Chapter 4: Water Resources

Chapter 4

Water Resources

The Water Resources Element (WRE) of the Charles 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. It complies with the requirements of the Land Use Article, Chapter 426 of the Annotated Code of Maryland. It is consistent with Models and Guidelines 26 (M&G 26), the state guidance for preparing a WRE, as modified by subsequent written guidance from the Maryland Department of the Environment (MDE)—see Section 4.1.

The Towns of Indian Head and La Plata (the County's two incorporated municipalities) own and operate their own public water systems, wastewater treatment plants, most of their water distribution and wastewater collection systems, and municipal separate storm water systems (MS4). Both municipalities have adopted their own Water Resources Element (WRE) and Municipal Growth Elements (MGE). This countywide Water Resources Element compiles, to the greatest degree possible, up-to-date data from these and other municipal planning documents in order to coordinate water resources, growth, and land use planning.

Goals and Objectives

The goals of this element of the Plan are as follows:

4.1 In cooperation with the County's municipalities, the County will maintain safe and adequate drinking water supplies for existing and projected population and non-residential uses.

4.2 In cooperation with the County's municipalities, the County will ensure that adequate wastewater treatment capacity exists in public systems for existing and projected population and non-residential uses.

4.3 The County will take steps to meet regulatory requirements by protecting and restoring water quality in rivers and streams.

4.4 Water resources planning shall be a tool to direct the location, amount, and type of development in Charles County, by ensuring water resources are available to accommodate development in areas provided at densities established on the land use map without adverse impacts upon available water resources.

Supporting objectives are:

4.1 Measure supply and demand on an ongoing basis to determine future public water needs and take other actions needed to ensure adequate supply is available to meet demand.

4.2 Measure discharge and capacity on an ongoing basis to determine future public wastewater treatment needs and take other actions needed to ensure adequate treatment capacity is available to meet demand.

4.3 Continue to monitor point-source discharges to ensure compliance with the National Pollution Discharge Elimination Systems (NPDES) wastewater permit requirements.

4.4 Continue to monitor water quality and implement water quality improvements to ensure progress towards local Total Maximum Daily Loads (TMDL's), the Chesapeake Bay Total Maximum Daily Load (TMDL) County targets, and the State's Watershed Implementation Plan(s) (WIPs).

4.5 Continue to identify, develop and participate in programs and initiatives that reduce point and nonpoint source discharges of nutrients and other pollutants.

4.1 Background

Surface water and groundwater are highly complex systems that involve numerous inputs, outputs, and physical, chemical, and biological interactions. In accordance with M&G 26, this chapter is not intended to supersede the detailed water resources planning and implementation efforts underway in the State of Maryland and throughout the Chesapeake Bay watershed (see below). Rather, the WRE summarizes the best available water resources information and data in a way that facilitates the establishment and implementation of land use and other policies in the Comprehensive Plan.

Nutrient and Sediment Discharges and Assimilative Capacity

Along with sediment, nitrogen and phosphorus (more generally referred to as "nutrients") from wastewater, stormwater, and other "non-point sources" are the primary contributors to degraded water quality in the Chesapeake Bay watershed. Nutrients are generated by a variety of sources, such as wastewater treatment plants (WWTPs), residential and agricultural fertilizer, waste from livestock and wild animals, and airborne deposition of nitrogen and phosphorus. Watershed planning must take into account the "assimilative capacity" of a receiving body of water—the mass of nutrients that the water body can receive while still maintaining acceptable water quality. This section describes the key limits on assimilative capacity as they apply to the County.

Chesapeake Bay TMDL and WIP

The WRE synthesizes ongoing work associated with the approval and implementation of the nutrient and sediment Total Maximum Daily Load (TMDL)[1] for the Chesapeake Bay. In December 2010, after more than two decades of efforts to address this impairment, the US Environmental Protection Agency (USEPA) in partnership with state agencies within the Bay watershed, established the Chesapeake Bay TMDL. As part of the TMDL, the state and each county must prepare a Watershed Implementation Plan (WIP) to demonstrate how the TMDL will be successfully implemented. The Maryland Department of the Environment (MDE) has assigned nutrient and sediment targets to counties. Table 4-1 summarizes Charles County's maximum targeted nutrient loads by sector. MDE has not provided target sediment loads for sectors.

[1] A TMDL is a numerical expression of the maximum amount of pollutant that a water body can receive while still supporting designated and existing uses (such as swimming and fishing). TMDLs are established for "impaired" waters, as required by section 303 of the Clean Water Act. The Chesapeake Bay is impaired by nutrients (nitrogen and phosphorus) and sediments. The overall annual limits under the Chesapeake Bay TMDL are 185.9 million pounds of nitrogen, 12.5 million pounds of phosphorus, and 6.45 billion pounds of sediment, for the entire 64,000-square mile Bay watershed, which includes portions of six states and the District of Columbia.

Table 4-1 Watershed Implementation Plan Targets for Charles County

	2010 Progress		2017 Interim Target		2025 Final Target	
Sector	**N[1]**	**P[1]**	**N**	**P**	**N**	**P**
Agriculture	232,522	22,790	186,763	19,106	167,152	17,527
Stormwater	222,546	30,419	212,372	29,732	208,011	29,438
Septic[2]	182,507	n/a	141,584	n/a	124,046	n/a
Forest	331,904	11,263	335,316	11,386	336,779	11,438
Wastewater	224,508	13,557	300,205	17,264	346,976	19,911
Total	**1,193,987**	**78,029**	**1,176,240**	**77,488**	**1,182,964**	**78,314**

Source: MDE, WIP Phase II County Strategy Summary, via website: http://www.mde.state.md.us/programs/Water/TMDL/TMDLImplementation/Pages/WIP_Phase_II_County_Strategy_Summaries.aspx:
1: N = Nitrogen; P = Phosphorus. All units expressed in pounds per year.
2: MDE does not consider septic systems to be sources of phosphorus (See M&G 26).

In 2012, Charles County entered into official correspondence with the Maryland Department of Planning (MDP) and MDE regarding the relationship between the County's WRE, Maryland's Bay Phase II WIP, and USEPA's Bay TMDL. The agencies stated that in light of ongoing State and County WIP development, the WRE need not include some of the technical analyses recommended in M&G 26, specifically water quality modeling. Please see Section 4.5 for a more detailed description of these recommendations.

The State's Phase II WIP for Charles County lists specific actions to achieve Bay TMDL targets. The County published its Phase II WIP Strategy in February 2013. Actions in the State's Phase II WIP affect agriculture, forest, developed land, septic systems, stormwater management (SWM), and wastewater facilities. Actions in the County's Phase II WIP affect septic systems, SWM, and wastewater facilities. Many implementation actions, such as preservation of wetlands and forest, and agricultural nutrient management, are already County policy or state law. Examples of recommended actions in the WIPs include:

- stream restoration and shoreline erosion control;
- grazing and pasture management;
- adding nitrogen-removing technology to septic systems;
- connecting existing septic systems to waste water treatment plants; and
- improving urban nutrient management and stormwater filtering (including stormwater management retrofits), through techniques such as stormwater infiltration facilities, sand filters, landscaped swales, or bioretention areas.

Other TMDLs

Prior to establishment of the Chesapeake Bay TMDL, MDE had established (and the US EPA approved) nutrient TMDLs for the Mattawoman Creek and Port Tobacco River watersheds. Table 4-2 lists these nutrient-impairments and the corresponding TMDL.[2] Although the Chesapeake Bay TMDL limits nutrients and sediment loads in every County watershed, the two watershed-specific TMDLs also remain valid. No other watershed-specific draft or final nutrient TMDLs were prepared for impaired waters in Charles County. In addition to nutrients, some watersheds in Charles County are impaired by other substances, such as bacteria, PCBs, or excess amounts of sediment.

Table 4-2 Approved Nutrient TMDLs for Charles County Watersheds

Watershed	Impairing Nutrient	Nonpoint Source TMDL (lbs/year)	Point Source TMDL (lbs/year)
Mattawoman Creek[1]	Nitrogen	116,699	85,784
	Phosphorus	5,304	11,786
Port Tobacco River	Nitrogen	194,750	42,720
	Phosphorus	13,300	1,870

Notes:
1: The Point Source component of the Mattawoman TMDL includes approximately 52,006 lbs/year of nitrogen and 5,815 lbs/year of phosphorus from urban stormwater in Charles County. This runoff is regulated as a point source discharge through the County's NPDES MS4 permit.

The point source TMDLs shown in Table 4-1 apply to WWTPs and municipal storm sewer systems discharging into these watersheds.

Antidegradation

Maryland's antidegradation policy significantly limits new or expanded discharge permits that would degrade water quality. The focus of the antidegradation policy is on Tier II (high quality) waters, as defined by the US Environmental Protection Agency (EPA), which are subject to special protections to maintain high water quality. Within Tier II watersheds, new or expanded discharges can only be permitted in limited circumstances. (Note: These "Tier" designations are not the same as when we refer to the "Tier Map", based on the Sustainable Growth and Agricultural Preservation Act of 2012, which is focused on controls of septic systems.)

[2] MDE maintains a full listing of impairments and available TMDLs at http://www.mde.state.md.us/programs/Water/TMDL/Integrated303dReports/Pages/303d.aspx

Charles County has 34 segments of Tier II waters.[3] The Mount Carmel Woods WWTP currently discharges to Jennie Run, a Tier II stream. However, this discharge is in the process of being eliminated, with flows transferred to the Mattawoman WWTP via a new pump station. None of the other WWTPs evaluated in this WRE discharge to (or upstream of) a Tier II stream segment. Stormwater is also evaluated when being discharged to a Tier II water.

Other Assumptions

In developing the WRE, the County makes the following assumptions regarding water, wastewater, stormwater, and nonpoint source pollution:

- Analyses of water and sewer systems are based on average daily demand and/or flow. Engineering considerations such as the maximum single-day demand or the month of maximum demand are addressed in the County's Comprehensive Water and Sewer Plan.
- Average water consumption in Charles County is 208 gallons per day (gpd) per dwelling unit. Average wastewater generation is 250 gpd per dwelling unit. Non-residential water demand and wastewater generation is expressed in terms of "equivalent" dwelling units (EDU). Wastewater generation per dwelling unit is higher than water consumption, to account for inflow and infiltration into sewer lines.[4]
- The characterizations of groundwater in Charles County are intentionally general. The County recognizes that water availability in individual wells and communities does not always match the WRE's broad descriptions of water supplies.

4.2 Scenarios

As described in Chapter 1, the 2016 Comprehensive Plan process included substantial public input. As part of this input, alternative land use scenarios were created and evaluated to varying degrees. To gauge how alternative land use policies might affect water quality and drinking water supply, the WRE specifically evaluates two scenarios, described below. This compares the alternatives based on the recommended plan by the Planning Commission in 2013, with more recent changes in 2016 based on adoption of a Tier Map and land uses adjusted to match the Tier Map. While each scenario assumed a different distribution of land use and development, they each assumed the same total population in 2040.

