Water Resources Element

Carroll County
Freedom
Hampstead
Manchester
Mount Airy
New Windsor
Sykesville
Taneytown
Union Bridge
Westminster

Official Draft for Review by State Agencies and for Concurrent Public Review

As of December 2, 2009

60-Day Review Beginning December 7, 2009

Preface

This plan document was a joint effort between Carroll County and its municipalities: Hampstead, Manchester, Mount Airy, New Windsor, Sykesville, Taneytown, Union Bridge, and Westminster. Coordination and review took place through the Water Resources Coordination Council. **The plan is based on the adopted comprehensive/land use plans, regulations, and policies in place in 2007 and 2008 (not on any proposals).** Upon adoption by each of these jurisdictions, it is intended to satisfy the requirements of House Bill 1141 (2006) to develop and adopt a Water Resources Element (WRE) of the comprehensive plan for each of these jurisdictions.

The entire plan document is intended to be applied to and adopted by each jurisdiction, with the exception of the "Overview by Municipal System." Within this section, only the portion specific to an individual jurisdiction is intended to apply to and be adopted by that jurisdiction. If any jurisdiction chooses not to or fails to adopt this plan document, it does not invalid the document and/or adoption for the other jurisdictions.

The plan provides information and evaluation of the county's water resources at the MDE 8-digit watershed level and a countywide assessment of nonpoint source issues. Strategies are offered on a countywide basis. Water supply and wastewater are also discussed for each individual municipal system that serves a designated growth area. Strategies that are specific to those systems and that reflect the unique characteristics and needs of those systems and communities are included in the individual municipal system sections. Strategies are intended to identify measures that could, and should, be taken by each jurisdiction to achieve the goals and intentions of this plan document. However, they do not require any jurisdiction to implement every strategy contained in the document.

The information and recommendations provided in this plan are supported by technical assessments conducted and reported in documents separate from, but as support to, the WRE plan document. The supporting reports, prepared by Malcolm Pirnie, are referenced for more detailed information than the summaries provided in this plan document. They are:

- Technical Memorandum, "Review of 1988 Water Resources Study," dated March 26, 2009
- Report, *Carroll County Demands and Availability*, dated July 30, 2009
- Report, *Carroll County Wastewater Limitations*, dated May 29, 2009
- Report, *Carroll County Alternatives Evaluation*, dated September 28, 2009

The information contained within and addressed by this plan is based on the requirements of the legislation as interpreted by guidance presented within the Models and Guidelines (No. 26), The Water Resources Element: Planning for Water Supply and Wastewater and Stormwater Management. Additional guidance on information to be included and issues to be addressed was provided by Maryland Departments of Environment, Planning, and Natural Resources through a "Guidance Team" and the cooperative process undertaken to include these State agencies in the planning process.

Prepared by ***Carroll County Department of Planning***

In collaboration with the:
Carroll County Water Resources Coordination Council

On behalf of:
Carroll County
Freedom
Hampstead
Manchester
Mount Airy
New Windsor
Sykesville
Taneytown
Union Bridge
Westminster

Table of Contents

Countywide Strategies: Objectives & Action Items for All 135

List of Supporting, Contributing, & Guiding Documents

- Technical Memorandum, "Review of 1988 Water Resources Study," dated March 26, 2009
- Report, *Carroll County Demands and Availability*, dated July 30, 2009
- Report, *Carroll County Wastewater Limitations*, dated May 29, 2009
- Report, *Carroll County Alternatives Evaluation*, dated September 28, 2009
- Guidance Document, *Models and Guidelines Managing Maryland's Growth No. 26*, "The Water Resources Element: Planning for Water Supply and Wastewater and Stormwater Management," Prepared by Maryland Departments of Environment, Planning, and Natural Resources, dated June 2007 (http://www.mdp.state.md.us/ourproducts/publications.shtml)
- Guidance Document, *Water Supply Capacity Management Plans*, Maryland Department of the Environment, dated 2006 (www.mde.maryland.gov/assets/document/water/WaterSupplyCapacityPlansGuidance.pdf)
- Guidance Document, *Wastewater Supply Capacity Management Plans*, Maryland Department of the Environment, dated 2006 (www.mde.maryland.gov/assets/document/water/WastewaterCapacityMgmtGuidance.pdf)
- Plan, *Maryland's Chesapeake Bay Tributary Strategy Statewide Implementation Plan*, Maryland Departments of Natural Resources, Environment, Planning, and Agriculture, dated February 22, 2006, draft (www.dnr.state.md.us/Bay/tribstrat/implementation_plan.html)
- Plan, *Carroll County Master Plan for Water & Sewerage*, Carroll County Planning Department, dated September 2007 (http://ccgovernment.carr.org/ccg/plan/w-splan/2006%20update/default.asp)

Acronyms

APFO	Adequate Public Facilities Ordinance
BRF	Bay Restoration Fund
BMC	Baltimore Metropolitan Council
BMP	best management practice
BNR	biological nutrient removal
BLI	Buildable Land Inventory
CMP	capacity management plan
CIP	Capital Improvement Program or Community Investment Plan
CBP	Chesapeake Bay Program
CWA	Clean Water Act
CWP	Center for Watershed Protection
DGA	Designated Growth Area
DU	dwelling unit
DNR	(Maryland) Department of Natural Resources
EAC	Environmental Advisory Council
ENR	enhanced nutrient removal
ESD	Environmental Site Delineation
GAB	Growth Area Boundary
Gpd	gallons per day
GHG	greenhouse gas
GW	groundwater
HB	House Bill
HUC	hydrologic unit code
I&I	infiltration and inflow
IPA	installment purchase agreement
LULC	Land Use/Land Cover
LID	Low-impact design or low-impact development
MACS	Maryland Agricultural Cost Share Program
MCL	maximum contaminant level
MD	Maryland
MDA	Maryland Department of Agriculture
MDE	Maryland Department of the Environment
MDP	Maryland Department of Planning
mgd	million gallons per day
NPDES	National Pollutant Discharge Elimination System
NPS	nonpoint source
NPSS	Nonpoint Source Spreadsheet
OSDS	onsite disposal system
PFA	Priority Funding Area
PDR	purchase of development rights
SBR	sequencing batch reactor
SOC	synthetic organic compounds
SSA	sewer service area
SW	surface water
SWA	source water assessment
SPH	Super Pump House
TMDL	Total Maximum Daily Load
TDR	transfer of development rights
U&O	use and occupancy (permit)
USACE	United State Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOC	volatile organic compounds
WSA	water service area
WLA	wasteload allocation
WWCMP	Wastewater Capacity Management Plan
WWTP	Wastewater Treatment Plant
WSCMP	Water Supply Capacity Management Plan
WTP	Water Treatment Plant
WIP	Watershed Improvements Plan
WMA	Watershed Management Agreement
WSM	watershed model
WRCC	Water Resources Coordination Council
WRE	Water Resource Element

1 Introduction

Legislation

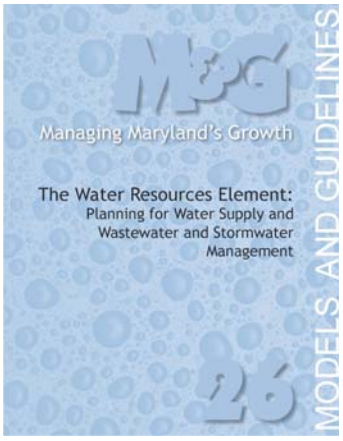
Legislation (HB 1141) passed by the 2006 Maryland General Assembly resulted in several significant changes to land use regulations controlled by Article 66B of the Annotated Code of the State of Maryland. New watershed-based planning requirements are among the more significant changes. Section 3.05 (a)(vi) of Article 66B of the Annotated Code of Maryland mandates that all Maryland counties and municipalities that exercise planning and zoning authority prepare and adopt a water resources element to their comprehensive plans. The legislation required the Water Resources Element (WRE) to be developed and adopted by all local governments on or before October 1, 2009. The legislation also provided for the granting of up to two six-month extensions of that deadline. Carroll County and all eight municipalities requested and were granted an extension of the deadline to April 1, 2010.

The purpose of the WRE is to ensure that future county and municipal comprehensive plans reflect the opportunities and limitations presented by local and regional water resources. WREs are intended to improve local jurisdictions' contribution to the protection of state land and water resources; to the protection of public health, safety and welfare; and to meet local and state smart growth policies.

Requirements

This WRE must address both water quantity and quality issues. Local jurisdictions must identify drinking water and other water resources needed to adequately address the needs of existing and future development proposed in the land use element of the plan. It also must identify suitable receiving waters (where stormwater and treated wastewater can be discharged) and land areas for NPS management and wastewater treatment. Pollutant loads from both stormwater and septics must be addressed. The WRE must indicate pollutant reductions, where needed, from both existing development and future growth. This legislation comes at a time when water quality and quantity planning is of utmost importance.

Models & Guidelines



The *Models and Guidelines* document was prepared by the Maryland Departments of Planning (MDP), Environment (MDE), and Natural Resources (DNR). Its purposes are to help local governments prepare the WRE in a manner that will not only meet the requirements of the law but will strengthen their planning efforts by ensuring that water resources will be adequate to support smart growth while meeting local economic, environmental and land use goals. The guidance document suggests assessments and methodologies to be used in completing the WRE plan document. Plans submitted to the State

for review will be evaluated based on the inclusion of these components.

To achieve these purposes, planning must reflect the broader geographical context of watersheds. Successful WREs will be based on this perspective. The common goals for Maryland's water resources are reflected in the Chesapeake Bay Tributary Strategies, federal and state regulatory programs and smart growth policies.

Process

Carroll County and its municipalities are working collaboratively to develop one unified WRE document that can be adopted by all of Carroll County's jurisdictions to satisfy the requirements of HB 1141.

Since this process involved substantial technical information, a WRE Guidance Team was formed to discuss issues as they arise. This team included representatives of County staff, each municipality, the Carroll County Health Department, and the three relevant State agencies – MDE, MDP, and DNR. The Carroll County Water Resources Coordination Council served as the local body for guiding, directing, and reviewing the assessments and development of the plan document. All meetings of this group were open to the public. A WRE Work Group, consisting of the County and municipal representatives from the Water Resources Coordination Council (WRCC), met periodically to work through more specific issues related to data collection and technical background assessments.

The ***Water Resources Coordination Council*** (WRCC) was formed in March 2007 to serve as the lead intergovernmental agency for water resource planning, development, and protection in Carroll County. The Council consists of representatives from each of the municipalities, the County, and the Carroll County Health Department.

The WRE Work Group followed the Models and Guidelines (No. 26) developed jointly between MDE, MDP, and DNR for the development of this plan element.

The Group collected data on the current capacity of each community municipal water and wastewater system. This information helped identify additional capacity needs based on current and planned future demand/growth. If limitations were identified that could not be overcome, reductions in future demand were considered. The methodology and format for collecting this data were based on MDE's guidance documents for Water Supply Capacity Management Plans (2006) and Wastewater Capacity Management Plans (2006).

The County hired a consultant, Malcolm Pirnie, to provide technical assistance with several of the background assessments needed to inform decisions and develop strategies to be included in a plan element. The consultant provided a number of assessments/evaluations, including.

- Updating the 1988 water study completed by RE Wright
- Completing a water balance assessment for each 8-digit watershed (water available for future consumption, from both groundwater and surface water sources)
- Assessing overall limitations of wastewater

- Evaluating options/alternatives for individual water and wastewater municipal systems as well as countywide
- Identifying strategies to address water and wastewater issues

Technical reports developed by Malcolm Pirnie and summarized in this plan document as needed and appropriate include the following:

- *Carroll County Water Demands and Availability, July 30, 2009*
- *Carroll County Wastewater Limitations, May 29, 2009*
- *Carroll County Alternatives Evaluation, September 28, 2009*

The nonpoint source (NPS) component of this plan addresses both stormwater and individual private septic systems. This component was completed by County staff. MDP and MDE provided a loading analysis model, the results of which are expected to be acceptable to the State. Recommended strategies needed to address the NPS contribution to or impact on impaired waters (303d), Total Maximum Daily Loads (TMDLs), Tier II waters (high quality), and Tributary Strategies, among other things.

The County participated in the Center for Watershed Protection's Builders for the Bay Better Site Design Standards assessment and consensus document. This project provided the stormwater programmatic assessment required in the WRE guidance document. The consensus document primarily provided recommendations for addressing impervious surfaces and reducing runoff. Many of the recommendations were implemented prior to completion of the draft WRE. Others will be incorporated into the County's comprehensive planning process.

Upon completion of these assessments, County and municipal staff worked together to draft the actual WRE plan document. The background assessments and resulting strategies for the WRE were based on ***current conditions*** – adopted plans, policies, and regulations in place at the time the assessments were completed and the plan was drafted. The assessments and strategies do not consider proposals or drafts ***not*** adopted at the time of the drafting of the WRE. However, recommendations to address or support some of the issues surrounding other proposals may be included in the strategies as appropriate.

2 Vision

Vision

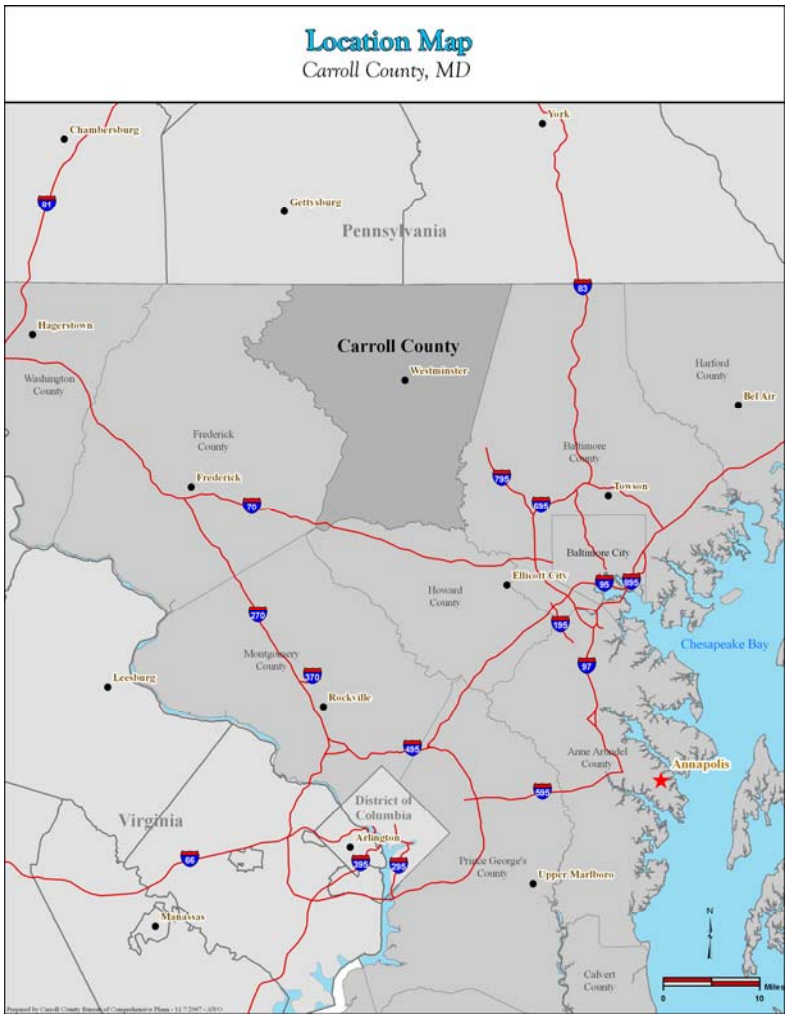
The land use and planned growth for the county and individual municipalities are balanced with and complementary to the water resources available in the county and the collective ability of all nine jurisdictions to maintain and protect water quality. Provision of public water supply and wastewater services continues to be concentrated in designated growth areas while protecting and preserving rural lands for continued agricultural use, open space, environmental protection, and recognition of the county's heritage.

Goals

- To restore water quality and protect it from pollution and encroachment
- To protect the habitat value of Carroll County's rivers, streams, and reservoirs
- To comply with applicable State and federal requirements related to water quality and quantity
- To maintain and protect adequate water supplies to serve current and planned population and development

3 Background

Eight municipalities reside within Carroll's borders – Hampstead, Manchester, Mount Airy, New Windsor, Sykesville, Taneytown, Union Bridge, and Westminster. All but Sykesville also own and operate their own water systems. All but Sykesville and Hampstead own and operate their own wastewater systems. The County provides public water and sewer service to Sykesville through the systems that serve the Freedom area. The County owns and operates the sewer system that serves Hampstead.



In 2004, Carroll County adopted revisions to seven major environmental regulations to strengthen their implementation and impact on water resource and environmental protection. The stormwater management regulations were included. A Water Resource Management Ordinance was also adopted.

In the past decade, water quality and quantity issues have had a tremendous influence on growth and development policies. In the early part of the decade, many private wells and public water supplies were impacted due to drought conditions. These conditions brought about many changes to State policies and local development activity.

Three of Carroll County's municipalities – Mount Airy, Westminster, and Taneytown – entered into consent agreements with MDE to develop additional water supplies. Most of the county's public water supply systems have faced challenges of some sort conforming to State policies related to water quantity, which results in challenges to achieving Smart Growth.

Location

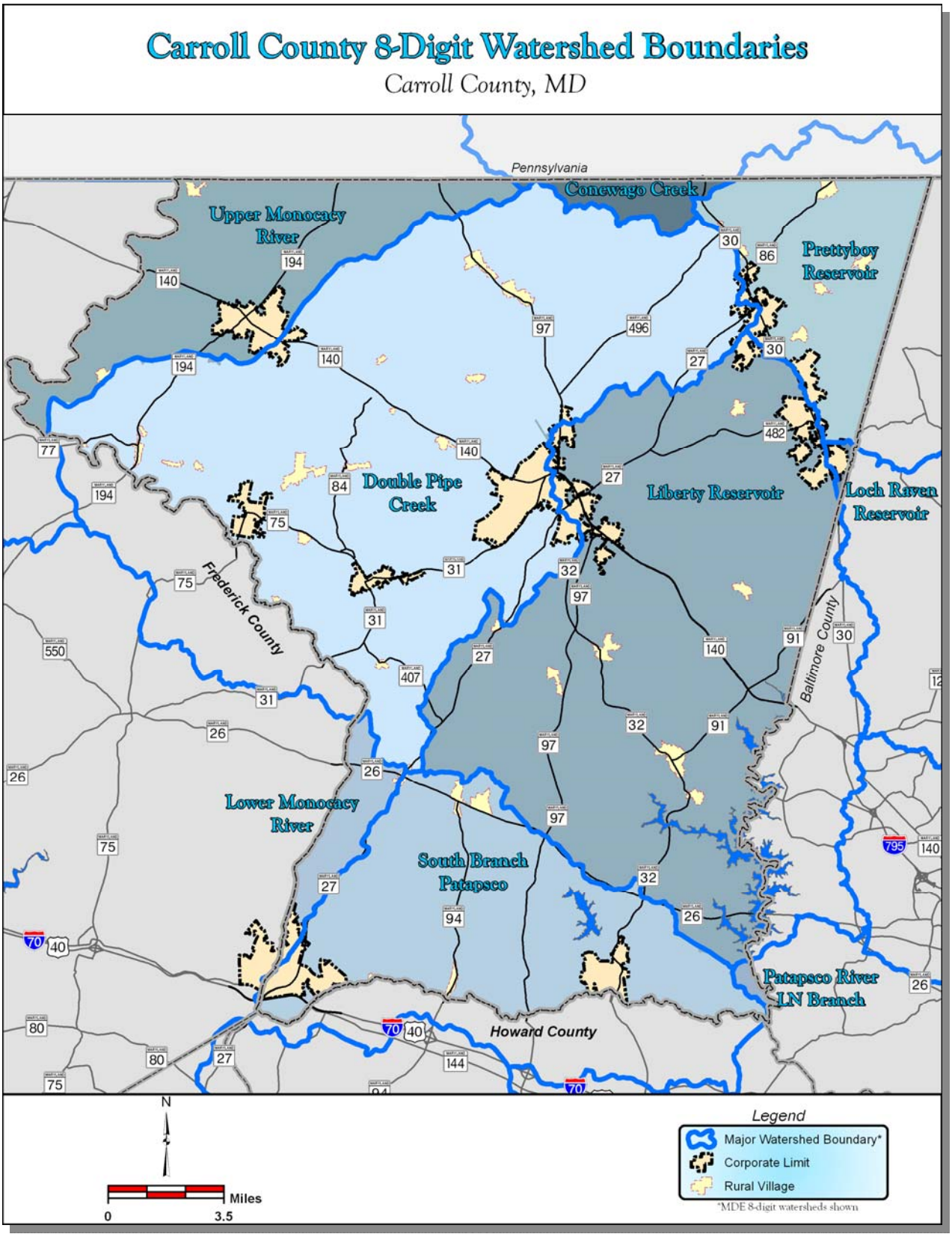
Carroll County is located in the Piedmont region of north-central Maryland, between Baltimore and Frederick Counties. Parr's Ridge, which runs roughly from Manchester to Mount Airy, diagonally divides Carroll County into two major drainage basins. Streams to the north and west drain into the Monocacy River and eventually the Potomac River. Streams to the south and east flow into the Patapsco and Gunpowder Rivers. The county is 289,678 acres in total size, or 452.6 square miles. See the "Location Map" for Carroll's location respective to the rest of the Baltimore metropolitan area.

Watersheds

At the most basic level a watershed is the total land area that drains surface water and/or groundwater into a common body of water. Because of the nature of gravity, watersheds (also known as drainage or catchment basins) are confined by their surrounding topography.

Water, both above and below ground, originates at the highest point and drains downhill to the lowest ground area. As one waterbody flows into another, the flows gradually increase in size. A small spring turns into a run and progressively merges with ever-larger creeks, streams, and rivers. Ultimately, these flows collect into the largest water bodies, such as the Chesapeake Bay, and eventually feed into the world's oceans.

Watersheds can be defined at many different scales. The United States Geological Survey (USGS) developed a ranked system for mapping all of the nation's watersheds. They are grouped from largest to smallest. These areas are called Hydrologic Units and are assigned a number known as a Hydrologic Unit Code (HUC) based on size. Currently, the most detailed level of nationwide drainage basin mapping available from the USGS is the 8-digit HUC. This plan will utilize this system of 8-digit watersheds.



The political boundary of Carroll County includes lands which drain to nine different 8-digit watersheds. Two of these watersheds, Double Pipe Creek and Liberty Reservoir, cover most of Carroll County. Parr's Ridge, which is approximately followed by MD 27, is the east-west boundary between these two drainage basins. Their southern boundaries approximately follow MD 26. To the north, MD 30 roughly follows these watersheds' upper reaches.

The map titled "MDE 8-Digit Watershed Boundaries in Carroll County" depicts the nine watersheds found wholly or partially in Carroll County. Water throughout the county eventually flows to the Chesapeake Bay.

Following is a summary of the nine watersheds of Carroll County. The watersheds are listed from west to east beginning at the northernmost edge of the County. The information came from the MD DNR webpage titled "Maryland's Surf Your Watershed," which can be found at http://www.dnr.state.md.us/watersheds/surf/index.html.

Upper Monocacy River

This watershed is located in the northwestern-most portion of Carroll County and contains most of the City of Taneytown. The Monocacy River forms the border with Frederick County in this portion of Carroll and ultimately drains into the Potomac River. The majority of the 156,327 acres that bound this watershed are located in Frederick County. Roughly 57 percent of this watershed is used for agricultural purposes, such as dairy and cropland, and is the predominant land use.

Conewago Creek

This watershed abuts the Mason-Dixon Line in east central Carroll County, extending just east of MD 30 north of the village of Melrose. This watershed drains into the Susquehanna River. The vast majority of this watershed's lands are located in south central Pennsylvania, primarily York and Adams Counties. Only 3,431 acres of the watershed are within Carroll County. Approximately 55 percent of that land area is used for agriculture, and the remaining 30 percent is considered forested land.

Prettyboy Reservoir

This watershed is found in the northeast corner of Carroll County. It contains significant portions of both Manchester and Hampstead. It is considered to be part of the Upper Western Shore Tributary basin and drains to the Gunpowder River. The 44,903-acre land area of this watershed is predominantly divided between Carroll and Baltimore Counties, with a smaller portion in York County. About 45 percent of the watershed is located in Carroll County. Just over 10 percent of the total watershed area is classified as urbanized. Approximately 50 percent is devoted to agricultural purposes. Roughly 36 percent of the watershed retains its forest cover.

Double Pipe Creek

This watershed occupies the largest portion of land area within Carroll County. This land drain to the Upper Potomac River Tributary Basin on their way to the Chesapeake Bay. Nearly all (105,390 acres, or 85%) of the watershed's 123,366 acres are found in Carroll County with a relatively small section in Frederick County. The watershed spans MD 27 between approximately MD 30 in the north and MD 26 to the south (Taylorsville area). It

extends from Manchester in the northeast to Detour in the west. This watershed includes portions of Taneytown, Manchester, Westminster and all of New Windsor and Union Bridge. More than 70 percent of the total acreage is devoted to farming pursuits. This watershed also contains the Little Pipe Creek Rural Legacy area. Significant urbanized areas account for more than 10 percent of the total land area. Approximately 15 percent of the watershed is forested.

Liberty Reservoir

This watershed is the second largest in land area within Carroll County. The total watershed contains 101,404 acres with the southeastern edge crossing into Baltimore County; 87,292 of those areas (83%) are located in Carroll. It is part of the larger Patapsco River - Back River Tributary drainage basin. It shares its western edge with Double Pipe Creek watershed. Its northeastern boundary begins in Manchester near the junction of MD 27 and MD 30. It extends south to the Eldersburg area. It runs west to Taylorsville, where it meets the Double Pipe Creek basin. This watershed contains portions of Manchester, Hampstead, and Westminster. It also contains the unincorporated areas of Finksburg and a portion of the Freedom Growth Area. The Liberty Reservoir watershed is among the most urbanized with nearly 20 percent of the land area developed. Nearly 50 percent of this basin is devoted to agricultural uses and includes the Upper Patapsco Rural Legacy area. The majority of the remaining land area of the watershed is forested.

Loch Raven Reservoir

The Carroll County portion of this watershed is the smallest land area of any of the County's nine watersheds. The watershed contains a total of 138,803 acres but only the westernmost tip (0.4%) crosses into Carroll County. This watershed is considered part of the Upper Western Shore Tributary drainage basin. This small section is entirely located within the Town of Hampstead. The western edge runs concurrent with the alignment of MD 30 at the southeastern corner of the community. Its northern edge roughly follows MD 88/Black Rock Road. The Carroll County portion of this watershed is considered urbanized. Within the total watershed area, slightly more than 40 percent is used for agricultural purposes. Roughly 40 percent is forested areas. The remainder is considered urbanized.

Lower Monocacy River

This watershed is found in the southwestern corner of Carroll County and also drains into the Potomac River via the Upper Potomac Tributary drainage basin. The Carroll County portion of this basin is a small wedge (3% of the watershed) along the eastern edge of the

watershed. Its northern limits extend just north of MD 26 where it abuts the Double Pipe Creek watershed. Its eastern boundary nearly matches the course of MD 27 to its intersection with Buffalo Road in Mount Airy. The Carroll County – Frederick County border defines the western limits of the Carroll County portion. The watershed contains a portion of the Town of Mount Airy. The watershed covers a total of 194,397 acres. The remaining lands are classified as forested.

South Branch Patapsco River

This watershed spans most of the southern portions of Carroll County that lie south of MD 26. It is bounded to the west by the Lower Monocacy watershed along the MD 27 corridor and by the Liberty Reservoir watershed to the north. The South Branch watershed is part of the larger Patapsco River – Back River drainage basin. This watershed contains the largest portion of the Carroll County section of Mount Airy, the entire Town of Sykesville, and a portion of the Freedom Growth Area. The Piney Run Reservoir is located in the eastern section of the watershed. The planned Gillis Falls Reservoir will also be located in this watershed. The southern limits of this watershed cross over the main stem of the South Branch of the Patapsco River into northern Howard County. This watershed contains 54,616 acres of land; 70 percent of the watershed lies within Carroll. Approximately 10 percent is urbanized and about 50 percent devoted to agriculture. Slightly more than 30 percent of the watershed is forested.

Lower North Branch Patapsco River

This watershed is found at the extreme southeastern corner of Carroll County. Only a very small portion (555 acres, or 1%) of the watershed's 75,513 acres lies within the county's borders. The majority of the Carroll County portion of the watershed lies within Patapsco Valley State Park. More than 42 percent of the total land area is urbanized, and another 40 percent is forested. Roughly 12 percent of the basin's lands are in agricultural use.

It should be noted that the Town of Mount Airy is divided between two counties, Frederick and Carroll. Although this WRE is based on Carroll County, the Town of Mount Airy needs to be reported as a whole. The boundaries need to consider the entire limits, and, therefore, need to include the applicable Frederick County watersheds. In particular, the following Frederick County watersheds are within the Town of Mount Airy: Upper Bush Creek, Lower Linganore Creek, and Upper Linganore Creek. For the purposes of Mount Airy's requirements, additional information regarding these watersheds is found in the Frederick County WRE.

Designated Growth Areas (DGA)

Designated Growth Areas are the smaller geographic areas of the county where the majority of Carroll County's growth is planned to occur. Community comprehensive plans are prepared for these areas that are focused on these areas and evaluate land uses at a more local scale. Carroll's eight municipalities are at the heart of the DGAs, with the exception of Sykesville, which lies along the southern edge of the Freedom area. Additional land surrounding most of the municipalities is identified and planned for future annexation into the municipality to accommodate and serve planned growth. The limit to which a municipality plans to annex land in the future is referred to as the GAB. In most cases, the

Freedom Growth Area Boundary (GAB) extends well beyond what Sykesville will ever annex. The Finksburg area is not considered a DGA. The municipal Priority Funding Areas (PFAs) can be found within these boundaries. These are the areas for which municipal public water and sewer services are provided. Each of these communities develops an individual community comprehensive plan.

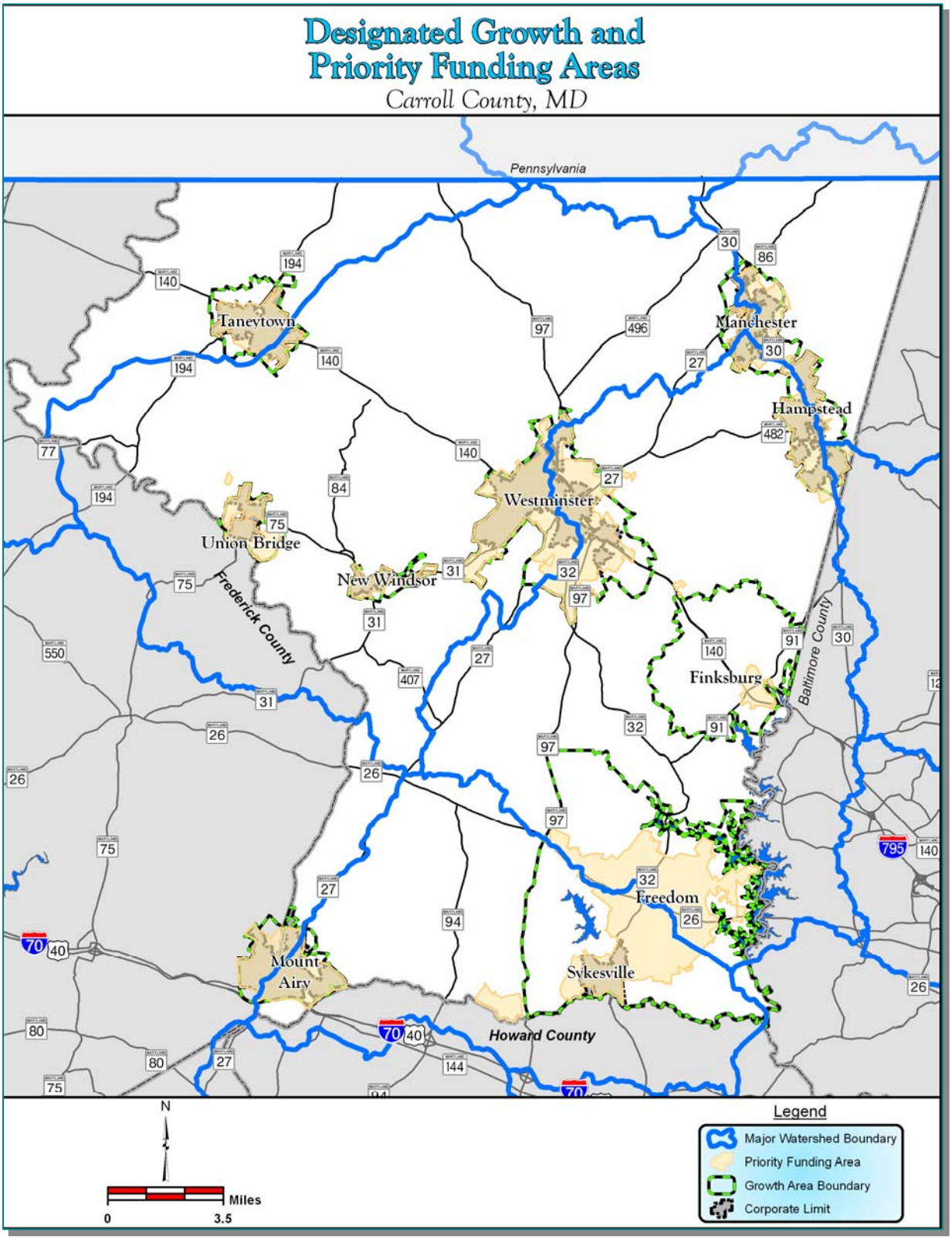
Carroll County's DGAs and their associated GAB are shown on the map titled "Designated Growth Areas and Priority Funding Areas."

Priority Funding Areas (PFAs)

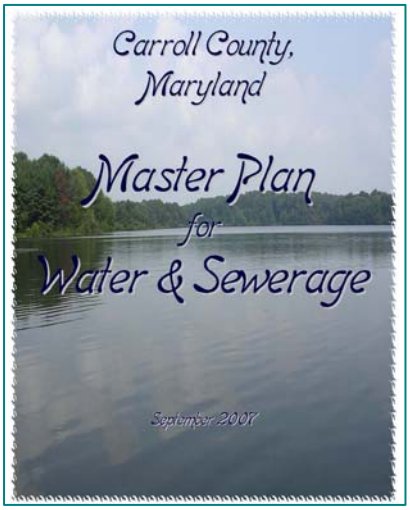
The PFA requirements were adopted in 1997 as part of a larger group of State Smart Growth implementation measures and became effective on October 1, 1998. The intent is to ensure that State funding and resources are directed to the most appropriate areas for growth and development. The measure established criteria to define PFA boundaries. Locations that were already developed (such as existing towns or rural villages) and could grow further, via infill development and residential or business development within planned growth areas, were targeted.

To be designated as a PFA, a residential area needed to meet minimum density requirements, already be served (or planned to be served) by public water and sewer facilities, and land use designations and/or development plans must satisfy Smart Growth guidelines for minimum density. Other land uses such as employment, industrial, commercial/business, or mixed-use or transit-oriented developments may also be designated as a PFA as long as sewer service is (or will be) provided and these uses fall within DGAs. A PFA was originally designated for each of the municipalities or growth areas, eligible industrial areas, and the 35 rural villages in Carroll County.

The existing PFA boundaries for Carroll County are shown on the "Designated Growth and Priority Funding Areas" map.



Master Plan for Water and Sewerage



The Carroll County *Master Plan for Water & Sewerage* presents the goals for water and sewer planning for the entire county. Background information is provided for water and sewer planning and service in Carroll County and its municipalities, including legislative and policy decisions that have been made by local and state governments.

The *Master Plan for Water & Sewerage* is updated on a triennial basis. With the triennial updates, revisions are made to reflect changes that have occurred to various water and wastewater facilities or plans for improvement to these facilities around the county. Amendments to the plan are processed on a biannual basis – in the spring and fall each year.

Both the water and wastewater facilities are separated into service areas. Existing and planned facilities and associated infrastructure are detailed. In addition, the plan contains more specific information on the maintenance and operations of the public systems and associated infrastructure. Charts and maps illustrate where the specific water and sewer infrastructure is located, as well as the planned water service and sewer service areas. Information is included for specific privately and publicly owned systems. Carroll County has no combined stormwater sewer systems or overflows.

For more information and details regarding operations and management or specific improvements in design and capacity, please reference the *Carroll County Master Plan for Water & Sewerage*.

Water and Sewer Service Areas

The residents and businesses of Carroll County receive their water supplies and sewerage services from a mixture of public and private systems. The majority of Carroll's *land area* is served by individual wells and septic systems which are privately owned and operated. Most of these systems serve individual properties while some serve a small cluster of users. The majority of the County's *population* (89,545, or about 51%) is served by public water and/or sewerage systems. The current public systems serve Carroll's DGAs, in which the highest densities are located, including the County's eight municipalities. Four of the County's rural villages are also served by either public water and/or sewer systems, as a result of problems that occurred in those areas. These systems are not intended to accommodate additional growth beyond any infill potential.

Maryland law requires that operators of public water and/or sewerage systems develop and regularly update a master plan for these services. Operators are directed to describe not only the current systems components, capacities, service areas, and operational requirements, but also plans for future service needs, demands, and capacities. In Carroll

County this plan, the *Master Plan for Water & Sewerage*, is updated by the County in cooperation and consultation with each of the municipalities every three years and is amended semi-annually. While the local governing bodies develop and adopt the plan, it cannot be implemented until reviewed and approved by MDE.

Among the most important components of this master plan are the planned service areas for each system. These system service areas describe the location where the service exists or is planned to be provided. They also establish a prioritized sequence for expanding the systems. The master plan establishes four categories for providing either water or sewer system services:

Existing/Final Planning Service Areas

These are locations where community systems are either in place, under construction, or have completed final plans and/or engineering specifications for that portion of the system.

Priority Service Areas

These are areas that are likely to be served by community systems and are anticipated to begin construction within two years or where major system components will likely either be funded or completed as part of the current six-year capital improvement program (CIP) budgeting cycle. Priority areas also include areas which are immediately adjacent to existing facilities. It is a standard requirement that any development projects occurring in a Priority Service Area will be required to connect to the community system(s).

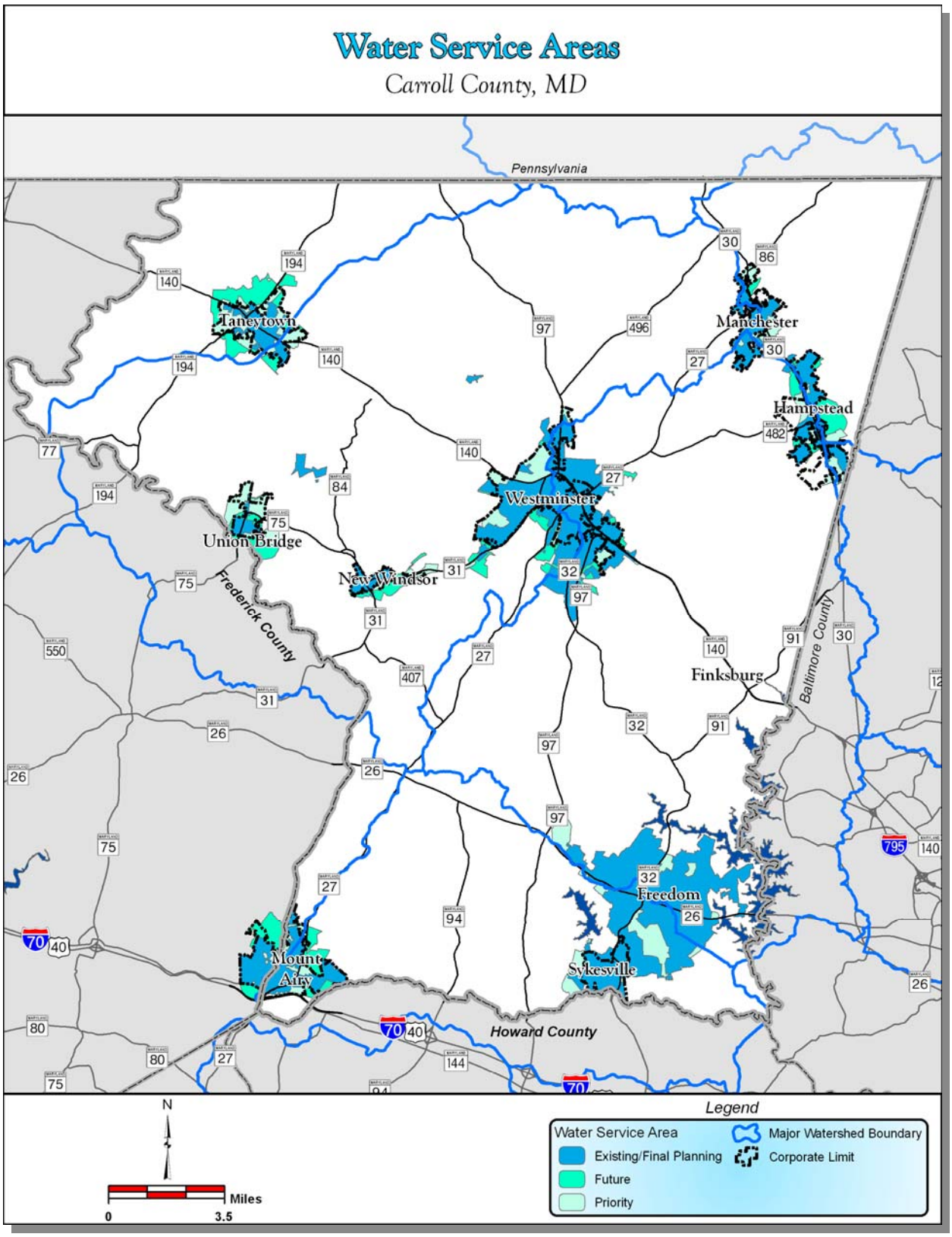
Future Service Areas

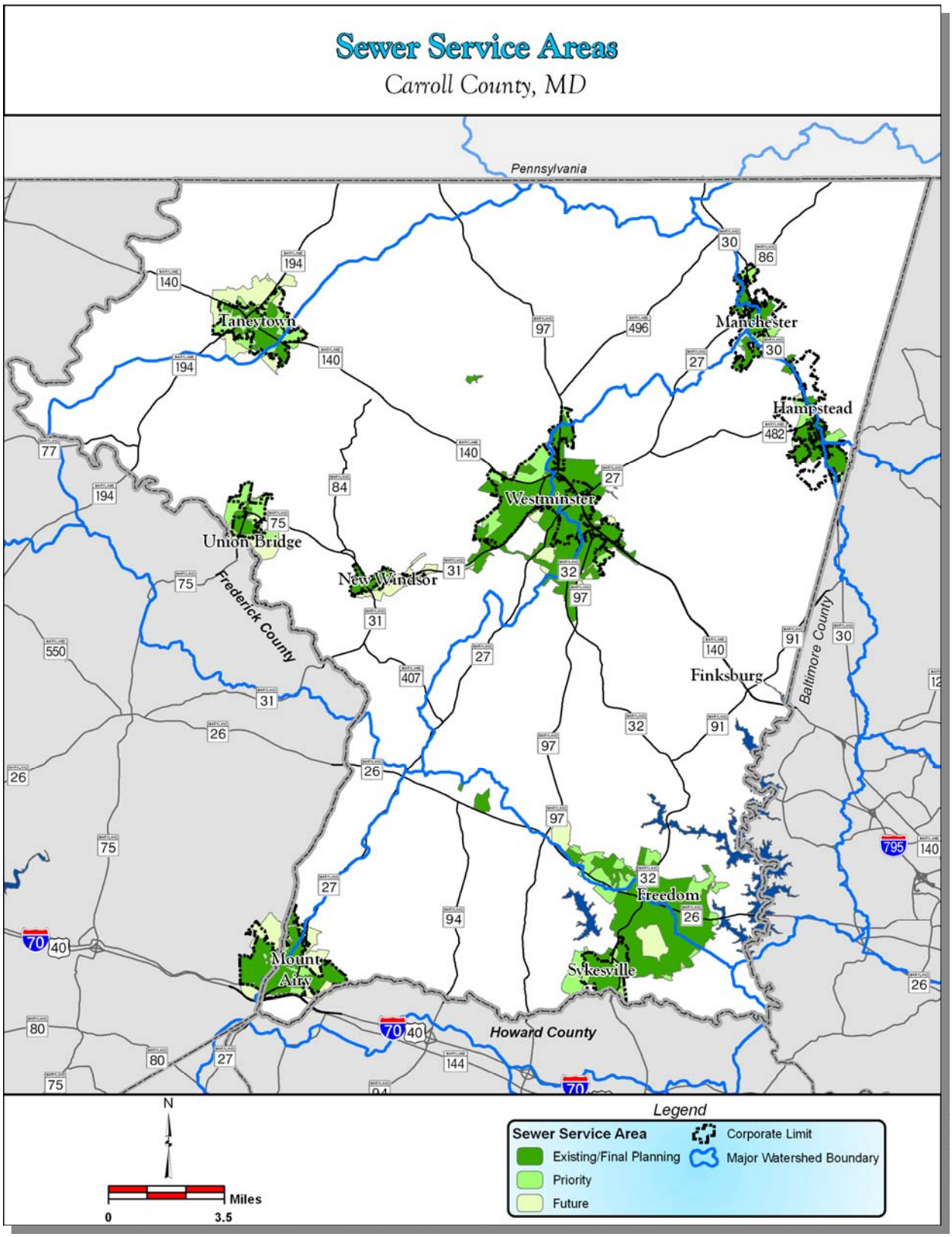
Future Service Areas are those regions where community systems are anticipated to expand and be served within a seven- to ten-year period. Location in the Future Service Area, however, does not guarantee that services will be provided within that time period or that the region will develop in any specified timeframe. Before a property can connect to the relevant community system(s), the master plan would need to be amended to place the property in at least the priority service area(s).

No Planned Service Areas

No Planned Service Areas are those locations which are not envisioned to be served by a public water and/or sewerage system within the current construction or CIP cycle or within a 10-year planning horizon.

This delineation process helps individual communities direct their growth and development patterns. By planning for needed expansion, system operators seek to balance the rates of residential growth with needed commercial, employment or other business development while ensuring that appropriate capacity will be available for public facilities such as schools, libraries, and other community services. These prioritized rankings are also intended to aid system operators in budgeting for and seeking funding needed to ensure that planned capacity and system needs are met on a timely basis.





Carroll County's existing public water and sewerage systems and their current planned service areas are shown on the maps titled "Water Service Areas" and "Sewer Service Areas." As depicted on these maps, planned service areas for public water do not always match planned service areas for public sewer.

The following tables detail the major public water and sewer systems within Carroll County. The data are organized by service area and relationship to the total area within a community's GAB. For each municipal system, the tables show the acreage for the planned service area within the GAB and outside it. The portion of the DGA that is in the No Planned Service Area is also reported by acreage. These acreages are summed for a countywide total.

2008 Existing and Planned Water Service Areas Acreage

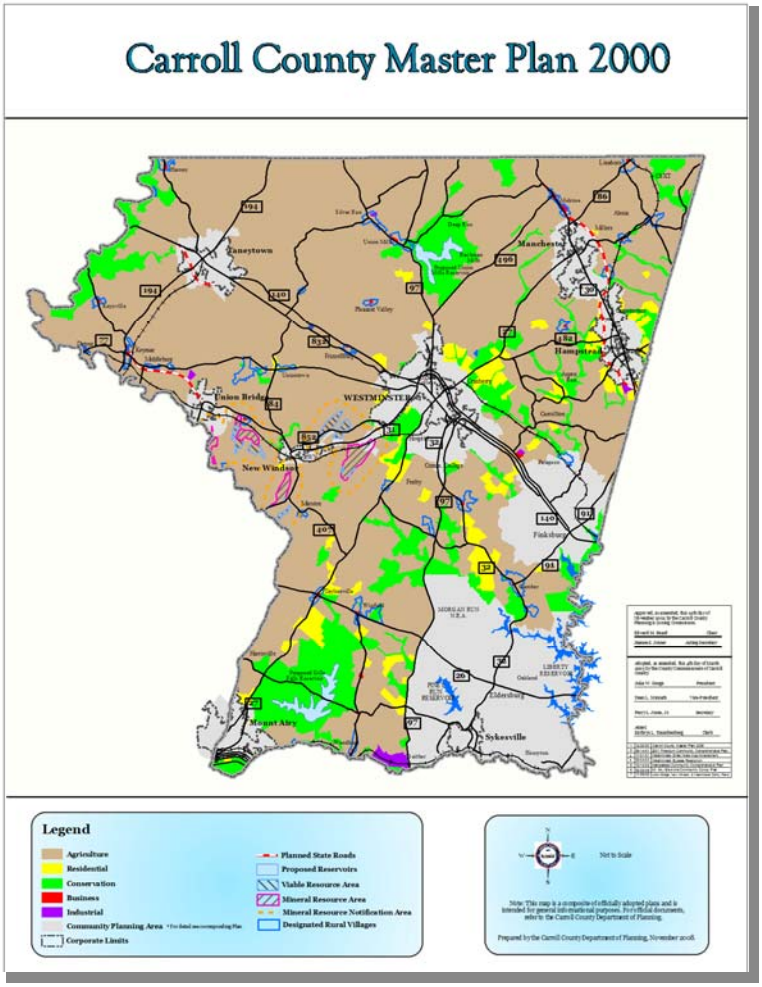
System Name	Service Area (by category) Inside GAB			Service Area Outside GAB	No Planned Service Inside GAB
	Existing/Final Service	Priority Service	Future Service		
Freedom/Sykesville	8,460.5	1,576.1	0.0	0.0	17,612.4
Hampstead	1,422.1	708.4	812.2	22.7	501.9
Manchester	1,042.8	361.3	94.1	0.0	1,982.8
Mount Airy	2,047.9	388.8	1,172.7	10.3	73.7
New Windsor	424.2	330.8	293.4	0.0	14.6
Taneytown	1,014.2	1,053.3	1,255.3	10.9	7.7
Union Bridge	265.3	712.6	452.3	0.0	212.2
Westminster	6,566.7	1,011.5	965.3	178.0	2,486.2
Total Acreage	*21,243.7*	*6,142.8*	*5,045.3*	*221.9*	*22,891.5*

2008 Existing and Planned Sewer Service Areas Acreage

System Name	Service Area (by category) Inside GAB			Service Area Outside GAB	No Planned Service Inside GAB
	Existing/Final Service	Priority Service	Future Service		
Freedom/Sykesville	5,517.6	1,979.2	731.3	0	19,421.0
Hampstead	557.7	1,252.5	0.0	22.7	1,634.4
Manchester	796.3	351.0	115.1	0	2,218.6
Mount Airy	2,047.9	388.8	1,172.7	10.3	73.6
New Windsor	342.8	73.9	525.0	6.8	25.0
Taneytown	1,019.7	1,066.0	1,238.0	18.8	14.6
Union Bridge	280.7	744.3	406.8	0	210.5
Westminster	6,759.0	916.2	504.0	111.8	2,784.3
Total Acreage	*17,321.7*	*6,771.9*	*4,692.9*	*170.4*	*26,382.0*

4 Comprehensive Plan Overview

The *2000 Carroll County Master Plan* represented the first review and revision of the direction set forth by the original *1964 Carroll County Master Plan*. The 2000 plan essentially reaffirmed support for the basic premises, concepts, and development patterns charted in the 1964 Plan. There were two overriding goals of the 1964 plan. The first was to focus growth in and around existing population centers, primarily the incorporated towns, where public water and sewer service is already available. The second goal was to preserve farmland.



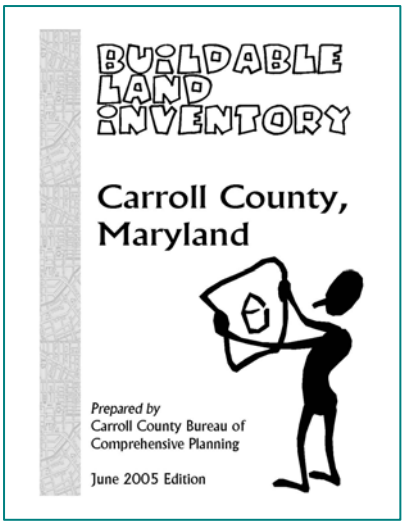
In the 2000 master plan, Carroll's eight municipalities and the Freedom area would continue to serve as the county's DGAs. These are the areas in which the majority of planned growth is focused. The rural character of the county is to be preserved through measures that protect our natural and cultural resources, minimize residential sprawl, and save farmland. The County would also continue to pursue the long-standing goal of preserving 100,000 acres of farmland. Employment growth and provision of adequate public facilities are also priorities. The implementation of the concurrency management program came about through the 2000 master plan process.

5 Existing Planned Growth

This section presents growth estimates for future residential, commercial, and industrial development that is based on the land use designations identified in the county's community comprehensive plans and countywide comprehensive plan as currently adopted. The tables provided report additional residential growth in *lots*. Additional commercial and industrial growth is reported in acres of *land*.

Buildable Land Inventory

Methodology for calculating future growth is defined in the *Carroll County Buildable Land Inventory Report*. The buildable land inventory (BLI) is an inventory of potential additional residential lot yield that could result from unimproved lots and lots with further subdivision potential. Various factors influencing residential lot yield were considered, such as easements, ownership, certain environmental features, etc. Each individual parcel that is designated Residential, Agriculture, or Conservation was calculated based on its residential development potential. Acreage of land zoned for commercial or industrial uses was included in the report, but an analysis of buildable acreage was not.



A subsequent analysis identified land designated for business or industrial use. Buildable acreage for each parcel was estimated and calculated. Various constraints were factored in to derive a net amount of land that is considered developable (i.e., buildable). Some of the factors included size of the parcel, location of existing development on the parcel, availability of public water and sewer service, streams, wetlands, and floodplains.

Population Projections

Annual population projections produced by the Carroll County Planning Department are primarily derived from number of households. The number of use and occupancy (U&O) permits issued each year is used to determine population growth. Over the last decade, the County has experienced periods of both rapid growth and declines in development activity. Because of this inconsistency, a growth rate (.986%) was determined by examining the last eight years in total (instead of the typical last 5-year period) for the County's Round 7B submittal to the Baltimore Metropolitan Council in January 2009.

Based on current land use designations in the county, and an average household size of 2.79 persons, the entire county will grow to a total population of nearly 258,200 once all land is fully developed (i.e., at buildout). Using the average number of U&Os issued over the last 8 years, it was determined that the County would add approximately 13,700 additional households, or roughly 685 units per year, between 2010 and 2030. The table below shows the projected population for 2030 and the projected year the county would reach build out under current land use designations. At this rate of growth, the county would reach a buildout population of 258,187 around 2060.

Carroll County Population Projections

	2010	2030	Buildout (2060)
Population	175,520	207,317	258,187
Households*	61,594	76,148	95,315
PPH*	2.79	2.67	2.65

Source: Carroll County Department of Planning (Round 7B submittal to BMC), January 2009
* excludes group quarters

The BLI data were used to estimate development capacity of each Census Block Group, essentially a smaller subdivision of Census Tracts and Election Districts. The number of future lots was determined by adding the number of existing lots to the number of potential lots. Under current conditions, population and household projections for Carroll County (Round 7B) show a number of Block Groups throughout the county reaching build out by 2030, some as early as 2015 assuming the 685 units per year is achieved. Once the number of potential lots was reached in a determined area, the growth rate was no longer applied and the population and household numbers remained static. If more development potential existed, the applicable growth rate continued to be applied.

Within Each Watershed

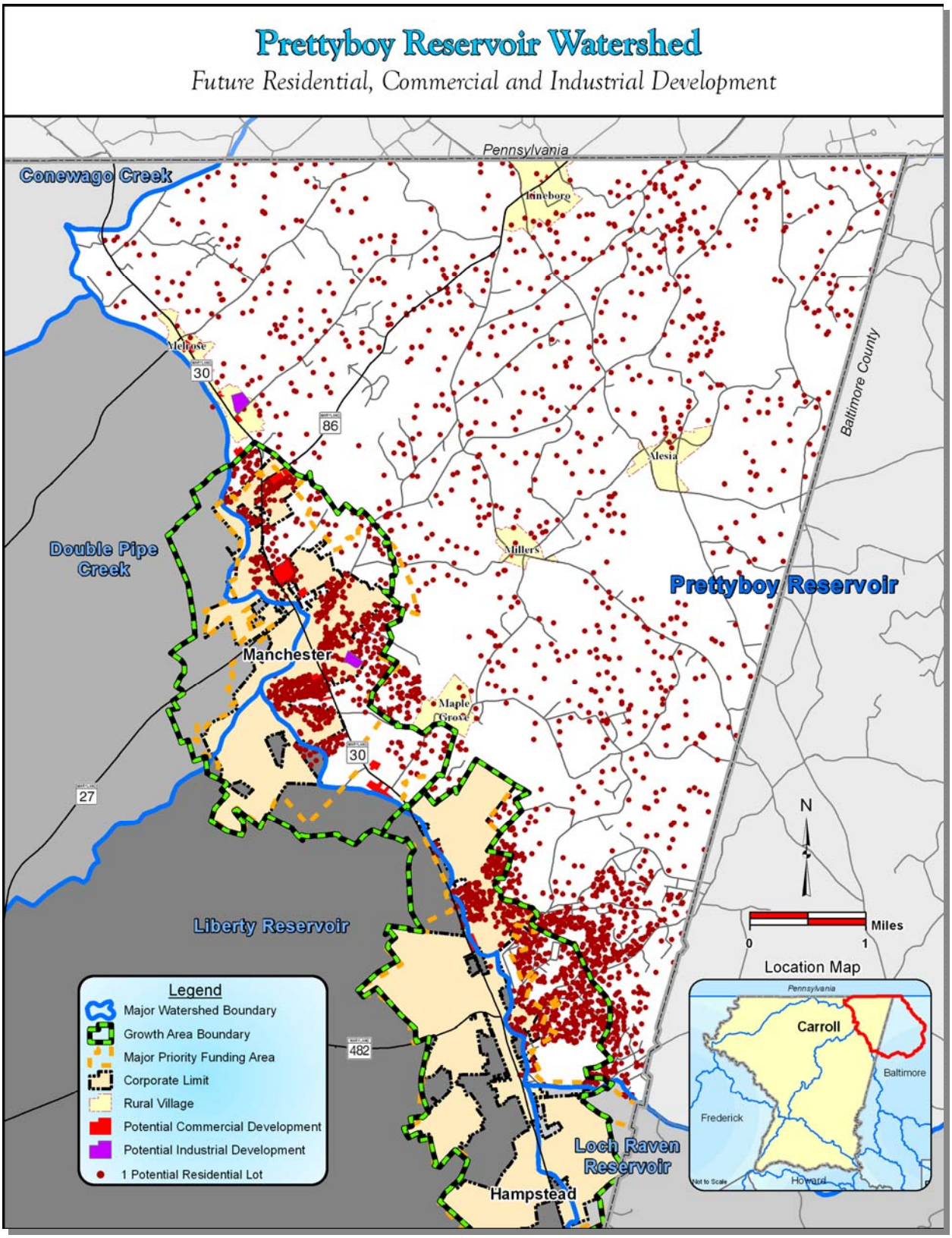
The following table provides estimated future residential, commercial, and industrial development within the county, broken down by watershed. The Liberty Reservoir and Double Pipe Creek watersheds represent the majority of the county's land area. Combined, therefore, it is not surprising that they account for almost two-thirds of the total number of additional residential lots. The same watersheds account for just over half of the developable acreage planned for commercial development. For industrial development, the Liberty Reservoir alone contains nearly 40 percent of all the developable industrial land in the county. Countywide, an additional 34,354 potential residential units are estimated.

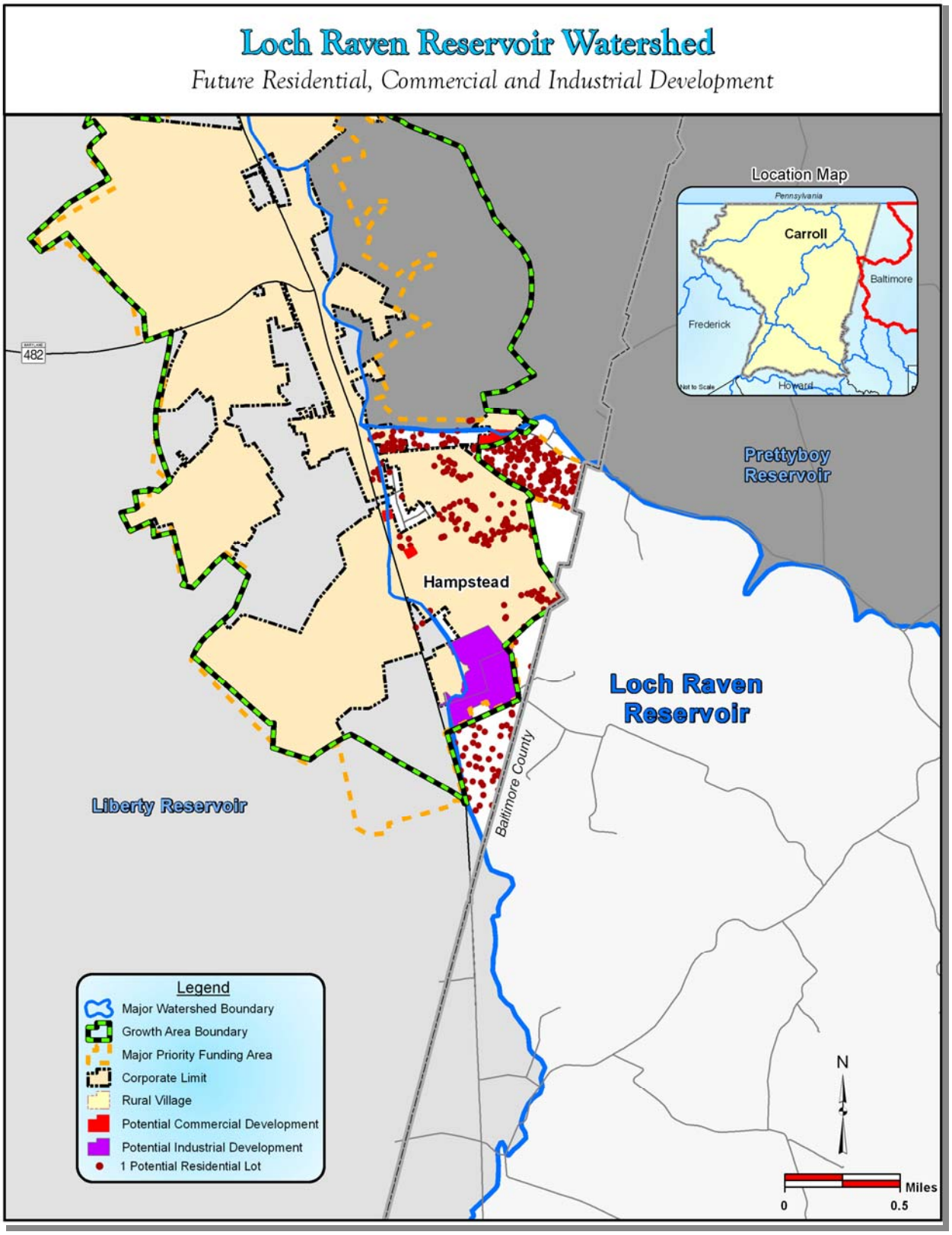
Planned Additional Residential, Commercial, and Industrial Development for each Watershed

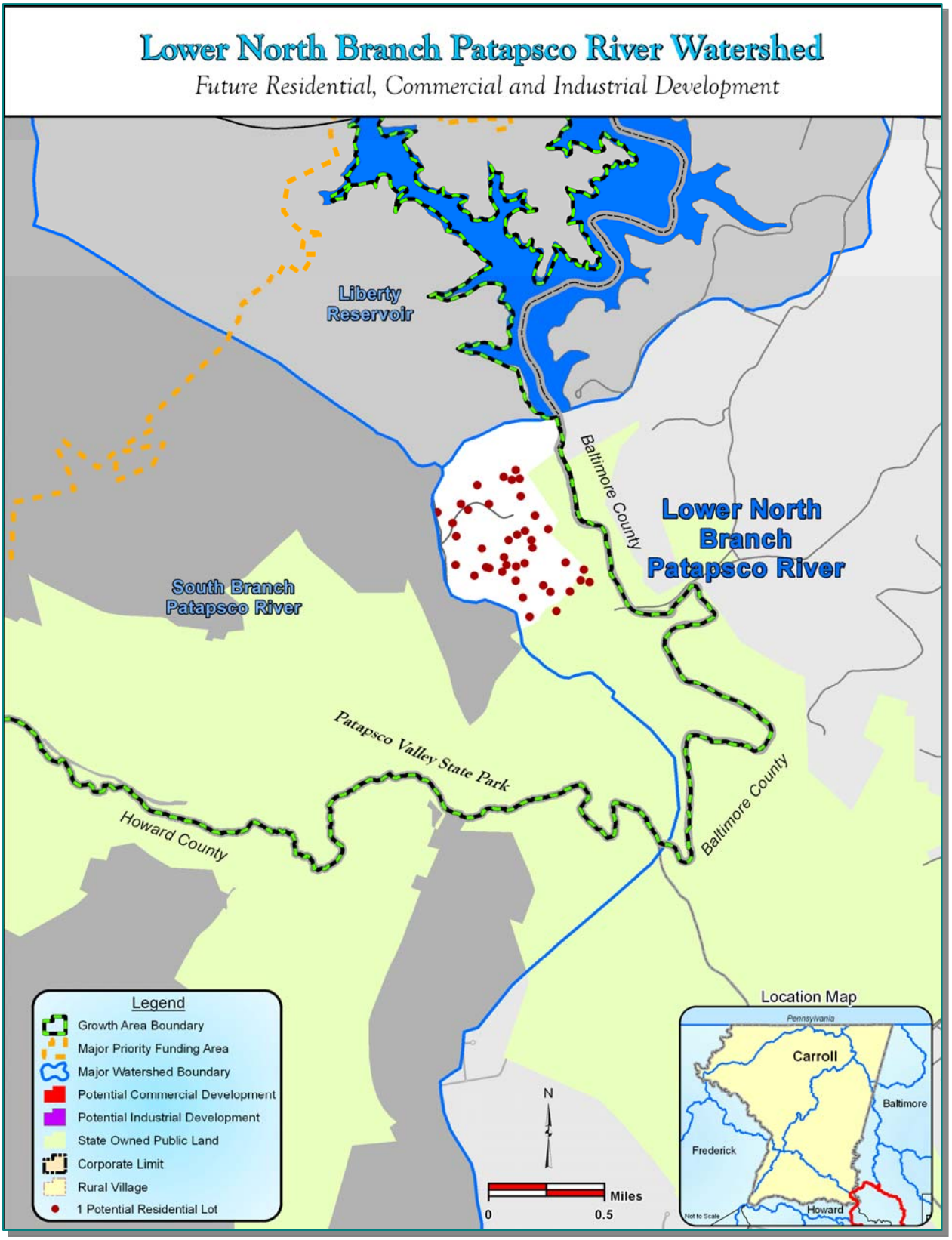
Watershed	Additional Residential Units (lots)	Developable Commercial Land (acres)	Developable Industrial Land (acres)
Prettyboy Reservoir	3,045	61	19
Loch Raven Reservoir	383	7	54
Lower North Branch Patapsco River	40	0	0
Liberty Reservoir	10,895	102	1,125
South Branch Patapsco River	5,172	68	640
Lower Monocacy River	372	13	0
Double Pipe Creek	11,214	118	589
Upper Monocacy River	3,057	58	483
Conewago Creek	176	0	0
County Total	*34,354*	*427*	*2,910*

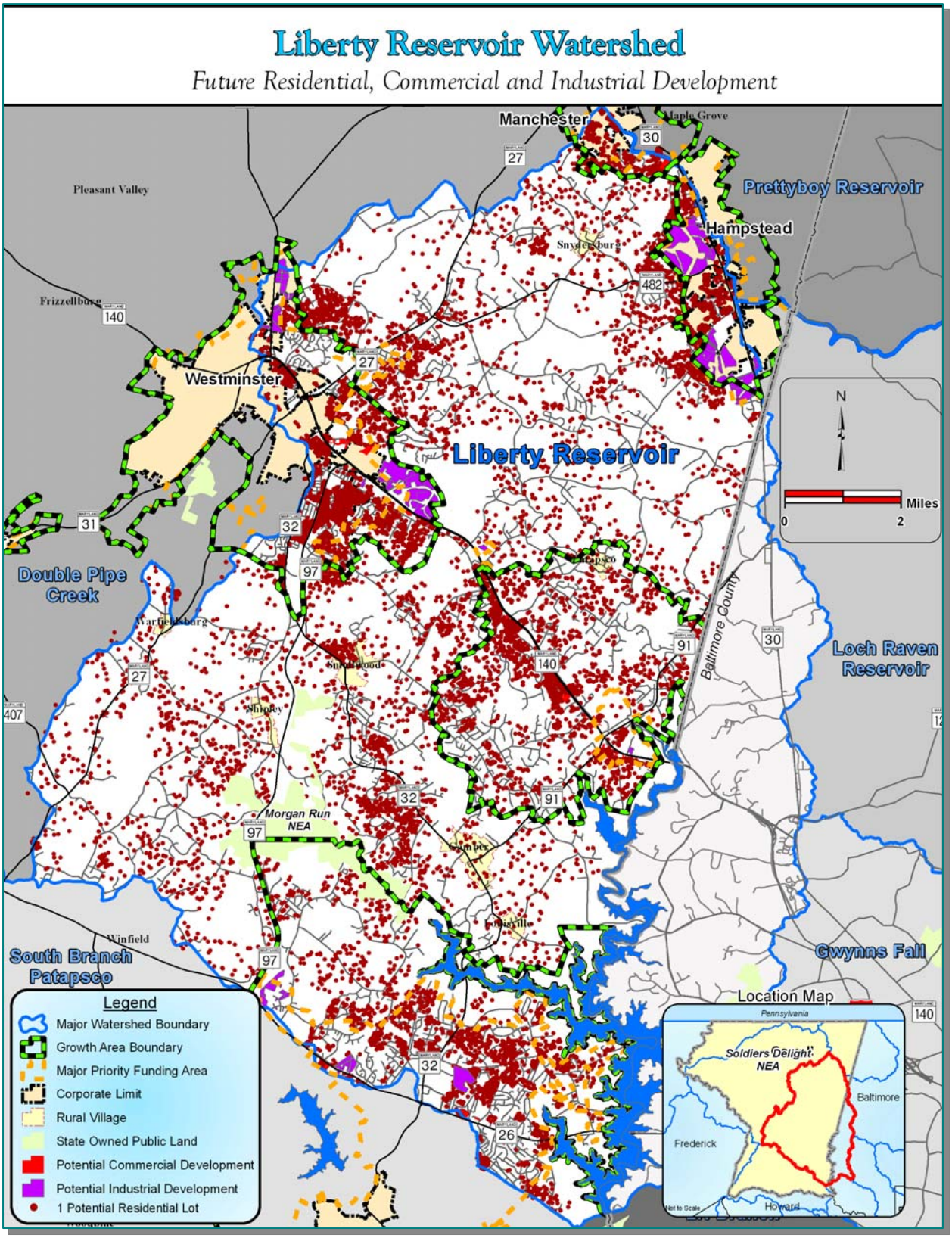
Source: Carroll County Department of Planning, March 2009

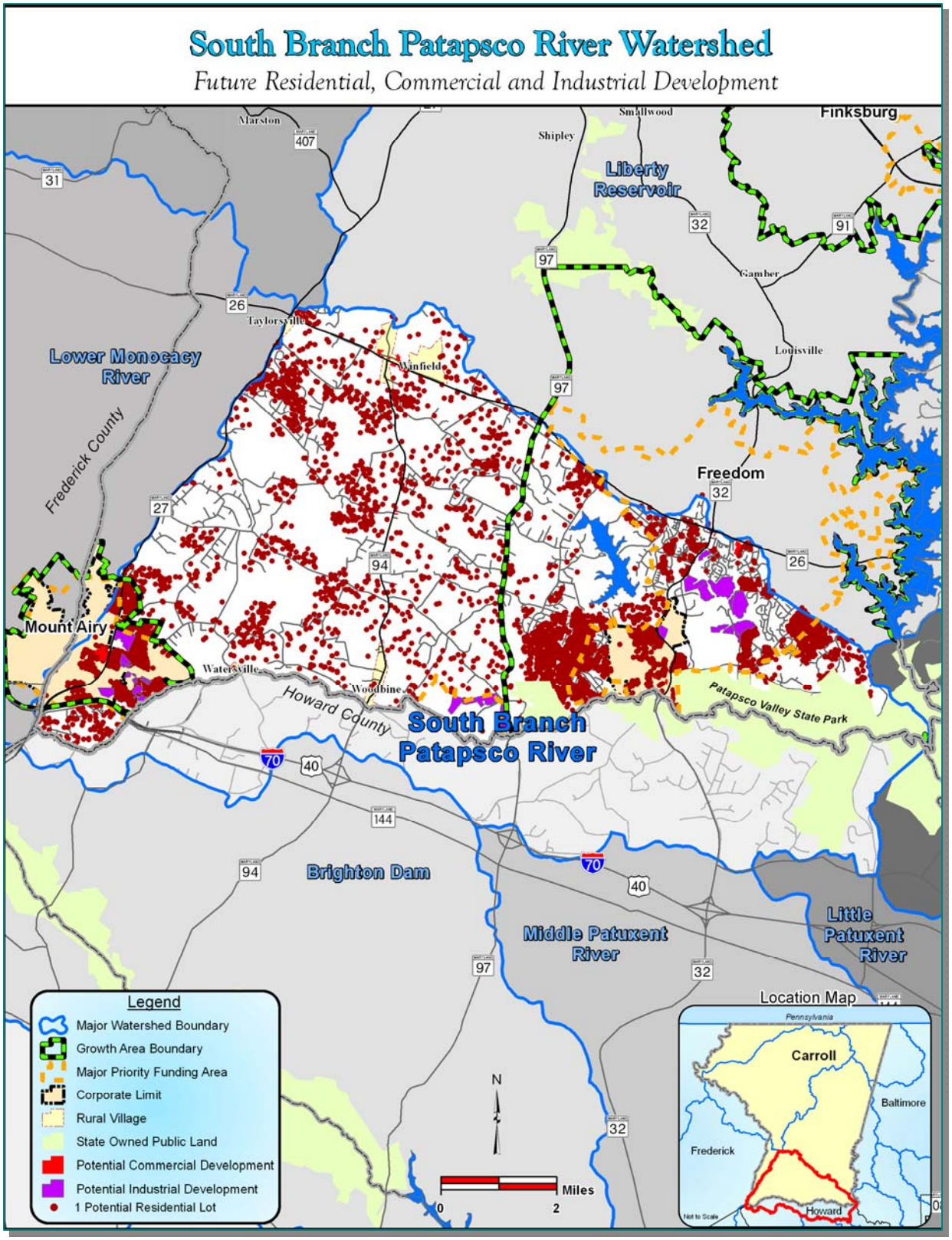
The following nine maps show potential additional residential lots and developable commercial and industrial land based on current land use plans. Each map provides this information within the confines of one of the nine watersheds that comprise Carroll County. As can be seen on the maps, much of the planned growth is concentrated within the planned growth areas and municipalities. However, substantial growth, particularly new residential units, would still occur outside these planned growth areas.

