar and Fruitland are scheduled in 2010 and 2012, respectively. **Table 5-10** uses MDE nutrient load assumptions to calculate potential and future nutrient contributions based on treatment technology, existing demands and 2030 projected demands for each municipal WWTP. As previously mentioned in the beginning of this Chapter, the results of this analysis should only be used to obtain a better understanding of the overall relative impacts of various future growth and treatment technologies as it relates to point-source nutrient loads.

This table demonstrates the benefits of implementing ENR technology in the three largest municipal systems in the County. As indicated in the table, the nitrogen contribution is decreased significantly for

all projected flows after implementation of ENR technology in the Salisbury, Fruitland and Delmar systems.

The strategy for 'non-significant' treatment systems with capacities under 500,000 GPD is to base annual nutrient loads on design capacity or projected 2020 flow, whichever is less. The State of Maryland has expressed this policy in the following fashion: "For non-significant WWTPs, when the WWTP seeks to expand, its projected nutrient loads become point source caps. If the projected nutrient loads are less than 6,100 lbs/yr of nitrogen and 457 lbs/yr of phosphorus, as the WWTP expands, the municipal WWTP cap must remain at the projected nutrient load level. If the projected nutrient loads are more than 6,100 lbs/yr of nitrogen and 457 lbs/yr of phosphorus, then the municipal WWTP cap will be limited to no more than 6,100 lbs/yr of nitrogen and 457 lbs/yr of phosphorus." In simple terms, future flows at small municipal treatment plants are limited by these nutrient caps. The individual municipalities should recognize this constraint and begin identifying solutions such as nutrient trading, changes in future land use or consideration of spray irrigation as a means of disposing the effluent. To obtain more information about the current nutrient loads of the seven publicly-owned and operated WWTPs located in the County as well as constraints of the facility, consult the appropriate municipal WRE.

TABLE 5-10: POINT SOURCE ANALYSIS – MUNICIPAL WWTPs

WWTP Location	Type Of WWTP (Based on Design Capacity)	Existing Demand (MGD*)	Existing Nutrient Load Nitrogen (Lbs./ Year**)	Existing Nutrient Load Phosphorus (Lbs./ Year)	2030 Projected Demand (MGD)	2030 Total Nutrient Load Nitrogen (Lbs./ Year)	2030 Total Nutrient Load Phosphorus (Lbs./ Year)
City of Salisbury	Significant	5.86	142,776[1]	35,694[1]	6.97	63,683[2]	6,368[2]
City of Fruitland	Significant	0.67	16,324[1]	4,081[1]	1.01	9,228[2]	923[2]
Town of Delmar	Significant	0.72	17,542[1]	4,386[1]	1.0	9,137[2]	914[2]
Town of Hebron	Non-Significant	0.10	5,482[3]	1,827[3]	0.15	8,223[3]	2,741[3]
Town of Sharptown	Non-Significant	0.08	4,386[3]	1,462[3]	0.09	4,934[3]	1,645[3]
Town of Willards	Non-Significant	0.11	6,030[3]	2,010[3]	0.14	7,675[3]	2,558[3]
Town of Pittsville	Non-Significant	0.13	7,127[3]	2,376[3]	0.16	8,771[3]	2,924[3]

SOURCE: Maryland Department of the Environment, 2009

Notes:
* MGD refers to millions of gallons per day.
** LBS / Year is a measurement of total pounds of a nutrient per year.

Assumptions about Pollutant Discharge Treatment Level:
[1] Assumes that loads with BNR prior to ENR upgrade are 8 mg Nitrogen and 2 mg Phosphorus per liter of effluent: Source: MDE
[2] Assumes that loads after ENR upgrade are 3 mg Nitrogen and 0.3 mg Phosphorus per liter of effluent: Source: MDE
[3] Assumes that loads prior to BNR upgrade are 18 mg Nitrogen and 6 mg Phosphorus per liter of effluent: Source: MDE

Calculations used to perform point source analysis:
WWTP Existing Demand (MGD) * Pollutant Discharge Treatment Level (MG / L) * 365 days * 8.344 (Constant Conversion Factor) = Pounds of pollutant per year: Source: MDP

Tier II Waters

The State of Maryland has also adopted an antidegradation policy requiring special protection for waters of very high quality, also referred to as Tier II waterways. Five segments have been identified in Wicomico County: Little Burnt Branch, Adkins Race, Nassawango Creek, Aydellotte Branch, and Plum Creek. Nassawango Creek is one of the eight watersheds examined in this Element. A discussion of the impacts of various land use approaches on the watershed may be found in the Non – Point Source Assessment Section.

