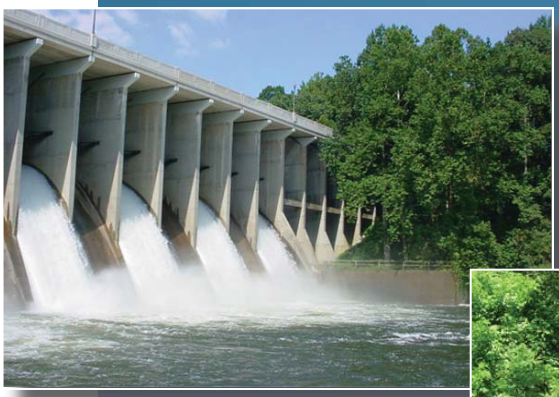
# WATER RESOURCES ELEMENT



## An Amendment to **General Plan 2000**

**Howard County**

**April 2010**

# PREFACE

During the 2006 legislative session, the Maryland General Assembly enacted House Bill 1141 Land Use – Local Government Planning. HB 1141 requires that local jurisdictions adopt a water resources element in their comprehensive plans. The Howard County Water Resources Element (WRE) serves as an amendment to General Plan 2000 that adds Policies and Actions intended to ensure that the County has adequate water resource capacities to meet future growth needs through 2030.

The Howard County Environmental Sustainability Board, which is comprised of environmental experts that advise the County Executive on environmental matters, served as a citizen's advisory committee for the Water Resources Element amendment. The Environmental Sustainability Board and Department of Planning and Zoning cosponsored two public meetings in fall 2009 to acquaint the public with the Draft WRE and to solicit comments. The Proposed WRE Amendment was presented to the Planning Board for review at a public hearing in December 2009. The Planning Board unanimously approved a motion to recommend County Council approval of the WRE. The County Council held a public hearing to consider the WRE Amendment in March 2010. By vote of the County Council and signature of the County Executive, the Amendment was approved on April 7, 2010 and became effective on June 8, 2010.

Additional information about the Water Resources Element amendment is available either by contacting the Department of Planning and Zoning or through the Howard County web site at:

http://www.howardcountymd.gov/

# TABLE OF CONTENTS

# EXECUTIVE SUMMARY

## Water Resources Element

The Water Resources Element (WRE) is an amendment to the General Plan that is required by State legislation passed in 2006. The intent of the WRE is to ensure a safe and adequate supply of drinking water, and adequate land and water capacity for the treatment of wastewater and stormwater, to support future growth.

This Water Resources Element amendment incorporates and updates relevant Policies and Actions from General Plan 2000 and adds new Policies and Actions. These Policies and Actions are intended to help the County meet an overarching goal of managing our water resources more sustainably to ensure that as the County continues to grow, our water resources will be conserved, protected and restored to health. It is critical to ensure the health of our local and regional waters, if we are to restore the Chesapeake Bay.

Growth projections for the Water Resources Element extend to the year 2030 and are based on the General Plan 2000. The WRE projections were modified to address potential requests for new development or redevelopment in Columbia Town Center, the Village Centers and Doughoregan Manor.

## Drinking Water and Wastewater

The water for Howard County's public water supply system is purchased from Baltimore City and the Washington Suburban Sanitary Commission (WSSC). More than 95% of the County's public water supply is provided through the Baltimore City Central System and less than 5% is provided by WSSC. The supply of public water is not expected to be a constraint on projected growth and development within the Planned Service Area (PSA) through the year 2030. Outside the PSA, there is generally an adequate supply of good quality groundwater to serve projected demand from individual and community wells.

Source: Versar, Inc.

*Although the County only gets 5% of its drinking water from the WSSC reservoirs, about half the reservoirs watershed is in the County.*

To manage water resources more sustainably, the County should encourage water conservation, which will also help reduce flows to the wastewater treatment plants. The County should also increase support for the Baltimore and Patuxent Reservoirs interjurisdictional watershed protection efforts, to maintain the high quality of these drinking water supply sources.

Wastewater treatment within the PSA is provided by the Little Patuxent Water Reclamation Plant (WRP), which is owned and operated by Howard County, and the Patapsco Wastewater Treatment Plant (WWTP), which is owned and operated by Baltimore City. The service areas for these plants are largely defined by the natural drainage areas for the Patuxent and

Patapsco Rivers. Capacity at the plants is expected to be adequate to meet projected growth and development within the PSA through the year 2030.

Source: Howard County Public Information Office

*The Little Patuxent Water Reclamation Plant treats wastewater for about 70% of the County served by public sewer.*

To meet Chesapeake Bay cleanup goals, Maryland has established annual nutrient (nitrogen and phosphorus) loading caps for all major wastewater treatment plants in the State. Once flows at the Little Patuxent WRP exceed the amount used to establish this cap, the plant must maximize treatment to ensure the cap is met. Capacity at the Patapsco WWTP may be reduced once treatment at the plant is upgraded to meet the cap, which may in turn reduce the County's capacity allocation at the plant.

The nutrient caps must be maintained to help restore the health of the rivers and the Bay, into which the plants discharge, while ensuring the County has adequate wastewater treatment capacity to allow continued growth. To help maintain the nutrient cap at the wastewater treatment plants, development on properties added to the current PSA, large redevelopment sites within the PSA and large sites with zoning intensification within the PSA should minimize increases in flow and the nutrient concentration in flow sent to the plants. This can be achieved through a combination of water conservation and reuse, and on-site treatment of wastewater. In addition, the County should continue to look for opportunities to expand wastewater reuse and investigate options for nutrient trading.

Outside the PSA, County soils are generally capable of supporting individual and shared septic fields. The County should encourage the use of nitrogen reducing treatment for new and upgraded septic systems, to reduce nitrogen loads to groundwater and surface water.

## Water and Related Land Resources

The County develops watershed management plans to set priorities and guide efforts to protect, restore and improve the County's water resources. These efforts help the County meet Federal and State requirements to improve water quality. Most water bodies in the County have degraded water quality and habitat for aquatic life, although there are also stream segments with excellent water quality and habitat. The watershed management plans have generated an extensive list of restoration projects that far exceeds the current capital budget for these projects. It is easier and more cost effective to protect high quality resources in a watershed than to allow resources to become degraded and then attempt restoration. To manage water resources more sustainably, the County should strengthen resource protection measures and enhance watershed restoration efforts.

The County should continue to prepare watershed management plans for all County watersheds. The Middle Patuxent River watershed should be a priority for future study, because it is projected to have the largest percentage of the County's future land use change. Watershed management plans should also be expanded to address wetland resources, and establish goals for forest cover and riparian forest buffers.

Development regulations can help protect water resources from impacts caused by development. New State stormwater management regulations increase pollutant removal, groundwater recharge and stream channel protection requirements for new development and redevelopment. Howard County must adopt these new regulations by May 2010. The County should also strengthen buffer requirements to enhance protection of streams, wetlands and floodplains.

Development regulations must be properly implemented and enforced to be effective. The County should ensure there are adequate resources to monitor and enforce development regulations and to effectively educate developers and contractors. The County must also ensure that stormwater management facilities, which will increase significantly in number as a result of the new stormwater management regulations, are inspected regularly and maintained over time.

The majority of land in the County is privately owned, so implementing best management practices (BMPs) on private residential, business and agricultural property is critical to improving water quality and habitat. Current outreach and education efforts should be expanded and new programs initiated to increase BMP implementation on private property. The County can also provide leadership in BMP implementation by incorporating environmentally sensitive site development and property management practices into County activities.

If the County wishes to increase the pace of watershed restoration, expanding outreach and education to increase the implementation of best management practices on private properties, additional funding is needed. The County should institute a dedicated fund to provide increased and sustained funding for the watershed management program, which is anticipated to continue to expand and evolve in response to Federal and State regulatory requirements.

*Protecting our rivers, streams and wetlands from degradation is more sustainable than trying to mitigate the damage done to them.*

# GENERAL PLAN 2000

## General Plan Visions

The central theme for the General Plan 2000 is that we are stewards of the County's social, economic and environmental systems. Six visions for Howard County's future support this central theme and provide a foundation for the Policies and Actions of the General Plan.

***Vision 1:*** ***Our actions will complement State and regional initiatives in resource and growth management.***

***Vision 2:*** ***Our rural lands will be productive and rural character will be conserved.***

***Vision 3:*** ***Our development will be concentrated within a growth boundary, will be served by adequate public facilities and will encourage economic vitality.***

***Vision 4:*** ***Our communities will be livable, safe and distinctive.***

***Vision 5:*** ***Our environmental resources will be protected, used wisely and restored to health.***

***Vision 6:*** ***Our citizens will take part in the decisions and actions that affect them.***

## The Water Resources Element

The Water Resources Element is an amendment to the General Plan that is required by State legislation passed in 2006. The intent of the Water Resources Element is to ensure a safe and adequate supply of drinking water, and adequate land and water capacity for the treatment of wastewater and stormwater, to support future growth. The Water Resources Element must reflect the opportunities and limitations presented by local and regional water resources. It is intended to improve the protection of water resources and to address water resource goals within the context of local and State Smart Growth policies.

Source: MD Office of the Secretary of State

*The Chesapeake Bay is an important regional water resource.*

Our water resources include our rivers, wetlands, floodplains, lakes, reservoirs and groundwater. These are vital natural resources that provide drinking water, stormwater management, pollution abatement, floodwater storage, transportation and recreation, as well as important habitat for a wide variety of plant and animal species. Water resources are linked together through the hydrologic cycle, which circulates water from the atmosphere to the land, groundwater and surface water, and then back to the atmosphere. This linkage means that impacts on one resource can have successive impacts on other resources.

The General Plan 2000 contains numerous Policies and Actions related to the protection and restoration of water resources. The Responsible Regionalism chapter addresses cooperation for regional protection of water resources, Preservation of the Rural West addresses groundwater and septic systems, Balanced and Phased Growth addresses the adequate supply of drinking water and wastewater treatment capacity, and Working with Nature addresses environmental stewardship, the protection of streams and wetlands, and stormwater management.

The Working with Nature chapter also contains Policies and Actions related to green space and greenways, as a resource protection network. Green space includes open space, easements, parks and other types of conservation areas. These Policies and Actions provide the basis for green space and greenways planning in the 2005 Howard County Land Preservation, Recreation and Parks Plan.

This Water Resources Element amendment incorporates and updates relevant Policies and Actions from General Plan 2000 and adds new Policies and Actions. These Policies and Actions are intended to help the County meet an overarching goal of managing our water resources more sustainably. This includes protecting and restoring water quality to reduce the treatment costs for drinking water and ensure our waters remain fishable and swimmable, and conserving water to reduce the energy and infrastructure costs associated with water supply and wastewater treatment.

## Planned Service Area and Priority Funding Area

A significant policy decision in Howard County General Plans since the 1970s was the division of the County into an eastern, urban development area, which would have public water and sewer service, and a less densely developed Rural West, which would not. The Planned Service Area (PSA) in the Master Plan for Water and Sewerage corresponds to the urban development area.

The boundary of the Planned Service Area is Howard County's growth boundary. This identification was strengthened by Maryland's 1997 Smart Growth initiatives under which most categories of State spending for infrastructure and services must be targeted to "Priority Funding Areas" in each County. Howard County's Priority Funding Area is the eastern 40% of the County that lies within the Planned Service Area for both public water and sewerage. The PSA has changed little since 1979, demonstrating the County's commitment to growth management.

Agriculture is the preferred land use in the Rural West. Zoning for the west allows low density residential development, which can be more economically served by individual wells and septic systems. Consequently, this part of the County is designated as the No Planned Service Area.

In July 1993, the County Council voted to extend the PSA to include the area around the Alpha Ridge Landfill. This extension was done solely to address citizen concerns about potential groundwater contamination originating from the Alpha Ridge Landfill, therefore, only water service is provided in this area. In 2006, the County Council voted to allow the provision of sewer service in the Alpha Ridge Water Service Area to provide public services on qualifying government owned parcels. Qualifying parcels are parcels owned by Howard County or the Board of Education, that adjoin another parcel where sewer service is available. Sewer service may be extended to a qualifying parcel only if sewer service can be extended without making the service available to any intervening non-qualifying parcel.

Generally, an extension to the PSA is allowed only if the proposed expansion is part of a proposed zoning and is consistent with the General Plan and Smart Growth policies or for public or institutional uses provided that such an extension is limited to the minimum parcel size necessary to serve the proposed use. In 2006, the County Council voted to limit expansions of the PSA for public or institutional uses to

properties adjoining the existing boundary of the PSA, excluding any intervening privately owned parcels not currently located in the PSA.

Figure 1 shows the General Plan 2000 Policies Map, which includes the PSA boundary.

## Growth Projections

Growth projections for the Water Resources Element are based on the General Plan 2000. In Chapter 4, Balanced and Phased Growth, the General Plan 2000 sets allowed annual levels of new residential units by planning area. Using these allowed annual levels, the growth in housing units is projected, then population is estimated based on persons per housing unit and occupancy factors. Since General Plan 2000 is a 20-year plan, the growth projections for the Water Resources Element extend beyond 2020 to the year 2030. The same general pace of growth is assumed between 2020 and 2030, although development slows as developable land becomes more scarce in the out years.

*Growth projections include potential redevelopment of Downtown Columbia.*

Growth projections for the Water Resources Element were developed in 2008 and are based on a modified version of Round 7a of the Baltimore Metropolitan Council Cooperative Regional Forecast. The Round 7a projections were modified to address the following potential proposals during development of the Water Resources Element.

- A General Plan amendment to request additional population and commercial square footage for the redevelopment of Downtown Columbia.
- A General Plan amendment to request an extension of the PSA to allow limited new residential development on a portion of Doughoregan Manor as part of a comprehensive strategy to protect this National Historic Landmark property.
- Requests for additional population and commercial square footage for the redevelopment of the Columbia Village Centers, as may be permitted under the New Town zoning district.

In 2007, Howard County's household population was 276,263. Based on Round 7a projections, as modified above, the population is expected to grow to almost 330,000 by 2030. This is an increase of about 53,600 residents or a 19% increase over the 23-year projection period. The majority of this growth (80%) will occur inside the Planned Service Area.

In 2005, commercial land use in the County totaled just over 3,500 acres. Based on Round 7a projections, as modified above, this is expected to increase to just over 4,700 acres in 2030. The majority of this acreage (90%) will be located inside the Planned Service Area.

All discussions of projected growth, including land use changes, in the Water Resources Element used the Round 7a projections as modified above. Appendix A provides additional information on the growth projections for the Water Resources Element.

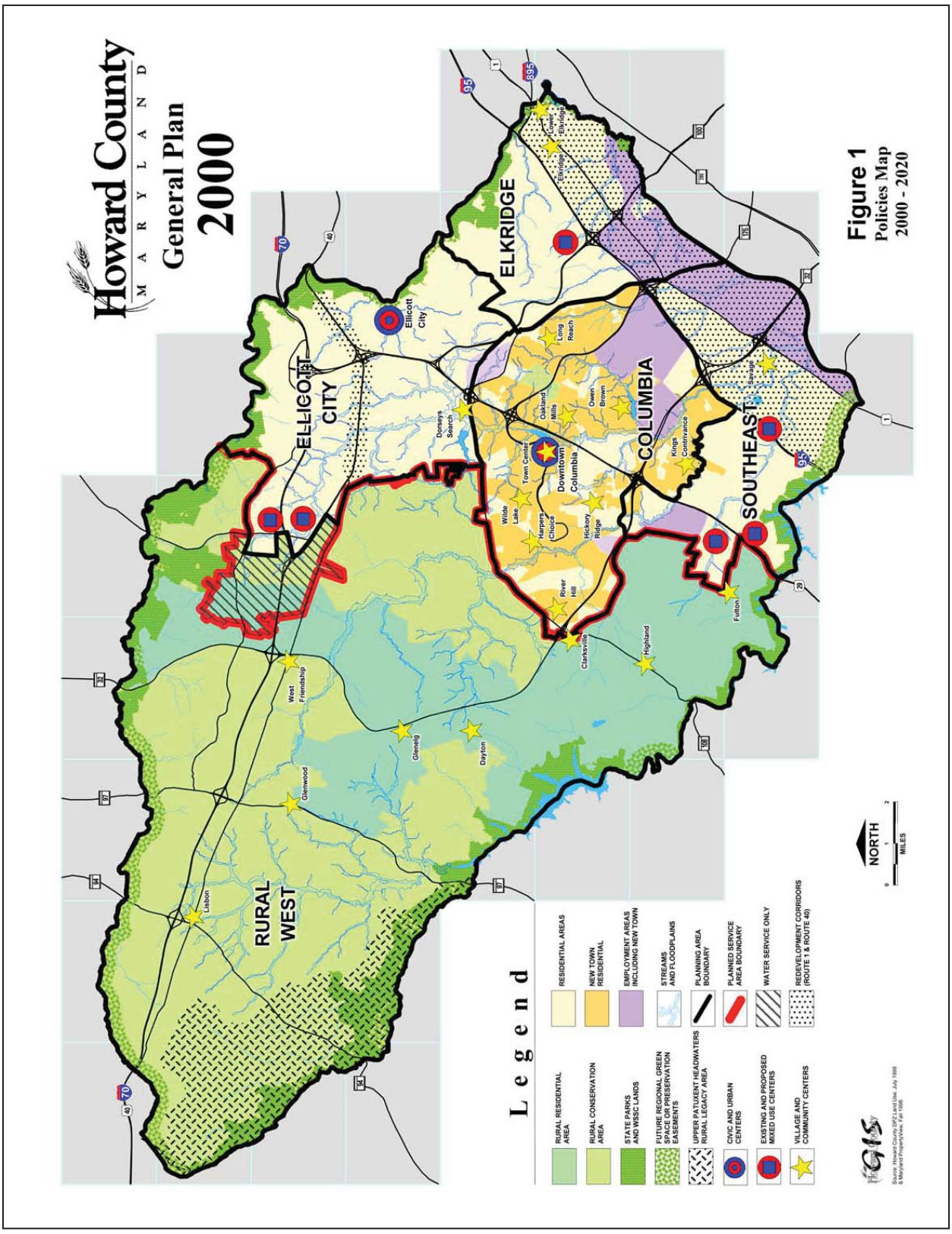



**Figure 1: General Plan 2000 Policies Map**

# DRINKING WATER AND WASTEWATER

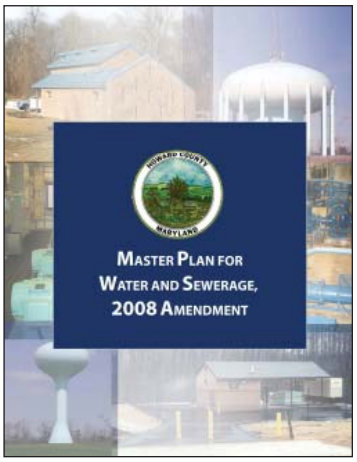
## Introduction

Approximately 86% of the County's population is served by the public water and sewer system and the remaining 14% of the population is served by individual wells and individual and shared septic systems. In 2030, approximately 85% of the County's population will be served by the public system.

The pace of residential and employment growth in the County is directly related to the need for additional water and wastewater service. It is important to maintain a growth rate that does not exceed the capacity of the Baltimore City and Washington Suburban Sanitary Commission (WSSC) water supply systems and the Little Patuxent and Patapsco wastewater treatment plants that serve eastern Howard County.

## The Provision of Public Water and Sewer Services

The County schedules the provision of water and sewer facilities in the Master Plan for Water and Sewerage (the Master Plan). This Water Resources Element incorporates by reference the Master Plan for Water and Sewerage adopted by the County Council on October 6, 2008. The Master Plan and any proposed amendments must be reviewed by both the Department of Planning and Zoning and the Maryland Department of Planning for consistency with the General Plan before being adopted by the County and approved by the Maryland Department of the Environment. Under State law the Master Plan must be updated every three years.




Source: Department of Public Works

*The current Master Plan for Water & Sewerage was adopted by the Howard County Council in 2008.*

The Master Plan establishes and delineates the Planned Service Area (PSA) and identifies the remainder of the County as the No Planned Service Area. For capital project planning and the orderly extension of facilities, the Master Plan delineates service priority areas within the PSA as existing and under construction, 0-5 years, 6-10 years, and comprehensive (beyond 10 years). Construction of water and sewer facilities requires a State permit, which may only be obtained if a property is within the 0-5 years service priority area.

