CHAPTER 3: WATER SUPPLY SYSTEMS

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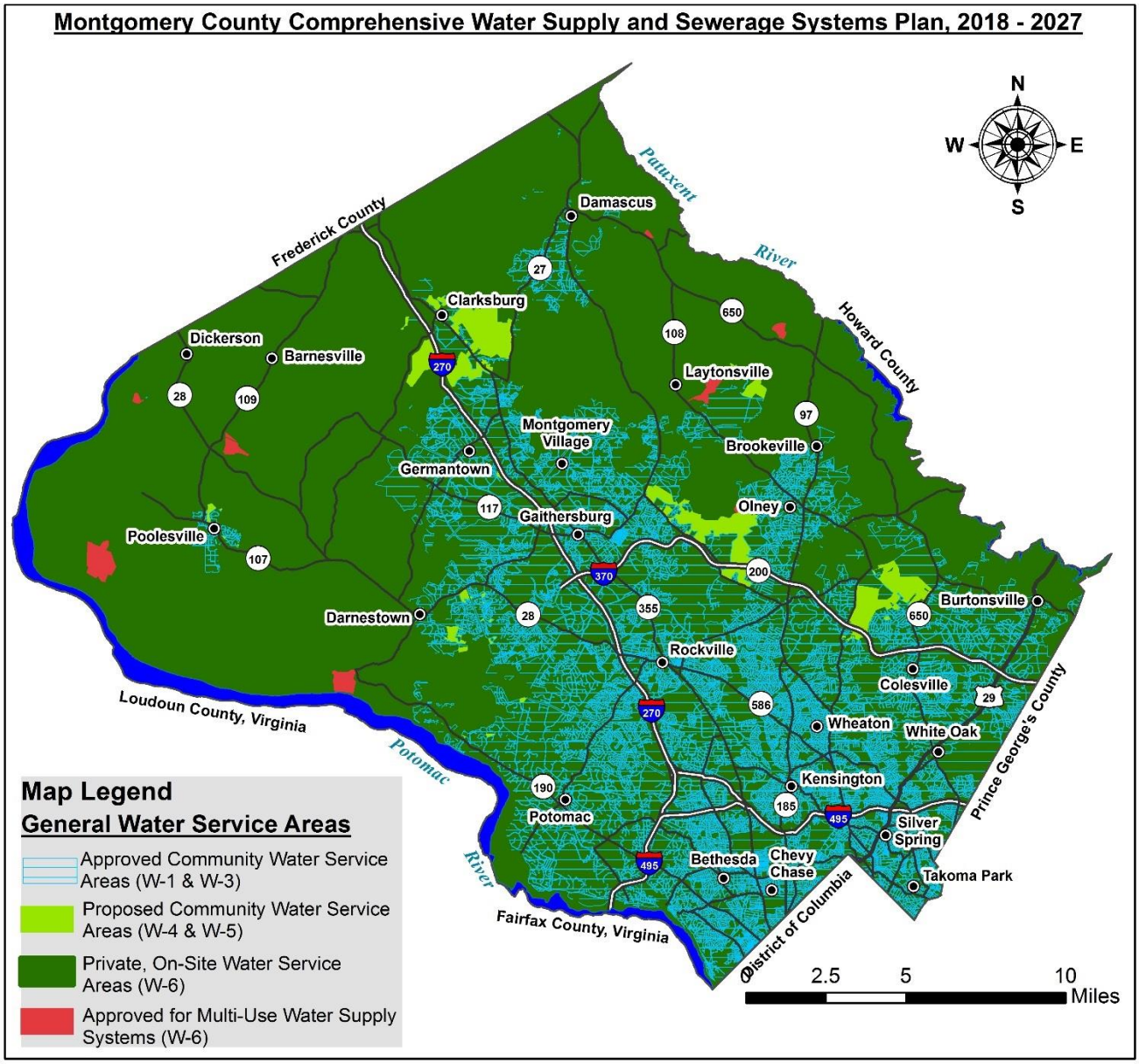
I: INTRODUCTION

This chapter addresses the County's water supply, demand, treatment, and distribution issues. It discusses the major water supply facilities that have been approved by various federal, state, and local agencies in recent years to provide for the mid- and long-range water supply needs of the County and the Washington Metropolitan Region. This chapter provides information addressing water consumption, water system transmission, storage facilities, planning, and financing issues, and projected water treatment and area distribution systems' needs. As part of a long term strategy to provide adequate service to increasing regional population and reducing treatment costs, this Plan recognizes the importance of protecting the quality of water supply resources.

I.A: Water Service Area Categories:

As discussed in Chapter 1, this Plan classifies all areas of the county into one of five category designations for water service areas. The categories range from areas currently served by community systems (W-1), to areas where improvements to or construction of new community systems will be planned in the future (W-3, W-4, and W-5), to areas where there is no planned community service (W-6). Note that in practice, Montgomery County does not use category W-2, which the State uses to designate areas where community water system projects are in the final planning stages. Montgomery County does not find this planning designation useful due to its short duration relative to that of this Planning document. Figure 3-F1 shows a generalized distribution of water service area categories throughout the county. For additional detailed information on water service categories, please refer to Chapter 1 section II.D.

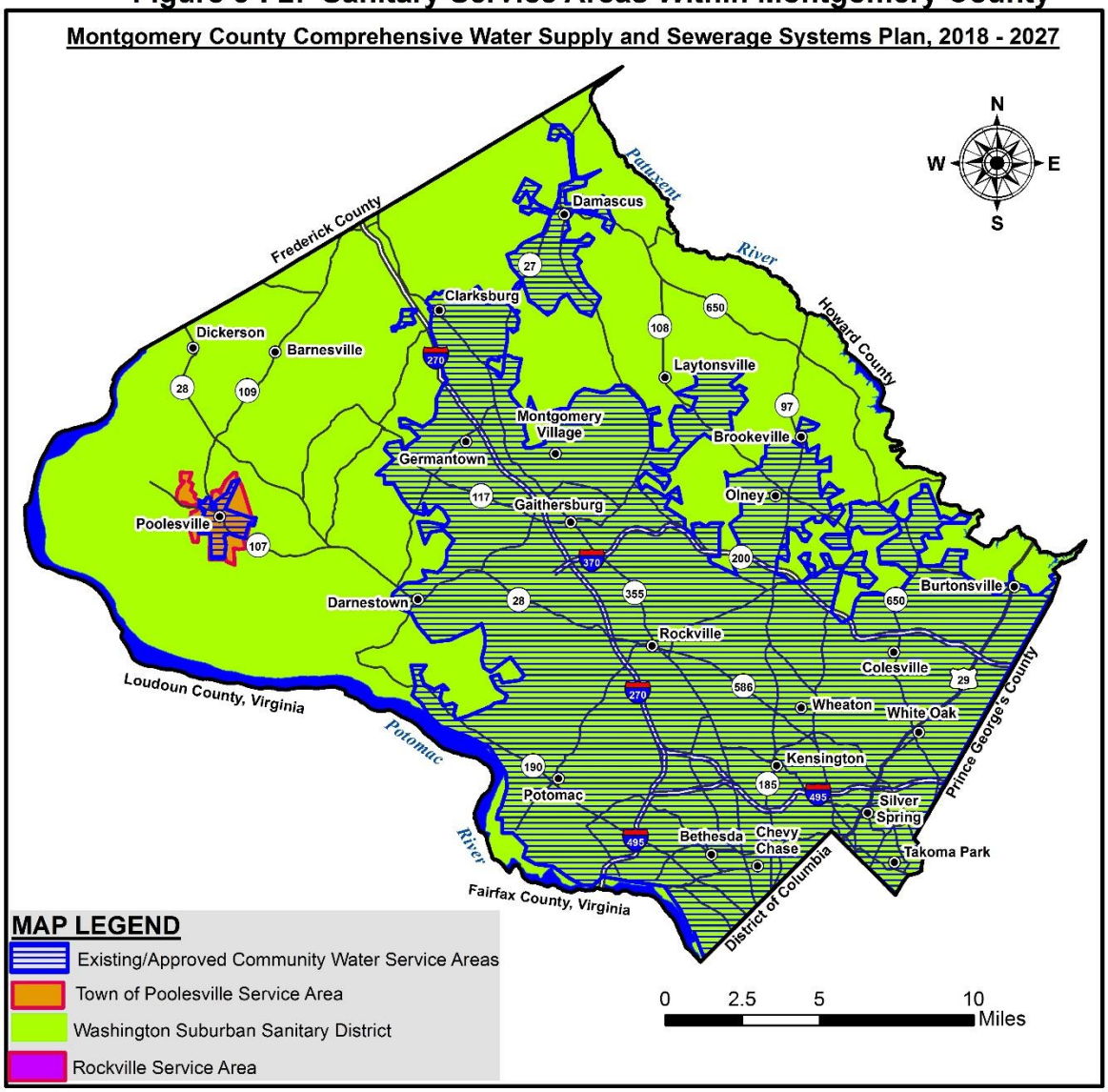
Figure 3-F1: Montgomery County Water Service Areas



I.B: Sanitary Service Areas:

The County is divided into three publicly owned and operated sanitary service areas or districts. As shown in Figure 3-F2, these districts are: The Washington Suburban Sanitary District (WSSD), the largest system, serving most of the county; and two smaller municipal districts, one owned and operated by the City of Rockville and the other by the Town of Poolesville. Each district has its own designated water supply source(s), water treatment facilities, and water distribution systems; these districts also manage wastewater services. Information for the districts serving Rockville and Poolesville was provided primarily by those municipalities and incorporated into this Plan consistent with State law.

Figure 3-F2: Sanitary Service Areas Within Montgomery County



This chapter addresses each of these districts independently, starting with the WSSD, with a primary focus on community water systems and service. Within each sanitary district, some properties are served by individual, on-site systems, rather than community systems. The vast majority of these individual systems are within the WSSD, though they are not served by the WSSC. Information on individual, on-site systems, or rural sanitation service (individual wells), follows at the end of the chapter.

II: WASHINGTON SUBURBAN SANITARY DISTRICT (WSSD)

The WSSD, established by State law in 1918, includes most of Montgomery and Prince George's Counties, and encompasses a total area of approximately 1000 square miles in both counties. Although the WSSD covers much of the majority of the county, WSSC does not provide community water and sewer service everywhere within the district. Guided by the policies included in this Plan, the provision of community water service within Montgomery County generally follows the patterns initially established by the County's General Plan for land use and development "On Wedges and Corridors" (see Chapter 2). The General Plan is further refined by area master plan updates. Community water and sewer service was initially established and planned for the southern part of the county, sometimes referred to as the “urban ring” that follows the Interstate 495 Capital Beltway. Community service then extends north along three major transportation corridors planned for higher density development:

- The U.S. Route 29 (Colesville Road/Columbia Pike) corridor to Burtonsville.
- The State Route 97 (Georgia Avenue) corridor to Olney.
- The U.S. Interstate 270/State Route 27 (Ridge Road) corridor to Clarksburg and Damascus.

County water service policies also allow for some limited provision of community service to lower-density areas adjacent to and between these major corridors.

Community service in the WSSD depends on surface water supply from two major rivers: The Potomac River and the Patuxent River. Elsewhere, primarily in the western and northeastern parts of the county, water service depends on individual, on-site systems, which utilize groundwater resources. Under an agreement with WSSC, Frederick County supplies community water service to the Rattlewood Golf Course, operated by the Montgomery County Revenue Authority and located at the northernmost tip of the county, approximately 4-1/2 miles north of Damascus. The community water supply is provided by three groundwater wells located in Frederick County in the Mill Bottom water supply system.

II.A: Government Responsibilities:

The responsibilities for planning for and providing water service within the WSSD are multi-jurisdictional and depend on the cooperative efforts of municipal, County, WSSC and regional authorities. This is especially true with regard to the Potomac River, a shared raw water source for several jurisdictions. These agencies include the following:

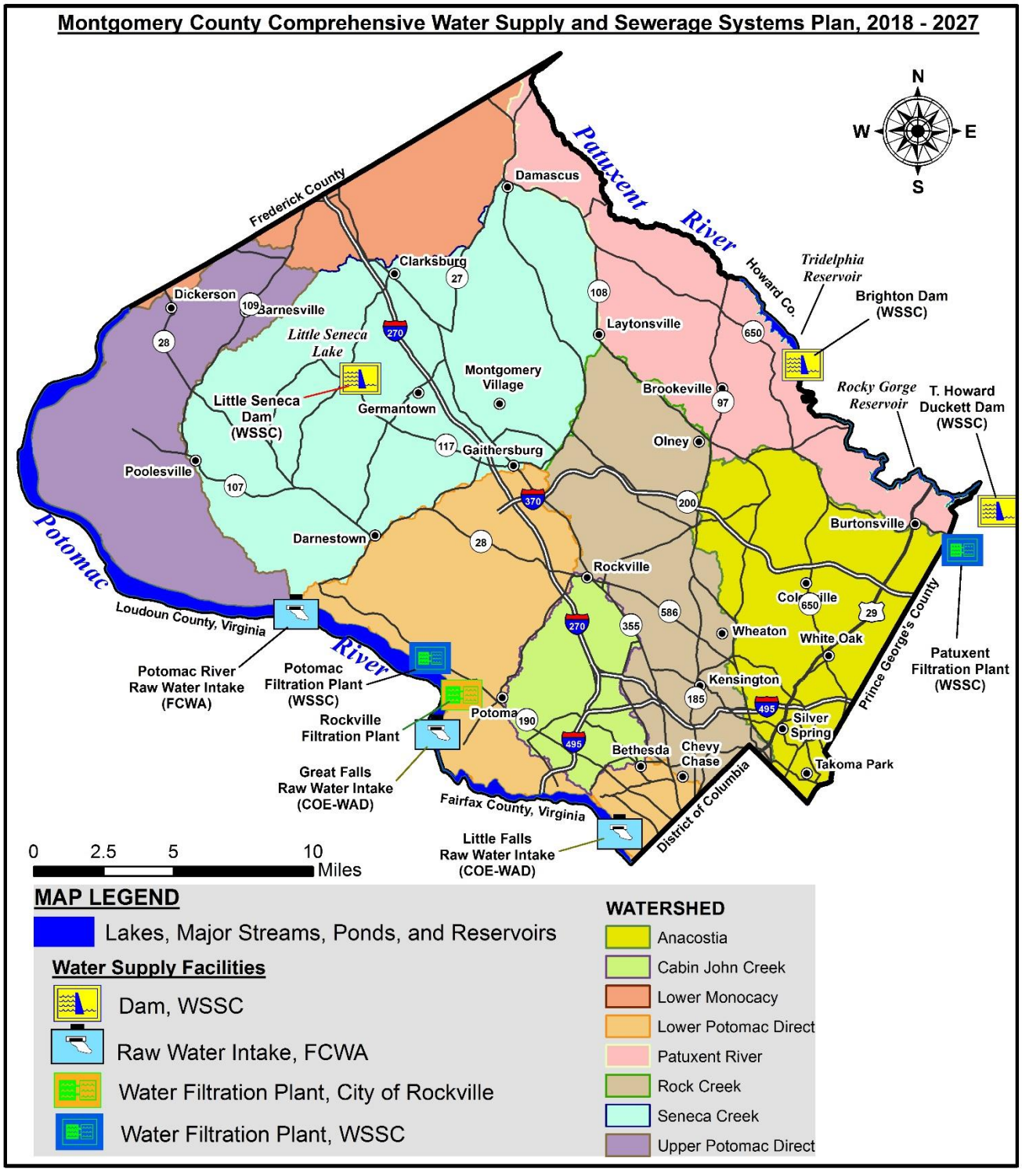
- Montgomery County Government:
  - Department of Environmental Protection (DEP)
  - Department of Permitting Services (DPS)
- Washington Suburban Sanitary Commission (WSSC)
- Maryland - National Capital Park and Planning Commission (M-NCPPC)
- Interstate Commission on the Potomac River Basin (ICPRB)
- Metropolitan Washington Council of Governments (COG)
- State of Maryland:
  - Department of the Environment (MDE)

These agencies, and their primary responsibilities and programs, are described in detail in Chapter 1, Section I.D.

II.B: Water Supply Sources:

Community water service in the WSSD depends on surface water supplied from the Potomac and Patuxent Rivers on opposite sides (west and east) of the county as shown in Figure 3-F3.

Figure 3-F3: WSSC Surface Water Supply Sources



II.B.1: Potomac River: The Potomac River is the larger of the two sources of surface water supply for Montgomery County. The river forms the southwestern border of Montgomery County with Virginia and serves as the source of drinking water to many communities in Maryland, Virginia, West Virginia, and Washington D.C. The Potomac River supplies over 40 billion gallons of water annually to the bi-county area of Montgomery and Prince George's Counties. WSSC withdraws water from the Potomac River at Watkins Island, approximately two miles upstream from Great Falls, near the mouth of Watts Branch.

In the Metropolitan area, the Potomac River is also a major source for Washington, D.C. (supplied by the Washington Aqueduct Division [WAD] of the U.S. Corps of Engineers), the City of Rockville, and the Fairfax County Water Authority (FCWA). All three utilities withdraw raw water from the Potomac River along the reach of the river adjacent to Montgomery County. The WAD withdraws water from the river at Great Falls and at Little Falls; Rockville withdraws water near its treatment plant at Sandy Landing Road; FCWA withdraws water from the Virginia side of the river near Great Seneca Creek and the Seneca Pool.

Three impounded water supplies can supplement flows directly to the Potomac River during periods of low flow. The Jennings Randolph Reservoir is located near Bloomington, Maryland, on the North Branch of the Potomac River on the State boundary with West Virginia, 200 miles upstream from the WSSC Potomac intake. This reservoir was completed in 1981 and provides 30 billion gallons of raw water storage with 13 billion gallons currently allocated to water supply. The Washington Metropolitan Area (WMA) water suppliers (WSSC, WASA (?), and DC) have purchased ownership of this storage capacity from the Federal government. The remaining capacity is for flood control and environmental flow augmentation. The Jennings Randolph Reservoir (formerly, the Bloomington Reservoir) is operated by the U.S. Army Corps of Engineers (COE). The Savage River Reservoir in Garrett County is operated by the Upper Potomac River Commission. It is used to supply local needs and supplement releases from Jennings Randolph for the WMA water suppliers, which contribute 80 percent of its operating and maintenance costs.