Non - Point Source Assessment

Introduction

Land use changes have a direct influence on water quality. The location of new development, whether or not the development is served by community sewer systems or is on private septic systems, the density of development and even decisions about the amount of impervious cover on a specific lot all affect the levels of new pollutants contributed to the waters of the State.

The models designed by MDE that are used in this element to assess pollutant contributions focus primarily on nutrient contributions and especially on nitrogen. The contribution of stormwater management and tributary strategies to this discussion are important for the control of many of the other pollutants generated by development. See the list of **Tributary Strategies** at the end of the Chapter.

Non – Point Source Loading

For the purpose of the WRE, three different growth scenarios have been created to evaluate non-point source pollution (**See Table 5-11**). The Build-out analysis was completed, but is not an option under consideration due to the unlikelihood that build-out will occur. Data from the Build-out analysis was used to distribute projected new housing units under the scenario assumptions discussed below (**See Table 5-12**). The first scenario is a lower concentration of growth focused in the Metro Core region. The second scenario is based on a higher concentration of growth focused in the Metro Core region. The third scenario is the higher concentration of growth in the Metro Core as well as implementing a conservation development approach for new subdivisions, as with Salisbury. All scenarios include the same population for incorporated municipalities, based on their own future land use plan.

TABLE 5-11: GROWTH SCENARIOS

	Scenario 1	Scenario 2	Scenario 3
Concentration of growth	Low	High	High
Conservation	N/A	N/A	40%

SOURCE: KCI Technologies, 2009

To evaluate non-point source pollution loadings into receiving waters, Wicomico County used the Nutrient Load Analysis Spreadsheet prepared by the MDE, which calculates non-point source pollution loadings based on different land uses. The spreadsheet generates results that can be used to show a general picture of non-point source pollution in the County, while also providing support for more detailed studies as necessary.

The analysis consists of a simple before-and-after assessment of the change in nutrient loads due to proposed land use changes, as well as a comparison among alternative future land use plan options, which are the growth scenarios described above. This spreadsheet calculates base nitrogen and phosphorus non-point source loads for the year 2002 land use/land cover and septic systems by State Basin. The Lower Eastern Shore serves as the basin that encompasses Wicomico County and the associated municipalities. For the purposes of this WRE, the model was run by jurisdiction, further broken down by watersheds. The model was run to show the existing conditions of Wicomico County and three other options. Each run of the model includes results summarized in **Table 5-14** by watershed.

TABLE 5-12: GROWTH SCENARIO: HOUSEHOLD DISTRIBUTION BY WATERSHEDS (2030)

Watersheds	Scenario 1		Scenario 2		Scenario 3	
	Housing Units	% of Total	Housing Units	% of Total	Housing Units	% of Total
Metro Core						
Wicomico River Head	7,568	27%	8,883	27%	8,883	27%
Nanticoke River	160	1%	255	1%	255	1%
Lower Wicomico River	19,706	72%	22,367	71%	22,367	71%
Wicomico Creek	8	0%	10	1%	10	1%
Total	*27,442*	*100%*	*31,515*	*100%*	*31,515*	*100%*
Outside Metro Core						
Nanticoke River	7,877	39%	6,150	38%	6,150	38%
Lower Wicomico River	3,112	15%	2,654	17%	2,654	17%
Wicomico Creek	601	3%	448	3%	448	3%
Wicomico River Head	1,745	9%	1,494	9%	1,494	9%
Dividing Creek	251	1%	185	1%	185	1%
Nassawango Creek	1,406	7%	1,059	7%	1,059	7%
Upper Pocomoke River	5,116	26%	4,045	25%	4,045	25%
Total	*20,108*	*100%*	*16,035*	*100%*	*16,035*	*100%*