Prior to the provision of public water or sewer service, a property must be included in the PSA and must enter the County's Metropolitan District. All properties in the current Metropolitan District are in the PSA, but not all properties in the current PSA are in the Metropolitan District. All properties in the Metropolitan District are subject to fees, assessments and charges, which are dedicated to the Enterprise Fund, which pays for the construction, operation, maintenance and administration of the public water and sewer system.

At times, a developer may want service to a property earlier than specified by the Master Plan and is willing to construct planned facilities in advance of the County capital project construction schedule. If the proposed development is an orderly extension of the system and is consistent with the General Plan and subdivision regulations, the County grants the service priority area change so development can occur. The request for a change in service priority area is made with the initial development plan submittal. These service priority area changes are reflected in the twice yearly update of the Master Plan.

***What are the four most critical uses for public water?***

- Fire protection and suppression (public safety).
- Flushing away waste (public health).
- Cooling critical equipment and computers.
- Drinking water and wash water.

The State mandates that local authorities may not issue building permits unless the water supply and sewer systems are adequate to serve the proposed development, taking into account all existing and approved developments within the service area. In addition, local authorities may not record or approve a subdivision plat unless water and sewer systems will be adequate and complete in time to serve the proposed development. In Howard County, water and sewer capacity is formally allocated to development at the end of the subdivision or site development plan review process.

Through the self-sustaining Enterprise Fund, the County pays the construction costs for major facilities in the public water and sewer system and the developer pays the cost for the system extension to their individual development. Orderly expansion of the public water and sewer system is controlled through the County's Capital Budget and Ten-Year Capital lmprovement Program, the Metropolitan District entry process, the development plan review process, and the Water and Sewer Capacity Allocation Program.

# Drinking Water

## The Public Water System

The water for the County's public water supply system is purchased from Baltimore City and WSSC, through a series of negotiated legal agreements. More than 95% of the County's public water supply is provided through the Baltimore City Central System and less than 5% is provided by WSSC.

Source: Department of Public Works

*Howard County has nine water storage tanks within the Metropolitan District.*

In addition to supplying water to Baltimore City and Howard County, the Central System also provides water to Anne Arundel, Baltimore, Carroll and Harford Counties. Howard County has several water supply agreements with Baltimore City and Baltimore County. These agreements specify the water supply through four physical connections to the Baltimore County system – one at Elkridge, two along Route 40 and one at Gun Road (also in Elkridge).

The Central System's primary water sources include Loch Raven, Prettyboy and Liberty Reservoirs, with the Susquehanna River as a backup source. The watersheds for the Baltimore system reservoirs lie primarily within Carroll and Baltimore Counties.

In addition to supplying water to Howard County, WSSC also provides water to Montgomery and Prince George's Counties. Water sources for WSSC are the Triadelphia and Rocky Gorge Reservoirs along the

Patuxent River, and the Potomac River. The watersheds for the Patuxent Reservoirs lie primarily within Howard and Montgomery Counties.

Howard County's water system is currently divided into eight pressure zones, as shown in Figure 2. An additional ninth water pressure zone is currently under development in the southern portion of the County for the Hammond Branch Extended area. This area is located west of US 29 between MD 216 and Johns Hopkins Road. The water from WSSC is normally used in the County's water pressure zone located east of I-95 between Laurel and Jessup.

***Why drink public water rather than bottled water?***

- Public water must meet higher standards for purity than bottled water.
- Public water is cheaper than bottled water.
- Bottled water requires considerable energy to produce and distribute.
- Bottled water results in large quantities of refuse that must be recycled or disposed of.

Baltimore City's 2003 Central System Report and 2006 Comprehensive Water and Sewer Plan outline the required improvements to the Central System through the year 2025. A future Central Water Supply System Agreement between Baltimore City, Baltimore County, Anne Arundel County and Howard County will identify the additional water supply facilities needed to provide for projected growth in the Baltimore metropolitan service area and will specify construction schedules, cost shares, water demands and flow limitations.

As shown in Figure 3, current average daily use for the County's public water system is 22.4 million gallons per day (mgd). Under current agreements, the allowable average daily flow from the Baltimore Central System and WSSC is approximately 41.5 mgd. The multiple connections and excess capacity in this supply system gives the County flexibility, should flows be reduced or unavailable through any one connection. If needed, the County system can also pump water from WSSC to other areas of the County, and water from Baltimore City can be substituted for water from WSSC.

The current agreement with WSSC provides for additional capacity, if requested by Howard County and approved by WSSC. The County is currently negotiating with WSSC for this additional capacity, to take advantage of the closer access to WSSC water. Access to this additional capacity would require distribution system improvements by WSSC and Howard County.

As shown in Figure 3, projected average daily use in 2030 is 29.1 mgd and allowable average daily flow is approximately 46.5 mgd. The projected use of water from WSSC in 2030 is maximized to take advantage of the closer access to WSSC water. If the increased flow from WSSC is not available, water from Baltimore City can be substituted. Therefore, the supply of water is not expected to be a constraint on projected growth and development within the Planned Service Area through the year 2030.

### Figure 3: Allowable Water Supply and Use

| Source | Current | | 2030 | |
|---|---|---|---|---|
| | Average Daily Use (mgd) | Average Daily Flow (mgd) | Projected Average Daily Use (mgd) | Planned Average Daily Flow |
| Baltimore City | 20.9 | 38.5 | 21.6 | 38.5 |
| WSSC | 1.5 | 3.0 | 7.5 | 8.0 |
| **Total** | **22.4** | **41.5** | **29.1** | **46.5** |

*Source: DPW 2008 and 2008 Master Plan for Water and Sewerage*
*Note: Current use based on FY2008 water purchase records.*

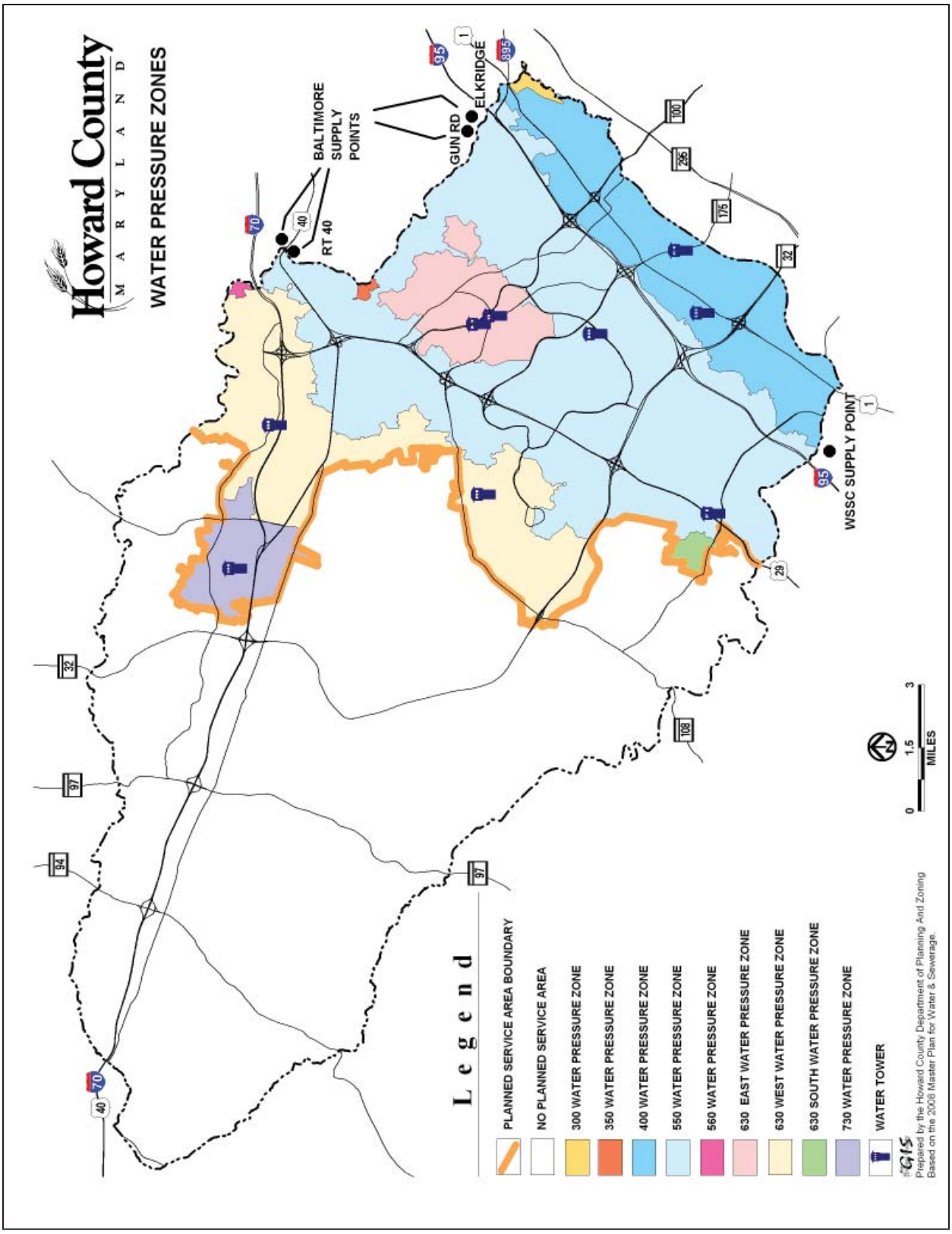



**Figure 2: Water Pressure Zones Map**

## Outside the Planned Service Area

Groundwater is the major source of potable water where public water service is not available. The most recent study of groundwater quality and yield in the County is Water Resources of Howard County, Maryland, published by the Maryland Geological Survey in 1995 as Bulletin 38. Overall groundwater quality is generally good, however, most of the water is somewhat acidic.

Howard County lies within two physiographic provinces, the Piedmont and Coastal Plain provinces. The Fall Zone forms a boundary between the two provinces and runs in a northeast to southwest direction roughly parallel with I-95. The majority of the County (90%) lies within the Piedmont province. In the Piedmont, groundwater is found in the joints and fractures of the crystalline rock formations. In the Coastal Plain, groundwater is found in the intergranular spaces of unconsolidated sediments. The vast majority of wells in the County are in the Piedmont province.

There is generally an adequate supply of good quality groundwater within these formations to serve projected ultimate development demand outside the PSA even under drought conditions. However, this is a regional analysis that does not address individual well conditions. The ability to locate and tap groundwater in the Piedmont may vary significantly with well location, because groundwater is stored in and travels through a network of fine cracks and fissures in the bedrock aquifer.

Source: Health Department

*The Health Department's Bureau of Environmental Health is responsible for review and approval of private wells in the County.*

The withdrawal of water from surface and groundwater supplies is regulated by the Maryland Department of the Environment (MDE), through the issuance of Water Appropriation Permits. Small water users such as individual residences and agricultural users of less than 10,000 gallons per day are exempt from permit requirements. Permit applications are reviewed to ensure that the quantity requested is available and reasonable, that the withdrawal will not affect downstream or other users, and that the withdrawal will not impact the resource. Examples of impacts to the resource that the permitting system is intended to prevent include withdrawal from groundwater that exceeds the recharge rate of the aquifer or withdrawal from a stream that reduces flows to the point that aquatic life in the stream is harmed.

The fractured-rock aquifers of the Piedmont are generally more susceptible to contamination than the Coastal Plain aquifers. There are a few well contamination problems in various unrelated areas outside the PSA. Currently, two subdivisions are experiencing well contamination problems with excess nitrates. These problems are being addressed by the property owners with individual water quality treatment devices. In addition, Lisbon is experiencing well contamination problems with gasoline and solvents, excess nitrates and bacteriological (coliforms). MDE is providing carbon treatment on several sites and other problems are being addressed by the property owners with individual water quality treatment devices.

Radium and radon are radioactive elements found naturally occurring in the Baltimore Gneiss geologic formation that underlies a significant area in central Howard County. The Health Department has done extensive testing of wells within this formation, and both elements have been detected. Property owners with elevated levels have been advised to install treatment devices and the Health Department has done follow up testing to confirm the treatment is functioning properly.

## Source Water Assessments

The Federal Safe Drinking Water Act Amendments of 1996 require source water assessments (SWA) for public water supplies. The SWA evaluates the susceptibility of the public water supply source to various contaminants and contains recommendations to protect the source from these contaminants. Source water assessments are designed to promote local, voluntary source water protection programs.

In Howard County, SWAs were developed from 2003 to 2005, for water supply systems that serve 25 or more individuals. This included the Baltimore and Patuxent Reservoir systems, and 76 well systems for facilities such as shopping centers and schools. The SWAs found that each system assessed provides drinking water that meets Safe Drinking Water Act standards, but each system is susceptible to one or more contaminants. In general, the SWA recommendations to reduce this susceptibility are to maintain and strengthen existing protection and monitoring efforts.

Source: Rob Hirsch

*The Baltimore Reservoirs, which provide a majority of Howard County's drinking water, are the subject of an interjurisdictional watershed protection agreement.*

### Reservoir Systems

The SWAs for the Baltimore and Patuxent Reservoirs recommended limiting nonpoint source pollution to the reservoirs, especially runoff from suburban and agricultural land uses in the watersheds. The SWAs deferred to the Total Maximum Daily Loads (TMDLs), a requirement of the Federal Clean Water Act, to quantify the needed pollutant reductions. The TMDL for the Patuxent Reservoirs is discussed in the Water and Related Land Resources section, under the Total Maximum Daily Loads topic.

The Baltimore Reservoirs and the Patuxent Reservoirs are both subjects of interjurisdictional watershed management and protection agreements. Signatories to the Baltimore Reservoirs Agreement include Carroll and Baltimore Counties, the Carroll and Baltimore County Soil Conservation Districts, Baltimore City, and the Maryland Departments of Agriculture and the Environment. Signatories to the Patuxent Reservoirs Watershed Protection Agreement include Howard, Montgomery and Prince George's Counties, WSSC, the Howard and Montgomery County Soil Conservation Districts, and the Maryland-National Capital Park and Planning Commission. The Baltimore Reservoirs Agreement was signed in 1984 and the Patuxent Reservoirs Watershed Protection Agreement was signed in 1996. As a customer of the Baltimore water supply system, Howard County participates in the Baltimore Reservoirs Agreement. Howard County is a signatory to the Patuxent Reservoirs Agreement, because the County contains just over half of the watershed for this system.

Signatories to these agreements are working together to protect and improve the quality of the water flowing to these reservoirs. The Baltimore Reservoirs effort is guided by an Action Strategy and the Patuxent Reservoirs effort is guided by a Priority Resource Protection Program. (More information about the priority resources is given in the Water and Related Land Resources section, under the Patuxent Reservoirs topic.) Ongoing activities include the implementation of best management practices such as agricultural nutrient management, stream buffer plantings, stream channel stabilization, and stormwater retrofits for the control of nonpoint source pollution from agricultural and developed land, water quality monitoring in watershed streams and the reservoirs, and outreach and education to encourage environmental stewardship among those living, working and recreating in the watershed.

The reservoir protection agreements and the work done under them will help Baltimore City and WSSC, as water suppliers, and the jurisdictions within the reservoir watersheds implement the recommendations of the source water assessments. However, addressing nonpoint sources of pollution from developed and agricultural land uses requires adequate and sustained funding and private landowner cooperation. Both reservoir protection programs would benefit from increased funding and support.

### Well Systems

The SWAs for the well systems recommended a number of protection measures to address potential point and nonpoint sources of contamination. Potential point sources of contamination include underground storage tanks, controlled hazardous substance generators (such as dry cleaning operations) and groundwater discharges associated with commercial areas. Nonpoint sources of contamination include agricultural land, commercial land and private septic systems.

To ensure the safety of these well systems, monitoring is conducted on a regular basis by the Health Department or the system owner and the results are reported to MDE. Education for system owners is part of this monitoring process. The Health Department also mails information regularly on the need for routine well testing to private residential and nonresidential property owners with wells.

***What can each of us do to conserve water?***

- Install low flow toilets, faucets and showerheads
- Take shorter showers and turn off the water while brushing teeth, shaving, etc.
- Use a water saving dishwasher and clothes washer, and only run full loads.
- Do not water lawn.
- Use rain barrels to capture rain water for watering lawns and gardens.
- Plant native plants that do not require regular watering.

## Water Conservation

Clean, safe drinking water is a valuable resource that should be used as wisely as possible. Potable water is currently used to flush our toilets, water our lawns and gardens, and wash our cars, when nonpotable water would suffice. The State requires low flow toilets and showerheads in all new residential construction and per capita water consumption has been decreasing in the County since 2000, primarily as a result of these fixture requirements. Additional water conservation in our homes, gardens and businesses would help the County manage water resources more sustainably and reduce flows to wastewater treatment facilities.

Source: Jennifer Dowdell

*Cisterns at the Chesapeake Bay Foundation collect rainwater for nonpotable indoor uses.*

Public outreach and education, as well as financial incentives, can encourage increased water conservation by residents and businesses. Relatively easy conservation measures include using rain barrels to collect rainwater for outdoor watering and washing, replacing lawns with native plants that require less watering, and installing water conserving fixtures and appliances. More complex measures include using cisterns to collect rainwater for indoor nonpotable uses and reusing greywater. Greywater reuse or recycling takes water from washing machines, sinks and bathtubs for nonpotable uses such as flushing toilets and irrigation. Rainwater harvesting and greywater reuse for nonpotable indoor uses have been discouraged or prohibited due to human health concerns. Building codes and regulations should be reviewed and modified

where necessary to remove impediments for retrofitting existing and building new homes and businesses with water conservation and reuse practices and technology.

# Wastewater

## The Public Sewer System

The public sewer system is divided into two main service areas, as shown in Figure 4. The service areas are largely defined by the natural drainage areas for the Patuxent and Patapsco Rivers, which allows sewage to flow by gravity to the wastewater treatment plants located at lower points along each river. The Patuxent Service Area includes the Columbia and Savage areas of the Metropolitan District, along with the Route 108 Pumping Station Service Area. The Patapsco Service Area covers the remainder of the Metropolitan District, including the Ellicott City and Elkridge areas. The Route 108 Pumping Station Service Area is a large sub-service area that provides system flexibility. This area is north of MD 108 and west of US 29 and is geographically part of the Patuxent Service Area. If needed, the Route 108 Pumping Station gives the County the option of diverting flow from this area to the Patapsco Service Area.

Source: Howard County Public Information Office

*The Little Patuxent WRP, located in Savage, is owned and operated by Howard County.*

The Patuxent Service Area flows are treated by the Little Patuxent Water Reclamation Plant (WRP), which is owned and operated by Howard County. The Little Patuxent WRP discharges approximately four miles downstream of the plant to a point below the Fort Meade water intake on the Little Patuxent River in Anne Arundel County. The Patapsco Service Area flows are treated by the Patapsco Wastewater Treatment Plant (WWTP), which is owned and operated by Baltimore City. The Patapsco WWTP discharges into the Patapsco River in the Baltimore Harbor. The County's share of capacity and operating and capital costs for the Patapsco WWTP are determined by formal agreements with three other jurisdictions – Baltimore City, Baltimore County and Anne Arundel County.

Increases in treatment plant capacity through the expansion of existing plants or the addition of new plants are controlled by National Pollutant Discharge Elimination System (NPDES) permits issued by the Maryland Department of the Environment in accordance with Federal Clean Water Act requirements. These permits consider the impact wastewater treatment plant discharges will have on the water quality and downstream uses of the receiving stream. If the increase in discharges will limit downstream uses of the stream, pollution offsets may be necessary and, if this is not possible, permits can be denied. In addition, downstream users of a stream can present legal challenges to permits for treatment plant expansions if the expansion threatens to limit their use of the stream.

As part of Maryland's commitment to meet Chesapeake Bay cleanup goals established in the Chesapeake 2000 Agreement, annual nutrient (nitrogen and phosphorus) loading caps have been established for all major (design capacity greater than 0.5 mgd) wastewater treatment plants in the State. These nutrient loading caps are enforced through the NPDES permit for the plant. The NPDES permit for the Little Patuxent WRP currently has an annual nutrient loading cap that is based on a plant design capacity of 25 mgd and the use of Enhanced Nutrient Removal (ENR), a biological treatment process.