The third impoundment, Little Seneca Lake, built primarily for water supply, is located near Boyds in western Montgomery County, and impounds 4 billion gallons of raw water storage. WSSC operates the dam and release facility as part of the (metropolitan) Water Supply Coordination Agreement. Releases from this reservoir are coordinated with releases from the Jennings Randolph Reservoir (JRR) to provide short duration water supply until releases from the JRR have traveled to the WMA. Table 3-T1 lists information on the impounded water supplies within Montgomery County (both Potomac and Patuxent River), which are also shown on Figures 3-F3 and 3-F4.

II.B.2: Patuxent River: The Patuxent River forms the northeastern border of Montgomery County with Howard County, and serves as another major source of water supply for the two counties supplied by WSSC. There are two water supply impoundments along the Patuxent River operated by WSSC, the Triadelphia and the Duckett Reservoirs, created by the Brighton and T. Howard Duckett Dams, respectively. They are used mainly for water supply (10.6 billion gallons), with additional excess capacity (1.5 billion gallons). The Triadelphia Reservoir dam is located at Brighton Road in Montgomery County. The reservoir is located generally northeast of Olney and Brookeville, and has a storage capacity of 6.4 billion gallons. The T. Howard Duckett dam is located approximately two miles northwest of Laurel, in Prince George's County. The resulting Rocky Gorge reservoir, located generally north of Laurel, Burtonsville and Spencerville, has a storage capacity of 5.7 billion gallons. Table 3-T1 lists the existing impounded water supplies along the Patuxent River, which are also shown on Figures 3-F3 and 3-F4.

Table 3-T1: Inventory of Existing Impounded Water Supplies in Montgomery County

Source	**Potomac River**	**Patuxent River**	
Owner Name	**Public: [A] Little Seneca Lake (Little Seneca Dam)**	**WSSC: Triadelphia Reservoir (Brighton Dam)**	**WSSC: Rocky Gorge Reservoir [E] (T. Howard Duckett Dam)**
Crest Elevation (above sea level)	385 feet	366.45 feet	286.45 feet
Spillway Length	300 feet	234 feet	189 feet
Total Length of Dam	600 feet	995 feet	840 feet
Height of Crest Above Stream Bed	77 feet	66.45 feet	125.45 feet
Flooded Area at Crest Elevation	530 acres	800 acres	810 acres
Shore Line Length at Crest Elevation	-	19 miles	35 miles
Area of Land Owned	530 acres [A]	2,963 acres	3,023 acres
First Overflow of Dam Crest	1985	1944	1955
Capacity of Reservoir	**3.9 billion gallons**	**5.6 (6.4 [B]) billion gallons**	**5.0 (5.7 [C]) billion gallons**
		Total Capacity = 10.6 (12.1 [D]) billion gallons	
Safe Yield	**-**	**45.3 MGD**	
Average daily withdrawal	**-**	**50.6 MGD**	

[A] Financed by WSSC, District of Columbia, and Fairfax County Water Authority.
[B] Normal storage is 5.6 billion gallons; capacity is 6.4 billion gallons.
[C] Normal storage is 5.0 billion gallons; capacity is 5.7 billion gallons.
[D] Normal storage is 10.6 billion gallons; capacity is 12.1 billion gallons.
[E] AKA T. Howard Duckett Reservoir

Figure 3-F4: Major Water Supply Reservoirs Serving the Washington Region

Montgomery County Comprehensive Water Supply and Sewerage Systems Plan, 2018 -2027

II.C: Water Supply Sources Programs and Policies:

The use of water supply sources in this region is managed and protected through a number of Federal and regional programs and agreements. The following include a brief description of some of these programs and policies currently in place.

II.C.1: Regional Drought Management in the Potomac River Basin: In order to provide regional service during drought conditions and ensure that there is adequate flow in the River to meet the environmental flow-by, the Cooperative (CO-OP) Section of the Interstate Commission of the Potomac River Basin (ICPRB) coordinates releases from the Jennings Randolph Reservoir, located near Bloomington, Maryland, on the North Branch of the Potomac River, and the Little Seneca Lake in the County on Little Seneca Creek. These two sources of water augment the Potomac River during periods of extreme low flow in the Washington Metropolitan area. The agencies that have intakes in Montgomery County and which are considered the Regional Water Supply system during a drought are: 1) The Washington Suburban Sanitary Commission, 2) the Fairfax County Water Authority (FCWA), and 3) the Washington Aqueduct Division (WAD) of the Corps of Engineers that serve the District of Columbia, Arlington, Falls Church, and a small portion of Fairfax County. The City of Rockville and the Town of Leesburg also draw their water from the Metropolitan area of the Potomac River. A new Potomac River intake and water treatment plant for the Loudoun County Sanitation Authority (Loudoun Water) are under construction downstream of Leesburg in Loudoun County.

There are a number of agreements among the region's utilities describing how the water is distributed and used during drought conditions. The agreements, included in chronological order in Table 3-T2, are:

Table 3-T2: Potomac River Regional Drought Agreements

Signatories	Major Provisions
Low Flow Allocation Agreement (LFAA) (1978)	
▪ State of Maryland ▪ State of Virginia ▪ District of Columbia ▪ U.S. Army Corps of Engineers ▪ WSSC ▪ FCWA	This agreement establishes allowable withdrawals among major water users of the Potomac River during periods when there is not sufficient supply to allow unrestricted withdrawals. As a result of the 1982 Regional Water Supply Agreements, the chance of invoking the LFAA is projected to be less than 5 percent during a repeat of the worst drought of record.
Modification No. 1, Potomac River Low Flow Allocation Agreement (1982)	
▪ State of Maryland ▪ State of Virginia ▪ District of Columbia ▪ U.S. Army Corps of Engineers	This amendment to the LFAA provides for releases from the Jennings Randolph and Savage Reservoirs and Little Seneca Lake to be subject to the allocation formula of the LFAA. Most importantly, as long as there are legally enforceable Regional Water Supply Agreements, the 1988 freeze provision of the LFAA will be inoperative. The 1988 freeze provision would have limited FCWA, WSSC, and District of Columbia withdrawal ratios to 1988 actual levels unless a water supply agreement was reached. Since the District of Columbia is the largest withdrawer of water, the District would have attained a disproportionately large share of water versus need over time. The Regional Water Supply Agreements are predicated on all water users obtaining water as needed and the sharing of resources.
Water Supply Coordination Agreement (1982)	
▪ Corps of Engineers ▪ Fairfax Co. Water Authority ▪ WSSC ▪ District of Columbia ▪ ICPRB.	This agreement establishes the precedents that the major water suppliers will operate systems in a coordinated manner during a drought and that water withdrawal will be based on need, not on the relative share paid for water storage facilities. This agreement also identifies the CO-OP section of the Interstate Commission of the Potomac River Basin (ICPRB) as the agency to administer provisions of the Drought Related Operations Manual, such as issuing long-range water supply projections and directing releases from Jennings Randolph and Little Seneca lakes during a drought. The water utilities fund the activities of the CO-OP section as follows: WSSC - 50 percent, FCWA - 20 percent, and DC - 30 percent.
Agreement for Future Water Supply Storage Space in the Bloomington Reservoir (1982)	
▪ District of Columbia ▪ Corps of Engineers ▪ WSSC ▪ Fairfax Co. Water Authority	This agreement entitles the District of Columbia, the Fairfax County Water Authority and the WSSC to 36.78 percent of Jennings Randolph Reservoir storage capacity known as future supply. The Metropolitan Areas share would equal 13.37 billion gallons when the reservoir is full. In return, the three non-federal signatories are required to pay 27.4% of the construction cost (local share estimated at $54.2 million, includes interest over 50 years), 34.75% of the cost of major replacement items and 28.56% of the annual operation and maintenance costs. Jennings Randolph water not contracted for water supply is used for water quality improvement in the North Branch of the Potomac River. Water Quality releases upstream also indirectly benefit local jurisdictions by delaying the time when low flows are experienced in the Washington area. The WMA water utilities fund the capital, operations, and maintenance costs for the water supply storage in the Jennings Randolph Reservoir. *Note: The Maryland Potomac Water Authority (MPWA) was created in 1978 to coordinate local governments in the acquisition of water storage of the Jennings Randolph Reservoir. However, the Novation Agreement of 1982 which provided for purchasing of storage by the District of Columbia, the Fairfax County Water Authority and WSSC transferred the function of the MPWA to the other three parties.*
Bloomington Payment Agreement (1982)	
▪ Fairfax Co. Water Authority ▪ District of Columbia ▪ WSSC	This agreement delineates the three major water users individual responsibility to pay for Jennings Randolph water supply in the agreed to ratios. This agreement was necessitated because the Corps of Engineer required that payments had to be guaranteed. The District of Columbia was unable to make such a guarantee because their budget must be approved annually by Congress. Under the provisions of the agreement, should a user default in payment, another user can make the payment and sue the defaulter for payment plus penalty. In addition, the defaulter loses right to use Jennings Randolph water supply while in default.

Table 3-T2: Potomac River Regional Drought Agreements

Signatories	Major Provisions
Little Seneca Lake Cost Sharing Agreement (1982)	
▪ District of Columbia ▪ Fairfax Co. Water Authority ▪ WSSC	This agreement establishes the cost shares and payment mechanisms to fund construction of Little Seneca Lake in Montgomery County. Capital and operating and maintenance cost were distributed according to the following ratios: WSSC 50%; District of Columbia 40%; and Fairfax County Water Authority 10%.
Savage Reservoir Maintenance and Operation Cost Sharing Agreement (1982)	
▪ District of Columbia ▪ Fairfax Co. Water Authority ▪ WSSC ▪ Allegany County, Md. ▪ Upper Potomac River Commission (UPRC)	This agreement addresses water releases from the Savage Reservoir, which as relatively basic, were intended to neutralize releases from the Jennings Randolph Reservoir, which were expected to be acidic due to upstream mine drainage. This dilution effect can be viewed as additional water supply gained without requiring local funds for the construction of the Savage Reservoir. The signatories exclusive of the UPRC have agreed to fund the annual operations and maintenance, and replacement and repair costs of Savage Reservoir according to the following percentages: Fairfax County Water Authority 16%; District of Columbia 24%; WSSC 40%; and Allegany County 20%. (See the preceding discussion of the reservoir for additional information.)
Metropolitan Washington Water Supply Emergency Agreement (1994)	
▪ District of Columbia ▪ Arlington, Fairfax, Loudoun, Montgomery, Prince George's and Prince William Counties ▪ Towns or Cities of Alexandria, Bowie, College Park, Fairfax, Falls Church, Gaithersburg, Greenbelt, Manassas, Rockville, Takoma Park, and Vienna ▪ Council of Governments ▪ Fairfax Co. Water Authority ▪ Loudoun Co. Sanitation Auth. ▪ WSSC	This agreement establishes three plans for coordinating regional actions in the event of emergencies that affect water supply from the Potomac River to the Washington Metropolitan Region. The first plan provides a regional response mechanism for health-related emergencies in the Washington Aqueduct Division system. The second plan provides a mechanism for emergencies that affect more than one of the utilities that withdraw raw water from the Potomac River. The final plan describes the routine planning and cooperative operating procedures which have significantly reduced the risk of drought affecting the region's water supply. Background information describing the conditions leading up to the plan and the procedures for updating it is also provided.
Metropolitan Washington Water Supply and Drought Awareness Response Plan: Potomac River System (2000)	
▪ District of Columbia ▪ Arlington, Fairfax, Loudoun, Montgomery, Prince George's and Prince William Counties ▪ Towns or Cities of Alexandria, Bowie, College Park, Fairfax, Falls Church, Gaithersburg, Greenbelt, Manassas, Rockville, Takoma Park, and Vienna ▪ Council of Governments ▪ Fairfax Co. Water Authority ▪ Loudoun Co. Sanitation Auth. ▪ WSSC	This COG plan provides implementation steps during drought conditions for the purpose of coordinated regional response. The Plan consists of two interrelated components: a regional year-round plan emphasizing wise water use and conservation; and a water supply and drought awareness and response plan. The water supply and drought awareness plan contains four stages: · Normal: Wise Water Use Program · Watch: voluntary water conservation measures · Warning: voluntary water restrictions · Emergency: mandatory water restrictions This plan is primarily designed for those customers who use the Potomac River for their drinking water supply source. The Plan will eventually be expanded to incorporate all water supply systems throughout the region.

II.C.2: Regional Drought Operations: During times of declared drought, the regional water supply system will operate according to the Drought Operations Manual of the 1982 Water Supply Coordination Agreement. Operations rules and procedures for reducing the impacts of severe droughts in the Potomac River for the Washington Metropolitan Area Water Suppliers are as follows:

- Make the most efficient use of all water supply facilities, including but not limited to the Potomac River, Jennings Randolph Lake, Occoquan Reservoir, Triadelphia Reservoir, Rocky Gorge Reservoir, and Little Seneca Lake to meet all water supply needs for the Washington Metropolitan Area.
- Maintain the probability of invoking the Restriction Stage of the Potomac River Low Flow Allocation Agreement at less than 5 percent during a repeat of the historical low stream flow record.
- Maintain the probability of entering the Emergency Stage of the Potomac River Low Flow Allocation Agreement at less than 2 percent with full reservoirs on June 1 of any year.
- Maintain the probability of not refilling any reservoir used for Washington Metropolitan Area water supply to 90 percent of useable capacity by the following June 1 at less than 5 percent during a repeat of the historical low stream flow record.
- Maintain flows in the Potomac River below Seneca Pool as agreed to by the signatories to the Potomac River Low Flow Allocation Agreement.
- Minimize conflict between normal utility operations and drought operations.
- Provide consistency with the requirements of the Potomac River Low Flow Allocation Agreement.

The underlying principle in this operating procedure is to reduce unneeded reservoir releases by making larger releases only as necessary to meet water needs. The capability of existing suppliers can be substantially extended in this manner. The Water Supply Coordination Agreement for cooperative system management is the critical element which allows the users to obtain the maximum benefits of existing resources and reduce water wastage.

During a drought, WAD and the CO-OP Section of the ICPRB play key roles in determining the operation of the Regional Water Supply System. The WAD is charged with determining when to declare alert, restriction, or emergency drought stages. If a restriction or emergency stage is declared, the WAD allocates each user's fair share of withdrawal based on previous usage. The CO-OP Section is responsible for coordinating water withdrawals to make the most efficient use of all water supply facilities. To accomplish this objective, CO-OP produces forecasts of water supply and need, and determines how much water the WSSC and FCWA should be withdrawing from non-Potomac River supplies on a daily basis. The CO-OP in consideration of the needs of the WAD, WSSC, and FCWA, also directs releases from Jennings Randolph Reservoir and Little Seneca Lake.

The signing of the Water Supply Agreements of 1982 and the completion of Little Seneca Lake in the fall of 1984 resulted in a regional consensus that area raw water supply needs are satisfied, at least through the year 2020. Recent water demand forecast and resource adequacy analysis (2015 Washington Metropolitan Area Water Supply Study) by ICPRB/CO-OP confirms that presently available resources will be stressed for the region by the year 2035 in the event of a repetition of the drought of record. The water demand forecasts were based on population projections by the Metropolitan Washington Council of Governments to the year 2040 (Round 8.3).

II.C.3: Potomac River Environmental Flow-By: As a heavily-used water resource, the Potomac River requires careful management to ensure its value for the utilities which draw its water and the health of its natural ecosystem. Part of the purpose of the preceding group of agreements is to ensure that the river has an adequate flow-by through and downstream from the Washington region sufficient to maintain its biological health, even under severe drought conditions. These agreements are consistent with a minimum recommended flow-by of 100 million gallons per day (Potomac River Environmental Flow-by Study, 1981) to support the biological health of the river system.

II.C.4: Potomac Water Filtration Plant Source Water Assessment: MDE and WSSC completed a source water assessment (SWA) for the Potomac River and WSSC's water filtration plant in 2002. The SWA addressed issues involved with the quality and safety of the raw water the plant draws from the river for treatment and does not directly address finished water quality. From its findings, the SWA recommended the development and implementation of a source water protection plan for the Potomac Plant and for other similar facilities which draw their source water from the river. The SWA predicted the following potential improvements as a result of the successful implementation of such a plan:

- Reducing the solids loading to the plant,
- Reducing the magnitude and frequency of high pH, high natural organic matter (NOM) events which result from algal, phytoplankton, and macrophyte activities in the Potomac and its tributaries,
- Improving protection from pathogens including *Cryptosporidium* and *Giardia*,
- Reducing the number and severity of taste and odor episodes which occur in the WSSC system, and
- Reducing ammonia levels and chlorine demand in the raw water.

Following the completion of the SWA, WSSC actively worked with other utilities and relevant governmental agencies to establish the Potomac River Basin Drinking Water Source Protection Partnership (Partnership). The Partnership was formed in 2004. The Partnership is a voluntary organization of drinking water suppliers and government agencies working to protect drinking water sources, thereby safeguarding both public health and the environment. Partnership member agencies (as of 2016) include:

- Berkeley County Public Service Water Authority, West Virginia
- City of Frederick, Maryland
- City of Hagerstown, Maryland
- City of Rockville, Maryland
- DC Water
- District of Columbia Department of Energy & Environment
- Fairfax County Water Authority
- Frederick County, Maryland
- Interstate Commission on the Potomac River Basin
- Loudoun Water, Virginia
- Maryland Department of the Environment
- Pennsylvania Department of Environmental Protection
- Town of Leesburg, Virginia
- United States Environmental Protection Agency, Region III
- United States Geological Survey
- Virginia Department of Environmental Quality
- Virginia Department of Health

- Washington Aqueduct Division, U.S. Army Corps of Engineers
- Washington County, Maryland
- Washington Suburban Sanitary Commission
- West Virginia Department of Health and Human Resources
- West Virginia Department of Environmental Protection

The WSSC has actively worked within the Partnership framework to develop a strategy of outreach and environmental programs to protect the Potomac drinking water supply, which serves more than 4 million people. Through work groups and active discussion at Partnership meetings, the Partnership is implementing a strategy for carrying forward source water protection as recommended by the source water assessments conducted throughout the Potomac basin, as well as important source water protection issues as they emerge.