SOURCE: KCI Technologies, 2009

The model uses three inputs: land use acreages, number of residential septic systems, and the acreage of non-residential land to be served by septic systems. The percentage of impervious surfaces by land use and by watershed is also incorporated into the model. Impervious surfaces are man-made surfaces (e.g. roads, sidewalks, and parking lots), which do not allow rainwater to enter the ground. The total amount of impervious surface in a watershed is a key indicator of water quality. According to the Center for Watershed Protection, water quality in streams tends to decline as watersheds approach 10 percent impervious coverage. Water quality is extremely impacted when a watershed approaches 25 percent impervious coverage. **Table 5-13** summarizes existing and potential impervious coverage by watershed for each of the three growth scenarios used in the model as well as the existing conditions.

TABLE 5-13: IMPERVIOUS SURFACES

	Existing	Scenario 1	Scenario 2	Scenario 3
Wicomico River Head	8.5%	12.8%	11.2%	10.3%
Wicomico Creek	1.8%	2.6%	2.4%	2.2%
Upper Pocomoke	1.1%	2.4%	2.1%	1.8%
Nassawango Creek	1.9%	2.7%	2.4%	2.2%
Nanticoke River	1.4%	2.1%	1.9%	1.7%
Lower Wicomico	4.6%	6.6%	5.9%	5.5%
Dividing Creek	0.1%	1.9%	1.6%	1.4%
TOTAL	3.0%	4.6%	4.1%	3.7%

SOURCE: Maryland Department of the Environment, KCI Technologies, 2009 and Salisbury / Wicomico County Department of Planning, Zoning and Community Development, 2009

Overall, under existing conditions, only three percent of all land in the County is considered impervious. Predominately, the existing impervious surface coverage is relatively low in comparison to more

urbanized areas throughout the State: one and two percent in the Wicomico Creek, Upper Pocomoke, Nassawango Creek, Nanticoke River and Dividing Creek Watersheds and roughly four and one-half percent in Lower Wicomico River Watershed. However, there is eight and one-half percent impervious coverage in the Wicomico River Head Watershed. The reason for this higher percentage of overall impervious coverage within this Watershed is because this area is more urbanized and contains a majority of the retail, commercial and industrial land uses in comparison to the other watersheds in the County. County-wide impervious coverage will increase slightly under all three scenarios. Scenario 3, which implements conservation development approach for subdivisions as well as directing more growth into the Metro Core, produces the slightest increase of impervious surfaces, only seven tenths of one percent (0.7%), in comparison to the existing rate of three percent impervious coverage county-wide.

The loading rates for future land use reflect implementation of best management practices (BMPs) suggested in the associated Tributary Strategy. Some of the strategies included are: riparian buffers, erosion and sediment control, enhanced stormwater management, and nutrient management plan implementation (for agricultural areas). These strategies are built into the model to ensure that the loading outputs will reflect only the changes in land use patterns.

Twenty-one different model runs were created, one for each jurisdiction/watershed combination in Wicomico County. For instance, there is a run for Wicomico County – Lower Wicomico River as well as a Metro Core – Lower Wicomico River. **Map 5-1** shows the watersheds and the municipalities in Wicomico County. One growth scenario was developed for each of the incorporated municipalities within Wicomico County, allowing each municipal government's predicted growth to be reflected in the model. **Table 5-14** shows the nitrogen and phosphorus outputs, respectively, for each jurisdiction/watershed combination across all three scenarios developed for the County.

The model results (**Table 5-14**) show that future nutrient loads are heavily impacted by five factors:

- The amount of new land developed;
- How much of the new growth occurs on formerly agricultural land;
- How much forested land is preserved;
- Whether new growth occurs on municipal sewer systems or there are substantial increases in septic systems; and
- Whether on-site conservation practices are employed to lessen the acreages impacted in each land use.