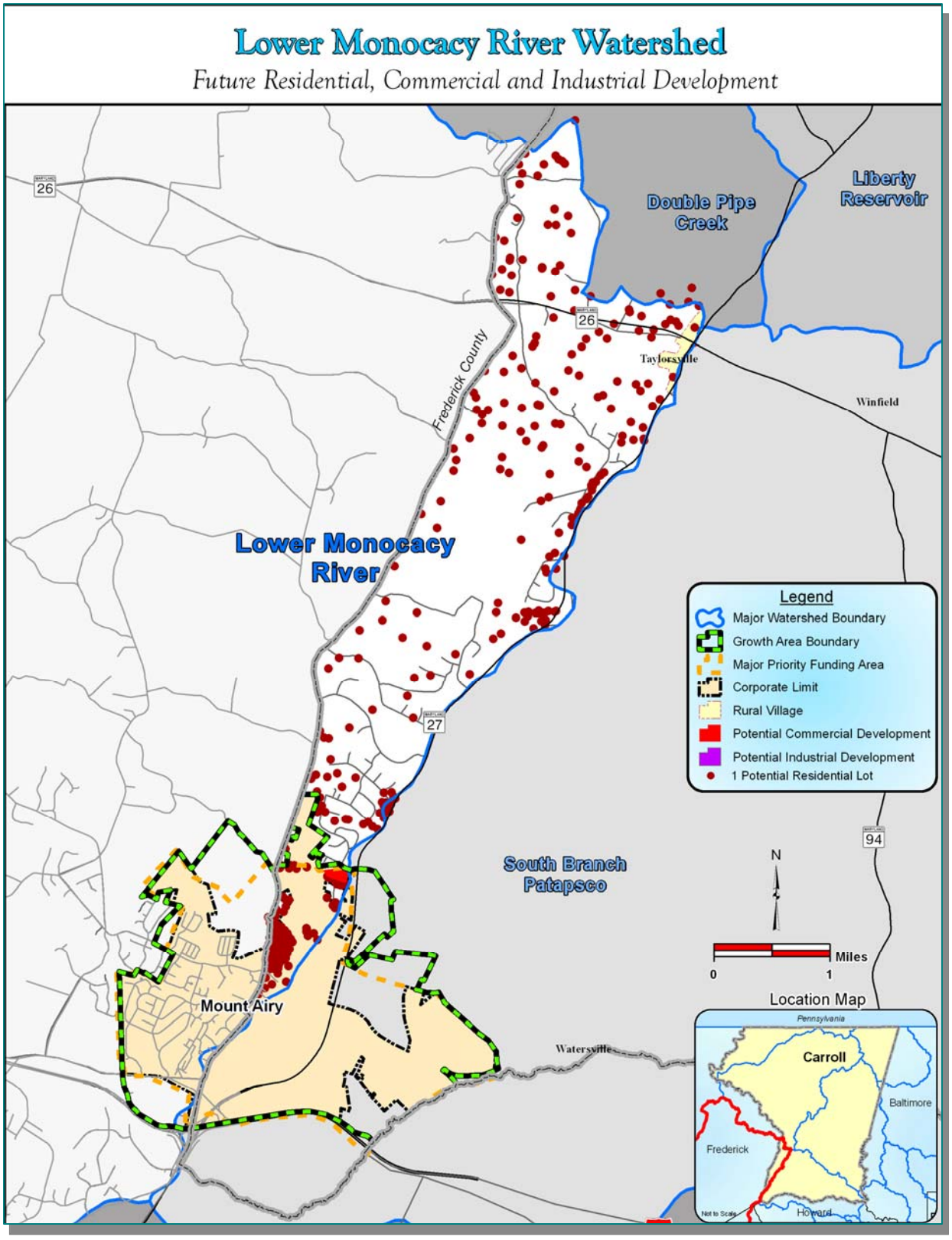


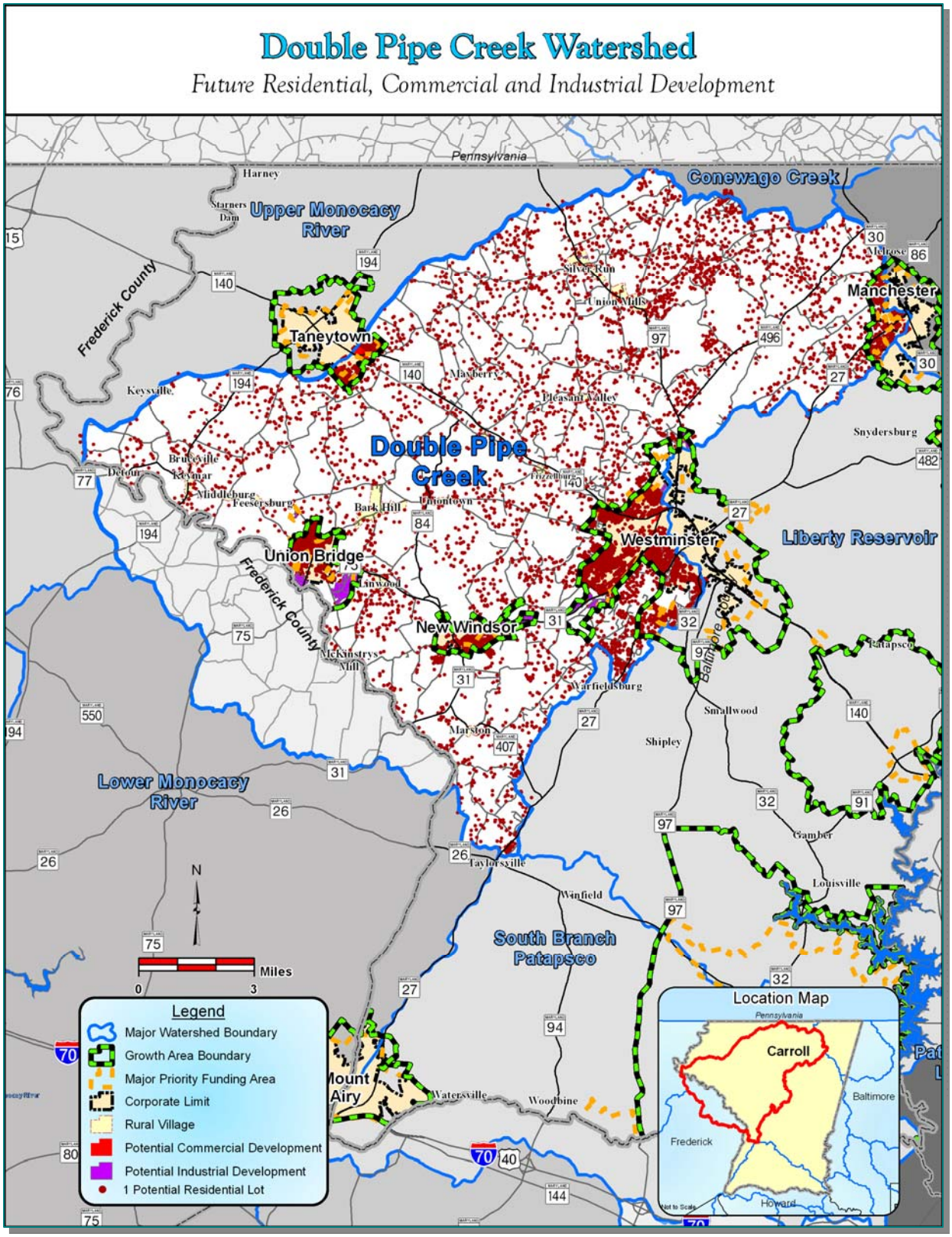


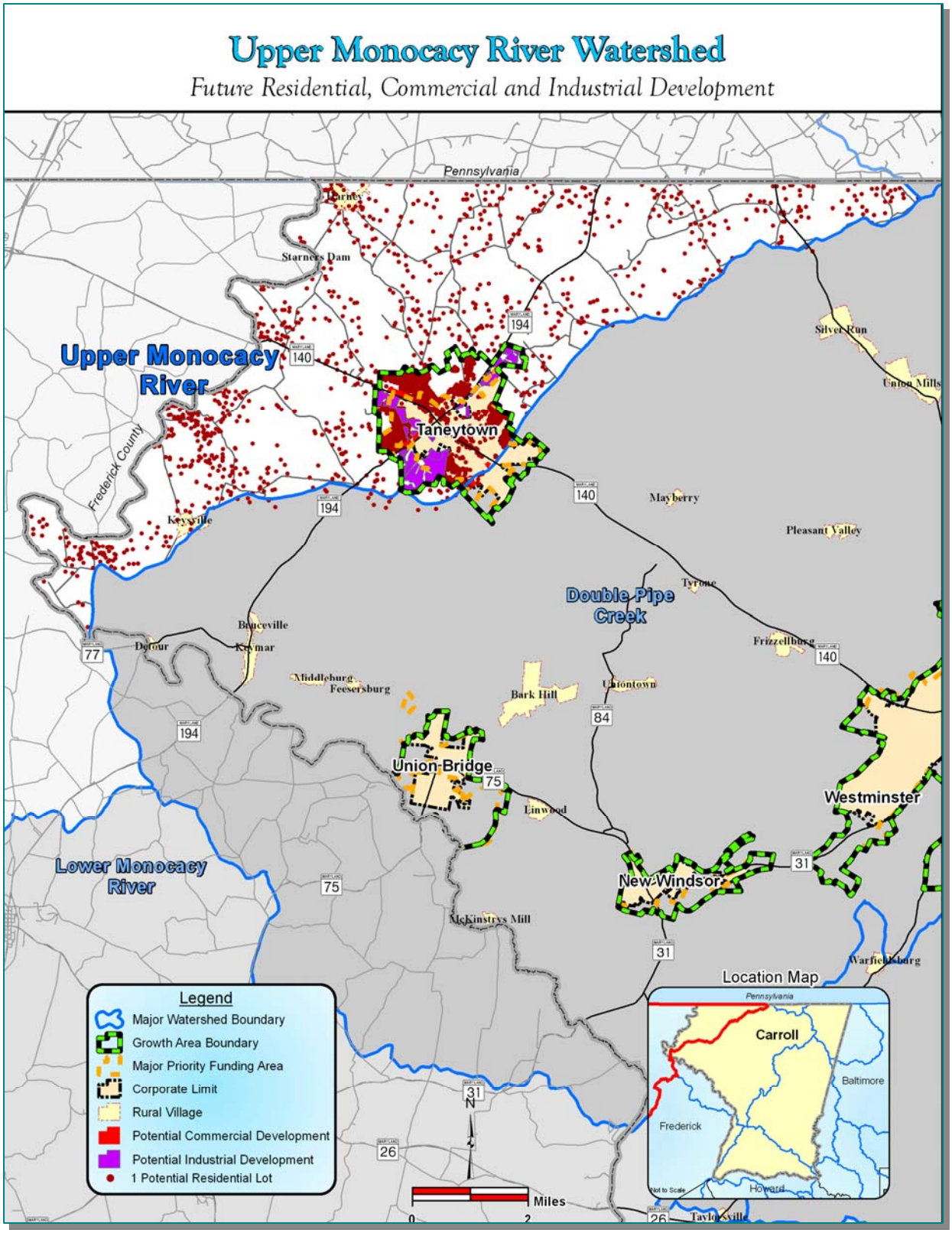


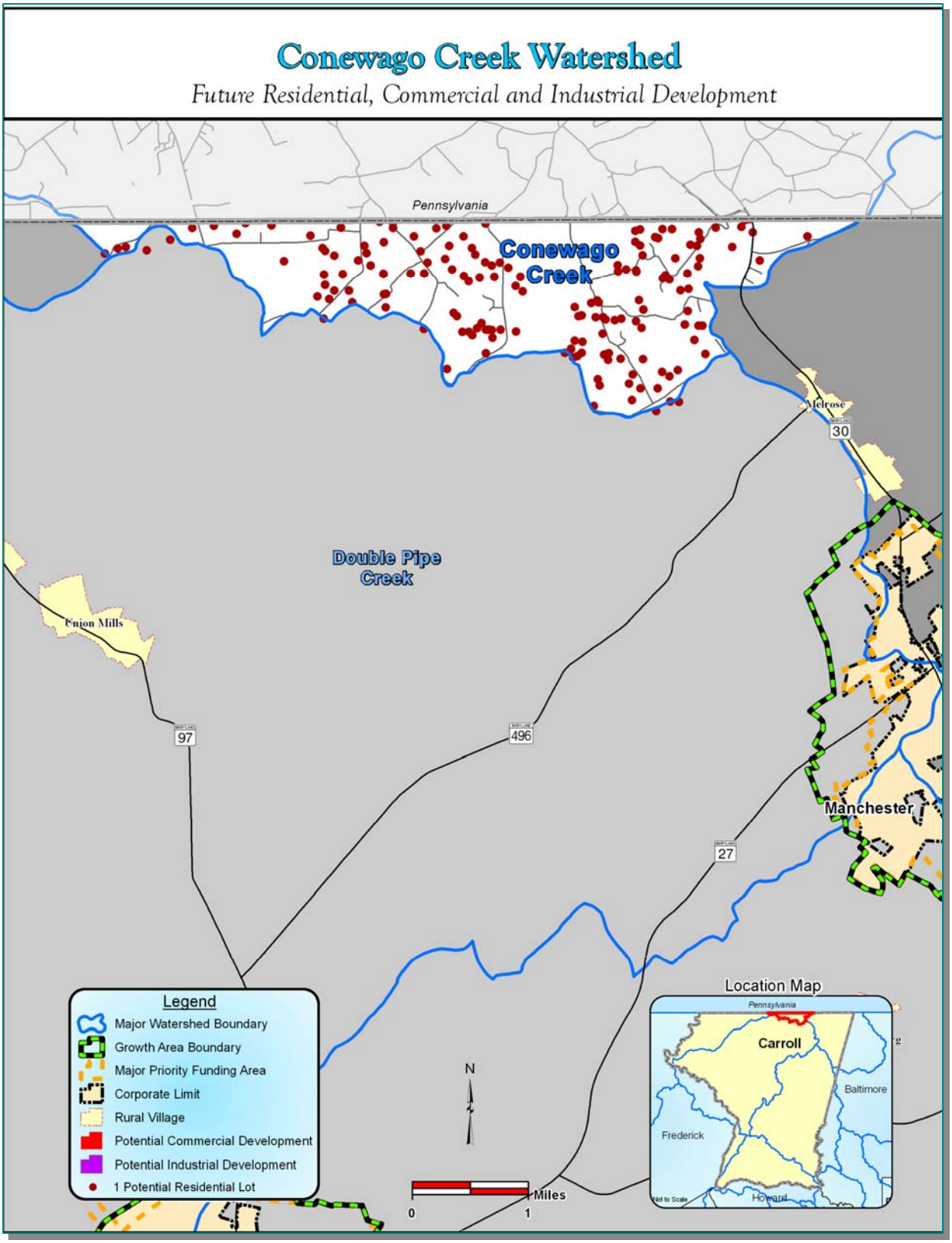












Within Designated Growth Areas

The following table reports additional development potential for each of the county's DGAs that have public water supply and sewerage systems that serve a portion of the DGA.

The overall planned water and sewer service areas include not only the areas that are developed and currently served, but also additional areas that are planned to be served. Some of these additional areas are undeveloped. Others have existing development but are currently unserved. The data in the table below pertain only to *new*, additional development that would be served by the respective system.

For most of the communities, the geographic area covered by the planned water service area and sewer service area are very similar, although differences do exist. There are some properties that may be served or planned to be served by one but not the other. In addition, the planned water and sewer service areas are located within the overall DGA and comprise a majority of that area for most communities. However, there are a few instances where the planned service area extends beyond the GAB. In the case of Mount Airy, the numbers of additional residential lots estimated for the planned service areas slightly exceed the number for the overall growth area. Other DGAs contain areas designated as No Planned Service, either because they are not intended to be served or they are not intended to be served within the ten-year timeframe of the Water and Sewerage Master Plan.

Note: The data in the following table are based on land use designation as identified in the respective community comprehensive plan. The one exception is for the "Existing/Final Planning" portion of the water and sewer service areas for commercial and industrial developable land, where the data are based on current zoning. The balance of the planned service areas (i.e., "Priority" and "Future") is based on land use designation. This small difference results in very minor disparities in the number of developable commercial and industrial acreages. Using the land use designations is meant to account for ultimate planned growth in these areas.

Planned Additional Residential, Commercial, and Industrial Development within Designated Growth Area and Planned Water and Sewer Service Areas

Community	Defined Area	Additional Residential Units (lots)	Developable Commercial Land (acres)	Developable Industrial Land (acres)
Freedom (including Sykesville)	Planned Water Service Area	2,823	35	466
	Planned Sewer Service Area	2,296	31	382
	Designated Growth Area	4,473	35	566
Hampstead	Planned Water Service Area	1,404	11	356
	Planned Sewer Service Area	582	19	198
	Designated Growth Area	1,404	21	534
Manchester	Planned Water Service Area	963	18	0
	Planned Sewer Service Area	874	17	0
	Designated Growth Area	1,741	63	8
Mount Airy	Planned Water Service Area	1,149	34	126
	Planned Sewer Service Area	1,149	34	126
	Designated Growth Area	1,147	34	126
New Windsor	Planned Water Service Area	528	0	124
	Planned Sewer Service Area	528	0	130
	Designated Growth Area	528	4	132
Taneytown	Planned Water Service Area	2,983	117	483
	Planned Sewer Service Area	2,983	117	483
	Designated Growth Area	2,985	118	481
Union Bridge	Planned Water Service Area	1,373	9	175
	Planned Sewer Service Area	1,373	9	180
	Designated Growth Area	1,383	10	265
Westminster	Planned Water Service Area	5,057	46	269
	Planned Sewer Service Area	4,982	48	265
	Designated Growth Area	5,655	47	578

Source: Carroll County Department of Planning, March 2009

Within Priority Funding Areas

The following table indicates additional development for each of the PFAs associated with larger communities. For a given community, the PFA generally comprises a portion of the area defined for the DGA. In the case of Hampstead, the number of developable acres of industrial land is larger in the PFA (575 AC) than in the DGA (534 AC). In this case, although it wasn't within the corporate limits, a large industrial area southwest of the growth area was included in the PFA.

Planned Additional Residential, Commercial, and Industrial Development within Priority Funding Area

Priority Funding Area	Additional Residential Units (lots)	Developable Commercial Land (acres)	Developable Industrial Land (acres)
Finksburg	154	6	5
Freedom/Sykesville	2,821	35	555
Hampstead	1,096	19	575
Manchester	1,267	31	8
Mount Airy	959	34	126
New Windsor	240	0	89
Taneytown	1,775	77	237
Union Bridge	1,338	10	231
Westminster	5,096	41	291

Note: This table includes only those PFAs that are associated with the County's major DGAs, plus the PFA for Finksburg; excluded are the PFAs relating to Rural Villages and various industrial areas located outside the DGAs.

Source: Carroll County Department of Planning, March 2009

6 Existing Water Resource Limitations: By Watershed & Countywide

Clean Water Act

"The Clean Water Act (CWA) is the cornerstone of surface water quality protection in the United States. (The Act does not deal directly with groundwater or with water quantity issues.) The statute employs a variety of regulatory and nonregulatory tools to sharply reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's waters so that they can support 'the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water.'

"For many years following the passage of CWA in 1972, US EPA, states, and Indian tribes focused mainly on the chemical aspects of the "integrity" goal. During the last decade, however, more attention has been given to physical and biological integrity. Also, in the early decades of the Act's implementation, efforts focused on regulating discharges from traditional "point source" facilities, such as municipal sewage plants and industrial facilities, with little attention paid to runoff from streets, construction sites, farms, and other "wet-weather" sources.

"Starting in the late 1980s, efforts to address polluted runoff have increased significantly. For "nonpoint" runoff, voluntary programs, including cost-sharing with landowners are the key tool. For "wet weather point sources" like urban storm sewer systems and construction sites, a regulatory approach is being employed.

"Evolution of CWA programs over the last decade has also included something of a shift from a program-by-program, source-by-source, pollutant-by-pollutant approach to more

holistic watershed-based strategies. Under the watershed approach equal emphasis is placed on protecting healthy waters and restoring impaired ones. A full array of issues are addressed, not just those subject to CWA regulatory authority. Involvement of stakeholder groups in the development and implementation of strategies for achieving and maintaining state water quality and other environmental goals is another hallmark of this approach." (*Source: Excerpted from the U.S. Environmental Protection Agency (US EPA) website, "Introduction to the Clean Water Act," found at http://www.epa.gov/watertrain/cwa/.*)

Impaired Waters and Total Maximum Daily Loads (TMDLs)

In 1998, the Chesapeake Bay and many of its tidal tributaries were added to the State's list of impaired waters (known as the 303(d) list), thus requiring the development of a TMDL to comply with the Clean Water Act. TMDL stands for "Total Maximum Daily Load." A load refers to the amount of a given type of pollutant found in a body of water coming from all sources. Simply put, the TMDL is the highest amount of a pollutant that a body of water can accept from all sources and still meet water quality standards. A body of water is tested and assigned a TMDL value. In Maryland, nitrogen and phosphorous are the most common pollutants.

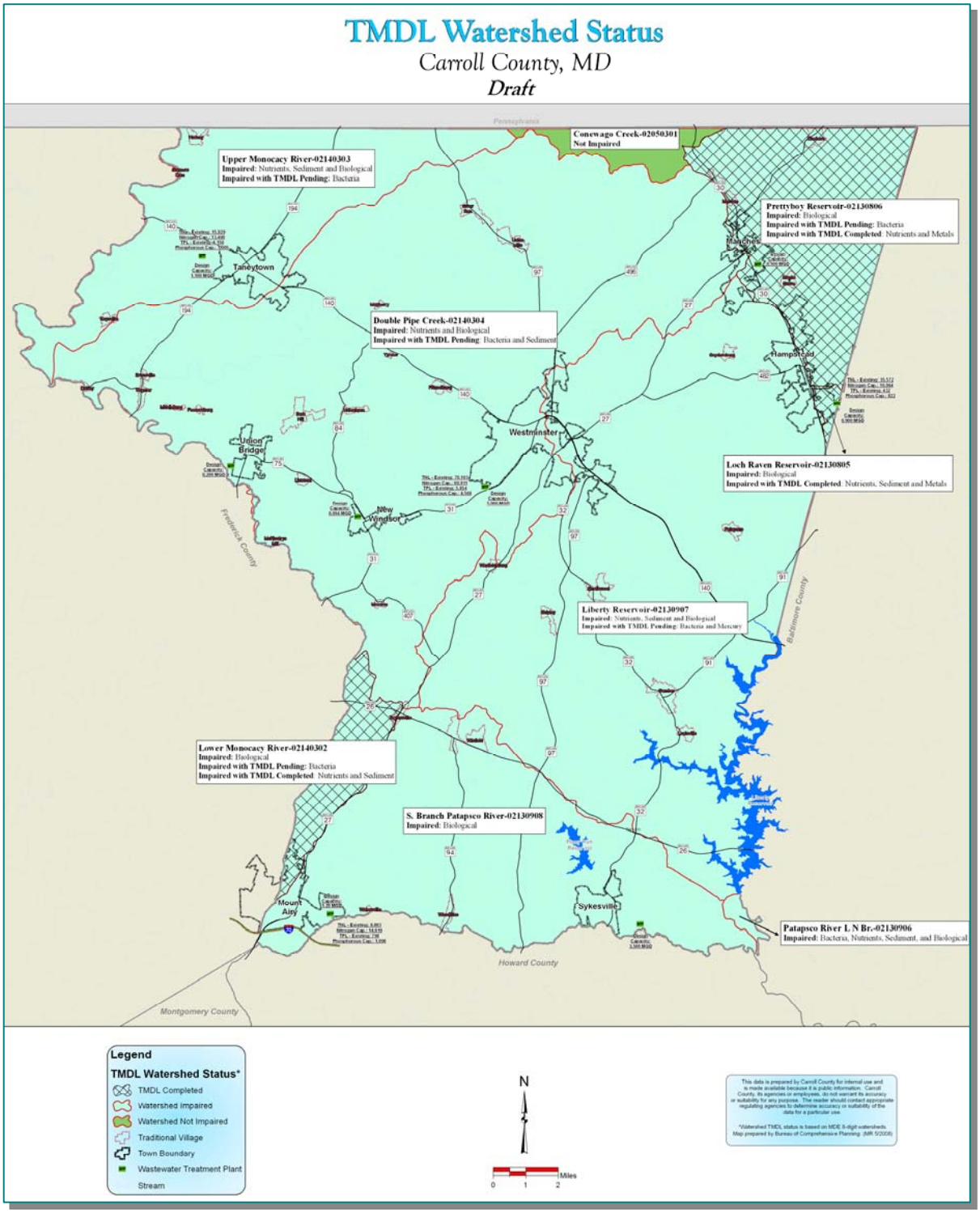
An impairment is identified when water quality monitoring data suggest that a waterbody (river, lake, estuary, or ocean) does not meet or is not expected to meet water quality standards. When a waterbody is listed, the cause (pollutant) and the priority of the impairment are identified. Waters scheduled for TMDL development in the next two years are also identified in the list.

In a standard regulatory approach, TMDLs would need to be completed for the Chesapeake Bay and its tributaries by 2010. It is currently underway and anticipated to be available for public comment in the summer of 2010. Through this process, pollutant load targets will be developed by Bay segment, by source sector, and by county. More info on the Bay TMDL can be found on the EPA website at http://www.epa.gov/chesapeakebaytmdl/. TMDLs require a very specific implementation plan, with "reasonable assurances" (e.g., enforceable permit limits) that pollutant load allocations will be achieved. If the water quality standards are not met by 2010, a TMDL will be developed and will set pollutant loading limits for all sources within the Chesapeake Bay watershed.

Because these goals represent a limit on the amount of nutrient loading from each tributary watershed of the Bay, it is in the interest of the State and each local jurisdiction to incorporate these strategies into its decision-making process and planning efforts.

State and federal requirements to meet water quality standards using TMDL limits are resulting in revised land use and environmental requirements for the future. TMDL requirements are intended to correct the existing conditions that add pollutants to a body of

water. New requirements for meeting TMDLs also mean new or updated planning strategies to prevent activities that may add pollutants in the future.



The TMDL Watershed Status map indicates the areas of the county, based on watershed, that were identified as impaired for at least one substance. The hatched areas indicate watersheds for which at least one TMDL for these impaired watersheds has already been completed. The Conewago Creek watershed is the only watershed within the county that is not included on Maryland's 303(d) list. This watershed does, however, fall within the Chesapeake Bay watershed. Therefore, 100 percent of the county's land area eventually will be affected by a TMDL.

Please refer to the table in Appendix B entitled "MDE Documented TMDL Impairments for Carroll County" for a status of each of the pending and completed TMDLs for Carroll County.

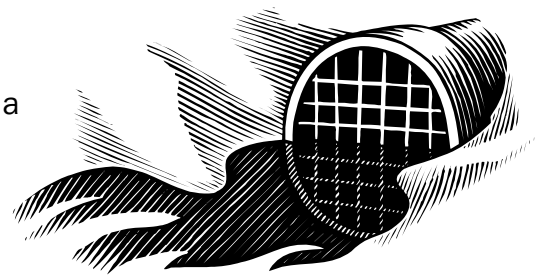
National Pollutant Discharge Elimination System (NPDES)

In 1972, Congress passed the Federal Water Pollution Control Act Amendments, commonly known as the Clean Water Act. This law was developed to control water pollution from wastewater discharges and stormwater runoff. In 1988, the US EPA created the NPDES Municipal Separate Storm Sewer System (MS4) to require municipalities, including counties, to apply for permits to control stormwater discharges. Beginning in 1990, US EPA, through the State-delegated MDE, required large municipalities, certain industrial facilities, and construction sites to obtain NPDES permits for stormwater discharges. The Phase 1 jurisdictions, located in counties or metropolitan areas with populations larger than 100,000, were required to obtain permit coverage. Carroll County was included as a Phase 1 jurisdiction.

The overall NPDES MS4 permit for Carroll County and its municipalities is administered through the County's Department of Planning. Programmatic oversight and reporting are the responsibility of the County's Office of Environmental Compliance. Monitoring, inspection, enforcement, and restoration efforts are a function of the County's Bureau of Resource Management. The County's municipalities comply with their NPDES responsibilities via a formal agreement with the County Commissioners and inclusion in the County's annual reporting requirements. In addition, they share in funding for a County position responsible for implementation and enforcement of the NPDES permit compliance.

The County has developed a very comprehensive, active NPDES restoration effort via the addition of appropriate staff and capital funding. The Bureau of Resource Management has staffing capable of monitoring, designing, managing, and funding the various initiatives needed for permit compliance. A listing of completed projects can be found in the table "Carroll County 2009 MS4 NPDES Watershed Improvement Projects." The approval of staffing and funding by the Board of County Commissioners confirms the commitment to water quality protection and enhancement by the County and its municipalities.

The County is in compliance with its current permit requirements. The County reapplied, via its annual report submittal dated July 2009, in anticipation of a new permit issuance in July 2010.



Carroll County 2009 MS4 NPDES Watershed Improvement Projects
Completed Projects

Project	BMP* Type	Watershed	Drainage Area	Impervious Acres Improved
Bateman Pond (Patapsco Project)	Surface sand filter with recovery gallery	Liberty	48.00	7.50
CC Airpark Watershed Restoration Project	Wet retention	Liberty	205.00	148.00
Chung Property Project	Wet fore-bay	Liberty	92.00	10.00
Collins Estates	Surface sand filter	Liberty	33.00	19.50
Eldersburg Elementary School	Surface sand filter	Liberty	1.45	1.00
Elderwood Village	Surface sand filter	Liberty	15.00	5.00
Englar Business Center	Shallow marsh	Liberty	95.00	80.00
Hickory Ridge	Surface sand filter with infiltration gallery	Liberty	24.00	5.00
Highpoint	Surface sand filter with infiltration gallery	Liberty	9.50	2.00
Longwell Run Project	Wetland	Liberty	550.00	208.00
Marriott Wood	Infiltration basin	Liberty	2.00	.50
Marriott Woods I	Surface sand filter with infiltration gallery	Liberty	25.00	5.00
Marriott Woods II	Surface sand filter with infiltration gallery	Liberty	12.00	2.00
Piney Run (Hampstead)		Loch Raven	400.00	107.00

*BMP = Best Management Practice

Watershed Restoration Projects

Name of SWM Retrofit	Location	Reservoir Watershed	TSS* (lbs/yr)	Total Phosphorus (lbs/yr)	Soluble Phosphorus (lbs/yr)	Total Nitrogen (lbs/yr)	Bacteria (lbs/yr)	Drainage Area (acres)	Impervious Area Treated (acres)
Marriott Woods I	Marriottsville Rd Eldersburg	Liberty	-234.82	-1.07	-0.81	-4.47	-14,908.98	24.13	5.00
Marriott Woods II	Marriottsville Rd Eldersburg	Liberty	-99.14	-0.45	-0.34	-1.89	-6,294.78	11.62	2.00
Hickory Ridge	Velvet Run Dr Westminster	Liberty	-234.79	-1.07	-0.81	-4.47	-14,907.53	23.75	5.00
Bateman Pond	Bethel/Patapsco Rd Finksburg	Liberty	-467.12	-2.13	-1.62	-8.90	-29,658.13	47.25	7.50
Carroll County Air Business Park	Magna Way Westminster	Liberty	-6,209.95	-23.36	-13.08	-124.88	-644,780.98	204.84	148.00
Collins Estates	Collins Ave Eldersburg	Liberty	-316.75	-1.45	-1.10	-6.03	-20,111.42	32.68	19.50
Elderwood Village	Monroe Ave Eldersburg	Liberty	-223.76	-1.07	-0.78	-4.26	-14,207.24	15.28	5.00
Devlin Square	Snowfall Way Westminster	Liberty							
Westminster High School Pond	MD 97 & MD 32 Westminster	Liberty							
High Point	Oklahoma Rd Sykesville	Liberty						9.40	2.00
Arthur Ridge	Laval Dr Eldersburg	Piney Run							
Totals			*-7,786.33*	*-30.60*	*-18.54*	*-154.90*	*-744,869.06*	*368.95*	*194.00*

*TSS = Total Suspended Solids

Safe Drinking Water Act (SDWA)

"The SDWA was originally passed by Congress in 1974 to protect public health by regulating the nation's public drinking water supply. The law was amended in 1986 and 1996 and requires many actions to protect drinking water and its sources: rivers, lakes, reservoirs, springs, and groundwater wells. (SDWA does not regulate private wells which serve fewer than 25 individuals.)

"SDWA authorizes the US EPA to set national health-based standards for drinking water to protect against both naturally-occurring and man-made contaminants that may be found in drinking water. US EPA, states, and water systems then work together to make sure that these standards are met.

"Millions of Americans receive high quality drinking water every day from their public water systems, (which may be publicly or privately owned). Nonetheless, drinking water safety

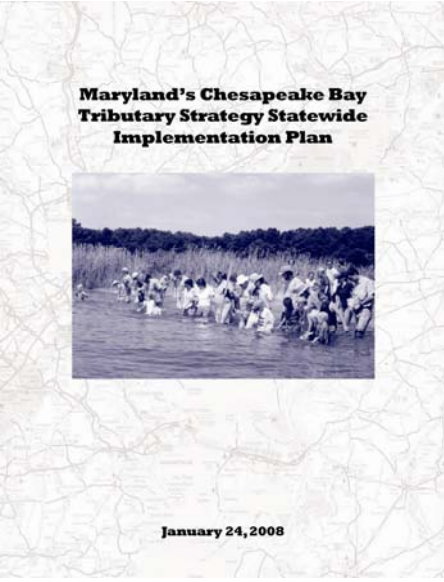
cannot be taken for granted. There are a number of threats to drinking water: improperly disposed of chemicals; animal wastes; pesticides; human wastes; wastes injected deep underground; and naturally-occurring substances can all contaminate drinking water. Likewise, drinking water that is not properly treated or disinfected, or which travels through an improperly maintained distribution system, may also pose a health risk.

"Originally, SDWA focused primarily on treatment as the means of providing safe drinking water at the tap. The 1996 amendments greatly enhanced the existing law by recognizing source water protection, operator training, funding for water system improvements, and public information as important components of safe drinking water. This approach ensures the quality of drinking water by protecting it from source to tap.

"SDWA applies to every public water system in the United States. There are currently more than 160,000 public water systems providing water to almost all Americans at some time in their lives." (*Source: Excerpted from the U.S. Environmental Protection Agency (US EPA) website, "Safe Drinking Water Act (SDWA), Basic Information," found at* http://www.epa.gov/OGWDW/sdwa/basicinformation.html.)

Chesapeake 2000 Agreement: Tributary Strategies and Pollutant Loading Caps

In June of 2000, the State of Maryland signed *Chesapeake 2000* (C2K), a new Agreement for restoration of the Chesapeake Bay. Maryland, together with Virginia, Pennsylvania, the District of Columbia, the US EPA, and the Chesapeake Bay Commission, pledged to achieve over 100 specific actions designed to restore the health of the Bay and its living resources by 2010. The actions, along with revised goals, were incorporated into *Maryland's Tributary Strategies Statewide Implementation Plan*.



Through the process of developing the tributary strategies, nutrient caps for municipal wastewater treatment plant discharges were also developed. These caps (called 'goals' for plants under 0.5 mgd), which limit the loading or amount of nutrients a plant can deliver or discharge to a receiving water body (normally a stream or river), have been established for all wastewater systems in Carroll County.

The nutrient caps and status of wastewater plant upgrades and expansions can be found in the table titled "Enhanced Nutrient Reduction (ENR) Implementation Schedule." System expansions beyond the caps can only occur if other alternative technologies or methods are undertaken which do not increase the total nutrient input to the receiving water body.

Enhanced Nutrient Reduction (ENR) Implementation Schedule

Point Source*	Design Capacity (mgd)	2000 TNL (lbs/yr)	ENR Strategy Total Nitrogen Load Cap (lbs/yr)	2000 TPL (lbs/yr)	ENR Strategy Total Phosphorus Load Cap (lbs/yr)	Projected ENR Construction Completion Year
Freedom	3.5	65,579	42,638	4,998	3,198	By 2010
Hampstead	0.9	35,572	10,964	432	822	After 2010
Mount Airy	1.2	8,883	14,619	798	1,096	By 2010
Taneytown	1.1	15,929	13,400	4,156	1,005	By 2010
Westminster	5.0	70,103	60,911	5,854	4,568	By 2010

*These facilities are identified by Maryland as "Significant," or having a planned design capacity of 500,000 gpd or greater.

Source: Maryland's Chesapeake Bay Tributary Strategy Statewide Implementation Plan, draft February 22, 2006

The County participates in the Tributary Teams. Carroll County is a part of three watersheds for which there are Tributary Teams in Maryland – Upper Potomac, Upper Western Shore, and Patapsco/Back River. Participation in the Tributary Teams allows the County to provide input and receive information on the design and timing of the basin implementation plans.

Once the Chesapeake Bay TMDL is completed, Tributary Strategies will be replaced with the Bay TMDL and the associated two-year milestones. For more information on the Two-Year Milestones, please see the BayStat website at http://www.baystat.maryland.gov/.

State Laws and Policies

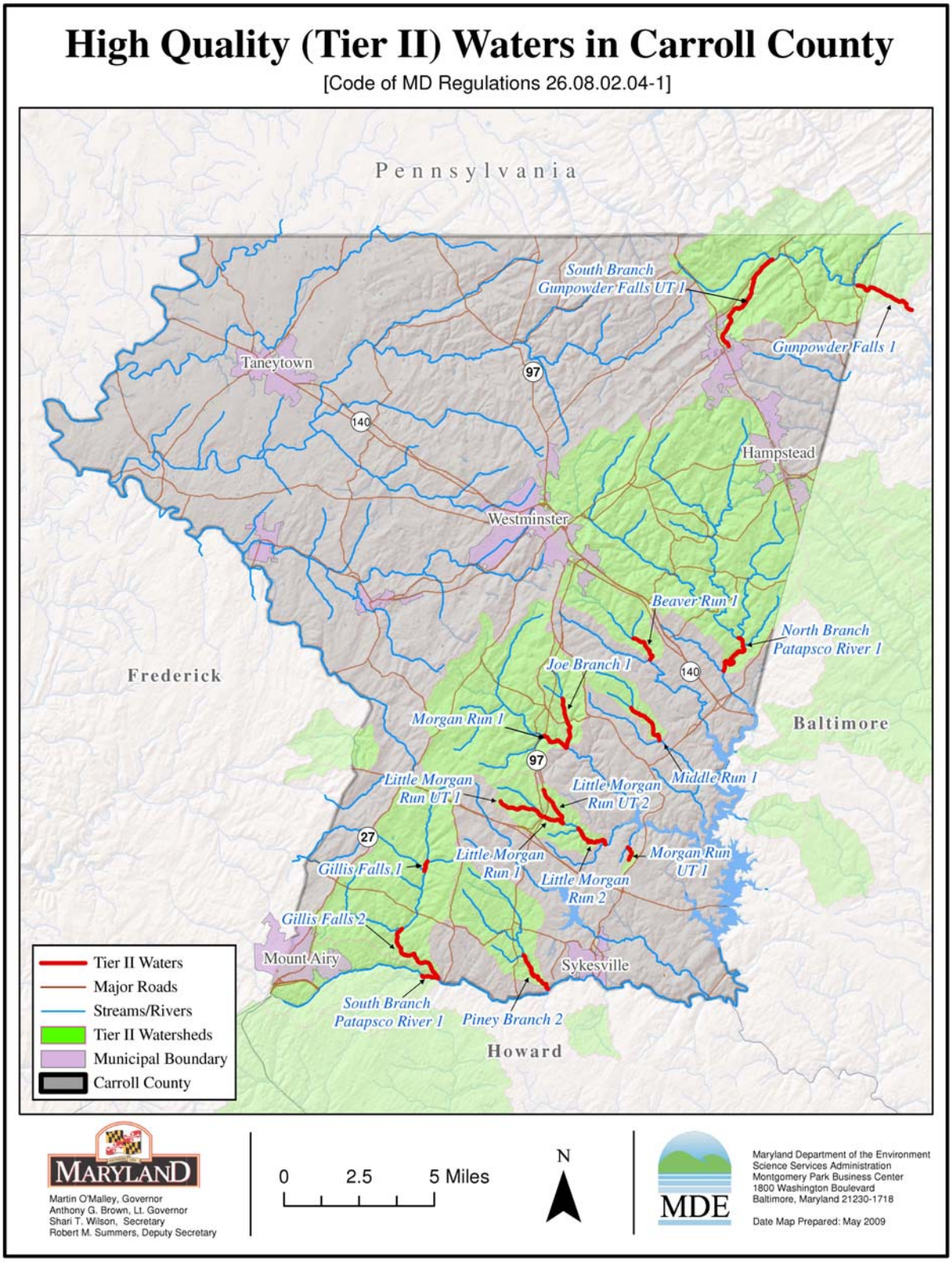
Trends in the implementation of the water appropriation and permitting process have created challenges to water resource development. Local governments are finding it difficult to secure enough water from sources to meet existing or projected demands. In some instances, the physical ability to develop groundwater sources may be limiting, but in the majority of cases, it is administrative or policy issues that create obstacles. The multitude of technical and administrative issues makes development of groundwater sources costly, time-consuming, and quite unpredictable in the Piedmont setting. One example is finding ways to address the adequacy of water recharge areas, which has resulted in additional work and timeframes for moving forward with planned growth.

The utilization of surface water resources has likewise become costly and complicated. Approval for stream withdrawals currently requires additional storage capacity within a water supply system. Therefore, using streams as a water source is typically difficult, expensive, and often not a viable option.

Tier II Waters

"Tier II Waters" relate to Maryland's Antidegradation Policy (COMAR 26.08.02.04, COMAR 26.08.02.04-1, and COMAR 26.08.02.04-2), which follows the national model required by the US EPA. Tier II protects surface water that exceeds the minimum requirements specified by water quality standards. All of Maryland's current Tier II waters were designated on the basis of biological indices of integrity. The MDE map titled "High Quality (Tier II Waters) in

Carroll County" shows the locations of the segments and their catchment areas (watersheds) that are located in part or in whole in Carroll County.



As of 2009, stream segments shown in the table titled "Tier II Segments and Catchment Areas" were listed for classification as Tier II streams. See the table for specific segment names and listing dates.

Tier II Segments and Catchment Areas

Segments and Catchment Areas	Date Listed
Gillis Falls 2	2003
Little Morgan Run UT 1	2003
Beaver Run 1	2007
Gillis Falls 1	2007
Gunpowder Falls 1& UT 1	2007
Joe Branch 1	2007
Little Morgan Run 1& UT 2	2007
Morgan Run 1	2007
Morgan Run UT 1	2007
N Branch Patapsco River 1	2007
Peggy's Run 1	2007
S Branch Patapsco River 1	2007
Weldon Creek 1	2007
Western Run 1	2007
Little Morgan Run 2	2008
Middle Run 1	2008
Piney Branch 2	2009

The designation of Tier II waters affects the ability to obtain permits for regulated activities within those watersheds, such as discharge and appropriation permits for new water supply wells. The Antidegradation policy requires "an applicant for proposed amendments to county plans [Water and Sewerage Master Plan] or discharge permits for discharge to Tier II waters that will result in a new, or an increased, permitted annual discharge of pollutants and a potential impact to water quality, shall evaluate alternatives to eliminate or reduce discharges or impacts. If impacts are unavoidable, an applicant shall prepare and document a social and economic justification. The Department shall determine, through a public process, whether these discharges can be justified." *(Source: MDE website, http://www.mde.state.md.us/ResearchCenter/Data/waterQualityStandards/Antidegradation/index.asp)*

A jurisdiction must provide a social and economic justification to MDE for permitting limited degradation of the water quality if a reasonable alternatives analysis indicates that an impact cannot be avoided or no assimilative capacity remains.

Stormwater Management Act of 2007

Also passed in Maryland in 2007 was the Stormwater Management Act of 2007 (SB 784/HB 786). Stormwater runoff is a major cause of stream erosion and Bay overnutrification and, in Carroll County, water quality impairment and stream ecosystem disruption. The Act requires stormwater management practices to mimic natural water runoff and minimize land development impact on water resources via the use of low-impact design (LID) methods. The stricter standards reduce pollution runoff to receiving water bodies from impervious surfaces such as pavement, roofs, and structures.

The Act's impact on Carroll County will most likely be minimal. The County and most of its municipalities have already adopted ordinances which mimic the State's model ordinance to a great extent. The use of non-structural practices as a requirement, greater use of infiltration practices and natural attenuation and increased management on redevelopment projects have been in place since 2004.

The County will be receiving, editing, and proposing amendments to its Stormwater Management Code in order to fully comply with the requirements of the new State Stormwater Management Law. County staff will then work with the municipalities to ensure continued delegation of the County Code or modifications to municipal codes for compliance. Carroll County will continue its efforts to implement state-leading stormwater management practices as identified through the Builders for the Bay process.

7 Review of Local Regulations & Protections

The County and its municipalities have a unique relationship regarding the development and implementation of regulations and protection measures.

The relationship is founded in a formal Town/County Agreement, which establishes the roles and responsibilities of each party. The agreements, while similar, are customized for each municipality. The implementation of State and local laws are then established between the County and municipalities by ordinance. The agreement allows for a cooperative environment under which coordinated, efficient implementation of regulations and protection measures can take place. In most cases, the County provides staff and other resources to manage, implement, and enforce measures needed to ensure compliance with applicable regulations and protection measures.

The regulations which provide for the protection and management of natural resources and the role assumed by the County and municipalities can be seen in the table titled "Review, Inspection, and Bonding: Assignment of Responsibilities." This table identifies the entity responsible for the key steps in the implementation of resource management. This arrangement between the County and its municipalities for the most part allows for consistent and uniform application of resource management regulations.

The Water Resource Management Ordinance was an unmandated action adopted by the Board of County Commissioners in 2004 to enhance the protection of water quality and quantity in Carroll County. This ordinance is one of the few of its kind in the State of Maryland. Even though not all of the municipalities have formally adopted the ordinance, reviews of development plans are still performed by County staff and comments / recommendations are forwarded.

In addition, the County and municipalities, along with the local Health Department, created the Carroll County Water Resource Coordination Council (WRCC). This group was formed in 2007 by a joint resolution signed by all parties. The WRCC meets monthly to discuss and address water resource management issues of mutual interest. The group has been overseeing the consultant work and drafting of this joint WRE effort.

In addition to the resource management regulations found in the "Review, Inspection, and Bonding: Assignment of Responsibilities" table, the County and each municipality also have Adequate Public Facilities laws in place. This table indicates activities and responsibilities associated with a proposed development – subdivision or site plan – and which jurisdiction implements those items.

The Carroll County Adequate Public Facilities and Concurrency Management Ordinance ensures that proposed or planned residential growth proceeds at a rate that will not unduly strain public facilities, including schools, roads, water and sewer facilities, and police, fire, and emergency medical services. Minimum adequacy standards, or thresholds, are established for these facilities and services and mandate that the cumulative impacts of proposed or planned residential growth, within the municipalities and the County, be considered in testing for adequacy under these standards.

Please refer to the table, "Water and Sewer Facility Minimum Adequacy Standards," for thresholds for public water and sewer facilities.

Water and Sewer Facility Minimum Adequacy Standards

Adequate	Approaching Inadequate	Inadequate
Water: The 'maximum day demand' is less than 85 percent of the total system production capacity.	Water: The projected maximum day demand is equal to or greater than 85 percent but less than 95 percent of the total system production capacity.	Water: The projected maximum day demand is equal to or greater than 95 percent of the total system production capacity.
Sewer: The projected annual average daily flow is less than 85 percent of the wastewater treatment facility permitted capacity.	Sewer: The projected annual average daily flow is greater than or equal to 85 percent but less than 95 percent of the wastewater treatment facility permitted capacity.	Sewer: The projected annual average daily flow is greater than or equal to 95 percent of the wastewater treatment facility permitted capacity.

Each of the municipalities has also adopted an Adequate Public Facilities Ordinance. Many of them use the same or similar standards to those adopted by the County.

Review, Inspection, and Bonding: Assignment of Responsibilities

Resource Management Ordinance and Activity	Hampstead	Manchester	Mount Airy	New Windsor	Sykesville	Taneytown	Union Bridge	Westminster
Floodplain								
Review*	C/C	C/C	C/C	C/C	C/C	N/A	N/A	C/M
Bond	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Inspection	C	C	C	C	C	N/A	N/A	C
Easement	C	C	C	C	C	N/A	N/A	M
Grading								
Review*	C/C	C/C	C/C	C/C	C/C	C/C	C/C	C/C
Bond	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Inspection	C	C	C	C	C	C	C	C
Sediment Control								
Review*	SCD/S	SCD/S	SCD/S	SCD/S	SCD/S	SCD/S	SCD/S	SCD/S
Bond	C	C	M	C	M	M	M	C
Inspection	C	C	C	C	M/C	C	C	C
Stormwater Management								
Review*	C/C	C/C	C/C	C/C	C/C	M	M	C/M
Bond	C	C	M	M/C	M	M	M	M
Inspection	C	C	C	M/C	M/C	M	M	C
Easement	C	M	M	M	M	M	M	M
Landscape								
Review*	C	C/C	C/M	?	C/M	C/C	M	M
Bond	C	C	M	C	M	C	N/A	M
Inspection	C	C	M	C	M	C	N/A	M
Forest Conservation								
Review*	C/C	C/C	C/C	C/C	C/C	C/C	C/C	C/C
Bond	C	C	C	C	C	C	C	C
Inspection	C	C	C	C	C	C	C	C
Easement	C	C	C	C	C	C	C	C
Water Resources								
Review*	C/No Code	C/C	C/C	C/C	C/C	C/ No Code	N/A	CO/ No Code
Bond	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Inspection	N/A	C	N/A	C	C	N/A	N/A	N/A
Easement	N/A	C	M	C	C	N/A		N/A
Environmental Site Delineation (ESD)								
Review*	N	Y	Y	Y	N	N	Y	N

Key: C = County M = Municipality S = State SCD = Carroll Soil Conservation District

* Review performed by / whose code

Source: Carroll County Bureau of Resource Management, November 14, 2008

Water

Water

"A safe and adequate drinking water supply is critical to the sustainability of existing communities and to the viability of future planned growth. Increasing demand from the 1.1 million additional people projected to live in Maryland over the next 25 years is expected to challenge local utilities' ability to provide safe drinking water and maintain good water quality. Some communities are already at or near current supply limitations.

"By 2030, the statewide demand for water for most uses, excluding self-supplied commercial and industrial uses, is expected to increase from 1,447 million gallons per day (mgd) in the year 2000 to 1,680 mgd, an increase of 233 mgd, or 16 percent. This total increase includes about 84 mgd of additional water for agricultural irrigation. Regional projections for 2030 demand are not available for irrigation uses.

"Maryland has faced a number of record drought periods in recent years that have necessitated the implementation of some difficult protective measures to enable the state to continue providing adequate water supplies. These stressors on water resources highlight the need to plan ahead to ensure adequate drinking water supplies at the local, comprehensive planning level.

"Existing regional and county water resource studies should be used to inform local planning efforts. Local government experience in obtaining permits for water appropriation should also be taken into account when assessing the reasonableness of future expectations.

"Decisions regarding growth and proposed land uses should consider planning-level assessments of the adequacy of drinking water resources for the planning time period under consideration. For the proposed number and location of homes, businesses and industrial facilities to be viable, the availability, costs and timeframes to provide an adequate water supply must be achievable. Local comprehensive plans must provide the vision and path needed to provide adequate water supplies for planned uses and needs within the planning timeframe.

"Limited water supplies can slow or stop planned development, resulting in the inability to fulfill the vision of local comprehensive plans and implement smart growth policies. Options for addressing these circumstances need to be explored, including, but not limited to, modifying the land use element to change the amount or location of growth, thereby capping growth where it cannot be supported. Local planning and zoning entities must be flexible enough to react to these changes.

"Protection of water supplies is a critical component of the vision for the comprehensive plan. Local land use and zoning decisions can have a profound impact on the risk of contamination to valuable drinking water supplies. Water supplies have varying degrees of vulnerability to contamination due to the nature of the aquifer being used, the size of the watershed, existing land uses and the potential sources of contamination within a recharge

or watershed area." [*Source: Models & Guidelines No. 26, Managing Maryland's Growth, The Water Resources Element: Planning for Water Supply and Wastewater and Stormwater Management*]

8 Carroll County Hydrogeologic Setting

Carroll County lies entirely within the Piedmont physiographic province. This is an area of moderate relief and rounded hills, with relatively gentle slopes. This subdued topography is formed by the underlying, deeply weathered, lower Paleozoic to Precambrian-aged metamorphic rock (500 million to 1 billion years old).

The northwesternmost corner of Carroll County falls in the Triassic Uplands subprovince. This subprovince derives its name from the unique, Triassic-aged (250 million) sedimentary rocks found there. Topography in this area is more subdued than that found in the eastern portion of the County.

The most prominent physiographic feature in Carroll County is the Parrs Ridge/Dug Hill Ridge topographic high which trends northeast-southwest and bisects Carroll County, separating the Piedmont Uplands into east and west divisions. Low and often broad valleys are formed in the easily weathered carbonate rocks of Carroll County, lenses and stringers of which may be mixed with other metamorphic rock types. Stream segments, generally straight for short distances, follow closely the joints and fractures in the bedrock systems which represent zones of relative weakness.

Carroll County is underlain by rocks of the easternmost Appalachian Mountain system. Sedimentary, igneous, and metamorphic rocks of diverse lithology, complex structure, and ages ranging from Precambrian to Triassic are found here.

The majority of Carroll County is underlain by metamorphosed sedimentary and volcanic rocks overlain by a thick mantle of unconsolidated weathered material (saprolite). The general structural trend of Carroll County is northeast to southwest. The grade of metamorphism, that is the general grain size of the rocks, increase across the trend, from northwest to southeast. Slates and phyllites are exposed near the northwesternmost outcrop area of the Piedmont Uplands near the Pennsylvania state line and Blacks Corner. These phyllites and slates (very fine to fine-grained metamorphic rocks) grade gradually to phyllites and fine-graded schists in the central portion of Carroll County, and finally to coarser schists and gneisses in the southeastern portion of the county near Sykesville, as the core of the Ancient Appalachians is approached. The Precambrian Baltimore gneiss is the oldest rock type found in Carroll County, and is generally interpreted as representing the central core of the Appalachian system.

These rocks are tightly folded into anticlines and synclines, with beds ranging in dip from horizontal to vertical. Faults are very numerous, but the lack of outcrops limits their mapping. Joints and fractures are common throughout the metamorphic rocks of Carroll County.

The remainder of Carroll County, the northwesternmost corner, is underlain by much younger Triassic-aged sedimentary rocks which form the Triassic Uplands. These are consolidated alluvial deposits of the New Oxford Formation. They generally become coarser textured east and southeastward from the Carroll County/Frederick County line, grading from shale to siltstone, and sandstone, to the ancient metamorphic rocks. These Triassic rock strata have a gentle west and northwest dip, and generally trend northeast just north of Union Bridge, and gradually bend to the north as the Pennsylvania line is approached. These beds are cut by a few large and numerous small faults, and have well-developed joint and fracture systems.

The vast majority of groundwater in Carroll County occurs in the upper 500 feet of the earth's crust. Rocks in this zone are by no means totally solid. All rock types have been subjected to various earth stresses, which have created a network of fracture systems which often extend to great depths. This rock system in Carroll County has been subjected to a great amount of weathering and erosion, which has created an upper weathered zone referred to as saprolite. The deepest weathered zones are found in areas along pre-existing fractures. This combination of the weathered zone and underlying fractured rock system constitutes the geologic "environment" in which groundwater occurs.

There are three distinct aquifer types in Carroll County which may be delineated from a groundwater resource development standpoint. These are the saprolite aquifer, carbonate rock aquifer, and Triassic rock aquifer. Groundwater development strategy in these aquifers is unique, and must be addressed as such.

The saprolite aquifer underlies the majority of the County. It occurs over all of the non-carbonate rock in the county, and is the sole source aquifer for Mount Airy, Hampstead, and Manchester, and a partial source for New Windsor and Westminster. This is a hybrid aquifer from which high-yielding water supplies have not traditionally been developed. The carbonate rock aquifer underlies limited portions of New Windsor, Union Bridge, and Westminster, and is the most productive and environmentally sensitive aquifer type in Carroll County. It is the sole source for Union Bridge and a partial source for New Windsor and Westminster. The Triassic rock aquifer underlies the northwestern portion of the county and provides all the potable water needs for Taneytown.

Groundwater in the metamorphic rocks of the Maryland Piedmont is transmitted primarily in joints, fractures, and bedding planes in bedrock, and along the saprolite/bedrock interface. The size, number, and openness of fractures naturally determine the amount of groundwater transmitted through them. In soluble carbonate rocks, fractures may be greatly enlarged by solution, although they are characteristically filled with a significant amount of insoluble residual material, usually silts and clays. Carbonate rock well yields may be quite large, but may also be prone to creating sinkholes in the overlying soils. Therefore determining optimal well production to reduce the creation of sinkholes becomes necessary. This aquifer type is also susceptible to an increased risk of pollutants due to the rapid movement of groundwater.

In coarser grained schists and gneisses, which are often very competent, fractures are generally narrower, but remain open to relatively great depths. Water bearing fractures may

occur to depths exceeding 500 feet. In finer grained phyllites, deep fracturing may occur less frequently due to the softness of these rocks. The discreteness of fracturing makes possible the development of very high yielding wells completely in fractured zones directly adjacent to "dry holes" not tapping such fractures.

Groundwater occurs in a somewhat different fashion in the Triassic rocks underlying the Taneytown region. Groundwater is primarily stored and transmitted along rock layers, joints, fractures, and faults. The weathered zone over these rocks is generally quite thin, and the water table is usually below this zone, in the fractured bedrock.

The layered nature of the Triassic rocks, with permeable sandstone sandwiched between less permeable shales, dipping at relatively low angles, creates a multi-aquifer system. Each competent, fractured sandstone/siltstone bed may respond as a single aquifer when it occurs between shale layers on local scale. Fracture zones often connect various beds vertically, creating the aquifer system.

9 Source Water Assessments

"Source water is water from rivers, streams, reservoirs, and aquifers that is treated and used for drinking water purposes. A source water assessment is a process for evaluating a public water system's source water and assessing its vulnerability to contamination. The assessment does not address the treatment processes, or the storage and distribution aspects of the water system, which are covered under separate provisions of the Safe Drinking Water Act. A source water protection program is intended to add an extra layer of protection by ensuring that the water entering a public water system is as safe as possible. Preventing contamination at the drinking water source protects public health and makes good economic sense.

"Groundwater is the most commonly used source of water supply. In Maryland, groundwater is obtained from both unconfined and confined aquifers. Confined aquifers are more protected from contamination than are unconfined aquifers. In Central Maryland, the aquifers are unconfined.

"Source water assessments conducted in Maryland indicate that the most common potential sources of contamination for systems in unconfined aquifers are underground storage tanks, service stations, dry cleaners, onsite septic systems, and agriculture. Volatile organic compounds and nitrates were the most common contaminants found in these water supplies, although microbiological pathogens were found in some wells located in limestone areas of Central and Western Maryland. Some of the systems that are in deeper confined aquifers were found to be susceptible to naturally occurring contaminants like arsenic, fluoride and radium, but were not found to be susceptible to contaminants originating from local land use activity.

"In Maryland, about 10 percent of the community water systems (around 50 systems) rely on surface water, yet these surface water systems serve about 80 percent of the population

using public water systems. Protecting a surface water source involves protecting the entire watershed, which can be relatively small (less than one square mile) to very large.

"Agricultural activities and urban development were the most prevalent sources of contaminants for surface water systems. Contaminants from agricultural land include nutrients and microbial pathogens. Excessive erosion (sediment) and de-icing compounds were contaminants of concern from runoff in developed areas. The discharge of treated wastewater and risks from overflowing sewage collection systems upstream of intakes were noted as a significant source of contaminants in some watersheds. Sources relying on river intakes are more susceptible to elevated levels of fecal contamination and turbidity following rain, while sources using reservoirs were more susceptible to eutrophication from phosphorus. Major roads, rail lines, and pipeline crossings presented the potential for spills above some intakes." *(Source: General source water assessment description excerpted from MDE website: http://www.mde.state.md.us/Programs/WaterPrograms/Water_Supply/sourcewaterassessment/factsheet.asp)*

Each Municipality

The MDE completed all Source Water Assessments (SWAs) described herein over the past ten years. Except as noted, SWAs were delineated by the Carroll County Bureau of Resource Management using US EPA-approved methodologies. Information on water sources has been updated to reflect current conditions.

Hampstead

The unconfined fractured rock aquifer in the Prettyboy Schist is the source of Hampstead's water supply, which is now comprised of 17 groundwater wells. All of Hampstead's wells are susceptible to contamination by nitrates, votatile organic compounds (VOCs), Synthetic Organic Compounds (SOCs), and radionuclides, but not to other inorganic compounds. Hampstead's wells were determined not to be susceptible to protozoans, but wells 19, 21, 23, and 24 are susceptible to total coliform.

The Town's inventory includes Wells 20 and 21. These two wells were used for over 20 years until the Town realized that it did not own the property where the wells are located. Both wells are high in nitrates and would require treatment or blending with lower nitrate water to meet the nitrate maximum contaminant level (MCL). The Town is attempting to acquire these wells.

Manchester

The unconfined fractured rock aquifer in the Marburg Formation is the source of water supply for the Town of Manchester. The system currently uses 14 wells and 1 spring to obtain its drinking water. All of Manchester's wells are susceptible to contamination by nitrates, VOCs, and radon (may be susceptible if currently proposed EPA standards are adopted), but not to SOCs, other radionuclides, or inorganic compounds. None of Manchester's water supply sources are susceptible to protozoan contamination except for the Walnut Street well and Crossroads Well 1. In addition, the Bachman Road, Patricia Court, and Walnut Street wells are susceptible to total coliform.

Mount Airy

The unconfined fractured rock aquifer within the Ijamsville Formation and Marburg Schist is the source of water supply for the Town of Mount Airy. The system uses 10 wells to obtain its drinking water. Well #11 is potentially being developed in the very near future and is approximately equal to Mount Airy's average size well. The Mount Airy water supply is susceptible to contamination by nitrates, VOCs (except well 8), SOCs, and radionuclides, but not susceptible to protozoans. Further, Wells 2 and 7 are susceptible to bacteria and viruses.

New Windsor

The Town of New Windsor relies upon both surface and groundwater for its potable supply. The unconfined fractured rock aquifer within the Wakefield Marble, Sam's Creek Formation, Marburg Formation, and Ijamsville Phyllite provide the source of water supply for two groundwater wells and one spring. The Hillside wellfield consists of two wells completely in the phyllite, while the Main Spring system is located near a contact of the Sam's Creek and Marburg Formations. The Hillside wells were determined to be susceptible to contamination from VOCs associated with commercial enterprises, as well as radionuclides. The Main Spring system was determined to be susceptible to contamination by nitrates, viruses, and bacteria associated with surface sources.

Taneytown

The unconfined fractured rock aquifer in the New Oxford Formation is the source of water supply for the City of Taneytown, which is comprised of 8 wells. The water supply for Taneytown is susceptible to contamination by nitrates, VOCs, and radionuclides, but is not susceptible to SOCs. Well 12 is also susceptible to bacteria, based on raw water sampling.

Union Bridge

The unconfined fractured rock aquifer in the Wakefield Marble is the source of water for the Town of Union Bridge. The system currently uses 2 wells to obtain its drinking water. All water supply sources for Union Bridge are susceptible to contamination by nitrates and protozoans. The water supply is not susceptible to organic compounds, radionuclides, or other inorganic compounds.

Westminster

The City of Westminster relies upon both ground and surface water for its potable supply. The unconfined fractured rock aquifer within the Wakefield Marble, Sam's Creek Formation, Marburg Formation, Ijamsville Phyllite, and Wissahickon Formation provide the source of water supply for 11 groundwater wells. Four of the City's wells (Wells 1, 2, 5, and 7) are in the Wakefield Marble. The remaining 7 wells are in the crystalline bedrock formations. The City also withdraws water from the Cranberry Run Reservoir. The SWA was delineated by a consultant in accordance with the 1999 MDE SWAP guidance document. Many of the wells are susceptible to natural contaminants such as radon, as well as anthropogenic contaminants like nitrates.

Freedom

Water is provided from both surface and groundwater sources in the Freedom District. The unconfined fractured rock aquifer in the Sykesville Formation is the source of groundwater supply for the Freedom District. This system is comprised of three groundwater supply wells. The Fairhaven well is located within the Piney Run Watershed and is drilled to approximately 600 feet. The Raincliffe well is approximately .5 mile south of the Fairhaven well and was drilled to approximately 500 feet. The Freedom District groundwater supply is susceptible to VOCs and radionuclides, but not susceptible to SOCs, nitrates, other regulated inorganic compounds, or microbiological contaminants.

Carroll County has a water treatment plant on the western shore of Liberty Reservoir. The reservoir was constructed in 1954 on the North Branch of the Patapsco River and is operated by Baltimore City. Carroll County, under agreement with Baltimore City, purchases raw water from this source. The treatment plant was expanded and now has a capacity greater than 3 mgd.

Potential sources of contamination for the Liberty Reservoir include point and non-point sources, including industrial sites, transportation (e.g., highways), a railroad, a petroleum product pipeline, agriculture, and septic tanks in rural portions of the watershed. The majority of point sources are located in the North Branch and Liberty subwatersheds.

The City of Baltimore maintains an extensive water quality monitoring program for Liberty Reservoir and its tributaries, as well as the Ashburton Water Filtration Plant. Routine sampling is performed at the City's water treatment plant, six tributaries of Liberty Reservoir, and four in-reservoir locations in an effort to monitor and improve the water quality conditions of the Liberty Reservoir water supply.

10 Future Additional Water Demand Based on Existing Planned Growth

Capacity Management Plan Worksheets – Methodology

To identify water supply and capacity needs, **current** service capacity must be determined. Recent guidelines published by MDE, Guidance Document: *Water Supply Capacity Management Plans* (WSCMP) (2006), provide a methodology for determining the net available capacity of existing water supplies. This available capacity, plus the estimated capacity from improving treatment of already existing sources or of obtaining water resources not yet permitted for withdrawal (to be determined using MDE recommended methodologies), can then be used to develop an estimate of the approximate number or range of additional households and associated commercial, institutional, and industrial water demand that can potentially be supported in a service area.

Data was collected for each of the public water systems owned or operated by Carroll County or a municipality. Appendix C: Water Supply Capacity Management Plan: Worksheets and Summary (Pg C-5) in MDE's Guidance Document: *Water Supply Capacity Management Plans* (2006) was used as a template and guide for collecting this data. A worksheet was prepared for each of these eight systems to capture a snapshot of the **current** capacity and projected demand, based on **existing** adopted land use plans, ordinances, and policies. (See the Appendices for copies of each individual worksheet, associated data, and any variations from the standard method.)