Highest priority issues for the Partnership in 2016 are enhancing chemical contaminant knowledge in the Potomac watershed, implementing improvements to regional spill response, and source water protection activities related to toxic and non-toxic algae. In light of the West Virginia Elk River MCHM spill and the North Carolina Dan River coal ash spill in 2014, several utility members in the Partnership, together with Metropolitan Washington Council of Governments, retained a consultant to update the 2002 SWA data of potential point-source contaminants upstream of the D.C. metropolitan area water intakes. The Partnership plans to use this data to update their understanding of upstream risks, and to prioritize both outreach efforts to upstream contaminant owners and early warning and response efforts. The Partnership also plans to implement further improvements to cooperative spill response, based on lessons learned during an exercise with the Colonial Pipeline and the response to an actual latex spill in the upstream North Branch Potomac River in 2015. Finally, much national attention has been given recently to toxic algal blooms, arising from nutrient pollution, that annually affect drinking water systems around the county. While such blooms have not been commonly observed in the Potomac River, the Partnership recognizes the severe risk such blooms present to the safety of drinking water. Thus, the Partnership is devoted to advancing source water protection activities that prevent and minimize impacts of toxic and non-toxic algal blooms.

Within the separate workgroups, the Partnership also continues to monitor other high priority issues such as emerging contaminants, pipeline safety, road salts, water quality standards, stormwater, engaging upstream stakeholders and forests protection. Since 2013, the Partnership has been tracking results of sampling by water utilities in the Potomac River Basin for the third round of Unregulated Contaminant Monitoring Rule (UCMR3); a workshop was held in October 2013. The urban issues workgroup recently sponsored an information session on chloride trends in urban-affected watersheds. Utility members in the Partnership are also supporting a project under Water Research Foundation and U.S. Endowment for Forestry and Communities to evaluate benefits to upstream forest protection on drinking water quality and treatment costs.

II.C.5: Patuxent Reservoirs Watershed Protection Agreement: The Patuxent Reservoirs Watershed Protection Group (PRWPG) was formed by agreement in October 1996 to protect the long-term biological, physical, and chemical integrity of the Triadelphia and Rocky Gorge Reservoirs and the contributing 132 square mile watershed. This group consists of a Policy Board and a Technical Advisory Committee (TAC). Signatories to the agreement include Montgomery County, Howard County, Prince George's County, the Montgomery and Howard Soil Conservation Districts, the M-NCPPC, and the WSSC. To protect the Patuxent Reservoirs Watershed, those signatories have developed and continue to implement a multi-barrier

watershed management approach to assure the integrity of a continued supply of high quality, potable water at reasonable cost.

Initially an Action Plan was written to begin implementing the multi-barrier watershed management approach. The plan listed action items in three categories: data analysis and collection tasks, implementation tasks, and public information tasks. In 2003, the PRWPG adopted a revised action plan. This revised list of action items or work plan, titled *Performance Measures and Goals for Priority Resources*, represents a continuation of the commitment to coordinate protection efforts in coming years. This table contains goals, performance measures, implementation items, and a time line to achieve each goal for six priority resources selected by the TAC. Those priority resources include the following:

1. Reservoir/water supply
2. Terrestrial habitats
3. Stream systems
4. Aquatic biota
5. Rural character and landscapes
6. Public awareness and stewardship

Since then, the signatories and support agencies have successfully accomplished many tasks including:

- Expanded reservoir and tributary water quality monitoring necessary for status and trends analysis
- Developed a GIS-based watershed loading model linked to a reservoir eutrophication model to predict changes in reservoir water quality based on changes in watershed land cover characteristics
- Implemented an inter-agency funded, local-cost share program for streamside agricultural best management practices. This program was recently updated and expanded to attract greater participation.
- Established a network of programs and contacts through local agencies, schools, and citizen groups for more effective public outreach on watershed awareness and reservoir protection
- Established riparian forest buffers along reaches of the Reddy Branch and the Hawlings River.
- Completed the watershed restoration project for Cherry Creek in Howard County

In recognition of the interagency accomplishments, the US EPA awarded the PRWPG its Clean Water Partner for the 21st Century in 2003.

The member agencies regularly evaluate the program progress to date, the establishment of quantifiable measures to judge success in protecting priority resources, the feasible rates of projects and control strategies implementation, and the need to revise or add additional goals. Many important studies have been accomplished since the PRWPG was formed. For example, in 2008, PRWPG completed the *Sediment Study* and the *Forest Management and Recreation Use Study*. In 2009, an *Interim Watershed Management Report* was prepared.

Outreach activities to further public awareness of watershed issues have included the H2O Fest Watershed Festival, a Patuxent River Cleanup Day, and the annual Family Campfire.

In 1998, the Maryland Department of the Environment (MDE) identified both reservoirs as impaired by nutrients and identified Triadelphia Reservoir as impaired by sediment; consequently, MDE determined that the reservoirs were unable to achieve State water quality standards for their designated uses. To address these impairments, the US Environmental Protection Agency (EPA) approved Total Maximum Daily Loads (TMDLs) for both reservoirs in November 2008. A phosphorus TMDL was established for each reservoir, and a sediment TMDL was established for Triadelphia Reservoir (29% reduction required). Significant phosphorus load reductions are required (58% for Triadelphia Reservoir, 48% for Rocky Gorge Reservoir) to meet Maryland's water quality standards. (Maryland Department of the Environment. June 2008. *Total Maximum Daily Loads of Total Phosphorus and Sediments for Triadelphia Reservoir (Brighton Dam) and Total Maximum Daily Loads of Total Phosphorus for Rocky Gorge Reservoir, Howard, Montgomery and Prince George's Counties, Maryland*. Baltimore, MD.)

In 2016, an assessment was completed estimating the progress made from 2000-2015 towards achieving the pollutant reduction goals specified in the TMDLs for the reservoirs. Urban stormwater management and agricultural best management practices (BMPs) were tallied and modeled pollutant load reductions were generated. Pollutant load estimates were also derived for land use changes, such as land converted from agricultural to residential land uses. Refer to the table below for progress towards achieving the TMDL goals.

Pollutant	TMDL Goal	Progress to Date	Gap Remaining
Total Phosphorus (Rocky Gorge Reservoir)	**58%**	**10%**	**48%**
Total Phosphorus (Triadelphia Reservoir)	**48%**	**17%**	**31%**
Sediment (Triadelphia Reservoir)	**29%**	**8%**	**21%**

The 1982 "Water Supply Coordination Agreement" also affects the use of the Patuxent River's reservoirs relative to the agreement's Drought Operations Manual. See Section II.C.1 for additional information.

Plan Recommendation:
Potential Use of Travilah Quarry for Additional Raw Water Storage

This Plan recommends a more comprehensive re-evaluation of the potential benefit to the WSSC water supply system from the eventual closeout and acquisition of the Travilah Quarry, which could supply up to 17 billion gallons of raw water storage, within several miles of the Potomac Water Filtration Plant. This quarry has been evaluated by WSSC for several years and this Plan, along with the Potomac Subregion Master Plan encourages actions be taken to ensure its future availability to the water supply needs of the County and possibly the region.

II.D - Water Treatment Facilities:

The WSSC operates two major water filtration plants in its sanitary district which provide water treatment for Montgomery County. These plants draw "raw" or untreated water from the Potomac and Patuxent Rivers and process it into "finished" water suitable for public consumption based on the

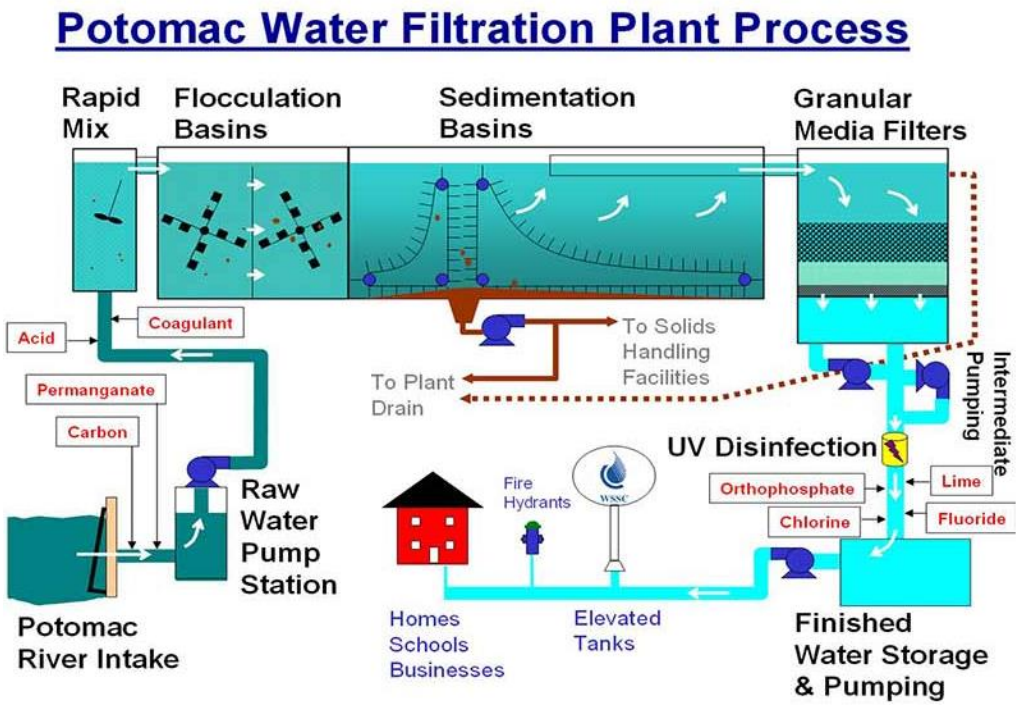
latest National and local drinking water quality standards. Location of these plants and their current capacities and other information are provided in Figure 3-F3 and Table 3-T3.

Table 3-T3: WSSC Water Treatment Facilities

Facility Owner/Operating Agency Plant Location & Coordinates	Water Source Treatment Type	Rated Plant Capacity Average Production Maximum Peak Flow Storage Capacity *	Sludge and/or Filter Backwash	Status/Comments
Potomac Filtration Plant WSSC River Road N439,000/E727,000	Potomac River Conventional treatment including coagulation (either polyaluminum chloride or ferric chloride), flocculation, sedimentation, filtration, ultraviolet disinfection (UV), chlorination, fluoridation, and pH adjustment (hydrated lime) and orthophosphate for corrosion control. Seasonal Low pH Enhanced Coagulation using sulfuric acid addition prior to coagulation to minimize chlorine disinfection byproduct formation (typically employed from May to October).	capacity: 288 MGD production: 112 MGD peak flow: 149 MGD storage: 19.3 MG	Much of the solids volume originating from the Potomac River and treatment processes are removed through the solids handling facility and are then land-applied	Various treatment processes have recently been renovated and upgraded. These include: • UV Disinfection Facility • Backwash Pumping Station • Intermediate Pumping Stations (IPS) • Lime Feed Facilities • Upgrade of Sulfuric Acid System • Ferric Chloride and Caustic Soda Feed Systems
Patuxent Filtration Plant WSSC Sandy Spring Road (Prince George's Co.)	Patuxent River (Rocky Gorge Reservoir) coagulation (polyaluminum chloride), flocculation, sedimentation, filtration, chlorination, fluoridation, and lime adjustment of pH and orthophosphate for corrosion control, and ultra violet disinfection	capacity: 56.0 MGD production: 49 MGD peak flow: 64.5 MGD storage: 18.4 MG	Discharged to sanitary sewer. A solids handling facility is currently under construction which will eventually eliminate discharge to sanitary sewer.	Critical components of the Plant have recently been renewed and upgraded. These include: • Existing Filter Unit #1 was demolished • Five new treatment trains were completed in 2005 • Phase II of the Plant expansion is currently under construction, which includes ultraviolet disinfection and a 6th treatment train

See Figure 3-F3 for the locations of these facilities.
See Table 3-T11 for information on the City of Rockville's filtration plant.
* Production and Peak Flow values are based on calendar year 2015 data.

II.D.1 - Potomac Water Filtration Plant: This facility, located on River Road (Route 190) at Lake Potomac Drive, two miles upstream from Great Falls, serves both Montgomery and Prince George's Counties. The plant draws water from the Potomac River just downstream from the mouth of Watts Branch. The Potomac Water Filtration Plant has a State-permitted maximum intake capacity of 300 million gallons per day (MGD), and a rated treatment capacity of 288 MGD. However, the plant generally operates in a range of 105 to 150 MGD. The diagram below shows the Potomac Water Filtration Plant treatment process.



Anticipating future demand, WSSC has studied and is currently implementing various treatment process improvements at the plant to reliably meet the projected demands and updated drinking water quality standards.

II.D.2 - Patuxent Water Filtration Plant: This facility is located on Sandy Spring Road (Route 198) at Sweitzer Lane near Laurel in Prince George's County, approximately one-half mile east of the Montgomery County border. Although the plant serves primarily Prince George's County, its effective reach extends west into Montgomery County to approximately Georgia Avenue (Route 97). The plant draws water from the Rocky Gorge Reservoir on the Patuxent River. In 2005, WSSC completed a comprehensive replacement and expansion of the aging critical components of the Patuxent Filtration Plant. The new and upgraded plant now has a nominal treatment capacity of 56 MGD and the capacity to provide up to 72 MGD. Most of the plant's processed water is gravity fed to the WSSC system in Prince George's County. Pumping and transmission capacity also exists to provide approximately 12 MGD to the Montgomery High Zone and 36 MGD to the Montgomery Main Zone. Anticipating a need to improve water supply system redundancy in the WSSD, WSSC is currently implementing a second phase of improvements at the plant which will expand its sustained capacity to 72 MGD and its peak rated capacity to 110 MGD.

II.E - Water Distribution and Storage Systems:

WSSC delivers finished drinking water from its treatment plants to consumers throughout the WSSD community water service area in Montgomery County by a series of pumping facilities and transmission mains. Providing adequate water service also requires strategically located water storage facilities serving sections of the county. The following sections discuss these distribution and storage systems.

II.E.1 - Water Service Pressure Zones:

The WSSD community water service area within Montgomery County is divided into separate pressure zones. These are grouped into two major zones, as shown in Figure 3-F5: The

Montgomery County Main Zone serves the southern and eastern parts of the county, and the Montgomery County High Zone serves the northern and western parts. The division between these two major pressure zones traverses the county west to east through western Potomac, Travilah, Rockville, Norbeck, Cloverly, and Fairland. Each of the major zones consists of several smaller pressure zones as shown in Table 3-T4. The Montgomery County Main Zone also provides service to pressure zones in Prince George's County.

TABLE 3-T4: WSSC Major Water Pressure Zones in Montgomery County

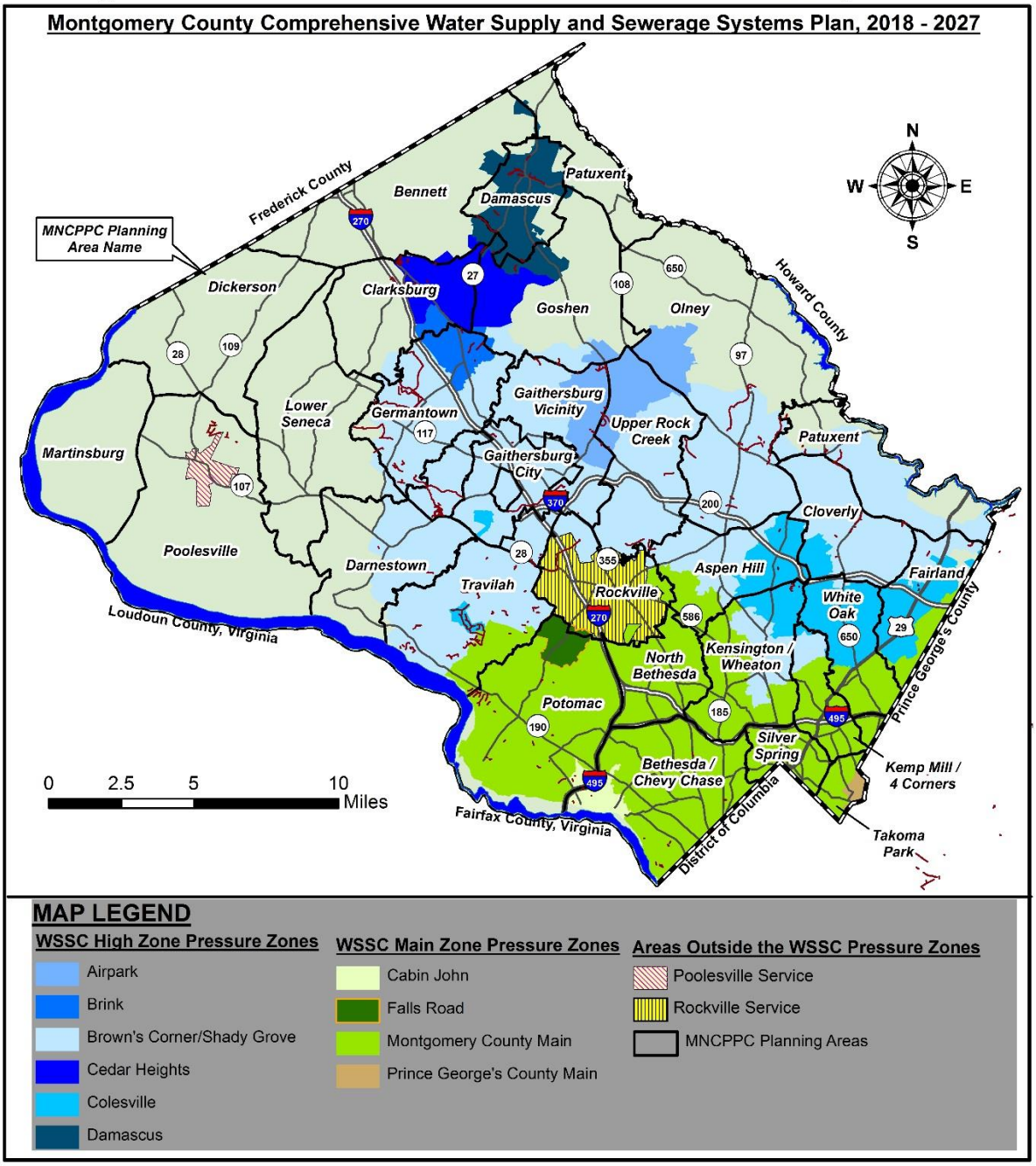
Pressure Zones			Normal Hydraulic Grade	Primary Water Supply Source
MAJOR PRESSURE ZONES	**Montgomery County Main Zone** Potomac Plant	Montgomery Co. Main Zone	495 feet	Potomac Plant
		Cabin John Zone	350 feet	Montgomery County Main Zone
		Falls Road Zone	552 feet	Montgomery County Main Zone
	Montgomery County High Zone Potomac Plant	Colesville Zone	560 feet	Shady Grove Zone
		Shady Grove Zone	660 feet	Potomac and Patuxent Plants
		Air Park Zone	685 feet	Shady Grove Zone
		Laytonsville Zone	750 feet	Air Park Zone
		Brink Zone	760 feet	Shady Grove Zone
		Cedar Heights Zone	836 feet	Brink Zone
		Damascus Zone	960 feet	Cedar Heights Zone
	Prince George's County Main Zone*		320 feet	Potomac and Patuxent Plants

**There is a small portion of Takoma Park served by the Prince George's County Main Zone Pressure Zone*

WSSC divides areas of the county into water pressure zones based primarily on ground elevations. Each pressure zone must have its own source or sources of supply (storage), transmission systems (i.e., pumping stations or pressure reducing valves and transmission mains), and storage facilities to transport water from the sources to the points of use. A water supply source for a pressure zone is usually a storage tank and/or another adjacent pressure zone. Water supply to zones at higher elevations must be pumped, while water supply to lower elevations must be controlled by pressure regulation valves. The water supplied to each zone is maintained at a pressure sufficient to provide adequate quality and quantity of service to the consumers in that zone. The water system within each of these zones may be designed to serve the population of that zone as well as adjacent zones. Because of the large area and the number of pressure zones within the County, the availability of mutual backup support capabilities is extremely important. This is accomplished through the use of interconnected pressure zones, the two sources of supply, and water storage facilities. Table 3-T4 lists the hydraulic grade and primary water supply for the major pressure zones within Montgomery County, showing which

zones are interdependent with others. WSSC establishes new pressure zones and adjusts zone boundaries in response to projected development demands and improvements to system efficiency. The existing layout of major pressure zones in Montgomery County is shown in Figure 3-F5.