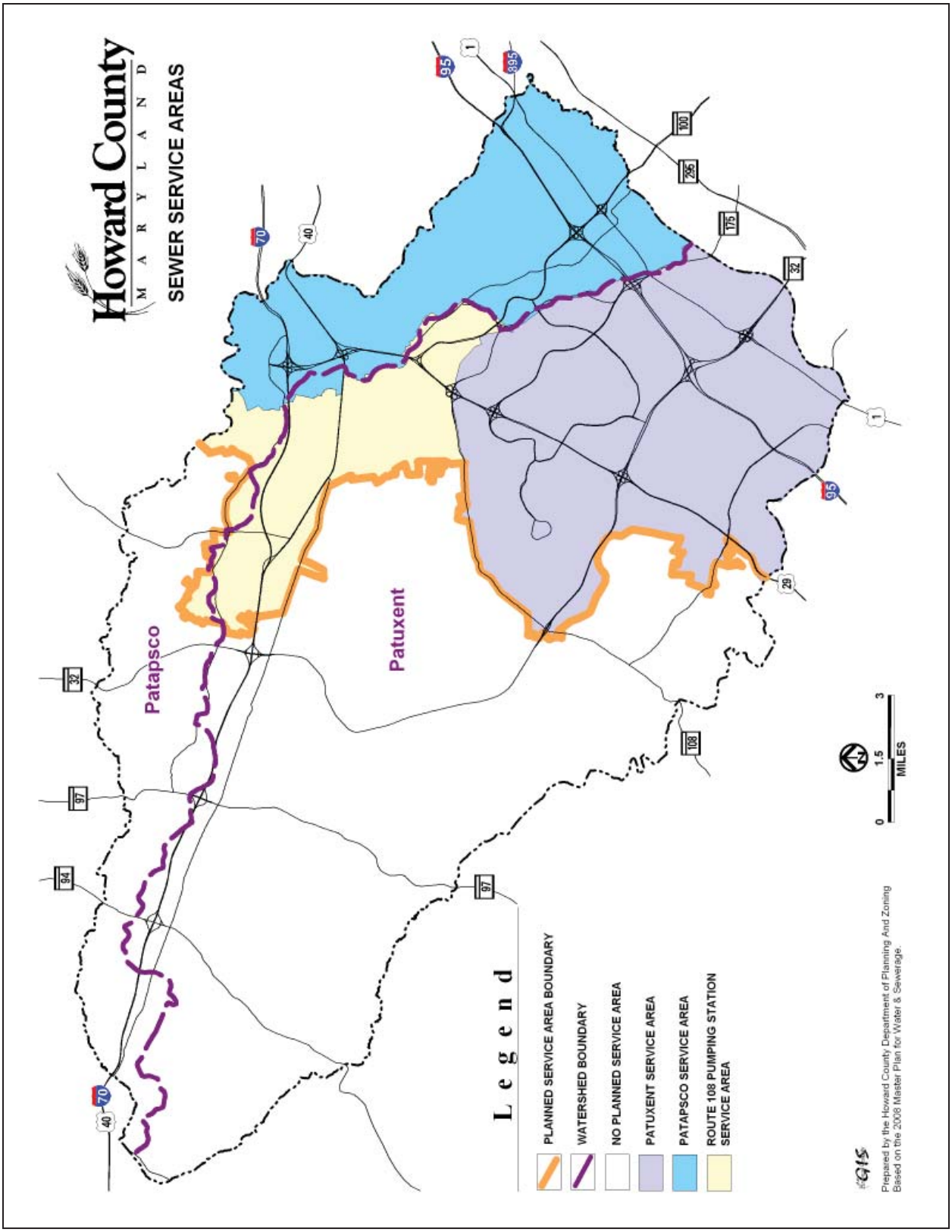



**Figure 4: Sewer Service Areas Map**

When ENR treatment is operating at maximum efficiency, an effluent nutrient concentration of 3.0 milligrams per liter (mg/L) or less total nitrogen and 0.3 mg/L or less total phosphorus can be achieved. However, since ENR relies on biological processes, this effluent concentration may be difficult to achieve in the winter when cold weather slows these processes, especially for nitrogen. To provide a margin of safety for nitrogen in the NPDES permit, the nutrient loading cap is based on an annual average concentration of 4.0 mg/L total nitrogen and an annual average concentration of 0.3 mg/L total phosphorus. This generates an annual nutrient loading cap for the Little Patuxent WRP of 304,556 lbs of nitrogen and 22,842 lbs of phosphorus.

As shown in Figure 5, the Little Patuxent WRP has a current capacity of 25.0 mgd and the current County usage is 18.7 mgd. This capacity will meet County needs through 2015. The County is currently expanding plant capacity to 29.0 mgd and adding ENR treatment at the plant. Construction began in 2009 and is expected to be completed in 2012. The projected usage at the plant in 2030 is 26.9 mgd.

Once flow at the Little Patuxent WRP exceeds 25 mgd, the NPDES permit will require an annual average nutrient concentration of 3.45 mg/L total nitrogen and 0.25 mg/L total phosphorus. This is based on a reduction of the nutrient cap concentrations by a ratio of 25/29. To achieve these reduced nutrient concentrations as flow increases from 25 to 29 mgd, the plant must be running at a higher efficiency for ENR treatment for a longer time each year.

Figure 6 presents the current and future annual nutrient loads for the Little Patuxent WRP. The current load is based on an annual average concentration in the discharge of 5.3 mg/L total nitrogen and 0.4 mg/L total phosphorus. The projected 2030 load is based on an annual average concentration of 3.45 mg/L total nitrogen and 0.25 mg/L total phosphorus. The addition of ENR treatment will decrease annual nitrogen loads by 6.4% and decrease annual phosphorus loads by 11.4%, even with increased flows, and keep the plant under its nutrient loading cap.

The expansion of the Little Patuxent WRP will use the entire parcel on which the plant is currently located. The County also owns an adjacent parcel that could be used for future expansions or treatment improvements, if needed.

The Patapsco WWTP has a current capacity of 73 mgd and the current County share of this capacity is 10.0 mgd. As shown in Figure 5, current usage by the County is approximately 6.6 mgd. Sewage flows in the Patapsco Service Area are projected to be 10.2 mgd by 2030. The Patapsco WWTP is currently adding ENR facilities and expanding capacity to 81 mgd. Construction began at the end of 2009 and is expected to be completed in 2012. The County share of this new capacity is projected to be 11.0 mgd.

The Patapsco WWTP also has an annual nutrient cap that is based on a plant design capacity of 73 mgd and the use of ENR treatment. This generates an annual nutrient loading cap for the plant of 889,304 lbs of nitrogen and 66,698 lbs of phosphorus. If Howard County's portion of this cap is based on the current County share of capacity at this plant, this generates an annual nutrient loading cap for County usage of 121,822 lbs of nitrogen and 9,137 lbs of phosphorus. The addition of ENR treatment may reduce future capacity at the plant, because this plant has no additional land available for expansion, and ENR treatment requires additional space and treatment time. If plant capacity is reduced, this may in turn reduce the County's capacity allocation at the plant. Capacity at the plant will be determined after the ENR addition is completed and a new NPDES permit is issued.

Figure 6 presents the current and future annual nutrient load from Howard County usage at the Patapsco WWTP. The current load is based on an annual average concentration in the discharge of 19.46 mg/L total nitrogen and 1.16 mg/L total phosphorus. The projected 2030 load is based on an assumed annual

average concentration of 3.60 mg/L total nitrogen and 0.27 mg/L total phosphorus. This is based on a reduction of the nutrient cap concentrations by a ratio of 73/81. The addition of ENR treatment will decrease annual nitrogen loads by 71.4% and decrease annual phosphorus loads by 64.0%, even with increased usage by Howard County.

The total currently planned treatment capacity of 40.0 mgd will satisfy the County's projected needs of 37.1 mgd in 2030, while maintaining the nutrient load limits at the plants. However, a question remains about a possible decrease in capacity at the Patapsco WWTP, due to the ENR upgrade and nutrient cap.

### Figure 5: Wastewater Treatment Plant Capacity and Use

| Treatment Plant | Current | | 2030 | |
|---|---|---|---|---|
| | Average Daily Use (mgd) | Capacity (mgd) | Projected Average Daily Use (mgd) | Planned Capacity (mgd) |
| Patapsco | 6.6 | 10.0 | 10.2 | 11.0 |
| Little Patuxent | 18.7 | 25.0 | 26.9 | 29.0 |
| **Total** | **25.3** | **35.0** | **37.1** | **40.0** |

*Source: DPW 2008; 2008 Master Plan for Water and Sewerage; 2007 flows for current usage.*

### Figure 6: Wastewater Treatment Plant Nutrient Loads

| Treatment Plant | Current Usage (mgd) | Current Nutrient Load (lbs/year) | | 2030 Usage (mgd) | 2030 Nutrient Load (lbs/year) | | Nutrient Cap (lbs/year) | |
|---|---|---|---|---|---|---|---|---|
| | | Nitrogen | Phos. | | Nitrogen | Phos. | Nitrogen | Phos. |
| Little Patuxent | 18.7 | 301,701 | 22,770 | 26.9 | 282,508 | 20,167 | 304,556 | 22,842 |
| Patapsco | 6.6 | 390,972 | 23,306 | 10.2 | 111,779 | 8,383 | 121,822 | 9,137 |

*Source: Howard County DPW 2008 and Baltimore City DPW 2010; 2008 Howard County Master Plan for Water and Sewerage; 2007 flows for current usage.*

## Outside the Planned Service Area

Outside the Planned Service Area, wastewater treatment is provided by individual and shared septic systems. In general, County soils are capable of supporting septic fields throughout the Rural West. Lisbon is the only problem area, due to small lot sizes, marginal soils in some areas and old systems. The County evaluated Lisbon for well and septic concerns and proposed a shared septic system in 2008; however, residents were not supportive of the proposal. Some of the problem lots may need holding tanks if suitable repair areas are not available. The Health Department also receives reports on a small number of individual failing septic systems in other areas of the County. Repairs to these systems are based upon the individual property conditions and available septic repair area.

The General Plan 2000 recommends the use of shared septic systems for cluster subdivisions, to protect groundwater and agricultural lands in the Rural West. Generally, soils that are well suited for septic systems are also well suited for agriculture. With a shared septic system, the common drain field is placed


Source: F. E. B Construction, LLC

*Septic systems provide wastewater treatment outside the Planned Service Area.*

on optimum soils and the individual septic tanks remain on individual lots. This allows homes to be located in areas that are marginally or poorly suited for agriculture.

Shared septic systems are owned, operated and maintained by the County, and maintenance costs are financed by the system users. The Master Plan for Water and Sewerage lists 29 existing or planned shared septic systems in the County. Nine of these systems are large enough (with design flows over 10,000 gallons per day) to require an MDE groundwater discharge permit. Because the maintenance cost per house is very high for large systems, the County no longer allows any new, large systems requiring an MDE permit after 2004, or, if owned by the Howard County Board of Education, after 2006.

The Master Plan also lists one private community and five institutional WWTPs with subsurface discharge outside the PSA. The Howard County Public School System owns three of these institutional plants.

Limiting the amount of nitrogen discharged to groundwater by individual on-site septic systems is a water quality concern. Excess nitrogen in groundwater limits the use of groundwater as a water supply source. Additionally, since groundwater is a source of base flow in streams, excess nitrogen in groundwater can also contribute to nutrient enrichment problems in streams and the Chesapeake Bay.

A variety of on-site treatment technologies have been developed to reduce the amount of nitrogen discharged from septic systems, and MDE has a list of approved manufacturers and treatment units for nitrogen reducing septic systems. Other local jurisdictions have approved, and in some areas required, the use of nitrogen reducing septic systems for replacement and new septic systems. Nitrogen reducing septic systems provide substantially better treatment, but they cost significantly more than a standard system and have ongoing operation and maintenance costs.

As part of Maryland's commitment to meet Chesapeake Bay cleanup goals, Maryland developed Tributary Strategy plans to reduce nutrient and sediment loads from each major tributary to the Chesapeake Bay. These Tributary Strategy plans include reduction strategies for nitrogen discharges to groundwater from on-site septic systems. The Tributary Strategy plans call for all new (as of 2006) septic systems to be nitrogen reducing systems, and for retrofits of all existing conventional septic systems with nitrogen reducing technology or for these systems to be connected to a wastewater treatment plant. In 2009, the State passed legislation that requires all new or replacement septic systems in the Chesapeake Bay and Coastal Bays Critical Areas use nitrogen reducing technology. Future State regulations may require nitrogen reducing technology for new and upgraded septic systems in additional areas of the State or Statewide.

Maryland's new Chesapeake Bay 2010 Restoration Fund has grant funds available for the addition of nitrogen reducing systems for existing septic systems. The priority area for these funds is the Chesapeake Bay and Coastal Bays Critical Areas. Recently, due to a surplus of funds, MDE made the funds available on a Statewide basis and Howard County residents applied for them. Most of this surplus has now been allocated. The County should make information about the CB 2010 grant funds more widely available to

residents when the funds are available on a Statewide basis, to encourage greater voluntary participation in the program. The County could also provide financial incentives such as tax credits to encourage the use of nitrogen reducing treatment for new and upgraded septic systems.

Nitrogen reducing septic systems require regular inspection and maintenance to ensure proper operation. As these systems become more numerous, the County should investigate options to establish a long-term inspection and maintenance program.

## Redevelopment within / Expansion of the Planned Service Area

The water and sewer systems in Howard County have been designed based on projected growth as permitted by zoning and the limits of the Planned Service Area, as the PSA was designated in the General Plan and the Master Plan for Water and Sewerage at the time of the system design. Growth projections developed in 2008 for the redevelopment of Columbia Town Center and the Village Centers, and the development of a portion of Doughoregan Manor create an increased water and sewer service demand within the PSA. This increase is within the projected capacity of the water supply and sewage treatment system, however, the development of a portion of Doughoregan Manor will require an expansion of the current PSA. The development for Doughoregan Manor will not require any resizing of the water delivery system, but will require the advancement and construction of a capital project, currently in the capital budget, to provide adequate capacity in the sewage collection system.

Consideration of bringing a portion of Doughoregan Manor into the PSA is premised on permanent preservation of most of this National Historic Landmark property. It is not intended to signal the potential for inclusion of any other properties with existing or proposed multi-use septic systems adjacent to the PSA. Including additional properties would further increase flow to the Little Patuxent WRP and increase the need to achieve higher efficiency ENR treatment. Wastewater treatment should be provided within the Patuxent Service Area to minimize increases in flow and the nutrient concentration in flow sent to the Little Patuxent WRP from expansion of the PSA for Doughoregan Manor.

Source: Department of Public Works

*Wastewater pretreatment, such as at this industrial facility on US 1, can help reduce flow and nutrient concentration in flow sent to wastewater treatment plants.*

Any future redevelopment within the PSA or extension of the PSA westward, beyond that currently projected, could require further improvements to the wastewater treatment system. These improvements could include: adding parallel collection lines, increasing capacity at existing pumping stations and adding pumping stations. Additionally, such redevelopment or new development may also require more capacity than the County has available under current NPDES nutrient cap limits and/or interjurisdictional agreements. Development on properties added to the current PSA, large redevelopment sites within the PSA and large sites with zoning intensification within the PSA should minimize increases in flow and the nutrient concentration in flow sent to the wastewater treatment plants. This can be achieved through a combination of water conservation and reuse, and wastewater treatment and the use of reclaimed water.

The nutrient loading caps for the Little Patuxent WRP and the Patapsco WWTP may be further reduced in the future to accommodate cleanup plans mandated under the Federal Clean Water Act for the Patuxent River, Patapsco River and Chesapeake Bay. An additional concern for the nutrient caps is that the effluent nutrient concentration is currently based on an annual average, but there is discussion by the regulatory

Source: Illinois Institute of Technology

*Wastewater reuse for irrigation can help reduce discharges from wastewater treatment plants.*

agencies of moving to a monthly average. A monthly average would be more difficult to achieve at higher flows in the colder months when the biological treatment process is slowed.

Two options available to reduce nutrient discharges from wastewater treatment plants are wastewater reuse and nutrient trading. Wastewater reuse is currently under development in Howard County. A reclaimed wastewater system is currently being constructed to use effluent from the Little Patuxent WRP for cooling and wash down water to serve industrial customers along the Route 1 corridor. This is expected to be one of the first wastewater reuse facilities in Maryland, but final implementation awaits new State regulations. Additional opportunities for wastewater reuse are being explored. Reuse of flow from the Little Patuxent WRP helps meet the nutrient cap by reducing discharges from the plant.

A variation on wastewater reuse is to build a small treatment plant (or "scalping plant") upstream of the Little Patuxent WRP, so flow is intercepted and treated for reuse before reaching the main plant. The County is considering options for scalping plants when potential customers are identified and site conditions are favorable.

Nutrient trading must take place within the framework of Phase I of Maryland's nutrient trading policy, which addresses trading between point sources and trading involving the removal of septic systems. The policy divides the State into three large trading regions: the Potomac Tributary Basin, the Patuxent Tributary Basin, and the Eastern Shore and Western Shore Tributary Basin, including the Susquehanna River watershed. The Little Patuxent WRP is located within the Patuxent Tributary Basin, and the Patapsco WWTP is located within the Eastern Shore and Western Shore Tributary Basin. The policy states that sources within each basin may trade only with other sources within that basin. Nutrient trading will be implemented through the NPDES permit system. Point sources such as WWTPs must secure the right to nutrient credits for two 5-year permit terms and submit a plan to secure the credits for at least 10 years beyond this period.

Options for nutrient trading include:

- Acquire point source discharge credits from other dischargers.
- Upgrade treatment at an existing minor WWTP (a plant with a design capacity of less than 500,000 gpd).
- Retire an existing minor WWTP after connecting its flow to a Biological Nutrient Removal or ENR facility. The County is pursuing this option by connecting the MD-VA Milk Producers WWTP to the Little Patuxent WRP.
- Retire an existing septic system by connecting it to a WWTP with ENR.
- Land application of wastewater with pre-treatment and nutrient management controls.

### *What can each of us do to reduce wastewater flows and the nutrient content in these flows?*

- Eliminate or reduce the use of garbage disposals.
- Compost food wastes (but not meat, dairy or fats) rather than use garbage disposal.
- Do not pour fats, oil or grease down the sink.
- Do not flush down the toilet or pour down the sink objects that should go in the trash or to a household hazardous waste collection site, such as tissues, pharmaceuticals, chemical cleaners, paints, solvents, etc.
- Install a composting toilet or waterless urinal.

- Implement nonpoint source practices. There is no State policy yet on this type of trading, Phase II of the nutrient trading policy will address trades between point and nonpoint sources.

Given the uncertainty surrounding future nutrient cap limits and the influence they have on future capacity at the Little Patuxent WRP and the Patuxent WWTP, the County should continue to look for opportunities to expand wastewater reuse and investigate options for nutrient trading to reduce nutrient discharges from the plants. In evaluating alternative options, consideration shall be given to the impact on County residents and the County with respect to, but not limited to, odor, transportation of sludge, capital costs, and operating costs.

## Infrastructure Maintenance

Source: Department of Public Works

*The Department of Public Works, Bureau of Utilities, is responsible for maintaining the County's water and sewer system.*

Maintenance of the existing water and sewer system is an ongoing concern as portions of each system reach the design life of 50 years. The Bureau of Utilities schedules major infrastructure replacements, based on an equipment design life of 50 years. Major infrastructure replacements are funded through the capital budget process and are paid for by the Enterprise Fund. The Capital Improvement Master Program has a ten-year planning horizon, which facilitates planning for major infrastructure replacements. The Bureau of Utilities also evaluates infrastructure maintenance needs annually, based upon operations and maintenance activities. These activities can include the type, number and location of water main breaks and water quality inquiries, which may be related to aging water mains, and the type, number and location of sewer system overflows and facility operational efficiencies. Based on this evaluation, recommendations are given for replacement or renovation.