2016 Planning Commission Recommended Scenario (Includes Adopted Tiers Map): This scenario reflects the land use plan proposed by the Planning Commission, as well as the Tier Map adopted by the County Commissioners on April 29, 2014. For modeling purposes, this chapter assumes that development under the Planning Commission's Plan Recommended Scenario (considering the new Tiers Map) will use approximately five percent more rural land (i.e., Rural Conservation areas) than the Merged Scenario developed in late 2011[4], and that public water and sewer system demand is unchanged from the Merged Scenario. The

[3] Source: Maryland Department of the Environment, http://mde.maryland.gov/programs/Water/TMDL/Water%20Quality%20Standards/Pages/HighQualityWatersMap.aspx

[4] Source: Charles County Water/Sewer Allocation Study, 2012.

[4] Resulting in approximately 875 additional acres of impervious surface in the Rural Conservation area.

portion of the Watershed Conservation District that falls into Tier 4 is evaluated as Tier 4 land, and not as land that would eventually be developed using public water and sewer service.

The basis for the five percent assumption is a GIS-based comparison of the Merged Scenario, Tiers map, and the Planning Commissions Recommended Scenario. While the land use designations in the Merged and Planning Commissions Plan Scenarios differ, the net effect on development patterns—the number of housing units and amount of land developed through 2040—is small. Therefore, the Merged Scenario is not evaluated as a distinct third scenario in this chapter.

- **2013 Planning Commission Recommended Scenario:** This land use scenario is the Recommended Scenario from the August 5, 2013 Planning Commission Recommended Comprehensive Plan.

It should be noted that the existing water and sewer demand data in this Water Resources Element differ from similar numbers that were in the 2013 Planning Commission Recommended Comprehensive Plan. This change reflects updated demand data collected by the County. In some cases, these data show a drop (relative to the 2013 Planning Commission Recommended Comprehensive Plan) in existing water or sewer demand, and thus an increase in existing water or sewer capacity. In other cases, permitted limits may have changed, affecting the available capacity in particular water or wastewater systems.

Note: At their final work session on the Comprehensive Plan on June 28, 2016, the County Commissioners made final changes to the plan's land use map to limit development in rural areas and protect natural resources, including placing 37,455 acres into the Watershed Conservation District with a density of one unit per twenty acres. It is expected that these changes will further reduce pollution loads than that documented by the previous scenarios as outlined above.

4.3 Drinking Water Assessment

Drinking Water Sources

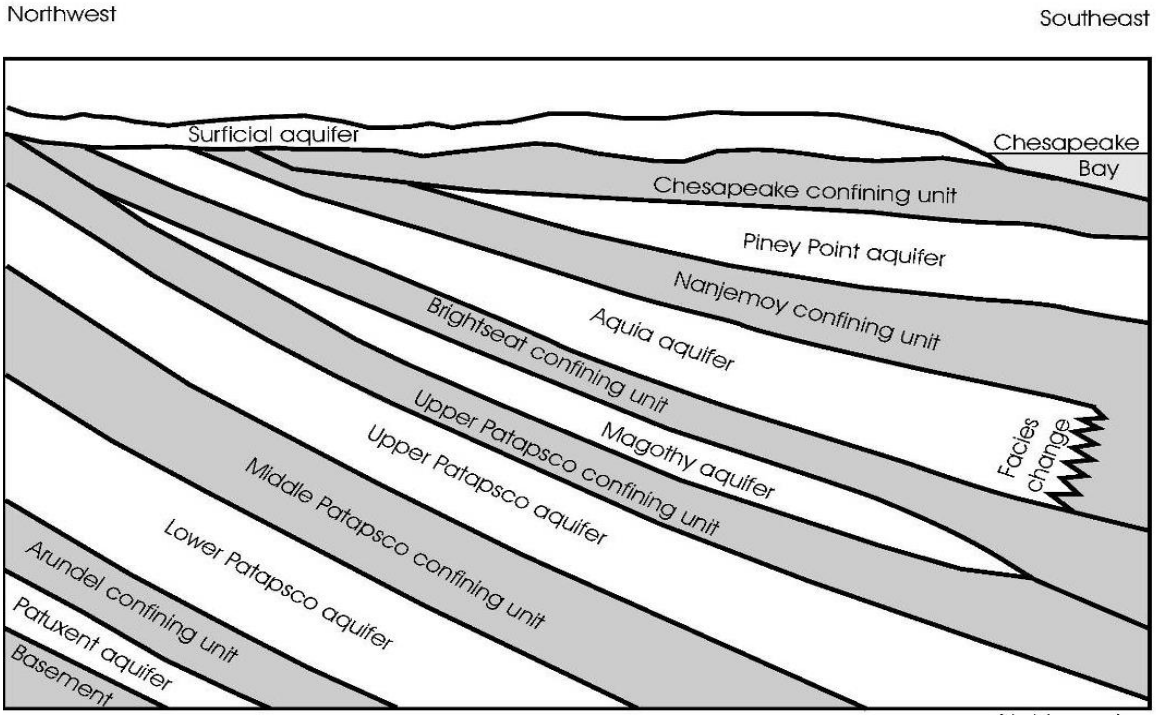
Although Charles County is bordered by both the Patuxent and Potomac River systems, groundwater is the primary source of water for nearly all of the County's public and private water systems. The major groundwater resources of Charles County are the aquifers of the Patuxent, Patapsco, Magothy, and Aquia Formations (see Figure 4-1). A more detailed description of these aquifers is included in the County's Comprehensive Water and Sewer Plan. Several studies over the last two decades have determined that the local groundwater supply may be limited in certain areas due to the natural geology and recharge rate of these aquifers.

At the same time, the ability to obtain drinking water supplies from surface water within the County is constrained because of salinity concentrations. The County supplements the groundwater supply to the Waldorf and Bensville areas by purchasing potable water from the Washington Suburban Sanitary Commission (WSSC). WSSC obtains its water from a more

northern reach of the Potomac River near Washington, D.C., which has lower salinity concentrations. Surface water treatment systems within the County will require a detailed investigation, analysis, cost assessment, and permitting, in order to develop an additional public drinking water source.

Concerns have been raised over natural gas drilling and in particular the use of "fracking" technology and potential impacts to groundwater in Maryland. Fracking is the process of drilling down into the earth before a high pressure water mixture is directed at the rock to release the gas inside. Water, sand and chemicals are injected into the rock at high pressure which allows the gas to flow out of the head of the well. The State of Maryland is studying the environmental impacts of this technology and Charles County has established a "no-fracking" policy until further impacts are determined safe for groundwater and the Board of County Commissioners authorizes such action. The zoning code will be updated to implement this policy.

Figure 4-1 Major Aquifers in Southern Maryland



Source: Maryland Geological Survey, Reports of Investigations #76, 2007.

Public Water Systems

Groundwater is the primary source of potable water for Charles County's public water systems. There are 49 central water supply systems in Charles County that provide potable water service to approximately 35,000 housing units (two thirds of the County total).[5] Of these systems, 17 are operated by the County. The Towns of Indian Head and La Plata each operate their own water systems, and the remaining systems are privately operated. Table 4-3 shows the sources and

[5] Based on 2014 estimates/updates from the 2006 Charles County Comprehensive Water and Sewer Plan. Charles County Department of Planning & Growth Management, 2014.

characteristics of the 11 existing "major" public drinking water systems—those with a permitted withdrawal of more than 50,000 gpd—as well as non-public systems at the Naval Support Facility Indian Head (NSFIH) and the Morgantown Generating Station.

The County's public water systems rely on four primary water-bearing formations. From the deepest to shallowest they are the confined Patuxent, Patapsco (Upper and Lower), Magothy, and Aquia aquifers. County-operated public systems primarily use the Magothy and Lower Patapsco aquifers. The Patuxent Aquifer is the main source of potable water for the Town of Indian Head Municipal Water System and the County's Bryans Road Water System in the western section of the County. However, the Patuxent aquifer remains a relatively unused water resource for the County. Figure 4-2 shows the location of water service areas in Charles County. Table 4-4 shows the existing and projected water supplies, demands, surpluses, and deficits for these water systems under each of the scenarios described in Section 4.2.

Table 4-3 Drinking Water System Characteristics

Water System[1]	Source Aquifer (number of wells)	Source Concerns/System Issues
Avon Crest	Patapsco (1)	
Benedict	Aquia (2)	
Bryan's Road	Patapsco (1) Patuxent (3)	New Patuxent aquifer well and planned interconnection with Waldorf/Bensville system for support/flow redundancy. Lower Patapsco well only for temporary back-up supply. Includes Strawberry Hills Estates water system (connected in 2014).
Cliffton	Patapsco (2)	Replace one existing well
Hunter's Brook	Patuxent (2)	
Indian Head	Patapsco (4), Patuxent (1)	Increased Patuxent Appropriation requested.
La Plata	Patapsco (5)	Increased water appropriation needed to support projected growth.
Swan Point	Patapsco (2)	
Waldorf	Magothy (9), Patapsco (7)	Additional WSSC appropriation as needed
College of Southern MD	2 wells	
NSFIH	Patuxent (3), Patapsco (3)	Some past river water intrusion. Additional Patuxent aquifer well planned.
Morgantown Generating Station	Patapsco (1), Surface Water (Potomac River)	

Source: Charles County Department of Planning and Growth Management, and Department of Public Works.
Only lists systems with capacities greater than 50,000 gallons per day (gpd)