Figure 3-F5: WSSC Water Pressure Zones and MNCPPC Planning Areas



II.E.2 - Water Pumping Stations: Community water service in the Montgomery County portion of the WSSD depends on pumping systems from both the Potomac and Patuxent filtration plants. Because all finished water leaving the Potomac Plant must be pumped, the plant output cannot exceed its finished water pumping capacity. The Potomac Plant Main Zone Pumping Station has

a pumping capacity of 249 MGD; the High Zone pumping station provides a pumping capacity of 88 MGD. The Patuxent Main Zone Pumping Station has a capacity of 36 MGD; the Patuxent Plant High Zone Pumping Station has a capacity of 12 MGD. (Note: Water leaving the Patuxent Plant for Prince George's County may also flow by gravity). These pumping stations at the filtration plants are complemented by other stations located throughout the county to maintain consistent water pressures required by pressure zones at higher elevations (see Figure 3-F6). Capacities of water pumping facilities are shown on Table 3-T5.

Figure 3-F6: WSSC Water Distribution System and Facilities

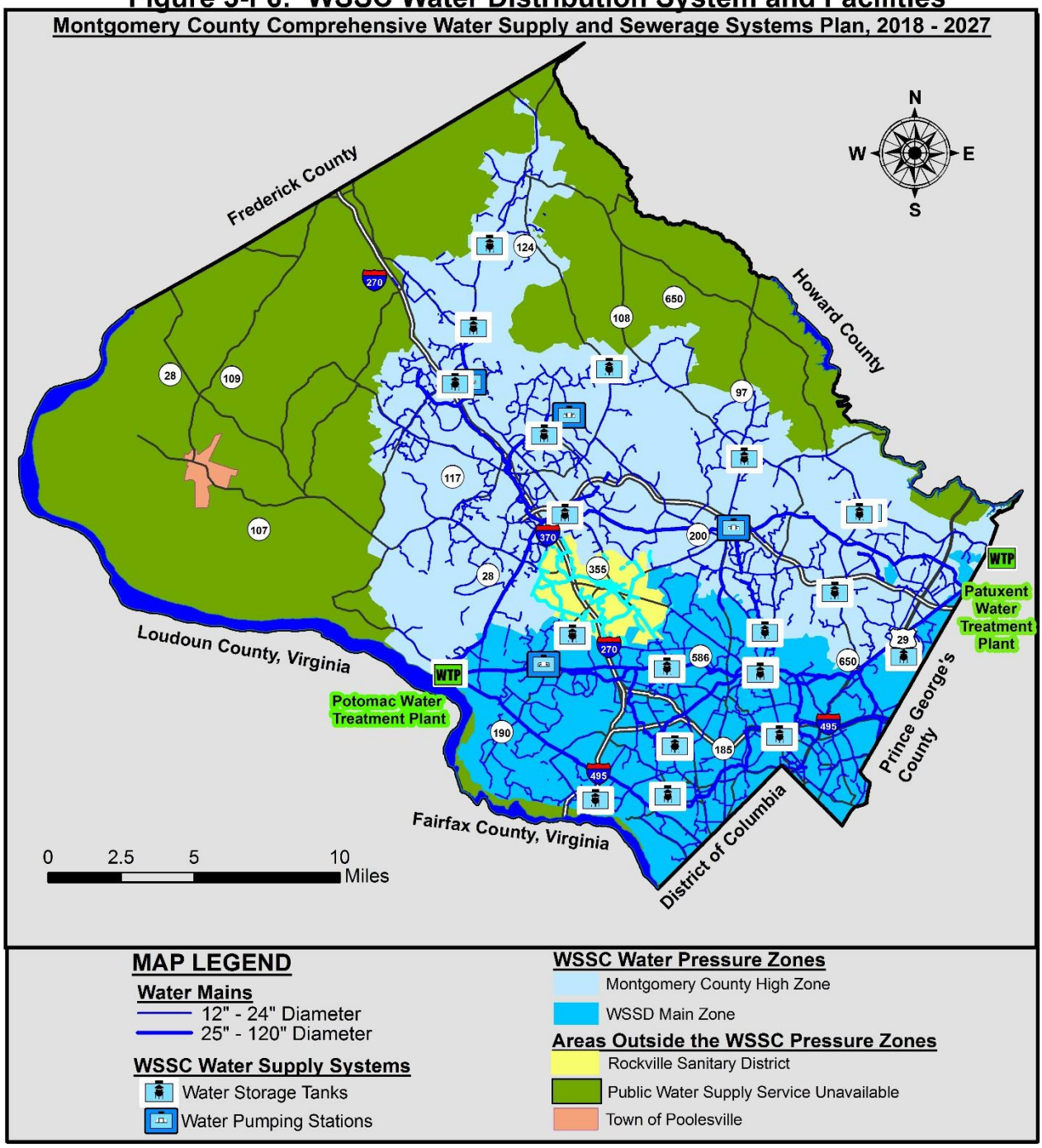


Table 3-T5: WSSC Water Pumping Facilities

MAJOR PRESSURE ZONE	Pumping Station	Capacity (MGD)
Montgomery County Main Zone	**Potomac Plant**	249.0
	Patuxent Plant	36.0
	Falls Road	7.8
Montgomery County High Zone	**Potomac Plant**	88.0
	Patuxent Plant	12.0
	Air Park	5.0
	Laytonsville	1.7
	Laytonsville	1.7
	Brink	8.0
	Cedar Heights	4.5
	Colesville	5.0
	Goshen Road	10.0
	Neelsville	10.8
	Norbeck	15.0
	Wheaton	25.5

II.E.3 - Water Transmission Mains: Major water transmission mains move finished water from WSSC's pumping stations into the various pressures zones, to their associated storage facilities, and ultimately to the smaller, local service mains which serve consumers. These mains generally decrease in diameter as they progress through the system from supply to the point of consumption, depending upon their relationship with other elements of the network. Major transmission lines (over 12 inches in diameter) are shown in Figure 3-F6. Transmission mains leading from the Potomac Filtration Plant consist of 36-inch and 60-inch lines for the High Zone; and 48-inch, 66-inch, and 96-inch diameter lines for the Main Zone. In 2015, construction was completed on the 84-inch Potomac Bi-County Supply Main in the Main Zone. This project significantly increased transmission capacity from the Potomac Water Treatment Plant to the Montgomery County Main Zone and to Prince George's County. Transmission lines leading from the Patuxent Filtration Plant consist of 20-inch, 24-inch, 30-inch, and three 42-inch lines.

II.E.4 - Water Storage Facilities: Associated with each water pressure zone are water storage facilities. These finished water storage facilities are important elements of the water distribution system, performing the following essential functions:

- Provide equalization storage during periods of peak water demand in order to reduce peak loads required on sources of water supply, filtration plants, pumping stations, and transmission pipelines.
- Provide an essential reserve capacity in meeting fire service demand and provide water pressure during short-term interruptions caused by localized power failures or the need for system repairs.
- Provide "cushions" to pump against while maintaining pressures within the distribution system in certain cases. The cushioning effect of stored water helps prevent damage to piping and other water distribution appurtenances arising from inadvertent surges in pumped water pressure and resultant damage from "water hammer" effects.

- Reduce capital costs required for relatively expensive transmission mains by strategic placement of adequate storage facilities.
- Permit the use of pumping equipment during periods of off-peak electrical demand.
- Provide better stabilized system flow rates and pressures over entire water service areas.

The determination of how much storage capacity each pressure zone and each individual facility requires varies widely between utilities. There are no national standards for determining acceptable levels for each of these storage purposes. WSSC has set its storage standards based on the generally accepted levels of reliability and risk. WSSC designs its water storage facilities to meet the following three storage volume criteria:

- **Equalization Storage:** Meets hourly fluctuations in demand, satisfying all hourly demands in excess of the maximum day demand.
- **Fire Protection Storage:** Provides high flow rates for fire protection required during a major fire automatically without the reliance on mechanical pumping systems, preventing substantial drawdowns or reversals in water system pressure.
- **Emergency Storage:** Maintains service during emergencies such as pipeline breaks, power outages, and equipment failure, providing 4 hours of maximum day demand.

In light of more recent operational, water quality and foreseen drinking water regulations with more stringent standards; WSSC has recently reevaluated and revised its criteria for water storage facilities. The revised storage volume criteria may be generally summarized as follows:

- **Equalization Storage:** 15% of the maximum day demand.
- **Fire Protection Storage:** 0.63 Million Gallons.
- **Emergency Storage:** 4 hours of maximum day demand.

When designing and siting a proposed water storage facility, WSSC staff first consider the need for elevated, gravity-fed storage within a pressure zone. Elevated storage provides advantages over ground-level, pumped storage in terms of greater system reliability and faster response time to flow demands. Because elevated storage structures have a greater potential for affecting the visual landscape of a neighborhood, WSSC designs and constructs facilities in an architecturally desirable manner to minimize the impact on the surrounding neighborhood. In rare cases, ground-level or below-ground-level storage may provide gravity-fed storage to a pressure zone, but only where sufficiently high ground elevations exist which allow for such facilities. WSSC develops siting studies for water storage facilities with the involvement of local community. WSSC traditionally locates water storage facilities within or at the periphery of the community water service envelope, which minimizes both transmission costs and intrusion into areas not intended for community service.

WSSC's efforts to develop aesthetically pleasing storage facilities are widely recognized. Examples of this practice in both Montgomery and Prince Georges County include the Germantown Elevated Storage Tank--or the "Big Blue Ball"-- on the Montgomery College campus, which is painted to resemble the Earth as seen from space; and the Airpark Tank near Montgomery Village in eastern Gaithersburg, which is designed to resemble a cluster of farm silos and the Patuxent Wildlife Research Center elevated water storage tanks which blend in with the natural setting of the environment. WSSC currently has 27 water storage facilities distributed throughout Montgomery County. Including the water storage reservoirs at the Potomac and Patuxent Filtration Plants, total available storage capacity is approximately 129 million gallons. The capacity of individual public potable storage facilities is indicated on Table 3-T6. The locations of WSSC's water storage facilities are shown in Figure 3-F6.

Table 3-T6: WSSC Water Storage Facilities Serving Montgomery County

Water Storage Facility	Total Capacity Million Gallons	Usable Capacity Million Gallons
MAIN ZONE		
Alta Vista Standpipe	0.475	0.158
Bradley Hills Standpipe 1	2.5	0.85
Bradley Hills Standpipe 2	2.62	0.88
Cabin John Elevated Tank	0.5	0.41
Falls Road Standpipe	3.24	1.27
North Woodside Standpipe	7.52	2.6
Wall Lane Standpipe	2.5	1.786
Wheaton Reservoir 1	4.0	3.956
Wheaton Reservoir 2	4.0	3.956
Wheaton Reservoir 3	15.0	14.75
Wheaton Reservoir 4	10.28	10.0
HIGH ZONE		
Air Park Elevated Tank	2.0	0.75
Brink Elevated Tank	1.0	0.67
Brink Reservoir	10.0	9.75
Cedar Heights Reservoir	2.45	2.25
Colesville Elevated Tank	2.2	1.375
Colesville Reservoir	1.0	0.95
Damascus Elevated Tank	1.5	1.48
Germantown Elevated Tank	2.0	1.78
Glenmont Elevated Tank	0.5	0.42
Goshen Road Reservoir	4.0	3.6
Hampshire Greens Elevated Tank 1	1.25	1.0
Hampshire Greens Elevated Tank 2	1.25	1.0
Hampshire Greens Elevated Tank 3	1.25	1.0
Laytonsville Elevated Tank	0.5	0.5
Olney Standpipe	2.54	0.762
Shady Grove Standpipe	5.05	3.08
TREATMENT PLANTS		
Potomac Plant Reservoirs	19.3	11.9
Patuxent Plant Reservoirs	18.4	6.025
TOTAL	**128.8**	**88.9**

I.E.5 - Distribution System Interconnections: WSSC serves or has system interconnections with the jurisdictions shown in Table 3-T7. Some of these jurisdictions have agreements with WSSC for water supply as everyday supply, and/or for emergencies only and/or to meet peak demands. If all supply commitments to other jurisdictions were fully utilized, including current withdrawals where no agreement exists, the total withdrawals would exceed 14 MGD.

Table 3-T7: Interconnections with the WSSC Water System

Jurisdiction	Allowable Withdrawal	Average Withdrawal
City of Bowie [A]	Not specified – emergency only	Not currently metered
Charles County	1.4 MGD	1.8 MGD [B]
Howard County	5.0 MGD	4.0 MGD
City of Rockville [C]	8.0 MGD	Negligible
Washington, DC	Not specified	Negligible

[A] Within Prince George's County.
[B] The additional withdraw has been allowed by WSSC as it has proven to be seasonally beneficial since it enhances water storage turnover which, in turn, assists in water quality within the far end of the water system. Charles County is currently performing a water supply alternatives study due to concerns with competing interests in the aquifer from which they withdraw. An increase in water supply allocation from WSSC is one of several alternatives being explored. At the conclusion of this study, regardless of whether an additional allocation from WSSC is requested, WSSC will enter into discussions with Charles County to amend the water supply agreement."
[C] Within Montgomery County; see Table 3-T13 for specific interconnection locations.

II.E.6 - Water Supply System Redundancy: This plan promotes general water supply system designs where large water pressure zones, such as the Montgomery County Main Zone and the Montgomery County High Zone, have equal and adequate protection from prolonged major service interruptions. Such service interruptions could include a filtration plant outage similar to that which occurred in 1977, which resulted in 15 hours of complete shutdown and 2.5 days of partial shutdown, or breaks in major transmission mains, or any other occurrence that could substantially reduce water service to WSSC customers. WSSC designs the water supply system within some pressure zones to allow it to also serve an adjacent pressure zone. WSSC uses interconnected pressure zones, the two sources of supply, and water storage facilities to accomplish this important mutual backup support capability.

There are a limited number of interconnections between the District of Columbia and WSSC systems in Montgomery and Prince George's Counties. However, the size and number of the interconnections are insufficient to adequately supply all water demands between the systems during emergency situations. At this time, there are no system interconnections which provide for substantial system redundancy from outside the WSSC service area. However, as of the date of this plan, the Metropolitan Washington Council of Governments (MW-COG) is working on a Regional Water System Redundancy Study with water systems in the D.C. Metropolitan Area. The objective of the study is to evaluate infrastructure improvements to enhance the reliability of the regional water system through increased raw and treated water interconnections.

The Patuxent Pumping Station that serves Montgomery County can provide up to 12 mgd to the High Zone and 36 mgd to the Main Zone during an emergency. WSSC has initiated planning for an expansion of this filtration plant's capacity (see Section II.F.2.).

Plan Recommendation: Investing in Major Water Supply System Infrastructure

Most of the water supply needs are addressed by the WSSC. As such, the Montgomery County Council directs the focus of WSSC's efforts by approving the WSSC's annual budget and the associated six year CIP. These documents in addition to this comprehensive water supply and sewerage systems plan allow the County Council to direct the policies and investments needed to meet the future needs of the County. In recent years the emphasis has been on investing in major water supply system infrastructure with a commitment to large diameter water main evaluations, rehabilitation and replacement efforts, particularly for the Pre-Stressed Concrete Cylinder Pipes (PCCP). Emphasis has also been placed on the sustainability of the small diameter water distribution pipes, adopting programs for the 1 percent replacement of these pipes. This program was adopted to allow a replacement interval of 100 years for these distribution mains, consistent with their expected useful life.

II.F - Projected Water Demand and Supply System Needs:

A critical role of the County's Water and Sewer Plan is not only addressing current water supply needs, but also projecting and adequately planning for future water needs based on the County's growth forecasts and historic water demand. The following sections provide the basis for and determination of future community water demand in Montgomery County. The Plan also provides a summary of the major capital facilities needed to satisfy that projected demand.

II.F.1 - Overall Water Supply System Demand: Table 3-T8 presents WSSC's daily average and maximum water production levels since 1995. Based on analysis of the latest water production and consumption data, WSSC has developed the following water demand per unit to be used for growth projections and planning water system improvements:

- Single-Family Dwelling Unit (SFDU):----------177.0 gallons per day (gpd)
- Employees:----------36.1 gpd
- Multi-Family Dwelling Unit (MFDU):----------146.8 gpd

Table 3-T8: WSSC Historic Water Production

Year	Average Production (MGD)	Maximum Day Production (MGD)	Ratio
1995	167.1	233.9	1.40
1996	161.3	198.9	1.23
1997	164.7	245.8	1.49
1998	166.6	219.8	1.32
1999	168.2	263.4	1.57
2000	162.0	200.8	1.24
2001	167.4	253.2	1.51
2002	164.8	221.8	1.35
2003	164.3	206.5	1.26
2004	168.1	210.4	1.25
2005	171.9	226.2	1.32
2006	169.2	224.9	1.33
2007	172.4	222.8	1.29
2008	162.7	251.1	1.54
2009	163.0	210.0	1.29
2010	175.4	232.8	1.33
2011	169.4	225.4	1.33
2012	163.9	226.2	1.38
2013	158.6	205.7	1.30
2014	161.7	205.0	1.27
2015	164.9	200.0	1.21

Note: Data includes all of the WSSC service area (Montgomery and Prince George's Counties)
MGD: Million Gallons/ Day
Source: WSSC- Planning Group – June 2016

WSSC has prepared water demand projections through the year 2040 for Montgomery County (Table 3-T9), using COG/M-NCPPC Round 8.1 population forecasts and current water use factors for single-family dwelling units, multi-family dwelling units, and employees.