Scenario 1, a relatively low density sprawl pattern results indicate increased nitrogen load levels in comparison to Scenarios 2 and 3. This increase in nitrogen loads can be explained by the amount of growth predicted as well as the amount of residential and commercial land developed in areas outside of the sewer service areas. However, as the County moves toward a more directed growth pattern consistent with the Comprehensive Plan and more recent land use trends, the increases are largely mitigated due to a reduction in the total number of new septic systems (Scenario 2). Scenario 3 combines a more directed growth pattern along with conservation planning techniques in the approval of specific developments, which actually begins to show reductions of nitrogen loads even compared with current contributions due to a decrease in impervious cover.

Based on the results of the non-point source analysis, Scenario 3 is the preferred growth pattern because of the potential reductions of pollutants (nitrogen and phosphorus) and changes in impervious coverage. Therefore, Scenario 3 should be used to assist in creating a land use pattern that is supportive of the goals included in this WRE. The County should continue to explore opportunities to improve agricultural management practices to reduce run-off as well as reducing pollutants from private septic systems by encouraging septic dentrification technologies, which both recommendations will have a direct impact on improving the quality of our local water bodies.

TABLE: 5-14: Wicomico County Non-Point Source Loading by Watershed (2030)

	EXISTING					SCENARIO 1					SCENARIO 2					SCENARIO 3				
	LAND USE				TOTAL	LAND USE CHANGE				TOTAL	LAND USE CHANGE				TOTAL	LAND USE CHANGE				TOTAL
	Developed	Agriculture	Forest	Septic		Developed	Agriculture	Forest	Septic		Developed	Agriculture	Forest	Septic		Developed	Agriculture	Forest	Septic	
WICOMICO RIVER HEAD																				
NITROGEN (LBS/YR)	37,643	75,012	13,257	37,712	163,624	59,452	50,356	12,165	32,355	154,328	50,889	59,218	12,717	32,828	155,652	46,328	60,166	13,628	32,828	152,950
PHOSPHORUS (LBS/ YR)	2,530	7,984	189		10,889	3,995	5,292	174		9,461	3,422	6,268	182		9,872	3,124	6,371	195		9,690
LOWER WICOMICO RIVER																				
NITROGEN (LBS/YR)	94,064	167,645	44,460	84,828	390,997	127,190	122,210	44,027	63,393	356,820	121,040	127,249	44,460	66,131	358,880	111,390	129,276	46,536	66,131	353,333
PHOSPHORUS (LBS/ YR)	6,324	18,137	635		25,096	8,550	13,090	629		22,269	8,137	13,641	635		22,413	7,489	13,682	664		21,835
UPPER POCOMOKE																				
NITROGEN (LBS/YR)	14,372	195,911	31,140	14,214	255,637	37,663	162,739	27,490	34,447	262,339	31,426	171,695	27,490	24,765	255,376	25,641	171,695	28,827	24,765	250,928
PHOSPHORUS (LBS/ YR)	965	21,423	393		22,781	2,532	17,800	392		20,724	2,112	18,788	392		21,292	1,734	18,788	411		20,933
NASSAWANGO CREEK																				
NITROGEN (LBS/YR)	6,258	47,107	16,006	10,020	79,391	12,383	38,698	16,006	14,639	81,726	10,617	41,234	16,006	11,503	79,360	8,982	41,234	16,384	11,503	78,103
PHOSPHORUS (LBS/ YR)	439	5,018	229		5,686	832	4,100	229		5,161	714	4,377	229		5,320	604	4,377	234		5,215
NANTICOKE RIVER																				
NITROGEN (LBS/YR)	30,792	216,235	59,858	31,411	338,296	57,123	178,761	59,812	65,946	361,642	49,894	189,146	59,816	51,181	350,037	42,967	189,490	61,431	51,181	345,069
PHOSPHORUS (LBS/ YR)	2,070	23,257	854		26,181	3,840	19,169	854		23,863	3,353	20,303	854		24,510	2,882	20,341	876		24,099
WICOMICO CREEK																				
NITROGEN (LBS/YR)	2,812	25,656	4,618	2,792	35,975	5,154	22,292	4,618	5,482	37,546	4,448	23,307	4,618	4,218	36,591	3,794	23,307	4,769	4,218	36,088
PHOSPHORUS (LBS/ YR)	189	2,766	66		3,021	346	2,398	66		2,810	298	2,509	66		2,877	255	2,509	68		2,832
DIVIDING CREEK																				
NITROGEN (LBS/YR)	791	7,838	2,432	1,137	12,198	1,921	6,206	2,432	2,335	12,894	1,578	6,698	2,432	1,738	12,446	1,266	6,698	2,505	1,738	12,207
PHOSPHORUS (LBS/ YR)	53	814	35		902	129	635	35		799	106	689	35		830	85	689	36		810