Figure 4-2 Public Water Service Areas

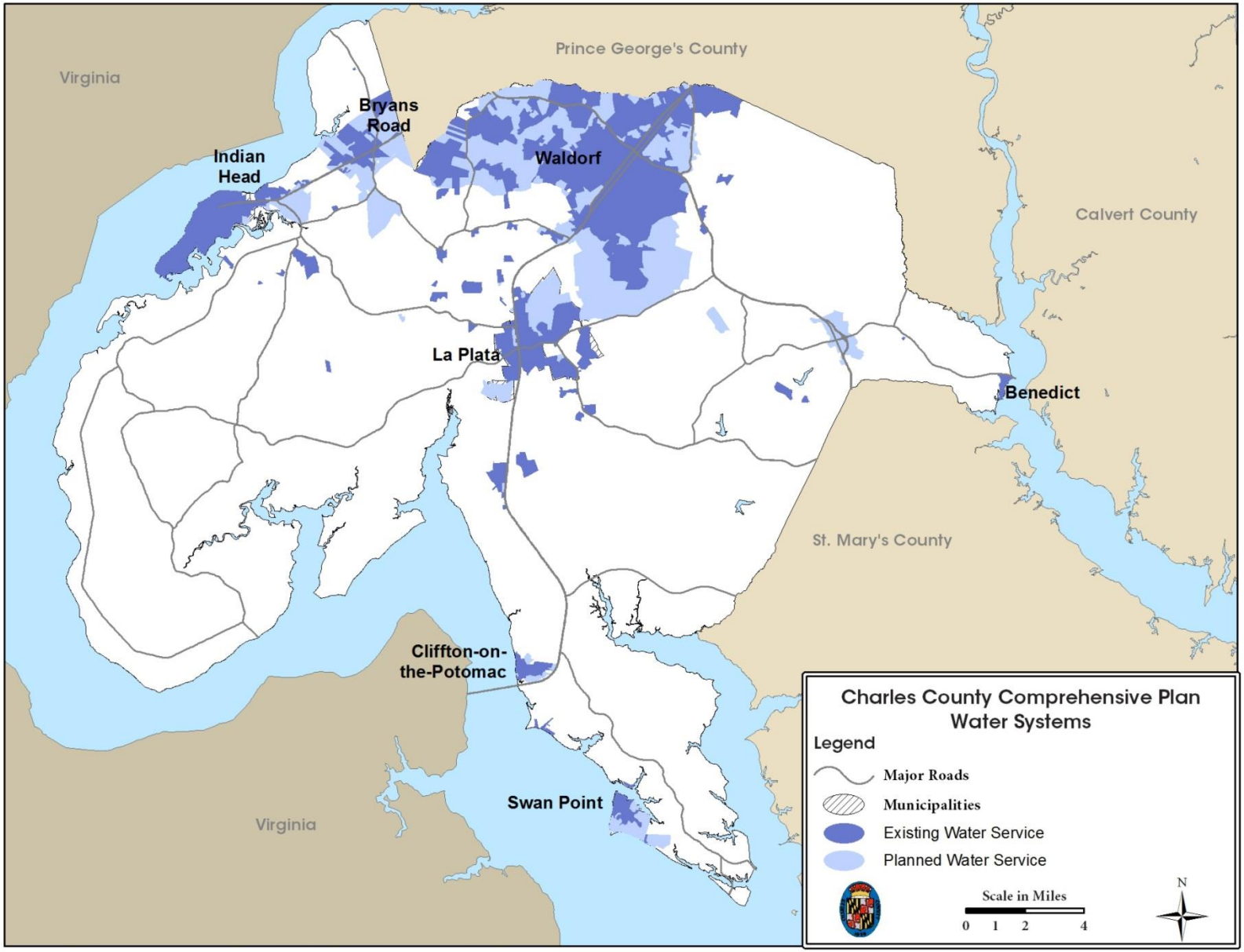


Table 4-4 Drinking Water System Demand and Capacity, 2040

Scenario[1]		Benedict (St. Francis) A	Benedict (St. Francis) B	Bryans Road[5] A	Bryans Road[5] B	Cliffton on the Potomac A	Cliffton on the Potomac B	Hunter's Brooke All	Town of Indian Head[6] All
Existing Permitted Water Production	gpd[2]		56,000		570,000		85,000	116,000	338,000
	EDU[2]		269		2,740		409	558	1,657
Average Daily Demand, 2013	gpd		18,775		400,213		53,647	45,799	279,957
	EDU		90		1,924		258	220	1,372
Net Available Capacity, 2013	gpd		37,225		169,787		31,353	70,221	58,043
	EDU		179		816		127	338	285
Total Projected New Demand, 2013-2040[3]	gpd	8,320	7,488	398,528	366,080	41,600	37,856	-	194,250
	EDU	40	36	1,916	1,760	200	182	-	952
Grand Total Projected Demand, 2040	gpd	27,095	7,488	798,741	366,080	95,247	37,856	45,799	474,207
	EDU	130	36	3,840	1,760	458	182	220	2,325
System Capacity, 2040[4]	gpd		56,000		570,000		90,000	116,000	588,000
	EDU		269		2,740		433	558	2,882
Net Available Capacity, 2040	**gpd**	**28,905**	**29,737**	**(228,741)**	**(196,293)**	**(10,247)**	**(6,503)**	**70,201**	**113,793**
	EDU	**139**	**143**	**(1,100)**	**(944)**	**(49)**	**(31)**	**338**	**558**

Notes:
1: A =2014 Comprehensive Plan Recommended Scenario; B = 2013 Planning Commission Recommended Scenario
2: gpd = gallons per day; EDU = An Equivalent Dwelling Unit (EDU) is 208 gallons per day (gpd) for County systems, 204 gpd for the Town of Indian Head, and 222 gpd for the Town of La Plata.
3: Includes projected new residential and non-residential demand, as well as new demand from system extensions. Assumes that new non-residential system demand is approximately 20 percent of total new residential demand.
4: Incorporates ongoing, planned, and recommended upgrades and expansions. La Plata has requested total allocation of 2.0 MGD. Indian Head's future supply reflects a Patuxent aquifer well with a 250,000 gpd allocation.
5: Reflects the connection of the Strawberry Hills system to the Bryans Road system. While the Comprehensive Plan assumes that the Bryans Road and Waldorf systems will be interconnected by 2040, the Bryans Road system is modeled separately here due to its relatively large permitted withdrawal.
6 The Town of Indian Head did not provide updated water and sewer data. Information presented here reflects data presented in the County's 2011 WRE.

Table 4-4 Drinking Water System Demand and Capacity, 2040 (Continued)

Scenario[1]		Town of La Plata A	Town of La Plata B	Swan Point A	Swan Point B	Waldorf System A	Waldorf System B	NSFIH All
Existing Permitted Water Production	gpd		1,234,000		500,000		7,070,000	1,890,000
	EDU		5,559		2,404		33,990	9,087
Average Daily Demand, 2014	gpd		930,500		60,953		5,302,000	1,106,000
	EDU		4,191		293		25,490	5,317
Net Available Capacity, 2014	gpd		303,500		439,047		1,768,000	784,000
	EDU		1,367		2,111		8,500	3,769
Total Projected New Demand, 2014-2040[3]	gpd	1,174,368	1,253,412	100,048	91,520	4,305,600	4,305,574	0
	EDU	5,646	5,646	481	440	20,700	20,700	0
Grand Total Projected Demand, 2040	gpd	2,090,676	1,253,412	161,001	152,473	9,607,600	9,607,574	1,106,000
	EDU	10,051	5,646	774	733	46,190	46,190	5,317
System Capacity, 2040[4]	gpd		2,000,000		500,000		7,070,000	1,890,000
	EDU		9,009		2,404		33,990	9,087
Net Available Capacity, 2040	**gpd**	**(856,676)**	**(935,720)**	**338,999**	**347,527**	**(2,537,600)**	**(2,537,534)**	**784,000**
	EDU	**(3,859)**	**(4,215)**	**1,630**	**1,671**	**(12,200)**	**(12,200)**	**3,769**

Sources:
Maryland Property View 2009; Charles County Comprehensive Water and Sewer Plan, and Charles County Department of Planning and Growth Management, and Department of Public Utilities. Data for the Towns of La Plata and Indian Head based on adopted Municipal Growth Elements and Water Resources Elements for those jurisdictions.

Waldorf

The Waldorf water system is the largest and most significant in the County. It serves much of the Development District, including Waldorf, St. Charles, Bensville, and portions of White Plains. The Bensville system, formerly a separate service area, was interconnected to the Waldorf system in 2008. Charles County owns, operates, and maintains the Waldorf water distribution system, as well as the 16 production wells that provide water to the system. Nine of these wells tap the Magothy Aquifer, while another seven wells are in the Patapsco aquifers.

As described above, the Waldorf system is interconnected to WSSC. Through an agreement, Charles County can purchase up to 1.4 MGD of water from WSSC. The County has also explored options to expand the WSSC agreement to allow purchase of up to an additional 5 MGD of water as a short-term to mid-term water source. Such expanded water purchases will involve coordination with Prince George's County, the "upstream" user of WSSC water. Additional mid-term to long-term options will be explored and determined during the planning period of this Comprehensive Plan.

Other future plans for the Waldorf system include interconnection with the Bryans Road water system, which will fulfill the Comprehensive Water and Sewer Plan's interconnection goal for the Development District.

Bryans Road

The Bryans Road water system is the second largest water system in the County, and serves the northwestern section of the County's Water Service Area. Primarily serving the Bryans Road Town Center and the surrounding suburban neighborhoods and commercial properties, the system previously consisted of five Lower Patapsco aquifer wells and two Patuxent aquifer wells. Due to declining aquifer water levels in the Lower Patapsco aquifer in 2007, the County coordinated a shift in withdrawals with the Maryland Department of the Environment (MDE), to the Patuxent aquifer. Subsequent to the shift to this deeper aquifer, groundwater levels in the Lower Patapsco aquifer in the surrounding area have rebounded significantly. The Strawberry Hills public water system was interconnected with the Bryans Road system in 2013, which included the de-commissioning of one of two remaining Lower Patapsco aquifer wells that were part of that system. The remaining Lower Patapsco well in Strawberry Hills will remain as a back-up supply well. In 2014 the County completed a third production well into the Patuxent aquifer to provide additional support and redundancy within the water system. The planned interconnection with the Waldorf water system will provide long-term system redundancy and will shift water withdraws to balance groundwater levels in the County's aquifers, while maximizing groundwater recharge rates.

Other Major Systems

Other major water systems in Charles County include the municipally-owned systems serving La Plata and Indian Head, as well as County-operated systems in Clifton, Benedict, and Swan Point, among others. More detailed information on existing and proposed future County water service areas can be found in the County's Comprehensive Water and Sewer Plan. The Water Resources Elements of the Indian Head and La Plata Comprehensive Plans include detailed information about these municipal water systems.

Minor Systems

Smaller public systems in the County (those with average permitted withdrawals of less than 50,000 gpd) account for nearly 1.55 MGD of permitted withdrawals from a variety of aquifers and an annual average of 0.66 MGD of demand. Collectively, these systems—which typically serve individual subdivisions, mobile home parks, or schools throughout the County—have nearly 0.89 MGD of unused capacity.

Water System Capacity

County-operated public water systems all have available capacity to support some additional growth and development. With no changes to current permitted water supplies, the Waldorf system would be able to support projected demand through 2040 under both scenarios. The Bryans Road system would need additional water supplies under both scenarios (under current permits).

The County's long-term intent is to interconnect the Waldorf and Bryans Road systems in order to prevent such a deficit. The resulting combined Bryans Road-Waldorf system would use nearly all of its current permitted capacity under the Comprehensive Plan Recommended scenario. Under the 2016 Comprehensive Plan Recommended Scenario, demand in the combined Waldorf-Bryans Road system would exceed permitted capacity by approximately 0.19 MGD. The County is developing production wells in the Patuxent aquifer as one way to address this concern.

Water demand in the Clifton system through 2040 would also slightly exceed the current permitted capacity under both scenarios. All other County-operated water systems would also have adequate capacity to support projected demand in both scenarios.

The Town of Indian Head's water system has adequate supply to support the growth identified in its Comprehensive Plan. The Town of La Plata is currently seeking an expanded groundwater permit for 2 MGD of withdrawal to meet their projected growth demands. However, the Town would still need additional water supplies to serve projected demand in both scenarios to meet projected demand in 2040.

Other Water Use

All residential units and businesses in Charles County outside of public water systems rely on individual or community wells. These wells are drilled in a variety of water-bearing formations, including the same confined aquifers used by public systems, as well as unconfined surficial aquifers.