Table 3-T9: Projected Average Daily Water Demands for Montgomery County

Calendar Year	Total Production - Million Gallons per Day (MGD)		
	Main Zone	High Zone	Total
2020	42.344	51.948	94.292
2025	43.601	56.202	99.803
2030	44.991	60.906	105.897
2035	46.122	63.136	109.258
2040	47.252	65.364	112.616

Note: Based on Round 8.1 Growth Forecasts and Per-Unit Production:
- Single-Family Dwelling Unit (SFDU): 177.0 gallons/day (gpd)
- Employees: 36.1 gpd
- Multi-Family Dwelling Unit (MFDU): 146.8 gpd

Source: WSSC Planning Group (2016 Water Production Projections)

To account for hourly variation in consumption and for the use and refilling of water storage facilities, consumption criteria must span at least a 24-hour time period. To account for seasonal variations, the criteria specifies the 24-hour period of greatest projected consumption within a given year, generally referred to as the maximum day consumption. The specific numbers are obtained by multiplying the average daily consumption for the year and the maximum day factor, and distributing the result over a typical 24-hour consumption pattern. The maximum day demand factor is the ratio of the peak day demand to the average day demand, and is used in sizing the capacity of the water system facilities. The current maximum day demand factor used by WSSC is 1.43 for system wide facilities, based on a 20% probability exceedance. Table 3-T10 lists WSSC's daily average and maximum water production projections and planned capacity for the Washington Suburban Sanitary District.

Table 3-T10: Projected Average Daily Water Demands WSSD

Calendar Year	Projected Demand (MGD)		Planned Capacity (MGD)* (Available Treatment Capacity) Daily Maximum
	Daily Average	Daily Maximum	
2020	180.8	255.7	398.0
2025	188.9	267.2	398.0
2030	197.8	279.6	398.0
2035	203.3	287.7	398.0
2040	208.7	295.2	398.0

** This is planned or available treatment capacity at both Potomac and Patuxent treatment facilities. The Daily Maximum Production at the Potomac Plant is 288 MGD. The Patuxent Plant is currently undergoing upgrades that will increase its capacity to 72 MGD (nominal) and 110 MGD (emergency).*

NOTE: The above data is based on the 2016 Water Production Projections report by WSSC Planning Group.

As shown in the preceding table, total water consumption is anticipated to increase in the future, as the population increases. Estimated water consumption at full development represents the average consumption expected when all parcels of land are developed to the extent allowed under current zoning classifications. Since zoning classifications for individual parcels may

change and the consumption factors used may also change, the full estimated development needs for production may change and are not shown in the preceding table.

The water demand projections noted above are based on the 2016 Water Production Projections Report. The 2016 update accounts for the local, regional, and national trends in per capita consumption which has been steadily declining due to water-saving fixtures and appliances. The rate of decline may shorten over time as market saturation occurs with plumbing upgrades to existing homes.

II.F.2 - Projected Water Supply System Needs: WSSC's standard practice to address the projected water supply system needs within WSSD is based on and in response to near-future and long-term (5 and 10-year priorities) needs and will be included in the WSSC's annual Capital Improvement Program (CIP). This includes projects related to needs assessment, planning, and project implementation involving facility upgrade and expansion.

WSSC uses several methods to fund the construction and operation of the water supply system needs. Detailed information concerning WSSC's funding methods is included in Chapter 1, Section IV.A. The current WSSC CIP budget document, and those for some prior years, are available through WSSC's budget webpage at: https://www.wsscwater.com/budget.

For specific information on any of these projects, please contact the appropriate agency or municipality.

As of the date of this Plan, WSSC is in the initial stages of a Water System Master Plan in which the overall capital needs of its water supply system is examined over the next 30 years. This will include raw water supply, water treatment, water transmission system and distribution networks. The plan will also address existing and future capacity needs, regulatory requirements, and rehabilitation/repair/replacement needs.

II.F.2.a - Projected Source Water and Treatment Facility Needs: The following sections include brief descriptions of major WSSC's current and planned studies and facilities needed to meet the projected treatment capacity at each of its water treatment plants.

- **Potomac Solids Handling:** The Potomac Water Treatment Plant's existing solids handling facility was designed to handle only a portion of the plant's solid load. Under terms of a 2016 Consent Decree, WSSC will study and plan facilities to capture additional solids from both sedimentation basins and filter backwash water, to comply with a new NPDES permit.
- **Source Water Protection:** Several efforts share the objective of protecting the source water in order to maintain a reliable water source. WSSC is an active participant in source water partnerships for both the Potomac River and Patuxent Reservoirs. WSSC works closely with the Interstate Commission on the Potomac River Basin, which is an advisory, non-regulatory interstate compact agency of the Potomac basin states. Additionally, a project to update the 2002 Potomac River Source Water Assessment by identifying upstream potential chemical contaminants is anticipated to be completed in 2016. WSSC also completed an Oil Spill Emergency Response Study in 2014 with the knowledge of the Colonial Pipeline river crossing just a few miles upstream of the Potomac Water Filtration Plant's intake.
- **Potomac Basin Corrosion Mitigation Project:** This project is designed to replace metallic components in the Plant's eight (8) sedimentation basins with materials more suitable to the seasonal low pH environment that results from the Commission's Annual

Low pH Enhanced Coagulation Program designed to reduce chlorine byproduct formation in the WSSC Water Distribution System. The project also includes modification to the basin cross collector chain drive tensioning system that is expected to reduce emergency maintenance activities to reinstall drive chains that disengage from lower (underwater) sprockets.

- **Potomac Submerged Channel Raw Water Intake:** This study is to develop alternatives and examine the construction of a new submerged channel raw water intake in the Potomac River. This raw water intake would serve as an alternate to the existing Potomac intake at the river channel's bank below the plant at the C&O Canal National Park. The implementation of this project would provide for several objectives including:

    - Provide an additional barrier against drinking water contamination (particularly *Giardia* cyst and *Cryptosporidium* oocysts) by drawing better and more consistent and stable raw water quality.
    - Enhancing plant operational reliability by avoiding the current problems associated with ice and vegetation blocking the existing bank withdrawal.
    - Provide desired operational redundancy during emergency situations.
    - Provide significant treatment cost reduction associated with solids handling and transportation, chemical use, and energy consumption.

    The project is expected to pay for itself over time based upon the reduced chemical usage, reduced solids handling, and reduced energy costs. This project is consistent with the industry's recommended multiple barrier approach and operational reliability and redundancy.

- **Patuxent Water Treatment Plant Replacement and Expansion:** Phase II of the Patuxent Water Treatment Plant Implementation project is currently under construction. The goal of the project is to support future growth and would include an expansion of an additional 16 MGD of nominal treatment capacity and the ability to provide up to 110 MGD of emergency capacity. A fourth raw water pipeline and modification and expansion of the Rocky Gorge Water Pumping Station will increase the raw water pumping / transmission capacity of the Plant. New ultraviolet disinfection facilities are also added to the Plant in order to comply with EPA regulations for *Cryptosporidium* treatment.
- **Drought Planning:** WSSC continues to maintain the Little Seneca Lake, a reservoir in Germantown, that can supplement the raw water supply in the Potomac River in the case of drought. The County recognizes that increased siltation and contamination in Little Seneca Lake may occur from the increased impervious surface coverage (new roads, sidewalks, houses, etc.) in the three main tributaries feeding the reservoir. In order to slow the rate of increase of runoff pollution entering the reservoir, the County has placed caps on imperviousness for new developments planned in the Ten Mile Creek watershed, along with reforestation goals.

II.F.2.b - Projected Distribution and Storage System Needs: This section includes brief descriptions of and explanations for major projects that are either currently underway or planned to address the water distribution system needs in the Montgomery County High Zone and Main Zone.

- **Germantown/Clarksburg Area Projects:** These transmission and storage projects are in response to the growth in the up-county area, primarily in Germantown and Clarksburg. These projects have been identified in the General Plan, the Clarksburg Master Plan, the

Montgomery County High Zone Facility Plan, the 1990 M-NCPPC Round 5 population forecasts, and numerous other studies.

- **Standpipe Replacement Projects:** Replacement of the existing Olney and Shady Grove Standpipes with elevated storage tanks will improve the control of chlorine (disinfectant) by-product residuals in the water supply system. Both standpipes have relatively large non-useable water storage that can contribute to by-product residuals problems.

II.F.2.c - Programs for Sustained Water Conservation and Waste Reduction: WSSC has a variety of programs to promote water conservation. These efforts include:

- **Water Conservation Plan:** Maryland Department of the Environment (MDE) requires the WSSC to prepare a Water Conservation Plan as a condition of the Water Appropriation Permit for the Potomac Water Filtration Plant. The objective of this Water Conservation Plan is to provide an overview of the water conservation initiatives undertaken by WSSC as required in the Water Appropriation Permit.

This Water Conservation Plan follows the guidelines and format presented in MDE's *Guidance for Maryland Public Water Systems and Best Management Practices for Improving Water Conservation and Water Efficiency* published in 2010 and the U.S Environmental Protection Agency's *Water Conservation Plan Guidelines* published in 1988.

The WSSC water conservation goals are also based on long term water resources management and infrastructure funding policy. The goals will enable the most efficient use of the existing water resources and save valuable resources over the long term, while providing safe and reliable drinking water to the community. WSSC's Water Conservation goals include;

  - Conducting an annual water audit to account and control water loss
  - Improving the utilization and extending the life of existing facilities
  - Improving drought or emergency preparedness
  - Educating customers about the value of water
  - Protecting and preserving environmental resources
  - Promoting environmental stewardship and sustainability

- **Public Outreach and Education Programs:** WSSC provides educational brochures which promote the importance of water conservation (including its relationship to reduction of wastewater loads) and to acquaint County citizens with the "tools" available to accomplish conservation. Special projects focus on water-saving and to promote the use of "common sense" tools of conservation in existing customer units. These projects include the distribution of WSSC's Bottle Kit/Dye Pill distribution and 3 gpm shower flow controls, water-saving idea and conservation poster contests, sponsorship in cooperation with the Montgomery County Recreation Department of "Plumbing Repair Clinics"; and other activities timed to reinforce and to support the WSSC's public education efforts.

  WSSC is also a partner in COG's Wise Water Use campaign, a regional program which is coordinated with the 2002 Metropolitan Washington Water Supply and Drought Awareness Response Plan for the Potomac River System. The campaign represents the plan's response to "normal" water supply conditions and includes many ideas for water conservation by users. WSSC provides the largest single source of funding for the regional campaign.

- **Plumbing Code:** Federal regulations require the installation of water saving fixtures (e.g., toilets, shower heads, and sink faucets) in new installations and in all applications where plumbing fixtures are being replaced. In 2007, the WSSC Plumbing Code incorporated the International Plumbing Code (a model code) that enables greater regulatory consistency with surrounding jurisdictions and employs the latest federal regulations and industry standards for water conservation. Approximately every 2 to 3 years WSSC publishes and updated version of the Plumbing and Fuel Gas Code, with the most recently updated version published in 2015. In addition, the WSSC is working with Montgomery County DEP to develop Water Re-use regulations that will reduce potable water dependencies. Re-use considerations include Graywater and Rainwater Harvesting Systems where recycled and treated non-potable water can be used at certain plumbing fixtures such as toilet and urinal flushing or as make-up supply to various closed mechanical systems.

- **Rate Structure:** WSSC uses a conservation-oriented water/sewer rate structure, which is based on Average Daily Consumption (ADC) in each metered billing period. The rate structure, in effect, charges lower rates per 1,000 gallons for the individual customer unit's total volume of consumption in the lower level of ADC. The billing rates are scaled up on progressively increasing 16 steps as the customer unit's ADC moves up.

Plan Recommendation: Local and Regional Water Conservation Programs

In reference to local and regional water conservation programs, this Plan urges the County's public agencies to lead by example with respect to water conservation measures. These conservation efforts are promoted by several mechanisms that require continued review and evaluation to be effective. Plumbing codes, water rates and unaccounted water use emphasized as key factors in ensuring efficient use of water resources for water supply needs.

II.F.3 - Cross-Connection Control Program: The WSSC operates a Cross-Connection Control Program to minimize the risk of contamination to the public and private water distribution systems. Federal and State regulations require this program be administered by all water purveyors

a. Backflow - Contamination is possible at various end use plumbing fixtures and water utilizing equipment due to backflow unless *backflow preventers* are installed to eliminate the condition.

b. New Plumbing Systems - New plumbing systems shall have the proper level of backflow prevention as mandated and inspected through the permitting and inspection processes currently required by the WSSC Plumbing Code. Typically, water supplied to utilizing equipment with a high degree of hazard requires installation of a testable backflow prevention assembly to isolate that equipment and only allow water to flow into (and not back from) that hazard.

c. Follow Up Enforcement – Testable backflow preventers require annual testing by property owners to ensure the assembly is functioning within acceptable parameters. WSSC employs two methods to ensure program compliance:

   i. Administrative – WSSC will utilize an interactive database with the capacity to send reminders and/or trigger greater enforcement actions where tracked backflow prevention assembly testing is not kept current.

   ii. Inspections – WSSC will utilize field inspections to ensure required testing is being performed and to visually inspect for system alterations or deficiencies that result in unprotected water outlets and issue corrective directives accordingly.

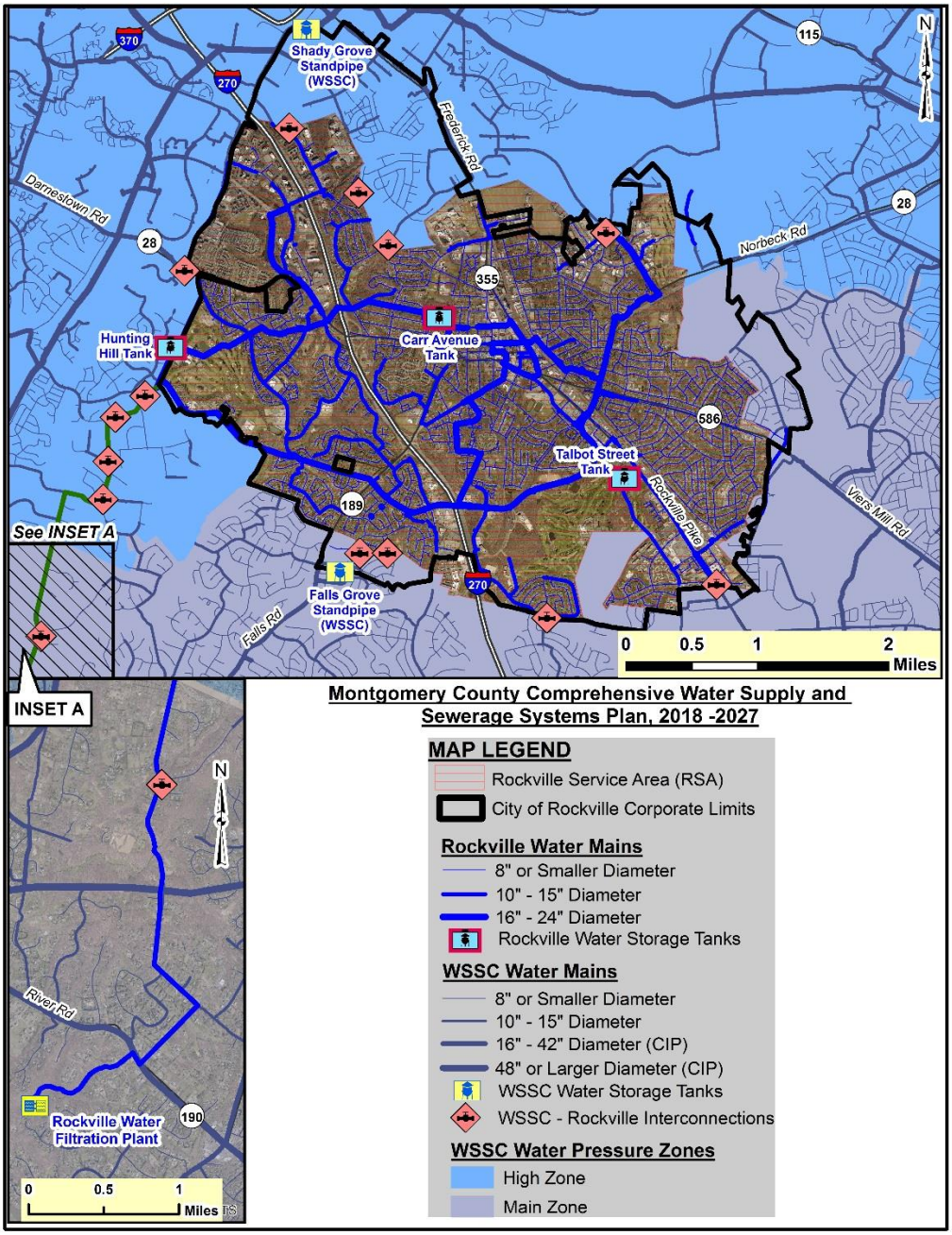
II.F.4 - Facility Planning: WSSC performs a comprehensive study, called a facility plan, for each major project to balance the technical components of engineering and economic factors with environmental issues and public concerns about the design and construction of the project. The study process identifies alternative approaches and their impacts, obtains technical information about alternatives, and determines measures to minimize or mitigate community and environmental impacts. A facility plan determines ways to meet system demands with sufficient lead time in order to avoid a reduced level of service to customers, and to gather and incorporate public input into the technical work.

II.F.5 - Financing the Water Supply System: WSSC uses several methods to fund the construction and operation of the water supply system. Detailed information concerning WSSC's funding methods is included in Chapter 1, Section IV.A. of this Plan. The current WSSC CIP budget document, and those for some prior years, are available through WSSC's budget webpage at: https://www.wsscwater.com/budget.