## *Policies and Actions*

Policies and Actions to address drinking water supply and wastewater treatment are based on the following goals:

- Maintain a safe and adequate drinking water supply and adequate amounts of wastewater treatment capacity to serve projected growth.
- Invest in water and sewer infrastructure that will provide adequate treatment capacity and reduce pollutant loading in rivers and streams.
- Maintain the nutrient caps at the Little Patuxent Water Reclamation Plant and the Patapsco Wastewater Treatment Plant.
- Reduce nutrient loads from septic systems.
- Encourage individuals, communities, organizations and businesses to be partners in helping the County meet drinking water and wastewater treatment goals.

## Policy 1: Ensure the safety and adequacy of the drinking water supply, and promote water conservation and reuse.

**1.1** Increase funding and support for implementation of the Baltimore Reservoirs Action Strategy and the Patuxent Reservoirs Priority Resource Protection Program.

**1.2** Require that properties added to the current Planned Service Area, large redevelopment sites within the PSA and large sites with zoning intensification within the PSA implement water conservation and reuse practices and technology.

**1.3** Modify codes and regulations as needed to remove impediments for existing development, new development and redevelopment to implement water conservation and reuse practices and technology.

**1.4** Allow and promote greywater reuse for nonpotable uses.

**1.5** Conduct public outreach and education to encourage greater water conservation in homes, gardens and businesses.

**1.6** Provide incentives to encourage property owners to install water conserving fixtures and appliances.

Source: WSSC

*Maintaining a safe and adequate supply of drinking water is a goal of the Howard County Water Resources Element.*

## Policy 2: Ensure the adequacy of wastewater treatment capacity.

**2.1** Accommodate flows from projected growth in the Planned Service Area by completing the expansion and upgrade of the Little Patuxent Water Reclamation Plant.

**2.2** Require that properties added to the current Planned Service Area, large redevelopment sites within the PSA and large sites with zoning intensification within the PSA minimize increases in flow and the nutrient concentration in flow sent to the wastewater treatment plants.

**2.3** Expand wastewater reuse and nutrient trading to reduce nutrient flows and help maintain the nutrient cap at the Little Patuxent WRP and the Patapsco WWTP.

## Policy 3: Reduce nitrogen loads to surface and groundwater from septic systems.

**3.1** Conduct public outreach and education to encourage use of State grant funds for septic system upgrades to nitrogen reducing systems when the funds are available on a Statewide basis.

**3.2** Provide financial incentives to promote the use of nitrogen reducing treatment for new and upgraded septic systems.

**3.3** Investigate options to establish and maintain a long-term septic system inspection and maintenance infrastructure for nitrogen reducing systems.

# WATER AND RELATED LAND RESOURCES

## Introduction

One purpose of the Water Resources Element is to ensure that the County has adequate land and water capacity for the treatment of stormwater runoff. To assess treatment capacity for stormwater runoff, the County must estimate current and future pollution loads from stormwater runoff, gauge the expected impacts of these loads on water quality in local streams, lakes and reservoirs, and determine the ability of existing and new tools to mitigate these impacts. Tools to mitigate impacts can include:

- Best management practices to reduce pollution from individual properties
- Development regulations
- Stormwater management, including new and retrofit facilities
- Stream and wetland restoration

These tools can be applied on a countywide basis or be tailored to specific watershed conditions under the guidance of watershed management plans.

## Stormwater Management

Stormwater runoff is generated when the amount of rainfall or snowmelt on the land exceeds the land's capacity to absorb and hold water. Human activities can decrease the land's capacity to absorb water by removing vegetation, disturbing and compacting the soil, and by covering the land with impervious surfaces such as buildings, roads and parking lots. When the land's capacity to absorb and hold water is decreased, the water available for groundwater recharge is also decreased. In addition, the land generates more runoff, which flows at a faster rate into local streams.

These changes in groundwater recharge and runoff degrade water quality and habitat in local streams. Groundwater supplies the low flow or base flow in streams. As groundwater recharge decreases, groundwater levels drop, which subsequently lowers base flow levels in streams. If base flow levels drop too much, stream channels can dry up in times of low precipitation. Conversely, increased runoff flowing at a faster rate increases the frequency and magnitude of flooding and increases stream channel erosion. Increased channel erosion generates more sediment loading in the stream and undercuts banks, often toppling trees and other vegetation along the stream banks.

*Increased stormwater runoff can increase stream channel erosion, degrading stream water quality and habitat.*

Stormwater runoff also carries many pollutants from the land, including: oil, grease, salts and metals from roads and driveways; sediment, fertilizers, animal waste and pesticides from lawns and agricultural fields; and nutrients and metals deposited from air pollution. This type of pollution is called nonpoint source pollution, because it comes from many diffuse sources on the land. This pollution degrades water quality and habitat in our local streams and reservoirs and, subsequently, in the Chesapeake Bay.

Stormwater management has been required in Maryland since 1984 to mitigate some of the environmental impacts caused to water bodies by development. As more has been learned about the negative impacts stormwater runoff can have on water quality and habitat conditions in our local streams, Federal, State and local regulations for stormwater management have been expanded to increase pollutant removal, groundwater recharge and stream channel protection requirements.

*Environmental Site Design uses small treatment facilities, such as rain gardens (above), rather than large ponds (below).*

The current State stormwater management regulations, adopted by Howard County in 2001, promote the use of low impact development or environmental site design (ESD). ESD emphasizes reducing the amount of stormwater runoff generated by using site design techniques that limit site disturbance and reduce the creation of impervious surfaces. The regulations promote the treatment of runoff by holding it on-site where it can be filtered and reabsorbed by the soil in multiple, small treatment facilities. This approach to stormwater management is different from the previous approach, which focused on collecting the majority of runoff in one or two large treatment facilities, most often stormwater management ponds.

ESD techniques can include: using cluster development and reducing road widths and parking requirements to limit site disturbance and impervious surfaces; preserving sensitive natural areas such as forests and nontidal wetlands; directing runoff from impervious surfaces such as rooftops to pervious surfaces such as lawns, to slow the flow of runoff and allow the runoff to filter through vegetation and soak back into the ground; and building smaller, on-site quality treatment facilities often called bioretention facilities. Bioretention facilities are small holding areas that treat runoff through natural processes, including soil filtration and nutrient uptake by vegetation. The use of ESD techniques can eliminate the need for large facilities such as ponds.

The State recently adopted new stormwater management regulations, in accordance with the Stormwater Management Act of 2007. The new regulations now require the use of ESD techniques to the maximum extent practicable and increase stormwater management requirements for redeveloping sites. The new regulations also require that local governments review and, where necessary, alter subdivision and zoning regulations to avoid impediments to ESD. The new State regulations went into effect on May 4, 2009 and the County has one year to adopt amended stormwater management regulations.

Requiring stormwater management for redevelopment sites offers an important opportunity to improve water quality and quantity controls for stormwater runoff in areas that were developed prior to current stormwater management regulations. The County should ensure redevelopment is designed and implemented to reduce stormwater runoff and pollutant loadings to the maximum extent practicable. The County could also create incentives for new development and redevelopment to provide onsite or offsite water quality enhancements that exceed minimum regulatory requirements.

## The National Pollutant Discharge Elimination System

As a requirement of the Federal Clean Water Act, Howard County has a National Pollutant Discharge Elimination System (NPDES) permit for discharges from the County's stormwater management system. The NPDES permit has significant requirements for maintaining and improving the County's stormwater management system.

Improvements to the stormwater management system may include retrofits of existing facilities to add water quality treatment and building new facilities to serve older areas built without stormwater management. The County is required to conduct watershed assessments and implement best management practices such as stormwater retrofits, stream channel restoration and stream buffer plantings to improve water quality in our local streams. The County must also document these water quality improvements and watershed restoration efforts through chemical, physical and biological monitoring.

NPDES permit requirements have placed and will continue to place substantial staff and financial demands on the County. These permit requirements are expected to increase as additional Federal and State requirements are incorporated into future permit conditions.

## Stormwater Management Facilities

Stormwater management systems must be regularly inspected and maintained and, as they age, deteriorated systems must be upgraded or replaced. The County is required by both State and local legislation to conduct inspections of stormwater management facilities every three years. There are approximately 3,000 stormwater management facilities in the County, and approximately 800 of these facilities are maintained by the County.

In general, the County shares maintenance responsibilities with homeowners associations for residential facilities located on open space lots, while non-residential facilities are privately maintained. The County executes maintenance agreements with the owners of stormwater management facilities that specify maintenance responsibilities and the County's right to inspect the facilities. The County is responsible for enforcement of these maintenance agreements.

With increased environmental site design, small treatment facilities will continue to become more prevalent. These types of facilities can include downspout infiltration areas or drywells and bioretention

Source: Portland Oregon Bureau of Environmental Services

*Small treatment facilities, such as this stormwater planter, will become more prevalent with Environmental Site Design.*

facilities that can be located on private residential lots. Long-term inspection and maintenance of these facilities is an area of concern. Developments with ESD have significantly more facilities than developments with traditional management facilities such as ponds, increasing staff time for inspections. Inspections for these facilities could range from full inspection by County staff or a consultant, to self-inspection by the property owner with reporting to the County. Routine maintenance of ESD facilities located on individual residential lots becomes the responsibility of the individual homeowner, resulting in property owner education and maintenance enforcement issues. The County should evaluate alternatives for improving, enforcing and funding long-term inspection and maintenance of stormwater management facilities, particularly those facilities located on private residential lots.

## Water Quality in Local Streams

Howard County lies within the Patuxent River and Patapsco River basins, two major tributaries to the Chesapeake Bay. Approximately 75% of the County is within the Patuxent River basin and the remaining 25% of the County is within the Patapsco River basin. The main stems of these rivers have many tributary streams which drain large areas of the County. The Patuxent River and Patapsco River basins in Howard County are divided by the State into seven major watersheds, as shown in Figure 7.

In accordance with the Federal Clean Water Act, Maryland has designated use classifications for all water bodies in the State, as listed in Figure 8. The use classifications for the streams in Howard County are shown in Figure 9 There are no Use II waters in Howard County.

### Figure 8: Stream Use Classifications

| Use Classification | Designated Use |
|---|---|
| Use I | Water contact recreation and protection of nontidal warm water aquatic life |
| Use II | Support of estuarine and marine aquatic life and shellfish harvesting |
| Use III | Nontidal cold water (Natural trout waters) |
| Use IV | Recreational trout waters |

*Note: A "-P" after a use classification number indicates an additional use for public water supply.*

*The County's biological monitoring program measures the number and types of aquatic insects living in our streams.*

Each use classification has specific water quality criteria. Baseline criteria are for Use I waters. The criteria are more stringent for certain parameters for Use II and IV waters, and Use III waters have the most stringent criteria.

In 2001, the County initiated a long-term, countywide biological monitoring program to track water quality and habitat trends in local streams. The results of this sampling indicate most streams in the County suffer from degraded water quality and habitat conditions. Stream corridor assessment surveys have also been conducted for all major watersheds. These surveys indicate eroding stream channels, a lack of riparian buffers and eroding pipe outfalls are common problems

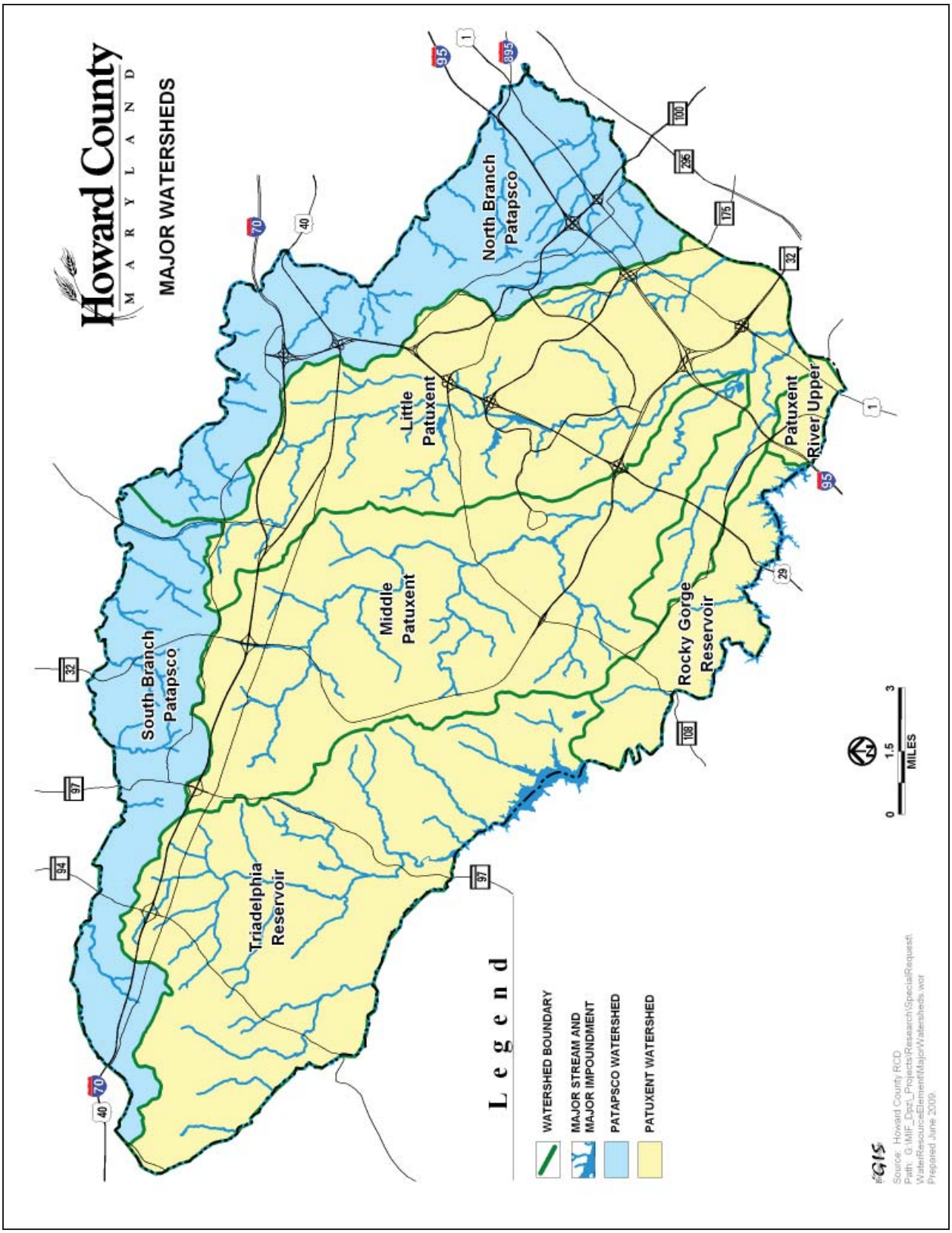



**Figure 7: Major Watersheds**

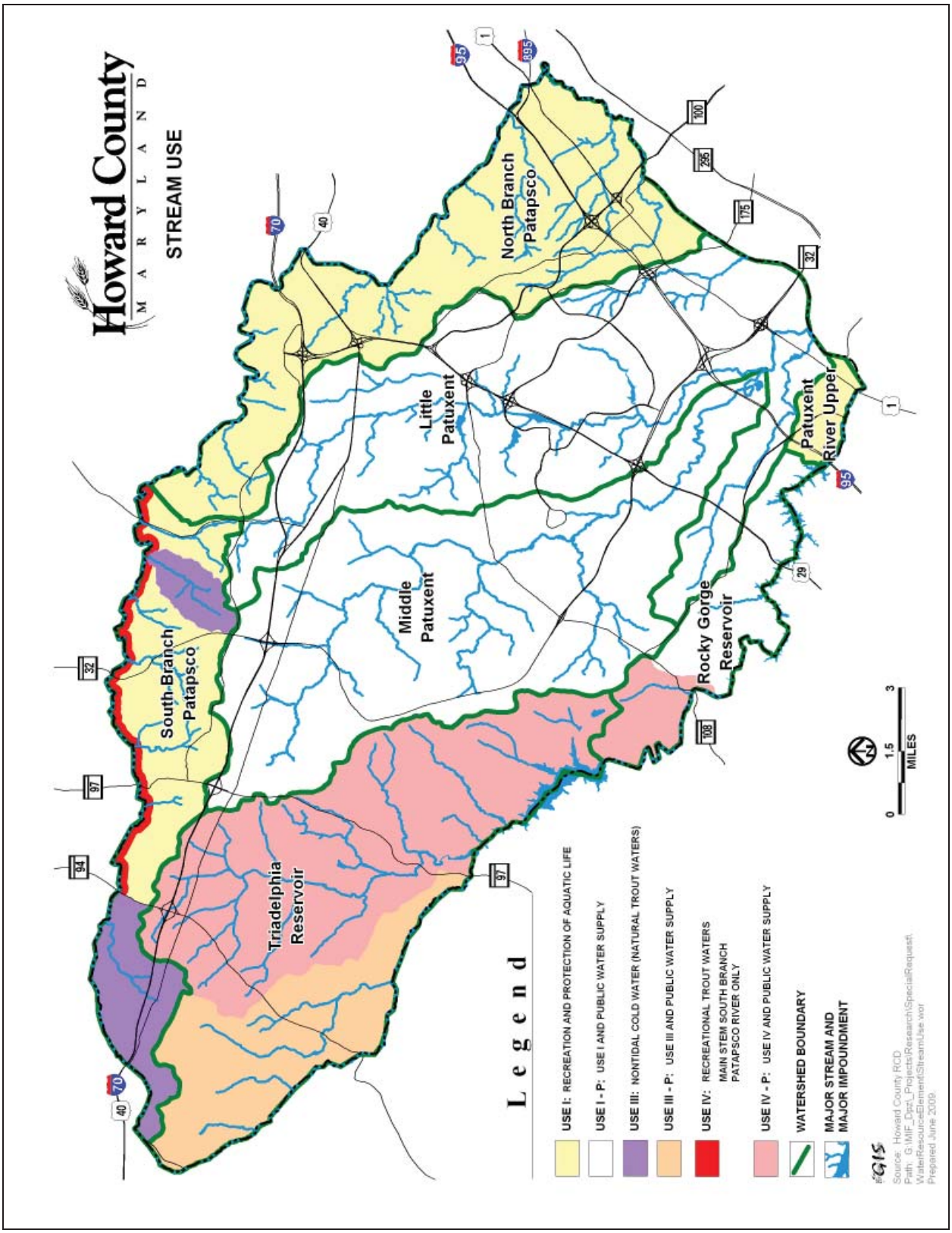



**Figure 9: Stream Use**

in the watersheds. In addition, most water bodies do not meet State water quality standards for their use classification.

### Tier II Waters

Despite the generally degraded condition of streams in Howard County, there are also stream segments in the County with excellent water quality and habitat for aquatic life. The State classifies these types of stream segments as Tier II waters and employs special procedures to regulate discharges to these waters to ensure water quality is not degraded. The State also encourages local governments to further protect these waters. There are six Tier II water segments in Howard County, all located outside the Planned Service Area, as shown in Figure 10. The State may designate additional Tier II waters as more information about stream conditions is collected.

*A segment of the South Branch Patapsco River is designated as a Tier II water.*

The County does not have information on potential water quality threats for these stream segments, which could include nearby development or agriculture that lacks best management practices or that impacts the stream buffer, particularly through forest clearing. The County should work with the State to collect information on these stream segments and institute any necessary measures to protect them.

## Land Use and Nutrient Load Changes

Pollution that comes from many sources throughout a watershed is called nonpoint source pollution. By comparison, pollution that comes from a wastewater treatment plant or industrial plant discharge pipe is called point source pollution because there is a single source for the pollution.

To assess the County's future treatment capacity for stormwater runoff, the County conducted a nonpoint source (NPS) loading analysis to calculate the change in nutrient (nitrogen and phosphorus) loads due to proposed land use changes from 2007 to 2030. These land use changes were based on the Round 7a growth projections, as modified for additional growth in Downtown Columbia, the Village Centers and Doughoregan Manor. This analysis used a spreadsheet developed by the State as an analytical tool for preparing the Water Resources Element. This analysis incorporated runoff loads from land use change as well as groundwater loads from septic systems, and also estimated the future change in impervious cover.

Total land use change for the County in 2030 is projected to be approximately 21,351 acres. Total acreage for the County is approximately 162,177 acres, so this is a change for 13% of the County. This change occurs with an increase in low, medium and high density residential, and commercial land uses, with the majority of this increase being in low density residential land use. Low density residential land use is defined as ranging from 2 dwelling units per acre to 1 dwelling unit per 5 acres. This land use change has a corresponding decrease in other land uses, primarily cropland, forest, rural residential and pasture.

