HANOVER COUNTY & TOWN OF ASHLAND

LONG RANGE WATER RESOURCES PLAN

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GLOSSARY OF ACRONYMS

AST	Aboveground Storage Tank
AWWA	American Water Works Association
BOVA	Biota of Virginia
CBPAs	Chesapeake Bay Preservation Areas
DEQ	Virginia Department of Environmental Quality
DPU	Hanover County Public Utilities Department
DRCP	Drought Response and Contingency Plan
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FMP	Hanover County Water and Wastewater Facilities Master Plan
GDP	Gallons per Day
GPD/P	Gallons per Day per Person
GPM	Gallons per Month
HVE	High Vacuum Extraction
IDAs	Intensely Developed Areas
LRWRP	Long Range Water Resources Plan
MGD	Million Gallons per Day
MGM	Million Gallons per Month
MS4s	Municipal Separate Storm Sewer Systems
MX	Mixed Use District
NOAA	National Oceanic and Atmospheric Administration
PRP	Parties Potentially Responsible
RC	Rural Conservation District
RM	Residential Multi-Family District
RMAs	Resource Management Areas
RPAs	Resource Protection Areas
RS	Single Family Residential District
SRF	State Revolving Fund Program
SSA	Suburban Service Area
SWAP	Source Water Assessment Plan

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1.0 INTRODUCTION + BACKGROUND

The jurisdictional boundaries of the County of Hanover and the incorporated Town of Ashland comprise the study area for the Hanover and the Town of Ashland Long Range Water Resources Plan (LRWRP). Preparation of the plan was supported by grant funds administered through the Department of Environmental Quality (DEQ).

1.1. LEGAL AND REGULATORY BACKGROUND

In response to drought conditions in 2002, the General Assembly amended the Code of Virginia to require the development of a comprehensive statewide water supply planning process. The Local and Regional Water Supply Planning Regulation (9 VAC 25-780) ("the Water Supply Planning Regulations") were promulgated by DEQ to implement this process. The purpose of the Water Supply Planning Regulations is to protect the health, safety and welfare of citizens by requiring local and regional water supply planning. The Water Supply Planning Regulations establish a basic set of criteria that each local or regional water supply plan must contain so that an adequate water supply will be provided to residents in a manner that balances the need for environmental protection and future growth.

Each Virginia locality is required to submit a water supply plan (either a local or regional plan) to DEQ for its review. After reviewing the plan, DEQ will then make a recommendation to the State Water Control Board (the "Board") as to whether the water supply plan complies with the Water Supply Planning Regulations. The Water Supply Planning Regulations require that a water supply plan be reviewed no later than five years after a compliance determination by the board in accordance with 9 VAC 25-780-140.F. Any significant changes in water supply issues that are identified at the 5-year compliance review will require the submission of an amended water supply plan. The Water Supply Planning Regulations require that each water supply plan be revised and resubmitted to DEQ every ten years after the date of last approval (9 VAC 25-780-50.E.).

1.2. REGIONAL WATER SUPPLY PLANNING FOR HANOVER COUNTY AND THE TOWN OF ASHLAND

DEQ encourages jurisdictions to participate in regional water supply planning efforts. Hanover County and the Town of Ashland notified DEQ of their intent to participate in a Regional Plan. The participation of the Town of Ashland and Hanover County in a regional water supply plan is permitted per state code.

1.3. PURPOSE OF THIS REPORT

The purpose of this report is to identify and evaluate current and future water supply conditions and to contribute to the development of a comprehensive statewide water supply planning process that (1) ensures that adequate and safe drinking water is available to all residents of Virginia (2) encourages, promotes, and protects beneficial uses of the Commonwealth's water resources and (3) encourages, develops and promotes incentives for alternative water sources.

2.0 GEOGRAPHY AND NATURAL RESOURCES OF HANOVER COUNTY & THE TOWN OF ASHLAND

Hanover County is located approximately 12 miles north of the City of Richmond and the Town of Ashland is located approximately 16 miles north of the City of Richmond. The Town of Ashland is located along Interstate 95 and lies completely within the boundaries of Hanover County. Hanover County consists of approximately 473 square miles and the Town of Ashland consists of approximately 7.02 square miles. Hanover County shares a border with the Counties of Caroline, King William, New Kent, Henrico, Goochland, Spotsylvania and Louisa. Hanover County is bordered by the North Anna River and Pamunkey River to the north and the Chickahominy River to the south. Waterways within Hanover County and the Town of Ashland are primarily used for irrigation, drinking water, and recreation.