III: ROCKVILLE SERVICE AREA

The City of Rockville owns and operates its own water supply system, separate from the WSSC community system, from source water to distribution. The City provides community water service to an area located within the corporate limits of Rockville and outside the designated limits of the Washington Suburban Sanitary District (WSSD). Properties located within the City's maximum expansion limit (MEL) and outside the WSSD are eligible to receive water service from Rockville upon annexation into corporate limits of Rockville. The approximate boundaries of Rockville Service Area are shown in Figure 3-F7.

Figure 3-F7: Rockville Service Area and Water Distribution Systems



III.A: Service Policies

Approximately 70 percent of Rockville residents and businesses receive their water from the City's Filtration Plant and distribution system. The remaining 30 percent receive water from WSSC. Periodically, the city's corporate boundary changes through property annexations. Historically, most annexations were driven by the property's location outside the WSSD. By code, Rockville provides water and sewer service only to properties located within its corporate limits. Accordingly, the City requires that properties located within the MEL, and outside of both the corporate limits and the WSSD must annex into Rockville to receive public water and sewer. (See Figure 3-F7).

III.B: Water Supply Source

Rockville draws raw water from the Potomac River at an intake structure located on the east bank of the river at Sandy Landing Road on the C&O Canal, approximately 0.8 mile southeast of Swains Lock and five miles southwest of the city. Aside from several interconnections with the WSSC water supply system (see Section II.E.3.), this facility functions as the City's only water supply source.

Rockville received its first Water Appropriation and Use Permit from the State of Maryland in 1958. The State issued this permit for a daily average of 5.5 MGD and a maximum daily withdrawal of 8.0 MGD. In May 2002, the State issued a Water Appropriation and Use Permit to Rockville increasing the daily average to 7.1 MGD and increasing the maximum daily withdrawal to 12.1 MGD. In 2014, the State issued a Water Appropriate and Use Permit to Rockville, without any changes from the 2002 permit.

III.C: Water Source Policies and Drought Management

Because they share a common raw water source, the Potomac River, Rockville and WSSC also share some of the same policies and agreements affecting their use of the river, especially during drought events. The City of Rockville abides by the 1978 "Low Flow Allocation Agreement" when the restriction stage is declared in the Washington Metropolitan area as required by MDE's Water Management Administration. Rockville is accorded the same status as the WSSC under the Maryland Drought Monitoring and Response Plan. The City is also a signatory of the 1994 "Metropolitan Washington Water Supply Emergency Agreement" and the COG Drought Management Plan (See Section II.B.). Notwithstanding, the City has an agreement, which was executed in 2010, with WSSC which allows the City to request as much as 8 MGD of water from the WSSC system to respond to emergencies and to meet peak demands. Rockville's water supply system benefits from water supply releases from the Jennings Randolph Reservoir and Little Seneca Lake; the Washington Metropolitan Area water suppliers and the City have entered into discussions about Rockville's financial participation.

III.D: Water Treatment Facility

The Rockville Water Filtration Plant has intake capacity of 14 MGD and a treatment capacity of 8 MGD. The treatment capacity is being increased to 12 MGD. As water demands are nearly flat, decreasing slightly over the last ten years even though customer growth is increasing slightly, Rockville has no plans within the next ten years to expand the treatment capacity of its Water Filtration Plant. When the Water Filtration Plant components were being updated and replaced from 1996 to 2004, many unit processes were designed and constructed to meet 14 MGD demand. Currently, the Plant generally operates in a range of 4.5 to 7.9 MGD (average day demand to peak day demand). (See Table 3-T11.)

Table 3-T11: RSA Water Treatment Facility				
Facility Owner/Operating Agency Plant Location & Coordinates	**Water Source Treatment Type**	**Rated Plant Capacity Average Production Maximum Peak Flow Storage Capacity**	**Sludge and/or Filter Backwash**	**Status/Comments**
Rockville Filtration Plant City of Rockville Sandy Landing Road N433,000/E734,500	Potomac River sodium hydroxide, ferric chloride, flocculation, filtration, chlorination, fluoridation	capacity: 8.0 MGD production: 4.7 MGD peak flow: 8.0 MGD storage: 11.2 MG	land application	Expansion to 12 MGD capacity approved in 2011. Interconnections with WSSC allow the City to draw up to an additional 8 MGD from WSSC in emergencies.
See Table 3-T3 for information on WSSC's filtration plants.				

Between 1996 to 2004 Rockville implemented multiple CIP projects to upgrade its then 40-plus-year old Water Filtration Plant and to meet the 1986 amendments to the Safe Drinking Water Act of 1974. Although the main objectives of most of these projects were to update the old plant and to meet higher EPA standards, the City also designed and implemented these projects to meet projected higher water demand, based on Rockville's 2002 Master Plan. Since 2009 Rockville continued to implement CIP projects primarily to meet EPA's Stage 2 Disinfectants and Disinfection Byproducts Rule, but also to continue to upgrade the now 60-year old Plant. These projects are addressed under Section III.E.5.

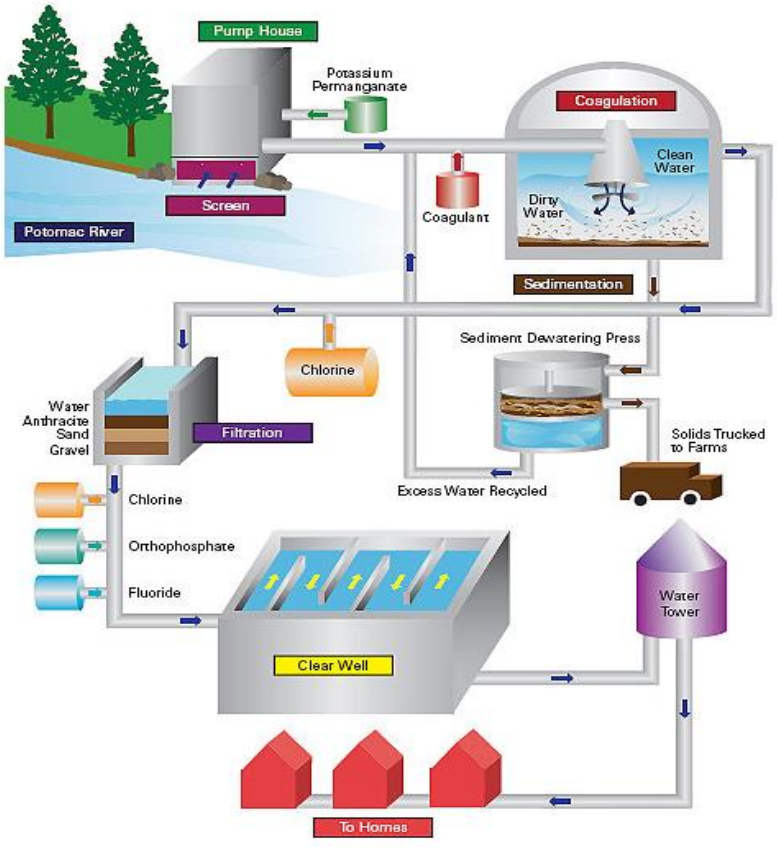


Diagram of Rockville's water treatment process.

III.E: Water Supply Distribution and Storage System

Rockville maintains its own water distribution system, supplying water service to residents, businesses, and institutions within the Rockville corporate limits and outside the WSSD. The major elements of that system are as follows.

III.E.1: Pumping and Major Transmission Facilities

Treated water leaving the Rockville Water Filtration Plant is pumped through 27,940 feet of 24-inch prestressed, steel cylinder, concrete pipe before it enters the distribution system at Glen Mill Road and Veirs Drive. In 2006 Rockville constructed a pump station on Glen Mill Road to meet projected growth demands of the water system. However, similar to the overall Washington Metropolitan area, Rockville's per capita demand is decreasing and accordingly Rockville has not experienced growth of the water demand as previously anticipated. Therefore, the existing Water Filtration Plant is still capable of providing water to meet peak water demand for Rockville customers. Rockville has only one primary water service pressure zone (Main Zone) with three smaller pressure zones (Tower Oaks, Rockville Pike and Twinbrook Zone) controlled by pressure reducing valves and no intermediate pumping stations. The major distribution system consists of 24-inch, 20-inch, and 16-inch trunk mains. (See Figure 3-F7.)

III.E.2: Water Storage Facilities

The City has three potable water storage facilities ranging in capacity from 0.2 to 8.0 million gallons (MG) with total storage capacity of 11.2 MG. One of the storage tanks, Talbot Street Tank (1 MG), was removed from service in 2014. Therefore, Rockville no longer includes the 1 MG of storage in the capacity determination. The capacities of individual public potable storage facilities are indicated on Table 3-T12.

Table 3-T12: Water Storage Facilities - City of Rockville

Storage Facility	Capacity (Million Gallons)
Carr Avenue Tank	3.0
Filter Plant Clearwell	0.2
Hunting Hill Tank	8.0
Talbot Street Tank*	0.0
Total	**11.2**

**Removed from service in 2014. Talbot Street tank has been disconnected from the system and will be demolished in the future.*

III.E.3: Water System Redundancy

Existing interconnections with the WSSC water system are listed on Table 3-T13. These interconnections serve primarily to increase the flow for available fire protection and to serve as an automatic emergency water source. In 2016 WSSC contacted Rockville to explore disconnecting some of the interconnections along Glen Mill Road. The maximum allowable withdrawal from WSSC is 8 MGD based on the City's 2010 agreement with WSSC. Since 2010, the City's withdrawals from the WSSC system have ranged from 0.1 MG to 568 MG; with the lower withdrawl amounts typically associated with intermittent Plant outages and the larger withdrawal amounts typically associated with prolonged plant outage for Plant upgrades or significant system failures resulting in prolonged water purchase. In 2010 Rockville withdrew approximately 568 MG, during a three-month period, while the City repaired its 24-inch transmission main. The City typically uses WSSC water to support planned outages at the Plant to make improvements at the Plant. Occasionally, the City uses WSSC water during non-planned outages at the Plant, which occur when system components fail or during a significant water main break.

Table 3-T13: Existing Interconnections with WSSC - City of Rockville			
Diameter Size (inches)	**Location**	**Diameter Size (inches)**	**Location**
12	Redland Rd. and Piccard Dr.	8	Stratton Dr. and Dunster La.
8	College Pkwy. north of Nelson St.	24	Glen Mill Rd. and Circle Dr.**
8	Wintergreen Terr. and Larkspur Terr.	24	Glen Mill Road and Lakewood Drive**
12	Southlawn La. south of E. Gude Dr.	24	Glen Mill Rd. and Lloyd Rd.**
16	Rockville Pk. and Rollins Ave.*	24	Glen Mill Rd. and Pheasant Drive**
12	Montrose Rd. and Farm Haven Dr.	24	Glen Mill Rd. and Valley Drive**
8	Dead end of Rothgeb Drive*	6	Dunster Lane and WSSD Boundary
6	Canterbury Way and WSSD Boundary	12	Shady Grove Rd. and Darnestown Rd.

** Piped connection is unconfirmed*
***WSSC may remove the interconnection in the future*

III.E.4: Projected Water Demand

The average daily production for 2010 was 5.04 MGD with a maximum day of 7.3 MGD. The average daily production for 2006 was 4.97 MGD with a maximum day of 7.9 MGD. Water production has trended downward slightly over the last ten years, even though Rockville's service population is slightly increasing, as shown below.

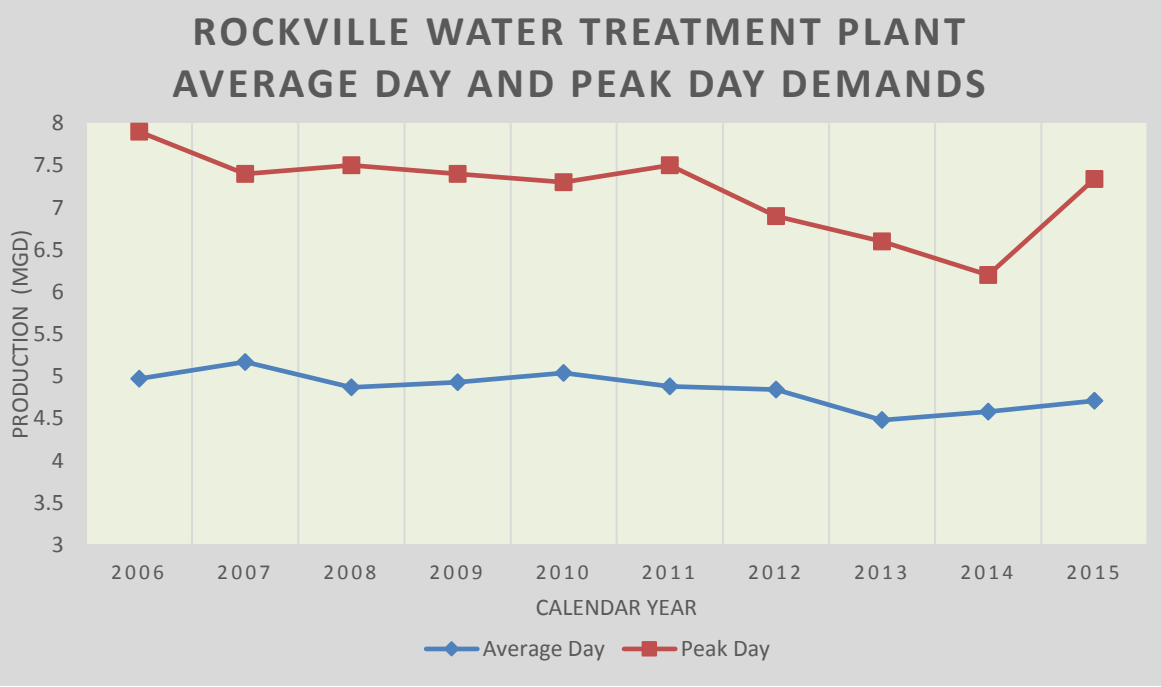


Table 3-T14 shows the following information: population projections for that part of Rockville outside the WSSD (Rockville's service customers), projected water demands, and planned water plant capacity. The average day demand for 2010 was 5.04 MGD with a maximum day demand of 7.3 MGD. The maximum daily demands are projected to be 9.2 MGD in 2030 and 9.8 MGD in 2040, both of which exceed the Plant's existing capacity.

Table 3-T14: Projected Water Supply Demands and Planned Capacity City of Rockville

Calendar Year	Rockville Service Population	Projected Demand (MGD)		Planned Capacity (MGD) Daily Maximum
		Daily Average	Maximum Daily	
2010*	46,300	5.04	7.3	8.0
2030	65,000	6.16	9.2	12.0
2040	65,700	6.55	9.8	12.0

Source: 2010 Rockville Water Resources Element (WRE)
Note: Average peaking factor of 1.5 was used based on WTP production records from 2006 to 2015.
*Actual

III.E.5: Projected Water Supply System Needs

Between 1996 to 2004 Rockville implemented multiple CIP projects to upgrade its then 40-plus-year old Water Filtration Plant and to meet the 1986 amendments to the Safe Drinking Water Act of 1974. Although the main objectives of most of these projects were to update the old plant and to meet higher EPA standards, the City also designed and implemented these projects to meet projected higher water demand, based on Rockville's 2002 Master Plan. The first major Water Plant project, which was completed in 1996, was the addition of the filter press. Other projects that were completed in the early 2000's include Rehabilitation of the Intake Structure (1999), Clarifier Upgrade (2000), Filter Rehab (2003), Water Plant Pump Upgrade (2005) and the Glen Mill Pump Station (2006). Since 2009 Rockville continued to implement CIP projects primarily to meet EPA's Stage 2 Disinfectant and Disinfection Byproducts Rule, but also to continue to upgrade the now 60-year old Plant. In 2009 Rockville received American Recovery and Reinvestment Act (ARRA) funding to upgrade and improve energy efficiency of the HVAC systems; raw water, solids transfer, chemical feed, and solids press pumps; instrumentation; and control panels. Other recent CIP projects include: improving Sanding Landing Road (2012), Upgrade Residual Handling (2016), Air Scour (2016), Ferric Chloride (2016), SCADA Improvements (2016) and Water Main Rehabilitation (2008 – current).

In 2008 Rockville initiated a program to rehabilitate the water mains within the distribution system. The primary goal of this program is to improve flow for fire protection. However, the water main rehabilitation program also improves localized water quality and over time will decrease the number of water main breaks. Rockville's water main rehabilitation program is on a 100-year cycle; water mains will be rehabilitated or replaced every 100 years. Initially, Rockville is focusing on removing cast iron water mains which are severely tuberculated and replacing them with lined ductile iron water mains.

Rockville will continue to address aging infrastructure issues at the Water Treatment Plant and more stringent environmental regulations as they are promulgated by EPA and MDE.

Projected water treatment and area distribution system projects intended to address aging infrastructure, EPA regulations and anticipated demands for Rockville water service include:

- Water Main Rehabilitation to improve fire flow within the distribution system
- Water Tank Improvements to extend the life of the water tanks
- WTP – Clarifier Improvements to extend the life of Clarifier No. 1

- WTP - Electrical System Upgrade to replace outdated electrical components and extend the life of the electrical system at the WTP
- SCADA at WSSC Interconnects to provide real time monitoring of WSSC usage

TABLE 3-T15 Immediate, 5-, and 10-Year Priorities for Water Supply Development City of Rockville

Fiscal Year -- Project Number	Location	Description	Estimated Costs*			Project Status - Construction Start	
			Total	Federal and/or State	Local	Immediate Priority Projects	Five and Ten Year Period Projects
2017	Glen Mill Rd and Carr Ave	Rehabilitate two Water Storage Tanks	$3.7 M	None	100%	Rehabilitate Water Tanks to extend useful life	Hunting Hill tank – Spring, 2017; Carr Ave Tank – Fall, 2017
2016 - Future	Varies	Replace Water Mains (20 miles over the next ten years)	Average $2.9 M / year	None	100%	Varies	Varies
2022	Sanding Landing Road	Replace Main components of Electrical System at the WTP	$5.7M	None	100%	Adopted FY2017 CIP proposes design in 2020 and construction in 2022	
Beyond 2021	Sandy Landing Road	Replace clarifier mechanism	$2.4 M	None	100%	Project deferred to allow Water Fund to meet Financial Policy Goal by 2021.	Adopted FY2017 CIP proposes construction beyond 2021.
Beyond 2021	SCADA at WSSC Interconnections	Real time monitoring of WSSC water usage at interconnections.	$0.4M	None	100%	Project deferred to allow Water Fund to meet Financial Policy Goal by 2021.	Adopted FY2017 CIP proposes construction beyond 2021.