The projected change in land use for the County will result in a less than 1% increase in nitrogen loads and a 1% increase in phosphorus loads from the 2007 baseline load. The change in land use actually generates a decrease in runoff nitrogen loads, but this is offset by an increase in nitrogen loads from septic systems. Policies and Actions to reduce nitrogen loads from septic systems are discussed in the Drinking Water and Wastewater section.

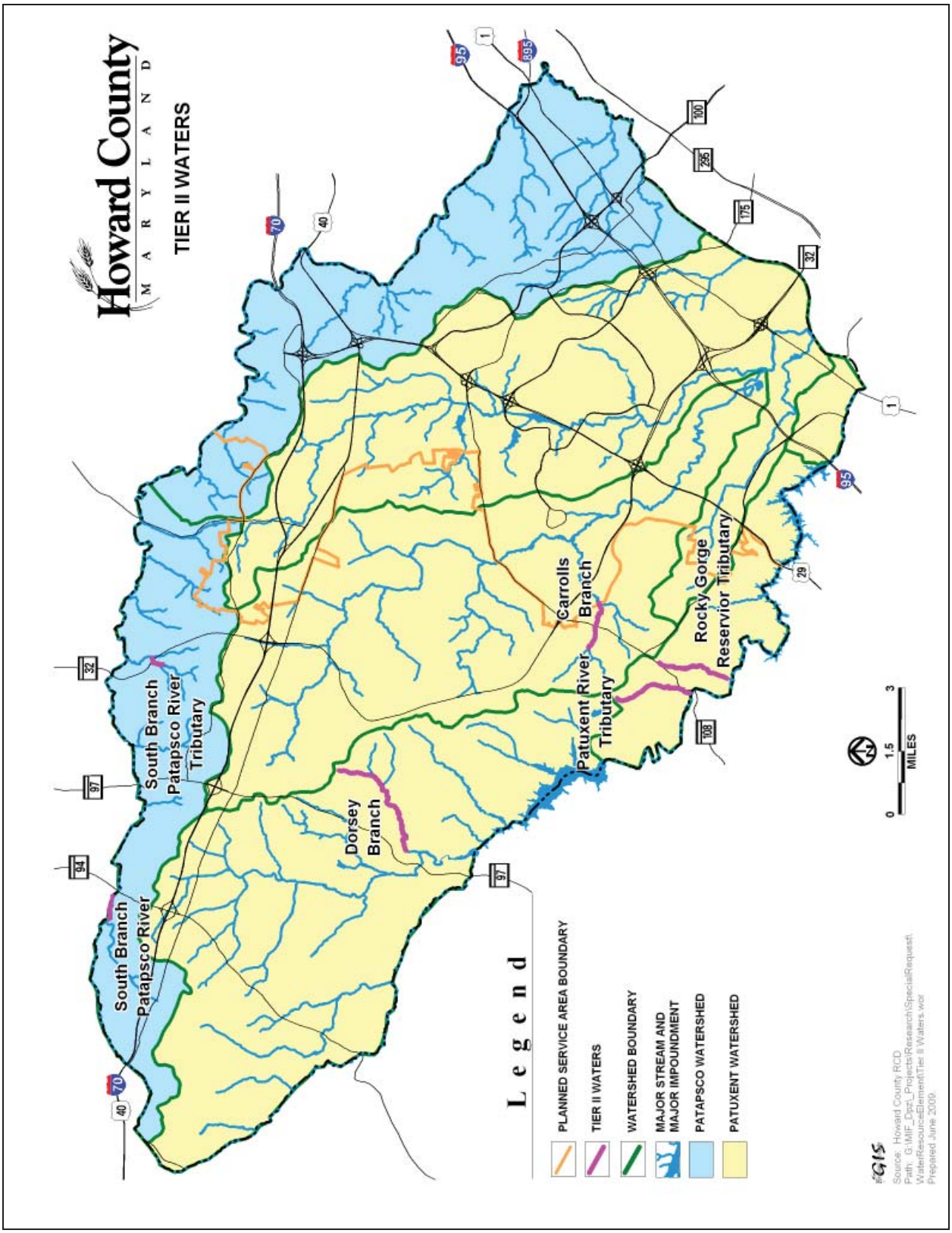



**Figure 10: Tier II Waters**

The NPS loading analysis provided changes in land use and nonpoint source loads for the Patapsco and Patuxent River basins, and for each of the seven major watersheds in the County. When the total land use change is divided between these seven watersheds, almost 50% of this change occurs in the Middle Patuxent River (26%) and Triadelphia Reservoir (23%) watersheds. The Little Patuxent River watershed will see the third largest portion of the change at 17%, followed by the South and North Branches of the Patapsco, each at 13%. The Rocky Gorge Reservoir watershed will have a 7% portion of the change and the Patuxent River Upper watershed will have the smallest portion, at 1%.

Appendix B provides additional information on the NPS loading analysis and also provides a combined point and NPS loading analysis for the Patuxent and Patapsco River basins and the County. Total nitrogen and phosphorus loads in the County will decrease by approximately 13.8% and 12.4%, respectively, due primarily to the decrease in nutrient loads from the ENR upgrade to the Little Patuxent WRP and the Patapsco WWTP.

## Impervious Cover

Impervious cover is a useful predictor of expected water quality and stream habitat conditions in a watershed. In general, as impervious cover increases with increasing development, stream health is expected to decline as forests are cleared, groundwater recharge is reduced, and polluted runoff into local streams increases in volume and frequency.

The County uses a system developed by the Center for Watershed Protection to place watersheds into one of three categories – sensitive, impacted or non-supporting – based on the level of impervious cover. Sensitive watersheds have the lowest level of impervious cover and are expected to have the healthiest streams. Impacted watersheds have a moderate level of impervious cover and are expected to have streams showing clear signs of degradation. Non-supporting watersheds have the highest level of impervious cover and are expected to have streams with significant degradation. This system can be used to prioritize healthy watersheds for actions that will protect water quality and habitat, and to prioritize degraded watersheds for actions to restore water quality and habitat. The more degraded conditions are within a watershed, the more difficult and expensive restoration efforts become.

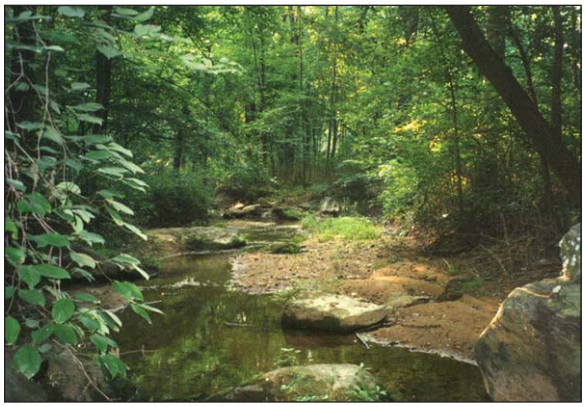
*Impervious cover in the County is projected to increase from 13% in 2007 to 15% in 2030.*

Overall, impervious cover in the County increases with the projected land use changes from 13% in 2007 to 15% in 2030, an increase of 2%. This increase in impervious cover will cause the Middle Patuxent River watershed to shift from the sensitive to the impacted category, and will cause the Little Patuxent River and Patuxent River Upper watersheds to shift from the impacted to the non-supporting category.

The impervious cover categories described above were developed when stormwater management requirements did not promote or require ESD. The new stormwater management regulations are intended to maintain and even improve predevelopment runoff conditions, which could significantly reduce the impacts from new impervious cover. The effectiveness of the new regulations in mitigating impacts from impervious cover should be monitored by the State and local governments.

## Development Regulations to Protect Water Resources

County regulations adopted in December 1988 require undisturbed streamside buffer areas of 75 feet along perennial streams within residential zoning districts. In 1992, regulations were added to require undisturbed streamside buffers of 50 feet along intermittent streams in all zoning districts and along perennial streams in non-residential zoning districts. In 1988, Howard County also instituted wetland protection by requiring a 25-foot undisturbed buffer around nontidal wetlands. Additionally, most wetlands in the County are found within the 100-year floodplain, and the County has prohibited development within the 100-year floodplain since 1974.



*A forested buffer provides the greatest benefits for stream water quality and habitat.*

In 2001, the stream buffer regulations were amended to require a 100-foot stream buffer in residential zoning districts for Use III and IV streams, located primarily in the Rural West. In addition, streams, wetlands and their buffers may no longer be located on residential lots, but must be located in open space or non-buildable preservation parcels, unless the residential lots are 10 acres or greater and the building envelope is set back from the buffer.

The effectiveness of stream and wetland buffers depends on the buffer width, vegetation and management practices. To provide the greatest benefit, buffers should be wide enough to allow adequate filtering of overland runoff and include adjacent steep slopes and highly erodible soils. A forested buffer provides the greatest benefits in terms of filtering pollutants, nutrient uptake through plant roots, erosion prevention, improved habitat for a variety of plant and animal species, and shading to keep water temperatures cool.

Current buffer requirements should be strengthened to enhance protection of streams, wetlands and floodplains. This could include increasing buffer width requirements for streams and wetlands, and instituting new requirements for floodplain buffers. In addition the stream buffer requirements should ensure that intermittent streams and perennial streams located in nonresidential areas have the same protections as streams located in residential areas.

Development regulations must be properly implemented and enforced to be effective. Sediment and erosion controls on construction sites must be correctly installed and maintained, stormwater management facilities must be built according to design plans, stream and wetland buffers and forest conservation easements must remain undisturbed during and after construction. The County should ensure there are adequate resources to monitor and enforce development regulations and to effectively educate developers and contractors.

## Watershed Planning and Management

The health of our wetlands, streams, lakes and reservoirs is directly linked to the use of land within their watersheds. For this reason, a holistic approach to protecting, restoring and improving water resources should be based on a comprehensive assessment of land use, water quality and habitat conditions for the entire watershed.

The County takes a comprehensive, watershed-based approach to improve water quality and habitat in our local streams by conducting watershed studies to analyze conditions and design improvements. In general, watershed studies include a description of current water quality and habitat conditions in the watershed streams, an identification and severity ranking of problem areas, an identification and priority ranking of potential restoration projects, preliminary designs and cost estimates for priority restoration projects, and an implementation schedule.

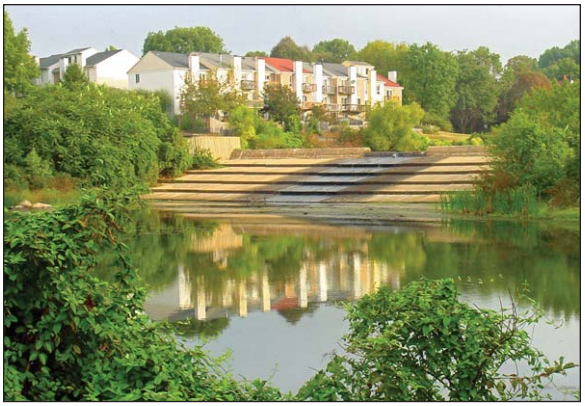
## Watershed Studies

In response to NPDES permit requirements, County watershed studies have focused on the more developed watersheds in the eastern portion of the County. The County has completed watershed studies for two major watersheds, the Little Patuxent River and North Branch Patapsco River watersheds. In addition, the major watersheds in the County were divided into 62 subwatersheds and prioritized for future detailed restoration studies. Subwatershed studies have been completed for: Wilde Lake and Centennial Lake within the Little Patuxent River watershed; Sucker Branch and Rockburn Branch within the North Branch Patapsco River watershed; and Cherry Creek within the Rocky Gorge Reservoir watershed. An additional watershed study for the upper Little Patuxent River addressing the five subwatersheds in the headwaters area was completed in 2009.

In addition to County efforts, the Columbia Association (CA) initiated a watershed study in 2008 for CA property, which lies within 20 subwatersheds. Phase I of the CA study focuses on six subwatersheds located in the center of the study area. The information collected by CA will be shared with the County and the County will work cooperatively with CA on restoration activities.

Watershed management plans are needed for each watershed in the County to set priorities and guide efforts to protect, restore and improve the County's water resources. To ensure watershed goals are being met, all watershed management plans should be revisited and updated as needed, on a regular cycle.

Watershed protection and restoration goals may vary by watershed. In a healthy watershed, the goal may be to protect and maintain current conditions, whereas in a degraded watershed, the goal may be to actively restore and improve current conditions. It is easier and more cost effective to protect high quality resources in a watershed than to restore degraded resources. The more degraded a watershed, the more difficult restoration becomes and in some more highly developed watersheds conditions may be so degraded that full restoration is prohibitively expensive.



*The County has completed a subwatershed study for Wilde Lake. Phase I of the Columbia Association watershed study includes the Lake Kittamaqundi subwatershed.*

Based on the NPS loading analysis, the Middle Patuxent River watershed is projected to have the largest percentage of County land use change and the largest area increase in impervious cover. If this land use change and resulting increase in impervious cover is not properly managed, significant water quality and

habitat degradation could occur. The Middle Patuxent River should be a priority for development of a watershed management plan to help guide future protection, mitigation and restoration efforts.

Currently, watershed studies are focused on stream water quality and habitat. Wetlands, another important water resource, are not mapped or assessed. State and Federal wetland maps exist for the County, but they are incomplete and outdated. Wetlands are mapped on individual properties as part of the development review process, but this information is not compiled into a countywide inventory. A wetland program that inventories and maps the County's wetlands, and assesses opportunities to restore and protect existing wetlands and create new wetlands, would provide additional water quality and habitat benefits.

## Restoration Projects

Restoration projects can include: building new stormwater management facilities and retrofitting existing facilities; planting forested buffers along streams; restoring and creating wetlands; stabilizing stream channels; and restoring instream habitats. Wherever possible, the County uses state of the art stream restoration design and construction techniques to achieve the long-term health of restored streams and their associated floodplains.

Source: Department of Public Works

*Restoration projects can stabilize eroding stream channels and improve stream water quality and habitat.*

Forest is the most beneficial land use for water quality, because forests absorb and filter stormwater runoff, prevent stream channel erosion, and provide shade to keep stream water temperatures cool. However, despite State and County forest conservation regulations, forest cover continues to be lost to development in Howard County as well as Statewide. As a result, Maryland is considering development of a "no net loss" of forest policy, but recommendations for this policy are not expected until the end of 2011.

The General Plan 2000 contains Policies and Actions related to the protection and restoration of forest, including development of a forest resource inventory and instituting a program to mitigate losses, targeting the establishment of forested stream buffers. Watershed management plans can be used to establish goals for forest cover and forested stream buffers in County watersheds. In more developed watersheds, it may be more appropriate to establish a tree canopy goal or a combination forest cover and tree canopy goal.

As each watershed and subwatershed restoration study has identified projects, these projects have been prioritized and added to the overall County watershed restoration master project list. This list also includes project sites identified from citizen referrals and complaints. The list is used as the basis for capital budget requests for restoration projects. The 2009 project list, which includes new projects from the Upper Little Patuxent Study, contains 150 projects with an estimated cost of $40 million. The County's current capital budget for these types of projects averages $1.2 million annually, although this amount is not consistent from year to year. This level of funding allows about 5 projects to proceed each year. If the County wishes to do additional watershed studies and increase the pace of restoration, additional funding is needed.

Many of these restoration projects require cooperation and participation from private landowners, so public outreach and education is a critical component of implementation. These projects not only provide environmental benefits for our local water resources and the Chesapeake Bay, but they also help the County address regulatory requirements for stormwater management NPDES permit requirements and flooding issues.

### *What can each of us do to reduce stormwater runoff and water pollution?*

- Plant trees.
- Replace lawn with native plants that need less water.
- Do not fertilize lawn and limit the use of pesticides and herbicides.
- Do not water lawn.
- Direct downspouts away from driveways to vegetated areas such as gardens and lawns.
- Install rain barrels.
- Create rain gardens.
- Install permeable pavement or pavers.
- Wash car at carwash or on lawn.
- Pick up pet waste and dispose of it in the trash.
- Do not litter.

## Best Management Practices

In addition to major construction projects such as stream restoration and stormwater retrofits, watershed studies also identify best management practices (BMPs) to reduce nonpoint source pollution that could be implemented by private property owners. These BMPs can include: reducing the use of fertilizers, pesticides and herbicides; planting native shrubs and trees, especially along streams; redirecting downspouts so they drain to rain barrels and/or vegetated areas; and creating rain gardens, which are gardens planted in created depressions to capture and treat runoff through soil filtration and plant uptake.

The majority of land in the County is privately owned, so implementing BMPs on private property is critical to improving water quality and habitat, especially in areas that were developed before stormwater management and resource protection measures were in place. Public outreach and education are essential to raise awareness about the cumulative positive or negative impacts individual actions can have on the environment. However, the County budget for outreach and education to encourage and assist private property owners with the implementation of BMPs is a minor portion of the budget for the watershed management program. Current outreach and education efforts should be expanded and new programs initiated to increase BMP implementation on private property. Working with community and environmental organizations, business associations and educational institutions often provides an effective way to reach a larger audience and encourage individual participation.

Source: Rainwater Solutions at Hayneedle.com (permission pending)

*Best management practices on private property can include the use of rain barrels to capture and reuse stormwater runoff.*

The County can also provide leadership in BMP implementation by incorporating environmentally sensitive site development and property management practices into County activities, as specified in the General Plan 2000 Policies and Actions. County actions can include: incorporating Green Building practices into facility design, construction and renovation; retrofitting stormwater management for County facilities; implementing demonstration projects to encourage their use by others; and reducing lawn and increasing forested riparian buffers and tree canopy on public property.

The watershed study recommendations for BMPs are directed primarily at residential and business property owners in the eastern portion of the County, but BMP implementation is also

Source: Soil Conservation District

*Stream buffer plantings are an important best management practice for agricultural, residential and business properties.*

important for residential and business property owners in the Rural West. It is also important in the Rural West that new best management practices continue to be implemented and existing practices be maintained on agricultural properties.

Best management practices for agricultural properties can include cover crops, conservation tillage, stream fencing to keep livestock out of streams, pasture management, stream buffer plantings and nutrient management. Nutrient management tailors the land application of fertilizers so the quantity applied does not exceed the needs of the crop. Implementing BMPs is generally voluntary, however, the 1998 State Water Quality Improvement Act requires the development and implementation of nutrient management plans for agricultural properties. Federal and State cost share programs are available to help farmers implement these practices. The Patuxent Reservoirs Watershed Protection Program also has a local cost share fund for establishing stream buffers in the reservoirs watershed. The lead agency in the County for working with agricultural landowners to assist them with technical and financial planning for the implementation of best management practices is the Howard Soil Conservation District.

## Regional Water Resources

In addition to watershed planning and management for our local water resources, it is also important to remember that the County is part of the larger Patuxent and Patapsco River basins. The Patuxent River basin is located within Howard, Montgomery, Anne Arundel, Prince George's, Calvert, Charles and St. Mary's Counties. Howard County contains 21% of the basin, the second highest of the seven counties in the basin. The Patapsco River basin is located within Carroll, Baltimore, Howard and Anne Arundel Counties, as well as Baltimore City.

In 1984, each of the seven counties in the Patuxent River basin formally adopted the Patuxent River Policy Plan, which contains land management recommendations to control nonpoint source pollution in the basin. The seven counties also each adopted a 1997 Policy Plan update, which addresses the continuing challenges of growth management, personal stewardship and financing. The County should continue to coordinate and cooperate with other local, regional and State agencies and organizations on joint watershed planning and management for the Patuxent and Patapsco Rivers.

The Patuxent and Patapsco Rivers are major tributaries to the Chesapeake Bay. The multistate effort to restore the Chesapeake Bay has been and continues to be a strong influence in promoting watershed-based planning and management efforts to protect not only the Bay, but also the Bay's numerous tributary rivers and streams.

The first Chesapeake Bay Agreement (the Agreement) was signed in 1983 by Maryland, Pennsylvania, Virginia, the District of Columbia and the Environmental Protection Agency (EPA). Initial Bay restoration efforts were predominantly focused on achieving a goal of the 1987 Amendments to the Agreement to reduce nitrogen and phosphorus loadings to the Bay by 40%, using 1985 as a baseline year. This reduction was to be achieved by 2000 and then held as a cap on subsequent loadings to the Bay.