The Average Annual Daily Demand was based on data collected through calendar year 2007, as a consistent timeframe for reference between municipalities/systems and a point from which to move forward in the process to develop the plan. The appropriate data was collected for each system to determine the existing water demand. For efficiency and productivity, 2007 data was used for the capacity management plan worksheets and water supply information, so the process could continue without constant changing of data.

For a standard WSCMP submission, the worksheet requests information on potential additional water demand for approved (but undeveloped) subdivision lots and issued building permits. However, for the purposes of the WRE, the potential demand was based on all of the potential residential units (lots), regardless of development status.

Potential additional residential demand was estimated based on the County's BLI data. Within the W-1 Existing/Final Planning Water Service Area (WSA), the potential additional residential lots were based on the current zoning. Within the W-3 Priority and W-5 Future WSAs, the potential additional residential lots were based on the currently adopted land use designations, which would reflect the growth that is ultimately planned. These were the required categories shown on MDE's worksheet. Future demand for water from development in the No Planned Service areas that fall within the County's DGAs was also estimated for the WRE, although it does not show in the worksheets.

Future residential demand for water was estimated assuming the potential additional residential lots, as well as existing unserved residences, consume 250 gallons per day (gpd) per household/lot.

To arrive at future commercial and industrial demand, areas with adopted land use designations for commercial or industrial use were reviewed. Acreage was estimated for areas that are developed but not yet served. The buildable acreage of unimproved land was also estimated. Buildable acreage excludes streams, wetlands, and floodplains (see Appendix titled "Methodology to Estimate Future Commercial & Industrial Demand for Water & Sewer Service/Capacity" for more detailed methodology). Developed but not yet served acreage was added to buildable acreage to get a total acreage on which future demand was calculated. The combination of acreage from these two types of commercial land was multiplied by 700 gallons per acre per day. Industrial acreage was multiplied by 800 gallons per acre per day (based on MDE guidance and the Water and Sewerage Master Plan).

In Manchester's case, additional demand was added to the residential demand category to reflect projected demand from two new schools that were coming online during this process

or shortly thereafter. In Freedom's case, additional demand beyond the BLI estimates used for residential demand was added to account for allocations and reservations. An additional 21,488 gpd in allocations was added, and an additional 27,765 gpd in reservations. For the Hampstead sewer system, additional demand beyond the BLI estimates used for residential demand also was added to account for 19,932 gpd in allocations.

For the Freedom water and sewer service areas, and for the Hampstead sewer service area, allocations represent capacity set aside to accommodate development that has already paid its area connection charges. These are typically sites for which building permits have already been issued, a site plan has been approved, or a minor subdivision has been approved. The capacity is "set aside" for two years after the area connection charges are paid. After two years, it is assumed that they are connected to the system.

Reservations represent a capacity that is unofficially 'reserved' for development that is in the pipeline, and represents a known quantity; area connection charges are unpaid. Both allocations and reservations are likely double-counting capacity demand. However, these numbers were included in the demand and capacity calculations knowing that it would provide very conservative numbers for the Freedom systems and for the Hampstead sewer system and would ensure the demand is accounted for.

For Hampstead and Westminster, numbers for residential, commercial, and industrial demand were modified or provided by the municipality rather than strictly using the BLI data.

Mount Airy demand and capacity numbers may not match the BLI estimates, as the County does not have BLI information for the portion of Mount Airy that lies within Frederick County. Therefore, where this is a factor in estimating figures used in these analyses, the Town used their own calculations to capture its entire area.

The MDE worksheets did not address demand that would be generated by areas within the GAB that are not currently within the planned WSA. This additional demand, however, was evaluated as part of Carroll County's WRE process.

To determine the capacity of the water supply system, the best available data were collected for each municipal system. The estimated excess water supply capacity available for allocation was determined through a series of formulas identified on MDE's worksheets.

Rural Areas

For the area of the county that lies outside the GABs of the DGAs, it is estimated that 15,038 additional residential lots could be developed, along with 95 acres of developable

commercial land and 220 acres of developable industrial land. Based on this amount of future development, an estimated 3,759,500 gpd of additional of water demand would be generated by residential development, 66,500 gpd by commercial development, and 176,000 gpd by industrial development. In total, the county's rural areas are estimated to generate an average of 4,002,000 gpd of additional water usage.

While the Finksburg area is more urbanized than is typically found in rural areas, it is included in the analysis for rural areas given that it lacks community water and sewerage facilities.

[Note: These estimates were calculated using data based on land use designation only.]

Agricultural Use

Agriculture and its associated support businesses are the leading economic generator in Carroll County. The county ranks 9th in the State in total value of agricultural products sold. The county has approximately 142,000 acres in farmland, with an average farm size of 124 acres. Cropland comprises approximately 72 percent of total farmland. The county ranks within the top 5 in the state regarding the major livestock categories.

The latest data on estimated water use that is available from the U.S. Geological Survey (USGS) is for 2000. According to these data, agricultural operations in Carroll County devoted an estimated 390 acres to irrigation and consumed an estimated 310,000 gpd through irrigation withdrawals. An estimated 810,000 gpd were withdrawn for livestock operations. In total, agricultural uses consumed an estimated 1,120,000 gallons of water per day in 2000.

Comparable data from the 1995 Survey were not reported; data from the 1990 and 1985 Surveys were irretrievable from the USGS website.

Carroll County anticipates that growth in water use for agricultural purposes will be minimal, projecting an increase in the range of one to two percent.

Municipal Systems & Designated Growth Areas

The following table provides estimated future water demand, broken out by planned water service area, for each of the major community (public) water supply systems that operate in the County. "Current Demand" represents actual water usage by residents, businesses, and industries. Demand is measured as the average number of gallons consumed per day. "Planned Future Demand" and "Other Potential Demand" include both new, additional development as well as existing development that is currently unserved. For purposes of this plan document, properties that are currently designated in the "No Planned Water Service Area", which are represented under "Other Potential Demand," and are located within the DGA boundary, are assumed to be served in the long term.

"Infill Demand" is based on current zoning, while "Future Demand" and "Other Potential Demand" are based on current land use designation.

Future Water Demand by Service Category for Each Designated Growth Area
(Gallons per Day)

Community	Current Demand[1]	Planned Future Demand[2]		Other Potential Demand[3]	Total Demand
		Infill Demand	Future Demand		
Freedom/Sykesville	2,182,422	641,250	712,590	974,620	4,510,882
Hampstead[4]	459,680	22,500	0	959,200	1,441,380
Manchester	299,693	74,600	108,710	319,520	802,523
Mount Airy	765,000	87,500	221,750	114,750	1,189,000
New Windsor	159,600	35,850	248,940	3,800	448,190
Taneytown	509,143	60,300	1,215,630	750	1,785,823
Union Bridge	199,123	46,700	592,840	36,420	875,083
Westminster	2,960,000	732,050	956,400	689,850	5,338,300
Countywide Total	*7,534,661*	*1,700,750*	*4,056,860*	*3,098,910*	*16,391,181*

[1] These data are the greatest annual average daily demand for the 5-year period from 2003 through 2007.
[2] These data relate to areas located within the designated planned water service area. Infill demand is calculated for areas classified in the "Existing/Final Planning" service category; Future demand is calculated for the combined area classified in the "Priority" or "Future" service category.
[3] These data relate to areas designated in the "No Planned Water Service Area" but located within the Community GAB.
[4] Calculations for future water demand used the CMP data. This demand is reflected under "Infill Demand". However, the CMP data do not account for additional demand that would occur within the balance of the planned water service area, or the additional demand within the balance of the growth area that is designated in the "No Planned Water Service Area." To factor in this further demand, future development potential and existing development that would be served were estimated and calculated for water demand.

Source: Carroll County Department of Planning, December 2008

The following table presents the same water demand estimates as the preceding table, except that demand is indicated by type of land use – residential, commercial, and industrial.

Future Water Demand by Land Use for Each Designated Growth Area
(Gallons per Day)

Community	Current Demand[1]	Additional Demand by Land Use			Total Demand
		Residential	Commercial	Industrial	
Freedom/Sykesville	2,182,422	1,754,750	33,950	539,760	4,510,882
Hampstead	459,680	441,000	43,260	497,440	1,441,380
Manchester	299,693	452,500	50,330	0	802,523
Mount Airy	765,000	285,500	85,250	53,250	1,189,000
New Windsor	159,600	169,750	2,520	116,320	448,190
Taneytown	509,143	709,750	98,770	468,160	1,785,823
Union Bridge	199,123	345,750	43,890	286,320	875,083
Westminster	2,960,000	1,497,250	53,130	827,920	5,338,300
Countywide Total	*7,534,661*	*5,656,250*	*411,100*	*2,789,170*	*16,391,181*

[1] These data are the greatest annual average daily demand for the five-year period from 2003 through 2007.

Source: Carroll County Department of Planning, December 2008

Annexation Areas within the Municipal Growth Elements

Portions of several of the DGAs are predominantly located outside the corporate limits of the municipality. Many of these areas also are outside the area planned for public water service within the horizon of the Water and Sewer Plan. These areas are designated "No Planned Service" in the *Carroll County Water and Sewerage Master Plan*. Estimated future water demand for these areas is identified as "Other Potential Demand" in the table titled "Future Water Demand by Service Category for Each Designated Growth Area." While these areas are currently designated "No Planned Service" because service is not planned (or guaranteed) to occur within the 10-year horizon of the *Master Plan for Water & Sewerage*, ultimately, inclusion in the GAB infers the intention to annex these areas at some point in the future. They would be planned to be served upon annexation.

11 Water Balance – Supply Available for Consumption

A water balance assessment was completed to help identify 'untapped' water supplies that might be available for consumption. In assessing available water supply, both groundwater and surface water were evaluated and pertinent inputs and outputs to the hydrologic system were considered. Total estimated water availability for each watershed was determined.

The evaluations for these watersheds generally followed the methodology used for the report *An Evaluation of the Water Resources in the Catoctin Creek Watershed*, which was produced by MDE in May 2006. A few notable exceptions to the methodology were made. The recharge from septic systems, as well as water returned to the system from wastewater discharge, was counted toward the available water. In addition, the impact of agricultural water demand also was considered.

The water balance methodology is based on the approach outlined in Maryland's June 2007 Water Resources Element of the Comprehensive Plan – Guidance Document (M&G #26) and detailed in MDE's May 2006 *An Evaluation of the Water Resources in the Catoctin Creek Watershed*. MDE's Catoctin Creek report did not include a comprehensive discussion of all source data and methods used in the analyses. Therefore, specific assumptions and changes were made in developing methodology which may differ somewhat from MDE's approach. Also, newer and/or County-specific datasets are incorporated into this analysis. The list of noteworthy differences in methods (or more detailed method specifications) is as follows:

1. Self-supplied residential water demands are estimated based on the number of existing households (not served by public water) in the current address database provided by the County. It is assumed that the water demands for all households outside of the service areas are self-supplied by onsite individual groundwater wells and that each household consists of a single family with an average day water demand of 250 gpd. Households

from the County address database are used as the basis for self-supplied residential demands, because the Census 2000 data is nearly ten years old and may not be as representative of the current population.

2. The methodology incorporates septic returns to groundwater in order to determine the final groundwater availability. These returns are included because a significant portion of the groundwater demands are returned via septic systems. While some failures in septic systems may occur in the future, it is anticipated that the majority of systems will continue to operate and return significant quantities of water as the county grows. Based on published literature values, the average return rate for domestic use is approximately 80 percent; that is the default assumption. The County's intent to incorporate septic-based recharge of the aquifer system was discussed with MDE prior to moving forward.

3. Future demands for serviced and self-supplied residences are evaluated based on the number of additional households estimated at buildout in the County's BLI plus the number of self-supplied residences within the GABs. The BLI is considered to constitute the best source of available data representing potential population growth, while also providing the spatial resolution necessary for analyses at the subwatershed level.

4. The analysis of surface water availability included in this evaluation is generally based on MDE's approach in the Catoctin Creek analysis. However, MDE's report did not explicitly describe the methodology for determining the storage-safe yield curves. For this analysis, equivalent storage-safe yield curves are developed for each subwatershed by estimating required storage using the worst drought on record for the same gauges used in the groundwater availability calculations.

Malcolm Pirnie prepared a detailed report on methods and results for completing water balance assessments for 8-digit watersheds in Carroll County. More detailed information can be found in the July 30, 2009 report, titled *Carroll County Water Demands and Availability*.

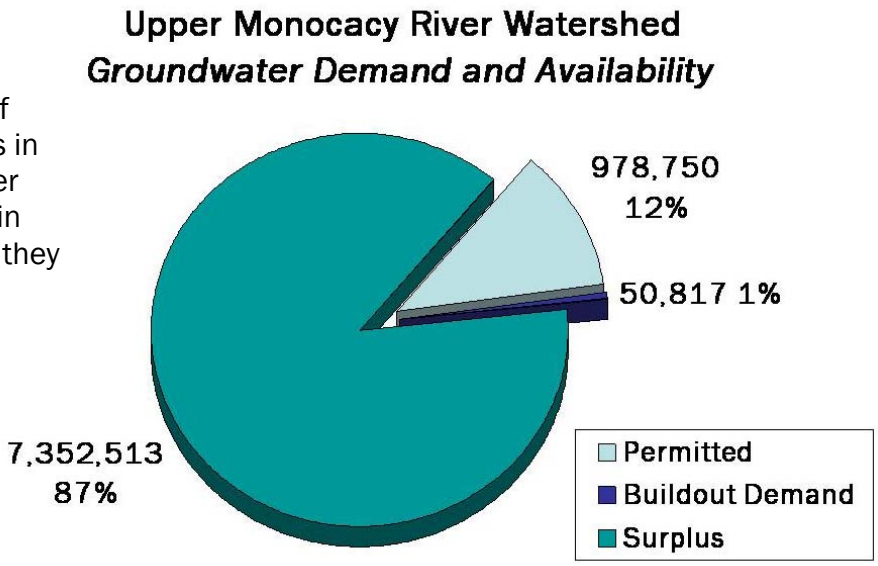
The following tables compare by watershed the reported, permitted, and buildout water demands, returns, and availability. "Reported" is based on existing water demands (for municipal supplies, 2007 average day withdrawals). "Permitted" refers to the maximum average day withdrawals permitted by MDE. "Buildout," for purposes of this particular analysis, was based on projected water demand (average day) for all areas within GABs on the adopted community comprehensive plans, but also includes buildout of areas outside DGAs that would be private wells. All data are reported in gallons per day, with the exception of the surface water storage figures. These figures represent total storage capacity in millions of gallons (MG).

The analysis focused on the two most significant aspects of returns – WWTPs and residential septic systems. The returns for each are reflected in the following tables. However, the total returns figure includes other categories factored into returns, such as industry, nonresidential septic systems, and quarries. Therefore, the total for returns is not the sum of the WWTPs and Septic figures shown in the tables.

In the following "Water Balance Assessment Results Summary" tables, the groundwater demand less septic returns equals the difference between the available groundwater and groundwater surplus. (GW Demands – Septic Returns = GW Availability – GW Surplus) In addition, it should be noted buildout demand was apportioned to the watershed in which the demand originates. Therefore, the buildout figure is less than the permitted figure for surface water. Many of the DGAs, however, are split between two or more watersheds. In this case, demand in a given watershed could be served by water that originated from another watershed.

Upper Monocacy River

Given the present level of analysis, water resources in the Upper Monocacy River watershed *are available* in sufficient quantities that they could be developed to meet projected buildout demands.



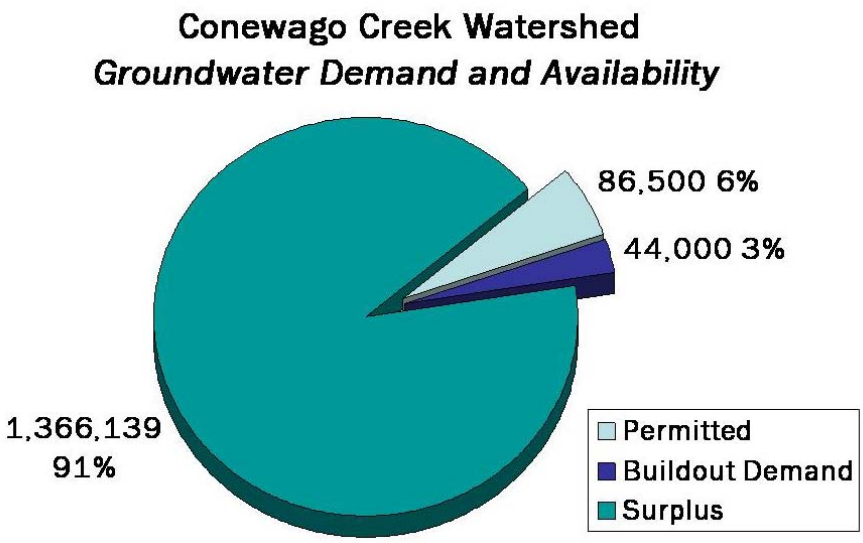
Upper Monocacy River Watershed
Water Balance Assessment Results Summary

		Reported	Permitted	Buildout
DEMANDS				
SW	Surface Water	707	10,000	707
GW	Groundwater	755,765	968,750	1,018,860
	Total	*756,472*	*978,750*	*1,019,567*
RETURNS				
	WWTP	407,055	466,400	1,390,885
	Residential Septic	238,800	238,800	364,000
	Other	6,000	121,200	149,165
	Total	*651,855*	*826,400*	*1,904,050*
WATER RESOURCES				
SW	Flowby	5,581,106	5,581,106	5,581,106
SW	Storage	683 MG	686 MG	683 MD
GW	Availability	7,919,973	7,919,973	7,919,973
GW	Surplus	7,409,009	7,206,023	7,352,513

Source: "Carroll County Water Demand and Availability," Malcolm Pirnie, July 30, 2009

Conewago Creek

Groundwater availability in the Carroll County portion of Conewago watershed was estimated to be approximately 1.4 mgd. Therefore, given the present level of analysis, water resources in the Conewago Creek watershed *are available* in sufficient quantities that they could be developed to meet projected buildout demands.



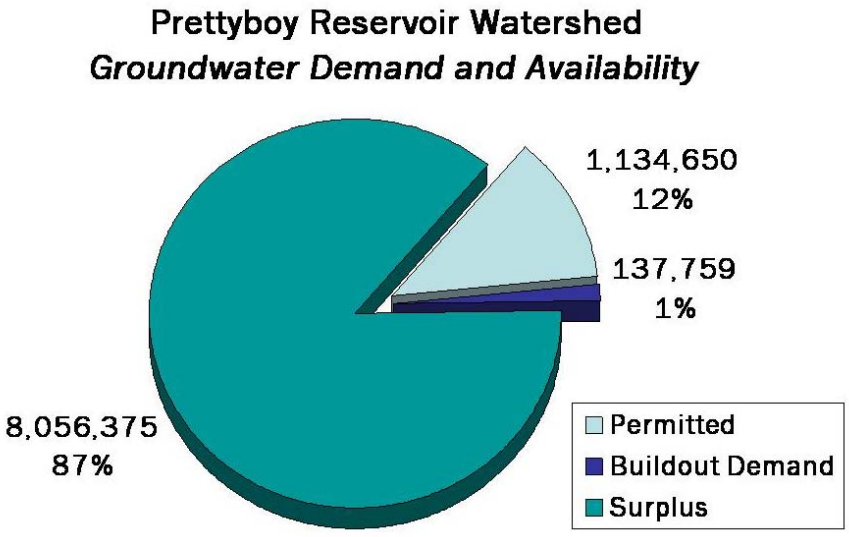
Conewago Creek Watershed
Water Balance Assessment Results Summary

		Reported	Permitted	Buildout
DEMANDS				
SW	Surface Water	0	0	0
GW	Groundwater	86,500	86,500	130,500
	Total	*86,500*	*86,500*	*130,500*
RETURNS				
	WWTP	0	0	0
	Residential Septic	71,000	71,000	91,800
	Other	0	0	12,600
	Total	*71,000*	*71,000*	*104,400*
WATER RESOURCES				
SW	Flowby	1,692,436	1,692,436	1,692,436
SW	Storage	NA	NA	NA
GW	Availability	1,392,239	1,392,239	1,392,239
GW	Surplus	1,376,739	1,376,739	1,366,139

Source: "Carroll County Water Demand and Availability," Malcolm Pirnie, July 30, 2009

Prettyboy Reservoir

Given the present level of analysis, water resources in the Prettyboy Reservoir watershed *are available* in sufficient quantities that they could be developed to meet projected buildout demands.



Prettyboy Reservoir Watershed
Water Balance Assessment Results Summary

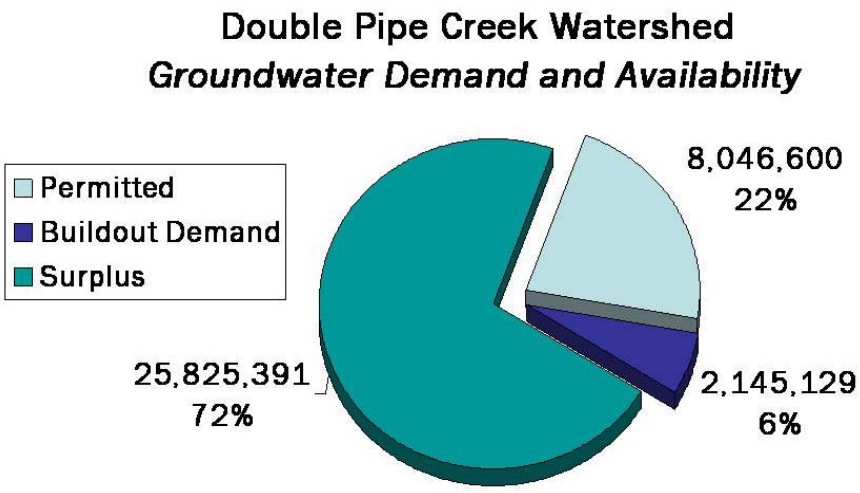
		Reported	Permitted	Buildout
DEMANDS				
SW	Surface Water	12,268	22,000	12,268
GW	Groundwater	876,583	1,112,650	1,260,141
	Total	*888,851*	*1,134,650*	*1,272,409*
RETURNS				
	WWTP	240,661	457,360	375,293
	Residential Septic	587,600	587,600	804,800
	Other	11,800	11,800	100,200
	Total	*840,061*	*1,056,760*	*1,280,293*
WATER RESOURCES				
SW	Flowby	10,431,070	10,431,070	10,431,070
SW	Storage	720	721	720
GW	Availability	8,411,515	8,411,515	8,411,515
GW	Surplus	8,134,332	7,898,265	8,056,375

Source: "Carroll County Water Demand and Availability," Malcolm Pirnie, July 30, 2009

Double Pipe Creek

Water returns in the watershed are largely comprised of municipal WWTP returns (2.6 mgd, 44%), quarry discharges (1.7 mgd, 30%), and septic returns (1.5 mgd, 26%). Total returns are projected to increase from the existing rate of 5.8 mgd to a buildout rate of 9.5 mgd.

Given the present level of analysis, water resources in the Double Pipe Creek watershed *are available* in sufficient quantities that they could be developed to meet projected buildout demands.



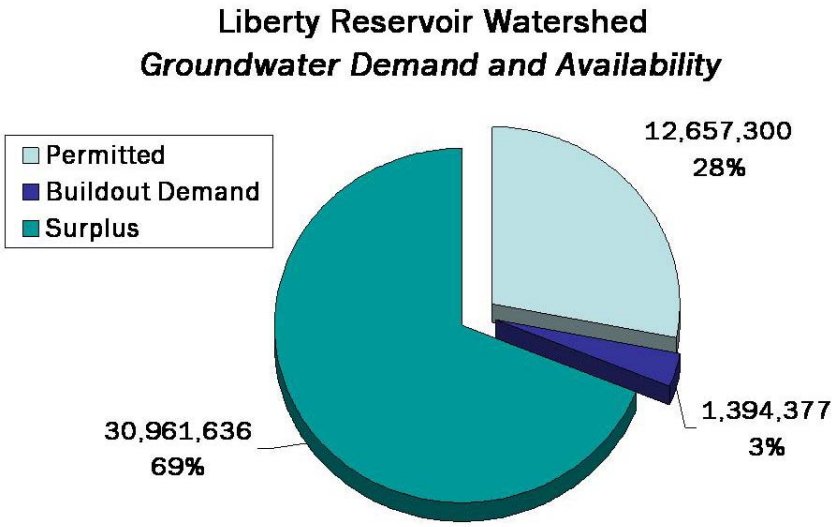
Double Pipe Creek Watershed
Water Balance Assessment Results Summary

		Reported	Permitted	Buildout
DEMANDS				
SW	Surface Water	139,907	792,300	1,352,061
GW	Groundwater	5,887,204	7,254,300	8,839,668
	Total	*6,027,111*	*8,046,600*	*10,191,729*
RETURNS				
	WWTP	2,553,821	3,327,290	4,017,641
	Residential Septic	1,491,200	1,491,200	2,157,600
	Other	1,740,800	1,845,600	3,288,122
	Total	*5,785,821*	*6,664,090*	*9,463,363*
WATER RESOURCES				
SW	Flowby	37,707,072	37,707,072	37,707,072
SW	Storage	5,029	5,254	5,447
GW	Availability	32,171,059	32,171,059	32,171,059
GW	Surplus	27,800,855	26,433,759	25,825,391

Source: "Carroll County Water Demand and Availability," Malcolm Pirnie, July 30, 2009

Liberty Reservoir

Water returns in the watershed are largely comprised of septic returns (2.8 mgd, 67%) and industry discharges (1.0 mgd, 25%). Municipal WWTP returns are largely returned to adjacent watersheds so that municipal returns only account for approximately 5.6 percent (0.23 mgd) of the total returns despite relatively large municipal demands in the watershed. Water returns are projected to increase to 5.8 mgd at buildout. Given the present level of analysis, water resources in the Liberty Reservoir watershed *are available* in sufficient quantities that they could be developed to meet projected buildout demands.



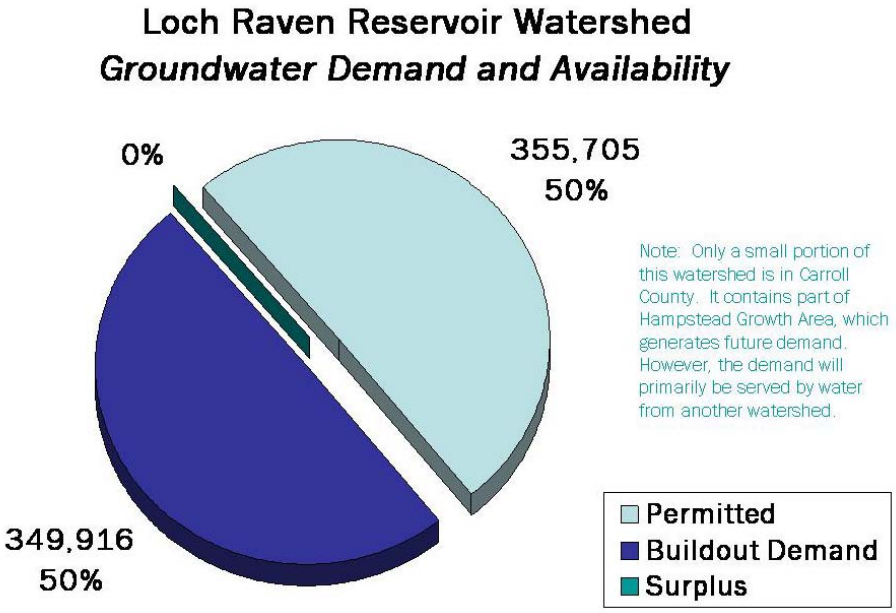
Liberty Reservoir Watershed
Water Balance Assessment Results Summary

		Reported	Permitted	Buildout
DEMANDS				
SW	Surface Water	4,318,319	6,764,900	5,977,392
GW	Groundwater	5,595,895	5,892,400	8,074,285
	Total	*9,914,214*	*12,657,300*	*14,051,677*
RETURNS				
	WWTP	231,770	296,310	262,554
	Residential Septic	2,770,600	2,770,600	3,664,400
	Other	1,151,303	1,336,760	1,865,126
	Total	*4,153,673*	*4,403,670*	*5,792,080*
WATER RESOURCES				
SW	Flowby	42,672,450	42,672,450	42,672,450
SW	Storage	3,534	3,868	3,760
GW	Availability	35,012,921	35,012,921	35,012,921
GW	Surplus	32,292,226	31,995,721	30,961,636

Source: "Carroll County Water Demand and Availability," Malcolm Pirnie, July 30, 2009

Loch Raven Reservoir

Without a more detailed evaluation or expansion of the analysis area, the water resources in the Carroll County portion of the Loch Raven watershed *would not be sufficient* to meet buildout groundwater demands. Future water demands in this watershed would have to be met using water from outside the small Carroll County portion of the watershed.



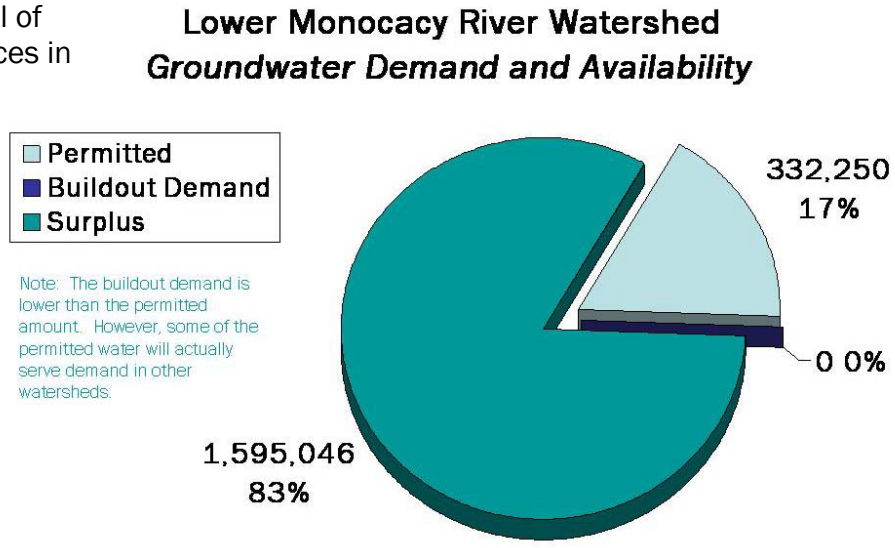
Loch Raven Reservoir Watershed
Water Balance Assessment Results Summary

		Reported	Permitted	Buildout
DEMANDS				
SW	Surface Water	0	0	0
GW	Groundwater	326,105	355,250	705,166
	Total	*326,105*	*355,250*	*705,166*
RETURNS				
	WWTP	367,719	464,000	592,550
	Residential Septic	3,400	3,400	45,600
	Other	200	200	2,800
	Total	*371,319*	*467,600*	*640,950*
WATER RESOURCES				
SW	Flowby	288,987	288,987	288,987
SW	Storage	NA	NA	NA
GW	Availability	237,727	237,727	237,727
GW	Surplus	-84,778	-113,923	-419,039

Source: "Carroll County Water Demand and Availability," Malcolm Pirnie, July 30, 2009

Lower Monocacy River

Given the present level of analysis, water resources in the Lower Monocacy River watershed *are available* in sufficient quantities that they could be developed to meet projected buildout demands.



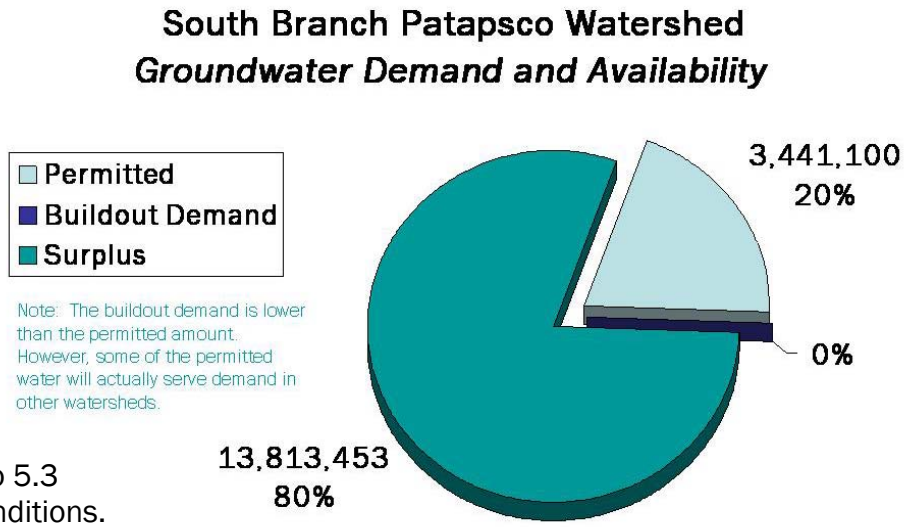
Lower Monocacy River Watershed
Water Balance Assessment Results Summary

		Reported	Permitted	Buildout
DEMANDS				
SW	Surface Water	0	0	0
GW	Groundwater	313,202	332,250	314,072
	Total	*313,202*	*332,250*	*314,072*
RETURNS				
	WWTP	0	0	0
	Residential Septic	192,200	192,200	222,600
	Other	4,600	4,600	21,400
	Total	*196,800*	*196,800*	*244,000*
WATER RESOURCES				
SW	Flowby	2,057,587	2,057,587	2,057,587
SW	Storage	NA	NA	NA
GW	Availability	1,665,118	1,665,118	1,665,118
GW	Surplus	1,548,717	1,529,668	1,595,046

Source: "Carroll County Water Demand and Availability," Malcolm Pirnie, July 30, 2009

South Branch Patapsco River

The majority of water returns in the watershed (3.1 mgd) currently consist of municipal WWTP returns (approximately 2.0 mgd, 65%) and septic returns (approximately 1.1 mgd, 35%). Future returns are projected to increase to 5.3 mgd under buildout conditions. Given the present level of analysis, water resources in the South Branch Patapsco River watershed *are available* in sufficient quantities that they could be developed to meet projected buildout demands.



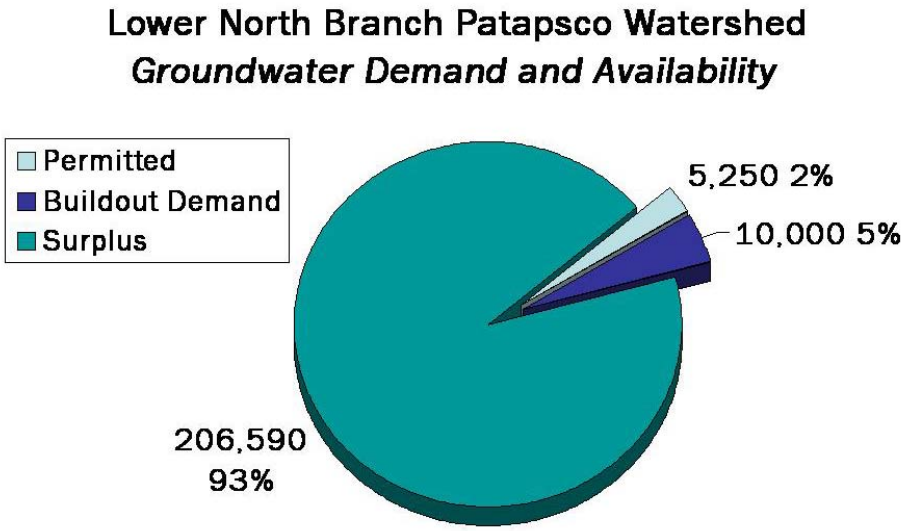
South Branch Patapsco Watershed
Water Balance Assessment Results Summary

		Reported	Permitted	Buildout
DEMANDS				
SW	Surface Water	53,660	3,441,100	635,530
GW	Groundwater	1,784,294	2,392,500	2,173,533
	Total	*1,837,954*	*5,833,600*	*2,809,063*
RETURNS				
	WWTP	1,988,161	6,745,000	3,683,066
	Residential Septic	1,071,600	1,071,600	1,440,400
	Other	20,402	86,242	172,112
	Total	*3,080,163*	*7,902,842*	*5,295,578*
WATER RESOURCES				
SW	Flowby	18,109,302	18,109,302	18,109,302
SW	Storage	1,497	2,232	1,610
GW	Availability	14,398,786	14,398,786	14,398,786
GW	Surplus	13,706,492	13,098,286	13,813,453

Source: "Carroll County Water Demand and Availability," Malcolm Pirnie, July 30, 2009

Lower North Branch Patapsco River

Given the present level of analysis, water resources in the Patapsco River Lower North Branch watershed *are available* in sufficient quantities that they could be developed to meet projected buildout demands.

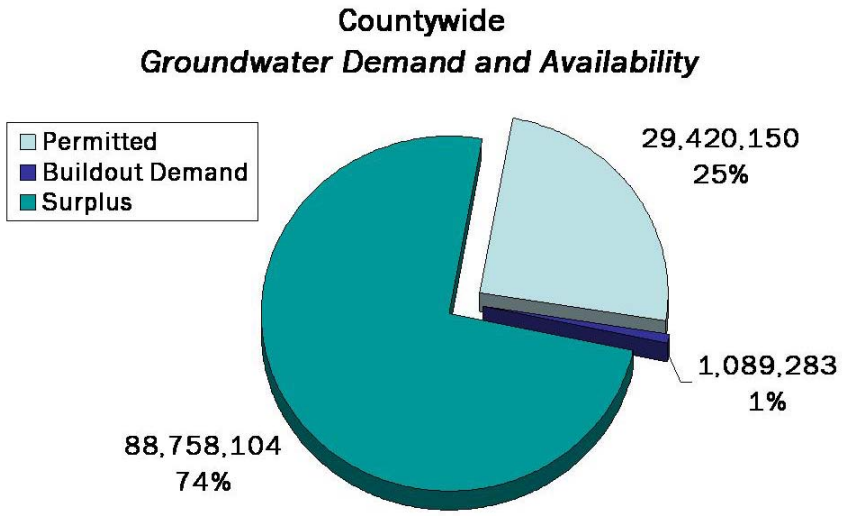


Lower North Branch Patapsco River Watershed
Water Balance Assessment Results Summary

		Reported	Permitted	Buildout
DEMANDS				
SW	Surface Water	0	0	0
GW	Groundwater	5,250	5,250	15,250
	Total	*5,250*	*5,250*	*15,250*
RETURNS				
	WWTP	0	0	0
	Residential Septic	3,200	3,200	10,600
	Other	0	0	1,600
	Total	*3,200*	*3,200*	*12,200*
WATER RESOURCES				
SW	Flowby	276,398	276,398	276,398
SW	Storage	NA	NA	NA
GW	Availability	209,640	209,640	209,640
GW	Surplus	207,590	207,590	206,590

Source: "Carroll County Water Demand and Availability," Malcolm Pirnie, July 30, 2009

Countywide



The majority of average water demands are mostly being met by groundwater wells (78%) compared to surface water sources (22%). A significant portion of the groundwater demand is from self-supplied domestic users (private residential wells) who do not require a water appropriation permit, given that their individual household demands are well below the current MDE permit requirement threshold. Current surface water withdrawals constitute a larger portion (4.1 mgd, 56%) of the total source supply (7.3 mgd) when only examining withdrawals subject to an MDE appropriation permit.

There are approximately 21 mgd of existing appropriations in the county, in addition to the approximate average of 8 mgd of self-supplied withdrawals for a total allocation of 29 mgd. The largest type of allocations in the county (40%) is municipal supply to the public water service areas.

Annual average buildout demands in the county are about 30.5 mgd. The majority of the existing demands are associated with residential uses, including 10.3 mgd (34%) for municipally supplied residential demands and 12.2 mgd (40%) for self-supplied residential demands.

With estimated existing and projected buildout groundwater demands of 15-23 mgd, and total projected demands of 30 mgd, groundwater resources in the county are theoretically more than adequate to meet existing and buildout demands. However, groundwater resources are not likely to be evenly distributed throughout the county.

Countywide Water Balance Assessment Results Summary

		Reported	Permitted	Buildout
DEMANDS				
SW	Surface Water	4,524,861	11,030,300	7,977,958
GW	Groundwater	15,630,797	18,389,850	22,531,475
	Total	*20,155,659*	*29,430,150*	*30,509,433*
RETURNS				
	WWTP	5,789,187	11,756,360	10,321,989
	Residential Septic	6,429,600	6,429,600	8,801,800
	Other	2,935,105	3,406,402	5,613,125
	Total	*15,153,892*	*21,592,362*	*24,736,914*
WATER RESOURCES				
SW	Flowby	118,816,408	118,816,408	118,816,408
SW	Storage	11,463 mgd	12,761 mgd	12,200 mgd
GW	Availability	101,418,978	101,418,978	101,418,978
GW	Surplus	92,391,182	89,632,128	88,758,104

Source: "Carroll County Water Demand and Availability," Malcolm Pirnie, July 30, 2009

Potential Effects Related to Climate Change

A rather dire climate picture was included in the Maryland Commission on Climate Change report, "Climate Action Plan - Interim Report to Governor and Maryland General Assembly" (2008). In this report it was stated that: "*The Chesapeake Bay has already warmed by about 2°F and continued warming will make our extensive efforts to restore its health that much more difficult. Examination of the detail of the global models used by the IPCC shows that, if GHG emissions continue to grow on the present trajectory, air temperatures will increase in Maryland more than the global average, resulting in average winter temperature increasing by about 8°F by the end of the century. While this might be welcomed by some, average summer temperature would also increase by about 7°F and the number of days with temperatures greater than 90°F is likely to quadruple, with 25 or more 100°F days.... Precipitation during the winter and spring is likely to increase 10-15%, coming mostly in heavy rainfall events, but the summers and falls are likely to be drier as increased evaporation depletes soil moisture*." A future that looks like this would include longer growing seasons, higher evaporation rates and higher water demands for domestic, industrial, and agricultural users. Perhaps of more concern is the possibility of more severe drought and flooding events, both of which could significantly affect the quantity and quality of Carroll County's water resources.

Climate change research efforts and data analyses too numerous to list have been undertaken in recent years. However, an important publication was released earlier this year (2009) by the federal government, entitled *Climate Change and Water Resources Management: A Federal Perspective*. This interagency report was prepared by the USGS, U.S. Army Corps of Engineers (US ACE), Bureau of Reclamation, and National Oceanic and Atmospheric Administration. Two key points made in this report are as follows:

- *"Climate change could affect all sectors of water resources management, since it may require changed design and operational assumptions about resource supplies, system demands or performance requirements, and operational constraints. The assumption of temporal stationarity in hydroclimatic variables should be evaluated along with all other assumptions."*

- *"Current expectations about future climate may indicate a need to supplement historical climate information. Planning assumptions might instead be related to projections of future temperature and precipitation. This can be accomplished using a multitude of approaches; a best approach has yet to be determined."*

Considering that Carroll County is looking out decades into the future toward a buildout condition, and with the possibility of reduced safe yield when considering pre-20th century history and potential climate change effects, future water supply needs may be greater than currently anticipated. The science has not yet progressed to the point of being able to quantify how groundwater levels, streamflow patterns, or drought severity will change in the Mid-Atlantic region as a result of current climate change trends. However, a prudent approach is needed to be pro-active in planning for future water needs and to consider a diverse suite of water sources to improve supply reliability in the event of severe drought or other climate-induced changes in water availability. Carroll County may wish to consider moving more in the direction of integrated water resources planning to integrate and balance all possible water resources to sustain water demands into the future. Integrated water resources planning is gaining momentum and, as summarized below, offers a number of significant improvements over traditional water supply planning approaches:

- Comprehensive and diverse evaluation criteria (not just least-cost solution)
- Considers supply reliability (not just current capacity)
- Demand can be modified (not just supply options)
- Embraces uncertainty with planning for multiple possible future scenarios

The above information was excerpted from the *Carroll County Water Demands and Availability* report, dated July 30, 2009, and produced by Malcolm Pirnie. Please refer to this report for more detail on the water balance assessment.

12 Current Capacity and Existing Water Quantity Limitations

Capacity of Individual Municipal Systems

The municipal water supply systems serve the populations in the DGAs. Combined, existing usage (average daily demand) totaled 7,534,661 gpd countywide. Residential population served by these systems countywide was about 89,545. The following table indicates the existing usage in 2007 and the population estimated to be served, based on WSCMP worksheet data. Where population data were not provided in the WSCMP worksheet, data was taken from the *2007 Carroll County Master Plan for Water & Sewerage*.

2007 Existing Demands and Residential Population Served

Community/System	Existing Usage	Population Served
Freedom/Sykesville	2,182,422	23,580
Hampstead	459,680	6,400
Manchester	299,693	4,628
Mount Airy	765,000	*8,631
New Windsor	159,600	1,414
Taneytown	509,143	*6,200
Union Bridge	199,123	1,000
Westminster	2,960,000	37,692
Totals	***7,534,661***	***89,545***

Source: Water Supply Capacity Management Plan worksheets, 2007
*For population served - Carroll County Department of Planning, 2007 *Water and Sewerage Master Plan*

The following table is a snapshot in time of the capacity of each water supply system in the county, based on 2007 data in the CMP worksheets. The net average day capacity available at buildout indicates the amount of additional capacity that would be needed to meet projected demand at full buildout of the growth area. The growth areas used are those that were in effect on the comprehensive plans adopted as of 2008. Capacity gained from planned improvements included in either a municipality's capital improvement program or in the 2007 *Carroll County Water & Sewerage Master Plan* would not be reflected in this figure.

To arrive at the net average day capacity available at buildout, the combined total of existing flows plus the sum of the capacity needed for infill, future, and no planned service ("Unserved Demand") is subtracted from the remaining capacity. If the remaining capacity is a negative number, the total unserved demand is treated as a negative number, with two negative numbers added together to determine the net average day capacity available at buildout.

Water Supply Capacity *Currently* Available for Existing and Future Growth
for Each Designated Growth Area
(in Gallons per Day)

Community	Current			Remaining Capacity	Unserved Demand		Net Avg Day Capacity Available at Buildout
	Permitted	Avg Day Capacity Limitation	Avg Day Drought Demand[1]		Infill + Future	No Planned Service	
Freedom/ Sykesville	4,648,000	3,448,000	2,400,664	1,047,336	1,353,840	974,620	(1,281,124)
Hampstead	521,400	521,400	505,650	15,750	22,500	959,200	(965,950)
Manchester	581,000	388,800	329,662	59,138	193,610	319,520	(453,992)
Mount Airy	865,000	865,000	841,500	23,500	309,250	114,750	(400,500)
New Windsor	196,100	78,462	175,560	(97,098)	284,790	3,800	(385,688)
Taneytown	583,000	563,846	560,057	3,789	1,275,930	750	(1,272,891)
Union Bridge	208,300	49,846	219,035	(169,189)	639,540	40,980	(849,709)
Westminster	3,476,000	2,273,077	3,256,000	(982,923)	307,960	689,850	(1,980,733)
Totals	*11,078,800*	*8,028,098*	*8,288,128*	*(260,030)*	*4,579,940*	*2,989,720*	*(7,829,690)*

[1] Average Day Demand here includes an additional 10% for drought demand

Source: Carroll County Department of Planning, December 2008

Summary of Capacity and Limitations Countywide

Total water demand for the eight municipal water supply systems within their respective DGAs is estimated to be 16,474,511 gpd. Subtracting total "current demand," estimated at 7,534,661 gpd, from the total number leaves 8,939,850 gpd of projected additional demand.

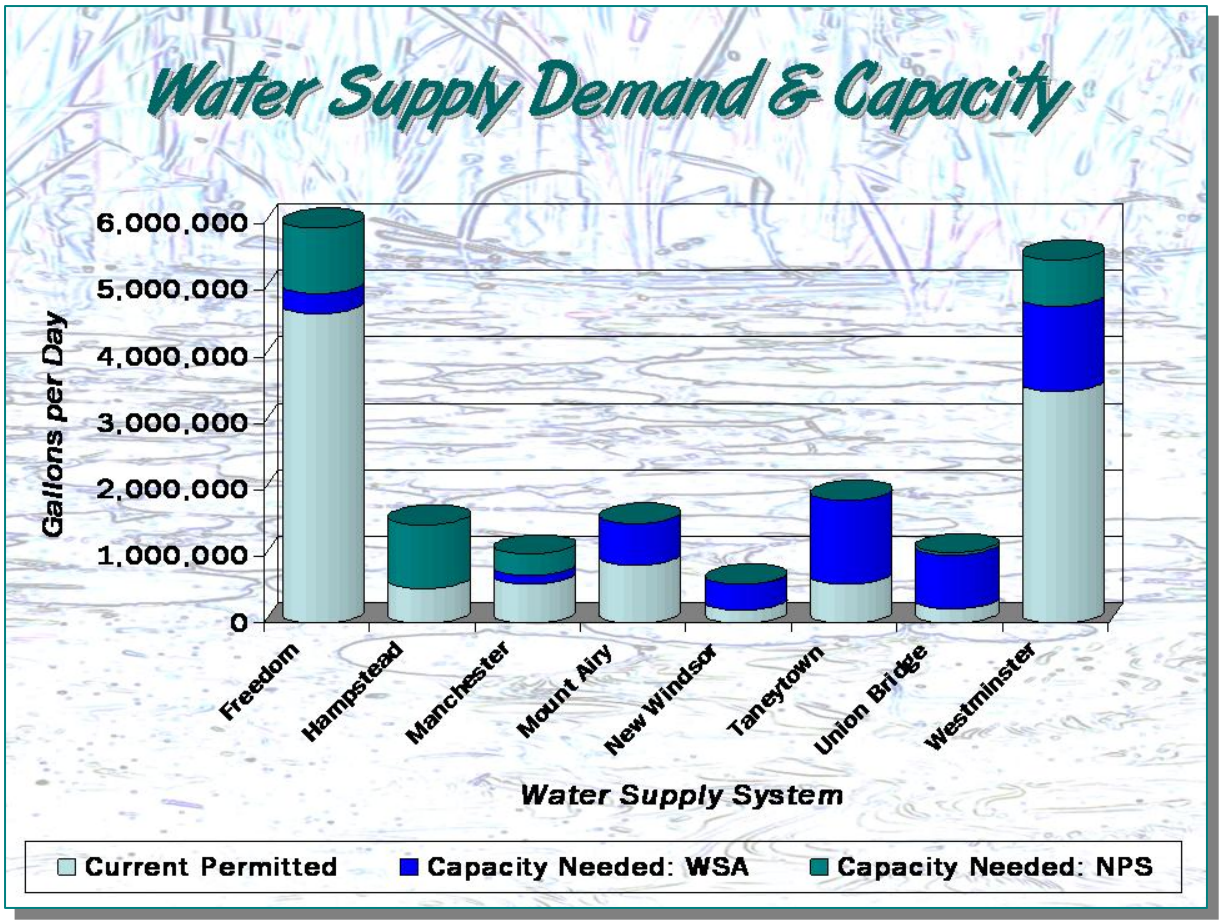
The combined additional residential, commercial, and industrial water demand for the balance of the county (i.e., the rural area outside the various DGAs) that would be generated by future development is estimated to be 4,002,000 gpd.

For 2000, an estimated 1,120,000 gpd of water were used for agricultural purposes. Assuming a 2 percent increase per year and calculating water demand over a 20-year period, agricultural operations would use an estimated 1,664,261 gpd, or an additional 544,261 gpd, by 2020.

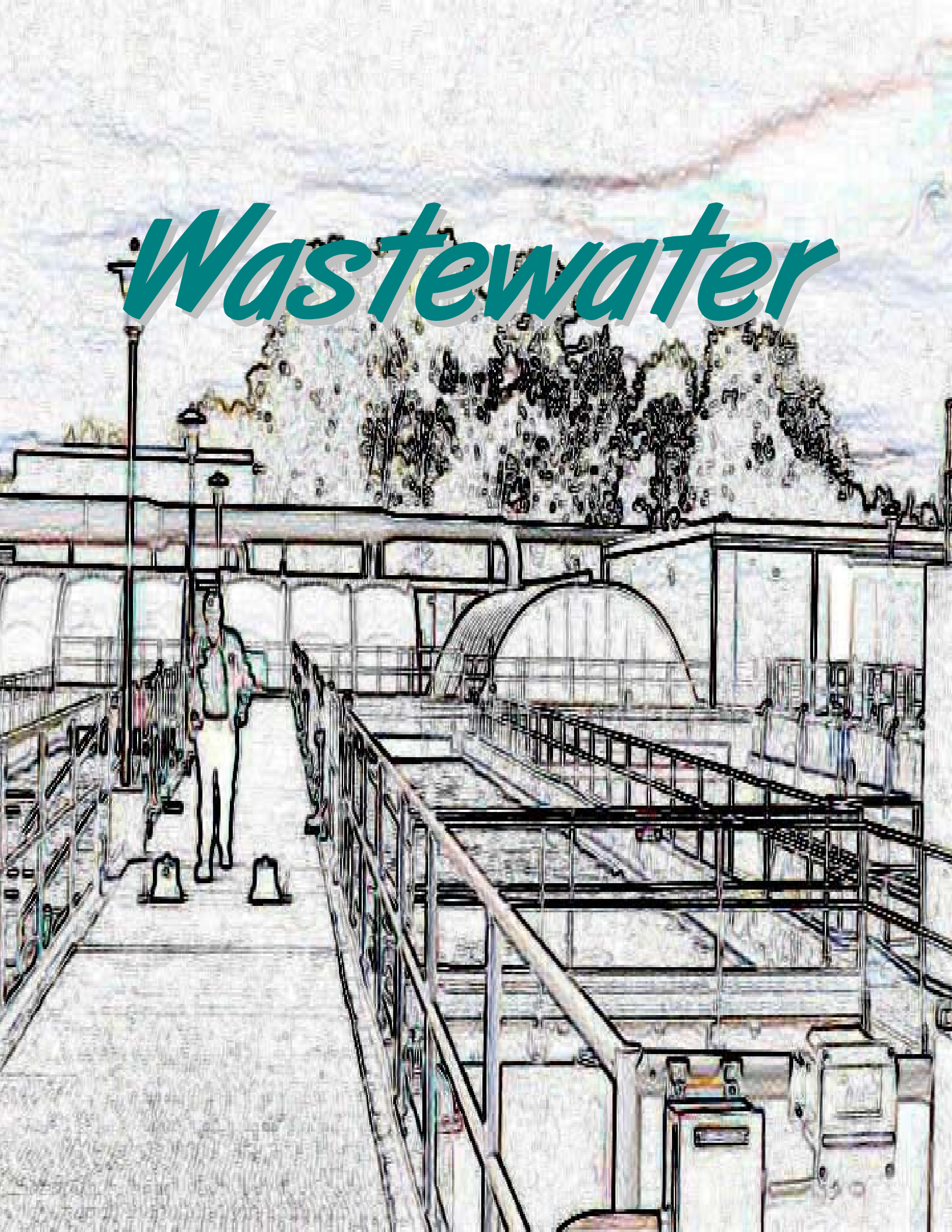
Given the above estimates for future water demand throughout the County, total additional water demand is estimated to be 13,486,111 gpd.

It is estimated that countywide 88,758,104 gallons of groundwater will be available after the county has fully developed (i.e., buildout) as currently planned. Based on groundwater resources alone, there appears to be ample water supplies available to accommodate future development. Combining available groundwater and surface water resources at buildout, the county has sufficient water supplies to accommodate future water demand.

When the county is examined in whole, even at buildout the total demand from all sources is approximately 25 percent of the theoretical resource, as determined by the water balance assessment (*Carroll County Water Demands and Availability*, July 30, 2009). The question becomes "Why are there apparent water shortages in some areas of the county?" First and foremost, abundant water resources are not evenly distributed across the region. Local hydrogeologic conditions and watershed or catchment area size are just some of the potential limiting factors. In addition, the ability to access the water resource, either directly due to land ownership issues or through expensive transmission methods, may be limiting factors. Those limiting factors and a host of additional ones are then evaluated for cost and administrative barriers. Therefore, the countywide results provide a more regional look at resources in the bigger picture of larger watersheds and ultimately the Chesapeake Bay.



Wastewater



Wastewater

Wastewater management in Carroll County takes place via one of two general methods. The first is sewage collection at an individual home or business with treatment by a septic system or similar onsite facility. This type of method is considered to generate a discharge which is referred to as a nonpoint source (NPS). The second type of collection is implemented in DGAs. In these areas, the sewage is collected from numerous homes and businesses in a sewer system, transmitted to a wastewater treatment plant (WWTP), and processed utilizing various methods. This type of wastewater treatment is considered to generate a discharge which is referenced to as a point source.

This second wastewater treatment system, utilized by municipalities and the county in select areas, requires permitting via the NPDES. This federally required permit is administered and issued by the State of Maryland. Following treatment, the amount of potential pollutant which is allowed to be discharged from the WWTP to a receiving water body (in most cases a stream or river) is regulated by the permit. The specific amount of pollutants is allocated by the amount of flow discharged and the assimilative capacity of the receiving waterbody. Various caps or limits have been applied to wastewater discharges to maintain the theoretical water quality standards of the receiving waterbody. Ultimately, the limitations on wastewater discharge are applied in an attempt to achieve goals established to help clean up the Chesapeake Bay.

This section in the WRE looks at the existing and planned capacity limits associated with municipal wastewater system in Carroll County, as well as those individual NPS facilities.

Note: In addition to individual septics systems, other types of NPS pollution include stormwater runoff and agricultural runoff. These NPSs are further addressed in the section entitled Nonpoint Source.

13 Future Additional Wastewater Demand Based on Existing Planned Growth

Capacity Management Plan Worksheets – Methodology

To identify wastewater capacity needs, you must first determine current service capacity. MDE expects potential demand and wastewater capacity needs for a planning area to be estimated using the guidance document prepared by MDE, *Wastewater Capacity Management Plans* (WWCMP).

A WWCMP is required to contain information on sewage system capacity and the demand created by existing and projected growth and development. A WWCMP is required by MDE

for municipalities operating at or above 80 percent of design capacity. However, MDE recommended using this tool to determine current capacity for purposes of the WRE as well.

Data was collected for each of the wastewater systems owned or operated by Carroll County or a municipality. Figure 2: Worksheet Style 2 (Pg 38) in MDE's Guidance Document: *Wastewater Capacity Management Plans* (2006) was used as a template and guide for collecting this data. A worksheet was prepared for each of these eight systems to capture a snapshot of the **current** capacity and projected demand, based on **existing** adopted land use plans, ordinances, and policies. (See the Appendices for copies of each individual worksheet, associated data, and any variations from the standard method.)

The current demand represents an average of the average daily flow for 2005, 2006, and 2007, less infiltration and inflow (I&I). I&I, for most systems, was estimated by subtracting the 2002 average daily flow (a particularly dry year) from the 2003 average daily flow (a particularly wet year) per MDE's worksheet. For efficiency and productivity, 2007 data was used for the CMP worksheets and wastewater information, so the process could continue without constant changing of data.

The S-1 Existing/Final Planning Sewer Service Areas (SSAs) were used to identify Existing and Encumbered S-1 Infill flow (numbers 6 through 10 on the worksheet). To estimate "future" flows, the Priority and Future Sewer Service Areas (S-3 and S-5) were used (number 11 on the worksheet). These were the required categories shown on MDE's worksheet. Demand for future flows from the No Planned Service areas that fall within the County's DGAs was also estimated.

The County's BLI data provides estimates of potential additional residential development based on either zoning or on adopted land use designations. Within the Existing/Final Planning Service Area, potential additional residential infill lots were based on the current zoning. Infill lots could potentially apply for a building permit and request to connect to the system at any time. For all other areas, future potential additional residential lots were estimated using the adopted land use designations, which would reflect the growth that is ultimately planned.

Future residential demand for wastewater then was estimated assuming residential lots would consume 250 gpd per household/lot, with the exception of Westminster. For Westminster, the usage is known to be closer to 235 gpd. Therefore, 235 gpd was used to estimate future residential demand for Westminster.

To arrive at future commercial and industrial demand, areas with adopted land use designations for commercial or industrial use were reviewed. Acreage was estimated for areas that are developed but not yet served. The buildable acreage of unimproved land was also estimated. Buildable acreage excludes streams, wetlands, and floodplains (see Appendix titled "Methodology to Estimate Future Commercial & Industrial Demand for Water & Sewer Service/Capacity" for more detailed methodology). Developed but not yet served acreage was added to buildable acreage to get a total acreage on which future demand was calculated. The combination of acreage from these two types of commercial land was

multiplied by 700 gallons per acre per day. Industrial acreage was multiplied by 800 gallons per acre per day (based on MDE guidance and the Water and Sewerage Master Plan).

In Manchester's case, additional demand was added to the residential demand category to reflect projected demand from two new schools that were coming online during this process or shortly thereafter.

In Freedom's case, additional demand beyond the BLI estimates used for residential demand was added to account for allocations and reservations. An additional 21,488 gpd in allocations was added, and an additional 27,765 gpd in reservations. The infill demand numbers in the Wastewater Capacity table, therefore, will not exactly match the infill demand numbers shown in the Wastewater Demand table.

For the Freedom water and sewer service areas, allocations represent capacity set aside to accommodate development that has already paid its area connection charges. These are typically sites for which building permits have already been issued, a site plan has been approved, or a minor subdivision has been approved. The capacity is "set aside" for two years after the area connections charges are paid. After two years, it is assumed that they are connected to the system.

Reservations represent a capacity that is unofficially 'reserved' for development in the pipeline, and represents a known quantity, but has not yet paid area connection charges. Using both allocations and reservations likely results in double-counting capacity demand. However, these numbers were included in the demand and capacity calculations knowing that it would provide very conservative numbers for the Freedom system but ensures the demand is accounted for.

For Hampstead and Westminster, numbers for residential, commercial, and industrial demand were provided by the municipality rather than strictly using the BLI data.

Mount Airy demand and capacity numbers may not match the BLI estimates, as the County does not have BLI information for the portion of Mount Airy that lies within Frederick County. Therefore, where this is a factor in estimating figures used in these analyses, the Town used their own calculations to capture its entire area.

On the worksheets, total demand for Infill and Future flows were added. The I&I estimate was added to total demand to arrive at a total Future Capacity Need. The difference between total future capacity needed and the current permitted flow represented the excess capacity available or additional capacity needed to serve the current SSAs. The MDE worksheets did not address demand that would be generated by areas within the GAB that are not currently within the planned SSA. This additional demand, however, was evaluated as part of Carroll County's WRE process.

Demand for Each Municipal System & Designated Growth Area

The following table provides estimated future sewer demand, broken out by planned sewer service area, for each of the major community (public) sewerage systems that operate in the County. "Current Demand" represents actual sewer flows generated by residents, businesses, and industries. Demand is measured as the average number of gallons treated per day. "Planned Future Demand" and "Other Potential Demand" include both new, additional development as well as existing development that is currently unserved. For purposes of this plan document, properties that are currently designated in the "No Planned Sewer Service Area," which are represented under "Other Potential Demand," and are located within the GAB, are assumed to be served in the long term.

"Infill Demand" is based on current zoning, while "Future Demand" and "Other Potential Demand" are based on current land use designation.

Future Wastewater Demand by Service Category for Each Designated Growth Area (in Gallons per Day)

Community	Current Demand*	Planned Future Demand***		Other Potential Demand****	Total Demand
		Infill Demand	Future Demand		
Freedom/Sykesville	2,160,000	445,100	1,077,130	1,344,190	5,026,420
Hampstead	628,000	65,400	236,750	576,190	1,506,340
Manchester	292,519	69,650	139,040	370,520	871,729
Mount Airy**	640,000	87,500	221,750	114,750	1,064,000
New Windsor	91,716	21,950	287,020	3,800	404,486
Taneytown	853,333	72,000	1,215,030	750	2,141,113
Union Bridge	177,967	101,900	609,640	40,980	930,487
Westminster	4,430,000	828,500	788,330	673,840	6,720,670
Total	*9,273,535*	*1,692,000*	*4,574,690*	*3,125,020*	*18,665,245*

* These data represent, in general, the annual average daily demand over the 3-year period 2005-2007.
**Mount Airy performed a full system I&I camera inspection of the original 1971 sewer system. The inspection revealed three major problems that averaged 250,000 gpd I&I flow. The current demand is the two-year average since repairs were made in May 2007.
*** These data relate to areas located within the designated planned sewer service area. Infill demand is calculated for areas classified in the "Existing/Final Planning" service category; Future demand is calculated for the combined area classified in the "Priority" or "Future" service category.
**** These data relate to areas designated in the "No Planned Sewer Service Area" but located within the Community GAB.

Source: Carroll County Department of Planning, December 2008

The following table presents the same sewer demand estimates as the previous table, except that demand is broken out by type of land use: residential, commercial, and industrial.

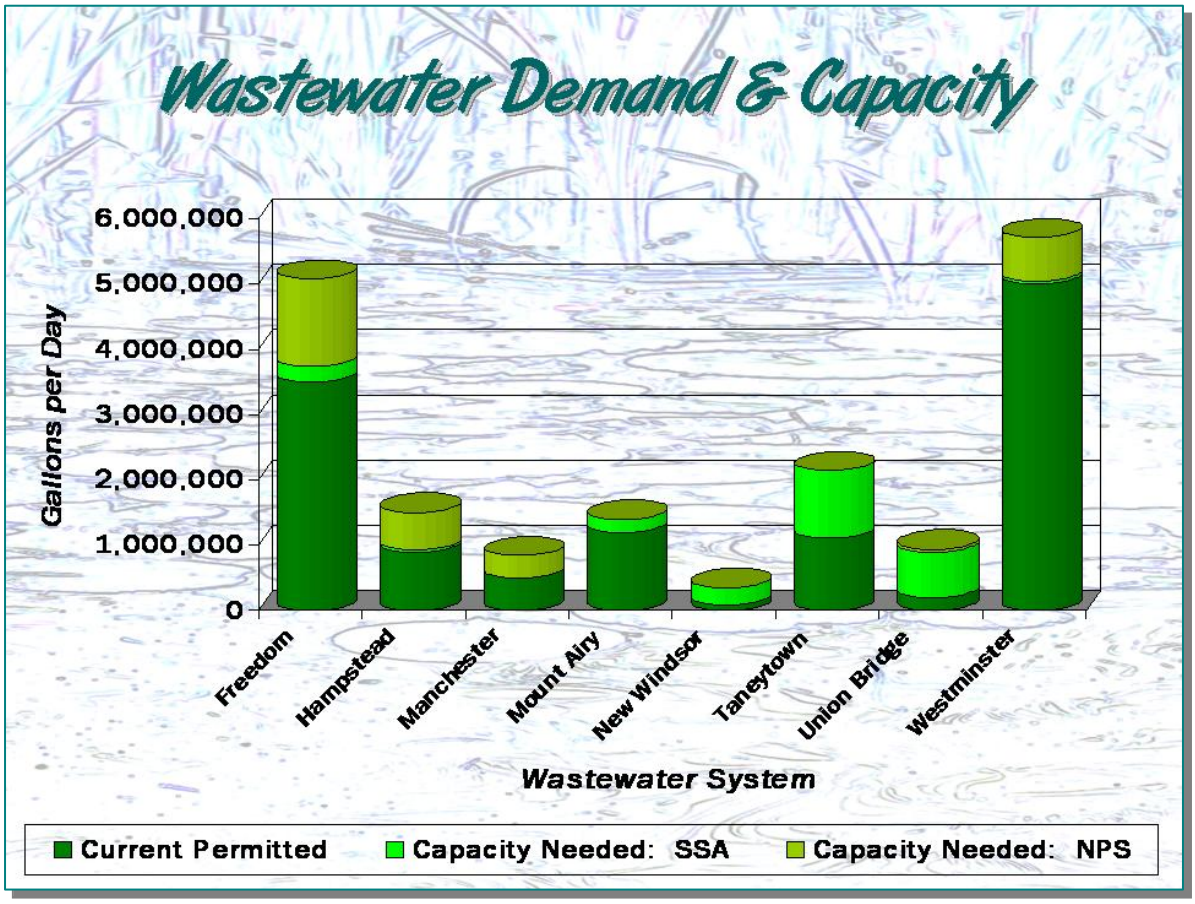
Future Wastewater Demand by Land Use for Each Designated Growth Area (in Gallons per Day)

Community	Current Demand*	Additional Demand by Land Use			Total Demand
		Residential	Commercial	Industrial	
Freedom/Sykesville	2,160,000	2,339,000	33,740	493,680	5,026,420
Hampstead	628,000	348,750	64,470	465,120	1,506,340
Manchester	292,519	530,000	49,210	0	871,729
Mount Airy**	640,000	285,000	85,250	53,250	1,064,000
New Windsor	91,716	162,250	2,520	148,000	404,486
Taneytown	853,333	714,750	100,310	472,720	2,141,113
Union Bridge	177,967	409,750	11,970	330,800	930,487
Westminster	4,430,000	1,501,000	49,910	739,760	6,720,670
Total	*9,273,535*	*6,290,500*	*397,380*	*2,703,330*	*18,665,245*

*These data represent, in general, the annual average daily demand over the 3-year period 2005-2007.

**Mount Airy performed a full system I&I camera inspection of the original 1971 sewer system. The inspection revealed three major problems that averaged 250,000 gpd I&I flow. The current demand is the two-year average since repairs were made in May 2007.

Source: Carroll County Department of Planning, December 2008



14 Current Capacity and Existing Wastewater Limitations

Capacity of Individual Municipal Systems by Watershed

The municipal wastewater systems serve the populations in the DGAs. Combined, existing flows totaled 6,239,685 gpd countywide. Population served by these systems countywide was about 69,839. The following table indicates the existing flows in 2007, based on CMP worksheet data, and the population estimated to be served, as indicated in the 2007 *Master Plan for Water & Sewerage*.

2007 Existing Flows and Population Served

Community/System	Existing Flows (from CMPs)	Population Served (from W&S Plan)
Freedom/Sykesville	2,160,000	19,051
Hampstead	628,000	5,520
Manchester	292,519	3,714
Mount Airy	896,000	8,631
New Windsor	91,716	1,114
Taneytown	853,333	6,200
Union Bridge	177,967	1,049
Westminster	4,430,000	24,560
Totals	*9,529,535*	*69,839*

Source: Carroll County Department of Planning, December 2008

In the following table, the "Current" figures identify the capacity that should be available ("Remaining Capacity") at each WWTP to serve existing and future demand once I&I is subtracted. The "Capacity Needed" represents the projected Infill and Future demand for undeveloped land and/or developed but unserved land. Areas designated for No Planned Service fall within the community's GAB, which generally represents the future annexation limit. However, provision of service is not anticipated to occur within a 10-year timeframe. For purposes of long-range planning, these areas are included in future demand projections for the buildout scenario. Remaining capacity minus the existing flows yields the amount of capacity available to serve future demand. If the future demand exceeds the capacity available, the difference between the capacity available to serve future demand and the projected future demand results in a negative number.

Based on the existing capacity of the community systems, all result in a negative available capacity at buildout. However, using the methodology from the MDE guidance documents for capacity management plans, these figures do not account for already identified system improvements that can be found in the Water and Sewerage Master Plan. Limitations that restrict expansion of design capacity are identified later in the text of this plan.