* Based on Costs from Adopted 2017 - 2021 CIP

III.E.6: Financing Water Systems

Information on the City's water systems financing is included in Section IV.B of Chapter 1. Additional information on Capital Program for the City of Rockville is available at: http://www.rockvillemd.gov/index.aspx?NID=1071

IV: TOWN OF POOLESVILLE:

The Town of Poolesville, located in western Montgomery County (see Figure 3-F1), has operated its own community water supply, storage, and distribution system since 1964. It is the only community water supply system in the County which relies on groundwater for its source water supply. Poolesville's water supply system serves only residences, businesses and institutions within the town, forming a sanitary district concurrent with the Town's corporate limits and exclusive from the WSSD.

IV.A: Water Supply Source:

The Town presently has nine municipal groundwater wells in operation, which have a combined total average constant sustainable yield per day of 728 gallons per minute (gpm), or 1,048,320 gpd (assumes 24 hours pumping).

All of Poolesville's wells are equipped with flow regulating valves and have been set to specific pumping rates to ensure that each wells' major water bearings zones are not dewatered. These rates were determined by continuous 30-day pumping of individual wells during drought conditions and do not take into account any interference that may occur between wells if they were pumped simultaneously for 30 days.

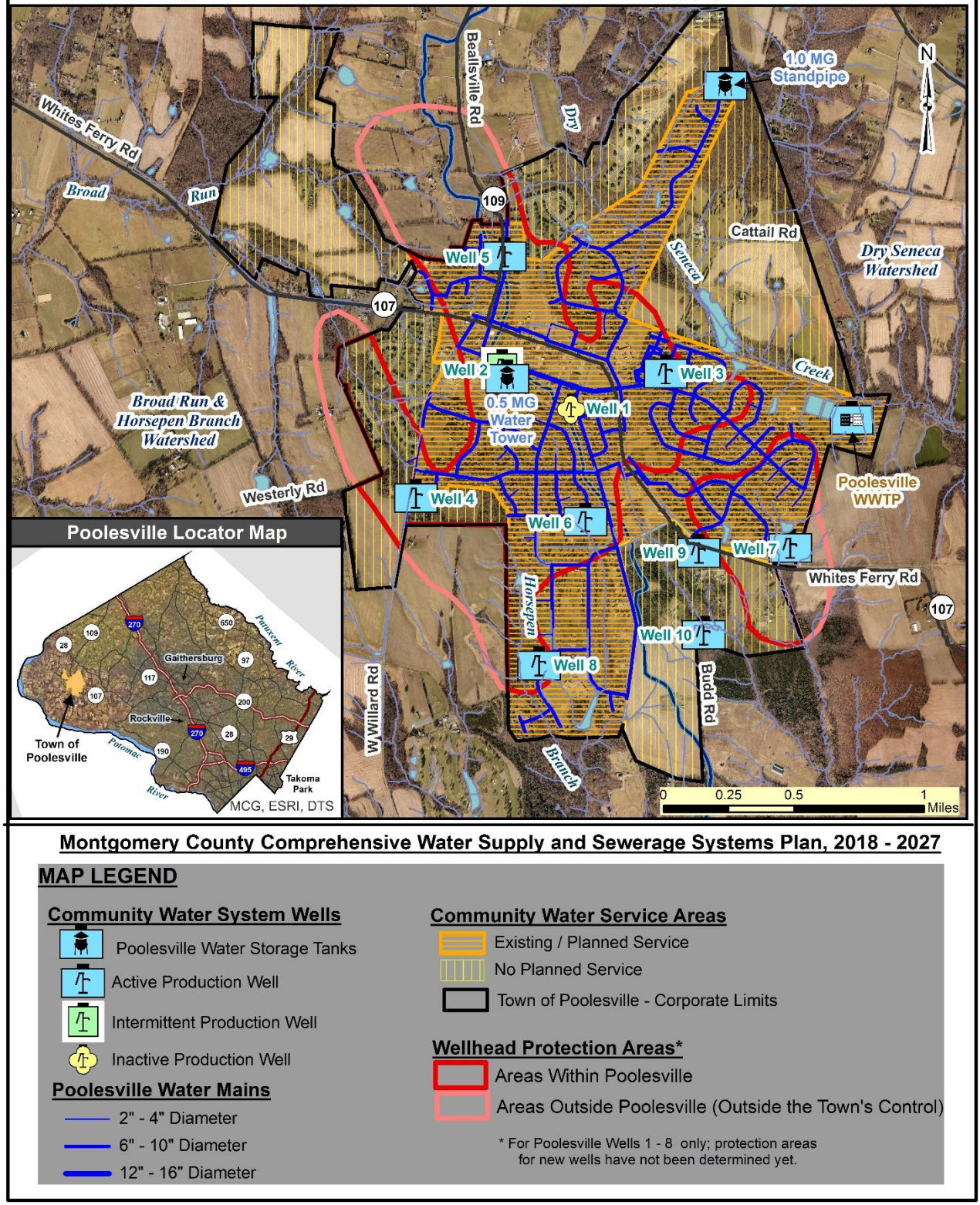
Poolesville's groundwater quality is very good and requires minimal treatment. All wells are treated with chlorine, as mandated by the Safe Water Drinking Act. In addition, well #2 utilizes a cartridge filtration unit due to signs of possibly being under the direct influence of surface water. Well #7 & 9 are tied together for one point of entry and are equipped for radon and uranium removal.

The Town currently withdraws groundwater from the New Oxford Formation aquifer and has four watersheds within its corporate boundaries: Horsepen Branch, Broad Run, Dry Seneca Creek, and Russell Branch. In 2008, MDE issued the Town new Water Appropriation and Use (WAU) permits for the Horsepen Branch, Dry Seneca Creek, Broad Run and Russell Branch watersheds. The total of the four watershed appropriation permits is 650,000 gpd for an annual daily average and 910,000 gpd for the daily average of the month of maximum use.

According to MDE, on a yearly basis the Town has a total daily average of 651,000 gpd (452 gpm) of groundwater theoretically available within the corporate boundaries. The permitted groundwater yields for both the Horsepen and Russell Branch watersheds are essentially "tapped out." The Dry Seneca Creek and Broad Run watersheds have an additional 52,500 gpd (36 gpm) and 92,500 gpd (64 gpm) of available groundwater supply on a daily average basis, respectively.

The Town wells and available groundwater supply per watershed are described on Tables 3-T16 and 3-T17, respectively, and are mapped in Figure 3-F8.

Figure 3-F8: Poolesville Community Water Supply Systems



Montgomery County Comprehensive Water Supply and Sewerage Systems Plan, 2018 - 2027

MAP LEGEND

Community Water System Wells
- Poolesville Water Storage Tanks
- Active Production Well
- Intermittent Production Well
- Inactive Production Well

Poolesville Water Mains
- 2" - 4" Diameter
- 6" - 10" Diameter
- 12" - 16" Diameter

Community Water Service Areas
- Existing / Planned Service
- No Planned Service
- Town of Poolesville - Corporate Limits

Wellhead Protection Areas*
- Areas Within Poolesville
- Areas Outside Poolesville (Outside the Town's Control)

* For Poolesville Wells 1 - 8 only; protection areas for new wells have not been determined yet.

Table 3-T16: Available Groundwater Supply by Watershed – Town of Poolesville

Watershed - Community System Wells	Area (Acres)	Theoretically Available Groundwater (gpd)	Ave. Daily Allocation (gpd)	Max. Monthly Average Allo-cation (gpd)	Potential Well Yields (gpd)	Ave. Daily Remaining Available Groundwater (gpd)
Horsepen Branch Wells 2,4,6, & 8	588	149,00	293,00	388,000	597,600	0
Broad Run Well 12	551	140,000	47,500	66,600	66,600	92,500
Dry Seneca Creek Wells 3, 5, & 13	973	247,000	194,500	273,400	303,400	52,500
Russell Branch Wells 7, 9, & 10	450	115,000	115,000	182,000	359,000	0
Totals	**2,562**	**651,000**	**680,000**	**910,000**	**1,326,600**	**145,000**

Table 3-T17: Inventory of Existing Community System Wells – Town of Poolesville

MDE Appropriation Permit	Well Name or Number	Aquifer	Coordinate Location	Depth (Feet)	Diameter (Inches)	Ave. Constant Sustainable Yield (gpm) [A]	Potential Daily Yield (gpd) [B]	Water Quality
#M01970G007 (10)	2	New Oxford Formation	N477,190 E682,120	453	6	100	144,000	Good
#M01970G107 (01)	3		N477,190 E685,030	285	6	60	86,400	Good
#M01970G007 (10)	4		N477,000 E680,000	600	6.5	40	50,400	Good
#M01970G107 (01)	5		N479,350 E681,850	500	6	100	144,000	Good
#M01970G007 (10)	6		N474,000 E684,000	500	6	110	187,200	Good
#M01970G207 (01)	7		N543,500 E687,500	700	8	45	72,000	Good
#M01970G007 (10)	8		N472,000 E637,500	500	8	65	86,400	Good
#M01970G207 (01)	9		N534,100 E1,198,275	800	8	125	179,600	Good
#M01770G207 (01)	10		N532,950 E1,198,360	762	8	0	0	---c
#M01970G007 (11)	11		39.132923-77.406878	1,200	8	100	144,000	Good
#M02004G006 (01)	12		39.142113-77.421577	466	8	72	108,000	Good
#MO2004G003 (01)	13		39.153584-77.415215	500	8	51	93,600	Good
TOTAL						**868**	**1,249,920**	

[A] *Based on well yield data and pump tests performed by the Town. Source: Town of Poolesville.*
[B] *Assumes 24 hours of pumping per day.*
[C] *The Town removed Well #10 from service due to iron bacterial contamination.*

IV.B: Source Water Protection Programs:

Poolesville's groundwater is generally of high quality. It meets all current drinking water standards and requires minimal treatment before it reaches the tap. In recent years, the Town has developed protective legislation to reduce the threat to groundwater from contamination arising from stationary sources. A threat from mobile sources of contamination will always remain from tank trucks carrying such products as gasoline, home heating fuel and pesticides. Appropriate contingency plans for this occurrence has been developed as part of the Wellhead Protection Plan and Emergency Response Plan. The Town will continue to develop one or more additional well fields as far removed from potential sources of contamination as possible. Further, the Town will pursue abandonment of In-Town private well and septic systems to limit this as a potential source of groundwater contamination. The Town views their Wellhead Protection Area as all land within the corporate boundaries and, in some cases, extending beyond the corporate limits. The Wellhead Protection Plan ensures a degree of certainty that the present planning process that reviews new development applications and changes in use provides protection for the Town's water supply.

Naturally occurring alpha emitters have been found in Poolesville's ground water, as well as in other area communities using ground water across the nation. Alpha emitters are naturally occurring radioactive elements in the earth's crust, and radioactive decay products. The most common alpha emitters in drinking water are radium, radon and uranium. Most of the radionuclides in drinking water occur naturally and are not considered a public health concern at very low levels. Due to the presence of some higher concentration of alfa emitters in Poolesville groundwater supply, the Town has installed uranium treatment systems on three of its wells and is planning to install additional radon removal systems in the future. The Town of Poolesville monitors for alfa emitters and the results are reported to MDE on regular basis. The Town's drinking water quality meets State and Federal regulatory compliance levels for Alpha Emitters and the results are published in the Town's Annual Water Quality Report.

The U.S. EPA has designated the Town's groundwater supply as part of a Sole Source Aquifer. Please refer to Section V.B.2. on this Chapter for additional information.

IV.C: Water Distribution System:

The Town of Poolesville has one pressure zone maintained by nine well pumps and two storage facilities. These two water storage facilities have a combined capacity of 1.5 million gallons. The storage facilities provide the Town with several days of capacity to respond to unexpected and non-catastrophic events such as well pump malfunction or water line breaks (see Figure 3-T8). The one-million-gallon ground level standpipe storage tank has a booster pump station with a capacity of 1500 gpm. Under normal operating conditions, the standpipe tank operates via gravity. The Town has approximately 110,000 feet of water mains ranging in diameter from 1" to 16".

IV.D: System Redundancy:

The Town of Poolesville currently has no immediate means of obtaining additional water supply other than the Town's existing wells. The two closest potential connection points with the WSSC water system are located in Darnestown along Route 28 and south of Darnestown along River Road and are a considerable distance (approximately seven and twelve miles, respectively) from Poolesville (no planning has been initiated to provide for future interconnections). The Potomac River, a possible source of surface water, is located approximately 4 miles from the Town.

Although the Town does not have an alternate source, redundant wells have been drilled and placed in service beyond the allowable withdrawal permit in the event of a watershed being contaminated or any other catastrophic event that might impact a portion of the well system.

Nonetheless, the Town has recently applied to the Maryland Department of the Environment (MDE) to add an additional redundant Well #14 to the system. Construction of the well, if approved, should take place sometime during 2017.

IV.E: Projected Growth and Water System Demand:

The Town's current six-year Master Plan, adopted in December 2011, establishes a population not to exceed 6,500 in the foreseeable future. In March 2002, the Town adopted a policy whereas the existing wells connected to the system are for current residents. Any additional residential construction shall be based on a calculation of six hundred (600) gallons per day per residence.

The Town has developed Water Capacity Management Plan. The Plan identifies wells that must be brought online by developers prior to the issuance of allocation to remain in compliance with the above policy. Although the permitted withdrawal will be consistent with MDE's 325 gpd/household, the additional capacity will provide for redundancy, drought conditions, and fire protection. The plan remains in place as about half of the 415 taps listed in the Town's Water and Sewer Allocation Plan are in service.

Table 3-T18 summarizes the Town of Poolesville's past and projected population along with projected water supply demands and planned capacity for the town.

Table 3-T18: Projected Water Supply Demands and Planned Capacity
Town of Poolesville

Design Year	Population			GPCD[A] (gallons)	CAPACITY (MGD)[B]	
	Total	Served	Unserved[C]		Average[D]	Peak Monthly Demand
2015	5,300	5,280	20	100	0.650	0.910
2020	6,500	6,480	20	100	0.650	0.910
2025	6,500	6,480	20	100	0.650	0.910

[A] Gallons Per Capita Per Day (GPCD) for the year 2015 based on actual data. Future GPCD projections estimated by the Town.
[B] For planning purposes, the Town estimates the peak monthly demand to be 1.5 times the average monthly demand.
[C] Unserved population utilizes private, individual wells.
[D] The Town of Poolesville's water capacity is permitted and capable of meeting the total expected population growth of 6,500 residents. To ensure an adequate water supply for current and future residents, the Town expanded the water supply capacity to meet future needs prior to the allocation of water taps and new development. The 2015 actual average daily demand was 500,577 gallons per day (GPD) and a peak monthly demand of 612,278 GPD. It is anticipated that by 2020, the Comprehensive population cap not to exceed 6,500 residents will be meet and the capacities and demand will be approximately 650,000 GPD with a peak monthly demand of 910,000 GPD.

IV.F: Projected Water Supply System Facility Needs:

To provide system redundancy, the Town continues to require developers to construct wells identified by the Town during the 2001 well search program. Growth has been slow and steady and plans put in place addressing capacity and growth continue to be implemented and will continue until the planned build out is complete.

The 1.5-million-gallon storage capacity currently provided in the Town is sufficient to serve the ultimate population. The Town has an adequate water supply for existing residents. As future

developments are approved more water sources will be added to the water distribution system as included on Table 3-T19.

TABLE 3-T19 Immediate, 5-, and 10-Year Priorities for Water Supply Development Town of Poolesville

Fiscal Year	Location	Description	Estimated Costs			Project Status - Construction Start	
			Total	Federal and/or State	Local	Immediate Priority Projects	Five and Ten Year Period Projects
2016	Hughes Rd	Well #11 & well House	$610,000		$610,000	X	
2017	West Willard Rd	Well #14 & well House	$525,000		$525,000	X	
Open	Cattail Rd	Well#15 & Well House	$800,000		$800,000		X

IV.G: Financing Water Systems:

Information on the Town's water system financing is included in Section IV.C of Chapter 1. Additional information on Capital Program for the Town of Poolesville is available at: http://www.poolesvillemd.gov/296/Budget.

V: INDIVIDUAL WATER SUPPLY SYSTEMS AND RURAL SANITATION

In the more rural, less-densely populated parts of Montgomery County, residents, businesses and institutions depend primarily on groundwater supplied by wells for their water supply. Approximately 80,000 county residents rely on groundwater for their only source of water supply. The areas dependent on groundwater wells form an irregular crescent starting in the southwestern part of the county, sweeping around to the west, then north of Clarksburg and around Damascus, then south and east along the Patuxent River watershed (see Figure 3-F9). The county has approximately 20,000 individual wells in use. Ground water wells are used not only for potable water supply, but also for uses such as irrigation, industrial processes, and ground water monitoring. Most wells are located in areas outside of the community water service envelope. However, Figure 3-F9 shows that some wells may be found within areas planned for community systems, often where community water system main have not yet been constructed.

Of the wells within the county, only Poolesville's municipal wells are part of a community water supply system. This Plan refers to private or non-municipal wells as "individual water supply systems," consistent with State law. Some larger individual water supply systems are referred to as "multiuse systems." (See Section V.D.).

Some information concerning wells and rural water supply systems that might logically be included in the following sections of Chapter 3 is consolidated in Chapter 1 with similar information concerning individual sewerage systems. One of the intents of this update of the Water and Sewer Plan is to start focusing attention on individual systems and concerns regarding rural sanitation. For the time being, Chapter 1 provides a more convenient venue for these issues.

V.A: Groundwater Supply Geologic Conditions:

All of the bedrock in the county is fractured to some extent, some formations more than others. Wells that intercept fractures usually provide the best groundwater yields. However, fractures do not normally extend great distances, and there is little or no interconnection between adjoining basins or sub-basins. Drainage divides for surface streams also define the boundaries for subsurface water movement. The flow in streams following the dissipation of storm flows is known as base flow and represents the gradual discharge of groundwater to the surface.

Most of Montgomery County is located in the Piedmont physiographic province. A thin section of Coastal Plain sediments overlays the crystalline rocks of the Piedmont formations in the area east of U.S. Route 29. The crystalline rocks of the Piedmont are chiefly phyllites and schist. In the southwestern portion of the county, red and gray siltstone and sandstone sedimentary formations overlay the crystalline rock. Most of the area underlain by schists or Coastal Plain sediments have already been developed on the WSSC or Rockville public water systems. Remaining areas in these geologic units are within the proposed water service envelope or are planned for relatively low density development.