In the 1992 Amendments to the Agreement, the 40% reduction goal was apportioned among each of the Bay's major tributary watersheds. In Maryland, nutrient reduction strategies were developed for each of the State's ten major tributary watersheds, including the Patapsco and Patuxent Rivers. These Tributary Strategies include diverse efforts such as improving treatment processes at wastewater treatment plants, installing agricultural best management practices, retrofitting stormwater management facilities and planting stream buffers.

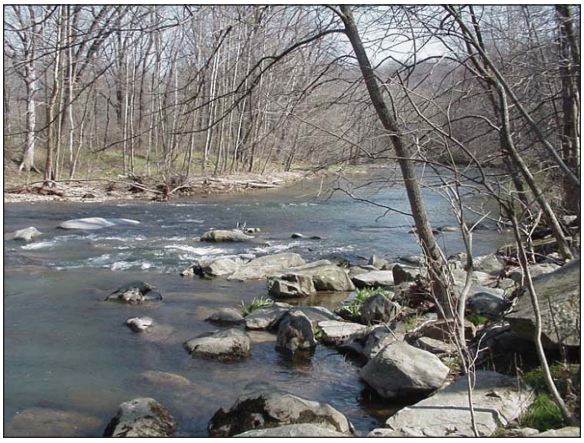
In 1995, Maryland appointed a Tributary Team for each watershed to coordinate State and local efforts to implement the strategy. The Tributary Teams are made up of representatives of the business and agricultural communities, environmental organizations, State and local governments and agencies, and private citizens. Howard County participates in the Tributary Team for the Patapsco River and the Patuxent River Commission, which is the Tributary Team for the Patuxent River.

In 2000, Maryland recommitted to restoring the Chesapeake Bay by signing the Chesapeake 2000 Agreement. This Agreement was intended to achieve water quality goals for the Bay by 2010, and requires substantially greater nutrient and sediment load reductions to protect aquatic living resources in the Bay. Maryland revised the Tributary Strategies to reflect these new reduction goals.

The current Tributary Strategies focus on three sources for best management practice implementation:

- Urban point sources – this strategy focuses on wastewater treatment plant upgrades using Enhanced Nutrient Removal technology.
- Urban nonpoint sources – this strategy addresses stormwater runoff, septic systems, growth management and urban nutrient management.
- Agriculture – this strategy addresses best management practices on farmland.

Although compliance with the Tributary Strategies is considered voluntary, the urban point source strategy is incorporated into NPDES permits issued by the State for wastewater treatment plants, and the urban nonpoint source strategy is partially incorporated into NPDES permits for stormwater discharges.



*The Patapsco River, which forms Howard County's northern boundary, is one of Maryland's ten major tributaries of the Chesapeake Bay.*

## Total Maximum Daily Loads

The Federal Clean Water Act requires that States identify water bodies that do not meet water quality standards. If necessary, the States must then develop a Total Maximum Daily Load (TMDL) or an allowable pollutant load and implementation plan to bring the water body into compliance with the water quality standards for that pollutant. Depending on the land uses within the watershed of that water body, the TMDL is divided or allocated between the point and nonpoint sources in the watershed. Stormwater management systems operating under an NPDES permit are included in the point source allocation. In general, the current point and nonpoint source loads in a watershed must be substantially reduced to achieve the TMDL.

The TMDL point source allocation must be included in the NPDES permit limits for regulated point sources. The TMDL allocations for nonpoint sources are addressed through the TMDL implementation

plan, which must provide reasonable assurance that future voluntary and regulatory actions will result in the needed nonpoint source reductions. There is no required time frame for achieving the TMDL.

Maryland has taken the approach that municipalities and counties that meet their stormwater NPDES permit conditions will be deemed to have controlled stormwater pollution to the maximum extent practicable and meet their load allocations under a TMDL. Recently, however, the State signaled that new NPDES stormwater permits may include a requirement to develop implementation plans to address the point source allocation for approved TMDLs. These implementation plans would be developed within one year of the new permit issuance and include best management practices, expected pollutant reductions, tracking processes, benchmarks, timelines and cost estimates. Howard County's NPDES stormwater permit will be up for renewal in 2010.

Howard County has the following approved TMDLs:

- Centennial Lake – for phosphorus and sediment
- Triadelphia Reservoir – for phosphorus and sediment
- Rocky Gorge Reservoir – for phosphorus

These TMDLs specify significant reductions (48 to 58%) in phosphorus loadings, with these reductions providing concurrent acceptable reductions in sediment loadings. These reductions must come primarily from controls on runoff from agricultural and developed land.

*The TMDL for Centennial Lake specifies a 51% reduction in phosphorus loads to the lake.*

An excessive input of the nutrients phosphorus and nitrogen to a water body can result in eutrophication, or the over-enrichment of the water body. The nutrients spur excessive growth of aquatic plants or algal blooms, which eventually die and decompose, using up dissolved oxygen. Excessive eutrophication can produce nuisance levels of algae and interfere with designated uses such as fishing and swimming. Excessive sediment loads can reduce the storage capacity and lifespan of lakes and reservoirs. The TMDLs for Centennial Lake, Triadelphia Reservoir and Rocky Gorge Reservoir are designed to limit eutrophication and ensure the lifespan of the lake and reservoirs.

Other waterbodies in Howard County listed by the State for potential future TMDLs, include the Little Patuxent River, the Middle Patuxent River, the Patuxent River Upper and the North Branch Patapsco River. Future TMDLs will also be developed for the larger Patapsco River and Patuxent River. In addition, the Bay States and the EPA recently acknowledged that voluntary efforts will not achieve the goals of the Chesapeake 2000 Agreement by 2010. Therefore, the EPA will develop a TMDL for nutrient and sediment loads for all sources within the Bay watershed. Early discussions by the Bay States and EPA indicate that the Tributary Strategies will be used as a baseline to develop actions needed to meet Maryland's share of the Bay TMDL.

One purpose of the Water Resources Element is to identify suitable waters and land areas to meet the stormwater management and wastewater treatment needs of existing and future development. All of the waterbodies in Howard County have or will require a TMDL at the major watershed and/or the basin scale. Those watersheds that are not listed by the State for a specific pollutant TMDL are listed for impacts to biological communities, which may in turn require a TMDL to control the identified stressor to these communities. The presence of a TMDL or the need for a future TMDL is an indicator that pollution control efforts must reduce loads to the water body from existing land uses and from future land use changes,

to prevent further degradation and restore the waterbody. This Water Resources Element includes recommendations for pollution control efforts for existing and future land uses to help meet TMDL goals. As TMDLs continue to be developed and nonpoint source pollution assessments are refined, the County can more closely document current and future pollution loads to measure achievement of the TMDLs.

## Patuxent Reservoirs

The Rocky Gorge and Triadelphia Reservoirs supply water for the Washington region's public water systems. Howard County contains 53% of the watershed for these reservoirs and Montgomery County contains 46%. The remaining 1% of the watershed is divided between Frederick and Prince George's Counties. The Patuxent Reservoirs are the subject of a 1996 Patuxent Reservoirs Watershed Protection Agreement, signed by Howard, Montgomery and Prince George's Counties, the Washington Suburban Sanitary Commission (WSSC), the Howard and Montgomery County Soil Conservation Districts, and the Maryland-National Capital Park and Planning Commission. Signatory agencies agreed to work together to protect the long-term biological, physical and chemical integrity of the watershed.

The Patuxent Reservoirs Watershed Protection Program identified six priority resources for protection and restoration within the watershed. These resources are the reservoirs and drinking water supply, terrestrial habitat, stream systems, aquatic biota, rural character and landscape, and public awareness and stewardship. For each priority resource, the program identified the associated resource protection issue, corresponding measures, goals, and implementation items to address the issue, and the time line and responsible partners to accomplish the implementation items.

Implementation items include reservoir and stream monitoring, stream buffer planting, agricultural BMP implementation, stormwater retrofits, stream channel restoration, agricultural land preservation, and public outreach and education. A priority implementation item is planting forested stream buffers, because this provides multiple benefits for the priority resources. Many of these implementation activities are ongoing, but additional resources are needed to meet the implementation time lines.

The NPS loading analysis indicates that phosphorus loadings will decline by 3% in the Triadelphia Reservoir watershed, but will increase by 8% in the Rocky Gorge Reservoir watershed. Given the need for additional resources to meet current implementation objectives and the significant phosphorus reductions required to meet the TMDLs, increased funding and support should be given to the Patuxent Reservoirs Watershed Protection Program.

Source: WSSC

*Increasing public awareness and stewardship of watershed resources is a priority of the Patuxent Reservoirs Watershed Protection Program.*

## Funding

The County's watershed management program helps the County comprehensively address: the design, construction and maintenance of an adequate stormwater management system; water quality and habitat improvements in our local streams; other NPDES permit requirements; and flooding concerns. However, the program requires a sustained source of funding, and if the County wishes to increase the pace of watershed restoration, including expanding outreach and education to increase the implementation of best management practices on private properties, additional funding is needed.

*Funding is needed for stream restoration and stormwater management retrofits, to maintain the SWM system, and to ensure that the County meets its Federal water quality permit requirements.*

Currently, watershed management is at a competitive disadvantage for General Funds when compared with other more widely recognized areas of public need such as schools and roads. The County should institute a dedicated fund to provide increased and sustained funding for the watershed management program, which is anticipated to continue to expand and evolve in response to Federal and State regulatory requirements.

Funding options for a dedicated fund should be equitable, enforceable and have reasonable administrative costs. All property owners are responsible for some degree of runoff, both from their individual properties and from public lands that serve the general public such as roads and schools. All property owners would benefit from a comprehensive watershed management program to address stormwater management, water quality and habitat improvements in our local streams, and flooding. Therefore, an equitable fee that would apply to residential, business, agricultural and institutional property owners should be considered.

In addition to local funding, the County should continue to pursue Federal and State grant and cost-share opportunities. Grant and cost-share programs can provide funding for activities such as watershed planning, wetland creation, stream channel restoration, riparian forest buffer plantings, public outreach and education, and stormwater management.

## *Policies and Actions*

Policies and Actions to address water and related land resources are based on the following goals:

- Use the best available water quality data and watershed analyses to guide growth policies to protect and improve water quality and meet water quality regulatory requirements.
- Improve stormwater management practices throughout the County to reduce nonpoint source pollutant loads and help achieve water quality standards.
- Protect and restore water resources, including streams, wetlands, floodplains and groundwater, to achieve water quality standards in the County's rivers and streams.
- Engage the public in watershed conservation and promote a stewardship ethic.

### Policy 4: Improve stormwater management practices throughout the County to help restore and protect water resources.

**4.1** Amend County ordinances to implement the 2007 Storm Water Management Act.

**4.2** Eliminate regulatory barriers to the implementation of environmental site design measures and create incentives to facilitate their use where appropriate.

**4.3** Ensure redevelopment is designed and implemented to reduce stormwater runoff and pollutant loadings to the maximum extent practicable.

**4.4** Create incentives for new development and redevelopment to provide onsite or offsite water quality enhancements that exceed minimum regulatory requirements.

**4.5** Evaluate alternatives for improving, enforcing and funding long-term inspection and maintenance of stormwater management facilities, particularly those facilities located on private residential lots.

### Policy 5: Ensure development regulations adequately protect water resources, including streams, floodplains and wetlands.

**5.1** Work with the State to collect information on the Tier II stream segments in the County and institute any necessary measures to protect them.

**5.2** Strengthen buffer requirements to enhance protection of stream, floodplain and wetland resources.

**5.3** Ensure there are adequate resources to monitor and enforce development regulations and to effectively educate developers and contractors.

### Policy 6: Use watershed management plans to guide the protection and restoration of water resources.

**6.1** Prepare comprehensive watershed management plans for all watersheds, to set priorities and guide efforts to protect, restore and improve the County's water resources. Complete and update all watershed management plans on a regular cycle.

**6.2** Make the Middle Patuxent River watershed a priority for future study, protection and restoration.

**6.3** Develop a wetland program to inventory, map, protect and enhance wetland resources.

**6.4** Establish and achieve measurable goals for forest cover and riparian forest buffers in all County watersheds.

**6.5** Encourage active participation of individuals, businesses and local community and environmental organizations in restoration activities.

**6.6** Institute a dedicated fund (often referred to as a stormwater utility) to ensure increased and sustained funding for the watershed management program.

*Protecting and restoring our rivers and streams is a goal of the Howard County Water Resources Element.*

**6.7** Pursue Federal and State grant and cost-share opportunities to secure additional resources for restoration efforts. Apply jointly with community and environmental organizations and with neighboring jurisdictions, as appropriate.

### Policy 7: Coordinate regional protection of water resources.

**7.1** Coordinate and cooperate with other local, regional and State agencies and organizations on joint watershed planning and management for the Patuxent and the Patapsco Rivers.

### Policy 8: Safeguard the environmental integrity of the Patuxent Reservoirs.

**8.1** Continue participation and leadership in interjurisdictional efforts to protect the Patuxent Reservoirs, including the Patuxent River Commission and the 1996 Patuxent Reservoirs Watershed Protection Agreement.

**8.2** Increase funding and support for implementation of the Patuxent Reservoirs Priority Resource Protection Program.

### Policy 9: Encourage individual environmental stewardship.

**9.1** Conduct public outreach and education to encourage individuals and businesses both to be good stewards of their own property and to participate in community environmental enhancement efforts.

**9.2** Initiate new and expand current outreach and education efforts to promote and assist private property owners with the implementation of best management practices, including installing rain gardens and rain barrels, planting stream buffers, replacing lawn with native plants, and increasing tree canopy.

**9.3** Encourage the agricultural community to continue to work with local, State and Federal agencies and programs to implement best management practices.

*Individual and group efforts such as planting trees are essential to achieving the goals of the Water Resources Element.*

# APPENDIX A: GROWTH PROJECTIONS

## Introduction

The Department of Planning and Zoning's (DPZ) Division of Research uses a geographic information system (GIS) land use projection system to track and project growth and development in the County. The projection system is maintained on a continuous basis as new plans are processed and move through the development pipeline. All steps of the development process are tracked and mapped, including plans in process, recently approved and recorded plans, issued building permits, and building completions. New housing potential for uncommitted land is estimated by zoning. Uncommitted land includes all undeveloped land that is not currently being developed or planned for development. At any given time, the total capacity for all housing in the County can be determined. If the zoning is changed or a conditional use petition is granted, then the capacity is re-calculated.

This dynamic projection system can project new housing for any geography. Current geographies used include transportation analysis zones, DPZ statistical areas, DPZ planning areas, school planning polygons, water pressure zones, sewer service areas, police beats and fire box areas.

Growth projections are based on General Plan 2000. The General Plan establishes growth control totals that are the allowed annual levels of new residential units by planning area. Using these General Plan control totals, the model projects future housing units in the following order: 1) issued permits, 2) recorded unbuilt lots, 3) approved site plans, 4) in-process site plans, 5) in-process subdivision plans, and 6) uncommitted land. Once these units are projected, population for each year can be estimated based on persons per unit and occupancy factors. For more information on DPZ's projection system, please refer to the Research Report on Issue 15: County GIS Land Use Projection System, located on the DPZ web site at: http://www.co.ho.md.us/DPZ/dpzpublicationsreports.htm#research.

Since General Plan 2000 is only a 20-year plan, the growth projections for the Water Resources Element extend beyond 2020 to the year 2030. The same general pace of growth is assumed between 2020 and 2030, although development slows as land becomes more scarce in the out years.

Growth projections for the Water Resources Element are based on a modified version of Round 7a of the cooperative regional forecast. Round 7a was completed in 2008. These forecast "rounds" are updated annually and are part of the Baltimore Metropolitan Council Cooperative Forecasting process used to plan for future transportation projects in the region. Howard County also uses these projections to plan for schools, roads, water and sewer, and public safety infrastructure and operations.

The Round 7a projections were modified to address three key General Plan and / or Zoning Regulation amendments that have been requested during development of the Water Resources Element. These modifications include additional population and commercial acreage for the redevelopment of Downtown Columbia and Village Centers, and for new development on a portion of Doughoregan Manor.

These projections were aggregated by water pressure zone and sewer service area for the Department of Public Works to use in their water and sewer analysis. The following discusses the Round 7a projections with these modifications in more detail.

# Projections

## Residential Projections

As indicated in the Introduction, residential growth projections for the Water Resources Element are based on a modified version of Round 7a. Round 7a was completed in early 2008, based on the latest construction and development information and zoning. Like all projection rounds, General Plan 2000 control totals and pace of growth by planning area were used to establish new development at 5-year intervals. For the Water Resources Element, Round 7a projections were modified based on the following assumptions:

1. **An additional 3,900 apartment units are assumed in Downtown Columbia.** General Plan 2000 assumes 1,600 new units in Downtown Columbia based on potential future zoning changes. General Growth Properties' current proposal includes 5,500 new units (rental and condominium), so the 3,900 extra units are added to the 1,600 already included in Round 7a. The pace of these units are phased at 780 per each 5-year increment between 2010 and 2035. Note that the Water Resources Element only goes to 2030.

2. **An additional 1,000 apartment units are assumed in the Columbia Village Centers.** This assumption is based on recent interest for Village Center redevelopment. It is assumed that the apartment units are built evenly over 5-year increments from 2010 to 2030.

3. **An additional 2,000 units are assumed in Doughoregan Manor.** It is assumed that 1,500 apartment units are built between 2010 and 2020, and another 500 units are built between 2020 and 2025. The water and sewer analysis assumes that the Planned Service Area is expanded for this option.

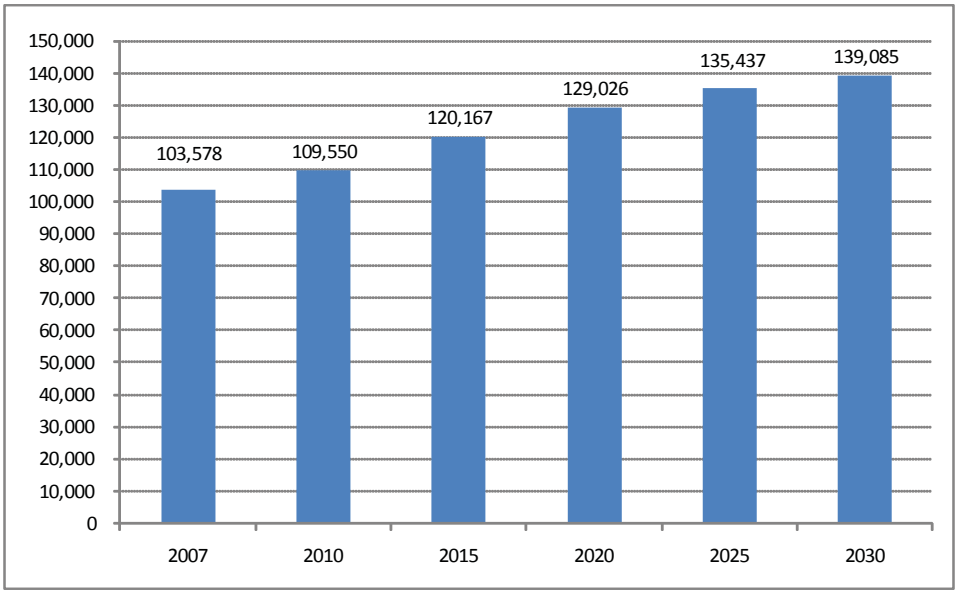
Figure A-1 summarizes the housing unit projections based on the above assumptions.

There were close to 103,600 housing units in the County in 2007. This grows to about 139,100 housing units by 2030, an increase of 35,500 homes over the 23-year projection period used for the Water Resources Element. This is a 34.2% increase over the 2007 base.