Wastewater Capacity for Each Designated Growth Area
(in Gallons per Day)

Community	Current			Existing Flows (2007)	Capacity Needed			Capacity Available at Buildout
	Permitted	I&I	Remaining Capacity		Infill	Future	No Planned Service	
Freedom/ Sykesville	3,500,000	630,000	2,870,000	1,530,000	494,123	1,077,130	1,344,190	(1,894,643)
Hampstead	900,000	231,000	669,000	397,000	38,856	259,011	576,190	(602,057)
Manchester	500,000	22,250	477,750	270,269	80,520	94,250	370,520	(337,809)
Mount Airy*	1,200,000	120,000	1,080,000	640,000	87,500	221,750	114,750	16,000
New Windsor	94,000	25,000	69,000	66,716	21,950	232,000	3,800	(255,466)
Taneytown	1,100,000	351,000	749,000	502,333	72,000	1,215,030	750	(1,041,113)
Union Bridge	200,000	50,600	149,400	127,367	101,900	609,640	40,980	(730,487)
Westminster	5,000,000	1,743,000	3,257,000	2,687,000	397,295	204,770	673,840	(705,905)
Total	*12,494,000*	*3,172,850*	*9,321,150*	*6,220,685*	*1,294,144*	*3,913,581*	*3,125,020*	*(5,541,480)*

*Mount Airy performed a full system I&I camera inspection of the original 1971 sewer system. The inspection revealed three major problems that averaged 250,000 gpd I&I flow. The current demand is the two-year average since repairs were made in May 2007.

Source: Carroll County Department of Planning, December 2008

Limitations of Individual Municipal Systems by Watershed

There are no major WWTP discharges to the Conewago Creek, Liberty Reservoir, Lower Monocacy River, or Lower North Branch Patapsco River watersheds. Therefore, these watersheds are not discussed in this section. "Infill+future" refers to the buildout of the entire planned sewer service area (SSA). For planning purposes, quantities reported as inflow, sewer demand, or discharge are considered comparable.

Double Pipe Creek

Westminster WWTP Summary of Wastewater Limitations: The existing controlling limitation for the WWTP is the current design capacity. By expanding to 6.5 mgd and upgrading to Enhanced Nutrient Removal (ENR), the Westminster WWTP will be able to accommodate all wastewater demands to buildout, and still have excess capacity, without exceeding loading limits imposed by the City's NPDES permit. The planned design capacity of the plant represents the controlling limitation.

Union Bridge WWTP Summary of Wastewater Limitations: The existing design capacity (0.2 mgd) of the Union Bridge WWTP represents the controlling limitation under current conditions. Longer-term, the Bay-related nitrogen loading cap represents a 0.67-mgd limit to surface water discharges. This limit is exceeded by the projected infill+future (entire planned sewer service area) and buildout (entire DGA) wastewater demands.

New Windsor WWTP Summary of Wastewater Limitations: The existing design capacity (0.094 mgd) of the New Windsor WWTP represents the controlling limitation under current conditions. As the plant expands and upgrades, the rated design capacity is likely to remain

the controlling limitation to discharge as long as advanced nutrient removal technology is employed. The Town plans to expand the capacity to 0.115 mgd as the WWTP is upgraded to sequencing batch reactor (SBR) technology.

Loch Raven Reservoir

Hampstead WWTP Summary of Wastewater Limitations: Until the effluent temperature issue is resolved, the current design capacity of 0.9 mgd will remain the controlling limitation. Given the high levels of treatment and large distance to the segment, the Western Run Tier II designation is not expected to represent a controlling limitation on the Hampstead WWTP discharge. Longer-term, the Bay-related nitrogen loading cap represents a 1.2-mgd limit to surface water discharges. As with plant expansion, no ENR upgrade is planned pending resolution of the temperature issue. With an ENR update, the WWTP could accommodate infill flows, but not the full 1.5-mgd wastewater demand projected at full buildout.

Prettyboy Reservoir

Manchester WWTP Summary of Wastewater Limitations: Given the limited land area to expand the plant and to spray irrigate, the existing design capacity (0.5 mgd) of the Manchester WWTP represents the effective wastewater limitation.

South Branch Patapsco River

Freedom WWTP Summary of Wastewater Limitations: The existing design capacity (3.5 mgd) of the Freedom District WWTP represents the controlling limitation under current conditions. The planned ENR upgrade project should achieve the loading limits. Longer-term, the Bay-related nitrogen loading cap represents a 4.67-mgd limit to surface water discharges.

Mount Airy WWTP Summary of Wastewater Limitations: The existing design capacity (1.2 mgd) of the Mount Airy WWTP represents the controlling limitation under current conditions. The approximate nitrogen-based capacity limitation of 1.6 mgd in discharge is larger than the maximum projected flows and is not anticipated to be a controlling limitation.

Upper Monocacy River

Taneytown WWTP Summary of Wastewater Limitations: The existing design capacity (1.1 mgd) of the Taneytown WWTP represents the controlling limitation under current conditions. Longer-term, the Bay-related nitrogen loading cap represents a 1.47-mgd limit to surface

water discharges. Both of these limitations are lower than the maximum projected flows at buildout of 1.74 mgd.

Summary of Capacity and Limitations Countywide

Most of the municipal WWTPs in Carroll County are projected to experience limitations to wastewater discharges, either under infill+future development or longer-term full buildout of the DGAs. "Infill+future" refers to the full projected buildout demand from development of the entire planned sewer service area (SSA), as of 2007 ("Infill+future" in this plan is referred to as "priority+future" in the supporting Malcolm Pirnie reports). "No Planned Service" refers to buildout development for the balance fo the DGA (full buildout).

Many of the municipalities in the county are already performing or planning activities to address wastewater limitations, such as WWTP expansions, ENR upgrades, and I&I reduction. Effluent reuse (*e.g.*, spray irrigation) has been implemented by one municipality (Manchester) and considered by others. The *Maryland Policy for Nutrient Cap Management and Trading in Maryland's Chesapeake Bay Watershed* presents several other options for reducing wastewater options, including nutrient trading and onsite disposal system (OSDS) hookup credits.

Infiltration and Inflow

Data from the CMP worksheets indicate that I&I is a major component of the total influent at most municipal WWTPs in Carroll County. Based on differences between 2002 (drought year) and 2003 (very wet year), I&I comprised a quarter to a third of the average influent flow at all of the larger WWTPs, except the Manchester WWTP, where it represented less than 10 percent. Representatives of municipal systems, such as Westminster, Sykesville/Freedom, Mount Airy, Taneytown, and Hampstead, report ongoing programs to identify and reduce I&I. These programs include elements such as smoke testing, camera surveys, pipe replacement, lining of pipes, and identification of inappropriate routing of stormwater into the sanitary sewer systems. The smaller municipalities, such as New Windsor and Union Bridge, appear to be resource-limited with regard to I&I reduction.

Wastewater Treatment Plant Expansion

Of the eight large WWTPs in Carroll County, only three (Freedom, Mount Airy, and Manchester) are projected to be able to accommodate infill+future wastewater demands without an expansion of treatment capacity. None is projected to be able to accommodate projected DGA full buildout wastewater demands without expansion. WWTP expansion projects are currently being planned for the Westminster and New Windsor. Other municipalities are likely to plan for WWTP expansions as wastewater demands increase, and as funding becomes available.

Several facilities face potential site limitations or other engineering challenges to expanding the plant at the current location, including the Freedom and Manchester WWTPs. The Freedom District WWTP has sufficient capacity to accommodate both existing and infill+future flows, so there is no near-term need to address site constraints. Challenges with expanding the Manchester WWTP represent a technical limitation to enlargement of the Manchester SSA, unless additional area for land application could be identified, or a new

WWTP were constructed outside of the Prettyboy Reservoir watershed. The Town currently does not plan to expand the SSA, and thus expansion might not be necessary.

The Taneytown WWTP is approaching its design capacity and has sufficient room to expand at the current location. However, the City's near-term strategy is focused on I&I reduction rather than plant expansion. The Union Bridge WWTP would need a major expansion—or construction of a new WWTP—in order to accommodate infill+future flows. Such a project would likely be contingent upon an agreement by developers to fund the majority of the expansion costs.

Regulatory Effect of Expansion on Minor Plant's Nutrient Allocations: Minor (≤0.5 mgd) plants that expand to an additional treatment capacity of more than 0.1 mgd will have their nutrient loading cap converted from goals to enforceable permit limits. In addition, when a minor plant expands, its nutrient loading caps will be assessed for adjustment to *no more than* 6,100 lbs/yr total nitrogen and 457 lbs/yr total phosphorus. Under this policy, the Manchester, Union Bridge, and New Windsor WWTPs would be susceptible to losing a portion of their nutrient allocations upon expansion.

Upgrades to Enhanced Nutrient Removal

ENR upgrades are the primary strategy being undertaken by Carroll County municipalities for complying with the Chesapeake Bay-related nutrient loading caps. The cost for most of these projects is eligible to be funded from Maryland's Bay Restoration Fund (BRF). All of the County's "major" (>0.5 mgd) facilities (Westminster, Freedom District, Mount Airy, Taneytown, and Hampstead WWTP) are likely to install ENR technology at some point. Most of these projects are already being planned or designed, although the unresolved effluent temperature issue at the Hampstead WWTP is likely to delay an ENR upgrade relative to the other WWTPs. The Town of Manchester has also applied for BRF funding of nutrient removal upgrades at the Manchester WWTP, primarily as a polishing step rather than a necessity for regulatory compliance. The expanded New Windsor WWTP will also use nutrient removal technology, although not at an ENR level.

The State of Maryland defines ENR as technology capable of achieving effluent concentrations of 3.0 mg/L total nitrogen and 0.3 mg/L total phosphorus. Although specific technologies differ, most ENR plants will employ a combination of biological nutrient removal and filtration. Phosphorus concentrations lower than 0.3 mg/L can often be achieved by chemical addition and filtration. However, many ENR plants cannot consistently achieve effluent total nitrogen concentrations that are significantly lower than 3.0 mg/L. Hence, the total nitrogen cap will be more limiting than the total phosphorus cap at most ENR facilities.

Of the County's five "major" WWTPs, three (Westminster, Freedom District, and Mount Airy) would be able to accommodate infill+future flows without exceeding nitrogen loading caps, assuming ENR upgrades were performed. The Taneytown WWTP could not discharge more than 1.47 mgd without exceeding the nitrogen cap. This flow is 0.27 mgd less than the projected infill+future flow of 1.74 mgd. All of the major WWTPs, except the Westminster, Mount Airy, and New Windsor WWTPs, would exceed nitrogen load caps under DGA buildout conditions and, even at ENR, would require offsets or no-discharge options.

ENR upgrades are not currently required for regulatory compliance at the Manchester and Union Bridge WWTPs, for which the Bay-related nutrient caps are goals rather than enforceable limits. However, advanced nutrient removal capability at the Manchester WWTP would help attain nutrient loading goals and further protect Prettyboy Reservoir. Improved nutrient removal capabilities are being designed for the New Windsor WWTP, for which the Bay-related nutrient caps will become enforceable permit limits upon completion of the planned expansion.

Summary of Long-Term Wastewater Limitations to Surface Water Discharge

WWTP	Long-Term Limitation to Surface Discharge (mgd)	Basis
Westminster	6.500	Design capacity after planned expansion; also close to nitrogen cap
Freedom District	4.700	Nitrogen cap, assuming eventual expansion
Mount Airy	1.200	Design capacity
Taneytown	1.470	Nitrogen cap, assuming eventual expansion
Hampstead	0.900	Design capacity, local water quality (temperature)
Manchester	0.500	Existing design capacity
Union Bridge	0.670	Nitrogen cap, assuming eventual expansion
New Windsor	0.115	Design capacity, assuming eventual expansion to meet future demand

15 Individual Private Septic Systems

Growth and development in Carroll County is concentrated in the DGAs where public water supply and wastewater services are available. Development outside the DGAs is generally served by individual private wells and septic systems. Existing development within the DGA but not yet annexed and served by the municipal system also is generally served by individual private wells and septic systems. The map titled “Estimated Existing Septic Systems” shows the estimated number and locations that may reasonably be assumed to be served by a private septic system. Each dot represents a lot that is likely served by a septic system based on its status as an improved lot and on its location outside of a public sewer service area.

The total number of residential septic systems outside of GABs is estimated at 22,970, based on the total number of improved residential parcels outside of GABs. Residential septic systems within the GABs represent an additional 9,178 septic systems. These systems are anticipated to be replaced by public sewer service upon annexation of areas into the municipal limits or the addition of properties to the sewer service area.

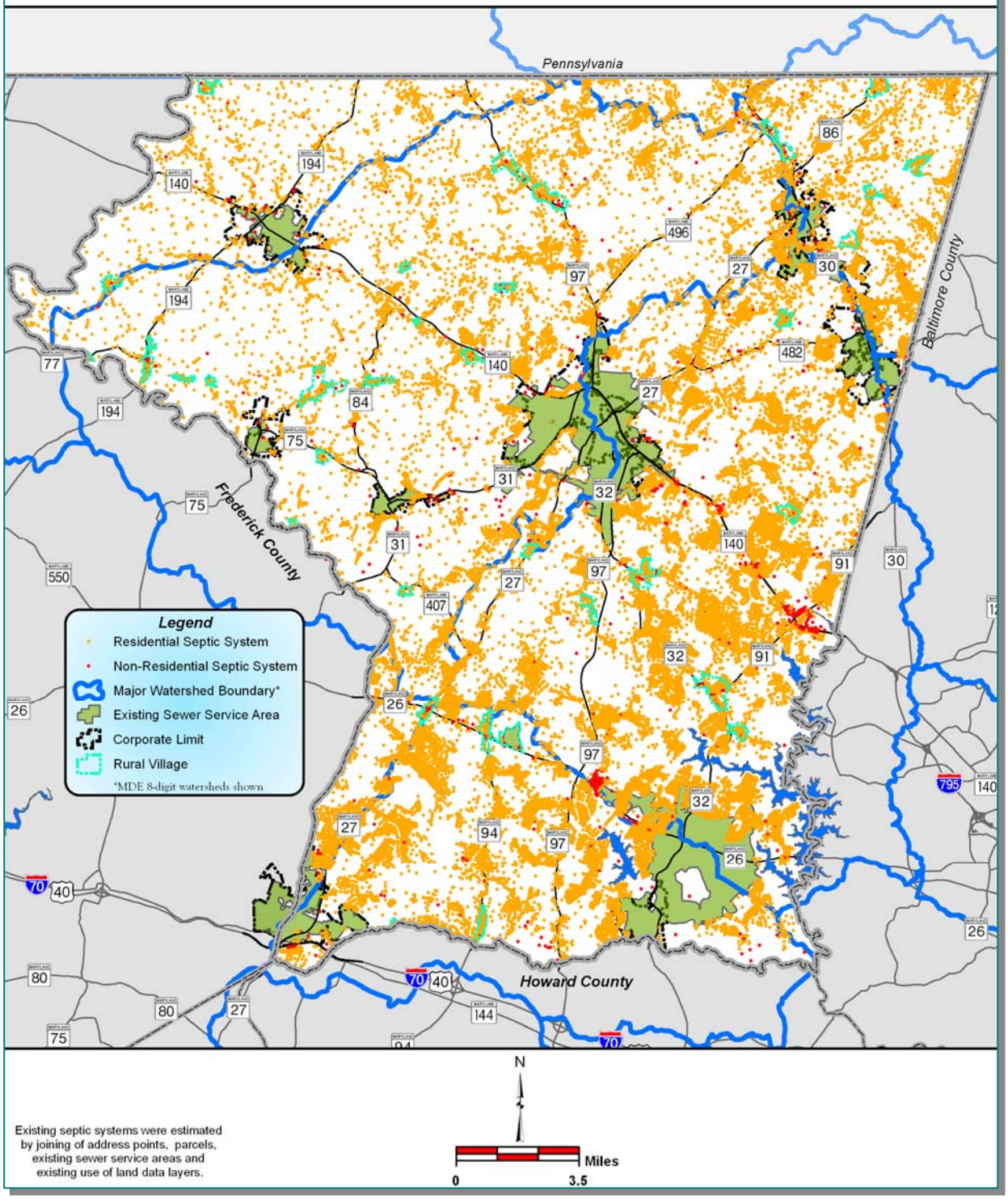
The Carroll County Health Department has identified areas of the county where septic systems may be failing. Table 9 within the *Carroll County Master Plan for Water & Sewerage* provides an inventory of sewage problem areas, which includes areas with failing septic systems. Reference this table for specific locations.

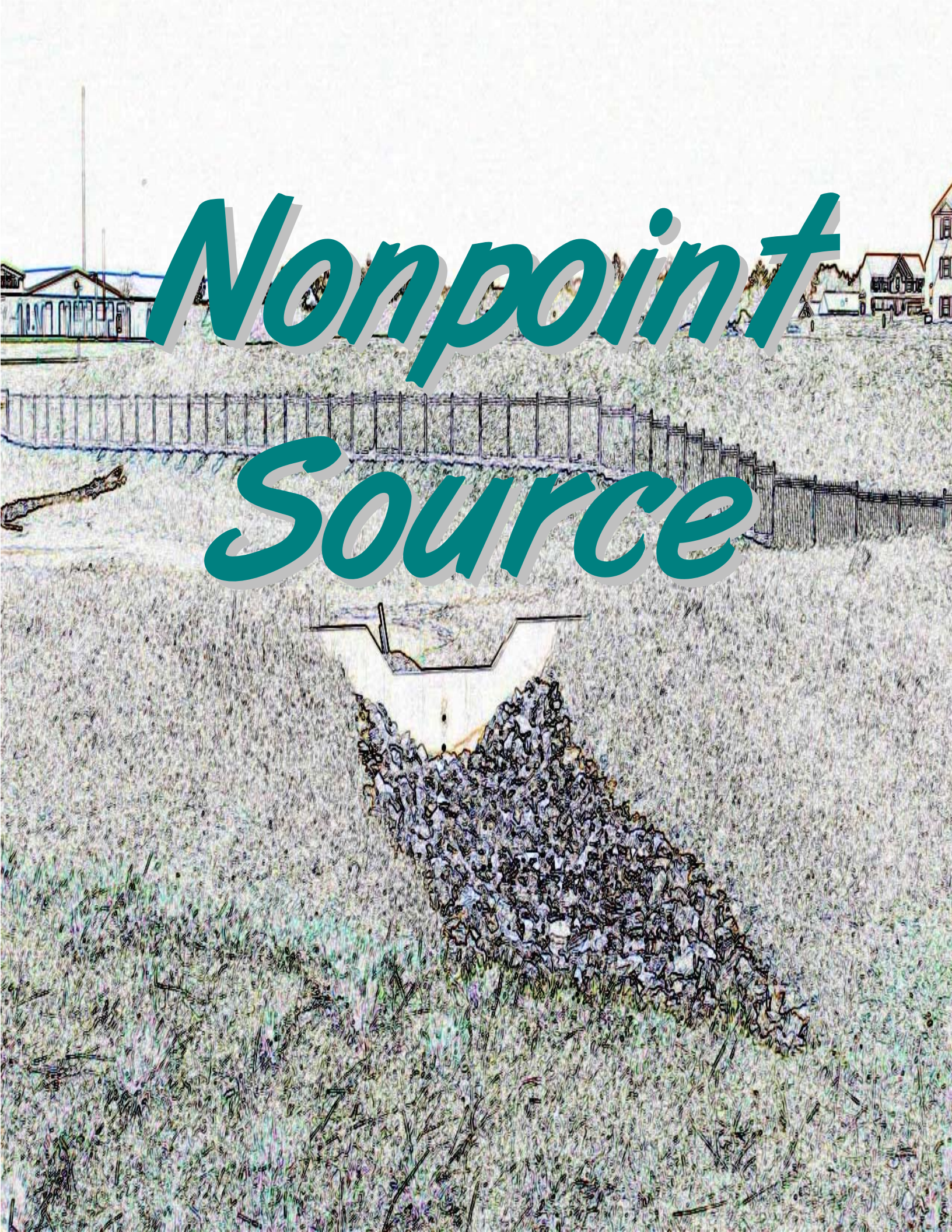
Since the mid-1990s, the Carroll County Commissioners have provided funding to resolve the nature and seriousness of water and wastewater issues in about 36 small communities or groupings of homes in the county. These small communities, or Rural Villages, are unincorporated, primarily residential, include historic structures, are characterized by older communities with high potential for water/septic problems, and are not within a DGA. The issues with onsite water and sewer systems include poor soils, small lots, high groundwater table, low-yield wells, old systems, contamination threats, and limited replacement areas.

A committee was formed that included representatives from the Carroll County Health Department, Department of Public Works, Department of Planning, and the Grants Office. The Carroll County Health Department performed sanitary surveys on these small communities. Factors evaluated as part of these sanitary surveys included total number of households, average lot size, average age of septic and wells, inadequate replacement areas, condition of onsite water and sewer systems, and other demographic data.

The committee reviewed the surveys from the Health Department. The committee evaluated and prioritized the small communities with potential water and/or wastewater issues. The committee worked closely with the owners and residents of these communities to gage interest and socio-economic factors. As a result of these efforts, projects were completed in some of the communities to improve water and wastewater issues. These improvements included extending waterlines, building a wastewater treatment plant, and development of new community wells. Other communities were removed from the list for various reasons. For some, improvements were deemed unnecessary. For others, residents were not supportive, and/or the income survey results indicated that the community did not qualify for the Maryland Community Development Block Grant Program. The Small Communities Survey Locations map shows the small communities that have been considered during this ongoing effort.

Estimated Existing Septic Systems in Carroll County, MD

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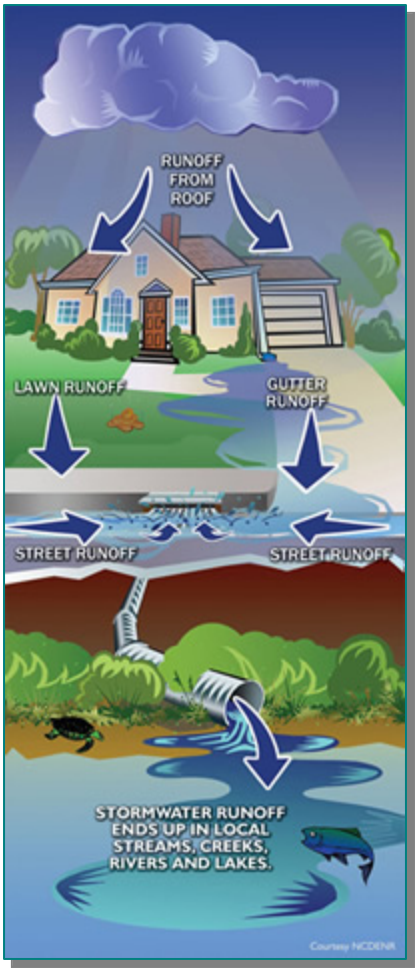


This section of the WRE is intended to assess the current level of existing and planned land use regarding nonpoint source (NPS) pollutant loading. It is also intended to evaluate the land use planning and management processes within the County and municipalities as to their effectiveness in addressing NPS loading issues. The specific NPS impacts are associated with stormwater runoff from urban/suburban development, agricultural runoff, and septic system loading via subsurface flow. Components of each of these sources may be regulated to some degree, but only from an individual permitting prospective. This evaluation and analysis provides a larger, more regional assessment of NPS loading. It provides, as called for in the Models and Guidance Document #26, "preliminary assessment… crafted to provide general insight into this process, and serve as a starting point for future nonpoint source analysis."

16 Stormwater Programmatic Assessment

According to the State Models and Guidelines document for the WRE, a jurisdiction should provide a stormwater programmatic assessment. This assessment should include a review of all stormwater management requirements and the effectiveness of program implementation. This analysis should include a review of local ordinances, policies, plan approval requirements, enforcement, as well as other key components of the program.

Builders for the Bay Process

Carroll County Government participated in a "Builders for the Bay" roundtable in coordination with the Alliance for the Chesapeake Bay, Home Builders Association of Maryland, and the Center for Watershed Protection (CWP). The purpose of the roundtable in Carroll County was to adapt the principles developed at the national level for local application and to identify local codes and ordinances that act to promote Better Site Design through a consensus-building process. The roundtable process was modeled after the National Site Planning Roundtable and has four basic objectives:

- Reduce overall site impervious cover
- Preserve and enhance existing natural resources

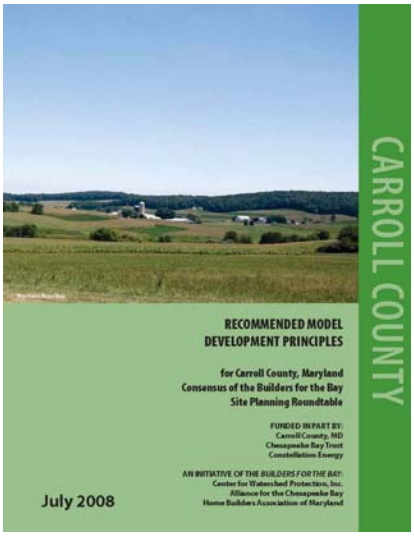
- Integrate stormwater management
- Retain a marketable product

The first step in the process was an evaluation of the County's existing codes, ordinances, policies, and regulations. The evaluation was performed via Model Development Principles and scored based on national benchmarks for Better Site Design. The evaluation was performed by staff from CWP. The findings in the final evaluation document (July 2008) provided an excellent summary regarding the County's existing efforts:

> *"The results of this review revealed that the County has an existing set of strong developed standards. In particular, the natural resource protection and stormwater management program are some of the best in the state. These programs include strong stream buffers and tree protection as well as requiring all new homes to disconnect their roof tops. In addition, the County's dedicated staff addressed environmentally friendly regulations even before the Roundtable process began."*

The roundtable process started September 2007 with a kick-off meeting that allowed all of the members to become acquainted with the Better Site Design principles. At this meeting, members were presented with the results of the in-depth review of the existing county codes, ordinances, and regulations. This meeting produced a detailed analysis of regulatory barriers to environmentally-sensitive site designs for Carroll County. The 35 participants of the roundtable process met several times over the course of eight months. From September 2007 through January 2008, subcommittee meetings were held, separating the participants into four committees based on their strengths and interests. These four committees went hand-in-hand with the four objectives of the roundtable. The committees were:

- Residential Streets and Parking Lots,
- Lot Development,
- Natural Resource Management, and
- Stormwater Management.



In February 2008, the roundtable participants reconvened to collect consensus on each subset of the Model Development Principles for better site plans and discuss their final recommendations. In April 2008, the members met again to discuss implementation principles.

Over the course of eight months, the roundtable composed specific recommendations and rationales based on suggestions from the four subcommittees. Each of the four subcommittees offered specific principles, recommendations, and rationale to minimize the amount of new impervious cover throughout the county and to reduce NPS pollution. The final consensus document was presented to and approved by the Carroll County Board of Commissioners on July 24, 2008. Prior to the presentation to the Commissioners, numerous boards and groups also presented findings. The specific

recommendations of each subcommittee can be found in the consensus document for the Carroll County Builders for the Bay Site Planning Roundtable.

17 Agricultural BMPs

Carroll County Agricultural Land Preservation Program

This program, implemented through the County Department of Planning, establishes permanent protection easements, through the purchase of development rights on lands throughout the County. The purchase of easements occurs in the rural region of the county, outside municipal boundaries and DGAs. In addition to the elimination of development potential (residential as well as other permitted uses), the establishment of an easement also requirements the implementation of a Total Farm Soil and Water Conservation Plan. These plans are designed and implemented through the local Conservation Partnership to protect and enhance the county's soil and water resources. Therefore, the program provides two vital functions related to NPS loading, the elimination of potential onsite wastewater systems and the development of a conservation plan designed to reduce nutrient and sediment runoff.

Currently, the county has approximately 55,348 acres of permanently preserved land with a goal of 100,000 acres. This acreage places Carroll County among the leaders nationally in preserved land. The Board of County Commissioners has approved programmatic changes and capital funding which will allow for the accelerated purchase of the additional 40,000+ acres of land. This critical programmatic/funding initiative will produce a tremendous restoration and preservation effort toward achieving NPS watershed goals and ultimately the restoration of the Chesapeake Bay.

Conservation Partnership

The Conservation Partnership is the combined efforts of the Federal Natural Resources Conservation Service, Maryland Department of Agriculture (MDA) and the locally funded/implemented Carroll County Soil Conservation District. The Partnership, which is located in Westminster, provides technical assistance and funding (through various federal/state programs) to local agricultural producers. The overall goal of the Partnership is to provide technical and administrative assistance to agricultural producers to help them implement Agricultural Best Management Practices (BMPs) that enhance/protect soil and water resources.

The Carroll County Partnership is a continual leader in the State of Maryland for conservation implementation (see the table below, "Maryland Agricultural Cost Share (MACS) Program"). This table indicates the total number of agricultural BMPs installed through the MACS program since 2000. The table also indicates the dollars of State-provided cost share monies received by producers. The local partnership consistently ranks first in the state with the construction of BMPs. The construction of BMPs results in specific reductions of nutrient and sediment runoff from agricultural operations.

Maryland Agricultural Cost Share Program
Carroll County

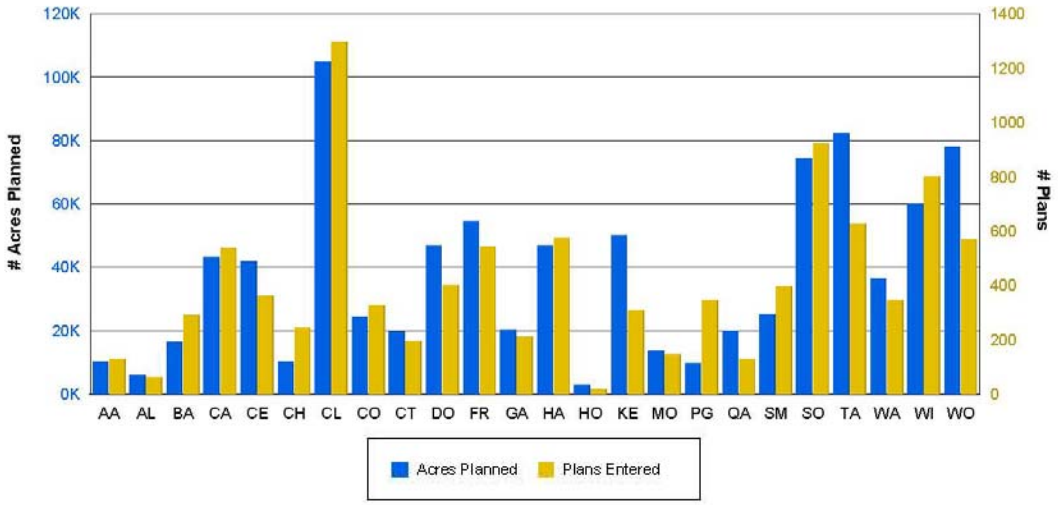
Year	Cost Share Received	Ag BMPs Completed	State of MD Ranking	Cover Crop (Acres)
2000	$457,841	184	1	1,292
2001	$642,785	204	1	No Data Available
2002	$562,277	213	2	1,675
2003	$546,266	273	1	4,726
2004	$403,024	177	1	5,982
2005	$674,809	149	1	1,666
2006	$579,842	132	1	4,495
2007	$600,458	140	1	14,796
2008	$683,092	153	1	10,443

Source: Maryland Department of Agriculture, MACS Annual Reports

The Partnership is the direct source of cost-share funding and develops, with the producer, a Soil and Water Conservation Plan for farm operations. These plans provide the design and timeframe for the implementation of the above referenced BMPs. The Soil and Water Conservation Plan acts as a comprehensive plan for the farm's operations. The figured titled "Conservation Tracker Summary" from the Conservation Tracker System managed by the Maryland Department of Agriculture identifies Carroll County (identified as "CL" in the graph) as a leader in total farm acres covered by a Soil and Water Conservation Plan.

It is clear that the combination of the Carroll County Agricultural Land Preservation Program in conjunction with the programs of the local Conservation Partnership provides a state-leading effort to control and reduce agricultural NPS loading. The sustained efforts of the Partnership, along with continued support of the Board of County Commissioners, ensures that the County will lead the state in the restoration, enhancement, and protection of soil and water resources via agricultural conservation measures.

Conservation Tracker Summary
as of 8/6/2009 9:36:04AM



District	# Plans	PLANNED ACRES	CROP ACRES	WOODLAND ACRES	PASTURE ACRES
Allegany	61	6,018.0	1,084.0	3,468.1	873.2
Anne Arundel	130	10,149.6	3,893.5	3,526.8	952.4
Baltimore Co.	290	16,412.9	10,251.2	3,336.2	1,751.7
Calvert	537	43,193.2	12,625.5	21,051.4	1,995.2
Caroline	328	24,279.0	24,121.2	8,277.7	237.0
Carroll	1,296	104,826.7	57,370.2	16,613.8	11,116.5
Catoctin	197	19,691.7	10,873.6	2,596.8	3,332.3
Cecil	360	41,797.0	27,512.2	9,759.5	2,285.5
Charles	243	10,346.4	8,624.1	351.4	363.8
Dorchester	402	46,906.2	16,187.5	5,619.3	75.9
Frederick	543	54,581.4	28,720.6	7,371.8	9,414.7
Garrett	212	20,085.4	7,242.3	7,415.3	4,001.9
Harford	573	46,913.6	19,432.4	14,131.0	8,604.3
Howard	20	3,025.9	1,574.4	534.3	643.9
Kent	308	50,080.6	38,093.3	10,860.6	781.8
Montgomery	148	13,723.4	8,454.5	4,159.6	1,859.5
Prince George's	347	9,639.8	8,647.2	12,675.5	1,380.9
Queen Anne's	128	20,019.5	13,291.8	4,942.4	481.5
Somerset	924	74,354.6	33,522.5	25,649.0	751.0
St. Mary's	398	25,175.2	12,696.8	19,288.4	838.8
Talbot	628	82,289.8	51,358.8	17,577.8	752.2
Washington Co.	346	36,480.6	18,324.0	6,571.3	7,870.6
Wicomico	800	59,919.2	34,994.1	19,611.6	886.8
Worcester	567	77,994.3	30,495.4	26,958.1	332.3
	9,786	**897,904.0**	**479,391.1**	**252,347.7**	**61,583.7**

Source: MDA, MACS

Forest Conservation Enhancement

The County and its municipalities have adopted several enhancements to the State Forest Conservation requirements which provide support to water quality goals. Since the adoption of the Carroll County Forest Conservation ordinance in the early 1990s, all forest areas remaining on developed sites have been retained via a perpetual protection easement. This has allowed Carroll County to retain, in long-term protection, an average of 82 percent of onsite forest. This places Carroll as one of two leaders in the state related to forest retention associated with development. Approximately 3.75 times more acres are placed in easement, overall, than cleared for development.

The County has also pioneered the use of forest banking. Banking is a process where a landowner agrees to reforest property, places a permanent protection easement on the new woodlands, and then sells acreage from the planted area to developers in need of mitigation. This process is between private entities. The County approves the sites, ensures the recordation of easements, and tracks bank status. The County directs reforestation banking on priority areas where water quality benefits are maximized. There have been hundreds of acres established using this specific mitigation option. The ability to target sensitive areas through the bank approval process has allowed the County to maximize water quality benefit associated with mitigation. In many cases, areas which were once productive agricultural lands or exhausted pastures have now become revitalized forest lands.

Stream Buffer Preservation

In order to mitigate the impacts of development on surface water resources, the County implemented stream buffer requirements in 1993. The initial effort required the preservation, via a perpetual easement, of all lands within 100 feet of a stream when property was subdivided for land development. In 2004, the Board of County Commissioners formally adopted stream buffer regulations as part of a comprehensive Water Resource Management Ordinance (Chapter 218). The enhanced requirements use a variable width calculation to delineate the buffer boundary. This buffer is required on all development projects (not just subdivision) and provides a permanent easement dedicated to the Board of County Commissioners. The new variable width buffer calculation incorporates site-specific features, including wetlands and steep slopes.

The delineation and permanent preservation of stream buffers provides one of the very best techniques for the mitigation/restoration of NPS pollution associated with land development. The County and municipalities have permanently preserved 1,234 acres of riparian steam buffers associated with land development activities.

18 Estimated Existing Nutrient Loads

Nonpoint Source Spreadsheets (summary)

The Nonpoint Source Spreadsheet (NPSS) is a loading analysis model used to assess the nonpoint source pollution loadings entering receiving waters. The methodology used in the NPSS was provided by the State and allows for a consistent comparison of current and future NPS loads. NPS pollutants in the model reflect estimated nitrogen and phosphorus entering receiving waters from stormwater runoff and septic systems. The NPSS is used to estimate the amount of nitrogen and phosphorus (or nutrients) in pounds/year by watershed. The load estimates are determined by assigning different loading rates for each type of land use and for septic systems. This tool produces results that allow the user to compare the relative change in loadings between different land use scenarios. The NPSS also estimates the amount of impervious cover and open space.

The NPSS was a collaborative effort by MDE, MDP, and Carroll County Government. MDP supplied the Land Use/Land Cover (LULC) data by water basin for 2002 and 2007 and projected the future LULC data scenarios. The Land Use/Land Cover data indicates how the land was actually being used or what type of vegetation or agricultural use was in place at the time the data was assembled. MDE tailored the NPSS to Carroll County and assigned loading rates and impervious cover ratios to each MDP LULC category at the MDE 6-digit watershed level. MDE obtained the loading rates from the Chesapeake Bay Program (CBP) Watershed Model (WSM) Phase 4.3. The CBP Watershed Model estimates nutrient and sediment loads delivered to the Chesapeake Bay and has been in use since 1982. The model uses rainfall, evaporation, and meteorological data to estimate runoff and subsurface flow for all the watershed land uses. The CBP is currently refining the WSM, with a draft of Version 5.0 currently available.

Methodology

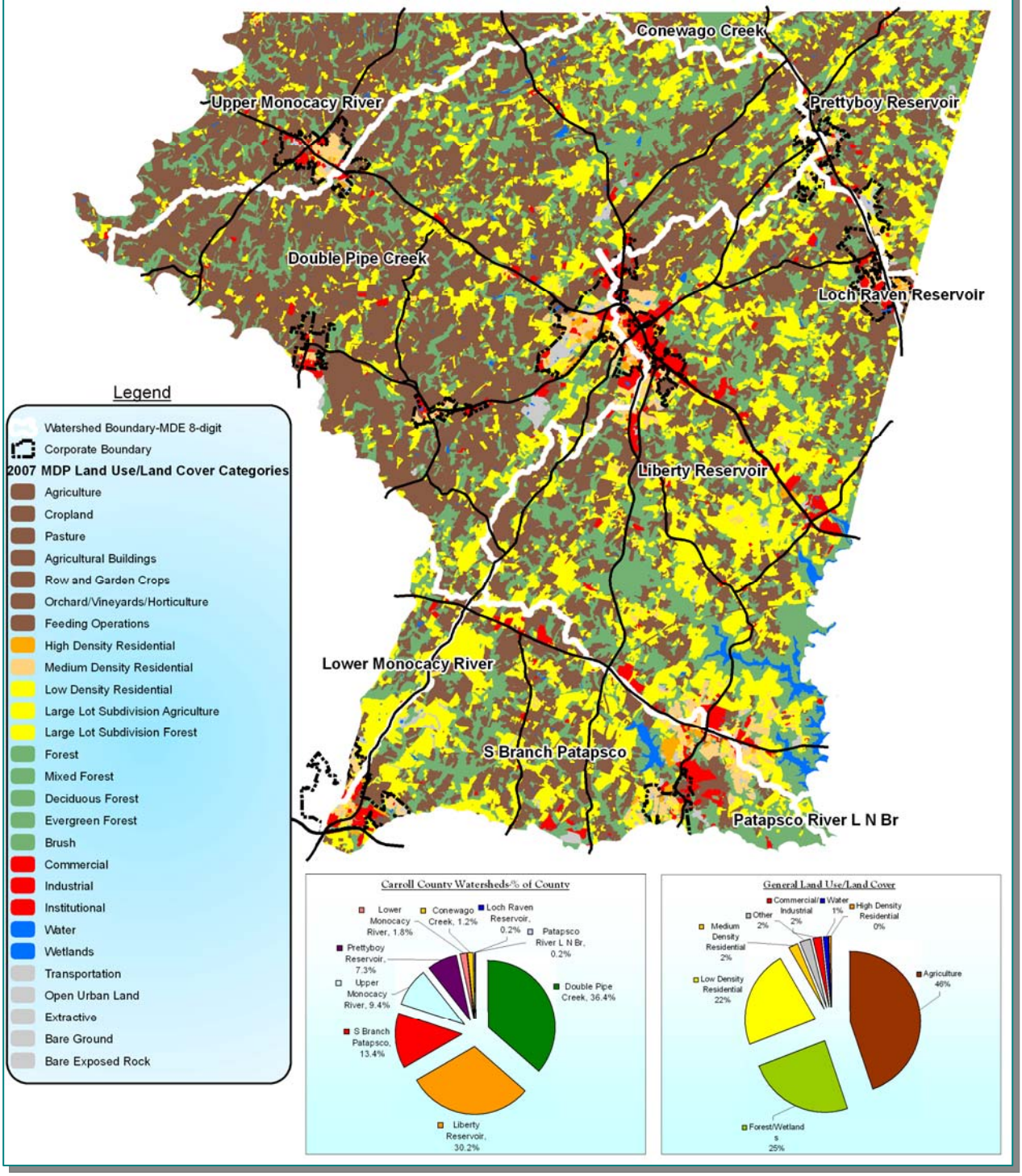
The spreadsheet consists of initial and future assessments of nutrient loads related to proposed land use changes. This information allows for comparison of various scenarios. MDP generated the initial LU/LC acreages for the county and future projections using their Growth Simulation Model to estimate population and land use changes over time.

For this plan, Carroll County's NPSS compares four scenarios, defined as follows:

1. 2007 LULC and 2007 BMPs (Current Condition) – This estimates loading based on 2007 LULC, while using BMPs in place as of 2007, which is the most current data available.

2007 Land Use/Land Cover Map

Carroll County, MD



2. 2007 Land Use and Full Implementation of Tributary Strategies (Baseline Condition) – This scenario also uses the 2007 LULC but assumes that the Tributary Strategies have been fully implemented (excluding denitrifying septic systems) in all watersheds. The State uses this scenario as a baseline condition.
3. Buildout with Current Zoning and Full Implementation of Tributary Strategies – This future scenario estimates buildout based on the County and municipal zoning (prescribed permitted use in the zoning regulations) in place at the time. The County's medium-range BLI estimates were used to calculate future septic systems.
4. Buildout with Current Land Use and Full Implementation of Tributary Strategies – This future scenario estimates buildout based on the County current land use designations, adopted in the 2000 Carroll County Master Plan and community comprehensive plans. The County's medium-range BLI estimates were used to calculate future septic systems. (Land use designations are used within GABs, and zoning was used outside GABs. The zoning classifications and land use designations outside GABs are roughly equivalent. The land use designations identify the uses envisioned through the comprehensive planning process. These designations are actually implemented through the zoning regulations. As a growth management measures, many of the municipalities change the zoning of an area to match the adopted land use designation upon annexation of an area. Therefore, the land use designation often envisions a higher level or more intensive use for the future annexation areas.)

MDE developed the "default" NPSS and established the loading rates and impervious percentages for each land use category. The spreadsheet uses three inputs that include land use acreages, number of residential septic systems, and non-residential acreage relying on septic systems. By changing these three inputs based on future projections, changes in nutrient loadings can be directly compared. Each scenario is summarized by watershed.

Inputs

Inputs into the NPSS model came from various sources, these inputs include:

(LULC Acreages - The LULC data were supplied by MDP and were generated statewide by interpretation of high altitude aerial photography flown in 2002 and 2007. Land uses generally greater than 10 acres in size were classified into 31 categories. For comparison purposes, these 31 categories were placed into one of five general land use types: Development, Agriculture, Forest, Water, and Other.

MDP also supplied the future LULC projections for each of the buildout scenarios. These were created using the MDP's Growth Model and projected future land use acreage based on the County/municipal adopted zoning and master/comprehensive plan. The default spreadsheet consisted of 2002 LULC data, but the County worked with MDP staff to update to 2007 LULC data.

Loading Rates - The nitrogen and phosphorus loading rates were determined by MDE using data from the CBP Watershed Model. Each of MDP's 31 land use categories are assigned two separate loading rates, one for the impervious portion and one for the pervious portion of lands. Each LULC category was assigned an impervious factor taken from a report completed by the CWP. The default spreadsheet originally consisted of 2002 loading rates, but the County worked with MDE to update to 2007 loading rates.

Residential Septic Systems - Initial and future residential septic systems were estimated by the County using the most recently adopted sewer service areas, address points, existing use of land, and BLI data (future septics only).

Non-Residential Septic Acreages - Initial and future non-residential septic acreages were estimated by the County. The initial acreages were determined using the most current sewer service areas and existing land use data. The future septic acreages were determined by identifying undeveloped buildable lands that were zoned or designated for business, commercial, or industrial uses.

The loads were calculated using the following formulas.

1. To determine the nitrogen (N) and phosphorus (P) loads from each individual LULC category, where each LULC category is assigned a pervious and impervious loading rate for N and P and an impervious percentage set by the State:

   Acres X (Impervious Loading Rate) X (Percent impervious) +
   Acres X (Pervious Loading Rate) X (Percent Pervious)

   .
2. To determine nitrogen loads associated with residential septic systems in a given watershed:

   Total # of septic systems X 9.5 lbs/person/year X
   average persons/household X 0.4 (transport factor).

3. To determine the non-residential septic loads:

   Nonresidential acres X 9.5 lbs/person/year X
   .892 (which is the Equivalent Dwelling unit per acre) X
   mean household size X 0.4 (transport factor)

Since the intent of the analysis is to compare the relative change in loadings, the same loading rate is used for initial and future land use. Both the initial and future estimates use the Tributary Strategies loading rates, which assume full BMP implementation. The Maryland Tributary Strategies BMPs include enhanced stormwater management, erosion and sediment control, riparian buffers, and nutrient management plans. These strategies are built into the model to ensure that the loading outputs will reflect only land use pattern changes.

The State has provided this default nutrient loading spreadsheet as a starting point and guidance tool. Each jurisdiction was encouraged to modify and refine the spreadsheet as needed to reflect more accurate estimates and additional land use scenarios with future updates of the WRE. With the assistance of MDP and MDE, the County updated the NPSS to include 2007 LULC data and 2007 loading rates. The default spreadsheet summarized the results into the three 6-digit watersheds; 99 percent of Carroll is comprised of two of these watersheds. However, to provide data at a smaller basin level, data were analyzed and presented at the MDE 8-digit watershed level and aggregated by 6-digit watersheds. BLI estimates were used to calculate future residential septic systems.

The results for each land use scenario were summarized at both the 6- and 8-digit watershed levels. For this document, county totals, terrestrial totals, and septic system totals were compared for each scenario. Total nitrogen and phosphorous derived from development for each scenario is modeled for comparison.

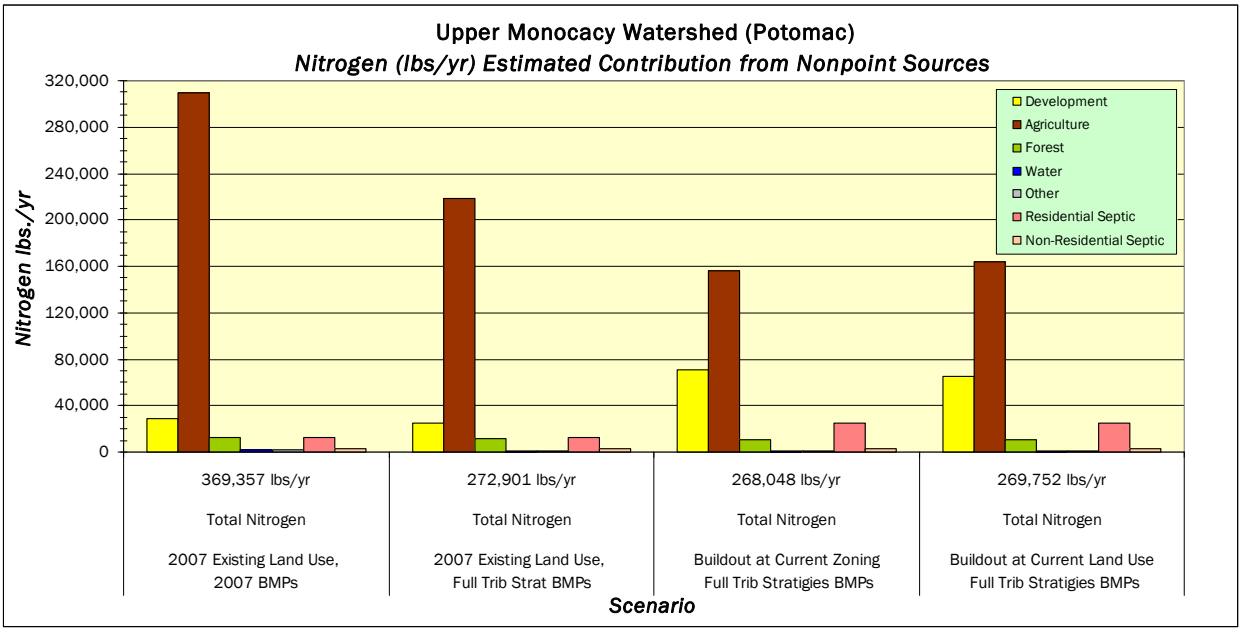
Potomac Watershed (6-digit)

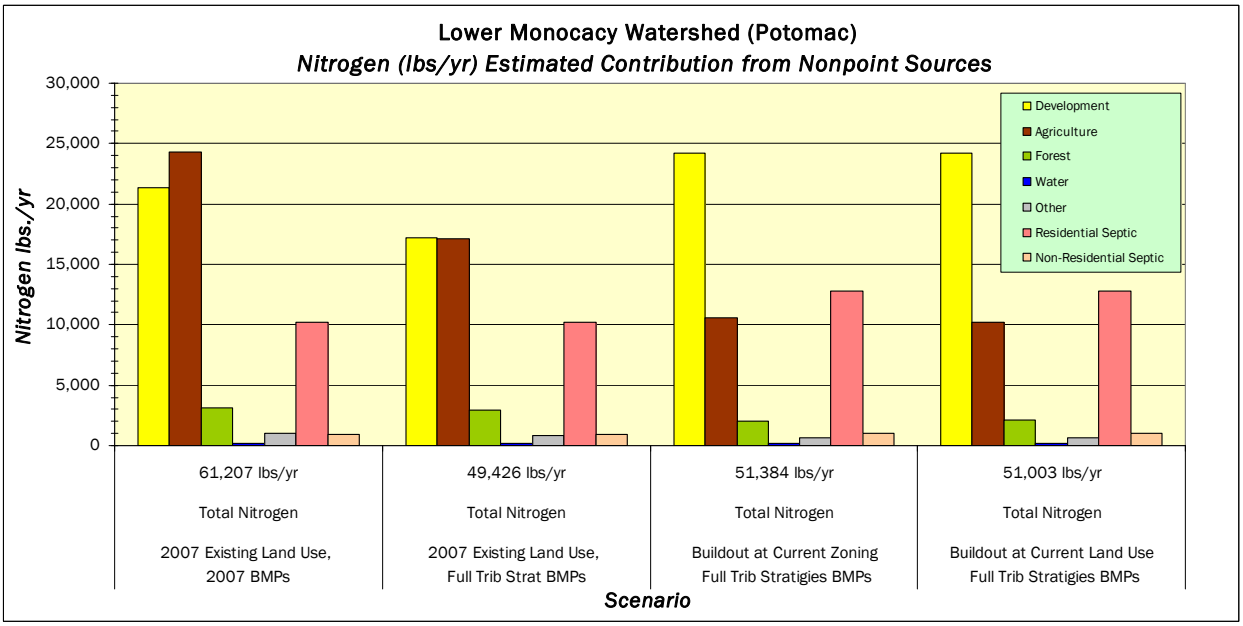
At the 6-digit watershed level, nitrogen loads are projected to decrease if the current land use plan is implemented along with the Tributary Strategy BMPs. Phosphorus loads decrease consistently with each scenario, from the current baseline scenario through the implementation of the current land use plan. Nitrogen loads decrease nearly 24 percent from the 2007 Tributary Strategies with BMPs scenario. Total phosphorus loads decrease by 12 percent from the 2007 Tributary Strategies with BMPs scenario to the implementation of the 2007 Current Land Use scenario.

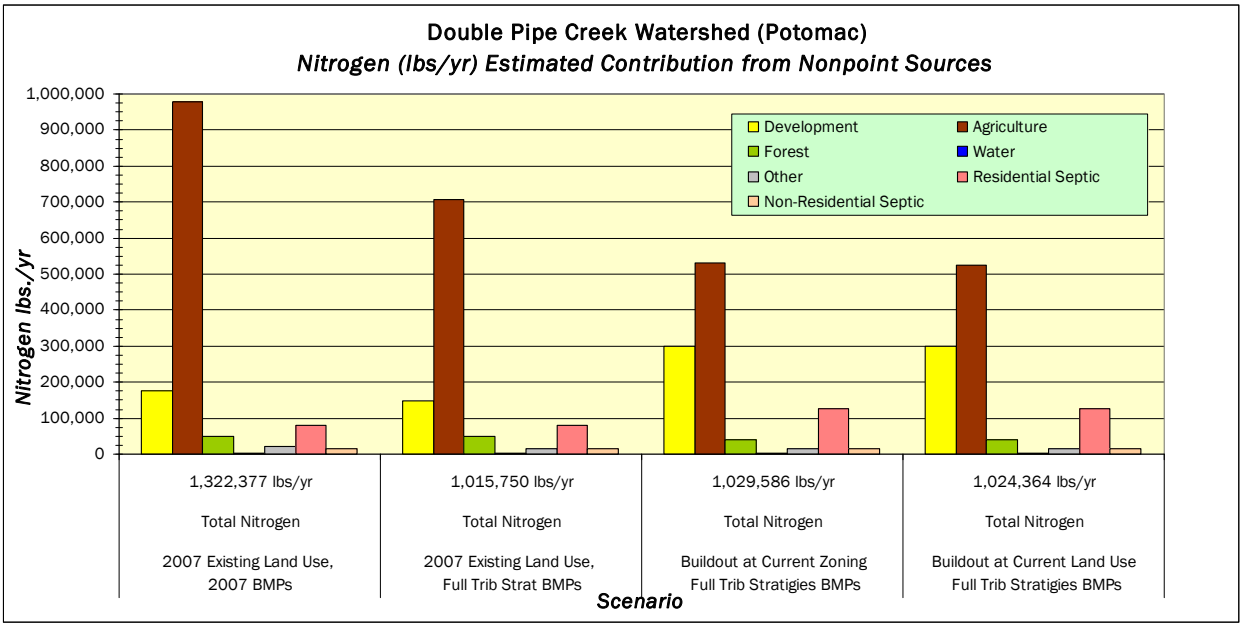
Total Estimated Nitrogen and Phosphorus Loads
For Each 8-Digit Watershed in the Potomac Basin

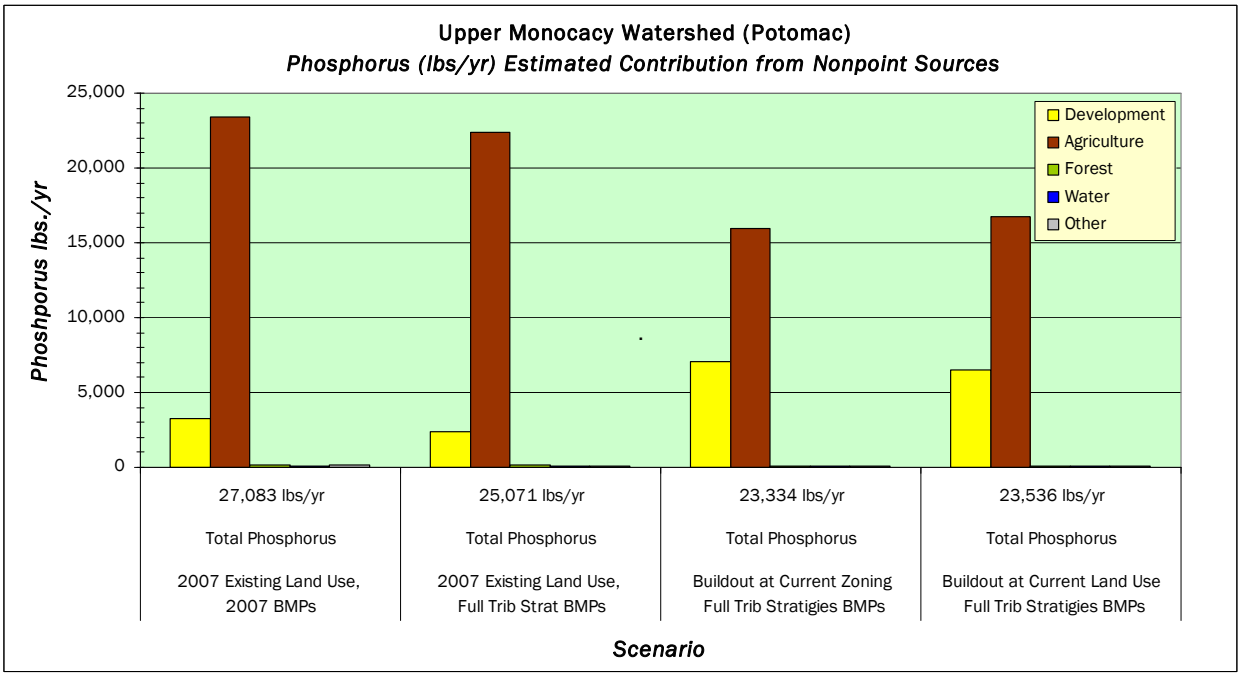
	2007 LU, 2007 BMPs (Lbs/Yr)		2007 LU, Trib Strat BMPs (Lbs/Yr)		Current Zoning Trib Strat BMPs (Lbs/Yr)		Current Land Use Trib Strat BMPs (Lbs/Yr)	
	Nit	Phos	Nit	Phos	Nit	Phos	Nit	Phos
Upper Monocacy	369,357	27,083	272,901	25,071	268,048	23,334	269,752	23,536
Lower Monocacy	61,207	4,531	49,426	3,463	51,384	3,444	51,003	3,405
Double Pipe Creek	1,322,377	102,720	1,015,750	89,492	1,029,586	86,304	1,024,364	85,801
Potomac Total	*1,752,941*	*134,334*	*1,338,077*	*118,026*	*1,349,018*	*113,082*	*1,345,119*	*112,742*

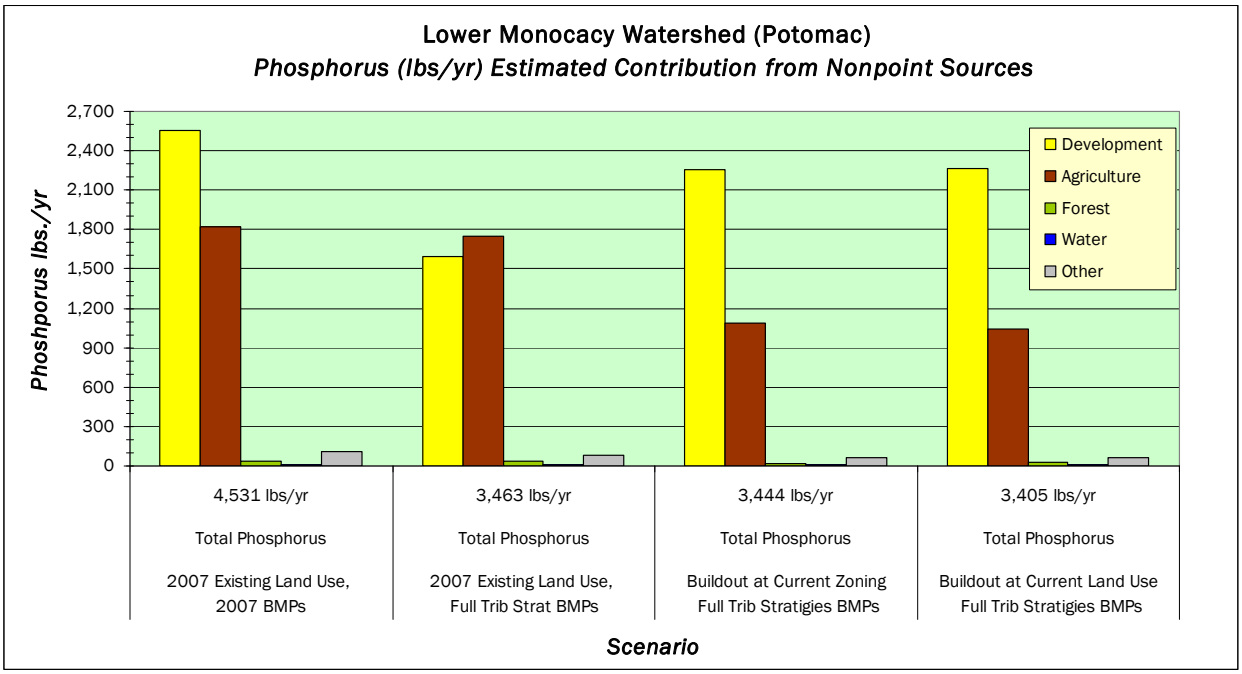
Source: NPSS, Data provided by MDP and Carroll County Comprehensive Planning, May 2009

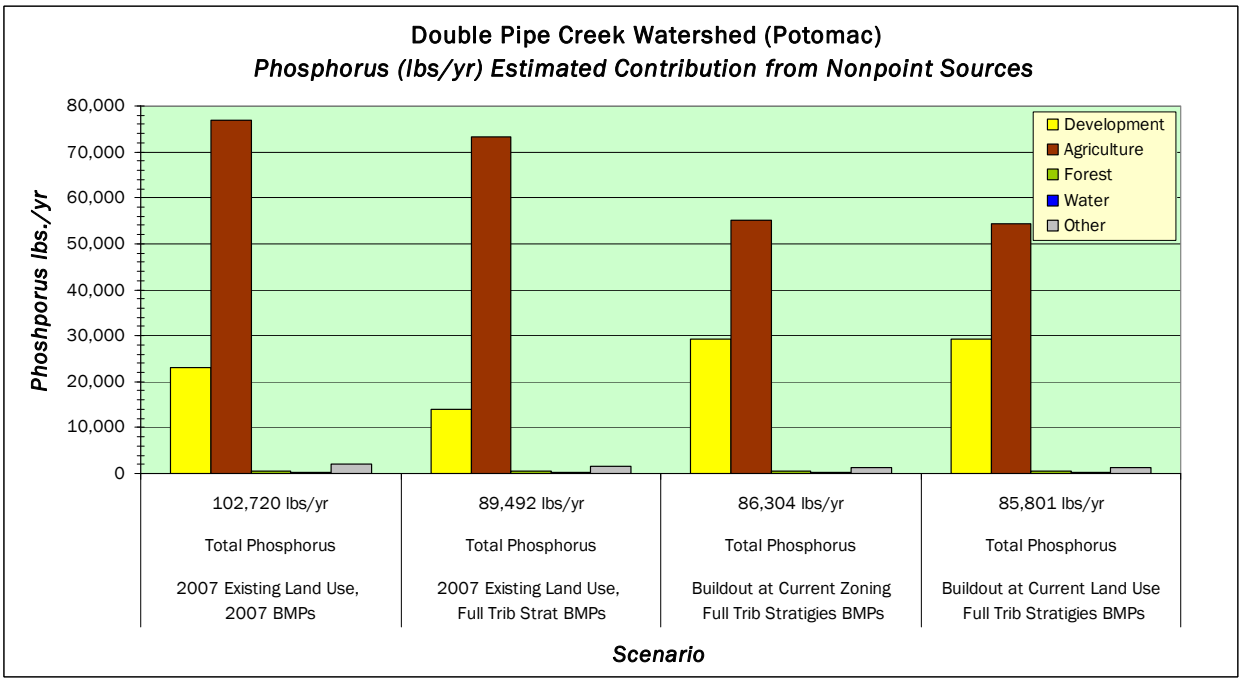












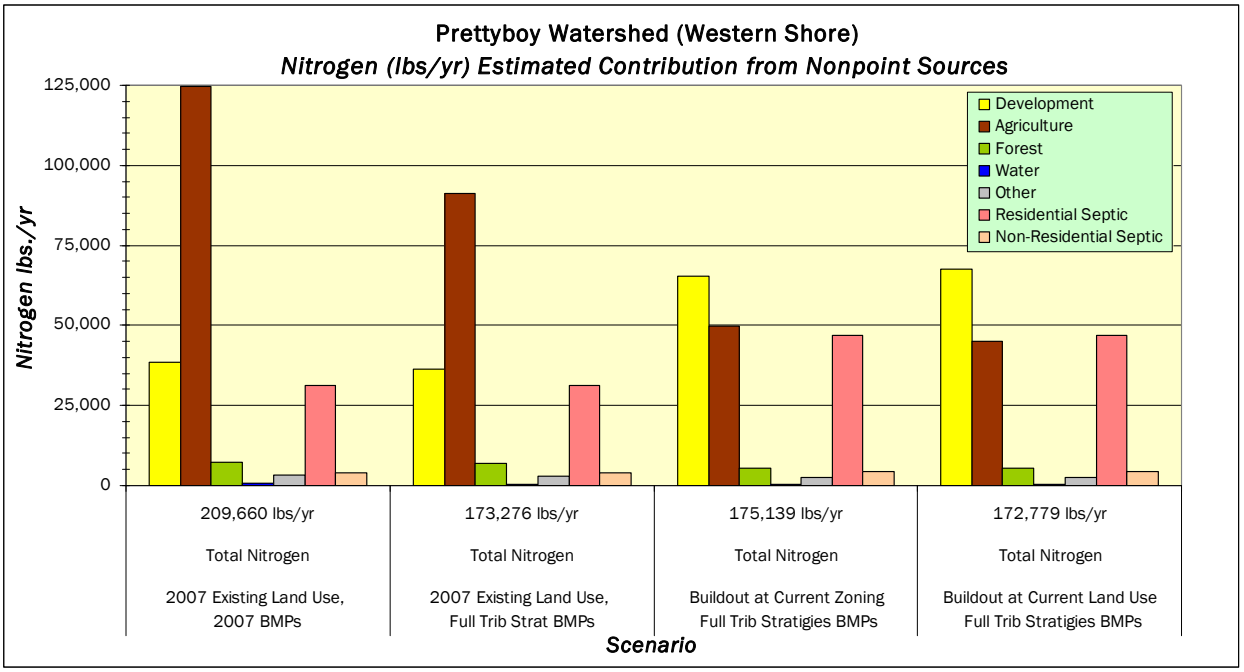
Upper Western Shore Watershed (6-digit)

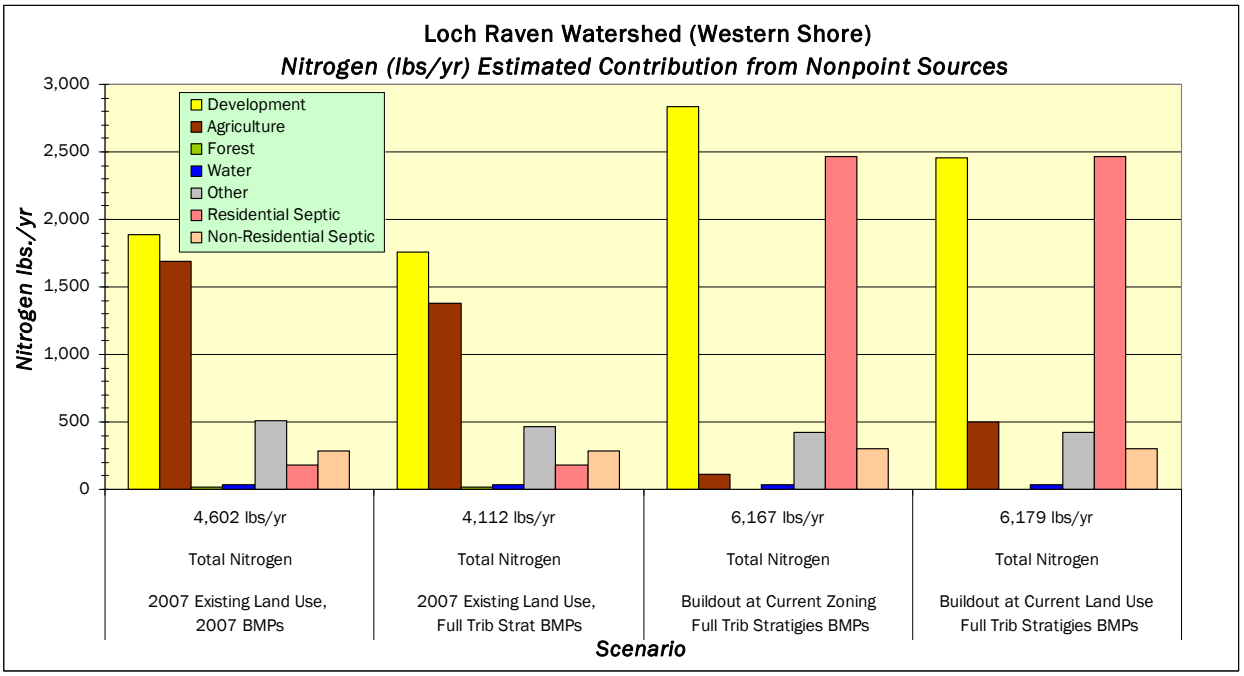
At the 6-digit watershed level, current nitrogen and phosphorous loads will decrease if the current land use plan is implemented in conjunction with full tributary strategies BMPs. The full implementation of either current zoning or land use scenarios would only produce a slight increase of approximately 2 percent for nitrogen and 4 percent for phosphorous over the 2007 Land Use with Tributary Strategy BMPs.