Stormwater Management Issues

Stormwater issues occur in many developed areas due to an increase in impervious surface cover. In natural areas, stormwater is slowed by existing vegetation, which allows the soil to absorb the majority of water. In cases of development, stormwater hits impervious surfaces, gathers, and travels to the nearest collection of water, whether it is a receiving stream or stormwater collection system. Since the impervious surfaces cover the soil, water can not be completely absorbed and used to recharge aquifers. Water picks up speed, since it cannot be absorbed and may cause scouring and erosion in a receiving stream. Additionally, stormwater can not go through natural filtration for nitrogen and phosphorus removal while traveling along impervious surfaces, and instead, typically picks up more pollution from road salt, road residue, and tire residue. All of these factors combine to support the claim that untreated stormwater needs to be mitigated in order to reduce adverse effects to the receiving water bodies.

In Wicomico County, though the above described process does occur, the County has a relatively flat topography, allowing for an exaggerated sheet flow, reducing nutrient pollution in stormwater runoff. The topography also produces slower flows due to the small changes in elevation, reducing erosion potential. For these reasons, tax ditches have been created in several areas of the County, significantly reducing the threat of flash floods and major erosion issues. As a result, if flooding occurs, the land is flooded over large areas at shallow depths.

Stormwater Management Ordinance

Wicomico County has an existing Stormwater Management Ordinance that covers all required materials for development in the County. The Stormwater Management Ordinance covers structural and non-structural stormwater management measures, the preparation of the plan as well as its contents, review and approval, and references the Design Manual for specific design criteria. These sections essentially serve as instructions for developers who require stormwater management, detailing what he/she may have to do and how to present it to the County. The ordinance discusses permitting, inspection, maintenance, appeals, severability, and penalties. These sections of the ordinance ensure that developers are completing appropriate stormwater management techniques to achieve optimum results. If, for some reason, the approved stormwater management plan is not followed or implemented properly, the County has established in its ordinance a way to make sure the developer solves the issues or he/she will be penalized.

Analysis of Water Resource Issues

Issues concerning aquifer quantity and quality have been raised by research and by the public. One main issue is the quantity of water in the Manokin Aquifer. Areas in Somerset County have shown a one foot per year draw down. While this has not occurred in any test wells in Wicomico County, this is an issue that the County should address to ensure that similar draw down does not occur. Additionally, all aquifers in Wicomico County should be protected from surficial contamination. The aquifers are relatively close to ground level, leaving them more susceptible to surface contamination. Lastly, due to the interjurisdictional breadth of the aquifers used in Wicomico County, strong coordination between neighboring counties and states is required.

Constraints on growth include sewer and water infrastructure capacity in municipalities. The three municipalities that may have constraints are Pittsville and Hebron (sewer) and the Town of Delmar, MD (water). Wicomico County does not have any sewer or water facilities under its ownership at the time of this publication; however, in the future the County reserves the right of ownership or management of a facility.

The non-point source nutrient loading outcomes that were modeled do not show nitrogen or phosphorus constraints for non-point source pollution at this time, however, they allow Wicomico County to identify a preferred pattern of growth with the least amount of nitrogen and phosphorus loads.

Table 5-15 summarizes the contributions (in pounds per year of nitrogen and phosphorus) of point and non-point sources by watersheds in Wicomico County. As was discussed earlier in this Element, the combination of point and non-point sources is less under Scenario three for each watershed in the County. Guidance from the State of Maryland suggested that the Water Resources Element should identify that pattern of future growth and development that has the least impact on water resources. Scenario Three is consistent with the pattern of future growth shown in the Land Use Plan Element of this Comprehensive Plan and is consistent with the land use management policies and strategies found in the Land Use Element, Sensitive Areas Element, and other elements of this Plan. **Table 5-15** is a snapshot of what might be achieved by 2030 based on existing land use plans and existing technologies for treating nutrient contributions from point and non-point sources. As treatment technologies and land development techniques change over time, the new technologies and techniques should be used in new WWTPs to ensure a reduction in point source contributions of pollutants.