Private/Individual Residential Wells

Approximately one-third of the housing units in the County (approximately 18,000 households) are served by individual wells.[6] These wells draw water from several different aquifers. The Aquia aquifer is primarily used in the eastern and southern portion of the County; the Magothy is used by individual wells in the north-central portion of the County; and the Upper and Lower Patapsco aquifers are used in the central

[6] Based on 2006 Charles County Water and Sewer Plan and MD Property View.

and western portions of the County. Of these major aquifers, the Aquia and Lower Patapsco are the most frequently used for individual wells.

The Maryland Department of the Environment has the responsibility for monitoring groundwater levels and managing and appropriating water withdrawals for public and domestic use. However, with the assistance of the Maryland Geological Survey (MGS), Charles County has taken the initiative to manage groundwater levels through monitoring. With the assistance of the County's Water Resources Advisory Committee (WRAC), the County has provided outreach and resources to operators of private community water systems. Where feasible, the County works with communities to connect aging private water systems to public water infrastructure. In a similar fashion, the County installs a connection stub to all developed properties that front a new water line, to provide an easier means of connection for the property owner. The County has established a water and sewer service area within the Development District and in several rural villages. While properties outside of those service areas will not receive public water service, the County continues to monitor water levels with the State's assistance and operates its public water systems in a way that minimizes effects on the water supply for individual homeowners, communities, and businesses outside the service area.

Major Commercial and Industrial Users Outside of Public Systems

Two major industries—the Morgantown Generating Station (adjacent to the Charles County terminus of the Harry Nice Bridge over the Potomac River) and the Naval Support Facility at Indian Head (NSFIH)—account for substantial non-residential groundwater usage in Charles County.[7] NSFIH withdraws groundwater primarily for domestic use on the base, and surface water from the Potomac River for cooling purposes within their on-site power generation facility. The Morgantown Generating Station also uses groundwater and withdraws as well as desalinates a significant amount of surface water (used as a coolant) from the Potomac River. The Morgantown and NSFIH plants are the only significant users of surface water in Charles County.

The Chalk Point Generating Station, at the extreme southern tip of Prince George's County (across Swanson Creek from the Benedict area in Charles County) also withdraws substantial amounts of groundwater—an average of approximately 0.45 MGD from the Magothy aquifer and 0.50 MGD from the Upper Patapsco aquifer. As part of the 2010 construction of the de-sulpherization scrubbers at the power plant, an additional well was drilled into Patuxent aquifer for use in their industrial cooling process.

Agricultural Users

Agriculture, irrigation, and livestock, largely in the eastern portion of the County, use groundwater and a small amount of surface water for irrigation. The groundwater source is typically the surficial (unconfined) aquifer.

[7] 2006 Charles County Water and Sewer Plan, 3-2.

Drinking Water Concerns, Issues, and Options

Water Quality

A limited number of homes and businesses in rural areas of Charles County obtain groundwater from shallow wells drilled into the surficial aquifer. These wells are at risk of bacterial contamination from individual septic systems, agricultural fertilizers, and other pollutants. Attrition of these shallow wells generally prompts these homeowners and businesses to drill a new well into a confined aquifer.

The Maryland Geological Survey (MGS)[8] and NSFIH have documented river-water intrusion into the Lower Patapsco aquifer from the Potomac River in the Indian Head area. Such intrusion is most likely to occur when very high volume groundwater pumping causes a reduction in underground pressure, allowing water from the Potomac riverbed (which may be unsuitable for human consumption) to intrude. There have not been documented instances of river water intrusion in public water systems operated by Charles County.

Groundwater Recharge

The primary goal for Charles County's major public water systems is to ensure the adequacy of available supplies to support existing users and projected growth. County-owned water systems obtain approximately half of their drinking water from the Lower Patapsco aquifer, which has shown past evidence of water level decline from increased use.[9] Other commonly used aquifers, such as the Magothy and Aquia, are heavily used across the state, particularly on the Eastern Shore, and are subject to withdrawal limitations.

Groundwater supplies in Southern Maryland, and particularly in Charles County, have been the subject of considerable study by MGS and other state agencies. The County has studied groundwater levels with the assistance of the State agencies and specialized consultants for over 25 years. These efforts have resulted in over 15 detailed studies, a widespread groundwater monitoring network, a capital program to build needed distribution infrastructure, and a local Water Resources Advisory Committee to continue the evolution of water supply techniques and sources. Additional detail on these studies and their recommendations and outcomes is included in the Appendix "E" materials at the end of this plan.

MDE adjusts withdrawal permits in response to aquifer behavior. The County has a contract with MGS to perform annual groundwater monitoring from 25 observation wells in various aquifers located across the County. The County works with MGS to ensure water levels are maintained above 80 percent management levels (or other designated management levels, as appropriate). Recent computer models of the aquifers have indicated to MGS and MDE that the Lower Patapsco Aquifer will likely have less available capacity than previously thought. Based on the unique geographic location,

[8] Source: MGS. 2007. Report of Investigations No. 76: Water-Supply Potential of the Coastal Plain Aquifers in Calvert, Charles, and St. Mary's Counties…

[9] 2006 Charles County Water Resource Advisory Committee Report, p.6.

geology and associated underground strata, it was estimated that Charles County would be affected by this change in available drawdown. To compensate for these forecasted issues, MDE reduced the allocation of (Lower Patapsco) groundwater to the Waldorf Water System during the 2014 Groundwater Appropriation Permit renewal. These permit changes and the resulting system capacity is reflected in Table 4-4 under the Waldorf System.

Residential and commercial development using public water within Waldorf may be limited by the Groundwater Appropriation Permits issued by the State if additional appropriation is not granted from other aquifers or alternative sources are not developed. The County is currently exploring alternative water resources to supplement drinking water supplies into the future. Once the results of the study are completed, the County will develop a strategy to implement the most effective plan of action for a sustainable source of water for existing and future water users. Development activity will be limited by the availability of water resources.

Municipal Water Systems

La Plata Water System

Whereas the Waldorf water system has several potential water sources (including groundwater aquifers and surface water sources via WSSC), the La Plata system is currently limited to withdrawals from the Lower Patapsco aquifer. The Town will need increased permitted withdrawals to meet water demand from development planned through 2040. MDE will examine any such request from the Town against known groundwater data and permitted capacity, and will take into consideration existing users of the aquifer—including individual wells.

One potential approach to meeting the Town's future needs is interconnection of the La Plata and Waldorf water systems. Interconnection could provide water supply redundancy while reducing dependence on a single water resource. Such an option would require construction of two to four miles of distribution lines to connect the two systems. An inter-jurisdictional interconnection agreement would also be required, and would specifically need to address the different fee structures of the two systems.

Indian Head Water System

The Indian Head water system withdrawals groundwater from the Lower Patapsco and Patuxent aquifers. Under the Town's current groundwater appropriation permits, adequate capacity exists to accommodate projected growth. However, in order to meet the needs of planned growth, and to reduce stress on the Patapsco aquifer—the primary source of drinking water for private wells in north-western Charles County—the Town recently drilled a new Patuxent well for water supply and has requested an additional allocation of 250,000 gpd from MDE. The draft permit will allow the Town to withdraw an average of 110,000 gpd from the Patuxent aquifer.

Options to Address Drinking Water Issues

This section lists policy and infrastructure options to address drinking water concerns and issues in Charles County, focusing on options that preserve or increase water supplies for current and future residents. Additional detail on these options is provided in the

Comprehensive Plan Appendix "C". [10] A combination of these actions is needed for the long-range planning horizon of 2040 to ensure that adequate capacity is available when needed.

Considering water demand on aquifers from projected growth throughout southern Maryland and Northern Virginia, the County anticipates the need to move to alternative water sources. While near term projections have adequate supply to meet demand, Charles County is currently studying various alternative water supply options such as those listed below. The results of the County's studies will be available in 2016, and the findings of this study will be used to plan and fund the necessary improvements to provide future water services to meet the projected demand described in this Comprehensive Plan.

Potential New Water Supplies

- Relocate water production wells to portions of the Patapsco Aquifer located farther southeast in Charles County where the aquifer has greater capabilities and capacity (underway as of late 2012).
- Implement a Wellfield Management System which includes construction of new well fields and the automation of well pumping, to better balance use of existing groundwater supplies (implementation underway).
- Develop potable water production wells (beyond those already being developed) in the Patuxent aquifer.
- Expand purchases of surface water from the WSSC, from the currently permitted 1.4 MGD to up to 6.4 MGD.
- Complete interconnection of the Waldorf and Bryans Road water systems to balance groundwater withdrawals and maintain adequate water levels in the aquifers.
- Develop a new surface water withdrawal, with desalinization and distribution infrastructure, on the Potomac or Patuxent Rivers within Charles County. This could occur in conjunction with private industry (e.g., Morgantown Generating Station) and/or neighboring jurisdictions.

Other Considerations

- Water conservation and water-conscious decision-making by residents and businesses are the lowest-cost option for making the most efficient use of available water supplies. Re-use of graywater and use of rainwater inside a building is permitted if compliant with the Maryland State Plumbing Code and/or local plumbing code.
- Expanded reuse of treated wastewater and/or stormwater—such as additional process water at power plants or landscape irrigation—reduces demand for groundwater.
- Development of an Aquifer Storage Recovery System, by injecting water back into the aquifers during low consumption periods to enhance groundwater recharge, if permitted by MDE.

[10] Many of these options are included in the 2006 Charles County Water Resource Advisory Committee Report, p.22.

- Continued implementation of source water protection measures helps to ensure the security and safety of existing water supplies.

4.4 Wastewater Assessment

Summary and Analysis of Wastewater System Data

Public Sewer Systems

Approximately 35,000 housing units in Charles County (two thirds of the County total) and a considerable share of businesses discharge wastewater to one of the six County, municipal, or private (community) WWTPs.[11] NSFIH also operates a WWTP.[12] Table 4-5 describes the County's public sewer service areas (including industrial systems not described in this chapter) and WWTPs, sorted by the watershed into which effluent is discharged. Figure 4-3 shows the location of these facilities. Table 4-6 shows the existing and projected demands, surpluses, and deficits for these wastewater systems under each of the scenarios described in Section 4.2.

The Mattawoman WWTP is the County's largest WWTP, with a capacity 20 MGD. The existing flows to this facility in Table 4-5 include approximately 1.1 MGD from WSSC (out of a total of 1.8 MGD allocated to WSSC); the future demand data in Table 4-5 assume that WSSC will utilize its entire 1.8 MGD capacity by 2040.[13] A more detailed description of the County's public wastewater systems is in the Comprehensive Water and Sewer Plan. The Towns of Indian Head and La Plata provide public sewer services for properties within their corporate limits. The Indian Head and La Plata Water Resource Elements include detailed information about these wastewater systems.

Charles County owns and operates the remaining WWTPs in the County. All of the County's public sewer systems have adequate capacity to serve the majority of projected development through 2040. With no changes to current permitted discharge amounts, the Mattawoman WWTP would be able to support projected development through 2040 under both scenarios.

Under both scenarios, the Mattawoman WWTP would have adequate capacity to support demand through approximately 2040. The Mt. Carmel Woods and College of Southern Maryland WWTPs will be decommissioned, with effluent to be pumped to the Mattawoman WWTP.