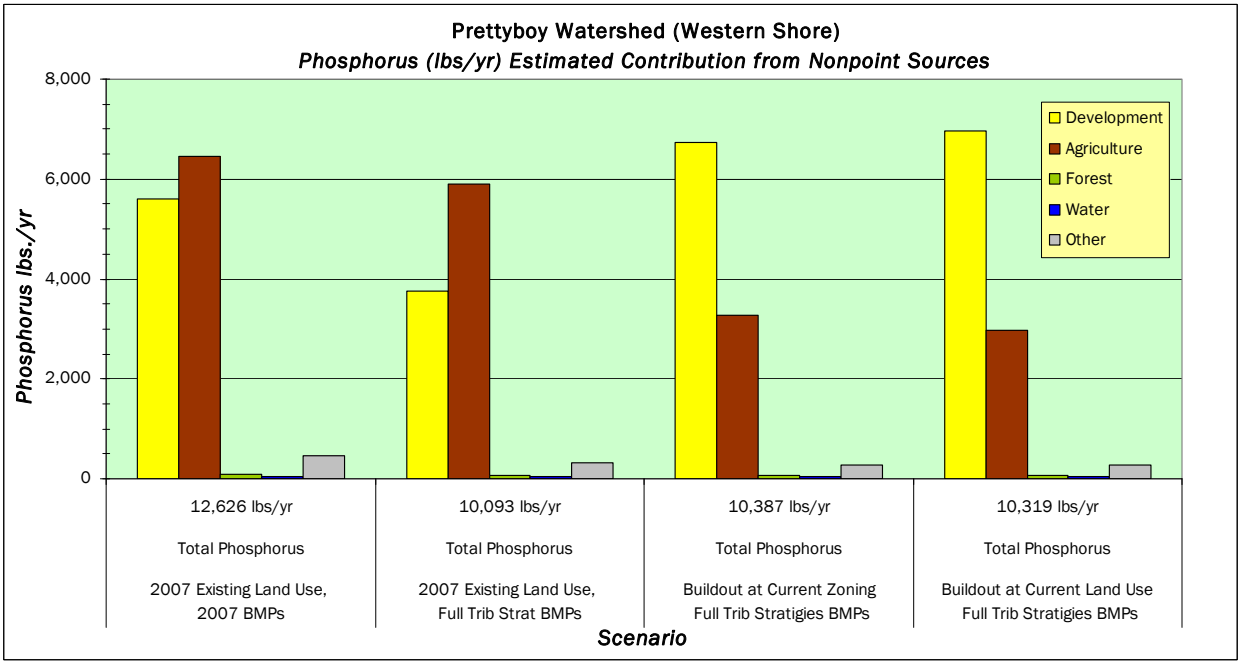
Total Estimated Nitrogen and Phosphorus Loads
For Each 8-Digit Watershed in the Upper Western Shore

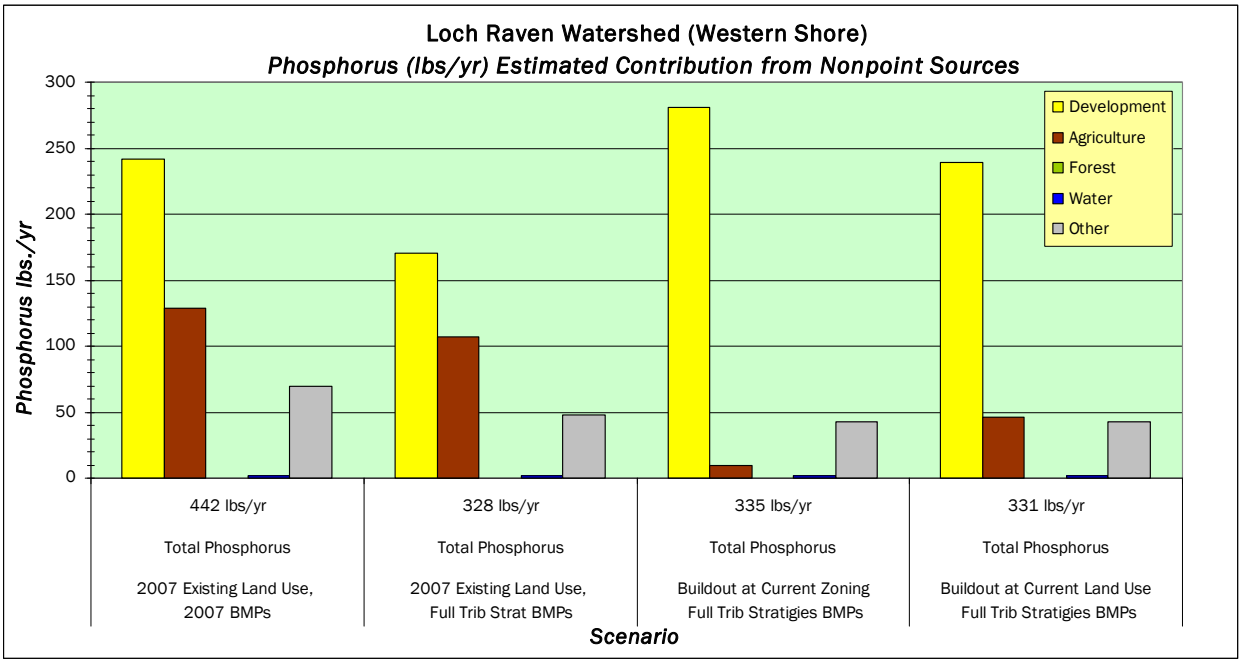
	2007 LU, 2007 BMPs (Lbs/Yr)		2007 LU, Trib Strat BMPs (Lbs/Yr)		Current Zoning Trib Strat BMPs (Lbs/Yr)		Current Land Use Trib Strat BMPs (Lbs/Yr)	
	Nit	Phos	Nit	Phos	Nit	Phos	Nit	Phos
Prettyboy	209,660	12,626	173,276	10,093	175,139	10,387	172,779	10,319
Loch Raven	4,602	442	4,112	328	6,167	335	6,179	331
Western Shore Total	*214,262*	*13,068*	*177,388*	*10,421*	*181 306*	*10,722*	*178,958*	*10,650*

Source: NPSS, Data provided by MDP and Carroll County Comprehensive Planning, May 2009









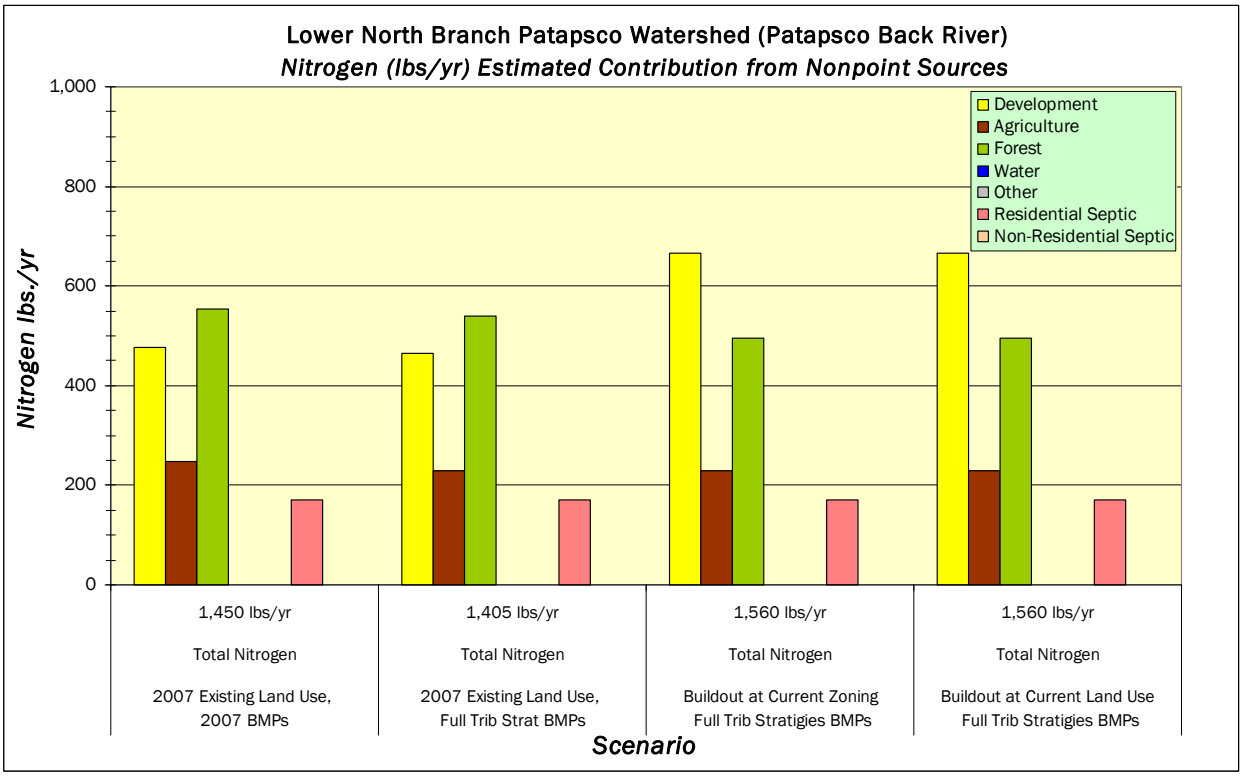
Patapsco/Back River Watershed (6-digit)

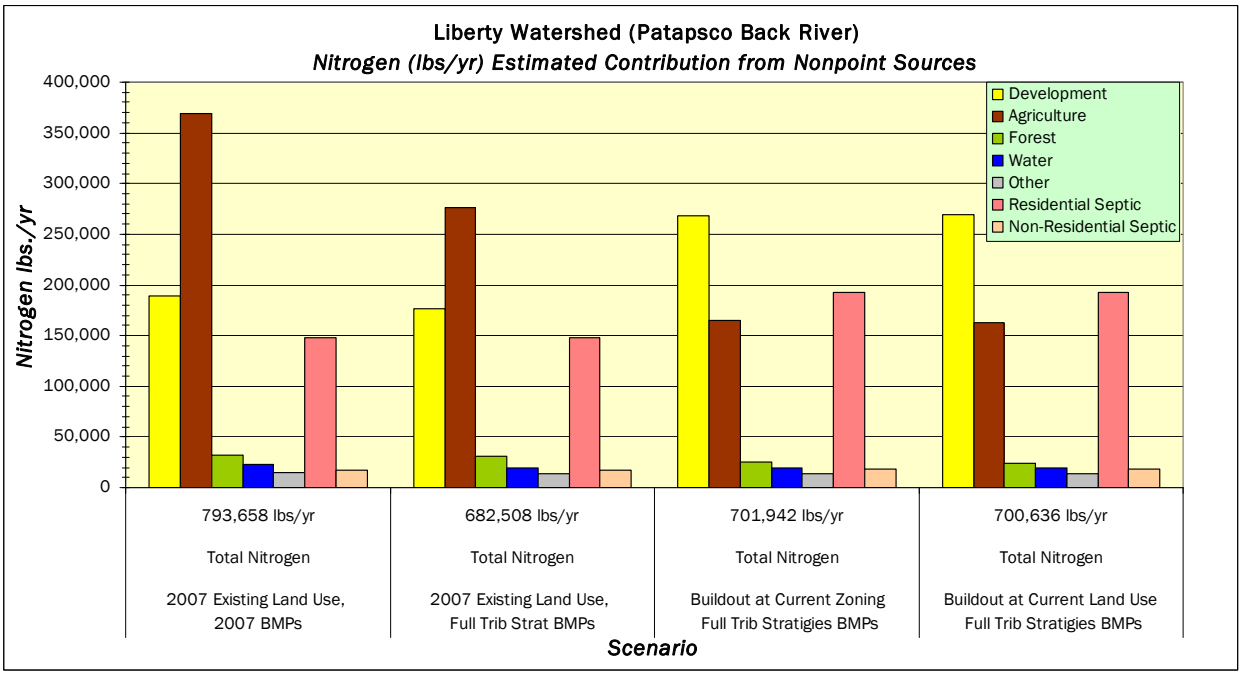
At the 6-digit watershed level, current nitrogen and phosphorous loads will decrease if the current land use plan is implemented in conjunction with full tributary strategies BMPs. The full implementation of either current zoning or land use scenarios would only produce a slight increase of approximately 2 percent for nitrogen and 4 percent for phosphorous over the 2007 Land Use with Tributary Strategy BMPs.

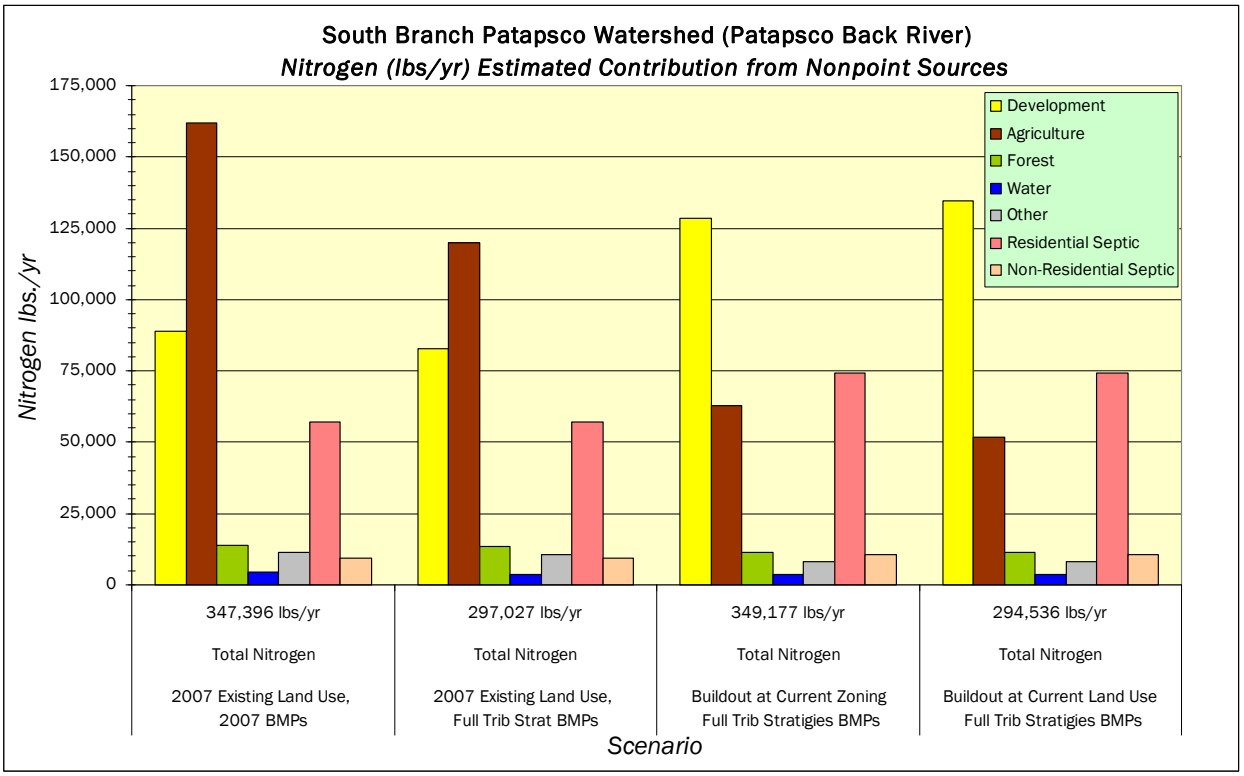
Total Estimated Nitrogen and Phosphorus Loads
For Each 8-Digit Watershed in the Patapsco/Back River Basin

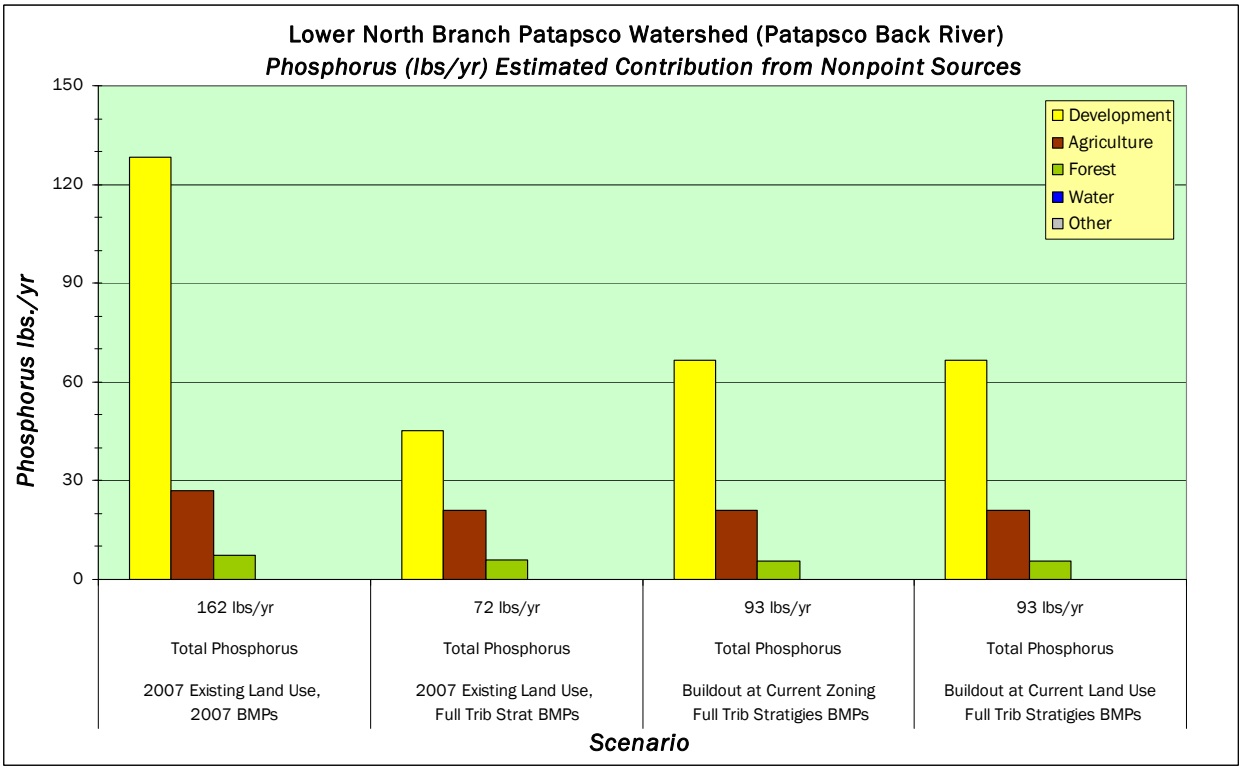
	2007 LU, 2007 BMPs (Lbs/Yr)		2007 LU, Trib Strat BMPs (Lbs/Yr)		Current Zoning Trib Strat BMPs (Lbs/Yr)		Current Land Use Trib Strat BMPs (Lbs/Yr)	
	Nit	Phos	Nit	Phos	Nit	Phos	Nit	Phos
Lower North Branch Patapsco	1,450	162	1,405	72	1,560	93	1,560	93
Liberty	793,658	52,037	682,508	39,871	701,942	41,830	700,636	41,744
S Branch Patapsco	347,396	23,354	297,027	17,923	299,434	18,724	294,536	18,646
Patapsco/ Back Total	*1,142,504*	*75,553*	*980,940*	*57,866*	*1,002,936*	*60,647*	*996,732*	*60,483*

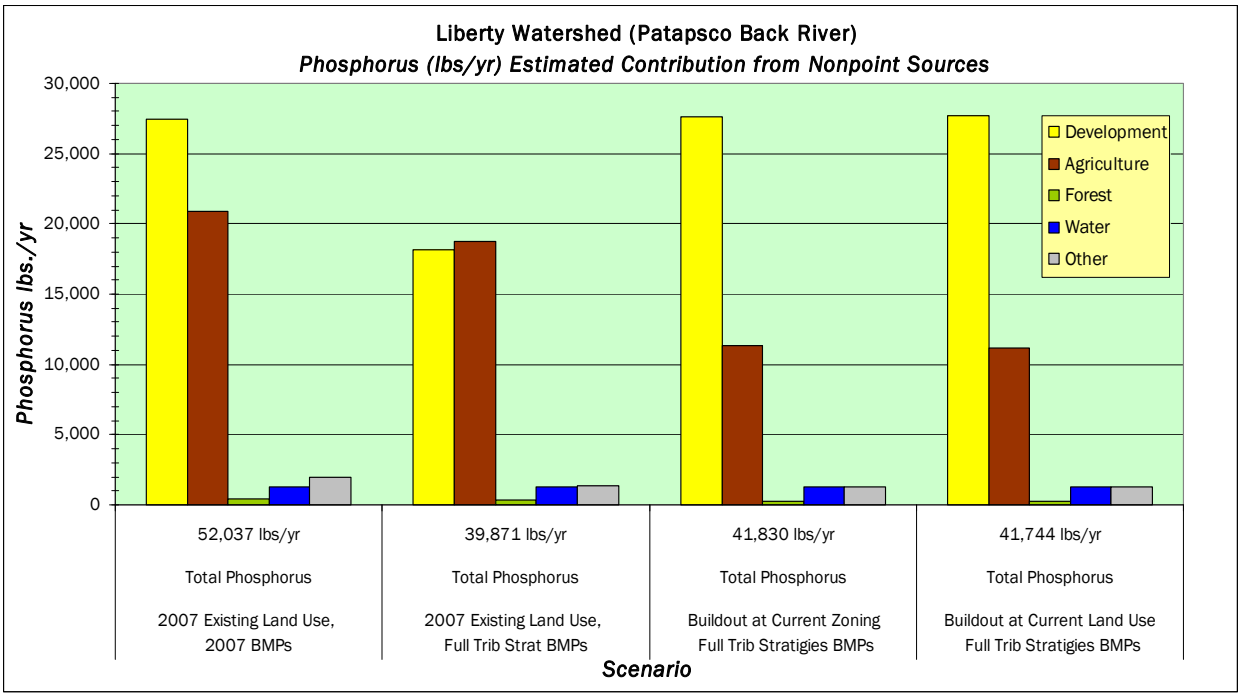
Source: NPSS, Data provided by MDP and Carroll County Comprehensive Planning, May 2009

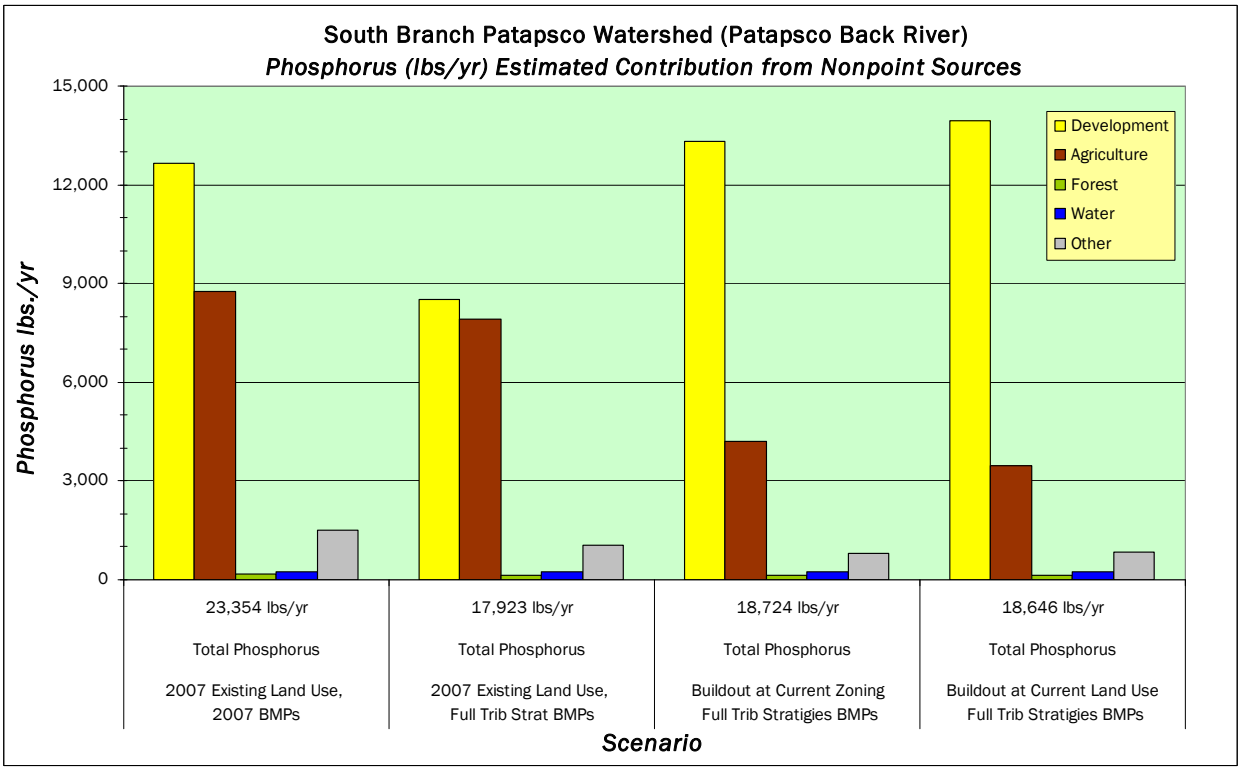


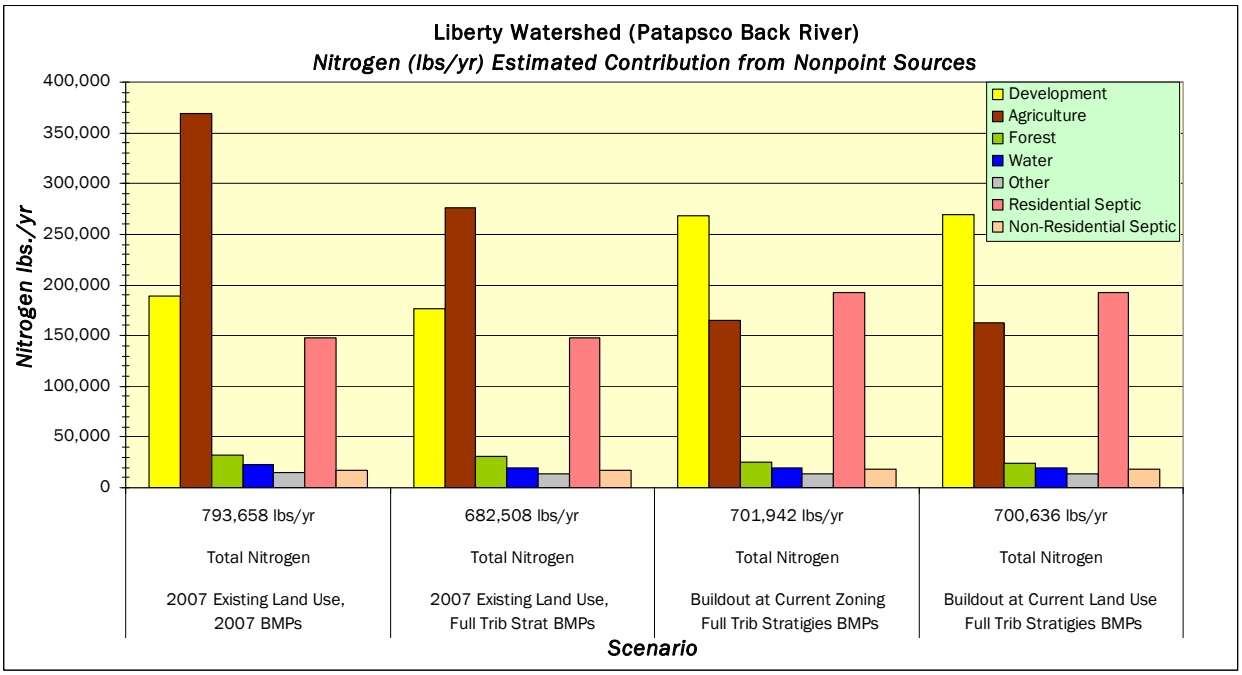












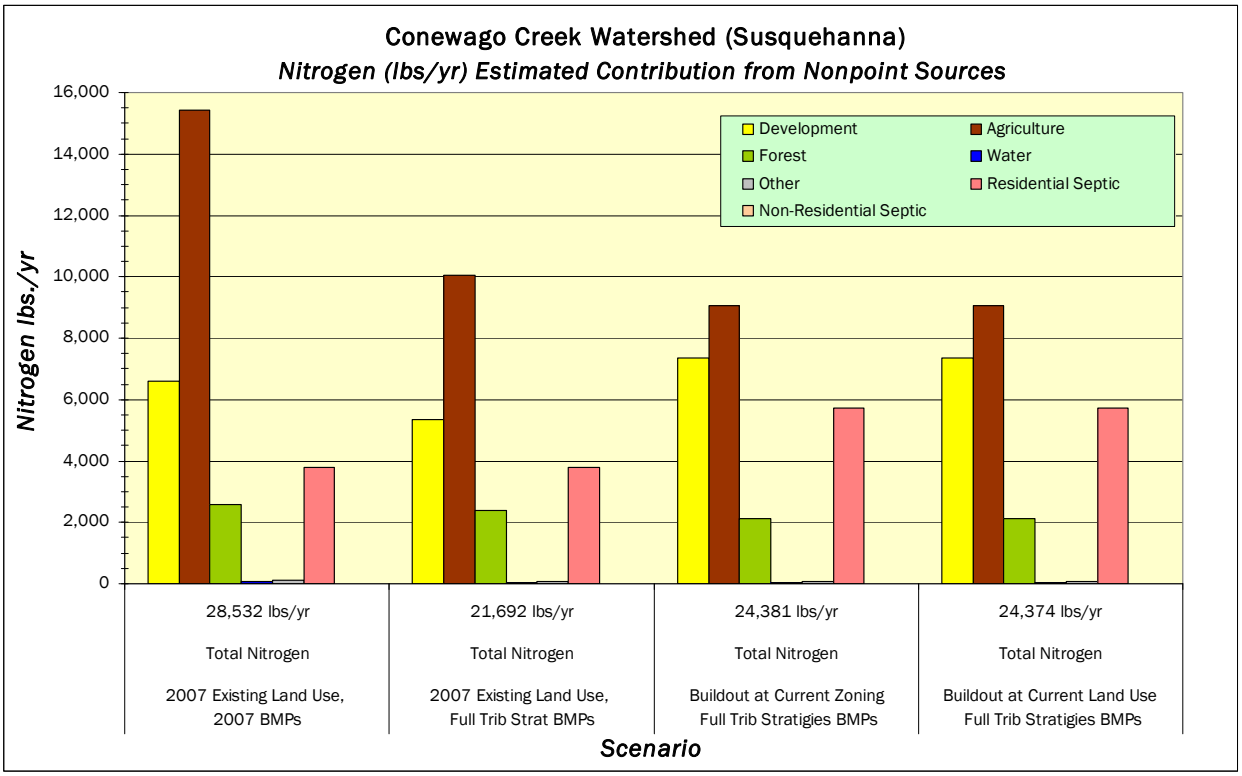
Susquehanna Watershed (6-digit)

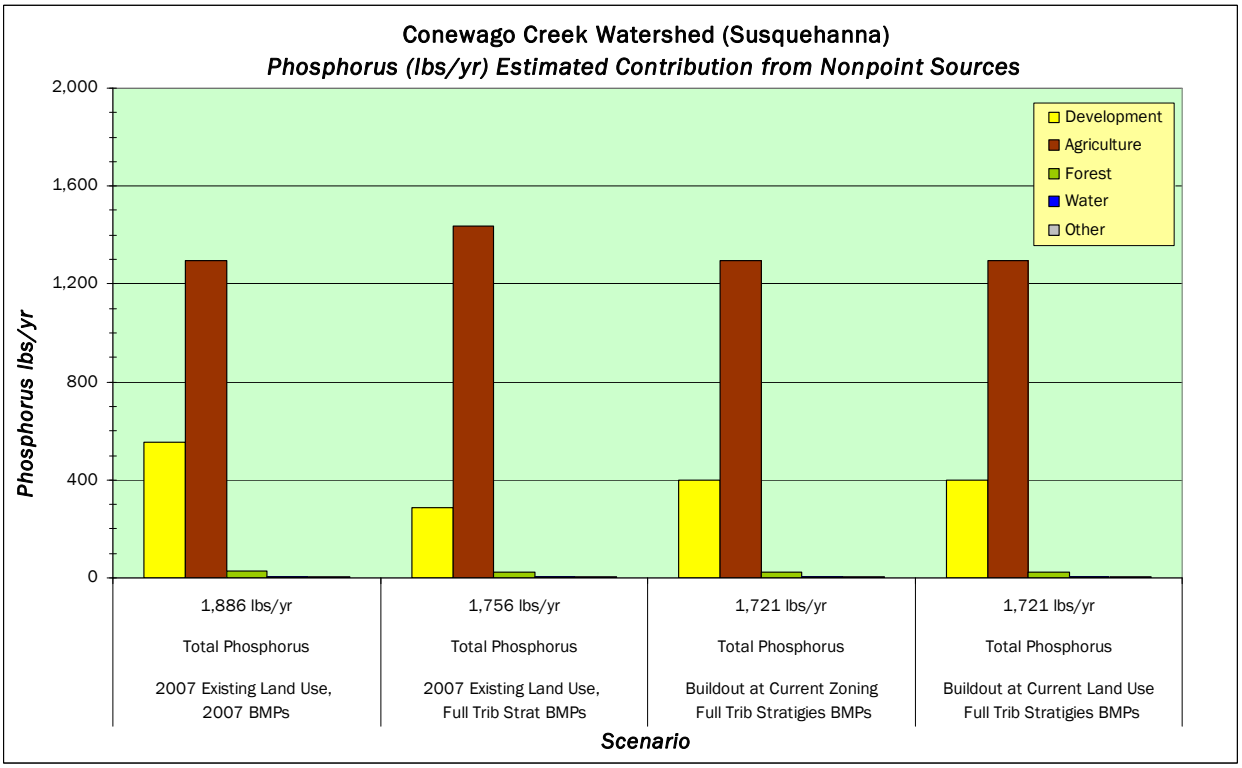
At the 6-digit watershed level, current nitrogen and phosphorous loads will decrease if the current land use plan were to be implemented in conjunction with full Tributary Strategy BMPs. The full implementation of either current zoning or land use scenarios would only produce a slight increase of approximately 12 percent for nitrogen and a slight decrease of 2 percent for phosphorous over the 2007 Land Use with Tributary Strategy BMPs.

Total Estimated Nitrogen and Phosphorus Loads For Each 8-Digit Watershed in the Susquehanna Basin

	2007 LU, 2007 BMPs (Lbs/Yr)		2007 LU, Trib Strat BMPs (Lbs/Yr)		Current Zoning Trib Strat BMPs (Lbs/Yr)		Current Land Use Trib Strat BMPs (Lbs/Yr)	
	Nit	Phos	Nit	Phos	Nit	Phos	Nit	Phos
Conewago Creek	24,746	1,886	17,907	1,756	18,666	1,721	18,659	1,721
Susquehanna Total	*24,746*	*1,886*	*17,907*	*1,756*	*18,666*	*1,721*	*18,659*	*1,721*

Source: NPSS, Data provided by MDP and Carroll County Comprehensive Planning, May 2009





Countywide Summary

Below is a chart showing the total NPS nitrogen and phosphorus loads and the total contribution from development.

Countywide Total Estimated Nitrogen and Phosphorus Loads

	2007 LU, 2007 BMPs (Lbs/Yr)	Baseline 2007 LU, Trib Strat BMPs (Lbs/Yr)	Current Zoning Trib Strat BMPs (Lbs/Yr)	% Change from baseline	Current Land Use Trib Strat BMPs (Lbs/Yr)	% Change from baseline
Total Terrestrial N Load	2,713,008	2,080,956	1,990,390	-4.35%	1,977,934	-4.95%
N from Residential Septic (EDUs)	342,770	342,770	487,084	42.10%	487,084	42.10%
N from Non-Residential Septic (EDUs)	49,808	49,808	52,442	5.29%	52,442	5.29%
Total Septic N Load	392,578	392,578	539,526	37.43%	539,526	37.43%
Total Nitrogen Load	3,134,453	2,514,312	2,551,926	2.28%	2,539,468	1.78%
Total Phosphorus Load	224,841	188,069	186,172	-1.02%	185,596	-1.33%

Combining all 6-digit watersheds in the county results in an overall decrease in nitrogen and phosphorous loads from the current 2007 land use through the modeled scenarios. The breakdown of nitrogen loads from differing sources indicates a predicted decrease in total terrestrial loads, significant increase from total septic loads, with an overall minor increase in total nitrogen loads (<3%). The results for phosphorous only slightly change with a 1 percent decrease.

Countywide nitrogen loads by general land use categories:
The graphs titled "Nitrogen (lbs/yr) Estimated Contribution from Nonpoint Sources," shown previously, provide a breakdown of nitrogen loads for the 8-digit watersheds for the modeled scenarios. The contribution and change in each source for the watersheds varies significantly. In just about every watershed, the contribution from agricultural sources decreases. In contrast, the contribution from development increases with future scenarios. In some watersheds, the contribution from residential septic systems increases dramatically.

Countywide phosphorus loads by general land use categories:
The graphs titled "Phosphorus (lbs/yr) Estimated Contribution from Nonpoint Sources," provide a breakdown of phosphorous loads for the 8-digit watersheds for the modeled scenarios. A similar trend is seen in agriculture and development as with nitrogen loads. Since the only sources are from agricultural and development, no contribution from septic system loading is modeled.

Countywide totals for Nitrogen and Phosphorus:
The following table provides a summary of calculated and modeled nutrient loadings totaled for Carroll County and its municipalities. These estimates become an important tool for land use planning, justification, and decision making.

Summary of Total Countywide Nutrient Loadings

	2007 LU, 2007 BMPs (Lbs/Yr)	Baseline 2007 LU, Trib Strat BMPs (Lbs/Yr)	Current Zoning Trib Strat BMPs (Lbs/Yr)	Current Land Use Trib Strat BMPs (Lbs/Yr)
Total NPS Nitrogen Load	3,134,453	2,514,312	2,551,926	2,539,468
Total NPS Phosphorus Load	224,841	188,069	186,172	185,596

The County and several of the municipalities are currently reviewing their community comprehensive plans. The results and findings of the WRE process have provided and are providing staff and their decision makers invaluable information regarding modifications to land use plans. An example is the Town of Manchester. The Town utilized information from capacity management plan worksheets, as well as other findings from initial WRE work, as support for the retraction of their Municipal GAB. This allows for their projected future growth area to align with estimated water, sewer, and other infrastructure capacities. Several other municipalities have incorporated similar recommendations within their strategies located in the Individual Municipal Systems sections of this document.

The determination of impacts either positive or negative to NPS loadings in Carroll County is a complicated issue. The modeled numbers above project significant improvements in loadings from 2007 Land Use if full implementation of Tributary Strategies occurs. This is, for all practical purposes, not a realistic scenario within the short term. If it is unrealistic, then using the Baseline 2007 Land Use with Tributary Strategy BMPs scenario becomes a true hypothetical exercise. The baseline scenario is an approximate 17-20 percent reduction in NPS nutrient loading countywide. The two additional scenarios, while exhibiting a slight increase, maintain this estimate. Therefore, it can be stated, based on hypothetical modeling, that current County and municipal land use designations and/or zoning projected to buildout will not significantly increase loadings from the baseline estimate.

The County and its municipalities have historically developed and adopted programs and methods related to managing nonpoint source loadings. In fact, as was highlighted via the Builders for the Bay effort, the County's stormwater management program is considered to be one of the leaders in the state. This effort will be continued and strengthened with the future adoption of the Stormwater Management Act of 2007 requirements. The County and its municipalities are also currently exploring techniques, programs, and methods through land use planning and zoning to reduce NPS loadings. High on the priority list is reducing development outside GABs (reduction in potential septic systems loadings) while promoting growth in the municipalities within water and sewer capacities.

The refinement of programs and techniques combined with enhancement of land use planning within and among the County and its municipalities provides the best possible scenario for continued improvements in NPS loading reductions.

Countywide Strategies

Countywide Strategies: Objectives & Action Items for All

This chapter contains the individual concepts, objectives, and policies and the associated specific action items recommended for all nine jurisdictions as a means of implementing the plan and moving the entire county on a path toward achieving the goals of the plan.

The objectives/policies that follow generally apply to all of the eight municipal water supply and wastewater systems in the county. Under each objective/policy, action items are already completed or being done by *some* of the municipalities or systems. However, if it would still apply to most of the systems, it was included in this section. Action items that are very specific, or would only apply to a particular system are included in relevant sections in the Overview of Municipal Systems in this plan document.

Water Supply Options

Countywide/Regional Planning and Coordination

In general, much of the water supply planning that has been conducted historically within Carroll County has been somewhat incremental in that the needs of individual towns have often been considered without a view toward a more countywide perspective. The countywide perspective used in the WRE Alternatives Evaluation fostered development of several alternatives where the needs of multiple communities could be met by a single large project, thereby offering potential economies of scale. Another consideration in moving toward countywide planning is that large projects, such as reservoirs or large interconnections with other water systems, can have the added benefit of helping avoid the sprawl that may otherwise occur where new development is based on individual large lots dependent on groundwater wells and septic systems, rather than a large reliable water source. Avoiding such sprawl and instead continuing to concentrate development in DGAs can help achieve the goal of the County Master Plan to preserve more farmland in the county.

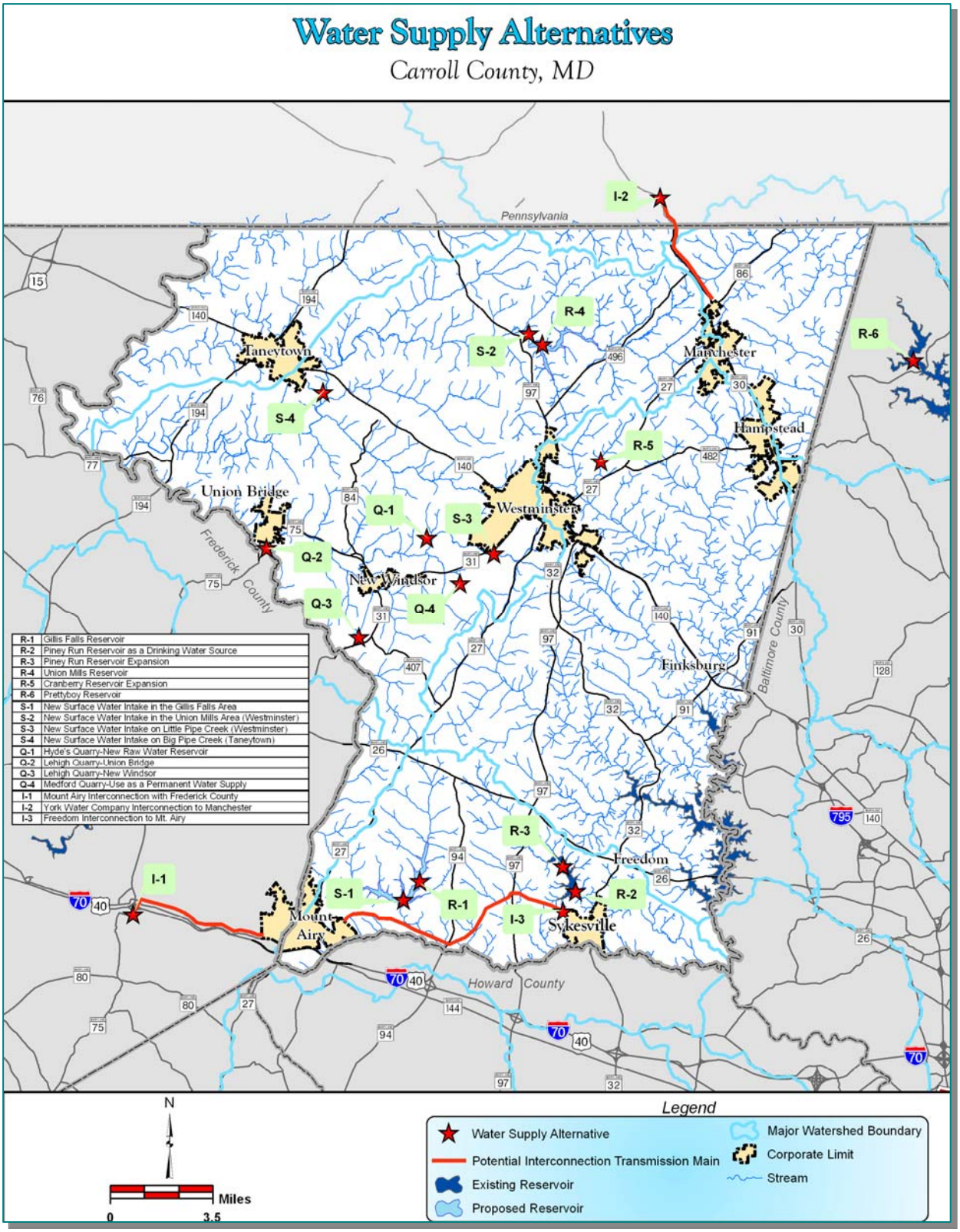
Diversification of Water Supplies

One of the most important recent trends in sustainable water supply planning is a movement toward diversified water supply development (e.g., not placing all your reliance on groundwater supplies). This new trend is often referred to as integrated water resources planning and can ensure that options still exist to meet water supply needs, even if the continued use of one water source becomes severely constrained. For example, regulatory or natural constraints can greatly limit use of certain water supplies during drought or other

emergency conditions. As a result, a diverse range of options were identified and included in this plan for future consideration to meet the county's future needs through a combination of reservoir, quarry, groundwater, and interconnection alternatives.

Water Conservation and Demand Management

Water conservation is the most cost-effective and sensible way to minimize our demand for water, a valuable and limited resource. Over the last decade, the county has experienced drought conditions on numerous occasions. As a result, water restrictions have been placed on publicly-maintained systems either through state, county, or municipal declaration or a combination thereof. As managed growth continues, both in and out of the DGAs, demand for water through public and private systems will persist.



In general, all jurisdictions and associated utilities should be encouraging water conservation and efficiency to reduce long-term system costs and produce additional societal benefits. In addition, as part of moving forward with development of new water supply alternatives that require significant regulatory approvals, it will be important to continue to document demand management practices that are already being followed within Carroll County. Water use tracking methods would allow the County and towns to better quantify the effect of demand management efforts already being taken. Careful evaluation of existing water use data (including numbers and types of connections) is typically required to quantify such effects. These data can then be used in support of permit applications required to implement new water supply projects.

Wastewater Options

Effluent Recycle / Reuse

"In addition to providing a dependable, locally-controlled water supply, water recycling provides tremendous environmental benefits. By providing an additional source of water, water recycling can help us find ways to decrease the diversion of water from sensitive ecosystems. Other benefits include decreasing wastewater discharges and reducing and preventing pollution. Recycled water can also be used to create or enhance wetlands and riparian habitats." *Source:* *http://www.epa.gov/region09/water/recycling/index.html*

The recycling and reuse of WWTP effluent (or "reclaimed water") is a viable long-term strategy for overcoming wastewater disposal limitations. In Maryland, the great majority of effluent reuse projects take the form of spray irrigation of cropland, as is practiced by the Town of Manchester. In states with a longer history of promoting effluent reuse (*e.g.*, Florida and California), many urban areas have separate distribution systems for reclaimed water, suitable for residential irrigation. There are also a growing number of examples nationwide of reclaimed water use by industries for process or cooling water. In areas such as Carroll County that have a predominance of rural and suburban land uses, irrigation of cropland or turfgrass is expected to remain the most prevalent opportunity for effluent reuse. Turfgrass opportunities include irrigation of golf courses, athletic fields, park land, or other green space.

As the Manchester situation illustrates, use of reclaimed water for irrigation does not eliminate the need for a NPDES permit, because it will still be necessary to discharge to surface water during the winter or when soil conditions do not permit irrigation. Both a surface water discharge permit and a groundwater discharge permit are required for such projects. State requirements for effluent irrigation systems are documented in MDE's *Guidelines for Land Treatment of Municipal Wastewaters*. Under these regulations, water used for irrigation must meet either Class I or Class II quality requirements, with associated buffer requirements. Maryland has also proposed draft amendments to the land treatment guidelines, which include Class III requirements for systems to which the public would have access.

Under Maryland's policy, application rates for new systems are limited by the *most* restrictive of either soil infiltration capacity or crop nitrogen requirements. Due to the prevalence of clay soils in the Piedmont, many parcels in Carroll County will not be suitable for reclaimed water irrigation. However, the restriction associated with the crop nitrogen requirement can actually be more limiting in many situations unless the WWTP employs nitrogen removal technology. Generally, application rates would be no greater than two inches per week, depending upon soil type, and can conservatively be estimated at one inch per week for planning purposes. This is equivalent to approximately 1.0 mgd per 260 acres of irrigated area, not including buffer zones.

Seasonal reuse of treated effluent can benefit those localities whose discharge to surface water is limited by loading caps or other water quality parameters such as temperature. Because a high level of treatment is still required, it does not provide relief for facilities that are primarily limited by treatment capacity. However, irrigative reuse is expected to be especially beneficial for major WWTPs that would be limited by nutrient loading caps even after installation of ENR technology. In most cases, it would still be necessary to discharge to surface water in the winter, or in other seasons, if the demand/land area for reused water is less than the total effluent generated. Facilities that have concentration-based nutrient limits would still be required to attain those limits when discharging to surface water.

Infiltration and Inflow Reduction

In addition to preserving treatment capacity for sanitary wastewater, I&I reduction also prevents sanitary sewer overflows (by reducing the amount of 'extra' flows during storm events), protects public health, reduces WWTP O&M costs, and improves the treatment process. I&I reduction programs should be considered a mainstay of collection system maintenance activities and a primary strategy for addressing wastewater limitations. In many of the systems, this may be the single most cost-effective means to increase capacity.

Bubble Permits

A bubble permit, also called an overlay permit, is an NPDES permit issued to two or more dischargers within a watershed and establishes aggregate loading limits with respect to one or more constituents, such as nitrogen and/or phosphorus. Under a bubbled permit, all facilities are deemed in compliance as long as the combined load does not exceed the combined load allocation. A bubble permit can be issued to either a single association (formed by multiple individual permittees) or a group of "co-permittees." Bubbling can only be performed within three large trading regions in Maryland, two of which include land area in Carroll County – Potomac trading region and Patuxent trading region.

Because different subwatersheds within these trading regions have different delivery factors (i.e., the ratio of the load delivered to tidal waters to the end-of-pipe load), the aggregate nutrient cap may have to be adjusted to ensure that it does not cause an increase in the delivered load. Technology-based or local water quality-based limits might still apply to individual facilities. In other words, bubbling cannot create a local water quality impairment. Bubbling is not a substitute for ENR upgrades at any major facility.

In Carroll County, bubbling of nutrient permit limits would be a viable option for reducing wastewater limitations under future growth scenarios.

Point Source Nutrient Credit Trading

The *Maryland Policy for Nutrient Cap Management and Trading in Maryland's Chesapeake Bay Watershed* establishes the principles by which discharges may obtain nutrient credits to offset loads above their nutrient caps. Nutrient credits may be generated by the following actions:

- Maintaining flow at ENR facilities at less than the design flow basis of its nutrient wasteload allocation
- Optimizing operation of ENR facilities
- Upgrading an existing minor WWTP to BNR or ENR
- Retiring an existing minor WWTP after connecting its flow to a BNR or ENR facility
- Retiring an existing Onsite Disposal System OSDS by connecting to an ENR facility
- Land application of wastewater with pre-treatment and nutrient management controls
- Implementing NPS practices.

Nutrient credit trades are subject to many requirements and caveats, including the following:

- Trades are not a substitute for upgrading major facilities to ENR
- Trading may not cause local water quality impairments
- Trades may only be performed within three large trading regions, two of which include land area in Carroll County
- Trades will be enforced through NPDES permits
- All trades will require a 5 percent retirement of nutrient credits to the State
- Nutrient credits are based on load delivered to tidal waters, not to the edge of stream; hence, delivery factors must be applied in the credit calculation
- Credits must be calculated and verified on an annual basis and cannot be banked for future years

In Carroll County, trading of nutrient credits between point sources would be a viable option for reducing wastewater limitations under future growth scenarios.

Onsite Disposal System Hookup Credits

Under the *Maryland Policy for Nutrient Cap Management and Trading in Maryland's Chesapeake Bay Watershed*, nutrient credits can be generated by the removal of OSDSs and by directing the flow to an ENR facility. In Carroll County, 7.5 lb/yr of credits would be generated by the hookup of an OSDS within 1,000 feet of a perennial stream, and 4.6 lb/yr of credit would be generated by the hookup of any other OSDS. As with point source nutrient credits, 5 percent of the credits would be retired to the State.

Potential OSDS hookup credits in Carroll County were estimated, applying the credit factors above and subtracting 5 percent of the credits to account for the mandatory retirement to the State. OSDS hookup credits were only estimated for the major SSAs that are likely to install ENR technology. Results demonstrate that OSDS hookup credits can serve an important role in offsetting nutrient discharges above load caps under buildout conditions. Such credits could potentially meet most if not all of the nutrient offset requirements. The large number of potential hookups in the Sykesville/Freedom DGA represents an especially large potential source of nutrient credits.

Nonpoint Source Nutrient Credits

In 2008, the MDA issued guidelines for generation and exchange of nutrient credits from agricultural operations. Under these guidelines, farmers may generate credits by implementing nutrient reduction practices that are above and beyond a baseline level established by the State, or by converting land uses with high nutrient loads to those with lower nutrient loads. This program is in an early stage, and the degree to which NPS credits will be available is currently unclear. Given the challenges of meeting the baseline requirements of the Maryland's tributary strategies, few NPS credits are expected to be available in the near term. NPS credits are also made less attractive by the greater complexity of identifying, obtaining, and documenting NPS credits, and by the application of "uncertainty ratios" which further decrease the credits available.

Urban and suburban stormwater management practices also have the potential to generate nonpoint credits. However, as with agriculture, credits would only be associated with practices that are above and beyond regulatory requirements and tributary strategy baselines. Given the stringent stormwater management requirements and high costs of stormwater management, it is not expected to be cost effective to offset excess point source loads by urban stormwater management. Such offsets might serve as a minor component of the countywide nutrient credit balance.

Due to the limitations and uncertainties discussed above, it is recommended that Carroll County explore point source nutrient credit trading and OSDS hookup credits before relying on NPS credits.

Water Supply Strategies

Specific "To Do" Action Items under each strategy in this plan are grouped by timeframe into short-term and long-term action items. Short-term action items are intended to refer to actions that are recommended to occur within the six-year timeframe before the plan will need to be updated again. Items listed as long-term are anticipated to occur more than six years after the adoption of the plan.

1. Protect and sustain existing water supplies serving existing development

Specific Action Items Already in Place:

- ✓ Continue to implement Chapter 218, Water Resource Protection, which provides programmatic and management practices such as buffering and setbacks needed to protect water resources from the impacts of development [*from Guidance doc*]
- ✓ Well sites are identified within and outside the GAB for future groundwater development potential
- ✓ Protect existing and potential sources from development

Specific "To Do" Action Items:

Short-term

- ❑ Use the WSCMP worksheets for each community water system to identify impacts of development and support new allocations or connections to the system and to prevent capacity over allocation [*from Guidance doc*]
- ❑ Continue to deny allocations and/or connections to any system that would cause system capacity to exceed a set percentage of maximum capacity in conformance with each jurisdiction's Adequate Public Facilities Ordinance [*from Guidance doc*]
- ❑ Require watershed and wellhead protection around existing water supply sources [*from Guidance doc*]
- ❑ Incorporate the county's open space and land preservation program measures that will support water protection requirements [*from Guidance doc*]
- ❑ Use interjurisdictional/regional approaches as necessary and adopt or amend ordinances as necessary to protection water resources [*from Guidance doc*]
- ❑ Identify existing older water pipes in need of repair or replacement and program improvements into the Community Investment Plan
- ❑ Promote and assist municipalities in the adoption of water resource management ordinances

Long-term

- ❑ Delineate and phase community water service areas in the land use element consistent with the ability of the water resource to support development based on population growth and development capacity analysis [*from Guidance doc*]
- ❑ Examine source water protection opportunities and threats to drinking water supplies, including streams and their buffers, from development, runoff, pollution and other

causes. Identify private or government actions that can be effective in protecting drinking water supplies [*from Guidance doc*]

- ❑ Create and implement drought management procedures and requirements [*from Guidance doc*]
- ❑ Examine the feasibility of re-using water pumped from area quarries

2. *Identify and develop, as needed, new water supplies adequate to support planned future growth without over-allocating available sources*

Specific Action Items Already in Place:

- ✓ Insist on rigorous implementation of existing laws that development plan approval be contingent upon a demonstration that water supplies are adequate to meet requested demands
- ✓ Include provisions in the subdivision/development regulations that require that site plan/subdivision plat submittals have documentation from an engineer or official notification from the appropriate municipal or county agency(ies) stating that adequate water either presently exists or will exist for all development approved
- ✓ Continue supporting future reservoir or watershed areas and the appropriate restrictions and/or protections to ensure water supply development can proceed in the designated future time period
- ✓ Continue collaboration efforts between the County and municipalities in the development and protection of water resources throughout the county

Specific "To Do" Action Items:

Short-term

- ❑ Ensure new development pays for the cost of providing water [*from Guidance doc*]
- ❑ Collaborate with the State on our regional contribution to the Piedmont water availability study [*from Guidance doc*]
- ❑ Implement a system to track demand for all known and potential development projects

Long-term

- ❑ Evaluate regional solutions to future water supply capacity planning [*from Guidance doc*]
- ❑ Explore additional sources for future water supply to prepare for policy changes or other changes that would result in the need for additional available water capacity, even in areas where current planned sources are enough to meet projected demand
- ❑ Approach future planning for water supply from a countywide, regional perspective for large projects to ensure collaborative implementation of comprehensive plans and use of water supplies to meet future demands

3. *Develop emergency supply plans and measures*

Specific "To Do" Action Items:

Short-term

- ❑ Determine the emergency supply measures or plans that are already in place

Long-term

- ❑ Coordinate with appropriate jurisdictions and agencies to update or develop emergency supply plans that bring the various existing measures together and identify any additional options
- ❑ Work toward getting agreements and other measures in place to implement the emergency supply plans

4. *Promote water conservation measures and manage demand for potable water to ensure adequate supplies are available for planned development*

Specific Action Items Already in Place:

- ✓ Interjurisdictional Coordination / Collaboration: Continue to support the efforts of the Carroll County WRCC
- ✓ Implement programs educating water customers about the importance of, and methods to, conserve water

Specific "To Do" Action Items:

Short-term

- ❑ Foster water conservation habits, by placing an emphasis on major components like behavioral change, technology, or an improved design through, outreach programs in order to reduce water loss, waste, or use
- ❑ Reduce the amount of water wasted through leakage (I & I) by targeting, improving, and/or replacing aging infrastructure
- ❑ Implement the recommendations of the "Carroll County Comprehensive Water Conservation Recommendations" report prepared by the WRCC and Environmental Advisory Council (EAC)
- ❑ Establish water use tracking methods that will allow the County and municipalities to better quantify the effect of demand management efforts already in place

Long-term

- ❑ Implement a zone/conservation pricing system for the County's public water supply and sewerage systems to create an incentive for water conservation
- ❑ Evaluate and adopt policies requiring the use of rainwater collection and reuse systems, such as rain barrels and cisterns
- ❑ Create natural landscaping demonstration projects on public grounds and parks to reduce the amount of irrigation needed for landscaping
- ❑ Evaluate and adopt policies requiring high-efficiency plumbing fixtures in all new construction
- ❑ Provide incentives for development projects that take steps that go beyond what is required to reduce water usage
- ❑ Continue to implement programs educating water customers about the importance of, and methods to, conserve water
- ❑ Provide incentives for businesses and homeowners to retrofit existing structures using high-efficiency fixtures and appliances
- ❑ Adopt and implement policies requiring water conservation from all users to promote more efficient use of available treatment capacity

- ❑ Design and implement a rigorous water conservation program including routine water audits, water accounting and loss-control procedures, water reuse initiatives, conservation rate structures, and outreach programs [*from Guidance doc*]
- ❑ Develop programs and modify regulations/policies that promote water conservation and reduced water demand by individual consumers (homeowners and business owners) of the public water supply systems

Water Quality Strategies

5. *Sustain existing wastewater treatment capacity*

Specific Action Items Already in Place:

- ✓ Limit allocations and connections that would not cause a system capacity to exceed a set level under maximum capacity

Specific "To Do" Action Items:

Short-term

- ❑ Use the WWCMP worksheets for each WWTP and system to determine the impact on capacity as part of the approval process for allocations and connections to the system [*from Guidance doc*]
- ❑ Establish and require water conservation measures to be implemented [*from Guidance doc*]
- ❑ Complete I&I studies for each system to determine where improvements can be made to reduce losses [*from Guidance doc*] and, thereby, potentially regain some capacity
- ❑ Share equipment among the jurisdictions to detect I&I to lower costs of this activity

Long-term

- ❑ Coordinate among the municipal systems on I&I reduction activities and identification of external funding sources to take advantage of economies of scale, thereby lowering costs to resource-limited communities
- ❑ Make system improvements to reduce identified I&I and adjust the capacity on the WWCMP worksheets to update available capacity
- ❑ Identify potential areas for spray irrigation and estimate the amount of additional wastewater capacity these areas would represent [*from Guidance doc*]
- ❑ Pursue nutrient offsets (point-nonpoint source nutrient credit trading) such as converting septic systems to connections to a public sewerage system [*from Guidance doc*]
- ❑ Continue efforts for planned ENR upgrade, enabling the current facility to operate at the limits of technology in terms of nitrogen and phosphorus removal and reducing the limitation on capacity that the caps might present

6. Develop new public wastewater treatment and disposal capacity

Specific "To Do" Action Items:

Long-term

- ❑ Proceed with planned "capacity-only" improvements identified in the *Carroll County Water and Sewerage Master Plan* to ensure capacity is available to meet demand where the WWTP is not already exceeding nutrient caps
- ❑ Should the loading rates approach the permitted limits prior to completion of the planned upgrades, evaluate options for spray irrigation and onsite treatment/reclamation of industrial effluent to divert flow from the WWTP
- ❑ Further evaluate land available for irrigation using reclaimed water through a GIS analysis of potential land use constraints; identify and prioritize land areas that should be pursued for water reuse opportunities
- ❑ Evaluate regional solutions to ensure future wastewater capacity and adequate management planning

7. Reduce nutrient loading via the implementation of the Statewide Tributary Strategies

Specific Action Items Already in Place:

Urban Sources: Stormwater Strategy

- ✓ Continue the County's strong support and implementation of erosion and sediment control and stormwater management regulations
- ✓ Administer local development processes to support the implementation of the Tributary Strategy and minimize water quality impacts on local waterways

Urban Sources: Growth Management Strategy

- ✓ Continue to promote and direct growth to PFAs, which will resolve conflicting and competing requirements [*from MD Trib Strat Impl Plan doc*]

Agriculture Strategy

- ✓ Provide staff and funding to the Soil Conservation District for technical assistance to farmers and landowners for the implementation of BMPs [*from MD Trib Strat Impl Plan doc*]
- ✓ Provide technical assistance and guidance on programs available to farmers and landowners for the implementation of BMPs and coordinate activities and funding between district, State, and federal programs [*from MD Trib Strat Impl Plan doc*]

Specific "To Do" Action Items:

Note: The timeframes for these items are organized differently than under other objectives. The order and categories are presented consistent with the Maryland Statewide Tributary Strategies Implementation Plan.

❑ Identify realistic measures and timeframes for implementing the Tributary Strategies

Point Source Strategy [Long-term]

❑ Initiate the planning, design, and construction of ENR upgrades at all significant WWTPs in the county for which they are not yet complete [*from MD Trib Strat Impl Plan doc*]

❑ Develop a trading/offset strategy to address growth and provide for nutrient cap maintenance [*from MD Trib Strat Impl Plan doc*]

❑ Work with congressional delegations and request additional Federal funding to make projects more affordable [*from MD Trib Strat Impl Plan doc*]

Urban Sources: Stormwater Strategy [Short-term]

❑ Revise and adopt local stormwater regulations to implement Maryland's Stormwater Management Act of 2007

❑ Investigate the creation of a countywide watershed protection (NPDES) utility fee

Urban Sources: Growth Management Strategy [Long-term]

❑ Develop procedures and methods for considering TMDLs and impaired waters in comprehensive plans and development review processes

Air Deposition Strategy [Long-term]

❑ Continue to work with State and regional partners (such as BMC) to develop local emission control programs needed to meet air quality goals [*from MD Trib Strat Impl Plan doc*]

❑ Support State and regional partners to push efforts for regional controls to reduce air pollution transport [*from MD Trib Strat Impl Plan doc*]

8. *Investigate the use of reclaimed water in appropriate areas to supplement water supply capacity and address water quality issues*

Specific "To Do" Action Items:

Short-term

❑ Work with MDE to develop regulations that would appropriately permit the use of reclaimed water technology in Maryland to enable the implementation of this infrastructure in Carroll County

Long-term

❑ Identify areas where limitations on water supply capacity to serve existing or future development demand could be mitigated by reusing water for appropriate uses

❑ Identify areas that could be suitable for spray irrigation as an alternative to discharging wastewater effluent to streams where a WWTP would otherwise exceed caps to meet demand

❑ Maximize the use of recycled water for appropriate applications including outdoor irrigation, toilet flushing, and commercial and industrial processes

9. Reduce the amount of impervious surface that could result from new development

Specific "To Do" Action Items:

Short-term

- ❑ Work with the municipalities, where applicable, to incorporate in their road standards measures that reduce the required street width and that allow for the minimum required pavement width needed to support travel lanes, on-street parking, and emergency vehicle access
- ❑ Implement new State stormwater management regulations, which are designed to reduce impervious surface associated with new construction
- ❑ Evaluate and adopt, where needed, amendments to parking requirements, imposing limits on the surface area of a site devoted to parking
- ❑ Evaluate and adopt policies that reduce the amount of impervious surface permitted in new development

Impervious surfaces are mainly constructed surfaces - rooftops, sidewalks, roads, and parking lots - covered by impenetrable materials such as asphalt, concrete, brick, and stone. These materials seal surfaces, repel water, and prevent precipitation from infiltrating soils. Soils compacted by urban development are also highly impervious. By decreasing infiltration, impervious surfaces increase stormwater runoff.

Impervious surfaces allow many types of pollutants, derived from a variety of sources, to accumulate upon them. Many of these pollutants are subsequently washed into waterbodies by stormwater runoff, severely degrading water quality. This type of pollution is known as nonpoint source water pollution and is linked to land use activities. Water quality problems increase with greater levels of imperviousness and intensity of land use. Carroll County currently has a number of streams on Maryland's list of impaired waters.

TMDL stands for "Total Maximum Daily Load." The load refers to the amount of a specific pollutant found in a body of water coming from all sources. Simply put, the TMDL is the highest amount of foreign substance that a body of water can accept from all sources without exceeding water quality standards. Once a TMDL is set and approved by the US EPA, requirements are imposed that are intended to correct existing impairments. New federal and state regulations for meeting TMDLs also mean planning to prevent activities that may add pollutants in the future. Changes to land use or the amount of planned development may be necessary to address the requirements of the TMDL.

Please refer to the table in Appendix D entitled "MDE Documented TMDL Impairments for Carroll County" for a status of each of the pending and completed TMDLs for Carroll County.

Long-term

- ❑ Retrofit stormwater management facilities into existing subdivisions where there are no stormwater facilities in order to help meet the NPDES permit requirements of reducing impervious cover
- ❑ Promote the use of landscaped islands as stormwater areas
- ❑ Investigate the feasibility of incorporating stormwater conveyance and treatment features, such as grass channels, stormwater curb extensions, and linear stormwater tree pits, into closed-section roadways
- ❑ Encourage the use of alternative, permeable sidewalk and trail surfaces

10. *Protect or restore water quality, keep waters off Maryland's list of impaired waters, and make progress toward any applicable TMDLs*

Specific "To Do" Action Items:

Short-term

- ❑ Develop education materials and programs to raise public and individual awareness of water quality measures, how our actions impact water quality, and what individuals can do
- ❑ Decrease allowable residential densities in rural areas outside DGAs to reduce the number of future residential septics that could be added, thereby reducing some of the potential increase in nitrogen loads
- ❑ Implement measures to increase the urban tree canopy, thereby increasing the interception of rainfall

Long-term

- ❑ Participate in State program of trading or offsets to maintain or reduce nutrient loading in impaired watersheds
- ❑ Initiate the planning, design, and construction of ENR upgrades at all significant WWTPs in the county for which they are not yet complete
- ❑ Collect/monitor water quality data on pollutant loads in local stream basins
- ❑ Explore water reuse and zero discharge treatment plant systems to maintain nutrient loading caps in water bodies that have been deemed impaired by the State
- ❑ Identify land application sites that could be used as an alternative to discharging directly to streams for wastewater treatment plant capacity expansion
- ❑ Retrofit existing municipal stormwater management facilities that do not meet existing stormwater management requirements, where doing so would have a significant water quality impact
- ❑ Develop a program to systematically re-establish forested stream buffers in the municipalities

- ❑ Increase the frequency of municipal storm drain cleanouts to prevent storm drain clogging and reduce the amount of stormwater runoff that bypasses existing stormwater management practices
- ❑ Preserve or restore riparian stream buffers with native vegetation that can be maintained throughout the municipal plan review, construction, and occupancy stages of development
- ❑ Conserve trees and other vegetation at a site by planting additional vegetation, clustering tree areas, and promoting the use of native plants
- ❑ Connect existing, unserved development within GABs to public sewer systems to reduce nutrient loading to groundwater and to be eligible for offset credits
- ❑ Ensure adequacy of wastewater treatment operations in terms of quantity and quality, while maintaining compliance with regulatory requirements

There are six existing or planned water supply ***reservoirs*** whose watersheds extend partially or entirely within Carroll County: Loch Raven, Prettyboy, Liberty, Piney Run, Gillis Falls, and Union Mills. Combined, these existing and planned reservoirs could potentially provide high-quality water for nearly 2 million people in Baltimore City and the five surrounding counties.

Most of the watersheds for these reservoirs are on the State's list of "impaired" waters (the 303(d) list), and a TMDL will ultimately be set for the impairing substance. A TMDL for phosphorus has already been set for Prettyboy Reservoir. A TMDL for phosphorus and sediments has been set for Loch Raven Reservoir. Liberty Reservoir is listed as impaired, which indicates that a TMDL will eventually be set for it as well. While no TMDL has been set for Piney Run Reservoir, a watershed management plan is being developed to ensure continued maintenance of its water quality. To ensure the future quality of water provided by these reservoirs, the County needs to take measures both to address the TMDLs as well as make certain that future development does not further negatively impact the watersheds that drain to these reservoirs.

The Board of County Commissioners signed a new Reservoir Watershed Management Agreement in 2005. This was an updated agreement whose beginnings date to 1984.