TABLE 5-15: TOTAL COMBINED NUTRIENT LOADS by WATERSHED (2030) Non-Point and Point Source Contributions

	Scenario 1 Lbs. / Year	Scenario 2 Lbs. / Year	Scenario 3 Lbs. / Year
Wicomico River Head	173,840	175,575	172,691
Wicomico Creek	40,356	39,468	38,920
Upper Pocomoke	304,991	298,596	293,789
Nassawango Creek	86,887	84,680	83,318
Nanticoke River	403,048	392,090	386,711
Lower Wicomico	459,291	461,495	455,370
Dividing Creek	13,693	13,276	13,017

SOURCE: MDE and KCI Technologies, 2009

Potential Changes to Land Use

Potential changes to land use for Wicomico County deal mainly with directing growth to suitable areas. Though there is no constraint to growth, smart growth decisions are necessary for a continued high quality of life. Growth Scenario 3 shows the most favorable nutrient loadings of any scenario, therefore, it should be considered when creating a future land use map, directing growth into the designated growth areas. The County should ensure that underlying zoning and other regulations should direct development to designated growth areas. Additionally, developing transportation as well as sewer and water facilities within the designated growth areas of the County will help support future growth.

Infrastructure concerns may affect land use decisions in Delmar, Hebron, Pittsville and Mardela Springs; however, this discussion will occur in the municipalities' respective comprehensive plans.

Water Quality

In general, the County should begin implementing water conservation techniques before water levels in the aquifers begin to lower in the County's vicinity. For example, retrofitting or replacing water fixtures with water-saving equipment in place of conventional plumbing fixtures, repairing all leaks in and around the home, and limiting watering of lawns to gardens. To learn more about water conservation techniques

visit the MDE website. In addition to the above mentioned water conservation techniques, the aquifers supplying the drinking water for the County should be protected from surficial contamination to ensure high-quality water.

Capital Improvements

Based on the population projections contained in this chapter and the projected demand, capital improvements will need to occur within Fruitland, Delmar, Salisbury, Hebron and Pittsville sewer systems as well as Delmar's water system. Because these systems are owned and operated by their respective municipalities, these improvements would be under municipal control. Additionally, the Wicomico County Comprehensive Water and Sewerage Plan will address these constraints and improvements in more depth.

Nutrient Trading

Nutrient trading is a way of allocating the total amount of pollutants that enter a water body. Trades can occur among point sources; between point and nonpoint sources, or among nonpoint sources. This is a relatively new program that creates an economic incentive for environmental protection and nutrient reduction. Wicomico County does not show nutrient levels as a growth constraint, so nutrient trading is not a suggested course of action, if taken alone. However, Wicomico County is looking at a possible Transfer of Development Rights (TDR) program. With the TDR program, a nutrient reduction component can be added to further reduce nitrogen and phosphorus loads. For example, if one can not develop due to a nutrient or other water quality constraint, a TDR program could be a mechanism to gain some compensation for the loss of development rights in that location as well as encouraging development to locate into a receiving area with no known nutrient or water quality constraints.

Saltwater Intrusion

Saltwater and freshwater co-exist in coastal areas based on a balance of pressure, since saltwater is denser and sinks lower than freshwater resources. Therefore, when significant withdrawals of freshwater are made on an aquifer, this balance becomes disrupted. As a result of this unequal balance saltwater may rise and possibly contaminate the freshwater aquifer. If the freshwater becomes contaminated, there is a high probability the well will pump saltwater. Therefore, in coastal areas, it is important to understand the impacts associated with groundwater withdrawals in relation to the freshwater and saltwater interactions. In particular, because of the County's close proximity to the Atlantic Ocean and the Chesapeake Bay, saltwater intrusion potential exists County-wide.