[11] The 2006 Charles County Water and Sewer Plan reports 33,600 units on public sewer systems, but more recent data from the County's Resource and Infrastructure Management Division indicates a total of nearly 40,000 units, including approximately 4,800 in incorporated municipalities.

[12] There are also several small (<0.1 MGD) privately-owned WWTPs scattered throughout the County. Because of their small size and private ownership, these facilities are not discussed in the WRE. Discharges from these facilities are included in the nutrient modeling that accompanies the County's WIP.

[13] Development plans for southern Prince George's County do not necessarily indicate full use of the 3 MGD allocation. However, this chapter assumes maximum use of the 3 MGD allocation for modeling purposes.

The Maryland Public Service Commission has authorized Competitive Power Ventures (CPV) to construct a gas fired power plant in Charles County. The CPV plant will use treated wastewater effluent from the Mattawoman WWTP for non-contact cooling, thus reducing the amount of effluent discharged to the Potomac River. Since State wastewater permits are based on discharge quality and quantity, these estimated reductions in discharge may create additional capacity for the WWTP and accommodate additional growth. As of 2014, construction permits for this wastewater reuse were issued; initial estimates are that the CPV plant could use up to 5 MGD of treated effluent (see Energy Conservation, Chapter 6).

Table 4-5 Public Sewer System Characteristics

Wastewater Treatment Plant (by Watershed)[1]	Discharge Location	Treatment Technology[2]	Planned/Potential Upgrades/Expansions
Patuxent River			
Benedict (future)	Land application system.	Biological Nutrient Removal (BNR)	Under design. Estimated online by 2020.
Hughesville (future)	Land application system.	BNR	Design pending. Estimated online by 2020.
Mattawoman Creek			
Indian Head	Harrison Cut	Enhanced Nutrient Removal (ENR)	
Potomac River Middle Tidal			
Mattawoman	Potomac River	ENR. Some effluent used as process water at PANDA Brandywine power plant.	Planned effluent reuse by CPV power plant, online in 2015
Cliffton on the Potomac	Potomac River	Secondary	BNR/ENR upgrade
NSFIH	Potomac River	Secondary	ENR upgrade
Port Tobacco River			
La Plata	Tributary of Port Tobacco River	BNR	ENR upgrade estimated by 2015.
Mt. Carmel Woods	Jennie Run	Secondary	Plants to be retired, flows pumped to Mattawoman.
College of Southern MD	Port Tobacco R.	Secondary	
Port Tobacco (future)	To be determined	To be determined	To be determined
Lower Tidal Potomac River			
Swan Point	Cuckold Creek	ENR	None
Cobb Island (Breeze Farm)	Spray irrigation system.	Lagoon System, with spray irrigation.	Planned interconnection to Swan Point WWTP

Notes:
1: Source: Charles County Department of Planning and Growth Management, and Department of Public Utilities. Only lists systems with capacities greater than 50,000 gallons per day (gpd)
2: ENR is the best available wastewater treatment technology, resulting in loading as low as 3 mg of Nitrogen and 0.3 mg of Phosphorus per liter of effluent, compared to 8 and 2 mg/L, respectively for BNR.

Figure 4-3 Public Wastewater Service Areas

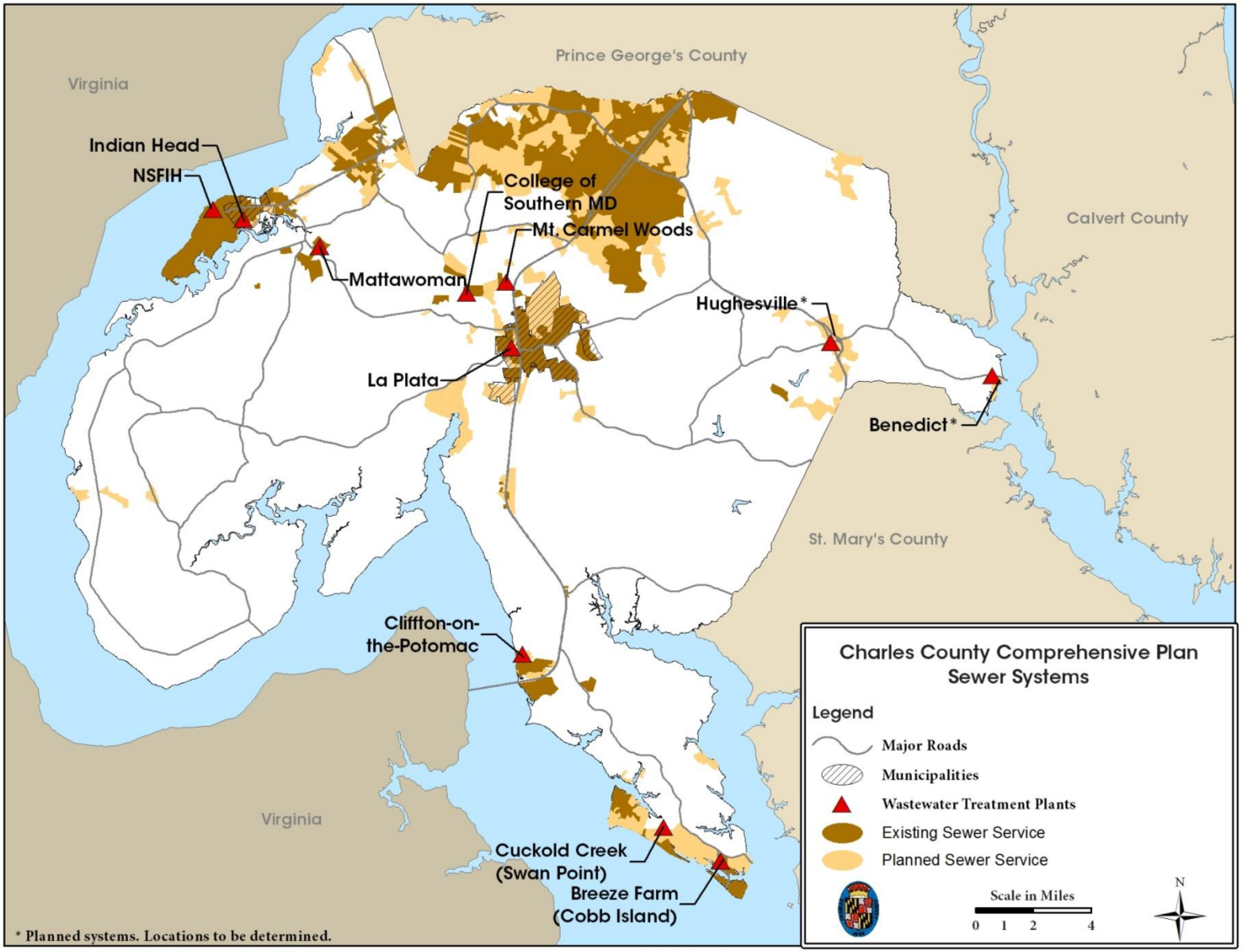


Table 4-6 Public and Major Private Sewer System Flows and Capacity, 2040

Watershed		Patuxent River	Middle Potomac River				
System		Benedict[6]	Mattawoman[7]		Cliffton on the Potomac		NSFIH[8]
Scenario[1]		All Scenarios	A	B	A	B	All Scenarios
Existing Treatment Capacity[2]	MGD[3]	0		20.000		0.070	0.500
	EDU[3]	0		80,000		280	2,000
Average Daily Flow, 2013	MGD	0		10.889		0.033	0.350
	EDU	0		43,556		132	1,400
Net Available Capacity, 2013	MGD	0		9.111		0.037	0.150
	EDU	0		36,444		148	600
Total projected new demand, 2013-2040[4]	MGD	0.059	8.818	8.257	0.006	0.007	0
	EDU	283	35,271	33,028	24	28	0
Grand Total Projected Demand, 2040	MGD	0.059	19.430	18.869	0.034	0.035	0.350
	EDU	283	77,720	75,477	136	140	1,400
Future Capacity, 2040[5]	MGD	0.059		20.000		0.070	0.500
	EDU	283		80,000		280	2,000
Net Available Projected Capacity, 2040	**MGD**	**0**	**0.570**	**1.131**	**0.036**	**0.035**	**0.150**
	EDU	**0**	**2,280**	**4,523**	**144**	**140**	**600**

Notes:
EDU 243 + 40 buffer
1: A =2014 Comprehensive Plan Recommended Scenario; B = 2013 Planning Commission Recommended Scenario
2: Indicates the more restrictive of either MDE's discharge permit or the system's design capacity.
3: MGD = Million Gallons per Day; EDU = Equivalent Dwelling Unit: 250 gallons per day for County systems and the Town of Indian Head; 253 gpd for the Town of La Plata; and approximately 190 gpd for the Benedict system (as required by MDE).
4: Includes projected new residential and non-residential demand, and new demand from system extensions. Assumes new non-residential system demand is approximately 20 percent of total new residential demand. Projected new demand for the Mattawoman WWTP includes 3 MGD dedicated to WSSC.
5: Incorporates ongoing, planned, and recommended upgrades.
6: Benedict WWTP completed the initial design as of 2013, and is expected to be operational by 2020. The design capacity of the WWTP is to 60,000 gpd, which matches the ultimate anticipated demand (average daily flow) of the Benedict service area.
7: Mattawoman WWTP's permitted capacity is 20 MGD. Of this capacity, 1.8 MGD is allocated to WSSC. This table shows the capacity available to support development in Charles County only.
For additional footnotes and sources, please see the continuation of this table on the next page.

Table 4-6 Public and Major Private Sewer System Flows and Capacity, 2040 (Continued)

Watershed		Mattawoman Creek	Port Tobacco River		Lower Potomac River		
System		Town of Indian Head[8]	Town of La Plata[9]		Swan Point		Cobb Island
Scenario[1]		All Scenarios	A	B	A	B	All Scenarios
Existing Treatment Capacity[2]	MGD[3]	0.500		1.500		0.600	0.158
	EDU[3]	2,000		5,929		2,404	632
Average Daily Flow, 2011	MGD	0.332		1.039		0.091	0.051
	EDU	1.328		4,107		472	205
Net Available Capacity, 2011	MGD	0.168		0.461		0.482	0.107
	EDU	672		1,822		1,928	427
Total projected new demand, 2011-2040[4]	MGD	0.026	1.526	1.492	0.120	0.110	0
	EDU	104	6,030	5,896	481	440	0
Grand Total Projected Demand, 2040	MGD	0.358	2.628	2.626	0.203	0.193	0.107
	EDU	1,432	10,512	10,378	814	773	205
Future Capacity, 2040[5]	MGD	0.500		2.000		0.600	0.158
	EDU	2,000		7,905		2,400	632
Net Available Projected Capacity, 2040	**MGD**	**0.142**	**(0.628)**	**(0.626)**	**0.397**	**0.407**	**0.107**
	EDU	**568**	**(2,482)**	**(2,473)**	**1,586**	**1,627**	**427**

Notes:
8 The Town of Indian Head and the Naval Support Facility Indian Head did not provide updated water and sewer data. Information presented here reflects data presented in the County's 2011 WRE.
9: For La Plata, new demand includes 250 EDU to account for the connection of failing residential and nonresidential septic systems, as described in the Town's WRE.