11. Establish additional measures to protect Carroll County's and Baltimore City's reservoir watersheds

Specific "To Do" Action Items:

Long-term

- ❑ Support the Reservoir Watershed Protection Agreement

12. Enhance stormwater management programs

Specific Action Items Already in Place:

- ✓ Continue to incorporate the use of nonstructural BMPs such as natural conservation areas, roof and non-roof top disconnection, vegetated swales, sheet flow to buffer, reduced impervious cover to the maximum extent practicable and promote ESD or LID techniques, as required in Carroll County local laws since 2004
- ✓ Continue to require permanent protection of existing forest on development sites and promote the enhancement of existing contiguous and creation of new forest areas

Specific "To Do" Action Items:

Short-term

- ❑ Revise stormwater management regulations to incorporate requirements of the 2007 Stormwater Act
- ❑ Evaluate and adopt policies requiring increased bioretention of stormwater and onsite infiltration of stormwater, i.e., bioretention areas
- ❑ Investigate a countywide watershed protection (NPDES) utility fee

Long-term

- ❑ Retrofit developed municipal areas lacking stormwater management systems.
- ❑ Retrofit existing stormwater management facilities that do not meet current stormwater management requirements where doing so would have a significant water quality impact

13. Address NPS loading impacts

Specific Action Items Already in Place:

- ✓ Continue to aggressively promote Carroll County's land preservation programs, such as the Maryland Agricultural Land Preservation Foundation (MALPF), Rural Legacy, Critical Farms, and the Leveraged Installment Purchase Agreement (IPA) program
- ✓ Decrease allowable residential densities in rural areas outside DGAs that are within reservoir watersheds or areas targeted for farmland preservation

Specific "To Do" Action Items:

Short-term

- ❑ Adopt changes to the Landscape Ordinance to require the use of xeriscaping principles

Long-term

- ❑ Modernize subdivision ordinances to promote innovative site design techniques [*from Guidance doc*]
- ❑ Create a dedicated fund for enhanced inspection, maintenance, and restoration activities for stormwater
- ❑ Further evaluate the causes of individual changes and differences between scenarios for each 8-digit watershed to determine more specific actions that could be taken in each watershed to address or NPS impacts
- ❑ Identify failing septic systems, prioritize the systems that should be either connected to public sewer or upgraded or replaced using best available technology, and leverage funds to pay for such improvements

14. Identify changes to planned land use patterns and land development requirements to help achieve the needed reduction in pollutant loads

Specific "To Do" Action Items:

Short-term

- ❑ Reduce water and wastewater demand from new development by adopting land use policies that promote higher densities and clustering within DGAs
- ❑ Evaluate and implement changes to the land use designation and/or zoning of certain areas to promote development in areas not environmentally sensitive and in locations with appropriate infrastructure
- ❑ Adopt zoning and land use changes to severely limit development in sensitive areas such as stream and wetland buffers, floodplains, areas underlain by carbonate rock, and steep slopes

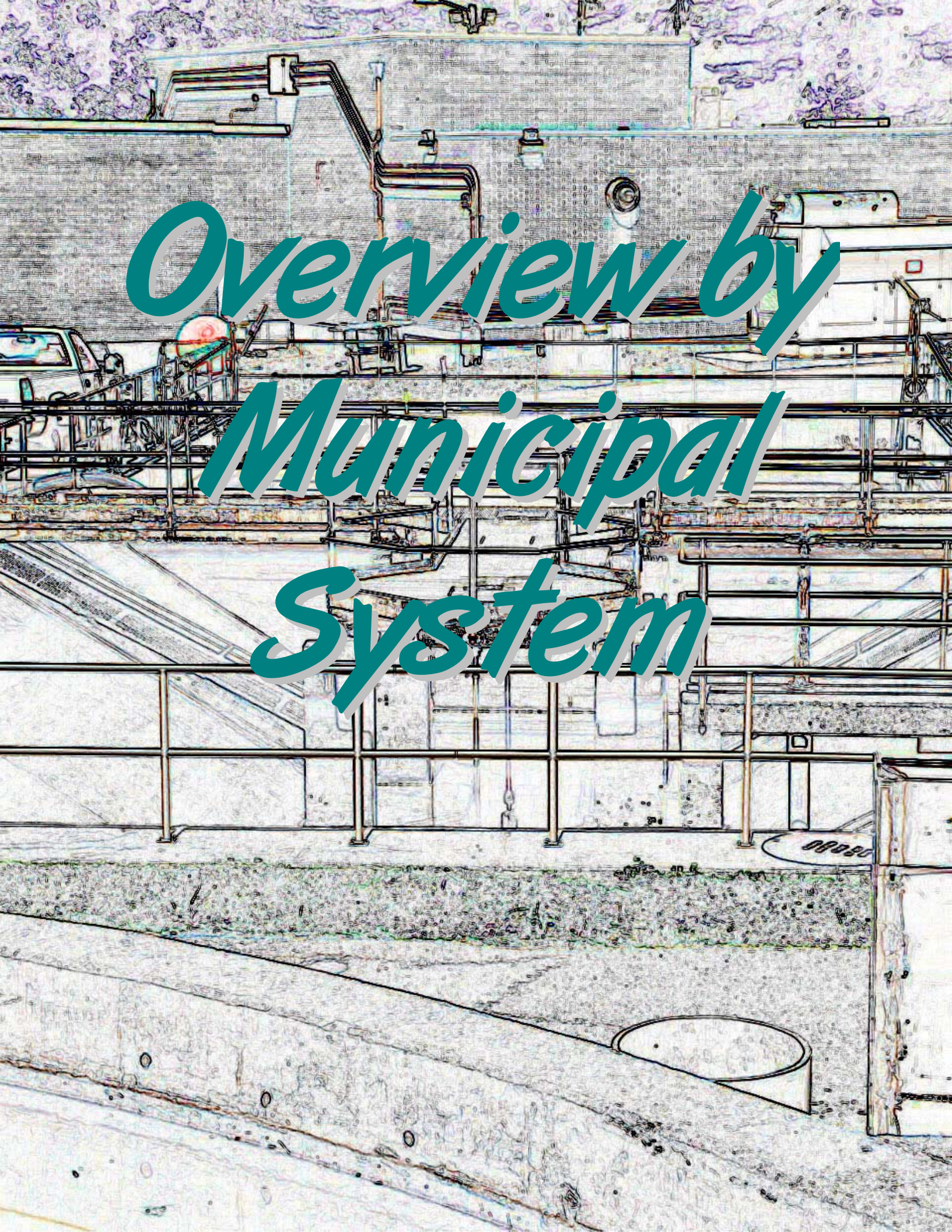
15. Refine the NPSS to more accurately reflect Carroll County conditions and to coincide with the revised Chesapeake Bay Program model and results

Specific "To Do" Action Items:

- ❑ Coordinate w/ the County to provide municipal data needed as inputs to the NPSS model

Nonpoint source loading analyses, conducted in support of a WRE, provide a preliminary assessment of potential changes in NPS loads due to land use planning decisions. Implementation policies should include a commitment to refining these analyses over time and at more refined geographic scales.

MDE estimates individual private septic systems generate a load of 11 pounds per year of nitrogen. Loads per household on public wastewater systems are estimated to produce nitrogen loads of only 3 pounds per year.


Overview by
Municipal
System

Carroll County
(in support of individual municipal systems & focusing growth in GABs)

The countywide strategies included in this plan apply to all nine jurisdictions. System-specific strategies for the Freedom water and sewer systems and the Hampstead sewer system are included in those sections. However, there also are strategies that are specific to the County that do not fall into either of these categories. The County undertakes many separate, County-specific actions in its support of individual systems, as well as continued focus of development into DGAs. This section describes those County-specific water supply and water quality projects and individual action items to help achieve the goals and land use plans of the County's and the municipalities' adopted comprehensive plans.

Water Supply Options/Alternatives

The County continues to be committed to working proactively with the municipalities to provide public water supply capacity to accommodate planned development in the DGAs. Therefore, the County continues to evaluate and support regional water supply projects to meet those needs.

The following projects are County projects that are considered for regional water supply options. However, inclusion here does not imply that there is a definite plan to move forward with an option. Exploration of additional sources, even for those systems that currently project enough capacity to meet demand, is included in order to be prepared for policy changes or other changes that would result in the need for additional available water capacity or other future scenario.

Note: Estimated cost is the total of cost plus 40 percent contingency.

Piney Run Reservoir (as built):

- Existing reservoir
- Safe yield 3.65 mgd with normal pool elevation of 524 ft.
- Construct new 2.0 mgd water treatment plant (WTP) on Hollenberry Road and 1.0 mg storage facility
- Approximately 1,000 feet of 16-inch diameter raw water transmission main
- Approximately 10.5 miles of 16-inch diameter treated water transmission main to connect to Mount Airy service area
- 2 pump stations – one at WTP, one booster pump station near Woodbine
- 2.0 mg storage tank (located near Woodbine)

- To serve as regional source of water supply for Mount Airy and Sykesville/Freedom Service Areas
- Estimated Capital Cost: WTP at Piney Run + Infrastructure to Serve Freedom Only = $18.15 Million
- Estimated Capital Cost: Treated Water Pipe ($13.51 M) + Pump Station ($1.96 M) = $15.47 Million (infrastructure to serve Mount Airy region)

Recommended Priority: Medium
Timeframe: 6-20 years
Justification: While the Alternatives Evaluation indicates that the Freedom system has adequate water available to serve planned development within the GAB, additional water supply sources are needed for the Mount Airy water system. Additional supply is needed to serve existing and planned growth, particularly if Mount Airy's planned commercial and industrial areas are to develop to their potential. Additionally, the Town has been part of a consent agreement with MDE. The Piney Run Reservoir was intended to serve as a regional water supply that includes the Mount Airy community.

Piney Run Reservoir (expanded):

- Increase capacity of existing reservoir by raising the spillway riser and emergency spillway; raise normal pool elevation by 4 feet
- Safe yield 4.11 mgd
- All components of Piney Run Reservoir (as built) option would already be in place prior to expansion of Piney Run Reservoir
- To serve as regional source of supply for Mount Airy and Sykesville/Freedom Service Areas
- Estimated Capital Cost: $8.8 Million

Recommended Priority: Medium
Timeframe: 6-20 years
Justification: While the Alternatives Evaluation indicates that the Freedom system has adequate water available to serve planned development within the GAB, additional water supply sources are needed for the Mount Airy water system. Additional supply is needed to serve existing and planned growth, particularly if Mount Airy's planned commercial and industrial areas are to develop to their potential. Additionally, the Town has been part of a consent agreement with MDE. The Piney Run Reservoir was intended to serve as a regional water supply, including the Mount Airy community. Expanding the capacity of the existing reservoir will provide the County with additional supply in the event another source is no longer available or needs to be supplemented. In addition, the State will view moving

forward with developing Piney Run Reservoir as a water supply as a prerequisite for successfully permitting another reservoir project in Carroll County.

Union Mills Reservoir:

- Planned reservoir (adopted *Carroll County Water and Sewerage Master Plan*)
- New intake, storage impoundment, three pump stations, raw and treated transmission mains, water treatment plant, dam
- To serve as regional source of supply for Westminster, Hampstead, Manchester, and Taneytown (to be served through flow augmentation of Big Pipe Creek and downstream withdrawal) Service Areas
- Potential for phased implementation, starting with a groundwater option, then a surface water intake on Big Pipe Creek; to be implemented prior to construction of a reservoir
- Environmental surveys may include wetland/stream delineation, cultural resources survey, and possibly a freshwater mussel survey
- Key permits required:
  - ❑ USACE Section 404 permit
  - ❑ Water appropriation and use permit
  - ❑ Water and sewerage construction permit
  - ❑ Non-tidal wetland and waterways permit
  - ❑ Dam safety permit

Justification: For the municipalities to be served by the planned Union Mills reservoir, projected demand was compared to the potential future water supply capacity that could reasonably be achieved based on water availability. The evaluation indicates that enough water supply is available through groundwater and other existing regional water supply options to serve the projected demand at buildout of the entire DGA for all four municipalities. However, several other factors could influence the need to continue to evaluate the feasibility of and make progress toward installing infrastructure for the planned Union Mills reservoir. Among these influences are the potential for administrative changes at MDE, changes in regulatory procedures or policy at the state and/or federal level, and climate change. The ability to justify need and administrative issues regarding land acquisition may present major challenges to full reservoir development. This phased project facilitates the diversification, regionalization, and redundancy of water supply sources for Carroll County's jurisdictions.

Phase 1: (Groundwater Wells + Pump House + Electrical) + Raw Water Transmission Main + Pump Station

Recommended Priority: High
Timeframe: 0-6 years
Estimated Capital Costs: $2.21 M + $7 M + $.97 M = $10.18 Million

- Develop 5-10 groundwater wells on the County's property at Union Mills; anticipated total yield 0.500 mgd; includes wells, pump houses, and electrical ($1.6M)

- Install about 5 miles of 20-inch diameter raw water transmission mains to connect Union Mills Reservoir to Cranberry Reservoir ($5M)
- Construct 1 pump station ($.69M)

Phase 2: (Surface Water Intake + Storage) + WTP + Envir Surveys

Recommended Priority: Medium
Timeframe: 6-20 years
Estimated Capital Costs: $23.5 M (including storage) + $4 M + $.2 M = $27.7 Million

- Develop a new surface water intake on Big Pipe Creek in the vicinity of the proposed Union Mills Reservoir dam area to supply water to Westminster ($23.5M)
- Safe Yield: 0.70 mgd yield achieved with a 4.0 mgd intake and a 280 mg storage impoundment
- Expand existing water treatment plant ($4M)
- Conduct environmental surveys ($.14M)

Phase 3: Reservoir + Treated Water Transmission Mains + 2 Pump Stations + WTP

Recommended Priority: Low
Timeframe: 20+ years
Estimated Capital Costs: $57 + $5.9 M + $1.94 M + $28M = $92.84 Million

- Safe yield 3.76 mgd with normal pool elevation of 610 ft. ($57M, contingency already built in)
- Install of approximately 7.8 miles of treated water transmission main to connect to Hampstead and Manchester Water Service Areas ($4.21M)
- 2 pump stations ($1.39M)
- Construct new WTP at reservoir ($20M)

Gillis Falls Reservoir:

- Planned reservoir (adopted *Carroll County Water and Sewerage Master Plan*)
- Safe yield 3.85 mgd with normal pool elevation of 610 ft.
- 1 pump station
- To serve as regional source of supply for Mount Airy and Sykesville/Freedom Service Areas
- Potential alternative use as mitigation site for wetlands and stream impacts resulting from the Union Mills reservoir
- Key permits required:
  - ❑ USACE Section 404 permit
  - ❑ Water appropriation and use permit
  - ❑ Water and sewerage construction permit
  - ❑ Non-tidal wetland and waterways permit
  - ❑ Dam safety permit
- Estimated Capital Cost: $104.4 Million (excluding additional land acquisition costs)

Recommended Priority: Low
Timeframe: 20+ years
Justification: While the Alternatives Evaluation indicates that the Freedom system has adequate water available to serve planned development within the GAB, additional water supply sources are needed for the Mount Airy water system. Additional supply is needed to serve existing and planned growth, particularly if Mount Airy's planned commercial and industrial areas are to develop to their potential. Additionally, the Town has been part of a consent agreement with MDE. The Gillis Falls reservoir has long been included in the *Carroll County Water and Sewerage Master Plan* as a planned public water supply source. However, despite the challenges that would be faced by moving forward with this project, it remains an option on the table. It will be considered and evaluated, along with the other options, in the event that additional water supply is needed as a result of changes in regulatory procedures or policy at the state and/or federal level, future expansion of GABs not currently contemplated in adopted community comprehensive plans, or climate change. It is, however, considered a low-priority project. If the project is deemed at some point in the future to be infeasible, the area will also be evaluated as a potential wetland and stream impacts mitigation site if the Union Mills reservoir project moves forward.

Prettyboy Reservoir:

- Based on Baltimore City's plans to develop a 120-mgd treatment plant for its Susquehanna River intake and the resulting increased system reliability, purchase excess capacity from Prettyboy Reservoir
- Conceptual plans for a 3.0 mgd intake and 7.5-mile long, 16-inch diameter raw water pipeline from Prettyboy Reservoir to a new 3.0 mgd water treatment plant in Hampstead
- Requires one high-service pump station located at the intake on Prettyboy Reservoir, and two pump stations for the Manchester and Westminster interconnections
- Regional approach includes an interconnection with the Manchester (3.0-mile transmission main) and Westminster (6.7-mile transmission main) Service Areas to help supply future demands
- Key permits required:
  - ❑ USACE Section 404 permit
  - ❑ Water appropriation and use permit
  - ❑ Water and sewerage construction permit
  - ❑ Non-tidal wetland and waterways permit
  - ❑ Dam safety permit
- Estimated Capital Cost: $39.8 Million

Recommended Priority: Low
Timeframe: 20+ years
Justification: The Alternatives Evaluation indicates that the Westminster, Manchester, and Hampstead systems have adequate water supply available as potential sources to serve

currently planned development within the GABs. However, this option will remain on the list of alternatives in the event that changes in regulatory procedures or policy at the state and/or federal level, future expansion of GABs not currently contemplated in adopted community comprehensive plans, or climate change necessitate implementation of additional public water supply sources. This option will be considered and evaluated, along with the other options, in the event that additional water supply is needed. It is considered a low-priority project, as the development of the phased Union Mills projects remain a higher priority.

Water Quality

Carroll County does not have specific capital projects to address regional wastewater supply or to provide wastewater capacity for multiple jurisdictions. (System-specific strategies for the Hampstead and Freedom WWTPs and systems are included in those sections.) However, specific actions and projects may be undertaken by the County to address septics and other water quality issues.

Septic System Improvements

Failing septic systems are a high-priority target for both nutrient reduction and protection of public health. Repair of a failing septic system, as well as connection to sanitary sewer or alternate treatment, would help reduce nutrient loading as well as address the problem of a failing septic for that affected homeowner. Leveraging of funds (e.g., the Bay Restoration Fund) to pay for such improvements may make it more cost effective.

Targeting of Sustainable Watershed Management Practices

(BMPs intended to protect water quality have other environmental effects that can be positive or negative with regard to ecosystem services and overall sustainability. Some BMPs provide net benefits to greenhouse gas (GHG) emissions, energy usage, wildlife habitat, flood risks, baseflow protection, etc., whereas other practices cause net detriments in these regards. Similarly, BMPs vary greatly in their cost-effectiveness; i.e., environmental benefit gain per dollar invested. For example, urban stormwater retrofits tend to be very expensive relative to the pollutant reduction achieved, and provide relatively low ecological benefits compared to other practices such as forestation, riparian buffers, and agricultural BMPs. WWTP upgrades increase GHG emissions, whereas nutrient management planning decreases GHG emissions and is extremely cost effective per pound of nitrogen load reduced. The County will need to carefully weigh costs and benefits when determining which BMPs to continue or encourage as well as which new BMPs should be pursued.

Funding Sources for Water Quality Implementation

Implementation of the Chesapeake Bay TMDL is expected to significantly increase financial burdens on all pollutant source sectors. ENR upgrades at major WWTPs will partially be funded by Maryland's Chesapeake Bay Restoration Fund. However, implementation for

stormwater, agriculture, and other nonpoint sectors will probably need to be met by a combination of sources, including local tax revenue and utility fees, state grants and cost-share programs (e.g., Maryland's Bay Restoration Fund), and federal grant and cost-share programs (e.g., Section 319 NPS implementation grants, the Conservation Reserve Enhancement Program, and the Environmental Quality Incentives Program), and out-of-pocket landowner costs.

The financial burden of TMDL-related mandates is thus a major element of the planning process, especially for the stormwater sector. In conjunction with other planning activities, the County will need to initiate focused efforts to evaluate the total costs of TMDL implementation, identify both internal and external funding sources to meet those costs, and pursue specific grant opportunities to ensure that County jurisdictions receive an equitable share of available public funding. Studies could include an evaluation of the impact of TMDL implementation costs on utility user fees, and the need/practicality of new revenue structures (e.g., stormwater/watershed fees).

Specific Strategies: Carroll County

■ Water Supply

1. *Protect and sustain existing water supplies serving existing development*

Specific Action Items Already in Place:

✓ Continue programmatic and management practices such as buffering and setbacks needed to protect water resources from the impacts of development (done through County Code) [*from Guidance doc*]

Specific "To Do" Action Items:

Short-term

❑ Include water resource protection as a criterion in the Land Preservation, Parks and Recreation Plan (LPPRP) [*from Guidance doc*]

Long-term

❑ Explore additional sources for future water supply to prepare for policy changes or other changes that would result in the need for additional available water capacity

2. *Identify and develop, as needed, new water supplies adequate to support planned future growth without over-allocating available sources*

Specific Action Items Already in Place: ("Continue to...")

✓ Rigorously enforce existing laws that require zoning, plat approval, and development approval be contingent upon a demonstration that water supplies are adequate to meet requested demands [*from Guidance doc*]

✓ Include provisions in the subdivision/development regulations that require that site plan/subdivision plat submittals have documentation from an engineer or official notification from the appropriate municipal or county agency(ies) stating that

adequate water either presently exists or will exist for all development depicted [*from Guidance doc*]

- ✓ Implement future water resource options and the appropriate restrictions and/or protections to ensure water supply development can proceed at the designated time period [*from Guidance doc*]
- ✓ Require watershed and wellhead protection around existing water supply sources [*from Guidance doc*]
- ✓ Created open space and land preservation program measures that support water protection requirements [*from Guidance doc*]
- ✓ Created and implemented drought management procedures and requirements [*from Guidance doc*]
- ✓ Protect and develop wellsite locations outside municipal boundaries

Specific "To Do" Action Items:

Short-term Strategy/ies

- ❑ Conduct detailed design and engineering studies for Union Mills reservoir
- ❑ Incorporate the acquisition of water recharge areas through land preservation easements to develop a bank of water allocations municipalities with recharge credit
- ❑ Rezone areas outside the GABs to be consistent with other areas of the county that are not within a DGA to reflect desired rural densities that would help protect or improve water quality
- ❑ Assist the municipalities with updating the WSCMP worksheets developed as background data for this plan document to reflect the most current information, then complete and for this plan document to reflect the most current information then complete and submit a full WSCMP to MDE for review

Long-term Strategy/ies

- ❑ Track development of credits available in commercial mitigation banks serving this region of Maryland in anticipation of stream and wetland mitigation requirements that would be associated with development of a planned reservoir

Long-term Water Supply Options

Note: These are options that will be considered for long-term supply. However, inclusion here does not imply that there is a definite plan to move forward with an option. Exploring additional sources, even for those systems that currently project enough capacity to meet demand, is included in order to be prepared for policy changes or other changes that would result in the need for additional available water capacity.

- ❑ Piney Run Reservoir (as built):
  - ❑ Obtain key permit required – Water and Sewerage Construction Permit
  - ❑ Complete land easement/acquisition for WTP and pipeline
  - ❑ Compete engineering for pipeline, storage, and pump station
- ❑ Piney Run Reservoir (expanded):
  - ❑ Receive approval from MDE Dam Safety to raise normal pool elevation and change dam classification from current "high hazard" designation
  - ❑ Obtain key permits required
  - ❑ Complete land easement/acquisition for reservoir expansion

- ❑ Complete surveys for aquatic habitat and cultural resources within the affected project footprint
- ❑ Develop mitigation plan: 12.6 acres wetland impacts and 1.05 miles of stream impacts
- ❑ Confirm that any impacts to Waters Edge Farm and County park/marina can be addressed
- ❑ Complete engineering for pipeline, storage, and pump station

❑ Union Mills Reservoir (planned):

- ❑ Continue County purchase of approximately 781 acres total of land
- ❑ Conduct more detailed design and engineering studies
- ❑ Consider whether other County-owned lands may be appropriate for use as habitat preservation and enhancement areas to mitigate for aquatic habitat losses that would be incurred with the Union Mills Reservoir alternative

❑ Gillis Falls Reservoir (planned):

- ❑ Continue County purchase of approximately 587 total acres of land
- ❑ Investigate less restrictive minimum reservoir releases with MDE to increase project safe yield
- ❑ Address any State requirements associated with Tier II stream designations extending upstream of the north arm from Gillis Road crossing and extending downstream from just upstream of the dam site

❑ Prettyboy Reservoir:

- ❑ Pursue discussions with the City of Baltimore to purchase raw water from Prettyboy Reservoir
- ❑ Evaluate treatment capacity of Manchester and/or Hampstead WTPs to treat additional water

4. Promote water conservation measures and manage demand for potable water to ensure adequate supplies are available for planned development

Specific Action Items Already in Place: ("Continue to...")

- ✓ Public Education Measures: Produce and distribute water-saving brochures through Bureau of Utilities
- ✓ Drought Management Measures: Restrict or limit water use in Freedom

■ Water Quality

5. Sustain existing wastewater treatment capacity

Specific Action Items Already in Place: ("Continue to...")

- ✓ Limit allocations and connections to a system that would cause the system capacity to exceed a set level under maximum capacity [*from Guidance doc*]

6. Develop new public wastewater treatment and disposal capacity

Specific "To Do" Action Items:

Short-term

❑ Coordinate with Carroll County Health Department to track and share relevant data for NPS modeling

7. Reduce nutrient loading via the implementation of the Statewide Tributary Strategies

Specific Action Items Already in Place: *("Continue to…")*

Urban Sources: Stormwater Strategy

✓ Strongly support and implement erosion and sediment control and stormwater management measures and requirements

✓ Administer local development processes to support the implementation of the Tributary Strategy and minimize water quality impacts on local waterways

Urban Sources: Growth Management Strategy

✓ Promote and direct growth to Priority Funding Areas, which will resolve conflicting and competing requirements

Agriculture Strategy

✓ Provide staff and funding to the Soil Conservation District for technical assistance to farmers and landowners for the implementation of BMPs

✓ Provide technical assistance and guidance on programs available to farmers and landowners for the implementation of BMPs and coordinate activities and funding among district, State, and federal programs

Specific "To Do" Action Items:

Urban Sources: Septic Strategy

Short-term

❑ Implement local policy and code requirements to encourage or require the upgrade of onsite sewage disposal systems (septics) [*from MD Trib Strat Impl Plan doc*]

Long-term

❑ Apply for funding on behalf of landowners in a block-grant approach, as appropriate, to reduce failing or inadequate septic systems and to replace septic systems with public sewer service [*from MD Trib Strat Impl Plan doc*]

Agriculture Strategy

Short-term

❑ Continue to lead the state in and be a model for agricultural BMP implementation [*from MD Trib Strat Impl Plan doc*]

❑ Continue to lead the state in and be a model for the agricultural land preservation program [*from MD Trib Strat Impl Plan doc*]

9. Reduce the amount of impervious surface that could result from new development

Specific Action Items Already in Place: *("Continue to…")*

✓ Evaluate and adopt amendments to parking requirements, imposing limits on the surface area of a site devoted to parking

Specific "To Do" Action Items:

Short-term

- ❑ Work with the municipalities, where applicable, to incorporate in their road standards measures that reduce the allowable street width while still allowing for the minimum required pavement width needed to support travel lanes, on-street parking, and emergency vehicle access
- ❑ Create a Geographic Information System (GIS) impervious cover data layer to help model loading impacts and track impervious surfaces
- ❑ Where cul-de-sacs are allowed, offer credit through the County Landscape Manual review process for landscaped cul-de-sac islands
- ❑ Encourage the use of sidewalks on one side of the street where safety and pedestrian circulation are not a concern and where pedestrian alternatives are provided

10. Protect or restore water quality, keep waters off Maryland's list of impaired waters, and make progress toward any applicable TMDLs

Specific Action Items Already in Place: ("Continue to...")

- ✓ Retrofit existing stormwater management facilities that do not meet existing stormwater management requirements, where doing so will have a significant impact
- ✓ Systematically re-establish forested stream buffers in the county
- ✓ Increased the frequency of storm drain cleanouts to prevent storm drain clogging and reduce the amount of stormwater runoff that bypasses existing stormwater management practices
- ✓ Continue to preserve or restore, where possible, riparian stream buffers with native vegetation that can be maintained throughout the plan review, delineation, construction, and occupancy stages of development
- ✓ Conserve trees and other vegetation at a site by planting additional vegetation, clustering tree areas, and promoting the use of native plants
- ✓ Retrofit existing stormwater management facilities that do not meet existing stormwater management requirements, where doing so would have a significant water quality impact
- ✓ Develop a program to systematically re-establish forested stream buffers in the county
- ✓ Increase the frequency of storm drain cleanouts to prevent storm drain clogging and reduce the amount of stormwater runoff that bypasses existing stormwater management practices
- ✓ Preserve or restore riparian stream buffers with native vegetation that can be maintained throughout the plan review, construction, and occupancy stages of development
- ✓ Conserve trees and other vegetation at a site by planting additional vegetation, clustering tree areas, and promoting the use of native plants

Specific "To Do" Action Items:

Short-term

- ❑ Work with the municipalities that do not have a water resource protection ordinance to adopt the County's ordinance or something with similar or greater levels of protection
- ❑ Decrease allowable residential densities in rural areas outside DGAs to reduce the number of future residential septics that could be added, thereby reducing some of the potential increase in nitrogen loads
- ❑ Provide strong leadership on joint planning of point and NPS pollutant reduction activities to help ensure that Watershed Improvements Plans (WIPs) and two-year milestones, developed as a result of the completion of the Bay TMDL, are reasonably attainable, cost-effective, and property targeted; and achieve ancillary public benefits
- ❑ Assemble a Watershed Implementation Plan Work Group to take the leadership in developing local Two-Year Milestones, to plan specific pollutant reduction activities, and to communicate with MDE (For more information on the Two-Year Milestones, see the BayStat website at http://www.baystat.maryland.gov/).
- ❑ Use GIS modeling tools to target specific management practices, explore grant funding opportunities, and play a role in public outreach/education programs to identify and address the WIP two-year milestones
- ❑ Develop a system for tracking all implementation activities to "take credit" for these nutrient reduction activities, including those already accomplished; use also as an accounting tool for point-point nutrient credit trades, point-nonpoint nutrient credit trades, and septic system hookup credits
- ❑ Initiate focused efforts to evaluate the total costs of TMDL implementation; identify both internal and external funding sources to meet those costs; and pursue specific grant opportunities to ensure that the County and municipalities receive an equitable share of available public funding

Long-term

- ❑ Participate in State programs of trading or offsets to maintain or reduce nutrient loading in impaired watersheds
- ❑ Develop a program to systematically re-establish forested stream buffers in the county
- ❑ Upgrade wastewater treatment plants to state-of-the-art technology, such as (but not limited to) ENR, to help meet Tributary Strategy load caps for total nitrogen and phosphorus
- ❑ Evaluate the need/practicality of new revenue structures

11. Establish additional measures to protect Carroll County's and Baltimore City's reservoir watersheds

Specific Action Items Already in Place: *("Continue to...")*

- ✓ Conduct watershed assessments for all watersheds in the county for which they have not yet been completed to identify improvements and retrofits for individual streams and watersheds
- ✓ Incorporate the commitments and strategies within the Reservoir Watershed Agreement into the County's planning, zoning, and decision-making process

Specific "To Do" Action Items:

Short-term

- ❑ Establish a priority preservation area that incorporates protection for reservoir watersheds
- ❑ Identify and develop additional funding and implementation mechanisms for preserving land and protecting reservoir watersheds
- ❑ Expand the focus and scope of the County Agricultural Land Preservation Program beyond agricultural land to encompass other types of easements and land preservation mechanisms that address forest land, natural system and sensitive environmental areas, open space, and features contributing to the county's heritage

Long-term

- ❑ Identify and develop additional funding and implementation mechanisms for preserving land and protecting reservoir watersheds

There are six existing or planned water supply ***reservoirs*** whose watersheds extend partially or entirely within Carroll County: Loch Raven, Prettyboy, Liberty, Piney Run, Gillis Falls, and Union Mills. Combined, these existing and planned reservoirs could potentially provide high-quality water for nearly 2 million people in Baltimore City and the five surrounding counties.

Most of the watersheds for these reservoirs are on the State's list of "impaired" waters (the 303(d) list), and a TMDL will ultimately be set for the impairing substance. A TMDL for phosphorus has already been set for Prettyboy Reservoir. A TMDL for phosphorus and sediments has been set for Loch Raven Reservoir. Liberty Reservoir is listed as impaired, which indicates that a TMDL will eventually be set for it as well. While no TMDL has been set for Piney Run Reservoir, a watershed management plan is being developed to ensure continued maintenance of its water quality. To ensure the future quality of water provided by these reservoirs, the County needs to take measures both to address the TMDLs as well as make certain that future development does not further negatively impact the watersheds that drain to these reservoirs.

The Board of County Commissioners signed a new Reservoir Watershed Management Agreement in 2005. This was an updated agreement whose beginnings date to 1984.

12. Enhance stormwater management programs

Specific Action Items Already in Place:
("Continue to...")

- ✓ Incorporate the use of nonstructural BMPs such as natural conservation areas, roof and non-roof top disconnection, vegetated swales, sheet flow to buffer, reduced impervious cover to the maximum extent practical and promote ESD or LID techniques, as required in Carroll County local laws since 2004 [*from Guidance doc*]
- ✓ Require permanent protection of existing forest on development sites and promote the enhancement and creation of

contiguous forest areas [*from Guidance doc*]

✓ Retrofit existing stormwater management facilities that do not meet existing stormwater management requirements where doing so will have a significant impact

Specific "To Do" Action Items:

Short-term

❑ Require open section roadways in all new developments outside DGAs [*from Guidance doc*]

❑ Perform a countywide review of individual programs and ordinances, relative to the new requirements to ensure compliance with the new 2007 stormwater management law

13. Address NPS loading impacts

Specific Action Items Already in Place: ("Continue to...")

✓ Aggressively promote Carroll County's land preservation programs, such as the MALPF, Rural Legacy, Critical Farms, and the Leveraged IPA program [*from Guidance doc*]

✓ Expand the IPA program outside of DGAs to offer leveraged IPA options that provide tax incentives to interested property owners as a means of accelerating the preservation of farmland (Leveraged IPAs could significantly accelerate easement acquisition while simultaneously decreasing acquisition costs.)

14. Identify changes to planned land use patterns and land development requirements to help achieve the needed reduction in pollutant loads

Specific Action Items Already in Place: ("Continue to...")

✓ Implement agricultural best management practices (BMPs) to reduce nutrient impacts from agricultural areas [*from Guidance doc*]

Specific "To Do" Action Items:

Short-term

❑ Reduce residential densities outside the GABs to decrease future nitrogen loads estimated to result from the current land use plan as well as to slow the growth rate of impervious surfaces

15. Refine the NPSS to more accurately reflect Carroll County conditions and to coincide with the revised Chesapeake Bay Program model and results

Specific "To Do" Action Items:

Short-term

❑ Create the remaining attributes of the impervious cover data layer so that a complete impervious cover layer is reflected by the combined attributes

❑ Evaluate the specific impervious cover rates for each land use category in Carroll County based on existing and projected development

- ❑ Remove all SHA-owned properties from the NPSS acreage, as these areas fall under a different NPDES permit
- ❑ Coordinate with the Carroll County Health Department to track new septic approvals to input and keep up-to-date
- ❑ Complete a true land cover layer for the county based on latest available orthophotography and using the same land cover categories as the Chesapeake Bay Program Model 5.0.
- ❑ Use BLI data to derive future land use scenario acreages
- ❑ Use updated loading rates from the CBP Model phase 5.0 or by using Carroll County specific data if available

Short-term

- ❑ Create a model in ArcMap to calculate loads within the GIS environment (instead of using ArcMap derived acreages in Excel to calculate loads)

Freedom

Water Supply

Source Water Assessment

Water is provided from both surface and groundwater sources in the Freedom District. The unconfined fractured rock aquifer in the Sykesville Formation is the source of groundwater supply for the Freedom District. This system is comprised of three groundwater supply wells. The Fairhaven well is located within the Piney Run Watershed and is drilled to approximately 600 feet. The Raincliffe well is approximately .5 mile south of the Fairhaven well and was drilled to approximately 500 feet. The Freedom District groundwater supply is susceptible to VOCs and radionuclides, but not susceptible to SOCs, nitrates, other regulated inorganic compounds, or microbiological contaminants.

Carroll County has a water treatment plant on the western shore of Liberty Reservoir. The reservoir was constructed in 1954 on the North Branch of the Patapsco River and is operated by Baltimore City. Carroll County, under agreement with Baltimore City, purchases raw water from this source. The treatment plant was expanded and now has a capacity greater than 3 mgd.

Potential sources of contamination for the Liberty Reservoir include point and non-point sources, including industrial sites, transportation (e.g., highways), a railroad, a petroleum product pipeline, agriculture, and septic tanks in rural portions of the watershed. The majority of point sources are located in the North Branch and Liberty subwatersheds.

The City of Baltimore maintains an extensive water quality monitoring program for Liberty Reservoir and its tributaries, as well as the Ashburton Water Filtration Plant. Routine sampling is performed at the City's water treatment plant, six tributaries of Liberty Reservoir, and four in-reservoir locations in an effort to monitor and improve the water quality conditions of the Liberty Reservoir water supply.

Water Supply Demand

For purposes of the background assessments and this plan document, the total future water demand assumes that everything within the 2001 Growth Area Boundary (GAB) builds out according to the adopted land use plans (which include the area covered by both the 2001 *Freedom Community Comprehensive Plan* and the 2003 *Master Plan for the Town of Sykesville*). If this were to occur, the total future water supply demand for the Freedom system would be 4,510,882 gpd. It should be recognized, however, that for Freedom in particular, it is very unlikely that everything within the existing Growth Area Boundary will be served by public water. A significant portion of the land within the GAB but outside the planned water service area is designated for Agriculture, Conservation, or low-density

residential growth. These lower-density areas are not typically planned to be served by public water service in Carroll County. In reality, the No Planned Service area represented by Other Potential Demand is unlikely to ever be served at the current planned densities.

In addition, the numbers in the "Freedom Future Water Supply Demand" table are based strictly on *Buildable Land Inventory* (BLI) calculations. They do not reflect factors unique to this municipal system that may have been considered in the capacity management plan (CMP) worksheet calculations and figures presented in the next table, "Freedom Water Supply Capacity *Currently* Available for Existing and Future Growth."

Freedom Future Water Supply Demand
(Gallons per Day)

Community	Current Demand[1]	Planned Future Demand[2]		Other Potential Demand[3]	Total Demand
		Infill Demand	Future Demand		
Freedom	2,182,422	641,250	712,590	974,620	4,510,882
Community	**Current Demand[1]**	**Additional Demand by Land Use**			**Total Demand**
		Residential	**Commercial**	**Industrial**	
Freedom	2,182,422	1,754,750	33,950	539,760	4,510,882

[1] These data are the greatest annual average daily demand for the five-year period from 2003 through 2007.
[2] These data relate to areas located within the designated planned water service area. Infill demand is calculated for areas classified in the "Existing/Final Planning" service category; Future demand is calculated for the combined area classified in the "Priority" or "Future" service category.
[3] These data relate to areas designated in the "No Planned Water Service Area" but located within the Community Growth Area Boundary.

Source: Carroll County Department of Planning, December 2008

Future water demand calculations were taken from the CMP data. This demand is reflected under "Infill + Future" (shown as "priority+future" in the Malcolm Pirnie reports). However, the CMP data do not account for additional demand that would occur within the balance of the area that is designated in the "No Planned Water Service Area." (To factor in this further demand, future development potential and existing development that would be served were estimated and calculated for water demand and are reported under "Other Potential Demand.")

Water Supply Capacity

If Freedom were to build out according to the planned land uses adopted within the 2001 GAB (which includes the area covered by both the 2001 *Freedom Community Comprehensive Plan* and the 2003 *Master Plan for the Town of Sykesville*), the water supply system would need to be expanded beyond its current capacity to make available another 1,281,124 gpd. The information in the following table is based on the December 2008 CMP worksheets.

Freedom Water Supply Capacity *Currently* Available for Existing and Future Growth
(in Gallons per Day)

Community	Current			Remaining Capacity	Unserved Demand		Net Avg Day Capacity Available at Buildout
	Permitted	Avg Day Capacity Limitation	Avg Day Drought Demand[1]		Infill + Future	No Planned Service	
Freedom	4,648,000	3,448,000	2,400,664	1,047,336	1,353,840	974,620	(1,281,124)

[1] Average Day Drought Demand here includes an additional 10% for drought demand

Source: Carroll County Department of Planning, December 2008

In addition to the water demand calculated above, there is a 399.0-acre area of industrial zoning located on the west side of MD 97 (in the general Hoods Mill area) that is located outside, but adjacent to, the Freedom growth area. Given its location, the possibility exists that future development of this site could eventually be served by the Freedom community water supply system. Average-day water demand generated by future development of this site is estimated to be 319,200 gpd.

With completion of the Freedom Water Treatment Plant expansion to 4.0 mgd, which came online in May of 2009, the Freedom plant has a total treatment capacity of 7.0 mgd. The water source for the plant is Liberty Reservoir. Presently, there is an agreement with Baltimore City which provides for a 4.2 mgd withdrawal for the average day and 180 million gallons total during the month of maximum use. In addition, the system has two wells with an average day withdrawal allocation of 0.438 mgd. This provides the Freedom water system with a 4.638 mgd average day capacity.

The expanded Freedom is designed to accommodate additional expansion capability to 12.0 mgd.

Water Supply Limitations

Based on the recent expansion of the Freedom water supply system to a permitted capacity of 7 mgd, the system should have adequate capacity to serve existing and planned demand. Should additional water supply be needed beyond this demand, the only limitation for the Freedom system would be the agreement with Baltimore City to allow for withdrawal from Liberty Reservoir. If an agreement to withdraw additional water from Liberty can be made, the Freedom system would have additional supply available. The design capacity of the water treatment plant has the ability to be expanded to up to 12 mgd.

Wastewater

The WWTP serving the Sykesville/Freedom area is owned by the State of Maryland and operated by the Maryland Environmental Service (MES). Effluent is discharged to the South Branch of the Patapsco River.

Wastewater Demand

For purposes of the background assessments and this plan document, the total future wastewater demand assumes that everything within the 2001 GAB builds out according to the adopted land use plan (which includes the area covered by both the 2001 *Freedom Community Comprehensive Plan* and the 2003 *Master Plan for the Town of Sykesville*). If this were to occur, the total future wastewater demand for the Freedom District WWTP would be 5,026,420 gpd. However, it should be recognized that, for Freedom in particular, it is very unlikely that everything within the existing GAB will be served by public sewer. A significant portion of the land within the GAB but outside the planned sewer service area is designated for Agriculture, Conservation, or low-density residential growth. These lower-density areas are not typically planned to be served by public sewer service in Carroll County. In reality, the No Planned Service area represented by Other Potential Demand is unlikely to ever be served at the current planned densities.

It should be noted that the numbers in the "Freedom Future Wastewater Demand" table are based strictly on BLI calculations. They do not reflect factors unique to this municipal system that may have been considered in the CMP worksheet calculations and figures presented in the next table, "Freedom Wastewater Capacity *Currently* Available for Existing and Future Growth."

Freedom Future Wastewater Demand
(in Gallons per Day)

Community	Current Demand[1]	Planned Future Demand[2]		Other Potential Demand[3]	Total Demand
		Infill Demand	Future Demand		
Freedom	2,160,000	445,100	1,077,130	1,344,190	5,026,420
Community	Current Demand	Additional Demand by Land Use			Total Demand
		Residential	Commercial	Industrial	
Freedom	2,160,000	2,339,000	33,740	493,680	5,026,420

[1] These data represent, in general, the annual average daily demand over the three-year period 2005-2007, and include I&I.
[2] These data relate to areas located within the designated planned sewer service area. Infill demand is calculated for areas classified in the "Existing/Final Planning" service category; Future demand is calculated for the combined area classified in the "Priority" or "Future" service category.
[3] These data relate to areas designated in the "No Planned Sewer Service Area" but located within the Community Growth Area Boundary.

Source: Carroll County Department of Planning, December 2008

Wastewater Capacity

If Freedom were to build out according to the planned land uses adopted within the 2001 GAB (which includes the area covered by both the 2001 *Freedom Community Comprehensive Plan* and the 2003 *Master Plan for the Town of Sykesville*), the system would need to expand beyond its current capacity to make available an additional 1,894,643 gpd in wastewater flows. The information in the following table is based on the December 2008 capacity management plan worksheets.

Freedom Wastewater Capacity *Currently* Available for Existing and Future Growth (in Gallons per Day)

Community	Current			Existing Flows	Capacity Needed			Capacity Available at Buildout
	Permitted	I&I	Remaining Capacity		Infill	Future	No Planned Service	
Freedom	3,500,000	630,000	2,870,000	1,530,000	494,123	1,077,130	1,344,190	(1,894,643)

Source: Carroll County Department of Planning, December 2008

In addition to the sewer demand calculated above, there is a 399.0-acre area of industrial zoning located on the west side of MD 97 (in the general Hoods Mill area) that is located outside, but adjacent to, the Freedom growth area. Given its adjacent location, the possibility exists that future development of this site could eventually be served by the Freedom community sewerage system. Average-day wastewater demand generated by future development of this site is estimated to be 319,200 gpd.

In Freedom's case, demand beyond the BLI estimates used for residential demand was added to account for allocations (21,488 gpd) and reservations (27,765 gpd). The infill demand numbers in the Wastewater Capacity table, therefore, will not exactly match the infill demand numbers shown in the Wastewater Demand table.

For the Freedom sewer service area, allocations represent capacity set aside to accommodate development that has already paid its area connection charges. These are typically sites for which building permits have already been issued, a site plan has been approved, or a minor subdivision has been approved. The capacity is "set aside" for two years after the area connections charges are paid. After two years, it is assumed that the development is connected to the system.

Reservations represent a capacity that is unofficially 'reserved' for development that is in the pipeline, and represents a known quantity. However, the area connection charges have not yet been paid. Both allocations and reservations are likely double-counting capacity demand. However, these numbers were included in the demand and capacity calculations knowing that it would provide very conservative numbers for the Freedom system but ensures the demand is accounted for.

The planned ENR upgrade would allow the WWTP to comply with the Bay-related nutrient caps. However, the upgrade will not provide additional design capacity. Discharge would still be limited to approximately 3.5 mgd.

Limitations Based on Design Capacity

Wastewater flows in 2007 (about 2.1 mgd) were well below the 3.5-mgd design capacity of the Freedom District WWTP. However, the facility would have to expand in order to accommodate the projected planned service area ("infill+future") and DGA buildout wastewater demands of 3.7 and 5.4 mgd, respectively.

Expansion of the Freedom District WWTP presents engineering and regulatory challenges due to space constraints, wetlands on site, and the low strength of influent wastewater. As an alternative to expansion, a larger plant could be built at another location. The State also has raised the possibility of pumping wastewater to a collection line in the Patapsco River drainage basin owned by the City of Baltimore, to take advantage of Baltimore's excess treatment capacity.

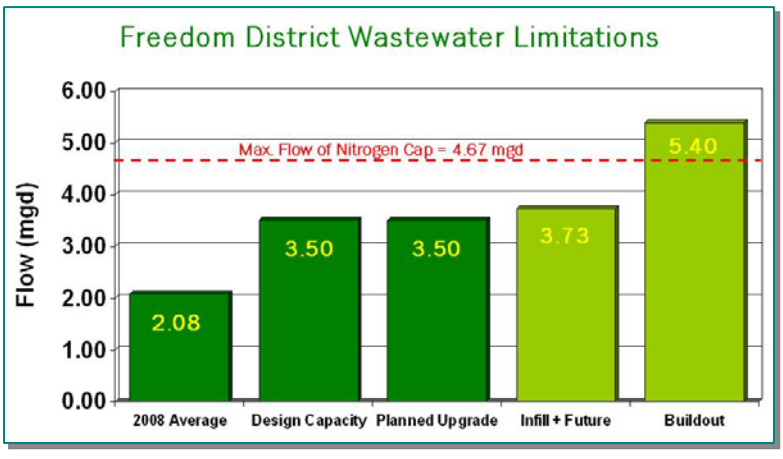
Limitations Based on Local Water Quality

Limits for parameters such as ammonia were derived for local water quality protection and are expected to remain achievable even under higher effluent flows. As long as it stays in compliance with water-quality based permit limits, the Freedom District is not expected to be a cause of biological impairments in the receiving stream.

Limitations Based on Bay Nutrient Caps

The Tributary Strategy Statewide Implementation Plan assigned nutrient loading caps for both total nitrogen and total phosphorus based on a design capacity of 3.5 mgd, a total nitrogen concentration of 4.0 mg/L, and a total phosphorus concentration of 0.3 mg/L. As with other major facilities, these nutrient caps will become enforceable NPDES permit limits in the future.

The planned ENR upgrade project will be designed to achieve 3.0 mg/L total nitrogen and a maximum 0.3 mg/L total phosphorus. At these concentrations, the total phosphorus loading limits would be more controlling than the nitrogen limit, and would limit discharge to approximately 3.5 mgd. However, it is expected that the plant will be able achieve lower effluent phosphorus concentrations, such that the nitrogen cap will represent a more controlling limitation. At 3.0 mg/L total nitrogen, the Freedom District WWTP would be limited to discharging approximately 4.67 mgd, which is more than the projected planned service area ("infill+future") wastewater demand but less than the projected DGA buildout demand.



Summary of Wastewater Limitations

The existing design capacity (3.5 mgd) of the Freedom District WWTP represents the controlling limitation under current conditions. Longer-term, the Bay-related nitrogen loading cap represents a 4.67-mgd limit to surface water discharges.

System-Specific Strategies: Freedom

Note: Numbers for each objective correspond to the relevant objective in the countywide strategies section of this plan. Objectives included below are those that apply specifically and uniquely to this system. Strategies that apply to the County and all of the municipal systems are included in the Countywide Strategies section of this plan.

1. Protect and sustain existing water supplies serving existing development

System-Specific "To Do" Action Items:

Short-term

- ❑ Amend the Freedom Community Comprehensive Plan to reduce the size of the Freedom GAB, thereby reducing water supply demand to a level below what the WWTP can accommodate based on the limits imposed by the nitrogen caps; eliminate areas planned for rural residential densities in the No Planned Service areas
- ❑ Update the WSCMP worksheets developed as background data for this plan document to reflect the most current information, then complete and submit a full WSCMP to MDE for review

2. Identify and develop, as needed, new water supplies adequate to support planned future growth without over-allocating available sources

Long-term Water Supply Options

Note: These are options that will be considered for long-term supply. However, inclusion here does not imply that there is a definite plan to move forward with an option. Exploring additional sources, even for those systems that currently project enough capacity to meet demand, is included in order to be prepared for policy changes or other changes that would result in the need for additional available water capacity.

- ❑ Piney Run Reservoir (as built): Safe yield 3.65 mgd with normal pool elevation of 524 ft.; existing reservoir; to serve as regional source of supply for Mount Airy and Sykesville/Freedom Service Areas
  - Direct pumping of raw water from Piney Run to Liberty to augment 'flows' at Liberty Reservoir accompanied by an increase in withdrawal from Liberty OR
  - Water treatment plant at Piney Run
- ❑ Piney Run Reservoir (expanded): Safe yield 4.11 mgd; increase capacity of existing reservoir by raising the spillway riser and emergency spillway; to serve as regional source of supply for Mount Airy and Sykesville/Freedom Service Areas
- ❑ Groundwater Wells: Drill and develop additional groundwater wells to meet projected demand requirements

- ❑ Obtain control (annex, purchase, or designate as planned WSA) over sufficient acreage in the appropriate watershed(s) to meet the MDE-required amount of recharge
- ❑ Begin MDE water appropriation permitting process
- ❑ Acquire ownership or easement of well site(s)
- ❑ Drill and develop well site(s)
- ❑ Conduct pumping test(s) and source water quality analyses
- ❑ Finalize MDE water appropriation permit process
- ❑ Install permanent wellhead(s) and fencing and construct treatment/transmission infrastructure necessary to connect wells to the WSA distribution system

❑ Gillis Falls Reservoir (as planned): Safe yield 3.85 mgd with normal pool elevation of 610 ft.; planned reservoir; to serve as regional source of supply for Mount Airy and Sykesville/Freedom Service Areas

4. *Promote water conservation measures and manage demand for potable water to ensure adequate supplies are available for planned development*

Specific Action Items Already in Place: *("Continue to…")*

✓ Public Education Measures: Produce and distribute brochures on water-saving measures through Bureau of Utilities

✓ Drought Management Measures: Restrict or limit water use in Freedom

5. *Sustain existing wastewater treatment capacity*

Specific "To Do" Action Items:

Short-term

❑ Amend the Freedom Community Comprehensive Plan to reduce the size of the Freedom GAB to more closely reflect the greater area planned for public water or sewer service, whichever is larger, eliminating the No Planned Service area planned for rural residential densities

❑ Work with MES to complete an I&I study that would identify where reductions in I&I could result in regaining capacity, reducing the 630,000 gpd estimate based on the difference in flows from 2002 to 2003 closer to or below MES's estimate of 300,000 gpd

❑ Update the WWCMP worksheets developed as background data for this plan document to reflect the most current information, then complete and submit a full WWCMP to MDE for review

Long-term

❑ Conduct an I&I study to determine the current level of inflows from I&I to potentially regain some capacity; make system improvements to reduce I&I; adjust the capacity on the WWCMP worksheets to update available capacity

❑ Continue efforts for planned ENR upgrade, enabling the current facility to operate at the limits of technology for nitrogen and phosphorus removal

❑ Identify potential industrial/manufacturing users for which water reuse in operations may be pursued

- ❑ Identify potential areas for spray irrigation to gain additional wastewater capacity at the WWTP
  - For an increase of 1,890,000 gpd, and an expected 5.39 mgd reuse flow, an estimated 454 acres of land would be required to reuse 50 percent of the buildout flow; assuming the demand is reduced to a level below the nitrogen cap, the estimated acreage needed would be reduced

Hampstead

The Town of Hampstead developed an initial WSCMP for the Hampstead community water supply system that provided information through 2006. The CMPs for the county's other municipal water systems provided data through 2007. This occurred because the Town submitted their capacity management plan well ahead of the other jurisdictions. To ensure consistency, the County requested Hampstead to provide an updated capacity management plan using data through 2007. The information provided in this section is based on the revised WSCMP (which includes the 2007 data). Data reported in other parts of this document and in the supporting background assessments that were developed prior to receipt of the revised capacity management plan are based on the Town's initial submission.

Water Supply

Source Water Assessment

The unconfined fractured rock aquifer in the Prettyboy Schist is the source of Hampstead's water supply, which is now comprised of 17 groundwater wells. All of Hampstead's wells are susceptible to contamination by nitrates, votatile organic compounds (VOCs), Synthetic Organic Compounds (SOCs), and radionuclides, but not to other inorganic compounds. Hampstead's wells were determined not to be susceptible to protozoans. Wells 19, 21, 23, and 24 are susceptible to total coliform.

The Town's inventory includes Wells 20 and 21. These two wells were used for over 20 years until the Town realized that it did not own the property where the wells are located. Both wells are high in nitrates and would require treatment or blending with lower nitrate water to meet the nitrate MCL. The Town is attempting to acquire these wells. Due to a recent change in ownership of the property where the wells are located, the Town believes there is a strong possibility the wells will be conveyed to the Town before the end of 2009.

Water Supply Demand

The total future water demand assumes that everything within the 2003 GAB builds out according to the adopted land use plan. If this were to occur, the total future water supply demand for the Hampstead system would be 1,441,380 gpd. The numbers in the "Hampstead Future Water Supply Demand" table are based strictly on BLI calculations. They do not reflect factors unique to this municipal system that may have been considered in the capacity management plan (CMP) worksheet calculations and figures presented in the next table, "Hampstead Water Supply Capacity *Currently* Available for Existing and Future Growth."

Hampstead Future Water Supply Demand
(Gallons per Day)

Community	Current Demand[1]	Planned Future Demand[2]		Other Potential Demand[3]	Total Demand
		Infill Demand	Future Demand		
Hampstead	459,680	22,500	-	959,200	1,441,380
Community	**Current Demand[1]**	**Additional Demand by Land Use**			**Total Demand**
		Residential	**Commercial**	**Industrial**	
Hampstead	459,680	441,000	43,260	497,440	1,441,380

[1] These data are the greatest annual average daily demand for the five-year period from 2003 through 2007.
[2] These data relate to areas located within the designated planned water service area. Infill demand is calculated for areas classified in the "Existing/Final Planning" service category; Future demand is calculated for the combined area classified in the "Priority" or "Future" service category.
[3] These data relate to areas designated in the "No Planned Water Service Area" but located within the Community Growth Area Boundary.

Source: Carroll County Department of Planning, December 2008

Calculations for future water demand used the CMP data. This demand is reflected under "Infill + Future." However, the CMP data do not account for additional demand that would occur within the balance of the planned water service area or the area that is designated in the "No Planned Water Service Area." To factor in this further demand, future development potential and existing development that would be served were estimated and calculated for water demand and are reported under "Other Potential Demand."

The "Other Potential Demand" figure reflects the possible annexation of developed properties. Hampstead, like many Carroll County municipalities, is bordered by developed areas including older residential subdivisions on private wells. The requirements of Maryland annexation law make annexation of these subdivisions highly unlikely; therefore, "Other Potential Demand" may be overstated.

While presuming the buildout of the entire area within the 2003 GAB may be unrealistic, Town officials were alarmed by the gap between the capacity of the existing system as permitted by the MDE and the cumulative demand represented by the 2003 GAB.

The findings of the WRE and related technical assessments and the research provided by County Planning and GIS staff directly informed decisions related to the Town's draft update of the *Hampstead Community Comprehensive Plan*. After careful consideration, the Town's Planning and Zoning Commission recommended a substantive reduction in the municipal GAB. Specifically, the draft GAB strives for a sustainable "buildout" footprint for future growth which: 1) recognizes the current limitations to water system capacity including the regulatory bottleneck in groundwater appropriations; 2) maintains adequate land for groundwater recharge; 3) preserves the ability of the Town to slowly and carefully grow within the limits of public infrastructure; 4) preserves to the extent possible the option of annexing and extending municipal water service to nearby properties currently dependent on private wells in the event of unforeseen circumstances like groundwater contamination.

Water Supply Capacity

If Hampstead were to build out according to the planned land uses adopted within the 2003 GAB, the Town would need to expand beyond its current capacity to make available another 965,950 gpd. The information in the following table is based on the December 2008 CMP worksheets.

Hampstead Water Supply Capacity *Currently* Available for Existing and Future Growth (in Gallons per Day)

Community	Current			Remaining Capacity	Unserved Demand		Net Avg Day Capacity Available at Buildout
	Permitted	Avg Day Capacity Limitation	Avg Day Drought Demand[1]		Infill + Future	No Planned Service	
Hampstead	521,400	521,400	505,650	15,750	22,500	959,200	(965,950)

[1] Average Day Drought Demand here includes an additional 10% for drought demand

Source: Carroll County Department of Planning, December 2008

In addition to the water demand calculated above, there is a 14.8-acre area of business zoning and 50.9-acre area of industrial zoning located south of Hampstead on the west side of MD 30. These adjoining areas are located outside, but adjacent to, the Hampstead GAB. Given its location, the possibility exists that future development of this overall site could eventually be served by the Hampstead community water supply system. Average-day water demand generated by future development of this site is estimated to be 51,080 gpd.

MDE recently approved renewed groundwater appropriation permits in the amount of 580,000 gpd (annual average). This represents an increase over the previous permit level of 521,400 gpd; however, it falls far short of the demand represented by buildout of the existing GAB. The permits also presume that Hampstead will have all 17 wells in its inventory online, including Wells 20 and 21 where the ownership issue remains unresolved.

During the past few years, Hampstead has operated its system on 12 of the 17 wells. Well 32 will be returned to service when manganese filtration equipment is installed later this year. As noted, the Town hopes to reacquire Wells 20 and 21. Another project will connect the final two wells in Hampstead's inventory to the system and potentially address the nitrate issues in Wells 20 and 21.

The Town has a fundamental unresolved difference with MDE over the capacity of the municipal water system. The initial determination by the Town working in close cooperation with the Carroll County hydrogeologist was an annual average capacity of 726,000 gpd. An independent analysis by Mr. Michael Knight of Gannett Fleming indicated a capacity of 925,000 gpd. The MDE analysis by Mr. Pat Hammond asserted a capacity of just over 561,000 gpd. With respect to the Water Capacity Management Plan for the Town of Hampstead, the Town intends to provide two plans. One will use the MDE permit number (580,000) as the capacity of the system; the other will use the Town's estimate of 726,000 gpd. These two CMPs will stand until the capacity issue is conclusively resolved, potentially through a permit application and appeal process.

Water Supply Limitations

Locating large water production wells is challenging in the Piedmont Plateau. The yield of any given well depends on intercepting water-bearing fractures in the bedrock of the aquifer. While surface topography and features can guide water exploration efforts, locating high yield wells can be difficult.

The Town of Hampstead faces some specific limitations in developing new groundwater resources. The existing appropriation permit prevents any further water well development in the Piney Run watershed (recharge limit). There are areas in Hampstead including the Black & Decker site (PCE/TCE contamination) and the Hillcrest area (MTBE contamination) where groundwater contamination limits groundwater use. Some groundwater has high nitrate levels or other issues such as elevated iron or manganese levels.

The Town conducted extensive exploratory drilling in the Brodbeck Valley and on Carroll County's Leister Park property. This exploration did not locate any suitable water production wells. The Town's existing system of 17 production wells creates a challenge for the location of new wells. Proximate wells may have yields reduced by MDE due to speculation regarding potential interference.

Hampstead provides significant habitat for bog turtles — a threatened species. The turtles live in emerging bogs. Groundwater withdrawal is a concern in these areas due to the artesian nature of some wetland areas.

Wastewater

The WWTP serving the Hampstead community is owned and operated by Carroll County. The plant discharges to North Piney Branch, within the headwaters of Loch Raven Reservoir.

Wastewater Demand

The total future wastewater demand assumes that everything within the 2003 GAB builds out according to the adopted land use plan. If this were to occur, the total future wastewater demand for the Hampstead WWTP would be 1,506,340 gpd. The numbers in the "Hampstead Future Wastewater Demand" table are based strictly on BLI calculations. They do not reflect factors unique to this individual municipal system that may have been considered in the CMP worksheet calculations and figures presented in the next table, "Hampstead Wastewater Capacity *Currently* Available for Existing and Future Growth."

Hampstead Future Wastewater Demand
(in Gallons per Day)

Community	Current Demand[1]	Planned Future Demand[2]		Other Potential Demand[3]	Total Demand
		Infill Demand	Future Demand		
Hampstead	628,000	65,400	236,750	576,190	1,506,340
Community	Current Demand	Additional Demand by Land Use			Total Demand
		Residential	Commercial	Industrial	
Hampstead	628,000	348,750	64,470	465,120	1,506,340

[1] These data represent, in general, the annual average daily demand over the three-year period 2005-2007, and include I&I.
[2] These data relate to areas located within the designated planned sewer service area. Infill demand is calculated for areas classified in the "Existing/Final Planning" service category; Future demand is calculated for the combined area classified in the "Priority" or "Future" service category.
[3] These data relate to areas designated in the "No Planned Sewer Service Area" but located within the Community Growth Area Boundary.

Source: Carroll County Department of Planning, December 2008

Wastewater Capacity

If Hampstead were to build out according to the planned land uses adopted within the 2003 GAB, the Town would need to expand beyond its current capacity to make available an additional 602,057 gpd in wastewater flows. The information in the following table is based on the December 2008 CMP worksheets.

Hampstead Wastewater Capacity *Currently* Available for Existing and Future Growth
(in Gallons per Day)

Community	Current			Existing Flows	Capacity Needed			Capacity Available at Buildout
	Permitted	I&I	Remaining Capacity		Infill	Future	No Planned Service	
Hampstead	900,000	231,000	669,000	397,000	38,856	259,011	576,190	(602,057)

Source: Carroll County Department of Planning, December 2008

In addition to the sewer demand calculated above, there is a 14.8-acre area of business zoning and 50.9-acre area of industrial zoning located south of Hampstead on the west side of MD 30. These adjoining areas are located outside, but adjacent to, the Hampstead GAB. Given its location, the possibility exists that future development of this overall site could eventually be served by the Hampstead community sewerage system. Average day wastewater demand generated by future development of this site is estimated to be 51,080 gpd.

For the Hampstead sewer system, demand beyond the BLI estimates used for residential demand also was added in the capacity management plan worksheet to account for previously allocated capacity. The demand numbers in the Wastewater Capacity table, therefore, will not exactly match the demand numbers shown in the Wastewater Demand table. In addition, because the planned water service area does not match the planned

sewer service area, the projected wastewater demand numbers will not match the projected water demand numbers.

For the Hampstead sewer service area, allocations represent capacity set aside to accommodate development that has already paid its area connection charges. These are typically sites for which building permits have already been issued, a site plan has been approved, or a minor subdivision has been approved. The sewer capacity is "set aside" for two years after the area connections charges are paid. After two years, it is assumed the development is connected to the system.

Allocations are likely double-counting capacity demand. However, these numbers were included in the demand and capacity calculations knowing that it would provide very conservative numbers for the Hampstead sewer system but ensures the demand is accounted for.

According to MDE's methodology for estimating I&I on the CMP worksheets, I&I flows averaged about .230 mgd, which is about a third of the total average plant influent. I&I flows take away capacity that might otherwise be available to wastewater demand.

The Hampstead WWTP NPDES permit is currently being operated under a consent judgment agreement, pending resolution of issues related to an effluent temperature limit.

Limitations Based on Design Capacity

The 0.9-mgd design capacity of the Hampstead WWTP is only slightly lower than the 0.93 mgd wastewater demand that was projected for buildout of the infill+future scenario (the entire planned service area). However, the plant would need to be expanded to approximately 1.5 mgd in order to meet the projected buildout wastewater demand for the entire growth area.

Limitations Based on Local Water Quality

Like other POTWs in Carroll County, the Hampstead WWTP is fully capable of meeting technology-based limits for conventional pollutants and water quality-based limits for constituents such as ammonia. The plant is successfully meeting a 0.3 mg/L total phosphorus limit required by the Loch Raven Reservoir phosphorus TMDL. However, during summer months this facility is not capable of meeting a very stringent effluent temperature limit, expressed as the higher of 20°C or the upstream ambient stream temperature. Installation and operation of chillers to reduce the effluent temperature would be very costly, energy-intensive, and may complicate environmental management. The County has performed studies that demonstrate that current effluent temperature is protective of the

aquatic life in the receiving stream and that Piney Run supports a balanced indigenous aquatic population. However, because the plant's NPDES permit cannot be finalized until the temperature issue is resolved, it represents a pending controlling wastewater limitation.

The Hampstead WWTP discharges into Piney Run approximately 8 river miles upstream of its confluence with a Tier II segment of Western Run in Baltimore County. Given the high levels of treatment and long distance to the segment, the Tier II designation is not expected to represent a controlling limitation on the Hampstead WWTP discharge.

Limitations Based on Bay Nutrient Caps

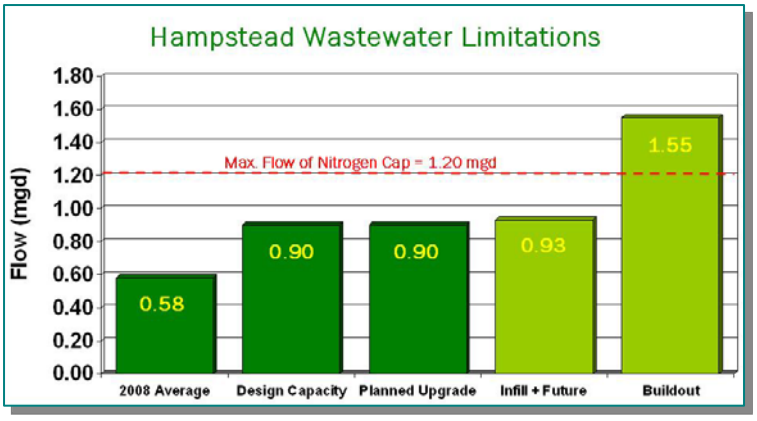
Regarding plant expansion, no ENR upgrade is planned pending resolution of the temperature issue. However, the Hampstead WWTP has been added to the list of facilities eligible for Bay Restoration Funds. If the Hampstead WWTP does eventually upgrade to achieve 3.0 mg/L total nitrogen, it could discharge up to 1.2 mgd without exceeding the nitrogen cap. This would allow accommodation of planned service area ("infill+future") flows, but not the full 1.5-mgd wastewater demand projected at full buildout within the GAB. Discharges above 1.2 mgd would require the County to obtain nutrient offsets/credits or to pursue no-discharge options such as land application or effluent recycle/reuse.

Limitations Based on 2005 Reservoir Watershed Management Agreement (WMA)

Point source management provisions pertaining to the Hampstead WWTP are currently tied to limitations set through the plant's NPDES permit and existing MDE programs, including limiting phosphorus effluent concentrations to below 0.3 mg/l and capping total phosphorus loads using the TMDL programs. The WMA by itself is not a limiting factor on the operation of the Hampstead WWTP. Hampstead is not currently a signatory to this Agreement. This is with the understanding that the WWTP is owned and operated by the County.

Summary of Wastewater Limitations

Until the temperature issue is resolved, the current design capacity of 0.9 mgd will remain the controlling limitation. Longer-term, the Bay-related nitrogen loading cap represents a 1.2-mgd limit to surface water discharges.



System-Specific Strategies: Hampstead

■ System-Specific Action Items Already in Place: Current Protections, Practices, and Policies

✓ Super Pump House (SPH)

This $1.8 million capital project will allow the connection of the remaining wells in the Town's inventory – Triple Green Court and Stansbury. The project will also allow the blending of the high nitrate water from Wells 20 and 21 (providing the Town acquires the wells). The Town also may connect Wells 11 and 12 to the SPH, thus avoiding a rebuild of the aging Melvin Miller Pump House (near the tennis courts). The SPH will add one modest capacity well from the 6-acre site (testing pending). This well will presumably add some measure of capacity to the existing 580,000 gpd permits. The precise amount will depend on the MDE determination of yield. The SPH also will include generator backup to operate wells in the event of an extended power outage.

The groundwater appropriation permit issued by MDE presupposes the Town will have all 17 wells in service. To put every well in service, the Town must construct the SPH.

✓ Water Reuse

The Town has engaged in discussions with MDE, BTR Capital Group (owners of the "Black & Decker" property), and the developer of the Houck/Leister property regarding reuse of post-VOC treatment water. The former Black & Decker plant is currently under an administrative consent order that requires the company to mitigate VOC contamination in the vicinity of the BTR plant. The "ring-well" configuration withdraws groundwater, removes the contamination and discharges it into the Patapsco watershed. The Town believes the post-treatment water would be appropriate for a "third-line" system serving the large industrial area. The treated water could be used to meet process and sanitary needs rather than simply being discharged. This system would greatly reduce demand for treated, potable water.

■ Additional Recommended Strategies

Note: Numbers for each objective correspond to the relevant objective in the countywide strategies section of this plan. Objectives included below are those that apply specifically and uniquely to this system. Strategies that apply to the County and all of the municipal systems are included in the Countywide Strategies section of this plan.

1. Protect and sustain existing water supplies serving existing development [Town]

System-Specific Action Items Already in Place:

✓ Adopted a Groundwater Conservation Zoning District (July 2008), which replaces the General Industrial Zoning District and allows a mix of environmentally-sensitive commercial and industrial uses while limiting water use

✓ Continue to provide development plans to County to review and offer comments to Town regarding Water Resource Protection

System-Specific "To Do" Action Items:

Short-term

❑ Amend the *Hampstead Community Comprehensive Plan* to reduce the size of the Hampstead GAB to more closely reflect a balance between future water demand and potential water supply capacity
- Land use designation and GAB changes proposed in the draft Hampstead comprehensive plan could reduce unserved demand from 981,700 gpd to about 503,612 mgd, thereby reducing the projected capacity deficit to 303,386 gpd

❑ Apply the Groundwater Conservation Zoning District in appropriate locations as identified in the *Hampstead Community Comprehensive Plan*

❑ Amend the Municipal Growth Element of the *Hampstead Community Comprehensive Plan* and associated annexation areas, as needed, to reflect the changes recommended in this plan

❑ Update the WSCMP worksheets developed as background data for this plan document to reflect the most current information, then complete and submit a full WSCMP to MDE for review

❑ Work to reach a clear, well-defined, and scientifically-sound understanding with MDE on how capacity is calculated in a groundwater system

❑ Continue to engage in and support hydrogeologic research in the Piedmont Plateau

2. *Identify and develop, as needed, new water supplies adequate to support planned future growth without over-allocating available sources [Town]*

System-Specific "To Do" Action Items:

Short-term Strategy/ies

❑ Pursue agreement with BTR for, and implementation of, post-treatment reuse of water from the former Black & Decker plant to meet process and sanitary needs of the large industrial area in that vicinity

❑ Optimize system operations

❑ Work cooperatively with MDE to develop a more reasonable approach to appropriating groundwater, calculating well yields, and giving credit for recharge

❑ Acquire existing high capacity wells when possible

Short-term Water Supply Solutions (Specific Projects):

❑ Complete exploratory drilling for new wells and construction of the Super Pump House

Long-term Water Supply Options

Note: These are options that will be considered for long-term supply. However, inclusion here does not imply that there is a definite plan to move forward with an option. Exploring additional sources, even for those systems that currently project enough capacity to meet demand, is included in order to be prepared for policy changes or other changes that would result in the need for additional available water capacity.