Though Wicomico County is highly susceptible to saltwater intrusion, it is not considered a major threat to the surficial and Manokin aquifers at this time because of the substantial volume of water in the surficial aquifer, especially the Paleochannel and the fact that the volume of users of the Manokin Aquifer are a substantial distance away from a saline water body (Chesapeake Bay or other tidal areas). However, the MGS aquifer database will include a distribution of brackish water in major aquifers. Once the database is completed and the report published, Wicomico County should review and decide on any further actions that may be deemed necessary.

Jurisdictional Issues

The Manokin Aquifer and the water table, as well as the Nanticoke Aquifer, traverse political boundaries into other jurisdictions. Because of this, it is important that Wicomico County continues to coordinate with its municipalities and Somerset, Worcester, and Dorchester Counties in Maryland, and Sussex County, Delaware, to resolve any issues that may arise. In the case of the Manokin aquifer, Somerset and Wicomico Counties should continue to coordinate with MDE. Ultimately, it is the responsibility of MDE to monitor the use and recharge of the aquifer to ensure that both counties can use the aquifer in the future.

Policies:

- Ensure the Maryland Department of the Environment continues to monitor potable water supply levels in the County.
- Reduce risk of surficial contamination in vulnerable aquifers.
- Ensure the Maryland Department of the Environment continues to monitor aquifer risk for saltwater intrusion.
- Ensure coordination with adjacent municipalities, counties, and states concerning water supply.
- Work to assure the provision of necessary facilities and services in areas designated for growth.
- Locate and employ conservation and preservation resources to encourage the preservation of woodlands and healthy forests.
- While development is permitted in the rural areas of the County, zoning and other regulations should be used to encourage increased development in designated growth areas and minimize the impact of development on rural lands.
- The establishment of Package Treatment Plants would be allowed in designated growth areas, provided that there are sufficient provisions to assure the long term maintenance and operation of a facility.
- Encourage environmentally sensitive design standards to minimize the impacts of nutrients and sediments into receiving waters, the Chesapeake Bay and its tributaries.

Implementation Strategies:

- Review USGS Atlantic Coastal Plain of Maryland Assessment and use methodology and resources to monitor aquifer levels and risk of surficial and saltwater contamination.
- Prohibit the use of package treatment plants in rural areas (Agricultural and Forested), except for institutional use and the service of existing development.
- Use funds from the State as well as Chesapeake Bay Restoration Funds to upgrade existing septic systems to denitrifying septic systems.
- Establish a Land Use Plan that supports the outcomes of the nutrient loading analysis. If the Land Use Plan does not support the outcome of the nutrient loading analysis, review the nutrient loading analysis to reflect the Land Use Plan.
- Establish water conservation techniques to be encouraged in development plans.
- Encourage the development of Sewer and Water Allocation Management Plans for each facility.

Tributaries Strategies applicable to 2009 Wicomico County Comprehensive Plan

Stormwater

- Newly developed and redeveloped lands should address stormwater management in accordance with Maryland's existing stormwater management regulatory requirements [i.e., using the Unified Sizing Criteria from the Maryland Stormwater Design Manual or promoting Environmental Sensitive (Site) Design (ESD) measures with the ultimate goal of sustainable development].
- All stormwater management practices for recently developed lands should be inspected and maintained in accordance with Maryland's existing stormwater management regulatory requirements or upgraded/retrofitted to more effectively reduce nutrients and/or provide channel protection where deemed appropriate and as funding is available.
- Educate residents to reduce home fertilizer use.
- Continue to implement Maryland's sediment and erosion control regulations for disturbed land.

On-site sewage disposal systems

- Encourage or require the upgrade of on-site sewage disposal systems and to consider applying for funding on behalf of landowners in a block-grant approach.