Sources: Maryland Property View 2009; Charles County Water and Sewer Plan, Charles County Department of Planning and Growth Management, and Department of Public Utilities. Data for the Towns of La Plata and Indian Head based on Municipal Growth Elements and Water Resources Elements for those jurisdictions. Benedict data are from the Benedict Central Sewer System Final Report (JMT).

The Benedict WWTP is under design, and is expected to be operational by 2020. The Hughesville WWTP is in the initial planning stages, and could potentially be online by 2020 with a treatment capacity of approximately 0.15 MGD. The service area and surface discharge location of the Hughesville WWTP has not been determined. Discharge from both the Benedict and Hughesville WWTPs would each be disposed via spray irrigation, or another form of land application (see below). The County is also studying a sewer service area and discharge location for the area near Port Tobacco. The WWTPs serving the Town of Indian Head and the Naval Support Facility Indian Head have adequate capacity to serve projected demand through 2040.

The permitted discharge from the La Plata WWTP will remain at 1.5 MGD after completion of ENR upgrades. In addition to ENR upgrades, La Plata has completed a new pump station and conveyance system to serve the eastern portion of the Town, with the goal of avoiding reoccurrences of sewer overflows that have occurred in this area. The La Plata WRE states that the Town plans to ultimately apply for an NPDES discharge permit of 2.5 MGD, which will serve the planned growth through 2030. The Town has not yet requested this capacity, and the Town WRE expresses concern about obtaining it based on MDE permitting policies.

An option to meet the septic nitrogen reduction targets shown in Table 4-2, is to connect existing septics to WWTPs for the most efficient nitrogen removal. This is also the most cost effective scenario identified by the County's WIP to meet targets, and includes connecting 1,575 existing septics to WWTPs. Policies regarding these connections need to be considered.

WWTP Point Source Caps and Discharges

The Chesapeake Bay TMDL and WIP establish caps on nutrients and sediments for wastewater treatment plants. To address nutrient loads from point sources such as WWTPs; the State's Chesapeake Bay Tributary Strategy also contains point source caps for smaller facilities not specifically enumerated in the WIP. These caps are numerical limits on the amount of nitrogen, phosphorus, and sediments that WWTPs can discharge to the Bay and its tributaries (expressed as pounds per year). The caps for the Indian Head and La Plata WWTPs are both more stringent than the TMDL point source caps for the Mattawoman and Port Tobacco River watersheds (respectively), the receiving bodies for these facilities. Thus, the point source caps for these WWTPs determine their allowable nutrient discharges. Table 4-7 lists the nutrient caps, as well as existing and projected future nutrient discharges for the County's WWTPs under each future land use scenario.

By 2040, the County assumes that these WWTPs will all be upgraded to ENR technology. Because the Cobb Island WWTP discharges effluent via spray irrigation, its point source discharges to the Potomac River are assumed to be minimal; the same assumption is made for the Benedict and Hughesville WWTPs and the Patuxent River.[14]

[14] This assumption is consistent with the discussion on page 30 of *Models and Guidelines 26*.

All County-operated WWTPs would meet the requirements of their nutrient caps under both future land use scenarios. The La Plata WWTP would exceed its nitrogen and phosphorus caps, assuming no change to the Town's existing NPDES permit. Additional actions such as the increase in water re-use as noted in this element will be needed prior to reaching these limits.

Table 4-7 Point Source Nutrient Discharges, Public WWTPs

Watershed and System		Middle Potomac River					Mattawoman Creek	Port Tobacco River		Lower Potomac River	
		Mattawoman[6]		NSFIH	Cliffton on the Potomac		Town of Indian Head	Town of La Plata		Swan Point	
Scenario[1]		**A**	**B**	**All**	**A**	**B**	**All**	**A**	**B**	**A**	**B**
Projected Capacity, 2040	MGD		20.000	0.500		0.070	0.500		2.000		0.600
Existing Nutrient Loads[2]	TN[3]		60,000	12,746		1,537	4,042		11,000		2,500
	TP[3]		2,500	1,517		512	303		500		50
WIP Phase II Target Loads[4] or other Likely Discharge Limits	TN		243,645	6,091		2,820	6,091		18,273		7,309
	TP		10,964	457		470	457		1,371		548
Projected ADF, 2040, from Table 4-6[7]	MGD	19.430	18.869	0.350	0.034	0.035	0.358	2.628	2.626	0.203	0.193
Treatment Technology, 2040		ENR		ENR	ENR		ENR	ENR		ENR	
Estimated Nutrient Discharges, 2040[5]	TN	177,313	172,196	4,259	311	319	6,403	23,983	23,960	1,857	1,763
	TP	10,639	10,332	319	19	19	480	2,398	2,396	186	176
Remaining Discharge Capacity (Overage)	**TN**	**66,332**	**71,449**	**1,832**	**2,509**	**2,501**	**(312)**	**(5,710)**	**(5,687)**	**5,452**	**5,546**
	TP	**325**	**632**	**138**	**451**	**451**	**(23)**	**(1,027)**	**(1,025)**	**362**	**372**

Notes:
1: A =2014 Comprehensive Plan Recommended Scenario; B = 2013 Planning Commission Recommended Scenario
2: Estimates for Mattawoman, La Plata, and Swan Point based on MDE's ENR Fact Sheets for (http://www.mde.state.md.us/Water/CBWRF/pop_up/enr_status_map.asp). Estimates for Indian Head reprinted from the Town's WRE. Estimates for Cliffton calculated, assuming discharges of 18 mg/L TN, 6mg/L TP (existing non-BNR).
3: TN = Total Nitrogen (lbs/year); TP = Total Nitrogen (lbs/year)
4: WIP II applies to Mattawoman, La Plata, and Indian Head facilities. , Source: MDE
http://www.mde.maryland.gov/programs/water/tmdl/tmdlimplementation/documents/final_phaseii_report_docs/appendix_f_phiiwip_major_facility_final_targets.pdf
5: Assumes discharge concentrations of 3 mg/L TN and 0.3 mg/L TP.
6: Mattawoman discharges assume full use of the 3 MGD allocated to WSSC, as well as flows from the Mt. Carmel Woods and College of Southern MD facilities.
7: In cases where the projected demand exceeds capacity, this reflects the facility's maximum permitted discharge capacity.

Alternative Wastewater Disposal Options

While County-operated WWTPs would be expected to meet their 2040 treatment and discharge capacities under both Scenarios, a number of factors (such as development demand) could change over that time period. Thus, it is prudent to identify intervening activities, such as those listed below, that could ensure compliance with point-source nutrient regulations (or mitigate unexpected overages) over the long-range planning horizon. This section summarizes key options that the County and La Plata should consider in order to obtain additional treatment capacity. More detailed information about these options is included in the Appendix.

- Continue to perform system maintenance and upgrades, particularly to reduce inflow and infiltration (I/I),[15] which consumes available wastewater system capacity.
- Expand the re-use of treated wastewater for industrial and landscape irrigation.
- Work with MDE and developers to investigate options for re-use of treated wastewater for agricultural irrigation, landscape irrigation, re-use within buildings, or potable reuse (particularly aquifer injection).
- Participate in nutrient trading, as per the State's Policy for Nutrient Cap Management and Trading [16] and the Chesapeake Bay TMDL and WIP. In particular, investigate opportunities for Charles County WWTPs to act as a "seller" of nutrient credits.
- Where appropriate and necessary, consider alternative disposal options for treated effluent, including land application (spray or drip irrigation or subsurface discharge, etc.) and tertiary treatment wetlands (see the Comprehensive Plan Appendix).

It should be pointed out that, should population growth in Charles County occur more slowly than is projected in this Comprehensive Plan, the resultant water demand and wastewater discharge would be lower than projected in Tables 4-4 and 4-6, and discussed in other sections in this chapter.

4.5 Stormwater and Nonpoint Source Policies

This section characterizes the policies and procedures in place to manage urban stormwater sources and nonpoint source pollution in Charles County. Municipal separate storm sewer systems (MS4s) are defined by the federal Clean Water Act as point sources of pollution. Nonpoint sources (NPS) of pollution include agricultural runoff, erosion, and sediment from development, unregulated stormwater runoff as well as atmospheric deposition and any source other than an outfall pipe. These sources are called nonpoint because they involve widely dispersed activities, and hence are difficult to measure. All point and non-point pollution eventually reach the waters of the Chesapeake Bay unless filtered or retained by a structural system or non-structural features. The Chesapeake Bay TMDL and WIP have designated nutrient and sediment targets for stormwater, agriculture, septic systems and forests.

[15] Inflow is water from storm events entering the system through roof drains sump pumps, and similar sources. Infiltration is groundwater entering the system through leaking pipes, manholes, and other elements. I/I takes up sewer capacity that should be reserved only for wastewater, effectively limiting the system's overall capacity.

[16] Information available at: http://www.mde.state.md.us/Water/nutrientcap.asp

Various technologies reduce nutrients from agricultural and developed lands. Nutrient reduction technologies for urban stormwater and nonpoint source pollution are generally referred to as "Best Management Practices" (BMPs). Examples of these technologies include urban and agricultural nutrient management, filtration systems, and erosion controls. Non-structural controls can be very effective in reducing the amount 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 maintaining and restoring the health of the aquatic environment.

Major Policies and Initiatives

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

Stormwater

The County's Stormwater Management Ordinance, adopted in 2010, incorporates Environmental Site Design (ESD) techniques for stormwater management. ESD is defined by state law as using small-scale stormwater management practices, nonstructural techniques, and better site planning to mimic natural hydrologic runoff characteristics and minimize the impact of land development on water resources. ESD is based on the premise that stormwater management should not be seen as stormwater disposal. Instead of conveying and treating stormwater in large, costly end-of-pipe facilities located at the bottom of drainage areas, ESD addresses stormwater through the use of small, dispersed, features that are frequently located onsite. It is an effective means of managing both stormwater quality and quantity.

Chesapeake Bay TMDL and Watershed Implementation Plan

As described in Section 4.1, USEPA and MDE have established a TMDL for the Chesapeake Bay watershed, and are working with Charles County through the WIP process to define watershed-level nutrient load targets. The key provisions of the WIP are:

- New development and redevelopment must offset NPS pollution loads. The amount of offset will depend upon the location of that development—development or redevelopment in relatively dense areas (especially areas already served by public sewer systems) will have less stringent offset burdens; development in rural areas will be required to offset significantly larger amounts of nutrients. ESD alone typically will not be sufficient to meet these requirements. Offset regulations implementing the State's WIP policies and per the Sustainable Growth and Agricultural Preservation Act of 2012 have not yet been developed.
- More stringent treatment requirements for the urban stormwater systems operated by Charles County. These are regulated as a point source under the MS4 permit system.
- More stringent requirements for the content of fertilizer used in urban areas.
- Numerous agricultural and rural strategies such as keeping livestock out of streams through fencing or other techniques, better management of animal waste, planting additional cover crops, increasing the extent of stream buffers, and more widespread use of tillage techniques that minimize soil disturbance.