❑ Groundwater Wells: Drill and develop 20 groundwater wells (based on the average MDE appropriation of existing Hampstead wells) to meet projected additional demand requirements of approximately 528,000 gpd

- ❑ Obtain (annex, purchase, or designate as planned WSA) control over sufficient acreage in the appropriate watershed(s) to meet the MDE-required amount of recharge
- ❑ Begin MDE water appropriation permitting process
- ❑ Acquire ownership or easement of well site(s)
- ❑ Drill and develop well site(s)
- ❑ Conduct pumping test(s) and source water quality analyses
- ❑ Finalize MDE water appropriation permit process
- ❑ Install permanent wellhead(s) and fencing and construct treatment/transmission infrastructure necessary to connect wells to the WSA distribution system

❑ Union Mills Reservoir: Safe yield 3.76 mgd with normal pool elevation of 610 ft.; planned reservoir; to serve as regional source of supply for Westminster, Hampstead, Taneytown, and Manchester Service Areas

❑ Prettyboy Reservoir: Based on Baltimore City's plans to develop 120 mgd treatment plant for its Susquehanna River intake and the resulting increased system reliability, purchase excess capacity from Prettyboy Reservoir. Conceptual plans for a 3.0 mgd intake and 7.5-mile long, 16-inch raw water pipeline from Prettyboy Reservoir to a new 3.0 mgd WTP in Hampstead. Also requires a high service pump station located at the intake site.

❑ York Water Company: Interconnection with York Water Company (in Pennsylvania) to provide approximately 0.90 mgd of finished water to Manchester and Hampstead. Requires a purchase agreement among all parties. Would require need and participation of Manchester. May not be necessary under normal operating conditions, but would provide ability to move water during extraordinary conditions, such as extreme drought.

4. Promote water conservation measures and manage demand for potable water to ensure adequate supplies are available for planned development [Town]

System-Specific Action Items Already in Place:

- ✓ Public Education: Water quality and quantity awareness at festivals, newsletters, e-newsletters, materials at town hall
- ✓ Water Loss Management: Give out dye tablets and give credits for fixing leaks
- ✓ Low-Flow Devices: Give out free or reduced cost low-flow devices
- ✓ Water Use Rate Schedule: Progressive water rate schedule
- ✓ Billing Cycle: Quarterly billing cycle
- ✓ High water use notification: Provide a written notice to users where water use is 20 percent higher than the seasonal average for the property
- ✓ Maintain system integrity: Difference between water pumped and water billed in Hampstead runs between 3 and 5 percent
- ✓ Outdoor water use: Limit discretionary outdoor water use
- ✓ Drought restrictions: Maintain the ability to limit use during drought period

5. *Sustain existing wastewater treatment capacity [County]*

System-Specific Action Items Already in Place:

✓ Currently conducting an I&I study that should identify where reductions in I&I could result in regaining capacity, reducing the 231,000 gpd estimate based on the difference in flows from 2003 to 2002

System-Specific "To Do" Action Items:

❑ Support the Town in amending the Hampstead Community Comprehensive Plan to reduce the size of the Hampstead GAB to more closely reflect a balance between future demand and potential wastewater capacity

❑ Identify potential industrial/manufacturing users for which water reuse in operations may be pursued

❑ Identify potential areas for spray irrigation to gain additional wastewater capacity at the WWTP

- For an increase of 650,000 gpd, and an expected 0.78 mgd reuse flow, an estimated 454 acres of land would be required to reuse 50 percent of the buildout flow

❑ Update the WWCMP worksheets developed as background data for this plan document to reflect the most current information, then complete and submit a full WWCMP to MDE for review

Manchester

The Capacity Management Plan (CMP) worksheets were developed well before the update to the Manchester Comprehensive Plan (adopted in January 2009). The plan reflects changes to planned water and sewer service. These changes were made, in part, to balance the capacity and demand calculated in the CMPs for public water and wastewater. Information provided in this section is based on data in the CMP worksheets and planned development projected for the adopted land use plan in effect at the time the CMP worksheets were developed – the 1998 Manchester and Environs Comprehensive Plan.

Water Supply

Source Water Assessment

The unconfined fractured rock aquifer in the Marburg Formation is the source of water supply for the Town of Manchester. The system currently uses 14 wells and 1 spring to obtain its drinking water. All of Manchester's wells are susceptible to contamination by nitrates, VOCs, and radon, but not to SOCs, other radionuclides, or inorganic compounds. None of Manchester's water supply sources are susceptible to protozoan contamination except for the Walnut Street well and Crossroads Well 1. In addition, the Bachman Road, Patricia Court, and Walnut Street wells are susceptible to total coliform.

Water Supply Demand

The total future water demand assumes that everything within the 1998 GAB builds out according to the adopted land use plan. If this were to occur, the total future water supply demand for the Manchester system would be 802,523 gpd. The numbers in the "Manchester Future Water Supply Demand" table are based strictly on BLI calculations. They do not reflect factors unique to this municipal system that may have been considered in the CMP worksheet calculations and figures presented in the next table, "Manchester Water Supply Capacity *Currently* Available for Existing and Future Growth."

For example, the projected demand for two new schools – Ebb Valley Elementary School and Manchester Valley High School – was included in the Infill demand number in the wastewater capacity table. However, since the demand based on BLI was calculated strictly from zoning, the estimates did not include the addition of the schools. Likewise, the future demand at the high school site was estimated using the BLI. The zoning at the time was for industrial use, and, therefore, the demand was calculated based on an industrial use. However, in actuality, the demand for a high school is much lower, which reduces the number used in the wastewater capacity table (and on the CMP worksheets).

Manchester Future Water Supply Demand
(Gallons per Day)

Community	Current Demand[1]	Planned Future Demand[2]		Other Potential Demand[3]	Total Demand
		Infill Demand	Future Demand		
Manchester	299,693	74,600	108,710	319,520	802,523
Community	Current Demand[1]	Additional Demand by Land Use			Total Demand
		Residential	Commercial	Industrial	
Manchester	299,693	452,500	50,330	0	802,523

[1] These data are the greatest annual average daily demand for the five-year period from 2003 through 2007.
[2] These data relate to areas located within the designated planned water service area. Infill demand is calculated for areas classified in the "Existing/Final Planning" service category; Future demand is calculated for the combined area classified in the "Priority" or "Future" service category.
[3] These data relate to areas designated in the "No Planned Water Service Area" but located within the Community Growth Area Boundary.

Source: Carroll County Department of Planning, December 2008

Calculations for future water demand used the CMP data. This demand is reflected under "Infill + Future." However, the CMP data do not account for additional demand that would occur within the balance of the planned water service area, or the additional demand within the balance of the growth area that is designated in the "No Planned Water Service Area." To factor in this further demand, future development potential and existing development that would be served were estimated and calculated for water demand and are reported under "Other Potential Demand."

Water Supply Capacity

If Manchester were to build out according to the planned land uses adopted within the 1998 GAB, the Town would need to expand beyond its current capacity to make available another 453,992 gpd. The information in the following table is based on the December 2008 CMP worksheets.

Manchester Water Supply Capacity *Currently* Available for Existing and Future Growth
(in Gallons per Day)

Community	Current			Remaining Capacity	Unserved Demand		Net Avg Day Capacity Available at Buildout
	Permitted	Avg Day Capacity Limitation	Avg Day Drought Demand[1]		Infill + Future[2]	No Planned Service	
Manchester	581,000	388,800	329,662	59,138	193,610	319,520	(453,992)

[1] Average Day Drought Demand here includes an additional 10% for drought demand
[2] This datum includes an additional 10,300 gpd estimated for two new school facilities

Source: Carroll County Department of Planning, December 2008

Water Supply Limitations

The total water appropriation for the Town of Manchester Water Supply System is 581,000 gallons per day (gpd). While the Town is permitted to use 581,000 gallons of water per day, the current pump capacity is 388,800 gpd. The need for new sources and accompanying infrastructure, therefore, becomes a limiting factor in determining how much water is available *today* to serve existing and planned growth.

State policy requires that an additional 10 percent be added to the current average amount of water used on any given day to accommodate potential drought conditions. When the current daily usage, including the drought factor, was subtracted from the pump capacity, 59,138 gpd remained to serve infill and future demand.

The figures for infill demand indicate that the Town will fall 27,132 gpd short of being able to pump enough water to meet unserved infill demand (the areas within the Existing/Final Planning Service Area). Since the Town is permitted to use 581,000 gpd, increasing pump capacity would address the pump capacity limitation, and adding wells to the Town system would access the water the Town has appropriated. This would give the Town the ability to meet this demand within their current appropriation.

The estimates for future demand (Priority and Future Planned Service Areas) also indicate that the Town will need to increase pump capacity and water withdrawal to serve that need. At this point, however, the Town becomes further constrained by the capacity of the wastewater system to treat flows. The wastewater treatment system is capped at 500,000 gpd. Therefore, the Town should not plan to accommodate water demand above 500,000 gpd.

Although enough water is appropriated to meet the demand, the wastewater system constraint results in 12,682 gpd of water demand that could not be served, even with additional pump capacity. In response, with the Town's recent update of its comprehensive plan, areas were removed from the planned service area and some land use designations revised to reduce demand.

Despite the current groundwater appropriation, additional water sources should be explored. Changing policies at the state and federal level for water supply and environmental protections, effects of climate change, and need for system redundancy will eventually dictate the need for at least additional backup sources. Identifying and planning for those sources should begin now.

Wastewater

From December to February, the effluent is discharged to George's Run, a tributary of Prettyboy Reservoir. Manchester's NPDES permit allows discharge to George's Run in March as well, but this would normally only be done if the soil conditions were unsuitable for

spray irrigation from March to November. The effluent is irrigated to approximately 70 acres of farmland growing reed canary grass.

Wastewater Demand

The total future wastewater demand assumes that everything within the 1998 GAB builds out according to the adopted land use plan. If this were to occur, the total future wastewater demand for the Manchester WWTP would be 871,729 gpd.

The numbers in the "Manchester Future Wastewater Demand" table are based strictly on BLI calculations. They do not reflect factors unique to this municipal system that may have been considered in the capacity management plan worksheet calculations and figures presented in the next table, "Manchester Wastewater Capacity *Currently* Available for Existing and Future Growth."

For example, the projected demand for two new schools – Ebb Valley Elementary School and Manchester Valley High School – was included in the infill demand number in the wastewater capacity table. However, since the demand based on BLI was calculated strictly from zoning, the estimates did not include the addition of the schools. Likewise, the future demand at the high school site was estimated using the BLI. The zoning at the time was for industrial use, and, therefore, the demand was calculated based on an industrial use. However, in actuality, the demand for a high school is much lower, which reduces the number used in the wastewater capacity table (and on the CMP worksheets).

Manchester Future Wastewater Demand
(in Gallons per Day)

Community	Current Demand[1]	Planned Future Demand[2]		Other Potential Demand[3]	Total Demand
		Infill Demand	Future Demand		
Manchester	292,519	69,650	139,040	370,520	871,729

Community	Current Demand	Additional Demand by Land Use			Total Demand
		Residential	Commercial	Industrial	
Manchester	292,519	530,000	49,210	0	871,729

[1] These data represent, in general, the annual average daily demand over the three-year period 2005-2007, and include I&I.
[2] These data relate to areas located within the designated planned sewer service area. Infill demand is calculated for areas classified in the "Existing/Final Planning" service category; Future demand is calculated for the combined area classified in the "Priority" or "Future" service category.
[3] These data relate to areas designated in the "No Planned Sewer Service Area" but located within the Community Growth Area Boundary.

Source: Carroll County Department of Planning, December 2008

With the January 2009 adoption of a comprehensive plan update, the sewer service area and annexation areas in the No Planned Service area were drawn in to help balance demand with capacity.

Wastewater Capacity

If Manchester were to build out according to the planned land uses adopted within the 1998 GAB, the Town would need to expand beyond its current capacity to make available an additional 337,809 gpd in wastewater flows. The information in the following table is based on the December 2008 CMP worksheets.

Manchester Wastewater Capacity *Currently* Available for Existing and Future Growth (in Gallons per Day)

Community	Current			Existing Flows	Capacity Needed			Capacity Available at Buildout
	Permitted	I&I	Remaining Capacity		Infill[1]	Future	No Planned Service	
Manchester	500,000	22,250	477,750	270,269	80,520	94,250	370,520	(337,809)

[1] This datum includes an additional 10,300 gpd estimated for two new school facilities

Source: Carroll County Department of Planning, December 2008

Limitations Based on Design Capacity

The total projected wastewater demands for all areas within the current planned sewer service area (shown as "priority+future" in the Malcolm Pirnie reports) would be approximately 0.47 mgd, which could be met by the current plant. However, the plant would need to be expanded in order to meet the projected buildout wastewater demand of 0.84 mgd. The buildout wastewater demand is unlikely to exceed 0.5 mgd as the Town has capped their plant capacity at 0.5 mgd. There is limited land area to expand the plant, and regardless, the Town reports that the land area available for spray irrigation would not allow treatment of more than about 0.6 mgd. Previous studies by the Town have indicated that low soil infiltration capacities prevent most other nearby parcels in the region from being suitable for spray irrigation of effluent.

Limitations Based on Local Water Quality

The plant can successfully comply with a 1.0 mg/L total phosphorus limit related to the Prettyboy Reservoir phosphorus TMDL. The Manchester WWTP is not upstream of a Tier II stream segment.

Limitations Based on Bay Nutrient Caps

The Manchester WWTP is considered a 'minor' facility under *Maryland's Tributary Strategies Statewide Implementation Plan*. As a minor facility, the nutrient loading caps are assigned as goals. These nutrient caps were based on a projected 2020 flow of 0.384 mgd for 120 days/year, a total nitrogen concentration of 18.0 mg/L, and a total phosphorus concentration of 0.5 mg/L. These caps will remain as goals rather than permit limits until/unless the WWTP expands or elects to trade nutrient credits with another point source facility.

At the design capacity flow of 0.5 mgd and assuming discharge for 120 days/year, the Manchester WWTP could meet its nutrient loading goals by attaining effluent concentrations of approximately 13.8 mg/L total nitrogen and 0.38 mg/L total phosphorus. Meeting these concentrations would require the plant to increase nutrient removal relative to the existing operation. Although the phosphorus goal could probably be achieved by increasing chemical addition, achieving the nitrogen goal at full design capacity would probably require additional nitrification/denitrification capability. However, if March discharges to surface water were relatively rare, most of the time the facility could achieve the annual loading goals without a major technology upgrade.

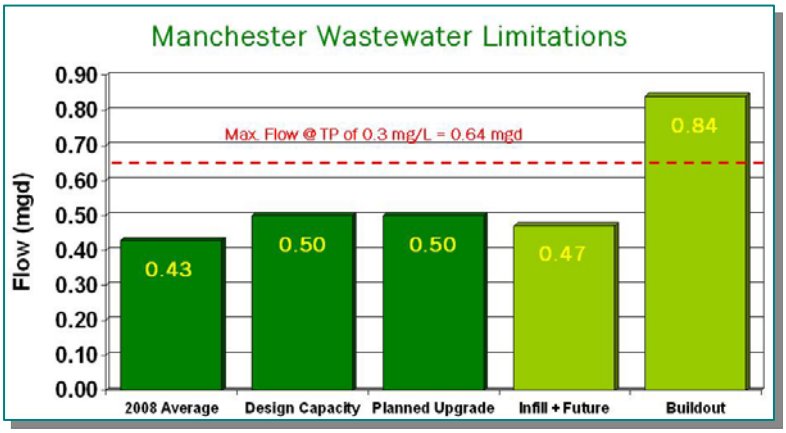
If the Manchester WWTP plant expanded, the nutrient caps would become enforceable permit limits. The buildout wastewater demand listed in the CMP worksheet (0.84 mgd) would require that the Manchester WWTP meet effluent concentrations of approximately 8 mg/L total nitrogen and 0.23 mg/L total phosphorus. These limits would be achievable with the installation of biological nutrient removal (BNR) or ENR technology. However, unless MDE would allow year-round discharge to Prettyboy Reservoir, treating this amount of flow would also require that sufficient land area be identified to spray irrigate the projected buildout wastewater demand during March-November.

Limitations Based on 2005 Reservoir Watershed Management Agreement (WMA)

Point source management provisions pertaining to the Manchester WWTP are currently tied to limitations set through the plant's NPDES permit and existing MDE programs, including limiting total phosphorus loads using the TMDL for Prettyboy Reservoir. The WMA by itself is not a limiting factor on the operation of the Manchester WWTP. Manchester is not currently a signatory to the Agreement.

Summary of Wastewater Limitations

Given the limited land area to expand the plant and to spray irrigate, the existing design capacity (0.5 mgd) of the Manchester WWTP represents the effective wastewater limitation.



System-Specific Strategies: Manchester

Note: Numbers for each objective correspond to the relevant objective in the countywide strategies section of this plan. Objectives included below are those that apply specifically and uniquely to this system. Strategies that apply to the County and all of the municipal systems are included in the Countywide Strategies section of this plan.

1. Protect and sustain existing water supplies serving existing development

System-Specific Action Items Already in Place:

✓ Amended the *Manchester Community Comprehensive Plan* to reduce the size of the Manchester GAB to more closely reflect a balance between future demand and potential water supply capacity [January 2009]
- Land use designation and GAB changes adopted in the Manchester comprehensive plan reduced unserved demand by 12,000 gpd from 513,130 gpd to about 501,130 mgd, which does not exceed the Town's water appropriation

✓ Adopted the Carroll County Water Resource Management Code, Chapter 218, which provides source water projection regulations

System-Specific "To Do" Action Items:

Short-term

❑ Support rezoning by the County of areas outside the Town's future annexation line (Growth Area Boundary) to be consistent with other areas of the county that are not within a DGA to reflect desired future buildout scenario for Manchester

❑ Update the WSCMP worksheets developed as background data for this plan document to reflect the most current information, then complete and submit a full WSCMP to MDE for review

❑ Amend the Municipal Growth Element of the *Manchester Community Comprehensive Plan* and associated annexation areas, as needed, to reflect the changes recommended in this plan

2. Identify and develop, as needed, new water supplies adequate to support planned future growth without over-allocating available sources

System-Specific "To Do" Action Items:

Long-term Water Supply Options

Note: These are options that will be considered for long-term supply. However, inclusion here does not imply that there is a definite plan to move forward with an option. Exploring additional sources, even for those systems that currently project enough capacity to meet demand, is included in order to be prepared for policy changes or other changes that would result in the need for additional available water capacity.

❑ Groundwater Wells: Drill and develop 6 groundwater wells to meet potential appropriated water demand deficit of approximately 124,000 gpd (buildout demand less 2007 avg day w/d)
- ❑ Obtain control (annex, purchase, or designate as planned WSA) over sufficient acreage in the appropriate watershed(s) to meet the MDE-required amount of recharge
- ❑ Begin MDE water appropriation permitting process
- ❑ Acquire ownership or easement of well site(s)
- ❑ Drill and develop well site(s)
- ❑ Conduct pumping test(s) and source water quality analyses
- ❑ Finalize MDE water appropriation permit process

- ❑ Install permanent wellhead(s) and fencing and constructing treatment/transmission infrastructure necessary to connect wells to the WSA distribution system

❑ Union Mills Reservoir: Safe yield 3.76 mgd with normal pool elevation of 610 ft.; planned reservoir; to serve as regional source of supply for Westminster, Hampstead, Taneytown, and Manchester Service Areas

❑ York Water Company: Interconnection with York Water Company to provide approximately 0.90 mgd of finished water to Manchester and Hampstead. Requires a purchase agreement among all parties. Continue discussions with York Water Company to identify potential, cost, and timing of connecting with the York County water lines that currently end at Pleasant Hill.

4. *Promote water conservation measures and manage demand for potable water to ensure adequate supplies are available for planned development*

System-Specific Action Items Already in Place:

✓ Public Education: Website postings; public service announcements (PSAs); newspapers; brochures/flyers; e-newsletters
✓ Water Loss Management: Current UAW at 7 percent; meter replacement program; Town owns its own leak detection equipment
✓ Drought Management: Three-staged drought management plan adopted
✓ Low-Flow Devices: Promote the use of low-flow devices by customers
✓ Water use Rate Schedule: Progressive water rate schedule
✓ Billing Cycle: Quarterly billing cycle

5. *Sustain existing wastewater treatment capacity*

System-Specific Action Items Already in Place:

✓ Conducted an I&I study to determine level of inflows from I&I; made system improvements to reduce I&I; periodically check I&I by using Town's own inspection cameras to identify and control any problems
✓ Amended the *Manchester Community Comprehensive Plan* to reduce the size of the Manchester GAB to more closely reflect a balance between future demand and potential water supply capacity [January 2009]
  - Land use designation and GAB changes adopted in the Manchester comprehensive plan reduced unserved demand by 13,500 gpd from 513,130 gpd to about 499,630 mgd, thereby eliminating the projected capacity deficit

System-Specific "To Do" Action Items:
Short-term

❑ Update the WWCMP worksheets developed as background data for this plan document to reflect the most current data, then complete and submit a full WWCMP to MDE for review

Mount Airy

The Town of Mount Airy is unique among all municipalities in that it is not only divided between two counties, Frederick and Carroll. It is also divided among five watersheds. For the past five years, the Town has been under Consent Order(s) with MDE to balance its source water supplies with the increasing water supply demands. The successful groundwater exploration for the past couple of years led to an anticipated new well at South Main Street. This well potentially will help the Town satisfy the existing Consent Order, although with no additional contingencies.

Water Supply

Source Water Assessment

The unconfined fractured rock aquifer within the Ijamsville Formation and Marburg Schist is the source of water supply for the Town of Mount Airy. The system uses 10 wells to obtain its drinking water. Well #11 is potentially being developed in the very near future and is approximately equal to Mount Airy's average size well. The Mount Airy water supply is susceptible to contamination by nitrates, VOCs (except well 8), SOCs, and radionuclides, but not susceptible to protozoans. Further, wells 2 and 7 are susceptible to bacteria and viruses.

Water Supply Demand

The total future water demand assumes that everything within the GAB builds out according to the adopted land use plan. If this were to occur, the total future water supply demand for the Mount Airy system would be 1,189,000 gpd. These demand estimates do not reflect factors unique to this individual municipal system that may have been considered in the capacity management plan (CMP) worksheet calculations and figures presented in the next table, "Mount Airy Water Supply Capacity *Currently* Available for Existing and Future Growth."

Mount Airy Future Water Supply Demand
(Gallons per Day)

Community	Current Demand[1]	Planned Future Demand[2]		Other Potential Demand[3]	Total Demand
		Infill Demand	Future Demand		
Mount Airy	765,000	87,500	221,750	114,750	1,189,000
Community	**Current Demand[1]**	**Additional Demand by Land Use**			**Total Demand**
		Residential	**Commercial**	**Industrial**	
Mount Airy	765,000	285,500	85,250	53,250	1,189,000

[1] These data are the greatest annual average daily demand for the five-year period from 2003 through 2007.
[2] These data relate to areas located within the designated planned water service area. Infill demand is calculated for areas classified in the "Existing/Final Planning" service category; Future demand is calculated for the combined area classified in the "Priority" or "Future" service category.
[3] These data relate to areas designated in the "No Planned Water Service Area" but located within the Community Growth Area Boundary.

Source: Town of Mount Airy, November 2009

Water Supply Capacity

If Mount Airy were to build out according to the planned land uses adopted within the GAB, the Town would need to expand beyond its current capacity to make available another 400,500 gpd.

Mount Airy Water Supply Capacity *Currently* Available for Existing and Future Growth
(in Gallons per Day)

Community	Current			Remaining Capacity	Unserved Demand		Net Avg Day Capacity Available at Buildout
	Permitted	Avg Day Capacity Limitation	Avg Day Drought Demand[1]		Infill + Future	No Planned Service	
Mount Airy	865,000	865,000	841,500	23,500	309,250	114,750	(400,500)

[1] Average Day Drought Demand here includes an additional 10% for drought demand

Source: Town of Mount Airy, November 2009

In September 2009, subsequent to the assessments completed for this plan, the Town's daily average water appropriation was increased from 865,000 gpd to 910,000 gpd. Although this is anticipated to drop, per the Consent Order, to 803,000 gpd in 2011, it is anticipated that re-appropriations on Well #6 and the addition of the South Main Street well (#11) will ultimately provide the Town with an appropriation of 897,000 gpd. This amount is just enough to meet the Consent Order without providing any contingency for Smart Growth or commercial development. The month of maximum use appropriation is anticipated to increase from 1,304,000 gpd by the appropriate month of maximum use on Well #11. The combined month of maximum use is not expected to have any limit on future growth.

The net maximum additional growth anticipated for the Town will drop at that time to 368,500 gpd. An appropriation of 150,000 gpd from the Harrison and Leishear property

wells would be a significant step towards the Town meeting its ultimate capacity. The Town is encouraged to enter into an agreement with Carroll County in the very near future in order to coordinate the upgrade of Water Station #2 with the added capacity.

Water Supply Limitations

The Town of Mount Airy has historically utilized groundwater wells for its primary water supply. The emphasis on groundwater supply has served the Town well over the last thirty years and the Town has been fortunate to find, purchase and drill several large production wells over that period of time. The Town currently has control over 11 production wells, all within our municipal boundaries.

The Town would like to continue this trend to rely primarily on groundwater resources within the municipal boundaries. The Town also understands that a long-term water solution may not fit within these desired criteria. Most importantly, the ultimate water supply side must not exceed the design capacity of our WWTP, permitted at 1.2 million gallons per day processing. The WWTP has reached its design and physical limitations at its present location. A second plant would be cost prohibitive for the Town now and in the future.

The Town, however, needs to keep our long-term water supply options open, but with serious consideration of what the long-term financial limitations are for a smaller municipality. Because of these potential financial limitations, the Town may not be able to seriously consider all options possible. The Town fully intends to continue a pace of growth only in line with its water capacity limitations for the long term.

Wastewater

The plant discharges to the South Branch of the Patapsco River. No expansion is anticipated for Mount Airy's WWTP; however, the Town is upgrading the plant to ENR.

Wastewater Demand

The total future wastewater demand assumes that everything within the GAB builds out according to the adopted land use plan. If this were to occur, the total future wastewater demand for the Mount Airy WWTP would be 1,064,000 gpd. The estimates do not reflect factors unique to this municipal system that may have been considered in the CMP worksheet calculations.

Mount Airy Future Wastewater Demand
(in Gallons per Day)

Community	Current Demand[1]	Planned Future Demand[2]		Other Potential Demand[3]	Total Demand
		Infill Demand	Future Demand		
Mount Airy	640,000[4]	87,500	221,750	114,750	1,064,000
Community	Current Demand	Additional Demand by Land Use			Total Demand
		Residential	Commercial	Industrial	
Mount Airy	640,000	285,500	85,250	53,250	1,064,000

[1] These data represent, in general, the annual average daily demand over the three-year period 2005-2007, and include I&I.
[2] These data relate to areas located within the designated planned sewer service area. Infill demand is calculated for areas classified in the "Existing/Final Planning" service category; Future demand is calculated for the combined area classified in the "Priority" or "Future" service category.
[3] These data relate to are as designated in the "No Planned Sewer Service Area" but located within the Community Growth Area Boundary.
[4] Mount Airy performed a full system I&I camera inspection of the original 1971 sewer system. The inspection revealed three major problems that averaged 250,000 gpd I&I flow. The current demand is the two-year average since repairs were made in May 2007.

Source: Town of Mount Airy, November 2009

Wastewater Capacity

If Mount Airy were to build out according to the planned land uses adopted within the GAB, the Town would have sufficient capacity available with current wastewater flows.

Mount Airy Wastewater Capacity *Currently* Available for Existing and Future Growth
(in Gallons per Day)

Community	Current			Existing Flows	Capacity Needed			Capacity Available at Buildout
	Permitted	I&I	Remaining Capacity		Infill	Future	No Planned Service	
Mount Airy	1,200,000	120,000	1,080,000	640,000[1]	87,500	221,750	114,750	16,000

[1] Mount Airy performed a full system I&I camera inspection of the original 1971 sewer system. The inspection revealed three major problems that averaged 250,000 gpd I&I flow. The current demand is the two-year average since repairs were made in May 2007.

Source: Carroll County Department of Planning, December 2008

Limitations Based on Design Capacity

Site constraints at the WWTP include a stream, floodplain, forest conservation, and a stormwater management facility; although, the design capacity of the existing plant is adequately sized to accommodate future growth. No expansion is necessary.

Limitations Based on Local Water Quality

The Mount Airy WWTP NPDES permit includes standard limits for secondary treatment facilities, and is fully protective of receiving waters. Limits for parameters, such as ammonia, were derived for local water quality protection and are expected to remain achievable even under higher effluent flows.

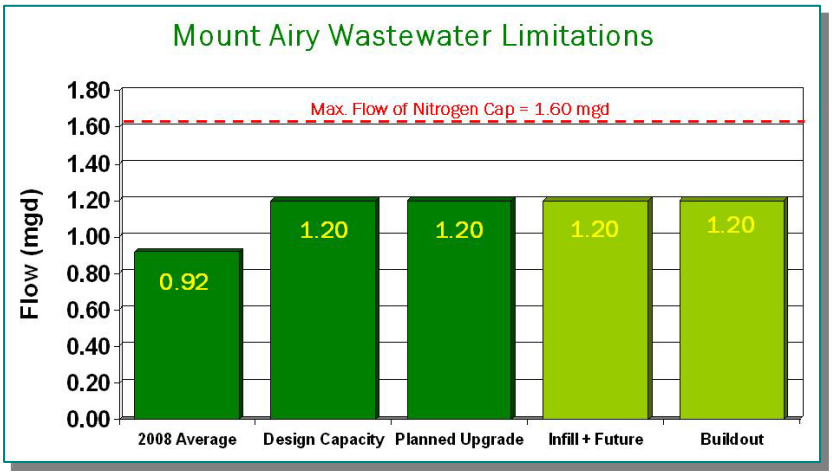
The Mount Airy WWTP discharges approximately 3 river miles upstream of a Tier II segment of the South Branch of the Patapsco River. Given the high levels of treatment and large distance to the segment, the Tier II designation is not expected to represent a controlling limitation on the Mount Airy WWTP discharge.

Limitations Based on Bay Nutrient Caps

The planned ENR upgrade project will be designed to achieve 3.0 mg/L total nitrogen and, at most, 0.3 mg/L total phosphorus. At these concentrations, the total phosphorus loading limits would be more controlling than the nitrogen limit, and would limit discharge to approximately 1.2 mgd. However, it is expected that the plant will be able to achieve lower effluent phosphorus concentrations, such that the nitrogen cap will represent a more controlling limitation. At 3.0 mg/L total nitrogen, the Mount Airy WWTP would be limited to discharging approximately 1.6 mgd, which is more than the projected infill+future (entire planned service area) wastewater demand and the entire GAB buildout demand. Therefore, upgrade to incorporate ENR would allow the facility to meet all projected future flows.

Summary of Wastewater Limitations

The existing design capacity (1.2 mgd) of the Mount Airy WWTP represents the controlling limitation under current conditions. The approximate nitrogen-based capacity limitation of 1.6 mgd is larger than the maximum projected flows and is not anticipated to be a controlling limitation.



System-Specific Strategies: Mount Airy

Note: Numbers for each objective correspond to the relevant objective in the countywide strategies section of this plan. Objectives included below are those that apply specifically and uniquely to this system. Strategies that apply to the County and all of the municipal systems are included in the Countywide Strategies section of this plan.

With the continued support of Carroll County, the Town explored the Gillis Falls area, drilled 28 wells, and performed a long-term test on a well with a marginal sustained yield. This and a couple of smaller wells together would be costly to treat and pipe into the Town, while providing such a low yield. Carroll County provided maps in which the Town could utilize up to 589 acres of the Middle Run Stream subwatershed of Gillis Falls. At an estimated 300 gpd per acre that is equivalent to 176,700 gpd of recharge area.

Additionally, the Town tested and currently has a pending appropriation request with MDE for Wells #1, #3, #12, and #18, which are located on the Harrison and Leishear properties. This was developer-owned land when the testing was performed and more recently was purchased by Carroll County. Based on the Town's testing, in accordance with MDE procedures, the wells have a known anticipated (combined) appropriation amount of 150,000 gpd.

The wells are situated in the Middle Run Stream subwatershed and are adjacent to the Town's Water Station #2, which has been in its capital plan to upgrade almost immediately.

As mentioned early in the Water section of this document, the limited water supplies can slow or stop planned development, resulting in the inability to fulfill the vision of local comprehensive plans and implement smart growth policies. With the proximity of the wells and the need for treatment upgrade, it would be most feasible, and in the Town's best interest, to acquire water rights and easements on the Harrison and Leishear properties AND be granted the equivalent water recharge area of the Middle Run Stream subwatershed, as was proposed previously by Carroll County. The addition of these wells would provide several years of manageable water to be used towards Mount Airy's smart growth policies.

1. Protect and sustain existing water supplies serving existing development

System-Specific Action Items Already in Place:

- ✓ Submitted to MDE a Water Supply Capacity Management Plan (WSCMP) as background data for this plan document to reflect the most current capacity
- ✓ Adopted the Carroll County Water Resource Management Code, Chapter 218, which provides source water projection regulations
- ✓ Adopted Wellhead Protection article into the Town Code
- ✓ Adopted Water Supply Protection requirements into the Town Code (Provides regulations related to recharge management)
- ✓ Adopted an Adequate Public Facilities Ordinance

System-Specific "To Do" Action Items:

Short-term

- ❑ Support the rezoning by the County of appropriate areas outside the Town's future annexation line (Growth Area Boundary) to be consistent with other areas of the county that are not within a DGA to reflect desired future buildout scenario for Mount Airy

- ❑ Update the WSCMP worksheets developed as background data for this plan document to reflect the most current information, then complete and submit a full WSCMP to MDE for review
- ❑ Amend the *Mount Airy Comprehensive Plan* to reduce the size of the Mount Airy GAB to more closely reflect a balance between future demand and potential water supply capacity
- ❑ Amend the Municipal Growth Element of the *Mount Airy Comprehensive Plan* and associated annexation areas, as needed, to reflect the changes recommended in this plan

Long-term

- ❑ Periodically review and update the Water Supply Capacity Management Plan (WSCMP) as a mechanism to continue to track, monitor, and evaluate available capacity

2. Identify and develop, as needed, new water supplies adequate to support planned future growth without over-allocating available sources

System-Specific "To Do" Action Items:

Short-term Water Supply Solutions

- ❑ Middle Run Branch (Harrison/Leishear) Wells: Anticipated yield 0.150 mgd
- ❑ South Branch Well: Anticipated yield 0.075 mgd
- ❑ Middle Run Branch (Gillis Falls) Well: Anticipated yield 0.050 mgd

Short-term Strategy/ies

- ❑ Amend the Mount Airy comprehensive plan to reduce the size of the Mount Airy GAB to more closely reflect a balance between future demand and potential water supply capacity

Long-term Strategy/ies

- ❑ Explore additional sources for future water supply to prepare for policy changes or other changes that would result in the need for additional available water capacity

Long-term Water Supply Options

Note: These are options that will be considered for long-term supply. However, inclusion here does not imply that there is a definite plan to move forward with an option. Exploring additional sources, even for those systems that currently project enough capacity to meet demand, is included in order to be prepared for policy changes or other changes that would result in the need for additional available water capacity.

- ❑ Groundwater Wells: Drill and develop 5 groundwater wells (based on the average MDE appropriation of existing Mount Airy wells) to meet projected additional demand of approximately 364,000 gpd. This is based on the 2003 adopted town comprehensive plan and the 2006 adopted 'environs' plan. [Note: The number of wells estimated by Malcolm Pirnie to be needed would be less with the increase in appropriation to 910,000 gpd.]
  - ❑ Obtain control (annex, purchase, or designate as planned WSA) over sufficient acreage in the appropriate watershed(s) to meet the MDE-required amount of recharge
  - ❑ Begin MDE water appropriation permitting process
  - ❑ Acquire ownership or easement of well site(s)
  - ❑ Drill and develop well site(s)

- ❑ Conduct pumping test(s) and source water quality analyses
- ❑ Finalize MDE water appropriation permit process
- ❑ Install permanent wellhead(s) and fencing and constructing treatment/transmission infrastructure necessary to connect wells to the WSA distribution system

❑ Surface Water Intake in Gillis Falls Area: Safe yield 0.85 mgd; develop new surface water intake on Carroll County-owned property near planned Gillis Falls Reservoir; 100-120 mg off-stream storage impoundment

❑ Interconnection with Freedom: Interconnect with the Sykesville/Freedom water system and purchase agreement to supply approximately 0.85 mgd; 9.7 miles

- Piney Run Reservoir (as built): Safe yield 3.65 mgd with normal pool elevation of 524 ft.; existing reservoir; to serve as regional source of supply for Mount Airy and Sykesville/Freedom Service Areas
- Piney Run Reservoir (expanded): Safe yield 4.11 mgd; increase capacity of existing reservoir by raising the spillway riser and emergency spillway; to serve as regional source of supply for Mount Airy and Sykesville/Freedom Service Areas

❑ Interconnection with Frederick County: Interconnection with Frederick County water system and purchase agreement to supply approximately 0.85 mgd (with a maximum agreement of 1.2 mgd)

❑ Gillis Falls Reservoir: Safe yield 3.85 mgd with normal pool elevation of 610 ft.; planned reservoir; to serve as regional source of supply for Mount Airy and Sykesville/Freedom Service Areas

4. Promote water conservation measures and manage demand for potable water to ensure adequate supplies are available for planned development

System-Specific Action Items Already in Place:

✓ Public Education: Website postings, water conservation brochures, posters available at town hall
✓ Water Loss Management: Annually locate and repair leaks in distribution system; all meters replaced a couple years ago; perform quarterly water loss audits; water loss currently 10-12 percent
✓ Drought Management: Tiered approach to restrict use during water emergencies
✓ Low-Flow Devices: Give out free low-flow devices
✓ Water use Rate Schedule: Progressive water rate schedule
✓ Billing Cycle: Quarterly billing cycle
✓ Other Measures: Provides rain barrels to residents at discounted price

5. Sustain existing wastewater treatment capacity

System-Specific Action Items Already in Place:

✓ Performed I&I inspection of entire 1971 original sewer system in 2007; I&I improvements are ongoing each year to minimize unwanted flows to the WWTP.

System-Specific "To Do" Action Items:
Short-term

- ❑ Amend the Mount Airy comprehensive plan to reduce the size of the Mount Airy GAB to more closely reflect a balance between future demand and potential wastewater capacity, reducing the future demand to bring it under the 1.2 mgd WWTP capacity
- ❑ On a regular basis, or as actions are taken or completed that would change the capacity calculation, update the WWCMP worksheets developed as background data for this plan document to reflect the most current information, then complete and submit a full WWCMP to MDE for review
- ❑ Complete ENR upgrade, enabling the current facility to operate at the limits of technology for nitrogen and phosphorus removal
- ❑ Identify potential industrial/manufacturing users for which water reuse in operations may be pursued

New Windsor

Water Supply

Source Water Assessment

The Town of New Windsor relies upon both surface and groundwater for its potable supply. The unconfined fractured rock aquifer within the Wakefield Marble, Sam's Creek Formation, Marburg Formation, and Ijamsville Phyllite provide the source of water supply for three groundwater wells and one spring. The Hillside wellfield consists of two wells completed in the phyllite, while the Dennings Road Well in the Main Spring system is located near a contact of the Sam's Creek and Marburg Formations. The Hillside wells were determined to be susceptible to contamination from VOCs associated with commercial enterprises, as well as radionuclides. The Main Spring system was determined to be susceptible to contamination by nitrates, viruses, and bacteria associated with surface activity sources.

Water Supply Demand

The total future water demand assumes that everything within the GAB builds out according to the adopted land use plan. If this were to occur, the total future water supply demand for the New Windsor system would be 448,190 gpd. The numbers in the "New Windsor Future Water Supply Demand" table are based strictly on BLI calculations. They do not reflect factors unique to this individual municipal system that may have been considered in the capacity management plan (CMP) worksheet calculations and figures presented in the next table, "New Windsor Water Supply Capacity *Currently* Available for Existing and Future Growth."

New Windsor Future Water Supply Demand
(Gallons per Day)

Community	Current Demand[1]	Planned Future Demand[2]		Other Potential Demand[3]	Total Demand
		Infill Demand	Future Demand		
New Windsor	159,600	35,850	248,940	3,800	448,190
Community	**Current Demand[1]**	**Additional Demand by Land Use**			**Total Demand**
		Residential	**Commercial**	**Industrial**	
New Windsor	159,600	169,750	2,520	116,320	448,190

[1] These data are the greatest annual average daily demand for the five-year period from 2003 through 2007.
[2] These data relate to areas located within the designated planned water service area. Infill demand is calculated for areas classified in the "Existing/Final Planning" service category; Future demand is calculated for the combined area classified in the "Priority" or "Future" service category.
[3] These data relate to areas designated in the "No Planned Water Service Area" but located within the Community Growth Area Boundary.

Source: Carroll County Department of Planning, December 2008

Calculations for future water demand in the table below used the CMP data. This demand is reflected under "Infill + Future." "Infill + Future" reflects the entire planned service area. "No Planned Service" reflects the balance of the area within the GAB. However, the CMP data do not account for additional demand that would occur within the balance of the planned water service area or the area that is located within the "No Planned Water Service Area." To factor in this further demand, future development potential and existing development that would be served were estimated and calculated for water demand and are reported under "Other Potential Demand."

Water Supply Capacity

If New Windsor were to build out according to the planned land uses adopted within the 2007 GAB, the Town would need to expand its water system beyond its current capacity to make available another 385,688 gpd. The information in the following table is based on the December 2008 CMP worksheets.

New Windsor Water Supply Capacity *Currently* Available for Existing and Future Growth (in Gallons per Day)

Community	Current			Remaining Capacity	Unserved Demand		Net Avg Day Capacity Available at Buildout
	Permitted	Avg Day Capacity Limitation	Avg Day Drought Demand[1]		Infill + Future	No Planned Service	
New Windsor	196,100	78,462	175,560	(97,098)	284,790	3,800	(385,688)

[1] Average Day Drought Demand here includes an additional 10% for drought demand

Source: Carroll County Department of Planning, December 2008

Water Supply Limitations

Town budget and user-pay (rate) limitations for funding the operation and improvement of a public water system and a public sewerage system impose a significant limiting factor for the Town of New Windsor. Additionally, competing State-imposed policies regarding land use (e.g. smart growth priority funding areas and future municipal growth area planning) on one hand, and severe water appropriation permit limitations (to accommodate worst case drought conditions) on the other, cause the former to be impeded by the latter. State administrative parameters and policy also significantly increases groundwater development costs and system uses fees, while currently not providing grants or cost sharing to mitigate capital costs resulting from State and federally-imposed mandates.

Wastewater

The New Windsor WWTP is owned and operated by the Town of New Windsor. The plant is currently rated as a .094-mgd facility. The average wastewater flow into the plant is .067 mgd (excluding I&I). The existing infiltration and inflow amount for the system is .025 mgd. The plant discharges to Dickerson Run, which flows into Little Pipe Creek. The Town is

currently designing an upgrade and expansion of the WWTP using sequencing batch reactor (SBR) technology with nutrient removal. The technology upgrade, resulting in additional treatment, would use the existing design capacity to increase the rated capacity of the WWTP to 0.115 mgd.

Wastewater Demand

The total future wastewater demand assumes that everything within the GAB builds out according to the adopted land use plan. If this were to occur, the total future wastewater demand for the New Windsor WWTP would be 404,486 gpd. The numbers in the "New Windsor Future Wastewater Demand" table are based strictly on BLI calculations. They do not reflect factors unique to this individual municipal system that may have been considered in the CMP worksheet calculations and figures presented in the next table, "New Windsor Wastewater Capacity *Currently* Available for Existing and Future Growth."

New Windsor Future Wastewater Demand
(in Gallons per Day)

Community	Current Demand[1]	Planned Future Demand[2]		Other Potential Demand[3]	Total Demand
		Infill Demand	Future Demand		
New Windsor	91,716	21,950	287,020	3,800	404,486
Community	Current Demand	Additional Demand by Land Use			Total Demand
		Residential	Commercial	Industrial	
New Windsor	91,716	162,250	2,520	148,000	404,486

[1] These data represent, in general, the annual average daily demand over the three-year period 2005-2007, and include I&I.
[2] These data relate to areas located within the designated planned sewer service area. Infill demand is calculated for areas classified in the "Existing/Final Planning" service category; Future demand is calculated for the combined area classified in the "Priority" or "Future" service category.
[3] These data relate to areas designated in the "No Planned Sewer Service Area" but located within the Community Growth Area Boundary.

Source: Carroll County Department of Planning, December 2008

Wastewater Capacity

If New Windsor were to build out according to the planned land uses adopted within the 2007 GAB, the Town would need to expand its WWTP beyond its current capacity to make available an additional 255,466 gpd in wastewater flows. The information in the following table is based on the December 2008 CMP worksheets.

New Windsor Wastewater Capacity *Currently* Available for Existing and Future Growth
(in Gallons per Day)

Community	Current			Existing Flows	Capacity Needed			Capacity Available at Buildout
	Permitted	I&I	Remaining Capacity		Infill	Future	No Planned Service	
New Windsor	94,000	25,000	69,000	66,716	21,950	232,000	3,800	(255,466)

Source: Carroll County Department of Planning, December 2008

Limitations Based on Design Capacity

The infill+future demand, which represents the entire planned service area in the table above, combined with the No Planned Service area wastewater demands would total approximately 0.35 mgd, which is greater than the planned WWTP expanded capacity of 0.115 mgd. With additional treatment and reactors, the SBR process could take the plant to .175 mgd in treatment capacity. According to the Town, the wastewater demand projections are unlikely to exceed 0.25 mgd. The CMP worksheets indicate that I&I flows averaged about .025 mgd in 2003, which represented about a quarter of the total average flows at that time.

Limitations Based on Local Water Quality

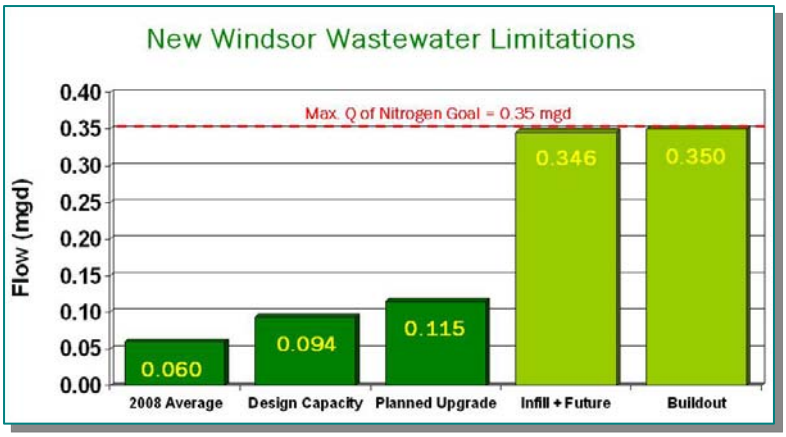
NPDES permit limits for parameters, such as ammonia, were derived for local water quality protection and will be achievable with nitrification even at expanded flows, after the plant expansion is complete.

Because the New Windsor WWTP can readily comply with fecal coliform and TSS limits, the TMDLs for Double Pipe Creek for fecal coliform and TSS will not represent the controlling limitations to discharge. Similarly, the future TMDL for biological impairments in the Double Pipe Creek watershed is also not expected to impose the controlling limitation on discharge rates. The future phosphorus TMDL for Double Pipe Creek is unlikely to impose phosphorus limits that are more stringent than the Bay-related nutrient caps. The New Windsor WWTP is not upstream of a Tier II stream segment.

Limitations Based on Bay Nutrient Caps

The New Windsor WWTP is considered a 'minor' facility under *Maryland's Tributary Strategies Statewide Implementation Plan*. As a minor facility, the nutrient loading caps are assigned as goals. These nutrient caps were based on a projected 2020 flow of 0.058 mgd, a total nitrogen concentration of 18.0 mg/L, and a total phosphorus concentration of 3.0 mg/L. Because the plant is expanding to a treatment capacity of more than 0.1 mgd, these loading caps will become enforceable permit limits upon completion of the expansion.

Even if the WWTP is increased to a flow of 0.175 mgd, the New Windsor WWTP could meet its nutrient loading caps by attaining effluent concentrations of approximate 6.0 mg/L total nitrogen and 1.0 mg/L total phosphorus, which are achievable with the technology selected for the upgrade. If the plant ultimately upgraded to full ENR (3.0 mg/L total nitrogen and



0.3 mg/L total phosphorus), it could attain its nutrient loading limits even at the 0.350 mgd flow projected for full buildout (based on CMP worksheets).

Summary of Wastewater Limitations

The existing design capacity (0.094 mgd) of the New Windsor WWTP represents the controlling limitation under current conditions. As the plant expands and upgrades, the rated design capacity is likely to remain the controlling limitation to discharge as long as advanced nutrient removal technology is employed.

System-Specific Strategies: New Windsor

Note: Numbers for each objective correspond to the relevant objective in the countywide strategies section of this plan. Objectives included below are those that apply specifically and uniquely to this system. Strategies that apply to the County and all of the municipal systems are included in the Countywide Strategies section of this plan.

1. Protect and sustain existing water supplies serving existing development

System-Specific Action Items Already in Place:

✓ Adopted the Carroll County Water Resource Management Code, Chapter 218, which provides source water projection regulations

System-Specific "To Do" Action Items:

Short-term

❑ Support the rezoning by the County of areas outside the Town's future annexation line (Growth Area Boundary) to be consistent with other areas of the county that are not within a DGA to reflect desired future buildout scenario for New Windsor

❑ Amend the Municipal Growth Element of the *New Windsor Community Comprehensive Plan* and associated annexation areas, as needed, to reflect the changes recommended in this plan

❑ Update the WSCMP worksheets developed as background data for this plan document to reflect the most current data, then complete and submit a full WSCMP to MDE for review

Long-Term

❑ Identify potential industrial/manufacturing users for which water reuse in operations may be pursued to reduce consumption of potable water

2. Identify and develop, as needed, new water supplies adequate to support planned future growth without over-allocating available sources

System-Specific "To Do" Action Items:

Short-term Strategy/ies

❑ Develop an agreement with Lehigh Portland Cement Company to use water pumped from the Lehigh New Windsor quarry

Short-term Water Supply Solutions

- ❑ Hillside Well 1 (2nd well @ Hillside): Bring back online; anticipated yield 0.050 mgd
- ❑ Well in Conjunction with Development of Snader Property: To be developer supplied and funded in conjunction with development approval
- ❑ Well #5 at Main Spring Farm: Connect existing Well #5 at Main Spring Farm to water supply system
- ❑ Groundwater Wells: Drill and develop 3 groundwater wells (based on the average MDE appropriation of existing New Windsor wells) to meet projected additional demand requirements of approximately 198,000 gpd
  - ❑ Obtain control (annex, purchase, or designate as planned WSA) over sufficient acreage in the appropriate watershed(s) to meet the MDE-required amount of recharge
  - ❑ Begin MDE water appropriation permitting process
  - ❑ Acquire ownership or easement of well site(s)
  - ❑ Drill and develop well site(s)
  - ❑ Conduct pumping test(s) and source water quality analyses
  - ❑ Finalize MDE water appropriation permit process
  - ❑ Install permanent wellhead(s) and fencing and constructing treatment/transmission infrastructure necessary to connect wells to the WSA distribution system

Long-term Water Supply Options

Note: These are options that will be considered for long-term supply. However, inclusion here does not imply that there is a definite plan to move forward with an option. Exploring additional sources, even for those systems that currently project enough capacity to meet demand, is included in order to be prepared for policy changes or other changes that would result in the need for additional available water capacity.

- ❑ Well in Conjunction with Development of Lease Property: To be supplied and funded by the developer in conjunction with development approval
- ❑ Well #6 at Main Spring Farm: Has been drilled and constructed; needs to be permitted
- ❑ Lehigh Quarry: Use of Lehigh Quarry near New Windsor as a raw-water reservoir to supply approximately 0.25 mgd to New Windsor; preferred method of transferring water to the WTP is via a release to the nearby stream, and a subsequent withdrawal at the treatment plant
- ❑ Regional Connection to Westminster (approximately 2 miles to raw water or 3 miles to treated water)
- ❑ Regional Connection to Union Bridge: Subsequent to any use of the Union Bridge Lehigh Quarry water

4. Promote water conservation measures and manage demand for potable water to ensure adequate supplies are available for planned development

System-Specific Action Items Already in Place:

- ✓ Public Education: Trying to shift attitude toward constant conservation, not just for emergencies; newsletters
- ✓ Drought Management: Three-staged drought management plan adopted

5. Sustain existing wastewater treatment capacity

System-Specific "To Do" Action Items:

Short-term

- ❑ Update the WWCMP worksheets developed as background data for this plan document to reflect the most current then complete and submit a full WWCMP to MDE for review
- ❑ Complete planned construction of SBR plant (2 tanks)
- ❑ Pursue re-rating of the WWTP capacity upon completion of the SBR construction to recognize additional capacity gained through operational upgrade
- ❑ Conduct an I&I study to determine current level of inflows from I&I to potentially regain some capacity; make system improvements to reduce I&I; adjust the capacity on the WWCMP worksheets to update available capacity

Long-Term

- ❑ Identify potential industrial/manufacturing users for which water reuse in operations may be pursued
- ❑ Complete further expansion of the SBR plant (filtering and 4 tanks)
- ❑ Evaluate the feasibility of a regional connection to Westminster's wastewater treatment system
- ❑ Investigate reuse of Town's gray water through spray irrigation at ballfields, for firefighting, industrial operations, or other appropriate uses

Sykesville

Water Supply

Source Water Assessment

The Town of Sykesville is served by the Freedom water supply system.

Water Supply Demand

The existing demand for water within the Town limits is included within the total annual average daily demand for the Freedom water supply system. Assuming that everything within the area on the Town's adopted land use plan builds out, additional residential demand to the Freedom water supply system from Sykesville would be 31,250 gpd (125 DU) based strictly on BLI calculations. Additional future non-residential demand is estimated at 177,400 gpd.

Water Supply Capacity

The Town of Sykesville has an adopted Adequate Public Facilities Ordinance. The Town is served by the Freedom water supply system. Therefore, capacity issues are discussed and addressed under the Freedom system section.

Water Supply Limitations

The Town of Sykesville is served by the Freedom water supply system. Therefore, limiting factors are discussed under the Freedom system section. Reliance on the capacity of the Freedom system is a limitation for the Town.

Wastewater

Wastewater Demand

The existing demand for wastewater within the Town limits is included within the current demand for the Freedom sewerage system. Assuming that everything within the Town builds out according to the adopted land use plan, additional residential demand to the Freedom wastewater system from Sykesville would be 31,250 gpd (125 DU) based strictly on BLI calculations. Additional future non-residential demand is estimated at 159,660 gpd.

Wastewater Capacity

The Town of Sykesville has an adopted Adequate Public Facilities Ordinance. The Town is served by the Freedom wastewater system. Therefore, capacity issues are discussed and addressed under the Freedom system section.

Limitations Based on Design Capacity

The Town of Sykesville is served by the Freedom wastewater system. Therefore, the design capacity limitations are discussed under the Freedom system section.

Limitations Based on Local Water Quality

The Town of Sykesville is served by the Freedom wastewater system. Therefore, the local water quality limitations specific to the system's infrastructure are discussed under the Freedom system section.

Limitations Based on Bay Nutrient Caps

The Town of Sykesville is served by the Freedom wastewater system. Therefore, the Bay nutrient cap limitations specific to the infrastructure itself are discussed under the Freedom system section.

Summary of Wastewater Limitations

The Town of Sykesville is served by the Freedom wastewater system. Therefore, the limitations specific to the infrastructure fall under the Freedom system section. Reliance on the capacity of the Freedom system is a limitation for the Town.

System-Specific Strategies: Sykesville

Note: Numbers for each objective correspond to the relevant objective in the countywide strategies section of this plan. Objectives included below are those that apply specifically and uniquely to this system. Strategies that apply to the County and all of the municipal systems are included in the Countywide Strategies section of this plan.

1. Protect and sustain existing water supplies serving existing development

System-Specific Action Items Already in Place:

✓ Adopted an adequate public facilities ordinance to ensure adequate water supply is available to serve planned development before it proceeds

System-Specific "To Do" Action Items:

❑ When updating the land use plan in the Town's master plan, coordinate with the County to ensure that the Freedom water supply system can adequately accommodate projected additional water supply demand

5. Sustain existing wastewater treatment capacity

System-Specific Action Items Already in Place:

✓ Adopted an adequate public facilities ordinance to ensure adequate wastewater capacity is available to serve planned development before it proceeds

System-Specific "To Do" Action Items:

Short-term

❑ When updating the land use plan in the Town's master plan, coordinate with the County to ensure that the Freedom WWTP can adequately accommodate projected additional wastewater demand

Taneytown

Section 1.03 (iii) of Article 66B of the Annotated Code of Maryland mandates that all Maryland counties and municipalities that exercise planning and zoning authority prepare and adopt a water resources element in their comprehensive plans.

This Water Resources Element of the 2010 Taneytown Comprehensive Plan and the projected water demand generated by the land use plan is based on a build-out scenario. The provision of an adequate public water supply has been one of the primary focuses of the City. This section of the plan will detail the significant improvements and planning programs that will provide high quality City water and wastewater systems.

Goals

- Identify drinking water and other water resources that will be adequate for the needs of existing and future development proposed in the land use element of the plan, considering available data provided by the Maryland Department of the Environment (MDE).
- Identify suitable receiving waters and land areas to meet the stormwater management and wastewater treatment and disposal needs of existing and future development proposed in the land use element of the plan, considering available data provided by MDE.

Current Conditions

Water Supply

Source Water Assessment

The unconfined fractured rock aquifer in the New Oxford Formation is the source of water supply for the City of Taneytown system, which is comprised of six wells in the Piney Creek drainage area and two wells in the Big Pipe Creek drainage area.

Water Supply Demand

The future water demand assumes that development will occur in accordance with the land use plan. If this were to occur, the total future water supply demand for the Taneytown system would be 1,785,823 gpd. The numbers in the "Taneytown Future Water Supply Demand" table are based strictly on Buildable Land Inventory (BLI) calculations.

Taneytown Future Water Supply Demand
(Gallons per Day)

Current Demand[1]	Additional Demand by Land Use			Total Demand
	Residential	Commercial	Industrial	
509,143	709,750	98,770	468,160	1,785,823

[1] This data is the greatest annual average daily demand for the five-year period from 2003 through 2007.

Source: Carroll County Department of Planning, December 2008

Water Supply Capacity

If Taneytown were to build out according to the land use designations in the GAB, the City would need to expand beyond its current capacity to make available another 1,272,891 gpd. The information in the following table is based on the December 2008 capacity management plan worksheets.

Taneytown Water Supply Capacity *Currently* Available
for Existing and Future Growth
(in Gallons per Day)

Current				Unserved Demand		Net Avg Day Capacity Available at Buildout
Permitted	Avg Day Capacity Limitation	Avg Day Drought Demand[1]	Remaining Capacity	Infill + Future	Public Use	
583,000	563,846	560,057	3,789	1,275,930	750	(1,272,891)

[1] Average Day Drought Demand includes an additional 10% for drought demand

Source: Carroll County Department of Planning, December 2008

Water Supply Limitations

A primary water supply limitation to meeting the future demand is acquisition and/or control of recharge lands. There is significant upland (up-watershed) open space for recharge and well development. However, water rights and land acquisition by the City will be costly. A secondary limitation is site specific constraints and environmental features for the acquisition and construction of water supply systems.

Another component of the City's water supply program is a planned expansion to include a surface water system including development of a City stream intake, reservoir, and water treatment plant, or participation in a County or multi-municipal project.

Wastewater

The City owns a wastewater treatment plant (including a BNR system) along Piney Creek on the west side of the City, which has a design capacity of 1.1 mgd. The plant discharges to Piney Creek, which flows into the Upper Monocacy River. The City plans to upgrade the plant

to ENR treatment standards in order to meet the Bay-related nutrient cap.

Wastewater Demand

The future wastewater demand assumes that development will occur as proposed in the land use plan. If this were to occur, the future wastewater demand for the Taneytown WWTP would be 2,141,113 gpd and includes flows from infiltration and inflow of surface water.

Taneytown Future Wastewater Demand
(in Gallons per Day)

Current Demand	Additional Demand by Land Use			Total Demand
	Residential	Commercial	Industrial	
853,333	714,750	100,310	472,720	2,141,113

[1] This data represents, in general, the annual average daily demand over the three-year period 2005-2007, and include I&I.
[2] Total demand includes anticipated I&I.

Wastewater Capacity

The future demand assumes that development will occur in accordance with the land use plan. The City would need to expand beyond its current capacity to make available an additional 1,041,113 gpd in wastewater flows. The information in the following table is based on the December 2008 capacity management plan worksheets.

Taneytown Wastewater Capacity *Currently* Available for Existing and Future Growth
(in Gallons per Day)

Current			Existing Flows	Capacity Needed			Capacity Available at Buildout
Permitted	I&I	Remaining Capacity		Infill	Future	Public Use	
1,100,000	351,000	749,000	502,333	72,000	1,215,030	750	(1,041,113)

Source: Carroll County Department of Planning, December 2008

Limitations Based on Design Capacity

The existing wastewater flow (~0.8 mgd) is approaching the 1.1-mgd design capacity of the Taneytown WWTP. The facility would have to expand in order to accommodate the projected priority+future and buildout wastewater demand of 1.74 mgd. The site has adequate land available for expansion if needed.

I&I is a major component of the existing influent flow. According to the CMP worksheets, I&I flows averaged about 0.35 mgd in 2003. The City has completed some additional detection and repairs to reduce I&I flows by televising the complete sewer system every three years. No additional studies have been completed to determine how much I&I has been reduced.

Limitations Based on Local Water Quality

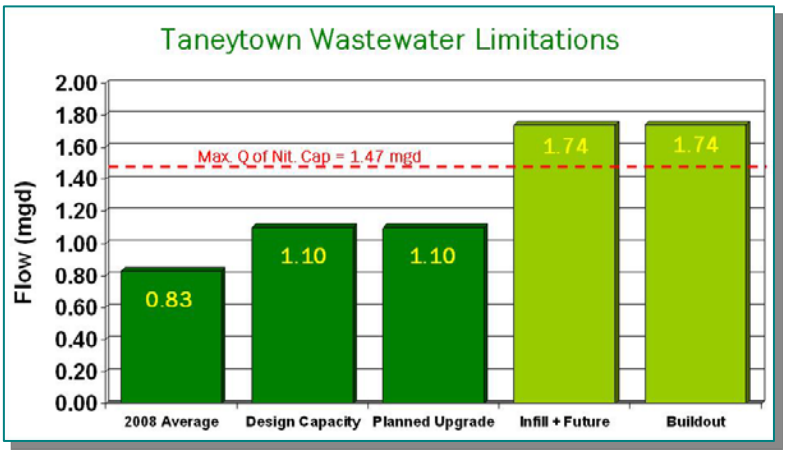
The Taneytown WWTP NPDES permit includes limits for conventional pollutants and parameters such as BOD5, fecal coliform, pH, total suspended solids, and dissolved oxygen. These limits are standard limits for secondary treatment facilities, and are fully protective of receiving waters. Limits for parameters such as ammonia were derived for local water quality protection and are expected to remain achievable even under higher effluent flows.

Limitations Based on Bay Nutrient Caps

The ENR upgrade project will be designed to achieve 3.0 mg/L total nitrogen and at most 0.3 mg/L total phosphorus. At 3.0 mg/L total nitrogen, the Taneytown WWTP would be limited to discharging approximately 1.47 mgd, which is less than the buildout wastewater demand of 1.74 mgd.

Summary of Wastewater Limitations

The existing design capacity of the Taneytown WWTP is 1.1 mgd. The Bay-related nitrogen loading cap represents a 1.47-mgd limit to surface water discharges. This limitation is lower than the maximum projected flows of 1.74 mgd.



Current Protections, Practices, and Policies

The City has taken several steps to improve the capacity and reliability of the public water supply system.

Procedure Improvements

✓ Adequate Public Facilities Ordinance

The City declared water supply an inadequate facility and has enforced the adequate public facilities ordinance. Developers have been advised that they would need to either wait until the city had resolved the situation or could provide water (source and recharge) for their project.

✓ Water Policy

The City has developed a draft water policy to guide and govern the materials and methods to be employed by developers and the City. This unique approach guides the City when making technical and hydrogeological decisions for the provision of an adequate water supply system.

✓ Water Audit

The City has performed several annual water audits including professional leak detection surveys. The water audit process identifies sources of unaccounted water usage; while the location and repair of leaks throughout the system has significantly reduced water loss.

✓ Water Supply Capacity Management Plan

The City completed a Water Supply Capacity Management Plan which is a valuable resource in the future management of water supply.

System Improvements

✓ Leak Repairs Identified (Water Audit)

The City's active leak detection and repair program has resulted in reduction of the annual average daily production to 466,000-gpd through the first seven months of 2009. That value is down from 478,000 gpd in 2004, despite the addition of over 400 new connections producing about 50,000 gpd of new water demand.

✓ Water Main Replacement

The City's deteriorating water main in Baltimore Street (11,000-LF) including all service laterals, are being replaced as part of the City's Streetscape project. Once completed, the City should realize further reduction in water loss through leakage.

✓ Existing Well Improvements

The City has completed the following improvement projects:

- **WELL NO. 14 / FRINGER WELLS** –The City increased the appropriated production capacity of Well No. 14, which was limited by MDE due to impact to local private wells. This was accomplished by drilling new wells on Fringer Road. This project was needed to increase the City's production capabilities to meet the drought year month of maximum use demand.
- **WELL NO. 9** – The City constructed granular activated carbon contactors to adsorb PCE, because levels had reached the MCL action level. As part of the project, the well was videoed, and the well pump and piping were replaced yielding a 20 gpm increase in production. The source of the contamination is under continuing investigation by MDE.

- **WELL NO. 13** – Radionuclide (Adjusted Gross Alpha) levels in Well No. 13 have risen to the MCL action level, and after consideration of alternatives, the city has taken the well out of service, while MDE investigates.
- **WELL NO. 12** – In efforts to develop additional production capacity to offset the loss of Well No. 13, Well No. 12 was deepened, yielding a 30 gpm increase in production.

✓ Groundwater Source Development

New water supply development has been focused on development of new supply wells to provide operational redundancy as well as appropriations capacity to support planned growth. The City engaged hydrogeologists to perform geologic analysis of the region surrounding the City, prioritize potential well drilling locations, identify specific drilling sites, and permit and oversee well drilling and pump testing.

- WELL NOS. 15 & 16 – The City has requested an expansion in the appropriation for Wells 15 and 16 based on demonstration of their actual production capabilities during extended periods in 2007 and 2008. During these operating periods, the wells were producing an average daily flow of 167,000 gpd without impact to surrounding wells. MDE is reviewing the City's appropriation renewal.
- TANEYTOWN BAPTIST CHURCH WELL (WELL NO. 17) –The City has developed one new supply well for production in the Big Pipe Creek basin. The well was drilled to about 1,000-feet, cased, grouted and step-tested. A 72-hour pump test in accordance with MDE and Carroll County requirements was performed at a rate of 250-gpm. The City's hydrogeologist is completing the hydrogeologic report and is proceeding with the appropriations permit through MDE.

Recommendations

System-Specific Strategies: Taneytown

- ❑ Protect and sustain existing water supplies serving existing development
- ❑ Support the County's land use plan for areas outside the City's GAB (Growth Area Boundary) when compatible with the City's Comprehensive Plan
- ❑ Perform an annual water audit to update the Water Supply Capacity Management Plan (WSCMP) to reflect the most current data and usage
- ❑ Complete and adopt the City water policy to serve as a uniform guidance document for projects in the City
- ❑ Complete City Code updates to address new water requirements
- ❑ Institute a priority system for water allocation to projects that promote economic development
- ❑ Identify and develop new water supplies adequate to support planned future growth
- ❑ Finalize development and permitting of the Baptist Church well (#17)
- ❑ Secure the recharge land needed to match the additional water appropriation
- ❑ Explore additional sources for future water supply and prepare policy changes that

would result in the need for additional available water capacity and to meet the projected water demand of 1,164,000 gpd

- ❑ Secure additional recharge land from Carroll County government
- ❑ Develop new surface water intake on Big Pipe Creek; safe yield 0.4 mgd; with 2.0 mgd intake and 125 mgd storage impoundment
- ❑ Explore and coordinate a Flow Augmentation program from planned Union Mills Reservoir to Big Pipe Creek with Downstream Withdrawal: Taneytown may be served through flow augmentation of Big Pipe Creek and downstream withdrawal. Construction of a new 1.8 mgd WTP in Taneytown. Installation of approximately 1.0 mile of raw water transmission mains in Taneytown to connect intake to new WTP

Promote Water Conservation Measures

- ❑ Three-phased water conservation program, which restricts use during drought conditions

Preserve Existing Wastewater Treatment Capacity

- ❑ Update the Wastewater Capacity Management Plan (WWCMP) worksheets on a regular basis to reflect the most current data and usage
- ❑ Conduct an I&I study to promote system improvements to reduce I&I and regain capacity
- ❑ Complete the ENR upgrade at the WWTP to operate at the limits of technology for nitrogen and phosphorus removal
- ❑ Identify potential areas for spray irrigation to gain additional wastewater capacity at the WWTP
- ❑ Identify plant expansion improvements needed to increase the design capacity of the WWTP from 1.1 mgd to 1.74 mgd
- ❑ Investigate technologies for the WWTP expansion to allow expansion to the 1.74 mgd providing the City can meet Bay-nutrient caps (currently set at 1.47 mgd)
- ❑ Identify potential industrial/manufacturing users for which water reuse in operations may be pursued

Union Bridge

Water Supply

Source Water Assessment

The unconfined fractured rock aquifer in the Wakefield Marble is the source of water for the Town of Union Bridge. The system currently uses two wells to obtain its drinking water. All water supply sources for Union Bridge are susceptible to contamination by nitrates and protozoans. The water supply is not susceptible to organic compounds, radionuclides, or other inorganic compounds.

Water Supply Demand

The total future water demand assumes that everything within the GAB builds out according to the adopted land use plan. If this were to occur, the total future water supply demand for the Union Bridge system would be 875,083 gpd. The numbers in the "Union Bridge Future Water Supply Demand" table are based strictly on BLI calculations. They do not reflect factors unique to this municipal system that may have been considered in the capacity management plan (CMP) worksheet calculations and figures presented in the next table, "Union Bridge Water Supply Capacity *Currently* Available for Existing and Future Growth."