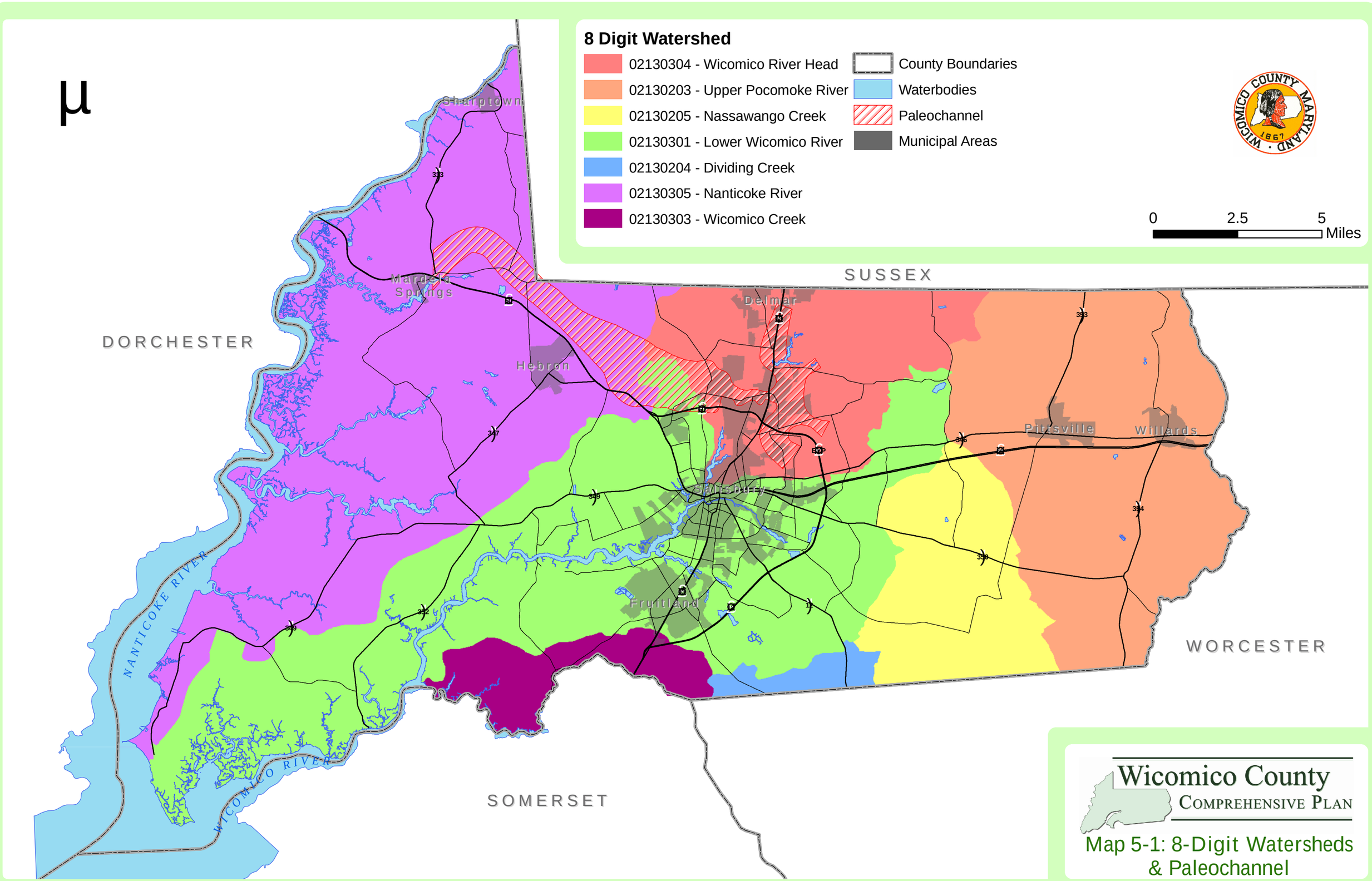
Growth management

- Enact and enforce regulations, provisions, policies, and programs that direct growth to designated growth areas.
- Plan for appropriate development in areas with impaired waters.
- Consider TMDLs and impaired waters in zoning decisions and comprehensive plans.

Agriculture

- Increase the retirement of highly erodible land. This is contingent on the reauthorization of the CREP Program.
- Encourage the use of grass buffers and riparian forest buffers.
- Encourage wetland restoration.
- Encourage long-term agricultural viability and management measures that minimize and reduce nutrient impacts.

Taken from *Maryland's Tributary Strategy Statewide Implementation Plan,* dated January 4, 2008



Map 5-1: 8-Digit Watersheds & Paleochannel