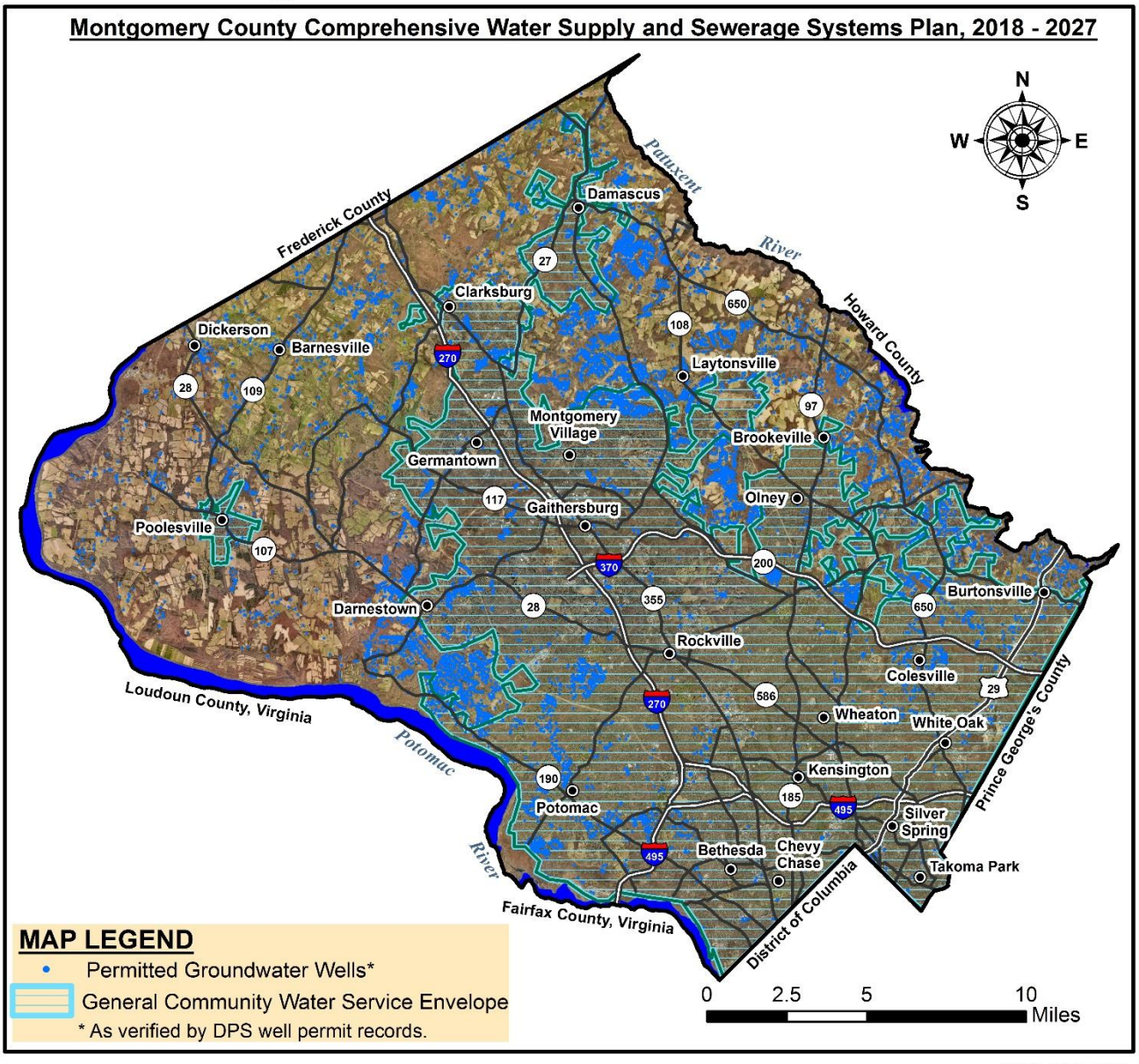
Moderately shallow soils with bedrock outcrops, particularly in stream valleys, characterize the Phyllite rock underlying the western and northwestern portions of the county. Although these areas have some of the lowest well yields of any area of the county, these yields are generally adequate for individual dwellings and businesses. Water quality is considered good; it seldom requires treatment for use, and there are no known areas of widespread pollution though localized pollution is a problem in some areas.

The southwestern portion of the county is characterized by sedimentary deposits of shale, sandstone and siltstone, which provide the source of water for the Town of Poolesville. The Town

uses all the water withdrawn from the sedimentary area for potable use. These sedimentary deposits, along with the phyllite areas, are not considered good aquifers from the standpoint of yield. Water in the sedimentary rock strata is chiefly found in fractures and crevices. Since the soil and overburden above the bedrock is thin, it offers little opportunity for groundwater storage. The yield of wells in this area can decline dramatically during extended drought periods, as has been experienced by the Town of Poolesville. During normal rainfall periods, well yields remain constant and adequate.

The water in the sedimentary area tends to be hard and mildly alkaline. Occasionally iron and/or manganese needs to be removed for aesthetic reasons. The water quality in this area is similar to water quality in other sedimentary areas of Maryland and Virginia that have primarily rural agricultural land uses and is generally considered to be good.

Figure 3-F9: Permitted Groundwater Wells



V.B: Groundwater Regulations and Protection Programs:

The following programs regulate the establishment and use of groundwater wells and protect the county's groundwater resources.

V.B.1: Well Permitting - The County's Department of Permitting Services (DPS), Well and Septic Section, is responsible for the administration and enforcement of County and State laws and regulations governing on-site, individual water supply systems. This authority is delegated from the State's Department of the Environment (MDE). Relevant regulations are included in COMAR 26.03.01, 26.03.05, and 26.04.02 -.04, and in County Executive Regulation 28-93AM "On-Site Water Systems and On-Site Sewage Disposal Systems in Montgomery County."

DPS accomplishes these responsibilities by:

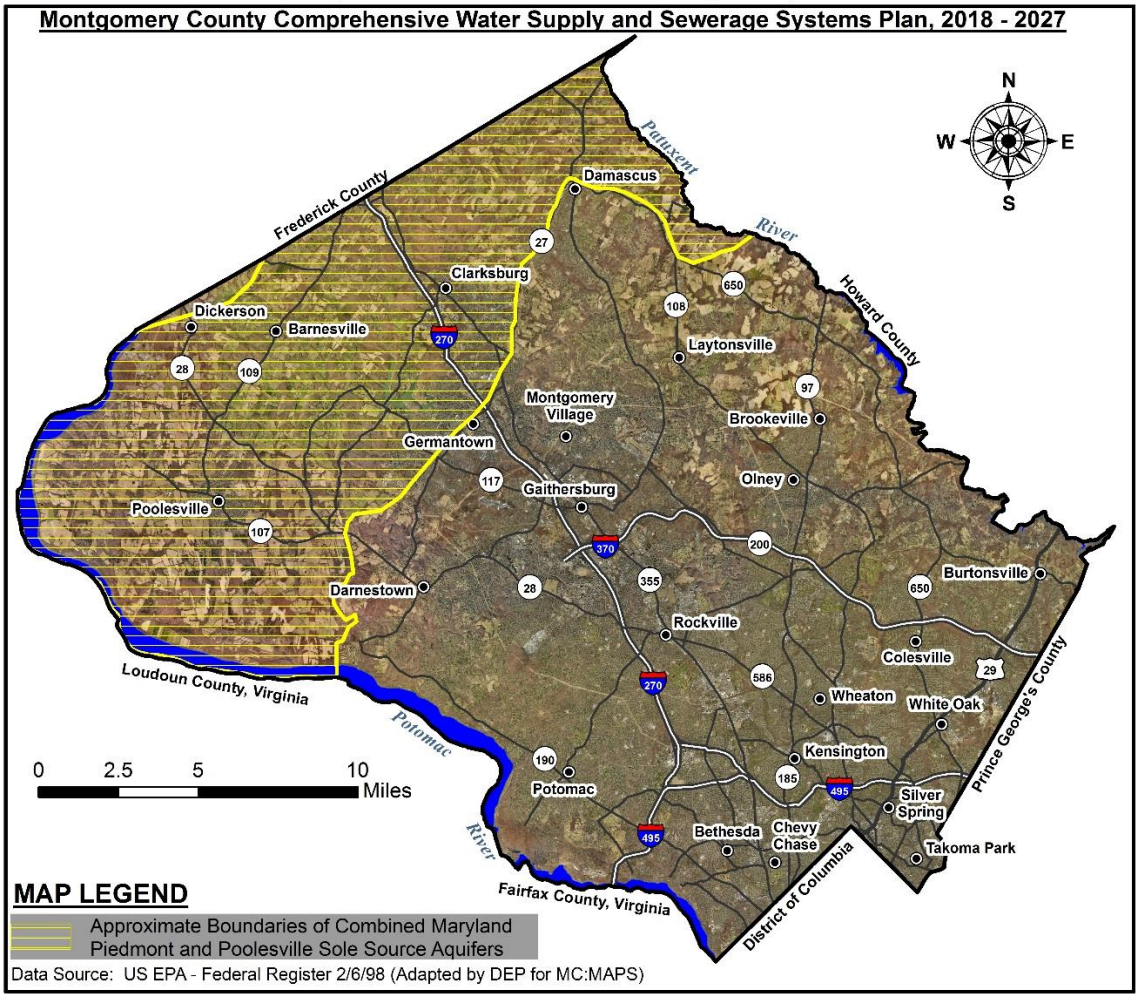
- Reviewing preliminary plans and record plats for properties served by on-site systems.
- Issuing permits for and inspecting the construction of new and replacement wells. In most areas of the county, wells are drilled without preliminary monitored by DPS. The capacity of drilled wells is checked by a draw test prior to final permitting.
- Sampling water supplies for potability. New wells for potable uses are normally sampled for nitrates, coliform bacteria, and turbidity.
- Responding to complaints about onsite systems.

On-going well monitoring is done when some subsequent licensure or approval is required, such as child care licenses, group or nursing homes, food service facilities, or swimming pools. There are no requirements for ongoing monitoring of wells used solely for single family residences. A typical residential demand is often calculated at 500 GPD per average single family residence for septic system design purposes. COMAR regulations require a well yield of at least one gallon per minute (or 1,440 gallons per day) and at least 500 gallons of water to be available during one two-hour period each day.

MDE maintains a permitting authority for commercial, institutional, and residential subdivision projects though its Water Appropriation and Use permit. This permit is also required for wells for non-potable uses such as irrigation or commercial uses. As the County authority responsible for water and sewer service planning, DEP reviews and signs off on these permits to ensure that they comply with the Water and Sewer Plan.

V.B.2: Sole Source Aquifer - The Sole Source Aquifer Program, established under Section 1424(e) of the Federal Safe Drinking Water Act of 1974, authorizes the Administrator of the U.S. Environmental Protection Agency (EPA) to designate aquifers as the "sole or principal" source of drinking water for an area. The program provides for EPA review of projects receiving federal financial assistance planned for the sole source aquifer area to determine their potential for contaminating the aquifer and creating a significant hazard to public health. EPA may approve, disapprove, or approve conditionally with modification a project using federal funds. In 1980 and 1998, EPA designated some of parts of western Montgomery County as Sole Source Aquifer and included the Piedmont and Poolesville sole source aquifers. The approximate boundaries of combined Piedmont and Poolesville sole source aquifers is shown in Figure 3-F10. For more information on the sole source aquifers, see Chapter 2, section II.E.1.

Figure 3-F10: US EPA Sole Source Aquifers in Montgomery County (Piedmont and Poolesville Aquifers)



V.C.: Ground Water and Well Problems:

Individual ground water wells fail for a variety of reasons:

- Contamination of the ground water from an onsite or offsite source, including but not limited to fuel leaks and spills, bacteria from leaking septic systems, and nitrates from fertilizers.
- Contamination of the well from bacteria.
- Inflow to the well from a surface water or shallow ground water source.
- Failure of the submerged well pump or water treatment systems.
- Structural failure of the well, especially older, shallow, hand-dug wells.
- Insufficient ground water flow into the well.

For the majority of areas located outside the planned community water service envelope, DPS addresses these problems with onsite solutions, such as water treatment systems, equipment repairs or replacement, well disinfection, and replacement wells. In areas with available community water service DPS will typically recommend connection to the community water system.

Some of the preceding problems, particularly ground water contamination, have the potential to affect not just one well, but also surrounding wells. In such cases, DPS may recommend a joint well survey of the affected area with DEP, especially where community water service is in close proximity.

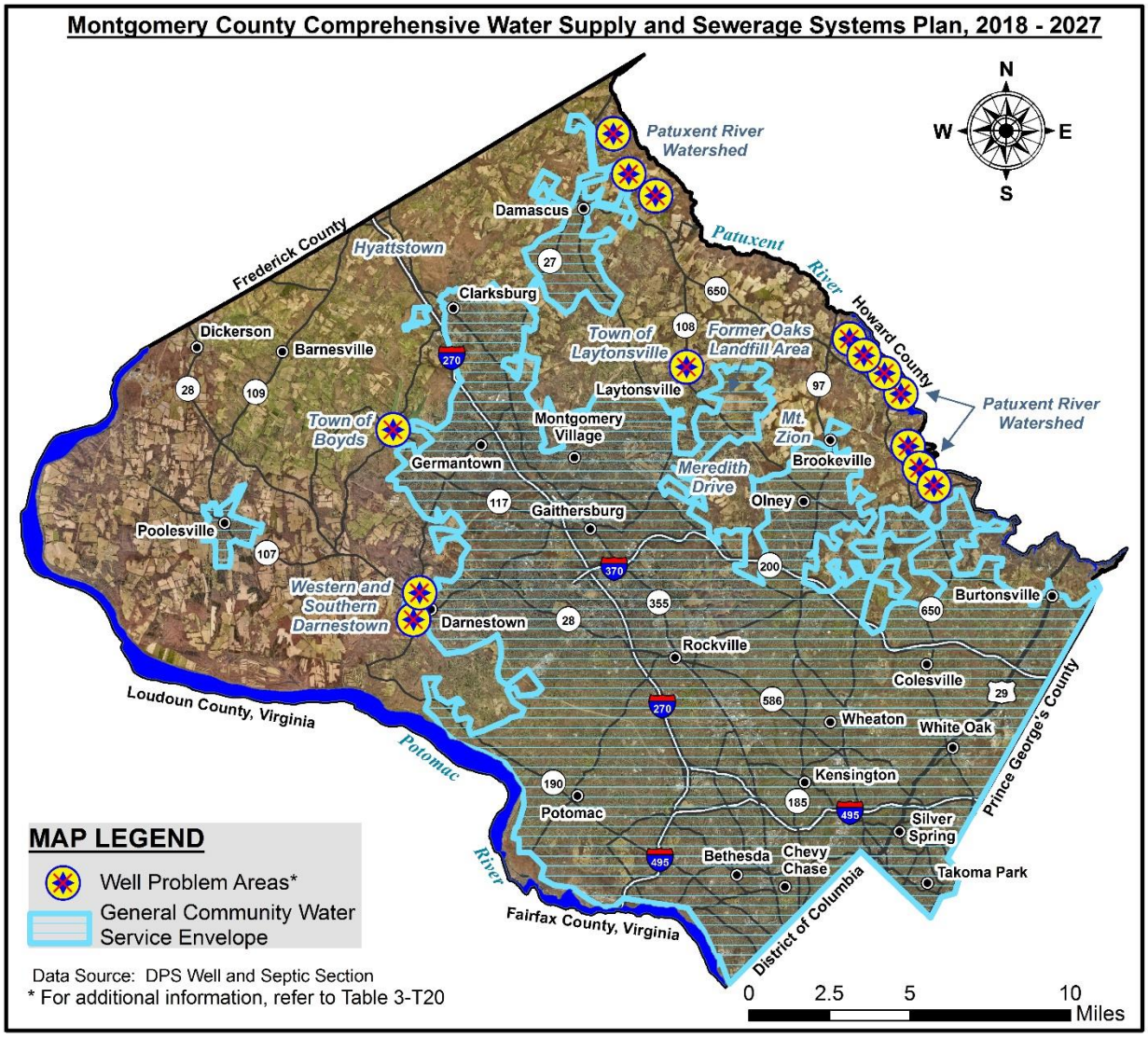
Although DPS does not currently maintain a comprehensive database of well yields and contamination problems throughout the county, that agency has provided information concerning groundwater problem areas based on staff experience as identified in Table 3-T20 and are identified on Figure 3-F11.

Table 3-T20: Groundwater and Well Problem Areas

Location	Problem	Potential Solutions	Actions Taken
Outstanding Problem Areas			
Town of Boyds	polluted aquifer	▪ community water service ▪ individual GAC filters	DPS is addressing well problems in this area as they come forward.
Town of Laytonsville	polluted aquifer (hydrocarbons and nitrates)	▪ community water service ▪ individual GAC filters ▪ handle old wells properly	The Town requested approval for community water service, which the County approved in the Plan in 2001. A WSSC community water system is completed and in service to the town and nearby properties. However, residents and businesses have been slower to connect to the system than anticipated. More coordination with the Town government may be needed to help move water service forward in the community.
Patuxent River Watershed: ▪ northeast of Damascus ▪ Between Routes 108 and 97	low well yields		DPS requires pre-testing of wells for adequate yields in these areas. Some areas have limited access to community water service.
Western & Southern Darnestown	elevated nitrate levels		DPS has required advanced treatment on larger, multi-use septic systems in this area. Properties near Routes 28 and 112 have access to community water service.

Additional information on well problems, relief measures, and County service policies is found in Chapter 1, Section III.B.

Figure 3-F11: Well Problem Areas



V.D.: Multiuse Water Supply Systems:

As described in Chapter 1(Section III.B.5.), multiuse water supply systems are defined as individual, on-site water systems with a capacity of 1,500 or more gallons per day (gpd). Because of their greater potential for impacts on ground water resources and neighboring wells, these systems require approval in the Water and Sewer Plan. These facilities are generally large-capacity well water systems, although some facilities use more advanced treatment systems. Almost all depend on groundwater for their water supply. DEP coordinates the Water and Sewer Plan amendments for these systems with DPS. Appendix B includes a listing of the multiuse water supply facilities in Montgomery County approved in this Plan.

For multiuse water supply system with capacities of 5,000 or more gpd, review and approval from MDE is also required. MDE mandates semi-annual operations reports for systems of this size.