USEPA has established a variety of penalties and other federal actions that can be applied if a jurisdiction fails to achieve the pollutant reductions specified in the Chesapeake Bay or other TMDLs:[17]

- Expansion of National Pollution Discharge Elimination System (NPDES) permit coverage to currently unregulated sources;
- Federal objections to state NPDES permits, and increased NPDES program oversight;
- Requirement of additional offsets for new or increased point source discharges (beyond replacement of anticipated new/increased loadings);
- Establishment of more geographically-specific TMDLs by the State;
- Requirement of additional reductions of loadings from point sources, such as wastewater treatment plants;
- Increased federal enforcement of air and water regulations in the affected watershed;
- Redirection of EPA grants away from the local jurisdiction, and/or incorporating more stringent criteria into future grants; and
- Federal promulgation of more stringent local nutrient water quality standards.

Other Nonpoint Source Management Policies and Considerations

This section summarizes existing and recommended policies for addressing nonpoint source pollution in Charles County. Additional details are provided in the Comprehensive Plan Appendix.

Septic Systems

Of the County's approximately 17,000 septic systems (including residential and non-residential units), approximately 11,000 were constructed prior to 1990[18] (an indicator of potential septic failure). County studies and plans have identified more than 1,000 failing septic systems in the Mattawoman Sewer Service Area,[19] and more than 1,100 potentially failing septic systems in the Port Tobacco River watershed.[20] Options for addressing these failing systems include repair or replacement, or connection of properties with failing septics to public sewer systems. The County has initiated a new "pump-out" program for septic systems as a cost effective way to improve performance and reduce pollutants. The County's Phase II WIP goal is to have 20% of the septics pumped annually. As of November, 2014 the County has completed 339 septic pump outs, and has sufficient budget to complete approximately 420 pump outs per year.

[17] Source: US EPA. 2009. Letter to the Chesapeake Executive Council, 29 December. Accessed at http://www.epa.gov/region03/chesapeake/bay_letter_1209.pdf

[18] Source: *Patuxent River Basin County Septics & Impervious Cover Examination, 2012*. In 1985, septic system regulations changed to require a 4 foot separation from the water table; 1990 marks the point at which older grandfathered regulations were completely abandoned and the new regulations took effect. Septic systems constructed prior to 1990 are more likely to fail.

[19] Source: 2006 Charles County Water and Sewer Master Plan

[20] Specifically, the Port Tobacco River Watershed Restoration Action Strategies (WRAS) document identifies 1,162 septic systems built prior to 1990, on unsuitable soils, and in areas with high water tables.

State law requires the use of Best Available Technology (BAT) for nitrogen removal in new construction and septic repairs within the Critical Area.[21] Such technology is now also required outside of the Critical Area, and the State's Phase II WIP for Charles County includes adding BAT for nitrogen removal to 14,324 septic systems. However, the County's Phase II WIP determined that it is more cost effective to connect some of these septics to wastewater treatment plants, and upgrade approximately 650 existing septics to BAT. To date, the Bay Restoration Fund has provided grants for 134 BAT upgrades for new and existing septics.

Stormwater Management

The County is responsible for inspecting all ESD treatment systems and structural stormwater management (SWM) facilities throughout the County under its triennial maintenance inspection program.

The majority of SWM systems are not maintained by the County, but instead are maintained by homeowners' associations or private property owners. The County continues to work to address concerns about responsibility for SWM maintenance, access rights, and financial burdens associated with such maintenance. The County adopted a stormwater remediation fee, as required by HB987, in 2013. This fee (a flat rate on all improved properties) provides a funding mechanism for the watershed restoration and protection programs described in Chapter 275 of the Code of Charles County, Maryland.

Other Considerations

- The County uses watershed planning (such as Watershed Restoration Action Plans) as holistic approaches to identify and address nonpoint source pollution problems.
- Septage from septic systems is treated at WWTPs. Sludge from County WWTPs is applied to farmland.
- The 2012 Land Preservation, Parks, and Recreation Plan (LPPRP) is a functional plan that helps implement the Comprehensive Plan. The LPPRP contains few goals, objectives, policies, and implementation actions that directly relate to the analyses in this WRE, but its overall emphases on the preservation of woodlands and wetlands, which release fewer nutrients into waterways, and use of waterways for recreation are consistent with the WRE.
- The Charles Soil Conservation District continues to work with the agricultural community to ensure that agricultural BMPs are implemented to the greatest degree feasible.
- Most new non-agricultural development in Charles County requires a soil erosion and sediment control plan, and construction sites are subject to inspection to ensure proper sediment and erosion control. The Charles Soil Conservation District reviews Soil Erosion and Sediment Control permits for every construction site that disturbs land.
- Where appropriate (based on transportation safety considerations), feasible, fiscally practicable new roads in such areas of the County are designed with open sections to disperse runoff, or as green streets to maximize and integrate onsite and offsite stormwater management within the right-of-way.

[21] Per Maryland Senate Bill 554 (2009 legislative session), which also defines BAT

4.6 Evaluation of Water Quality Impacts

Nutrient loads from point sources and nonpoint sources are major contributors to degraded water quality in the Chesapeake Bay and its tributaries. The WRE for the 2006 Comprehensive Plan (adopted in 2011) included detailed NPS nutrient modeling, as per the recommendations of the Models and Guidelines document for Water Resources (M&G 26), produced by the Maryland Departments of Planning and the Environment.

In preparation for the 2016 Comprehensive Plan Charles County entered into dialogue with MDP and MDE regarding whether similar modeling was appropriate for this WRE, in light of the WIP and concerns about the accuracy of nutrient loading assumptions in the default water quality model provided by MDE for use in the WRE. In June 2012, MDE responded to these concerns as follows:

> Preparation of the NPS Analysis included in M&G 26 is optional. Instead, MDE and MDP recommend that ERM (the county's consultant) characterize the acres of impervious surfaces and the acres of forest cover for alternative land use scenarios.[22]

MDE's memo also states that the WIP, and not the Comprehensive Plan, should be the County's primary tool for ensuring compliance with the Chesapeake Bay TMDL. The full letter from MDE is included in the Comprehensive Plan Appendix "E". Based on this guidance, this WRE discusses changes in impervious surface and forest coverage in the two comprehensive plan scenarios as indicators of their overall impacts on water quality.

Impervious Surface

Impervious surfaces are primarily human-made surfaces that do not allow rainwater to enter the ground. Impervious surfaces can create or worsen runoff that causes stream bank erosion, sediment deposition into stream channels, increases in stream temperatures, and potentially degradation of water quality and aquatic life. The amount of impervious surface in a watershed—particularly impervious surfaces that are not treated by stormwater management facilities—can be a key indicator of water quality. All other factors being equal, water quality in streams tends to decline as impervious coverage increases in a watershed. Table 4-8 summarizes existing and future impervious surface by watershed under current conditions and under the two scenarios.

As described in Section 4.2, while the land use designations in the Merged and 2016 Comprehensive Plan Scenarios differ, the net effect on development patterns would be small. As a result, the Merged Scenario is not evaluated separately here.

Countywide, less than five percent of all land (excluding open water within the County's boundaries) is currently impervious. On a percentage basis, impervious surface coverage is highest in the Mattawoman and Port Tobacco watersheds, where much of the County's developed land is found (i.e. within the County's Development District and the Towns of La Plata and Indian Head). Impervious coverage percentage in most other watersheds is moderate to low—typically under five percent impervious.

[22] Source: MDE 2012. Charles County Comprehensive Plan, Water Resources Element. Memorandum sent June 13, 2012 from Jay Sakai, Director of MDE's Water Management Administration to Steven Ball, Charles County Planning Director.

Under the 2013 Planning Commission Recommended Scenario, total impervious surface would increase to 7.1 percent of the County's land area, and would reach 15 percent in the Mattawoman watershed. Under the 2016 Comprehensive Plan Recommended Scenario, overall impervious surface would increase to 6.3 percent, and to approximately 11 percent in the Mattawoman watershed.

Under the 2013 Planning Commission Recommended Scenario, total impervious surface would increase by approximately 7,000 acres. By comparison, the 2016 Comprehensive Plan Recommended Scenario would result in approximately 4,500 acres of new impervious surface, approximately two-thirds of the increase under the 2013 Planning Commission Recommended Scenario.

Table 4-8 Impervious Surface Coverage

		Existing		2016 Planning Commission Recommended Scenario		2013 Planning Commission Recommended Scenario	
Watershed	**Total Acreage[1]**	**Acres**	**Percent of Land Area**	**Acres**	**Percent of Land Area**	**Acres**	**Percent of Land Area**
Gilbert Swamp	24,756	782	3.2%	821	3.6%	951	3.8%
Mattawoman Creek	44,662	4,361	9.8%	4,977	10.7%*	6,677	15.0%
Nanjemoy Creek	46,692	701	1.5%	1,121	1.9%	1,267	2.7%
Patuxent River	18,030	939	5.2%	986	5.5%	939	5.2%
Port Tobacco River	28,068	1,890	6.7%	1,985	7.8%	1,952	7.0%
Potomac Lower Tidal	28,312	914	3.2%	2,291	3.9%	1,978	7.0%
Potomac Middle Tidal	19,223	524	2.7%	1,035	3.1%	1,223	6.4%
Potomac Upper Tidal	2,039	44	2.2%	46	2.9%	44	2.2%
Wicomico River	17,430	221	1.3%	670	2.2%	515	3.0%
Zekiah Swamp	65,238	3,607	5.5%	4,512	6.4%	5,462	8.4%
Total	**294,450**	**13,981**	**4.7%**	**18,444**	**6.3%**	**21,008**	**7.1%**
Net Change				**7,027**	**2.4%**	**4,463**	**1.5%**

Notes:
1:Acreage excludes areas of open water.
Source: MDE Nonpoint Source Model, based on existing and projected land use/land cover.

*Due to changes made by the County Commissioners at their last work session on this plan which resulted in 30,000 acres of land being placed in the Watershed Conservation District and zoning it one unit per twenty acres, it is expected the impervious coverage will be less than 10% at build out to protect the water quality of this natural resource.

The use of Environmental Site Design (ESD), green streets,[23] and other alternative urban best management practices for new development, redevelopment, and watershed restoration can help to mitigate some of the impacts of impervious surfaces by reducing the amount, velocity, and pollutant content of stormwater entering streams. Thus, the total impervious

[23] The Green Streets Policy for the National Capital Region refers to a green street as using, "trees, landscaping, and related environmental site design features to capture and filter stormwater runoff within the right of way, while cooling and enhancing the appearance of the street."

acreage shown in Table 4-8 can be somewhat misleading. An acre of existing untreated or minimally treated impervious surface generates more substantial adverse stormwater impacts than an acre of ESD-treated impervious surface. It is therefore more helpful to compare the predicted impervious from the land use scenarios against each other—and not against existing conditions.