Union Bridge Future Water Supply Demand
(Gallons per Day)

Community	Current Demand[1]	Planned Future Demand[2]		Other Potential Demand[3]	Total Demand
		Infill Demand	Future Demand		
Union Bridge	199,123	46,700	592,840	36,420	875,083
Community	**Current Demand[1]**	**Additional Demand by Land Use**			**Total Demand**
		Residential	**Commercial**	**Industrial**	
Union Bridge	199,123	345,750	43,890	286,320	875,083

[1] These data are the greatest annual average daily demand for the five-year period from 2003 through 2007.
[2] These data relate to areas located within the designated planned water service area. Infill demand is calculated for areas classified in the "Existing/Final Planning" service category; Future demand is calculated for the combined area classified in the "Priority" or "Future" service category.
[3] These data relate to areas designated in the "No Planned Water Service Area" but located within the Community Growth Area Boundary.

Source: Carroll County Department of Planning, December 2008

Calculations for future water demand used the CMP data. This demand is reflected under "Infill + Future." However, the CMP data do not account for additional demand that would occur within the balance of the planned water service area or the area that is designated in the "No Planned Water Service Area." To factor in this further demand, future development

potential and existing development that would be served were estimated and calculated for water demand and are reported under "Other Potential Demand."

Water Supply Capacity

If Union Bridge were to build out according to the planned land uses adopted within the 2008 GAB, the Town would need to its system expand beyond its current capacity to make available another 849,709 gpd. The information in the following table is based on the December 2008 capacity management plan worksheets.

Union Bridge Water Supply Capacity *Currently* Available for Existing and Future Growth (in Gallons per Day)

Community	Current			Remaining Capacity	Unserved Demand		Net Avg Day Capacity Available at Buildout
	Permitted	Avg Day Capacity Limitation	Avg Day Drought Demand[1]		Infill + Future	No Planned Service	
Union Bridge	208,300	49,846	219,035	(169,189)	639,540	40,980	(849,709)

[1] Average Day Drought Demand here includes an additional 10% for drought demand

Source: Carroll County Department of Planning, December 2008

Water Supply Limitations

According to the *Carroll County Water Demands and Availability* report (July 30, 2009) prepared by Malcolm Pirnie, the present level of analysis indicated that water resources in the Double Pipe Creek watershed are available in sufficient quantities to be able to be developed to meet projected buildout demands.

Assuming groundwater availability is not a limiting factor, the Town still faces several other limitations with respect to water supply. The Town currently does not have the financial ability to secure recharge areas, obtain appropriation permits, and finance the construction of additional groundwater wells for the system. Even with developer funding as new development projects are proposed, the wastewater plant would also be a limiting factor. Until limitations associated with the WWTP are addressed, the capacity of the water supply system would be limited to the current design WWTP capacity of 200,000 gpd without water reuse measures in place.

Wastewater

The plant discharges to Little Pipe Creek, which flows into Double Pipe Creek. The Town currently has no immediate plans to expand the WWTP, nor upgrade to ENR.

Wastewater Demand

The total future wastewater demand assumes that everything within the 2008 GAB builds out according to the adopted land use plan. If this were to occur, the total future wastewater demand for the Union Bridge WWTP would be 930,487 gpd. The numbers in the "Union Bridge Future Wastewater Demand" table are based strictly on BLI calculations. They do not reflect factors unique to this municipal system that may have been considered in the CMP worksheet calculations and figures presented in the next table, "Union Bridge Wastewater Capacity *Currently* Available for Existing and Future Growth."

Union Bridge Future Wastewater Demand
(in Gallons per Day)

Community	Current Demand[1]	Planned Future Demand[2]		Other Potential Demand[3]	Total Demand
		Infill Demand	Future Demand		
Union Bridge	177,967	101,900	609,640	40,980	930,487
Community	Current Demand	Additional Demand by Land Use			Total Demand
		Residential	Commercial	Industrial	
Union Bridge	177,967	409,750	11,970	330,800	930,487

[1] These data represent, in general, the annual average daily demand over the three-year period 2005-2007, and include I&I.
[2] These data relate to areas located within the designated planned sewer service area. Infill demand is calculated for areas classified in the "Existing/Final Planning" service category; Future demand is calculated for the combined area classified in the "Priority" or "Future" service category.
[3] These data relate to areas designated in the "No Planned Sewer Service Area" but located within the Community Growth Area Boundary.

Source: Carroll County Department of Planning, December 2008

Wastewater Capacity

If Union Bridge were to build out according to the planned land uses adopted within the 2008 GAB, the Town would need to expand the system beyond its current capacity to make available an additional 730,487 gpd in wastewater flows. The information in the following table is based on the December 2008 CMP worksheets.

Union Bridge Wastewater Capacity *Currently* Available for Existing and Future Growth
(in Gallons per Day)

Community	Current			Existing Flows	Capacity Needed			Capacity Available at Buildout
	Permitted	I&I	Remaining Capacity		Infill	Future	No Planned Service	
Union Bridge	200,000	50,600	149,400	127,367	101,900	609,640	40,980	(730,487)

Source: Carroll County Department of Planning, December 2008

Limitations Based on Design Capacity

The 0.2-mgd facility would have to more than quadruple the current design capacity to accommodate the projected infill+future and No Planned Service area (buildout of balance of DGA) wastewater demands. Given the age of the current plant and its location in the Little Pipe Creek floodplain, preliminary engineering studies have indicated that it would be more cost-effective to build a new plant at another nearby location rather than expand the current plant. According to the CMP worksheets, I&I flows averaged about 0.050 mgd in 2003, or about a third of the total average plant flows at that time.

Limitations Based on Local Water Quality

Because the Union Bridge WWTP can readily comply with fecal coliform and TSS limits, the TMDLs for Double Pipe Creek for fecal coliform and TSS will not represent the controlling limitations to discharge. Similarly, the future TMDL for biological impairments in the Double Pipe Creek watershed is also not expected to impose the controlling limitation on discharge rates. The future phosphorus TMDL for Double Pipe Creek is unlikely to impose phosphorus limits that are more stringent than the Bay-related nutrient caps, but could result in a phosphorus limit in the NPDES permit. The Union Bridge WWTP is not upstream of a Tier II stream segment.

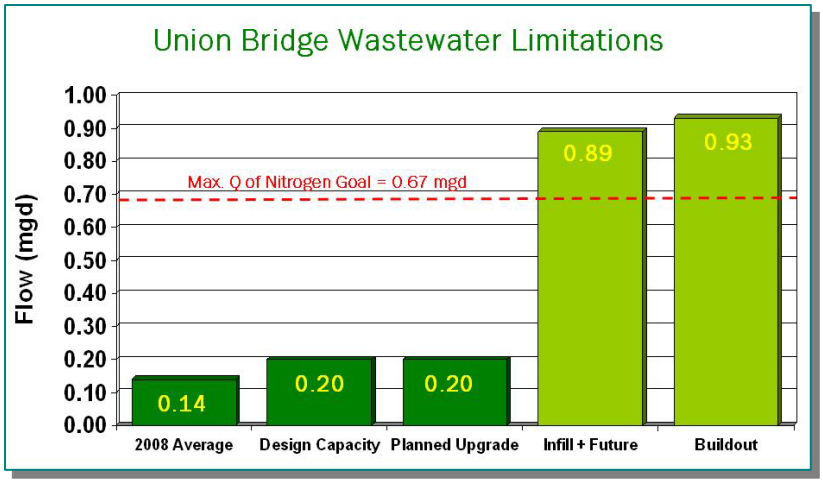
Limitations Based on Bay Nutrient Caps

The Union Bridge WWTP's NPDES permit does not have limits for total nitrogen or total phosphorus. However, the WWTP has been assigned nutrient loading caps for both total nitrogen and total phosphorus under Maryland's Tributary Strategy Statewide Implementation Plan. The nutrient caps were based on a projected 2020 flow of 0.112 mgd, a total nitrogen concentration of 18.0 mg/L, and a total phosphorus concentration of 3.0 mg/L. As with most other minor facilities, these nutrient caps will remain as goals rather than permit limits, until/unless the WWTP expands or elects to trade nutrient credits to another point source facility.

If the Union Bridge WWTP expanded and upgraded to ENR, the total nitrogen cap would represent a controlling limitation to the maximum discharge rate. At 3.0 mg/L total nitrogen, the Union Bridge WWTP would be limited to discharging approximately 0.67 mgd, which is less than the infill+future (entire planned service area, shown as "priority+future" in the Malcolm Pirnie reports) and buildout wastewater demands.

Summary of Wastewater Limitations

The existing design capacity (0.2 mgd) of the Union Bridge WWTP represents the controlling limitation under current conditions. Longer-term, the Bay-related nitrogen loading cap represents a 0.67-mgd limit to surface water discharges. This is less than the projected infill+future (entire planned service area) and buildout (entire DGA) wastewater demands.



System-Specific Strategies: Union Bridge

Note: Numbers for each objective correspond to the relevant objective in the countywide strategies section of this plan. Objectives included below are those that apply specifically and uniquely to this system. Strategies that apply to the County and all of the municipal systems are included in the Countywide Strategies section of this plan.

1. Protect and sustain existing water supplies serving existing development

System-Specific "To Do" Action Items:

- ❑ Rezone areas outside the Town's future annexation line (Growth Area Boundary) to be consistent with other areas of the county that are not within a DGA to reflect the desired future buildout scenario for Union Bridge [County]
- ❑ Amend the Municipal Growth Element of the *Union Bridge Community Comprehensive Plan* and associated annexation areas, as needed, to reflect the changes recommended in this plan
- ❑ Update the WSCMP worksheets developed as background data for this plan document to reflect the most current information then complete and submit a full WSCMP to MDE for review

2. Identify and develop, as needed, new water supplies adequate to support planned future growth without over-allocating available sources

System-Specific "To Do" Action Items:

Long-term Strategy/ies

- ❑ Explore additional sources for future water supply to prepare for policy changes or other changes that would result in the need for additional available water capacity

❑ Investigate the administrative feasibility in developing access to quarry discharge water for direct use or reuse

Short-term Water Supply Solutions

❑ Groundwater Wells: Drill and develop 6 groundwater wells (based on the average MDE appropriation of existing Union Bridge wells) to meet projected additional demand requirements of approximately 594,000 gpd
- ❑ Obtain control (annex, purchase, or designate as planned WSA) over sufficient acreage in the appropriate watershed(s) to meet the MDE-required amount of recharge
- ❑ Begin MDE water appropriation permitting process
- ❑ Acquire ownership or easement of well site(s)
- ❑ Drill and develop well site(s)
- ❑ Conduct pumping test(s) and source water quality analyses
- ❑ Finalize MDE water appropriation permit process
- ❑ Install permanent wellhead(s) and fencing and constructing treatment/transmission infrastructure necessary to connect wells to the WSA distribution system

❑ Bowman Property Well: Anticipated appropriation 0.065 mgd; still under developer control

Long-term Water Supply Options

Note: These are options that will be considered for long-term supply. However, inclusion here does not imply that there is a definite plan to move forward with an option. Exploring additional sources, even for those systems that currently project enough capacity to meet demand, is included in order to be prepared for policy changes or other changes that would result in the need for additional available water capacity.

❑ Lehigh Portland Cement Company Quarry: Use of Lehigh Quarry in Union Bridge as a raw water reservoir to supply approximately 0.6 mgd to Union Bridge; due to contamination concerns, this option is more feasible once quarry options cease

4. Promote water conservation measures and manage demand for potable water to ensure adequate supplies are available for planned development

System-Specific Action Items Already in Place:

✓ Public Education: Pamphlets regarding water use available at Town office
✓ Water Loss Management: Locate and repair leaks in distribution system; all meters were replaced about 5 years ago
✓ Billing Cycle: Quarterly billing cycle

5. Sustain existing wastewater treatment capacity

System-Specific Action Items Already in Place:

✓ Completed a WWTP expansion study

System-Specific "To Do" Action Items:

Short-term

- ❑ Update the WWCMP worksheets developed as background data for this plan document to reflect the most current data, then complete and submit a full WWCMP to MDE for review
- ❑ Evaluate areas that may be removed from the GAB with the next update of the Town's comprehensive plan to help reduce projected demand to correlate with the Town's caps and to the wastewater capacity that the Town is able to provide
- ❑ Study the upgrades needed to remain in compliance at existing flows
- ❑ Conduct an I&I study to determine current level of inflows from I&I to potentially regain some capacity; make system improvements to reduce I&I; adjust the capacity on the WWCMP worksheets to update available capacity

Long-term

- ❑ Undertake an engineering study to determine a new (relocated) location and design for a new WWTP and evaluate funding alternatives
- ❑ Identify potential areas for spray irrigation to gain additional wastewater capacity at the WWTP and evaluate whether spray irrigation is a feasible option for the Town
- ❑ Evaluate the feasibility of developing a water reuse system between the Town and Lehigh; investigate potential to use WWTP gray water for Lehigh cooling operations and subsequent withdrawal by the Town from the existing Lehigh pond to treat and use as potable water

Westminster

Water Supply

The City is divided into two watersheds by the northeast-to-southwest running Parr's Ridge. The western portion of the City falls into the Double Pipe Creek watershed, part of the Potomac Tributary basin area. The City's Wakefield Valley water system is located in this watershed. Also in this watershed are nine of the City's supply wells, the Medford Quarry emergency water supply, and the Wastewater Treatment Plant, which discharges into Little Pipe Creek. Future projects in this watershed include the Gesell Property well, Greenvale Mews observation well, and Little Pipe Creek intake.

The eastern part of the City falls into the Liberty Reservoir watershed and the North Branch Patapsco River 6-digit watersheds, which are part of the Patapsco/Back River Tributary basin. The City withdraws water from surface intakes on Cranberry Branch and Hull Creek in this watershed. Both creeks are tributaries of the West Branch of the Potomac. Water withdrawn from Cranberry Branch is stored in the raw water reservoir north of Lucabaugh Mill Road. Also in this watershed are three supply wells and one streamflow augmentation well. Portions of the Hampstead and Freedom water and sewer systems are located within this watershed.

Source Water Assessment

The City of Westminster relies upon both surface and groundwater for its potable supply. The unconfined fractured rock aquifer within the Wakefield Marble, Sam's Creek Formation, Marburg Formation, Ijamsville Phyllite, and Wissahickon Formation provide the source of water supply for 11 groundwater wells. Four of the City's wells (Wells 1, 2, 5, and 7) are in the Wakefield Marble. The remaining seven wells are in the crystalline bedrock formations. The City also withdraws water from the Cranberry Run Reservoir. The SWA was delineated by a consultant in accordance with the 1999 MDE SWAP guidance document. Many of the wells are susceptible to natural contaminants such as radon, as well as anthropogenic contaminants like nitrates.

Water Supply Demand

The area within the Westminster GAB is covered by both the *City of Westminster Comprehensive Plan* and the *Westminster Environs Community Comprehensive Plan*, which was developed in cooperation with the City of Westminster to cover the area with the DGA that is outside the City's corporate limits. The total future water demand assumes that everything within the GAB (also referred to in these plans as the future annexation line/limit) builds out according to the adopted land use plan. If this were to occur, the total future water supply demand for the Westminster system would be 5,338,300 gpd.

The numbers in the "Westminster Future Water Supply Demand" table are based strictly on BLI calculations. They do not reflect factors unique to the municipal system that may have been considered in the capacity management plan (CMP) worksheet calculations and figures presented in the next table, "Westminster Water Supply Capacity *Currently* Available for Existing and Future Growth."

Westminster Future Water Supply Demand
(Gallons per Day)

Community	Current Demand[1]	Planned Future Demand[2]		Other Potential Demand[3]	Total Demand
		Infill Demand	Future Demand		
Westminster	2,960,000	732,050	956,400	689,850	5,338,300
Community	**Current Demand[1]**	**Additional Demand by Land Use**			**Total Demand**
		Residential	**Commercial**	**Industrial**	
Westminster	2,960,000	1,497,250	53,130	827,920	5,338,300

[1] These data are the greatest annual average daily demand for the five-year period from 2003 through 2007.
[2] These data relate to areas located within the designated planned water service area. Infill demand is calculated for areas classified in the "Existing/Final Planning" service category; Future demand is calculated for the combined area classified in the "Priority" or "Future" service category.
[3] These data relate to areas designated in the "No Planned Water Service Area" but located within the Community Growth Area Boundary.

Source: Carroll County Department of Planning, December 2008

Calculations for future water demand used the CMP data. This demand is reflected under "Infill + Future." However, the CMP data do not account for additional demand that would occur within the balance of the planned water service area or the area that is designated in the "No Planned Water Service Area." To factor in this further demand, future development potential and existing development that would be served were estimated and calculated for water demand and are reported under "Other Potential Demand."

Water Supply Capacity

If Westminster were to build out according to the planned land uses adopted within the GAB, the City would need to expand the system beyond its current capacity to make available another 1,980,733 gpd. The information in the following table is based on the December 2008 CMP worksheets.

Westminster Water Supply Capacity *Currently* Available for Existing and Future Growth
(in Gallons per Day)

Community	Current			Remaining Capacity	Unserved Demand		Net Avg Day Capacity Available at Buildout
	Permitted	Avg Day Capacity Limitation	Avg Day Drought Demand[1]		Infill + Future	No Planned Service	
Westminster	3,476,000	2,273,077	3,256,000	(982,923)	307,960	689,850	(1,980,733)

[1] Average Day Drought Demand here includes an additional 10% for drought demand

Source: Carroll County Department of Planning, December 2008

These demand numbers shown in the Westminster Future Water Supply Demand table above were based on the BLI. However, in developing the CMP worksheets, the City planning staff was able to take a more detailed look at development potential based on a more intimate knowledge of the suitability of land for development in the GAB and the actual units achieved to refine the demand estimate further. Many of the residential projects that have been recently proposed or built achieved far fewer units than estimated in the BLI. In addition, City staff did not include potential lots from the subdivision of Conservation- or Agricultural-zoned land. Therefore, the demand estimates in the table, "Water Supply Capacity Currently Available for Existing and Future Growth," are lower than those in the demand table.

Water Supply Limitations

The average water usage per residential connection was calculated to be 234 gallons per day (gpd) per connection based on the existing connections and associated water usage. The buildout development for residential connections in the service area is projected to be complete in the year 2042; however, approximately 62 percent of the development is anticipated by 2027.

A linear growth rate has been used to estimate development of the available industrial and commercial development (421 acres) between 2010 and 2027. An assumed 800 gpd per acre for commercial and industrial development was used to estimate the future water demand.

The water allocation to residential, industrial, and commercial users is controlled by the City's Planning Department through the Interim Water Allocation Plan. The City has had discussions with property owners regarding the Interim Water Allocation Plan and the associated priorities. Additional growth beyond the allocated water will be dependent upon new water sources.

At the time of this plan, the City has received requests for water allocations under its Allocation Plan totaling over 228,000 gpd. Additionally, it is estimated that this demand could increase by approximately 50,000 gpd each year until buildout. It is anticipated that a portion of these requests may be fulfilled in the next 3 to 4 years by development of the Gesell Property well. Additional sources needed to fulfill the remaining requests are projected for development after 2015. Potential future sources have been identified (see Strategies later in this section), but not fully tested.

Wastewater

The Westminster WWTP is designed to handle 5.0 mgd. The average wastewater flow into the plant is 4.4 mgd. The existing infiltration and inflow amount for the system is 1.7 mgd. The projected buildout demand according to calculations by Malcolm Pirnie, Carroll County's WRE consultant, is 5.706 mgd. The City plans to start engineering for upgrades to the plant to include additional treatment capacity, and ENR technology. With these upgrades, the expanded plant will be capable of treating a flow of 6.5 mgd to the standards required by State and federal law.

Wastewater Demand

The total future wastewater demand assumes that everything within the GAB builds out according to the adopted land use plan. If this were to occur, the total future wastewater demand for the Westminster WWTP would be 6,720,670 gpd. The numbers in the "Westminster Future Wastewater Demand" table are based strictly on BLI calculations. They do not reflect factors unique to this municipal system that may have been considered in the capacity management plan (CMP) worksheet calculations and figures presented in the next table, "Westminster Wastewater Capacity *Currently* Available for Existing and Future Growth."

Westminster Future Wastewater Demand
(in Gallons per Day)

Community	Current Demand[1]	Planned Future Demand[2]		Other Potential Demand[3]	Total Demand
		Infill Demand	Future Demand		
Westminster	4,430,000	828,500	788,330	673,840	6,720,670
Community	Current Demand	Additional Demand by Land Use			Total Demand
		Residential	Commercial	Industrial	
Westminster	4,430,000	1,501,000	49,910	739,760	6,720,670

[1] These data represent, in general, the annual average daily demand over the three-year period 2005-2007, and include I&I.
[2] These data relate to areas located within the designated planned sewer service area. Infill demand is calculated for areas classified in the "Existing/Final Planning" service category; Future demand is calculated for the combined area classified in the "Priority" or "Future" service category.
[3] These data relate to areas designated in the "No Planned Sewer Service Area" but located within the Community Growth Area Boundary.

Source: Carroll County Department of Planning, December 2008

Wastewater Capacity

If Westminster were to build out according to the planned land uses adopted within the GAB, the City would need to expand the WWTP beyond its current capacity to make available an additional 705,905 gpd in wastewater flows. The information in the following table is based on the December 2008 CMP worksheets.

Westminster Wastewater Capacity *Currently* Available for Existing and Future Growth (in Gallons per Day)

Community	Current			Existing Flows	Capacity Needed			Capacity Available at Buildout
	Permitted	I&I	Remaining Capacity		Infill	Future	No Planned Service	
Westminster	5,000,000	1,743,000	3,257,000	2,687,000	397,295	204,770	673,840	(705,905)

Source: Carroll County Department of Planning, December 2008

The demand numbers shown in the Westminster Future Wastewater Demand table above were based on the Carroll County *Buildable Land Inventory*. However, in developing the CMP worksheets, the City planning staff was able to take a more detailed look at development potential based on a more detailed knowledge regarding the suitability of land for development in the GAB and the actual units achieved to refine the demand estimate further. Many of the residential projects that have been recently proposed or built achieved far fewer units than estimated in the BLI. City staff also did not include potential lots from the subdivision of Conservation- or Agricultural-zoned land. In addition, the general demand figures based on the County BLI assumed 250 gpd per household, MDE's standard planning figure, for consistency among demand estimates for each system. However, the WWCMP worksheets calculated demand at 235 gpd per household based on the City's estimate of actual usage per dwelling unit. Therefore, the demand estimates in the table, "Water Supply Capacity Currently Available for Existing and Future Growth," are lower than those in the demand table.

Limitations Based on Design Capacity

The 5.0-mgd facility must undergo expansion in order to accommodate wastewater demand projected for the planned sewer service area, as well as the entire DGA. The expanded 6.5-mgd facility will be capable of accommodating all projected wastewater flows under both planned sewer service area and DGA buildout conditions. Even under buildout conditions, the 6.5-mgd facility is projected to have an excess treatment capacity of nearly 0.8 mgd.

According to the CMP worksheets, infiltration and inflow (I&I) averaged about 1.7 mgd in 2003, which represented over a third of the total average plant influent at that time. The City has an ongoing program to identify locations of high I&I and to reduce I&I by pipe replacement or slip-lining. As I&I flow is reduced over time, estimates of future excess capacity will be even higher.

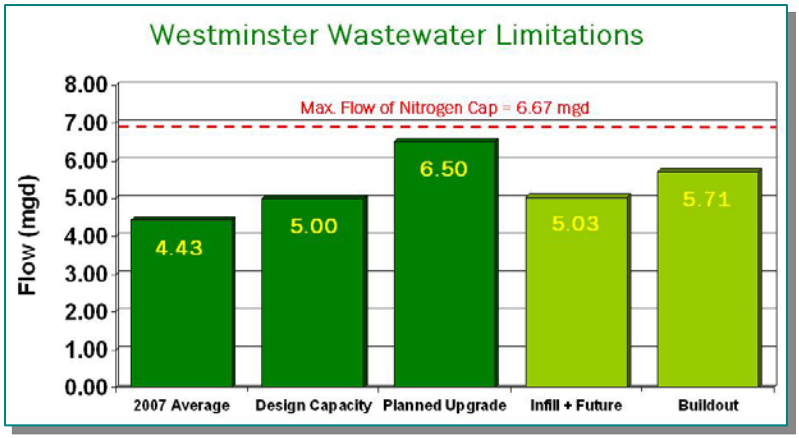
Limitations Based on Local Water Quality

Because the Westminster WWTP can readily comply with fecal coliform and TSS limits, the TMDLs for Double Pipe Creek for fecal coliform and TSS will not represent the controlling limitations to discharge. The most recent NPDES permit fact sheet for the facility states that "the evaluation of the recent water quality data collected upstream and downstream of the discharge point showed no significant impact of the effluent discharge to the receiving waters." Therefore, the future TMDL for biological impairments in the Double Pipe Creek watershed is also not expected to impose the controlling limitation on discharge rates. The future phosphorus TMDL for Double Pipe Creek is unlikely to impose phosphorus limits that are more stringent than the Bay-related nutrient caps. The Westminster WWTP is not upstream of a Tier II stream segment.

Limitations Based on Bay Nutrient Caps

The City's planned ENR upgrade project will be designed to achieve 3.0 mg/L total nitrogen and at most 0.3 mg/L total phosphorus. At these concentrations, the total phosphorus loading limits would be more controlling than the nitrogen limit, and would limit discharge to approximately 5.0 mgd. However, it is expected that the WWTP will be able to achieve lower effluent phosphorus concentrations, such that the nitrogen cap will represent a more controlling limitation. At 3.0 mg/L total nitrogen, the Westminster WWTP would be limited to discharging approximately 6.67 mgd, which is greater than the planned expansion to 6.5 mgd.

Summary of Wastewater Limitations



The existing controlling limitation for the WWTP is the current design capacity. By expanding to 6.5 mgd and upgrading to ENR, the Westminster WWTP will be able to accommodate all wastewater demands to buildout, and still have excess capacity, without exceeding loading limits imposed by the City's NPDES permit. The planned design capacity of the plant represents the controlling limitation.

System-Specific Strategies: Westminster

Note: Numbers for each objective correspond to the relevant objective in the countywide strategies section of this plan. Objectives included below are those that apply specifically and uniquely to this system. Strategies that apply to the County and all of the municipal systems are included in the Countywide Strategies section of this plan.

■ System-Specific Action Items Already in Place: Current Protections, Practices, and Polices

✓ Services to Areas Outside City Boundaries

The City's water service area currently extends outside the corporate limits to serve approximately 3,500 of the total 9,200 connections. In other words, 38 percent of the City's treated water serves unincorporated properties. In August 2002, the Mayor and Common Council adopted Good Cause Waiver Criteria for the extension of public water and sewerage service beyond the corporate limits of Westminster. That legislation requires new or redevelopment projects to be in compliance with the Town/County Agreement, which stipulates that if the property is contiguous to the corporate limits, the project must initiate annexation into the City of Westminster if it is to be served with public water and sewer service. If the property does not meet the legal test for annexation, its owner must file a Good Cause Waiver with the Mayor and Common Council. If approved, the applicant must execute an "Intent to Annex" agreement with the City of Westminster which is recorded in the Carroll County Land Records. This procedure provides control over the extension of City utilities outside of its corporate limits.

✓ Water Allocation Policy

The City compared water availability limitations for the Westminster service area to current demands and development projections. Due to current limits on water supply, limited growth has been projected. In order to satisfy the MDE consent order, development in the City has been regulated by an allocation policy, creating a prioritized "waiting list" for available water supplies. This process gives the City control over new connections on a project-by-project basis. Due to the use of the allocation policy, the City is considering only very limited changes to the land use plan, GAB, and utility service areas. The City is continuing to evaluate options for more efficient use of existing resources, as well as development of new water sources to accommodate projected growth. Additionally, the City is planning an ENR upgrade to its wastewater treatment plant, and modified site development standards to reduce non-point source pollution.

Until new water sources are developed to balance the drought deficit and provide resources for growth, development will be tightly managed, on a project-by-project basis by the allocation policy. Once development of resources to support growth begins, the City will coordinate with County planning staff regarding land use, GAB, and service area modification to best accommodate the development projected for the Westminster growth

area. It is projected that until approximately 2015, growth will be relatively stagnant due to a moratorium on annexations and good cause waiver applications.

✓ Drought Management Plan

During the summer of 2002, the State of Maryland experienced a severe drought, which required the City to take extensive emergency measures to ensure adequate water was in the system to serve the entire service area. In response to the drought, the Mayor and Common Council adopted a "Drought Management Plan," which provides for a series of water restrictions once drought conditions have been met. By the adoption of this plan, it is not necessary to seek legislative approval to impose water restrictions on all users of the system. This plan also authorizes all police personnel and Westminster Code Officials to issue citations against any person who violates water restrictions. As a result of the drought, The Mayor and Common Council made it a priority to find alternative sources of water.

✓ New Cranberry Water Treatment Plant

The US EPA has taken an aggressive approach to ensure that surface water treatment plants serving over 10,000 persons are in compliance with the *Disinfection By-Product Rule* and the *Long Term 2 Enhanced Surface Water Rule*. The Cranberry Water Treatment Plant was constructed in 1921 and additional units were built in 1964 and 1976. In June 2002, WATEK Engineering found significant deficiencies and identified infrastructure improvements that were needed to upgrade the plant. The technology in the existing water plant had gone well beyond its useful life. After a thorough review of all the alternatives, the City opted to construct a new water treatment plant utilizing membrane filtration. The new Cranberry Water Treatment Plant opened in April 2009. By incorporating the membrane filtration technology into the City's water treatment system, the City will now be able to handle current, proposed, and pending regulations.

Additional Recommended Strategies

1. Protect and sustain existing water supplies serving existing development

System-Specific Action Items Already in Place: ("Continue to...")

- ✓ Implement programs educating water customers about the importance of, and methods to, conserve water
- ✓ Update a WSCMP as background data for this plan document to reflect the most current information then complete and submit a full WSCMP to MDE for review
- ✓ Provide development plans to the County to review and offer comments to the City regarding Water Resource Protection

System-Specific "To Do" Action Items:

Short-Term

- ❑ Support the rezoning areas outside the City's future annexation line (Growth Area Boundary) to be consistent with other areas of the county that are not within a DGA to reflect the desired future buildout scenario for Westminster
- ❑ Periodically review and update the WSCMP as a mechanism to continue to track, monitor, and evaluate available capacity
- ❑ Adopt a moratorium on annexation and good cause waiver issuances until water supply is developed to fulfill currently known demand, or for five years, whichever is sooner
- ❑ Implement a system to track water demand for all known and potential development projects by modifying the allocation plan to include allocation of wastewater capacity
- ❑ Implement a system to track water demand demand for all known and potential development projects by modifying the allocation plan to give priority allocation status to projects that demonstrate significantly reduced demand through the use of water conservation measures

Long-Term

- ❑ Identify potential industrial/manufacturing users for which water reuse in operations may be pursued

2. Identify and develop, as needed, new water supplies adequate to support planned future growth without over-allocating available sources

MDE's goal is to ensure that the water quality and quantity at all public water systems meet the needs of the public and are in compliance with federal and State regulations. The City of Westminster will adhere to the guidelines of its allocation policy for the foreseeable future. Currently, the City is developing sources to meet the requirements of the drought-of-record demand. Once these requirements have been met, the City will develop identified sources to provide water to fulfill the 228,000 gpd of known requests plus the projected build-out demand of 4.33 mgd.

System-Specific Action Items Already in Place:

✓ Roops Mill Well: Yield 0.135 mgd, completed late summer 2009
✓ Gesell Property Well: Potential yield 0.500 mgd, still in testing phase

System-Specific "To Do" Action Items:

Short-term Strategy/ies

❑ Evaluate and adopt land use policies that promote higher densities and clustering
❑ Coordinate with efforts by the Carroll County government to develop nearby water sources that are outside City limits
❑ Coordinate with Carroll County government to obtain recharge credit for Woodward Farm
❑ Evaluate and implement measures to ensure adequate recharge for each existing and future water supply source, such as through easements, preservation programs, or purchase

Long-term Strategy/ies

❑ Continue to evaluate and develop surface water sources
❑ Phase upgrades to the newly constructed Cranberry Water Treatment Plant to coincide with projected demand
❑ Continue to implement and refine the Allocation Plan, which ensures the adequacy of water supplies for each project
❑ Continue to reduce unaccounted for water by continuing ongoing efforts to detect and repair leaks, resolve accounting errors, and reduce water that is unaccounted for to an acceptable range of 10-15 percent

Short-term Water Supply Solutions

❑ Groundwater development at Union Mills: Big Pipe Creek has a large, relatively un-tapped watershed, and could potentially produce 0.5 mgd. Due to the cost, testing, and permitting involved, this source would not likely be developed until 2015 or later.

Long-term Water Supply Options

Note: These are options that will be considered for long-term supply. However, inclusion here does not imply that there is a definite plan to move forward with an option. Exploring additional sources, even for those systems that currently project enough capacity to meet demand, is included in order to be prepared for policy changes or other changes that would result in the need for additional available water capacity.

❑ Groundwater Wells: Drill and develop 9 groundwater wells (based on the average MDE appropriation of existing Westminster wells) to meet projected additional demand requirements of approximately 1,176,000 gpd
  - ❑ Obtain control (annex, purchase, or designate as planned WSA) over sufficient acreage in the appropriate watershed(s) to meet the MDE-required amount of recharge
  - ❑ Begin MDE water appropriation permitting process
  - ❑ Acquire ownership or easement of well site(s)
  - ❑ Drill and develop well site(s)
  - ❑ Conduct pumping test(s) and source water quality analyses
  - ❑ Finalize MDE water appropriation permit process

- ❑ Install permanent wellhead(s) and fencing and constructing treatment / transmission infrastructure necessary to connect wells to the WSA distribution system

❑ Surface water intake on Little Pipe Creek: An intake on Little Pipe Creek, with storage at Hyde's Quarry, could potentially yield 0.150 mgd.

❑ Union Mills Reservoir: Safe yield 3.76 mgd with normal pool elevation of 610 ft.; planned reservoir; to serve as regional source of supply for Westminster, Hampstead, Taneytown, and Manchester Service Areas

❑ Finished water purchase from City of Baltimore

4. Promote water conservation measures and manage demand for potable water to ensure adequate supplies are available for planned development

System-Specific Action Items Already in Place:

✓ Public Education: Community conservation education and outreach activities
✓ Water Loss Management: As part of the Water Conservation Plan, testing and replacing, as needed, water meters, leak monitoring, and water use audits; City owns its own leak detection equipment
✓ Drought Management: Three-staged drought management plan adopted
✓ Low-Flow Devices: Currently distributing low-flow toilets to customers
✓ Water Use Rate Schedule: Progressive water-rate schedule
✓ Billing Cycle: Quarterly billing cycle

System-Specific "To Do" Action Items:

Short-term

❑ Adopt changes to the Landscape Manual to require the use of xeriscaping principles
❑ Coordinate with the County government to promote and educate about water conservation

Long-term

❑ Seek grant funding to supplement City contributions to programs which promote conservation and implement demand management recommendations
❑ Evaluate and enforce the City's Drought Management Plan to require reductions in water use during times of drought

5. Sustain existing wastewater treatment capacity

System-Specific "To Do" Action Items:

Short-term Wastewater Solutions:

❑ Continue efforts for planned ENR (Enhanced Nutrient Removal) upgrade, enabling the current facility to operate at the limits of technology in terms of nitrogen and phosphorus removal
❑ Conduct an I&I study to determine current level of inflows from I&I to potentially regain some capacity; make system improvements to reduce I&I; adjust the capacity on the WWCMP worksheets to update available capacity

6. Develop new public wastewater treatment and disposal capacity

System-Specific "To Do" Action Items:

Long-term

- ❑ Should the loading rates approach the permitted limits prior to completion of the planned upgrades, evaluate options for spray irrigation and onsite treatment/reclamation of industrial effluent to divert flow from the WWTP
- ❑ Continue to plan for and implement the specific expansion projects described or included in the adopted *Carroll County Water and Sewerage Master Plan*

9. Reduce the amount of impervious surface that could result from new development

System-Specific "To Do" Action Items:

Long-term

- ❑ Implement recommendations from the December 2004 *Source Water Assessment and Wellhead Protection* report, prepared by Advanced Land and Water, Inc.


Appendices

19 Appendices

- Appendix A = Carroll County Methodology to Estimate Future Commercial & Industrial Demand for Water & Sewer Service/Capacity
- Appendix B = Water Supply Capacity Management Plan Summary Worksheet
- Appendix C = Wastewater Capacity Management Plan Summary Worksheet
- Appendix D = MDE Documented TMDL Impairments for Carroll County, As of May 27, 2009
- Appendix E = State Agency WRE Checklist (working draft)

Appendix A
Carroll County Methodology to Estimate Future Commercial & Industrial Demand For Water & Sewer Service/Capacity

For: Capacity Management Plan Worksheets for Water Resources Element

Purpose:
To estimate the future demand for public water and sewer service and capacity based on "available" acreage of commercial and industrial zoning for each public system within Carroll County.

Factors Considered:
Since each commercial and industrial venture is uniquely different, an approach to identifying "available" or "buildable" land needs to be different than the process to estimate residential development potential. As with the residential estimates, each parcel zoned for commercial or industrial use was reviewed individually. The factors taken into consideration during the process included, but were not limited to the following:

- Parcel is within a planned water and/or sewer service area
- Size of parcel
- Vacant vs. non-vacant
- What type of use is currently on the property
- Location of building
- Environmental constraints:
  - Streams
  - Wetlands
  - Floodplains

Process:
The shapefiles for zoning for the County and each municipality were displayed in ArcGIS with parcels, orthophotos, and roads layers. The following constraints were added: streams, wetlands, and floodplains. It should be noted that there are known errors in the floodplain layer. For the purpose of the capacity management plans, only the eight designated planned water and sewer service areas were reviewed.

For each parcel with commercial or industrial zoning, the following factors were considered, and the initial amount of land to include in "buildable" acreage was determined by adjusting from the gross acreage.

- Environmental Constraints: If there were any environmental constraints, those areas were not included in the acreage calculations.
- Size of Parcel: Typically, anything less than ¼-acre was not included in "buildable" acreage.
- Vacant vs. Non-Vacant Land & Location of Building: If there was a structure on the property, that area was removed from the acreage calculations.

After the initial mapping of available areas, properties with a site plan in process were eliminated (using the "Site Plans in Process" layer).

The Comprehensive Planning staff then reviewed the maps to determine whether any areas were left out, needed to be removed, or if parcels already had site plans on them and were overlooked with the previous review. Maps were changed accordingly.

Results:
For purposes of the CMP worksheets, the remaining "buildable" commercial and industrial acreage was divided in "infill" and "future" flow categories. The areas to be considered to calculate infill demand were those areas located within the Existing/Final Planning water or sewer service area (W-1 or S-1). The areas to be considered to estimate future flow demand were those in the Priority and Future Planning water or sewer service areas (W-3 and W-5 or S-3 and S-5) combined.

Total commercial acreages and total industrial acreages were summed by "Infill" or "Future" demand for each public system:

- Total County
- Freedom
- Hampstead
- Manchester
- Mount Airy
- New Windsor
- Taneytown
- Union Bridge
- Westminster

Maps were created showing the acreage considered "buildable," for purposes of estimating demand, for each public system. Water and sewer service areas were separated onto different maps. The color used to show "buildable" acreage indicates the generalized zoning (commercial or industrial) for that parcel.

Appendix B

Water Supply Capacity Management Plan Worksheets Summary

Water Supply
Capacity Management Plan

Worksheets and Summary

System and Plan Submittal Information

	Freedom	Hampstead	Manchester	Mount Airy	New Windsor	Taneytown	Union Bridge	Westminster
Name of the water supply system								
Population served	23,580	6,400	4,628		1,414		1,000	37,692
Number of connections	8,103	2,141	1,585		525		306	9,157
Date of plan submittal to MDE								

Average Day Capacity Limitation (gpd) (Note: PF = peaking factor)									
C-4 Total permitted Annual Avg. Daily Appropriations	C-4	2,848,000	521,400	581,000	965,000	196,100	583,000	208,300	3,476,000
C-8 Well-field capacity during drought (1.5 to 1.5 PF)	C-8	-	635,815	518,400	704,667	78,462	563,846	49,846	1,223,077
C-9 Safe yield of the reservoir system	C-9	See note	0	n/a	-	-	n/a	-	1,050,000
C-10 Treatment capacity	C-10	3,500,000	826,560	n/a	1,524,800	282,000	-	504,000	2,750,000
C-11 Pump capacity	C-11	4,000,000	0	27 to 100 gpm	1,524,800	504,000	831,000	504,000	3,024,000
Average Day Capacity Limitation. Of the five factors listed above, enter the most limiting factor (in gpd)	D-1	2,848,000	826,560	581,000	704,667	78,462	563,846	49,846	2,273,077
Excess Average Day Capacity (gpd)									
D-1 Average Day Capacity Limitation	D-1	2,848,000	826,560	581,000	704,667	78,462	563,846	49,846	2,273,077
A-3 Average Day Drought Demand	A-3	2,400,664	480,368	329,662	841,500	175,560	560,057	219,035	3,256,000
Excess Average Day Capacity									
D-1 minus A-3	D-2	447,336	346,192	251,338	(136,833)	(97,098)	3,789	(169,189)	(982,923)
Average Daily - Maximum Month Capacity Limitation (gpd) (only for groundwater systems)									
C-6 Total permitted Avg. Day - Max Month Appropriations	C-6	721,000	743,000	886,200	1,267,000	282,000	813,000	84,000	1,940,000
C-8 Well-field capacity during drought	C-8	-	826,560	777,600	1,057,000	102,000	733,000	64,800	1,590,000
C-10 Treatment Capacity	C-10	3,500,000	826,560	n/a	1,524,800	282,000	-	504,000	2,750,000
C-11 Pump capacity	C-11	4,000,000	0	27 to 100 gpm	1,524,800	504,000	831,000	504,000	3,024,000
Avg. Daily - Max. Month Capacity Limitation. Of the 4 factors listed above, enter the most limiting factor.	D-3	721,000	826,560	886,200	1,057,000	102,000	733,000	64,800	1,590,000
Excess Avg. Daily - Maximum Month Capacity (gpd)									
D-3 Avg. Daily - Max Month Capacity Limitation	D-3	721,000	826,560	886,200	1,057,000	102,000	733,000	64,800	1,590,000
A-6 Avg. Daily - Max Month Drought Demand	A-6	2,709,123	522,500	357,880	915,573	209,000	670,610	47,300	3,686,100
Excess Avg. Daily - Max Month Capacity									
D-3 minus A-6	D-4	(1,988,123)	304,060	528,321	141,427	(107,000)	62,390	17,500	(2,096,100)
Maximum Day Capacity Limitation (gpd)									
C-5 Total permitted Max Day Appropriations (only for surface water systems)	C-5	3,000,000	0	-	-	250,000	-	-	3,000,000
C-10 Treatment capacity	C-10	3,500,000	826,560	n/a	1,524,800	282,000	-	504,000	2,750,000
C-11 Pump capacity	C-11	4,000,000	0	27 to 100 gpm	1,524,800	504,000	831,000	504,000	3,024,000
Max Day Capacity Limitation. Of the 3 factors listed above, enter the most limiting factor (in gpd)	D-5	3,000,000	826,560	-	1,524,800	250,000	831,000	504,000	2,750,000
Excess Maximum Day Capacity (gpd)									
D-5 Max Day Capacity Limitation	D-5	3,000,000	826,560	-	1,524,800	250,000	831,000	504,000	2,750,000
A-8 Max Day Drought Demand	A-8	3,446,300	531,300	-	1,344,167	338,800	902,000	47,300	4,136,000
Excess Maximum Day Capacity (gpd)									
D-5 minus A-8	D-6	(446,300)	295,260	-	180,633	(88,800)	(71,000)	456,700	(1,386,000)
Summary of Excess Capacity (gpd) (Copy the indicated items from the previous sections/pages.)									
D-2 Excess Average Day Capacity	D-2	447,336	346,192	251,338	(136,833)	(97,098)	3,789	(169,189)	(982,923)
D-4 Excess Average Daily - Maximum Month Capacity	D-4	(1,988,123)	304,060	528,321	141,427	(107,000)	62,390	17,500	(2,096,100)
D-6 Excess Maximum Day Capacity	D-6	(446,300)	295,260	-	180,633	(88,800)	(71,000)	456,700	(1,386,000)
Summary of Potential Additional Demand (gpd) from Approved but Undeveloped Subdivisions and Building Permits									
B-4 Potential Annual Average Daily Demand	B-4	1,353,840	50,750	189,360	501,770	284,790	1,275,930	639,540	307,960
B-5 Potential Avg. Daily Demand During the Max Month	B-5	1,759,992	65,975	246,168	652,301	370,227	1,658,709	831,402	400,348
B-6 Potential Maximum Day Demand	B-6	2,166,144	81,200	302,976	802,832	455,664	2,041,488	1,023,264	492,736
Net Excess Capacity Available for Allocation to New Growth The three net excess values calculated below indicate the approximate excess capacity (gpd) available for new growth. If an excess capacity value is a negative number, there is a capacity deficit for that demand category									
Annual Average Daily Capacity									
D-2 Excess Average Day Capacity	D-2	447,336	346,192	251,338	(136,833)	(97,098)	3,789	(169,189)	(982,923)
B-4 Potential Annual Avg. Daily Demand (from approved but undeveloped subdivisions/permits)	B-4	1,353,840	50,750	189,360	501,770	284,790	1,275,930	639,540	307,960
Net Excess (D-2 minus B-4)	gpd	(906,504)	295,442	61,978	(638,603)	(381,888)	(1,272,141)	(808,729)	(1,290,883)
Average Daily Capacity During the Max Month									
D-4 Excess Avg. Daily - Max Month Capacity	D-4	(1,988,123)	304,060	528,321	141,427	(107,000)	62,390	17,500	(2,096,100)
B-5 Potential Avg. Daily Demand during Max Month (from approved but undeveloped subdivisions/permits)	B-5	1,759,992	65,975	246,168	652,301	370,227	1,658,709	831,402	400,348
Net Excess (D-4 minus B-5)	gpd	(3,748,115)	238,085	282,153	(510,874)	(477,227)	(1,596,319)	(813,902)	(2,496,448)
Maximum Day Capacity									
D-6 Excess Maximum Day Capacity	D-6	(446,300)	295,260	0	180,633	(88,800)	(71,000)	456,700	(1,386,000)
B-6 Potential Day Demand (from approved but undeveloped subdivisions/permits)	B-6	2,166,144	81,200	302,976	802,832	455,664	2,041,488	1,023,264	492,736
Net Excess (D-6 minus B-6)	gpd	(2,612,444)	214,060	(302,976)	(622,199)	(544,464)	(2,112,488)	(566,564)	(1,878,736)

	Average Day Net Excess	Max Day Net Excess	Additional Planned Growth Demand	Demand by DU & C&I AC	Average Day Difference	Max Day Difference	
Freedom	(906,504)	(2,612,444)	(1,293,820)	1650+2223 DU + 9 I C + 399 I	(2,200,324)	(3,906,264)	✓
Hampstead	295,442	214,060	(353,480)	0+0 DU + 0+14 8 C + 378+50 9 I	(58,038)	(139,420)	✓
Manchester	61,978	(302,976)	(285,500)	757+365 DU + 0 C + 0 I	(223,522)	(588,476)	✓
Mount Airy	(638,603)	(622,199)	(1,000)	2+2 DU + 0 C + 0 I	(639,603)	(623,199)	✓
New Windsor	(381,888)	(544,464)	(3,800)	0+0 DU + 0+ 3 6 C + 1 6 I	(385,688)	(548,264)	✓
Taneytown	(1,272,141)	(2,112,488)	(750)	2+1 DU + 0 C + 0 I	(1,272,891)	(2,113,238)	✓
Union Bridge	(808,729)	(566,564)	(40,980)	10+8 DU + 0 C + 45 6 I	(849,709)	(607,544)	✓
Westminster	(1,290,883)	(1,878,736)	(689,850)	606+224 DU + 11 7 C + 592 7 I	(1,980,733)	(2,568,586)	✓
Totals	*(4,941,329)*	*(8,425,811)*	*(2,669,180)*		*(7,610,509)*	*(11,094,991)*	

Wastewater Treatment Capacity

Facility...	Freedom		Hampstead		Manchester		Mount Airy		New Windsor		Taneytown		Union Bridge		Westminster	
	A. Calculations (gpd)	B. Values (gpd)	A. Calculations (gpd)	B. Values (gpd)	A. Calculations (gpd)	B. Values (gpd)	A. Calculations (gpd)	B. Values (gpd)	A. Calculations (gpd)	B. Values (gpd)	A. Calculations (gpd)	B. Values (gpd)	A. Calculations (gpd)	B. Values (gpd)	A. Calculations (gpd)	B. Values (gpd)
1 National Pollutant Discharge Elimination System (NPDES) Permitted Flow (*list in column B1*)		3,500,000		900,000		500,000		1,200,000		94,000		1,100,000		200,000		5,000,000
2 2003 Daily Average Flow of Wastewater (*list in column A1*)	2,710,000		736,000		259,568		916,000		92,000		956,000		146,100		4,824,000	
3 2002 Daily Average Flow of Wastewater (*list in column A1*)	2,080,000		505,000		237,318		679,000		67,000		605,000		95,500		3,081,000	
4 Estimated Inflow and Infiltration Flow impacting the Wastewater Treatment Facility (*subtract line 3 from line 2; report in A4 and B4*). Or the I&I analysis from in-pipe monitoring and hydraulic modeling	300,000	630,000	231,000	231,000	-	22,250	-	237,000	-	25,000		351,000	50,600	50,600	-	1,743,000
5 Remaining capacity for existing and future wastewater flow. (*subtract B4 from B1; report in column B5*)		2,870,000		669,000		477,750		963,000		69,000		749,000		149,400		3,257,000
Calculating Existing and Encumbered S-1 Infill Flow																
6 Existing (current flow without I&I) S-1 Flow (*use Planning Sheet provided as Figure 1 to calculate*)	1,530,000		397,000		270,269		659,000		22,716		502,333		127,367		2,687,000	
7 Estimated encumbered flow approved S-1 building permits not connected. (*# of EDUs X flow rate per EDU*) Add additional large commercial and/or industrial flow. (*use Planning Sheet provided as Figure 1 to calculate*)	21,488		19,932		41,250		65,500		7,250		32,750		7,000		139,825	
8 Estimated encumbered flow approved S-1 record plats for Infill Lots having no building permits. (*# of EDUs X flow rate per EDU*) Add additional large commercial and/or industrial flow. (*use Planning Sheet provided as Figure 1 to calculate*)	472,635		18,924		39,270		46,230		14,700		36,170		94,900		257,470	
9 Allocated Capacity for Existing and Potential Infill Flow (*Total S-1 Flow less I&I, and report in A9 and B9*)	2,024,123	2,024,123	435,856	435,856	350,789	350,789	770,730	770,730	44,666	44,666	571,253	571,253	229,267	229,267	3,084,295	3,084,295
10 Subtract B9 from B5, and report current remaining capacity in B10.		845,877		233,144		126,961		192,270		24,334		177,747		(79,867)		172,705
Estimating Future S-3 and S-5 Flow																
11 Estimated future flows from S-3 and S-5 classified areas. (*# of EDUs X flow rate per EDU*) Add additional large commercial and/or industrial flow. (*use Planning Sheet provided as Figure 1 to calculate*)	1,077,130		259,011		94,250		390,170		232,000		821,450		609,640		204,770	
12 Add A9 + A11; report in A12.	3,101,253		694,867		445,039		1,160,900		276,666		1,392,703		838,907		3,289,065	
13 Estimated I&I Flow or I&I Analysis Value (*report value provided from B4*)	630,000		231,000		22,250		237,000		25,000		351,000		50,600		1,743,000	
14 Determine Future Capacity Needs: Add A12 and A13. (*if value exceeds B1, report over-allocation in B14.*)	3,731,253		925,867		467,289		1,397,900		301,666		1,743,703		889,507		5,032,065	
15 Report Available Capacity: Subtract A14 from B1. (*If A14 exceeds B1, report 0 in B15 and see notification below.*)	(231,253)		(25,867)		32,711		(197,900)		(207,666)		(643,703)		(689,507)		(32,065)	
Report Over-Allocation (*Subtract A14 from B1*)																

Note: If there is a reported negative value for the remaining capacity allocation, please contact MDE for assistance.

	Current remaining capacity	Future capacity available	Additional Planned Growth Demand	Demand Amount	Capacity Available for Future & Planned Growth	
Freedom	845,877	(231,253)	(1,663,390)	2164+3163 DU + 9.2 C - 399 I	(1,894,643)	✓
Hampstead	233,144	(25,867)	(626,970)	733+407 DU + 4.9+4.6 C - 358.7+50.7	(652,837)	✓
Manchester	126,961	32,711	(370,520)	845 DU + 2.1 AC IC	(337,809)	✓
Mount Airy	192,270	(197,900)	(1,000)	2+2 DU + 0 C + 0 I	(198,900)	✓
New Windsor	24,334	(207,666)	(3,800)	0+0 DU + 3.6 C + 1.6 I	(211,466)	✓
Taneytown	177,747	(643,703)	(750)	2+1 DU + 0 C + 0 I	(644,453)	✓
Union Bridge	(79,867)	(689,507)	(38,490)	10+8 DU + 0 C + 45.6 I	(727,997)	✓
Westminster	172,705	(32,065)	(673,840)	678 DU FLY + 514 Ex DU + 8 C + 462.8	(705,905)	✓
Totals	*1,693,171*	*(1,995,250)*	*(3,378,760)*		*(5,374,010)*	

As of Dec 12 08

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Appendix D
MDE Documented TMDL Impairments for Carroll County
As of May 27, 2009

Basin Name	DNR 8-Digit Basin Number	Impairment	Under Development	Notice of Intent to Develop a TMDL	Notice of Intent for Review and Comment	Submitted to EPA	EPA Approved
Double Pipe Creek	02140304	Fecal Bacteria				09/21/07	
Double Pipe Creek	02140304	Sediments	————	————	8/15/07	09/12/08	02/20/09
Double Pipe Creek	02140304	Nutrients	2009-2010				
Double Pipe Creek	02140304	Phosphorus	2009-2010	05/08/09		Projected September, 2009	
Liberty Reservoir	02130907	Mercury (4)	03/14/02	10/10/02	11/21/02	12/31/02	
Liberty Reservoir	02130907	Fecal Bacteria		03/28/08	07/25/08	09/26/08	
Liberty Reservoir	02130907	Chromium & Lead (WQAs)	----------	01/31/03	06/04/03	----------	11/10/03
Loch Raven Reservoir	02130805	Fecal Bacteria	2009-2010	11/12/08	04/05/2009 & 5/7/09 must be received by 6/9/09	Projected Summer of 2009	
Loch Raven Reservoir	02130805	Mercury	09/24/02	10/23/02	11/21/02	01/06/03	08/16/04
Loch Raven Reservoir	02130805	Nutrients and Sediments	----------	----------	----------	----------	03/27/07
Loch Raven Reservoir	02130805	Heavy Metals (WQA)	----------	----------	----------	----------	11/10/03
Lower North Branch Patapsco River	02130906	Metals (WQA) Eutrophication	————	10/08	08/27/04	09/29/04	01/18/05
Lower North Branch Patapsco River	02130906	Sediments (WQA)		5/09	06/19/09	Fecal to EPA in 2009	
Piney Run Reservoir	02130908	Sediments (WQA)	01/24/08	02/11/02	----------	————	12/18/03

Appendix D
MDE Documented TMDL Impairments for Carroll County
As of May 27, 2009

Basin Name	DNR 8-Digit Basin Number	Impairment	Under Development	Notice of Intent to Develop a TMDL	Notice of Intent for Review and Comment	Submitted to EPA	EPA Approved
Piney Run Reservoir	02130908	Phosphorus[2] (WQA)	----------	----------	----------	----------	01/20/05
Piney Run Reservoir	02130908	Eutrophication (WQA)	If Watershed Protection Plan is developed, no TMDL will be needed	————	09/30/04	————	01/20/05 – EPA concurrence of MDE's findings
Prettyboy Reservoir	02130806	Mercury	09/27/02	————	11/21/02	12/31/02	08/16/04
Prettyboy Reservoir	02130806	Nutrients	----------	----------	----------	----------	03/27/07
Prettyboy Reservoir	02130806	Heavy Metals (WQA)	01/31/03	----------	----------	----------	11/10/03
Prettyboy Reservoir	02130806	Fecal Bacteria		03/28/08	04/03/08	8/26/08	
Upper Monocacy River	02140303	Bacteria				09/27/07	
Upper Monocacy River	02140303	Nutrients	2009-2010				
Upper Monocacy River	02140303	Sediments	07/11/07		07/07/08	09/16/08	
Lower Monocacy River	02140302	Sediments	————	————	07/23/08	09/29/08	03/17/09
Lower Monocacy River	02140302	Non-Tidal Bacteria				09/27/07	
Lower Monocacy River	02140302	Nutrients	2009-2010				

Notes:

1. Documented impairments and TMDLs do not need to be issued on a body of water within the political boundaries of Carroll County to result in impact. Downstream impairments may impact up-stream land use and other activities that may contribute to the impaired condition;
2. WQA – Water Quality Analysis, determines whether TMDL is needed;
3. TMDL – TMDLs are either Under Development, issued as draft or are final with US EPA approval;
4. The mercury TMDLs are predominately associated with atmospheric depositions as a source;
5. Piney Run Lake – impairment was considered marginal resulting TMDL not being warranted. Carroll County committed to a Water Quality Management Plan (WQMP) in lieu of the issuance of a TMDL.

Green = taken from MDE's website
Black bold = taken from file information and/or from website
Word: OEC/TMDL/TMDL chart by status
Update location: http://www.mde.maryland.gov/Programs/WaterPrograms/TMDL/submittals/

Appendix E

WORKING DRAFT

STATE AGENCY WRE CHECKLIST

The Purpose of the Water Resources Element (WRE) is to ensure that future county and municipal comprehensive plans reflect the opportunities and limitations presented by local and regional water resources. WREs are intended to improve local jurisdictions' contribution to the protection of state land and water resources; to the protection of public health, safety and welfare; and to meeting local and state smart growth policies.

The adopted WRE in the comprehensive plan on or by October 1, 2009, should answer the following questions for a county or municipality:

- Is there adequate water supply to meet current and future needs?
- Is there adequate wastewater and septic supply to meet current and future needs?
- What impact will meeting these needs have on water resources?

The WRE should outline the adequacy of water and wastewater resources with respect to present conditions and future growth to the year 2030. The WRE should act as an early warning system to determine if water resources will be adequate to support growth in a jurisdiction. Also, the WRE must identify suitable receiving waters and land areas to meet the stormwater management and wastewater treatment and disposal needs of existing and future development proposed.

The following is a checklist for review of required WRE items. Check boxes for submitted data. [Page numbers referencing location of checklist items are provided in brackets after the applicable items].

REVIEW CRITERIA FOR DRINKING WATER – Does the WRE:

Show or refer to the boundaries of relevant areas used for planning, include:

- ❒ jurisdictional boundaries, *[19, 21, 36-44]*
- ❒ designated growth areas, *[26, 36-44]*
- ❒ watersheds, *[21, 36-44]*
- ❒ Priority Funding Areas, and *[26, 36-44]*
- ❒ other relevant geographies. *[29, 36-44, 137]*

Describe the types of assessments undertaken and the methods used: *[69-71]*

- ❒ note that population projections for sub-county areas bear a reasonable relationship to the latest countywide cooperative forecasting projection by MDP *[33-35]*
- ❒ if an alternative method of forecasting population is used, describe the information and methodology used for the analysis. *[33-35]*

Describe the available permitted capacity of:

- ❒ existing community water systems, *[88-90]*
- ❒ specifics about the sources of raw water and each source maximum reservoir, *[66-69]*
- ❒ uses according to WSCMP guidelines, *[72-73]*
- ❒ the current water demand to the size of the population being served, *[72-73, 88-90]*
- ❒ operational details about the supply and delivery of drinking water. *[See Carroll County Water & Sewerage Master Plan]*

Estimate the future demand for water for:

- ❒ population projections, *[73]*
- ❒ commercial projections, *[73]*
- ❒ industrial projections, *[73]*
- ❒ agricultural projections, *[72]*
- ❒ development capacity of existing community service areas, *[88-90]*
- ❒ development capacity of planned community service areas, *[88-90]*
- ❒ rural areas, *[71-72, 89]*
- ❒ future waters supply demand for Annexation Areas required if served, or if they are already being served. *[72-74, 88-89]*

Estimate the potential water supply of:

- ❒ surface water sources not yet permitted for withdrawal *[74-86]*
- ❒ groundwater resources not yet permitted for withdrawal. *[74-86]*

...that can then be used to develop an estimate of the approximate number or range of additional:

- ❒ households, *[71-86, 88-90]*
- ❒ commercial, *[72-86]*
- ❒ industrial, *[72-86]*
- ❒ agricultural water demand, that can potentially be supported in the planning area. *[72, 86, 89-90]*

Identify strategies to meet future water quality needs:

- ❒ including alternative water sources, *[155-160, 176-177, 186-188, 196-197, 204-205, 211-212, 222-223, 223-229, 239-241]*

- ❒ demand reductions, *[144-145, 163, 177, 188, 197, 205, 212, 223, 228-229, 241]*
- ❒ land use/zoning modifications, *[142-143, 162-162, 176, 186-187, 196, 203-204, 211, 216, 228, 239-240]*
- ❒ water supply issues and system management that anticipated growth plans might cause. *[135-138, 142-145, 161-163, 176-177, 186-188, 196-197, 203-205, 211-212, 222-223, 228-229, 239-241]*

Identify planning strategies to protect:

- ❒ current sources, *[142, 161, 176, 186-187, 196, 203-204, 211, 215-216, 222-223, 228, 239]*
- ❒ future sources, *[143-144, 161-163, 176-177, 187-188, 196-197, 204-205, 211-212, 222-223, 228-229, 239-241]*
- ❒ from pollution, *[146-152, 164-168, 242]*
- ❒ over allocation. *[143-144, 161-163, 176-177, 187-188, 196-197, 204-205, 211-212, 215-216, 220-223, 228-229, 237-241]*

Evaluate the capacity of rural areas:

- ❒ to support uses in those areas, *[71-72, 74-86]*
- ❒ individual systems, *[71-72, 74-86]*
- ❒ agricultural irrigation, *[72, 74-86]*
- ❒ other possible users. *[74-86]*

Provide policies that set forth the general goals of the jurisdiction with respect to:

- ❒ management and use of its water supply resources, *[135-138, 142-152, 155-160, 161-169, 176-178, 186-189, 196-197, 203-206, 211-213, 216, 228-230, 239-242]*
- ❒ describe water conservation plans or emergency supply plans that might be implemented, *[143-144]*
- ❒ how those goals guide the action sections of the WRE. *142-152, 161-169, 176-178, 186-189, 196-197, 203-206, 211-213, 216, 228-230, 239-242]*

Describe the actions planned for implementation to ensure that:

- ❒ water supplies are adequate, *[143-144, 161-163, 176-177, 187-188, 196-197, 204-205, 211-212, 215-216, 220-223, 228-229, 237-241*
- ❒ and safe to meet future needs. *[146-152, 164-168, 242]*

If necessary, do the actions:

- ❒ identify lead agencies,
- ❒ estimate budget needs, *[155-160]*
- ❒ establish a project timeline. *[142-152, 155-160, 161-169, 176-178, 186-189, 196-197, 203-206, 211-213, 216, 228-230, 239-242]*

REVIEW CRITERIA FOR WASTEWATER – Does the WRE:

Show or refer to the boundaries of all areas used for planning, including:

- ❒ jurisdictional boundaries *[19, 21, 36-44]*
- ❒ designated growth areas *[26, 36-44]*
- ❒ sewer planning areas *[30]*
- ❒ failing septic system areas *[data not available]*
- ❒ current wastewater service areas *[30]*
- ❒ watersheds *[21, 36-44]*
- ❒ Priority Funding Areas *[26,36-44]*
- ❒ other relevant geographies *[29, 30, 36-44, 105]*

❒ ***Describe the types of assessments undertaken and the methods used:*** *[93-98]*

❒ ***Discuss information about inter-jurisdiction agreements, if applicable:*** *[57-59]*

❒ ***Describe specifics about management and operation of the wastewater collection system:*** *[See Carroll County Water & Sewerage Master Plan]*

❒ ***Show locations and types of systems being used for treatment:*** *[30, See Carroll County Water & Sewerage Master Plan]*

❒ ***Show the Total Maximum Daily Loads (TMDLs), if applicable:*** *[48-49]*

❒ ***Show the Chesapeake Bay Tributary Strategic point source caps for the discharge:*** *[54, 99-101, 175-176, 184-185, 194-195, 202, 210-211, 219-220, 227-228, 235-236]*

❒ ***Discuss I&I issues within the wastewater system:*** *[94, 96-102, 139, 145, 173-174, 177, 183-184, 189, 193-194, 197, 201, 205, 208-210, 213, 219, 223, 226-227, 230, 234-235, 241]*

❒ ***Discuss combined sewer systems and CSOs, if applicable:*** *[not applicable]*

❒ ***Show number of failing septic systems and locations of areas:*** *[data not available]*

❒ ***Show the available capacity of existing WWTPs:*** *[97, 99, 174, 181, 194, 201, 208, 219, 226, 235]*

Show the estimated additional capacity that could be achieved by:

- ❒ higher levels of treatment *[99-103, 176, 185, 195, 202, 211, 220, 228, 236]*
- ❒ beneficial wastewater reuse such as spray irrigation *[138-139]*
- ❒ nutrient offsets *[140-141]*

Show the estimate of the approximate number or range of: *[See WWCMPs, data embedded within demand calculations]*

- ❒ additional households *[33, 36-44]*
- ❒ available household wastewater capacity potential
- ❒ available commercial wastewater capacity potential
- ❒ available industrial wastewater capacity potential

...to support this additional growth in the planning area.

Estimate:

- ❒ additional capacity needed to serve designated growth areas *[97, 99, 174, 181, 194, 201, 208, 219, 226, 235]*
- ❒ additional capacity needed to serve infill areas *[97, 99, 174, 181, 194, 201, 208, 219, 226, 235]*
- ❒ other projected development outside of these areas *[97, 99, 174, 181, 194, 201, 208, 219, 226, 235]*

Estimate:

- ❒ current pollution impacts *[54, 99-101, 175-176, 184-185, 194-195, 202, 210-211, 219-220, 227-228, 235-236]*
- ❒ future pollution impacts from the projected development and *[54, 99-101, 175-176, 184-185, 194-195, 202, 210-211, 219-220, 227-228, 235-236]*
- ❒ compare this to nutrient caps and the water body assimilative capacity *[54, 99-101, 175-176, 184-185, 194-195, 202, 210-211, 219-220, 227-228, 235-236]*

- ❒ ***Describe the current quality of the treated effluent in terms of nitrogen (N) and phosphorus (P) loading and any other contaminant that may be of concern to the watershed:*** *[54, 99-101, 175-176, 184-185, 194-195, 202, 210-211, 219-220, 227-228, 235-236]*

- ❒ ***Describe the future N and P loading that each new area of service would contribute:*** *[54, 99-101, 175-176, 184-185, 194-195, 202, 210-211, 219-220, 227-228, 235-236]*

- ❒ ***Describe the current estimation of all nonpoint source N and P loading (septic, stormwater, agricultural lands, etc.) and the future loading that the identified growth areas would contribute:*** *[54, 99-101, 175-176, 184-185, 194-195, 202, 210-211, 219-220, 227-228, 235-236]*

- ❒ ***While not required but necessary to manage growth and environmental stewardship, show the Public Facilities and Community Services capital projects that are funded and those that may be needed to address the growth demands outlined in the Plan, including those that will serve to minimize pollution loading, both point and nonpoint sources:*** *[See Carroll County Water & Sewerage Master Plan]*

Summarize the results of all:

- ❒ assessments and *[93-103]*
- ❒ limiting wastewater resource findings *[54, 99-101, 175-176, 184-185, 194-195, 202, 210-211, 219-220, 227-228, 235-236]*

Provide policies that set forth the general goals of the jurisdiction with respect to its:

- ❒ protection of water quality *[145-152, 163-169, 177-178, 189, 197, 205-206, 213, 223, 229, 214-242]*
- ❒ ability to meet regulatory requirements that are reflected in planned implementation actions

Describe the actions planned for implementation measures to:

- ❒ ensure that wastewater capacity is adequate *[145-146, 163-164, 177-178, 189, 197, 205-206, 213, 223, 229-230, 241-242]*
- ❒ pollutant loadings are safe to meet future needs *[54, 99-101, 175-176, 184-185, 194-195, 202, 210-211, 219-220, 227-228, 235-236]*

Planned actions (if necessary) that:

- ❒ identify lead agencies
- ❒ estimate budget needs, *[155-160]*
- ❒ establish a project timeline. *[142-152, 155-160, 161-169, 176-178, 186-189, 196-197, 203-206, 211-213, 216, 228-230, 239-242]*

REVIEW CRITERIA FOR STORMWATER MANAGEMENT – Does the WRE:

For Stormwater Management, does the WRE:

Show or refer to the boundaries of the relevant areas used for planning:

- ❒ jurisdictional boundaries *[19, 21, 36-44]*
- ❒ designated growth areas *[26, 36-44]*
- ❒ sewer and water service areas *[29, 30]*
- ❒ watersheds *[21, 36-44]*
- ❒ Priority Funding Areas *[26, 36-44]*
- ❒ other relevant geographies *[116]*

Recommend the adoption of the latest model ordinance for stormwater management: *[148, 168]*

- ❒ emphasize the use of nonstructural best management practices (BMPs) *[56, 109-115]*
- ❒ and/or better site design techniques to the maximum extent practicable *[151, 109-110]*

- ❒ ***Recommend the modification of local building codes and/or planning/zoning requirements as deemed necessary to minimize impediments to the use of nonstructural BMPs:*** *[56, 146-152, 167-168]*

For Nonpoint Source Loading, does the WRE: *[115-132]*

- ❒ include the nonpoint source loading analyses conducted in support of the WRE
- ❒ provide a preliminary assessment of potential changes in nonpoint source loads due to land use planning decisions
- ❒ make general findings for alternative land use options
- ❒ inform the land use element and other elements of the comprehensive plan *[152]*
- ❒ describe the alternative future development options for which nonpoint source and point source loading estimates were performed
- ❒ Note any alternatives that affect the number of development units and different usage of sewer versus septic systems
- ❒ Make findings that address estimated changes in both point and nonpoint nutrient loads [the WRE should discuss trade-offs in competing objectives that are revealed by the analyses, e.g., preservation of cropland that may result in higher nutrient loads than alternative land use options that consume more cropland, which at the same time would limit the amount of impervious surface and habitat fragmentation]
- ❒ provide reasonable justification with supporting documentation for any alternative analytical tools, parameters or assumptions that were used
- ❒ provide all existing procedures and/or recommendations for new procedures to ensure that future nonpoint source and point source loading analyses are instituted within local government planning and decision-making processes *[151-152, 168-169]*

Glossary

[to be added]