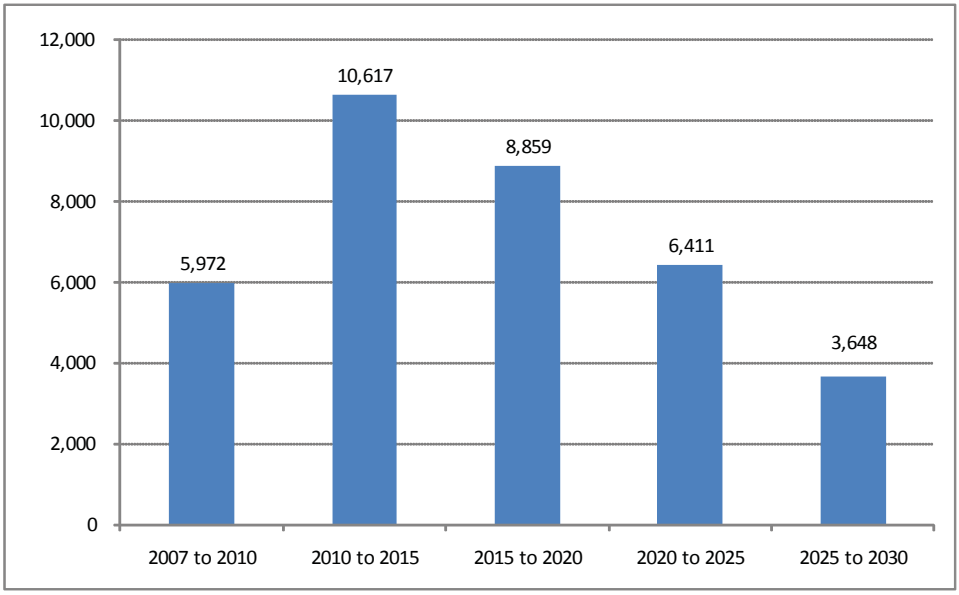
Figure A-2 shows the growth per increment. The first increment is only for 3 years. For the 5-year increments thereafter, the rate of change decreases over time – that is, the number of new homes built during each 5 years is less than the previous 5-year period.

Figures A-3 through A-5 show the projected growth by unit type in the County – single family detached (SFD), single family attached (SFA), and apartment (APT). There is a relatively small number of mobile homes (MH) not shown in the figures, so totals in these figures will not match those shown in Figures A-1 and A-2. Overall, apartments (rental and condominium) represent the largest percentage of new units projected at 47% of the total. SFD homes account for 32% of total new units projected. Townhomes or SFA units account for the remaining 20% of future units.

## Figure A-1: Housing Unit Projections from 2007 to 2030



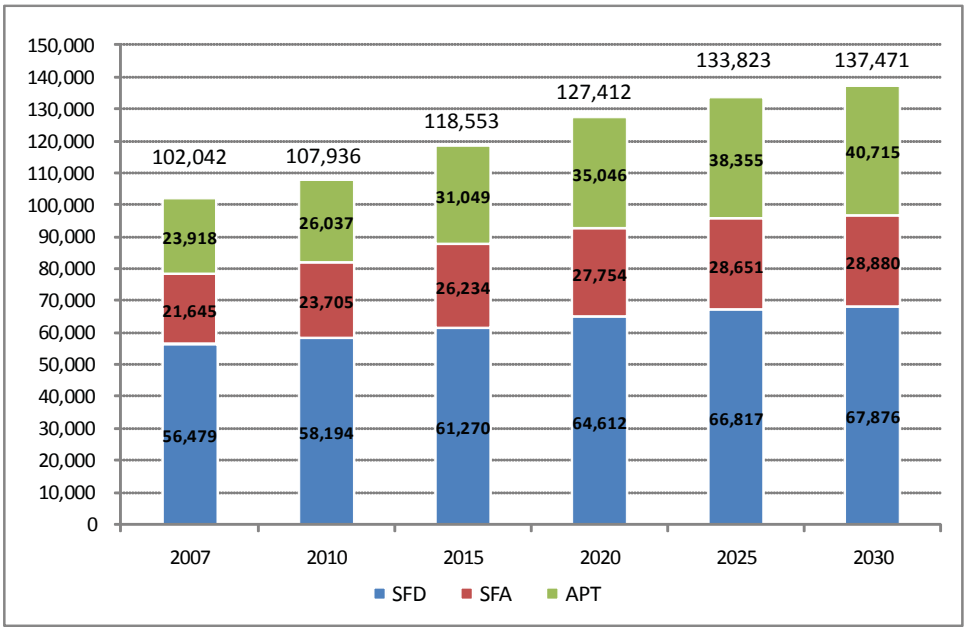

## Figure A-2: Incremental Housing Unit Projections from 2007 to 2030




## Figure A-3: Housing Unit Projections from 2007 to 2030

| Unit Type | 2007 | | 2030 | | Growth | |
|---|---|---|---|---|---|---|
| | Amount | Percent | Amount | Percent | Amount | Percent |
| Single Family Detached (SFD) | 56,479 | 55% | 67,876 | 49% | 11,397 | 32% |
| Single Family Attached (SFA) | 21,645 | 21% | 28,880 | 21% | 7,235 | 20% |
| Apartment (APT) | 23,918 | 23% | 40,715 | 30% | 16,797 | 47% |
| **Total** | **102,042** | **100%** | **137,471** | **100%** | **35,429** | **100%** |

## Figure A-4: Housing Unit Projections by Housing Unit Type from 2007 to 2030




## Figure A-5: Incremental Housing Unit Projections by Housing Unit Type from 2007 to 2030

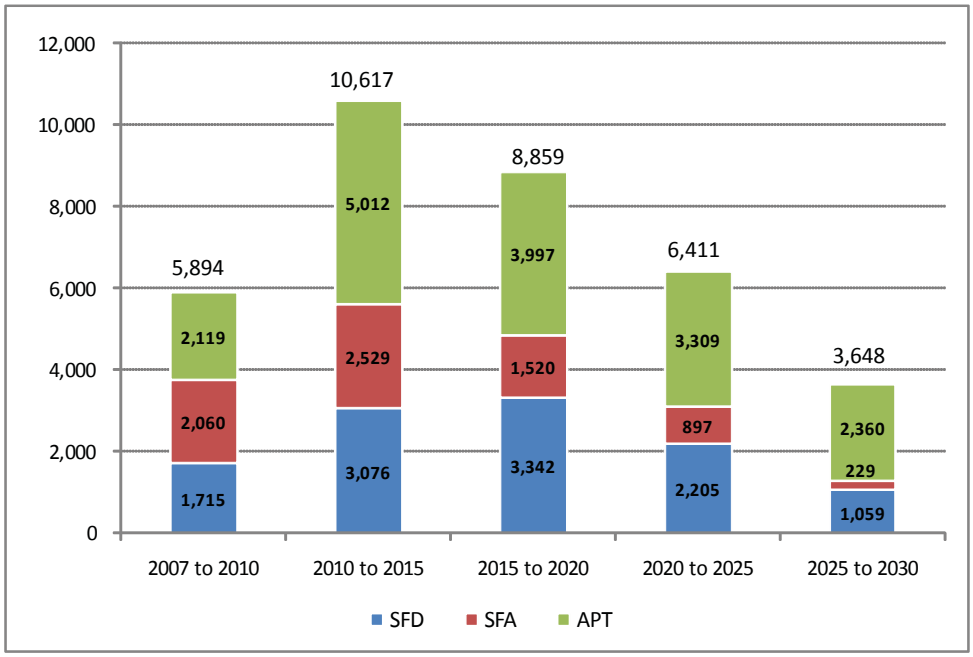
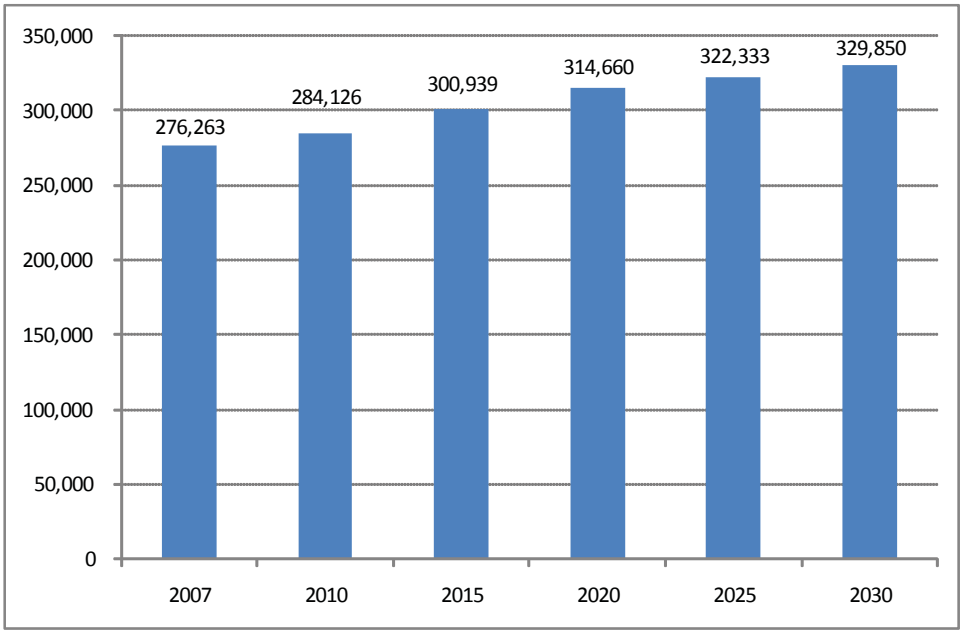


Figure A-6 summarizes the current and projected household population growth. In 2007, the household population was 276,263. It is expected to grow to almost 330,000 by 2030, an increase of about 53,600 residents. This is a 19% increase over the 23-year projection period. These estimates are based on the household size and occupancy factors shown in Figure A-7.

### Figure A-6: Household Population Projections from 2007 to 2030




### Figure A-7: Projected Household Size and Occupancy Rates from 2007 to 2030

| HOUSEHOLD SIZE | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Unit Type** | **2007** | **2010** | **2015** | **2020** | **2025** | **2030** | **2035** |
| **SFD** | 3.11 | 3.11 | 3.05 | 2.98 | 2.92 | 2.92 | 2.92 |
| **SFA** | 2.59 | 2.59 | 2.53 | 2.48 | 2.43 | 2.43 | 2.43 |
| **APT** | 1.89 | 1.89 | 1.85 | 1.81 | 1.78 | 1.78 | 1.78 |
| **MH** | 2.50 | 2.50 | 2.45 | 2.40 | 2.35 | 2.35 | 2.35 |
| **Age-Restricted Housing** | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 |

| OCCUPANCY RATES | |
|---|---|
| **Unit Type** | **Percent** |
| **SFD** | 98.0% |
| **SFA** | 97.0% |
| **APT** | 96.0% |
| **MH** | 97.0% |

## Details by Water Pressure Zone and Sewer Service Areas

Figure A-8 summarizes the total housing unit growth from 2007 to 2030 for inside and outside the Planned Service Area (PSA). This information was forwarded to the Department of Public Works (DPW) to be used in their water and sewer analysis. The details include the distinction between age-restricted housing and regular housing. Age-restricted housing has a lower household size. The detailed breakdown at 5-year growth increments and by water pressure zone and sewer service area were provided to DPW and are available from DPZ upon request.

### Figure A-8: Housing Unit Projections from 2007 to 2030

| | SFD | SFA | APT | MH | SFD Age Restricted | SFA Age Restricted | APT Age Restricted | TOTAL |
|---|---|---|---|---|---|---|---|---|
| Outside PSA | 3,961 | 2 | 0 | 0 | 50 | 0 | 2,000 | **6,013** |
| Inside PSA | 7,111 | 6,130 | 13,078 | 78 | 275 | 1,103 | 1,719 | **29,494** |
| **TOTAL** | **11,072** | **6,132** | **13,078** | **78** | **325** | **1,103** | **3,719** | **35,507** |

Figure A-9 shows the total household population growth from 2007 to 2030. The population was determined by multiplying the cumulative housing units times the household occupancy rates given in Figure A-7. The projected decline in household population in mobile homes is caused by the combination of a small increase in the number of mobile homes and the decrease in the household size. Similar to the housing unit information, detailed population projections at 5-year increments and by water pressure zone and sewer service area were provided to DPW and are available from DPZ upon request.

### Figure A-9: Household Population Projections from 2007 to 2030

| | SFD | SFA | APT | MH | SFD Age Restricted | SFA Age Restricted | APT Age Restricted | TOTAL |
|---|---|---|---|---|---|---|---|---|
| Outside PSA | 8,389 | 5 | 0 | (1) | 58 | 0 | 2,304 | **10,755** |
| Inside PSA | 9,898 | 10,377 | 19,139 | (113) | 322 | 1,267 | 1,943 | **42,833** |
| **TOTAL** | **18,287** | **10,381** | **19,139** | **(114)** | **380** | **1,265** | **4,247** | **53,586** |

## Nonresidential Projections

For the water and sewer modeling effort conducted by the Department of Public Works, future commercial and industrial acreage projections are required. For the Water Resources Element, the nonresidential acreage projections used are from the Round 7a projections, which were modified based on the following assumptions:

1. There will be redevelopment or an intensification of commercial use in Downtown Columbia totaling 1,008,040 square feet of retail space and 4,922,560 square feet of office space. There will also be an additional 640 hotel rooms during the development timeframe. All of this will be built out evenly over time between 2010 and 2035.

2. There will be redevelopment or an intensification of commercial uses in the Columbia Villages totaling 200,000 square feet of office space and 120,000 square feet of retail space. This will be built out evenly over time between 2010 and 2030.

3. For Doughoregan Manor, in addition to the 2,000 independent living units, there will also be a number of assisted living and nursing home beds in an institutional setting as part of a continuing care retirement community.

The cumulative industrial and commercial acreage totals for inside and outside the PSA are given in Figure A-10. Detailed projection information by sewer service area and water pressure zone was forwarded to DPW and is available from DPZ upon request.

### Figure A-10: Cumulative Nonresidential Acreage from 2005 to 2030

| Year | Outside PSA | | Inside PSA | | TOTAL | |
|---|---|---|---|---|---|---|
| | Indus | Comm | Indus | Comm | Indus | Comm |
| 2005 | 160 | 346 | 3,610 | 3,179 | **3,770** | **3,525** |
| 2010 | 161 | 364 | 3,910 | 3,476 | **4,071** | **3,840** |
| 2015 | 161 | 368 | 4,149 | 3,692 | **4,310** | **4,060** |
| 2020 | 161 | 414 | 4,416 | 3,891 | **4,577** | **4,304** |
| 2025 | 161 | 462 | 4,666 | 4,149 | **4,827** | **4,611** |
| 2030 | 161 | 469 | 4,997 | 4,252 | **5,157** | **4,721** |

## Modifications to the Growth Projections

Subsequent to the preparation of the growth projections used in this document, a proposal to develop 2,000 apartment units at Doughoregan Manor was withdrawn by the applicant. In the fall of 2009, the property owners submitted a new request to develop about 325 single family detached units on a portion of the property. It is assumed that the 325 homes would be built between 2010 and 2020. Based on the persons per household factors used in this report, the revised Doughoregan Manor development proposal would only have around 40% of the original population estimate. This new proposal for single family detached homes, if approved, would have a lesser demand for water and sewer services than the original proposal for a continuing care retirement community with 2,000 age-restricted dwelling units.

# APPENDIX B:

# NONPOINT AND POINT SOURCE LOADINGS

## Introduction

One purpose of the Water Resources Element is to ensure that the County has adequate land and water capacity to meet the stormwater management and wastewater treatment needs of existing and future development. To assess treatment capacity for stormwater runoff and wastewater, the County estimated the nutrient nonpoint source pollution loads from stormwater runoff and septic systems based on current and future land use, and gauged the expected impacts of these loads on water quality in local streams and reservoirs. In addition, the nutrient point source pollution loads from the two major wastewater treatment plants serving the County were estimated, and the total County point and nonpoint source nutrient loads were estimated. The following discusses the results of that nonpoint and point source nutrient load analysis.

## Land Use and Nonpoint Source Analysis

To assess future treatment capacity for stormwater runoff, the County conducted a nonpoint source loading analysis using the nonpoint source loading (NPS) spreadsheet developed by the Maryland Department of the Environment (MDE). MDE developed the NPS spreadsheet as an analytical tool for preparing the Water Resources Element. The NPS spreadsheet uses a simple assessment to calculate the change in nutrient (nitrogen and phosphorus) loads due to proposed land use changes and allows for a comparison between alternative future land use changes.

The NPS spreadsheet is designed for use with the Maryland Department of Planning (MDP) Growth Simulation Model (GSM), which projects future land use. Current land use is defined as the MDP 2007 land use / land cover. The GSM projects future land use on a parcel basis using population, household and employment projections, along with other local land management factors such as clustering, designated growth areas and land preservation programs. Population, household and employment projections are based on small area forecasts for Transportation Analysis Zones (TAZ). MDP uses a default zoning yield of 75% of the allowable density, although this yield is halved for infill parcels. MDP works with local governments to customize yield and to direct where growth occurs based on local growth management policies.

To confirm that the GSM was using the proper growth assumptions for Howard County, MDP also conducted a separate development capacity analysis for comparison with the County's capacity analysis. This comparison used the Baltimore Metropolitan Council TAZ Round 7a forecast. The MDP analysis included an estimate by zoning district for new household capacity. The MDP analysis estimated an additional 30,299 households, while the County analysis estimated an additional 30,674 households, a

difference of only 375 households or about 1%. This difference was not considered significant for this analysis.

The NPS spreadsheet calculates changes in nutrient runoff loads from land use changes, using a nutrient loading rate that reflects full implementation of the Tributary Strategy Best Management Practices (BMP). The Tributary Strategy BMP loading rate reflects the full spectrum of BMP implementation for all developed and agricultural land uses needed to achieve water quality goals for the Chesapeake Bay. This degree of BMP implementation may not be realistic, but it is acceptable for use in the NPS spreadsheet, because the NPS spreadsheet uses the same loading rate for current and future land use conditions. This analysis is used only for comparing the changes in current and future nutrient loads.

The nutrient loading rate is from the Chesapeake Bay Program Watershed Model phase 4.3, and varies by land use category and by basin. The loading rate is applied across 25 different land uses, including rural, low, medium and high density residential, commercial, industrial, cropland, pasture, wetlands and forest.

In addition to addressing nutrient loads from runoff, the NPS spreadsheet also includes a nitrogen loading rate for standard septic systems. The effect of replacing standard septic systems with nitrogen reducing systems can be estimated by halving the standard septic system loading rate. The NPS spreadsheet also calculates changes in impervious cover, agriculture and forest.

The GSM and the NPS spreadsheet divide Howard County into two basins – the Patuxent above the Fall Line and the Western Shore (which includes the Patapsco River) above the Fall Line. A small portion of eastern Howard County is below the Fall Line in each basin, but due to the large-scale analysis being conducted by the State, this refinement was not available. MDP used the GSM to provide an analysis for the two large basins, then ran a second analysis for the seven major watersheds in the County.

The results of the GSM for the Round 7a forecast generated future land use acreage in 2030 that was entered into the NPS spreadsheet. Land use changes for Downtown Columbia and Doughoregan Manor were then added to the NPS spreadsheet by the County. Redevelopment of the Village Centers did not result in a land use category change. The NPS spreadsheet then provided changes in nonpoint source loads for the County, the Patuxent and Patapsco River basins, and for the seven major watersheds. The following presents the results of the analysis from the GSM and the NPS spreadsheet.

## Land Use Change

Figure B-1 presents the change in County acreage from 2007 to 2030 for each land use category. Total land use change for the County in 2030 is projected to be approximately 21,351 acres. Total acreage for the County is approximately 162,177 acres, so this is a change for 13% of the County. This change occurs with an increase in low, medium and high density residential, and commercial land uses, with the majority of this increase (81%) being in low density residential land use. Low density residential land use ranges from 2 dwelling units per acre to 1 dwelling unit per 5 acres. This land use change has a corresponding decrease in other land uses, primarily cropland, forest, rural residential and pasture

Figure B-2 presents the change in County acreage from 2007 to 2030 for developed land, agriculture and forest. In total, the County is projected to gain 20,710 acres of developed land, for an increase of 32% over current developed land acreage. Developed land includes low, medium and high density residential, commercial, industrial, institutional and transportation. The developed land acreage does not equal total land use change, because acreage in the industrial and institutional categories declined. The County is projected to lose 9,890 acres or 28% of existing agricultural land and 6,599 acres or 16% of existing forest.