Forest Coverage

In addition to their value as habitat, forests are critical for the preservation of water quality. Forested areas tend to absorb more and discharge far less nutrients to surrounding waterways than any other land use. As such, changes in forest cover over time are good indicators of changes in water quality. All other factors being equal, water quality in streams tends to decline as forest coverage decreases in a watershed. Table 4-9 summarizes existing and projected forest coverage in Charles County by watershed.

Under the 2013 Planning Commission Recommended, total forest loss would increase by approximately 5,500 acres, nearly double the 2,800-acre forest loss projected under the 2016 Comprehensive Plan Recommended Scenario.

Table 4-9 Forest Coverage

		Existing		2016 Planning Commission Recommended Scenario		2013 Planning Commission Recommended Scenario	
Watershed	**Total Acreage[1]**	**Acres**	**Percent of Land Area**	**Acres**	**Percent of Land Area**	**Acres**	**Percent of Land Area**
Gilbert Swamp	24,756	11,801	47.7%	11,791	47.6%	11,690	47.2%
Mattawoman Creek	44,662	23,059	51.6%	22,716	50.9%	21,079	47.2%
Nanjemoy Creek	46,692	31903	68.3%	31,581	67.6%	31,446	67.3%
Patuxent River	18,030	8,036	44.6%	8,029	44.5%	8,036	44.6%
Port Tobacco River	28,068	13,828	49.3%	13,817	49.2%	13,782	49.1%
Potomac Lower Tidal	28,312	16,849	59.5%	15,960	56.4%	16,114	56.9%
Potomac Middle Tidal	19,223	14,190	73.8%	13,767	71.6%	13,567	70.6%
Potomac Upper Tidal	2,039	1,514	74.3%	1,513	74.2%	1,514	74.3%
Wicomico River	17,430	8,030	46.1%	7,813	44.8%	7,881	45.2%
Zekiah Swamp	65,238	34,242	52.5%	33,703	51.7%	32,868	50.4%
Total	**294,450**	**163,452**	**55.5%**	**160,691**	**54.6%**	**157,977**	**53.7%**
Net Change				**(2,762)**	**(0.9%)**	**(5,475)**	**(1.9%)**

Notes:
1: Acreage excludes areas of open water.
Source: MDE Nonpoint Source Model, based on existing and projected land use/land cover.

4.7 Choice of Land Use Plan

A major goal of the Water Resources Element is to more closely link land use and development policies with water quality goals. The Chesapeake Bay TMDL and WIP identify the assimilative capacity of each body of water within and adjacent to Charles County, and set interim and final goals for meeting that capacity. The majority of the land in the County's Priority Funding Areas (PFAs) falls within watersheds that are impaired by

nutrients, particularly the Mattawoman and Port Tobacco River watersheds. However, Maryland's Smart Growth principles fundamentally encourage the continued concentration of new development within these already-developed areas. The County is specifically using its Phase II WIP (see Section 4.1) to address water quality impairments caused by already-developed areas. In the Phase II WIP strategy, the County is setting two year milestones and costing alternatives to provide the most cost effective method to meet the goals.

As shown in Sections 4.3 and 4.4, public water and sewer systems could accommodate most, but not all projected development in both scenarios. The deficit indicated by the long term projections for drinking water capacity in the Waldorf Water System is equal in both land use scenarios (see Table 4-4). Therefore, both land use scenarios will have a very similar impact on overall groundwater resources, and require the same or similar means of alternative water resources to mitigate the forecasted deficit. While potential deficits would be slightly higher in the 2016 Planning Commission Recommended Scenario, that scenario responds in part to concerns that the County's population was growing faster than desirable. If the 2016 Scenario resulted in less overall population growth in the County—as some participants in the Comprehensive Plan Process desired—then it is likely that overall demands on water and sewer systems would remain within permitted capacities. Additional conservation and water reuse efforts could also reduce long term water demand and effluent discharge. ***(As stated on page 4-8, the plan scenario ultimately adopted by the County Commissioners reduced the overall growth rate and conserved approximately 37,455 acres of lands by placing them into the Watershed Conservation District which will result in lower impacts on pollution loads as documented herein).***

As shown in Tables 4-7, 8, and 9, there are differences in point source nutrient loadings, impervious surface, and future forest cover under each of the two land use scenarios. Both scenarios would result in increased nutrient loads and impervious surface, and decreased forest coverage. Both scenarios would also result in increased demand for drinking water in public water systems. The 2016 Recommended Scenario performs better in terms of water quality impacts (i.e., impervious surface and forest cover), largely because it would concentrate new development in a smaller area, and would reduce development in stream buffer areas and other rural portions of the County.

Ultimately, the County Commissioners choice of the modified 2016 Planning Commissions Recommended land use scenario as its preferred land use plan incorporates numerous factors in addition to water resources, such as:

- Large scale reduction in the Development District;
- A new Tier Map to match the revised land uses incorporated into this plan;

Furthermore, the State's proposed Accounting for Growth Policy will help manage the pollutant load from future growth to achieve Bay TMDL goals along with implementation of pollution prevention projects as designated in the County's Watershed Implementation Plan (WIP). The purpose of the policy is to permanently offset nitrogen loads from new residential and nonresidential development, so progress towards achieving the Bay TMDL isn't lost as Maryland grows. The policy applies to all new development and redevelopment that disturbs more than one acre. As an incentive for redevelopment, nonpoint source load offsets are not necessary. The cost to offset nitrogen loads for new development would be significantly higher under the 2013 Planning Commission Recommended Land Use Scenario than under the final adopted plan scenario as reflected on the Land Use Map.

However, the 2013 Planning Commission Recommended Land Use Scenario envisions a more dispersed population than the adopted plan, resulting in less intense water demand (on central systems) and wastewater discharge for the Waldorf area.

4.8 Policies and Actions

Policies

Water

4.1 Work with MDE, WSSC, and other agencies, as necessary, to identify, access, and sustainably utilize groundwater resources.

4.2 Continue to investigate options for expanded purchases of water from WSSC, coordinating with Prince George's County as necessary.

4.3 Evaluate the feasibility of establishing a new surface water source (likely incorporating desalinization). Specific considerations include the location, engineering requirements, and funding of such a facility.

4.4 Consider interconnection between the County-operated Waldorf water system and the Town of La Plata's water system. Several concerns should be evaluated including impacts on the aquifers and groundwater appropriation amounts, engineering challenges, fair distribution of system costs.

4.5 Work with MDE and developers to investigate the feasibility of wastewater reuse options.

4.6 Continue to promote water conservation through media and educational seminars and publications, staff guidance to homeowners, and coordination with home builders to advocate water-conserving designs.

Sewer

4.7 Consider extending public sewer service to existing communities identified as failing septic areas in the County's Comprehensive Water and Sewer Plan, to septic systems in the Chesapeake Bay Critical Area, and to septic systems identified by Charles County Watershed Implementation Plan(s).

4.8 Ensure that point source pollution discharges stay within safe levels through strict enforcement of state water quality standards for sewage effluent.

4.9 Ensure that the County receives nutrient credits for any connection of septic systems to public sewer systems, as well as other actions enumerated in Maryland's Policy for Nutrient Cap Management and Trading.

4.10 Promote water-reuse systems to be incorporated into new or significantly improved wastewater treatment facilities.

Stormwater and Nonpoint Source Pollution

4.11 Adhere to the Charles County Watershed Implementation Plan(s) to achieve stormwater waste load allocations from Total Maximum Daily Loads for the County's watersheds, as established by MDE and approved by US EPA.

4.12 Continue to encourage the installation of septic denitrification systems when retrofitting existing septic systems throughout the County.

4.13 Continue to use small scale biological treatment facilities (such as the planned Benedict and Hughesville WWTPs) to serve rural villages and clusters of existing septic systems throughout the County as identified in the County's WIP(s).

4.14 Work with MDE, DNR, and the Maryland Department of Agriculture (MDA) to assist farmers in adopting best management practices to reduce nonpoint source loads of nutrients and other pollutants. As part of this effort, develop an educational program and assistance for farmers to improve or limit their runoff.

4.15 Encourage the establishment of Soil Conservation and Water Quality Plans on all farms in Charles County to reduce sediment and nutrient export from agricultural activities.

4.16 Continue and improve programs, policies, and education and outreach to assure the functional maintenance of stormwater management systems.

4.17 Continue public education and outreach efforts to reduce stormwater pollutants.

4.18 Continue to explore and implement new techniques and technologies to reduce the impacts to streams during mass grading for development, and discourage mass grading for development.

4.19 Encourage the use of open section roads and green streets for stormwater management on new and existing roads.

4.20 Plan capital improvements consistent with growth in areas where development is encouraged to locate, especially in the Mattawoman Sewer Service Area.

4.21 Place special emphasis on management of the Mattawoman Creek and Port Tobacco River watersheds (the location of most existing and planned development in the County) to balance the protection of natural resources and water quality with development plans and Smart Growth strategies.

4.22 Ensure that stormwater discharges from industrial facilities are appropriately permitted under the NPDES industrial discharge program and that the necessary Pollution Prevention Plans are in place and implemented in accordance with the County's NPDES municipal stormwater permit.

4.23 Charles County prohibits the use of "fracking" drilling technology at this time until such time further evidence is provided to demonstrate it is safe and environmentally sound practice.

Actions

1. Pursue an additional waterline connection and appropriation through WSSC to provide additional support to the Waldorf and Bryans Road Water Systems.
2. Complete the planned interconnection of the Bryans Road and Waldorf public water systems.
3. Implement a wellfield management strategy, as recommended by the 2006 WRAC Report to the County Commissioners.
4. Complete an Alternative Water Source Study to determine the feasibility of various future water supplies.
5. Correct sanitary sewage problems in existing problem areas to provide a safe environment for all of the County's residents.
6. Implement a Green Streets policy directive in accordance with the National Capital Region Transportation Planning Board (TPB) Resolution 10-2014 for all County

financed transportation facilities to enhance stormwater management within the right of way.

7. Continue to implement the Mattawoman Creek Watershed Management Plan.
8. Continue to implement the Port Tobacco River WRAS per County Commissioners Resolution 07-57.
9. Continue to identify and map areas of failing septic systems, and reduce nonpoint source nutrient loads from such septic systems through retrofits for denitrification, replacement, pump-outs, or where appropriate, connection to public sewer systems (focusing on the Chesapeake Bay Critical Area as a first priority).
10. Continue to identify locations in need of stormwater restoration, and restore those areas with runoff reduction techniques, structural stormwater treatment, and alternative urban best management practices to comply with the County's NPDES MS4 permit.
11. Implement a tracking system to ensure the County receives nutrient and sediment credit for all new actions and maintenance activities supportive of the Bay WIP.
12. Develop an urban canopy program to evaluate and maintain the water quality benefits provided by healthy trees in the Priority Funding Areas.
13. Study Land Uses adjacent to high quality (Tier II) streams in the County and adopt mechanisms such as best management practices or other regulatory means for protecting these sensitive waters.
14. Change the zoning code to prohibit "fracking" drilling technology until such time the environmental impacts can be determined safe for drinking water.