## Figure B-1: County Land Use Change

| Land Use Category | 2007 (acres) | 2030 (acres) | Change (acres) |
|---|---|---|---|
| Low Density Residential | 29,315 | 46,631 | 17,316 |
| Medium Density Residential | 16,282 | 19,275 | 2,994 |
| Commercial | 3,882 | 4,734 | 852 |
| High Density Residential | 4,773 | 4,962 | 189 |
| Transportation | 2,364 | 2,364 | 0 |
| Row & Garden Crops | 58 | 58 | 0 |
| Water | 1,007 | 1,007 | 0 |
| Wetlands | 30 | 30 | 0 |
| Beaches | 0 | 0 | 0 |
| Bare Exposed Rock | 0 | 0 | 0 |
| Extractive | 38 | 22 | -16 |
| Feeding Operations | 127 | 122 | -5 |
| Agricultural Buildings | 256 | 226 | -30 |
| Industrial | 5,306 | 5,207 | -98 |
| Orchards & Vineyards | 344 | 221 | -123 |
| Bare Ground | 588 | 444 | -144 |
| Evergreen Forest | 919 | 633 | -286 |
| Institutional | 3,137 | 2,596 | -541 |
| Open Urban Land | 3,441 | 2,733 | -708 |
| Brush | 3,050 | 2,251 | -800 |
| Mixed Forest | 4,225 | 3,409 | -815 |
| Pasture | 5,280 | 3,616 | -1,664 |
| Rural Residential | 13,688 | 10,347 | -3,341 |
| Deciduous Forest | 34,280 | 29,583 | -4,697 |
| Cropland | 29,789 | 21,721 | -8,067 |

## Figure B-2: County Developed Land, Agriculture and Forest Land Use Change

| Land Use Category | 2007 (acres) | 2030 (acres) | Change (acres) |
|---|---|---|---|
| Developed | 65,059 | 85,769 | 20,710 |
| Agriculture | 35,854 | 25,964 | -9,890 |
| Forest | 42,475 | 35,876 | -6,599 |

Figure B-3 presents the change in land use from 2007 to 2030 for the Patuxent and Patapsco River basins. Total land use change for the Patuxent River basin is projected to be approximately 16,091 acres. This is a 13% change in land use for the basin as a whole, and 75% of the total County land use change. Total land use change for the Patapsco River basin is projected to be approximately 5,642 acres. This is a 14% change in land use for the basin as a whole, and 25% of the total County land use change. The land use changes in each basin are similar to overall County changes.

### Figure B-3: Land Use Change by Basin

| | Patuxent | | | Patapsco | | |
|---|---|---|---|---|---|---|
| **Land Use Category** | **2007 (acres)** | **2030 (acres)** | **Change (acres)** | **2007 (acres)** | **2030 (acres)** | **Change (acres)** |
| Low Density Residential | 22,947 | 35,701 | 12,754 | 6,367 | 10,929 | 4,562 |
| Medium Density Residential | 11,921 | 14,414 | 2,493 | 4,361 | 4,862 | 501 |
| Commercial | 2,954 | 3,594 | 640 | 928 | 1,141 | 213 |
| High Density Residential | 3,526 | 3,730 | 204 | 1,247 | 1,232 | -15 |
| Transportation | 1,768 | 1,768 | 0 | 596 | 596 | 0 |
| Row & Garden Crops | 58 | 58 | 0 | 0 | 0 | 0 |
| Water | 1,004 | 1,004 | 0 | 3 | 3 | 0 |
| Wetlands | 24 | 24 | 0 | 6 | 6 | 0 |
| Beaches | 0 | 0 | 0 | 0 | 0 | 0 |
| Bare Exposed Rock | 0 | 0 | 0 | 0 | 0 | 0 |
| Extractive | 3 | 3 | 0 | 35 | 19 | -16 |
| Feeding Operations | 122 | 122 | 0 | 5 | 0 | -5 |
| Agricultural Buildings | 186 | 173 | -13 | 70 | 54 | -16 |
| Industrial | 3,844 | 3,379 | -465 | 1,462 | 1,828 | 366 |
| Orchards & Vineyards | 298 | 189 | -109 | 46 | 32 | -14 |
| Bare Ground | 521 | 393 | -128 | 67 | 51 | -16 |
| Evergreen Forest | 745 | 502 | -243 | 174 | 131 | -43 |
| Institutional | 2,344 | 1,999 | -345 | 793 | 597 | -196 |
| Open Urban Land | 2,601 | 1,986 | -615 | 840 | 747 | -93 |
| Brush | 2,552 | 1,891 | -661 | 499 | 360 | -139 |
| Mixed Forest | 2,682 | 2,297 | -385 | 1,543 | 1,112 | -431 |
| Pasture | 4,154 | 2,707 | -1,447 | 1,126 | 909 | -217 |
| Rural Residential | 10,289 | 8,165 | -2,124 | 3,400 | 2,182 | -1,218 |
| Deciduous Forest | 23,502 | 20,201 | -3,301 | 10,778 | 9,382 | -1,396 |
| Cropland | 23,730 | 17,475 | -6,255 | 6,059 | 4,247 | -1,812 |
| **Total** | **121,775** | | **16,091** | **40,405** | | **5,642** |

Figure B-4 presents the land use change for the seven 8-digit watersheds in the County. When the total County land use change is divided between these watersheds, almost 50% of this change occurs in the Middle Patuxent River (25.9%) and Triadelphia Reservoir (22.9%) watersheds. The Little Patuxent River watershed will see the third largest portion of the change at 17.0%, followed by the South and North

Branches of the Patapsco at 13.0% and 12.9%, respectively. The Rocky Gorge Reservoir watershed will have a 7.2% portion of the change and the Patuxent River Upper watershed will have the smallest portion, at 1.0%.

The land use change in most watersheds is primarily an increase in low density residential development. Exceptions to this pattern occur in the Little Patuxent River, which has a larger increase in medium density residential development, and the Patuxent River Upper, which has larger increases in commercial, and high and medium density residential development.

There is a small difference (2%) in the sum of the basin and individual watershed land use changes and the overall County change in land use. This occurs because if land use change is measured as the sum of positive land use changes, a particular land use may increase in the County but still increase or decrease in a particular basin or individual watershed. For example, industrial land use decreases for the County as a whole, but increases in the Patapsco River basin.

### Figure B-4: Land Use Change by Watershed

| 8-digit Watershed | Change in Land Use (acres) | Percent County Total |
|---|---|---|
| Middle Patuxent River | 5,639 | 25.9% |
| Triadelphia Reservoir | 4,987 | 22.9% |
| Little Patuxent River | 3,688 | 17.0% |
| South Branch Patapsco | 2,835 | 13.0% |
| North Branch Patapsco | 2,809 | 12.9% |
| Rocky Gorge Reservoir | 1,555 | 7.2% |
| Patuxent River Upper | 223 | 1.0% |
| **Total** | **21,736** | **99.9%** |

## Impervious Cover

Impervious cover, caused by built structures such as parking lots, roads and buildings, is a useful predictor of expected water quality and stream habitat conditions in a watershed. In general, as impervious cover increases with increasing development, stream health is expected to decline as forests are cleared, groundwater recharge is reduced, and polluted runoff into local streams increases in volume and frequency.

The County uses a system developed by the Center for Watershed Protection to place watersheds into one of three categories based on impervious cover, as presented in Figure B-5. Sensitive watersheds have up to 10% impervious cover and are expected to have the healthiest streams. Impacted watersheds have more than 10 and less than or equal to 25% impervious cover and are expected to have streams showing clear signs of degradation. Non-supporting watersheds have greater than 25% impervious cover and are expected to have streams with significant degradation. This system can be used to prioritize healthy watersheds for actions that will protect water quality and habitat, and to prioritize degraded watersheds for actions to restore water quality and habitat. The more degraded conditions are within a watershed, the more difficult and expensive restoration efforts become.

## Figure B-5: Watershed Impervious Cover Categories

| Watershed Category | Percent Impervious Cover | Expected Water Quality and Stream Health |
|---|---|---|
| Sensitive | Less than or equal to 10 | Good to excellent |
| Impacted | Greater than 10 and less than or equal to 25 | Fair to good |
| Non-supporting | Greater than 25 | Poor to fair |

Figure B-6 presents the change in impervious cover for the seven major watersheds in the County. Overall, impervious cover in the County increases from 20,458 acres or 12.6% of the County to 23,964 acres or 14.8% of the County, an increase of 3,507 acres or 2.2%. Impervious cover in the Patuxent River basin increases from 15,335 acres or 12.6% of the basin to 17,847 acres or 14.7% of the basin. Impervious cover in the Patapsco River basin increases from 5,123 acres or 12.7% of the basin to 6,117 acres or 15.1% of the basin. When this change in impervious cover is divided between the 8-digit watersheds, the smallest increase in impervious area will occur in the Patuxent River Upper, but because this is also the smallest watershed, it will give the largest percentage change at 5%. This increase in impervious cover will move this watershed from the impacted to the non-supporting category. The remaining watersheds all have a change of just under or over 2%, with a range of 1.8 to 2.6%.

Triadelphia Reservoir, South Branch Patapsco and Rocky Gorge Reservoir will all remain in the sensitive watershed category, with impervious cover below 10%. The Middle Patuxent River watershed will move from the sensitive category to the impacted category. The Little Patuxent River and the Patuxent River Upper watersheds will also move from the impacted to the non-supporting category. The North Branch Patapsco will remain in the impacted category.

## Figure B-6: Impervious Cover by Watershed

| 8-digit Watershed | Impervious Cover (acres) | | Impervious Cover (percentage) | | Percentage Change |
|---|---|---|---|---|---|
| | 2007 | 2030 | 2007 | 2030 | |
| Middle Patuxent River (37,074 acres) | 3,380 | 4,227 | 9.1% Sensitive | 11.4% Impacted | 2.3% |
| Triadelphia Reservoir (36,958 acres) | 1,480 | 2,148 | 4.0% Sensitive | 5.8% Sensitive | 1.8% |
| Little Patuxent River (38,005 acres) | 9,512 | 10,215 | 25.0% Impacted | 26.9% Non-supporting | 1.9% |
| South Branch Patapsco (16,086 acres) | 676 | 1,059 | 4.2% Sensitive | 6.6% Sensitive | 2.4% |
| North Branch Patapsco (24,319 acres) | 4,447 | 5,058 | 18.3% Impacted | 20.8% Impacted | 2.5% |
| Rocky Gorge Reservoir (7,996 acres) | 535 | 742 | 6.7% Sensitive | 9.3% Sensitive | 2.6% |
| Patuxent River Upper (1,738 acres) | 428 | 515 | 24.6% Impacted | 29.6% Non-supporting | 5.0% |
| **Total** | **20,458** | **23,964** | | | |

# Nutrient Loads

Figure B-7 presents the change in nonpoint source nutrient loads from 2007 to 2030 by basin and for the County as a whole. The overall change in land use for the County will result in a small increase in nitrogen loading of 793 pounds, or a less than 1% increase from the 2007 load, and a small increase in phosphorus loading of 880 pounds, or a 1% increase from the 2007 load. The change in land use generates an increase in nitrogen and phosphorus loads from low, medium and high density residential and commercial land uses, because these land uses are projected to increase in acreage. A decrease in nutrient loads is generated by other land uses that are projected to decrease in acreage. The majority of the decrease (68% for nitrogen and 71% for phosphorus) occurs from the change in cropland, with the next largest decrease (14% for nitrogen and 18% for phosphorus) coming from the change in rural residential land use. The decrease in cropland has such a significant impact on the change in nutrient loads, because the nitrogen and phosphorus loading rates for cropland can be up to twice the loading rates for developed land.

The change in land use actually generates a decrease in runoff nitrogen loads, but this is offset by an increase in nitrogen loads from septic systems. The projected nitrogen load from septic systems will be 22% of the total Countywide nitrogen load in 2030.

### Figure B-7: Nonpoint Source Nutrient Loads by Basin and Countywide

| Source | Nitrogen Loads (lbs/yr) | | | | Phosphorus Loads (lbs/yr) | | | |
|---|---|---|---|---|---|---|---|---|
| | 2007 | 2030 | Change | % | 2007 | 2030 | Change | % |
| **Patuxent** | | | | | | | | |
| Land Use | 902,654 | 885,769 | -16,885 | | | | | |
| Septic | 210,647 | 226,069 | 15,422 | | | | | |
| **Total** | **1,113,301** | **1,111,838** | **-1,463** | **-0.1%** | **70,510** | **70,288** | **-222** | **-0.3%** |
| **Patapsco** | | | | | | | | |
| Land Use | 212,152 | 212,505 | 352 | | | | | |
| Septic | 75,025 | 76,928 | 1,903 | | | | | |
| **Total** | **287,177** | **289,433** | **2,256** | **0.8%** | **17,308** | **18,410** | **1,102** | **6.4%** |
| **Countywide** | | | | | | | | |
| Point | 1,114,806 | 1,098,274 | -16,532 | | | | | |
| Septic | 285,672 | 302,997 | 17,325 | | | | | |
| **Total** | **1,400,479** | **1,401,271** | **793** | **0.1%** | **87,818** | **88,698** | **880** | **1.0%** |

Under the Tributary Strategy BMP loading rates, nitrogen loading rates are generally higher in the Patuxent than the Patapsco River basin, but the difference in phosphorus loading rates is variable. A larger portion of the Patuxent River basin lies outside the Planned Service Area, and this basin has approximately three times the number of septic systems than does the Patapsco River basin.

In the Patuxent River basin, nitrogen and phosphorus loads have a minor decrease of less than 1% from 2007 loads. As with the Countywide loads, the change in land use generates an increase in nitrogen and phosphorus loads from low, medium and high density residential and commercial land uses. A decrease in

nutrient loads is generated by other land uses that are projected to decrease in acreage. The majority of the decrease occurs from the change in cropland, with the next largest decrease coming from the change in rural residential land use. The change in land use results in a significant decrease in runoff nitrogen loads, but this is offset by an increase in nitrogen loads from septic systems.

In the Patapsco River basin, nitrogen loads have a minor increase of less than 1% and phosphorus loads increase by 6% from 2007 loads. In a slightly different pattern from the Countywide loads, the change in land use generates an increase in nitrogen and phosphorus loads from low and medium density residential, commercial and industrial land uses. A decrease in nutrient loads is generated by other land uses that are projected to decrease in acreage. The majority of the decrease occurs from the change in cropland, with the next largest decrease coming from the change in rural residential land use. Both the change in land use and the addition of septic systems contribute to an increase in nitrogen loads.

Figure B-8 presents the change in nonpoint source nutrient loads from 2007 to 2030 for each major watershed. The GSM analysis of land use change for the seven 8-digit watersheds in the County did not include an assessment of septic systems, so total change in nitrogen cannot be calculated. Total change in nitrogen loads for land use Countywide is 16,532 verses 16,880 for the watersheds, or a difference of 2.0%. This seems reasonable, given the 2% difference in land use change. Total change in phosphorus loads for land use Countywide is 880 verses 758 for the watersheds, or a difference of 14%. This larger percentage difference may occur because the loadings are relatively small, so the difference is proportionately larger.

### Figure B-8: Nonpoint Source Nutrient Loads by Watershed

| 8-digit Watershed | Nitrogen Loads (lbs/yr) | | | | Phosphorus Loads (lbs/yr) | | | |
|---|---|---|---|---|---|---|---|---|
| | 2007 | 2030 | Change | % | 2007 | 2030 | Change | % |
| Middle Patuxent | 287,212 | 279,200 | -8,011 | -2.8% | 22,692 | 22,437 | -254 | -1.1% |
| Triadelphia Reservoir | 304,724 | 292,447 | -12,277 | -4.0% | 23,792 | 23,136 | -756 | -3.2% |
| Little Patuxent | 251,277 | 252,778 | 1,501 | 0.6% | 19,533 | 19,902 | 368 | 1.9% |
| S Branch Patapsco | 99,787 | 95,052 | -4,736 | -4.7% | 7,661 | 8,014 | 352 | 4.6% |
| N Branch Patapsco | 112,364 | 117,196 | 4,832 | 4.3% | 9,646 | 10,382 | 736 | 7.6% |
| Rocky Gorge | 49,225 | 50,962 | 1,736 | 3.5% | 3,716 | 4,017 | 302 | 8.1% |
| Patuxent River Upper | 10,286 | 10,361 | 75 | 0.7% | 785 | 795 | 10 | 1.3% |
| **Total** | | | **-16,880** | | | | **758** | |

*Note that nitrogen loads are for land use only and do not include nitrogen loads from septic systems.*

## Point and Nonpoint Source Loadings

Figure B-9 presents the combined point source loads from the Little Patuxent Water Reclamation Plant (WRP) and the Patapsco Wastewater Treatment Plant (WRP), and nonpoint source loads from land use and septic systems for the Patuxent and Patapsco River basins and Countywide. It should be noted that the point and nonpoint source loads are not comparable in terms of accuracy. The point source loads are based on actual and projected flows and nutrient concentrations. The nonpoint source loads are based on

an assumption for best management practice implementation that is not currently in place, so they are useful only for comparing changes in nonpoint source loads.

Total nitrogen and phosphorus loads in the Patuxent River basin will decrease by approximately 1.5% and 3.0%, respectively, due primarily to the decrease in nutrient loads from the Enhanced Nutrient Removal (ENR) treatment upgrade at the Little Patuxent WRP. Total nitrogen and phosphorus loads in the Patapsco River basin will decrease by approximately 40.8% and 34.0%, respectively, due to the decrease in nutrient loads from the ENR upgrade at the Patapsco WWTP. Total nitrogen and phosphorus loads in the County will decrease by approximately 13.8% and 12.4%, respectively, due primarily to the decrease in nutrient loads from the Little Patuxent WRP and the Patapsco WWTP.

### Figure B-9: Total Nutrient Loads by Basin and Countywide

| Source | Nitrogen Loads (lbs/yr) | | | | Phosphorus Loads (lbs/yr) | | | |
|---|---|---|---|---|---|---|---|---|
| | 2007 | 2030 | Change | % | 2007 | 2030 | Change | % |
| **Patuxent** | | | | | | | | |
| Point | 301,701 | 282,508 | -19,193 | -6.4% | 22,770 | 20,167 | -2,603 | -11.4% |
| Nonpoint | 1,113,301 | 1,111,838 | -1,463 | -0.1% | 70,510 | 70,288 | -222 | -0.3% |
| **Total** | **1,415,002** | **1,394,346** | **-20,656** | **-1.5%** | **93,280** | **90,455** | **-2,825** | **-3.0%** |
| **Patapsco** | | | | | | | | |
| Point | 390,972 | 111,779 | -279,193 | -71.4% | 23,306 | 8,383 | -14,923 | -64.0% |
| Nonpoint | 287,177 | 289,433 | 2,256 | 0.8% | 17,308 | 18,410 | 1,102 | 6.4% |
| **Total** | **678,149** | **401,212** | **-276,937** | **-40.8%** | **40,614** | **26,793** | **-13,821** | **-34.0%** |
| **Countywide** | | | | | | | | |
| Point | 682,673 | 394,287 | -275,966 | -40.4% | 46,076 | 28,550 | -16,594 | -36.0% |
| Nonpoint | 1,400,479 | 1,401,271 | 793 | 0.1% | 87,818 | 88,698 | 880 | 1.0% |
| **Total** | **2,083,152** | **1,795,558** | **-287,594** | **-13.8%** | **133,894** | **117,248** | **-16,646** | **-12.4%** |

## Modifications to the Nonpoint and Point Source Loadings

Subsequent to the preparation of the nonpoint and point source nutrient load analysis used in this document, the proposal to develop 2,000 apartment units at Doughoregan Manor was withdrawn by the applicant. In the fall of 2009, the property owners submitted a new request to develop about 325 single family detached units on the same portion of the property. It is assumed that the 325 homes would be built between 2010 and 2020. If approved, the revised Doughoregan Manor development proposal would change the future land use on the property from high density residential to low density residential. Total land use change in the County would stay the same, but the 2030 land use projections would have a minor increase in low density residential land use and a minor decrease in high density residential land use. There would be a minor decrease in future impervious cover and future nonpoint source nutrient loads, because low density residential land use has a lower impervious cover and lower nutrient loading rate than high density residential land use. Point source loads from the Little Patuxent WRP and the County's total nutrient loads would also be slightly lower than projected.

Howard County

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