2.1. PHYSIOGRAPHY

A physiographic province is a landform region that is delineated according to similar terrain that has been shaped by a common geologic history. Geographers and geomorphologists recognize more than 20 physiographic provinces in North America; Virginia has five of these provinces. Hanover County lies astride the Fall Line, which generally runs along the right-of-way of the Richmond, Fredericksburg and Potomac Railroad. The Coastal Plain is to the east of the Fall Line and the Piedmont Plateau is to the west. Therefore, Hanover County and the Town of Ashland are within both the Coastal Plain and Piedmont Plateau physiographic provinces (Figure 2-1). This Fall Line is the limit of navigation on the major streams; rapids are upstream from the Fall Line and navigable tidal water is downstream. Within Hanover County, elevation ranges from about sea level on the lower end of the Pamunkey River to about 370 feet above sea level on the highest ridges (Hanover County Soil Survey, 1980).

Groundwater sources vary widely in the Piedmont province for water quality and quantity. High iron levels and acidity are the two most common problems. Due to these variances, well monitoring and well site evaluation are two important actions to ensure the water source is available and not contaminated.

The Coastal Plain province extends east of the Piedmont province to the Atlantic Ocean. The eastern half of Hanover County lies in the westernmost portion of Virginia's Coastal Plain. The Coastal Plain consists of a terraced landscape that gradually steps down to the coast. The bedrock of the Coastal Plain province consists of a thick area of sediments that begins as a thin layer near the Piedmont province and increases in thickness closer to the coast. As Hanover County is split by the Piedmont and Coastal Plain provinces, the layer of sediments in Hanover County are likely to be thin.

There are both shallow and deep water aquifers in the Coastal Plain. The shallow aquifers have more interaction with surface water and contaminants. The deep aquifers are recharged miles away and present a

much more complex problem when contaminated. (College of William and Mary, Department of Geology, Coastal Plain Province: The Geology of Virginia, 2010).

2.2. CLIMATE

Hanover County and the Town of Ashland lie within the Humid Subtropical Climate Zone, which is characterized by hot, humid summers and cool winters. Significant amounts of precipitation occur in all seasons within this zone. Precipitation in the winter months is associated with large storms that the westerlies steer from west to east. Most precipitation in the summer months occurs during thunderstorms or the occasional hurricane or tropical storm.

The average temperature for Hanover County varies from 36.2 degrees Fahrenheit in January to 76.5 degrees Fahrenheit in July (Figure 2-2). The highest temperature on record, 105 degrees Fahrenheit, was recorded on August 12, 1900 and again on September 8, 1954 (Southeast Regional Climate Center, 2010). The average annual precipitation for Hanover County is 42.05 inches. On average, February is the driest month with an average precipitation of 2.87 inches and August is the wettest month with an average precipitation of 4.34 inches (Figure 2-3). In terms of snowfall, January and February are nearly even with averages of 4.8 and 4.7 inches of snowfall, respectively (Figure 2-4). Annually, Hanover County receives approximately 14.6 inches of snowfall (Southeast Regional Climate Center, 2010).

2.3. SOILS

Hanover County is chararcterized by gently rolling hills that are heavily wooded (in undeveloped areas) and bisected by streams and small rivers. There are two distinct geologic and hydrogeologic settings in Hanover County: the eastern portion of the County is located within the Coastal Plain Physiographic Province, and the western portion of the County is in the Piedmont Physiographic Province. The Coastal Plan Physiographic Province is comprised of unconsolididated marine and non-marine sediments overlying a crystalline rock complex. A major fault zone, the Fall Line, separates the Coastal Plan Physiographic Province from the Piedmont Physiographic Province. The Piedmont Physiographic Province is comprised of massive igneous and metamorphic rocks.

Nine major aquifers, or hydrogeologic units, exist in the Coastal Plain Physiographic Province. These acquifers are grouped into the confined and semi-confined aquifers: Potomac (Lower, Middle and Upper), Brightstar, Aquia, Chickahominy-Piney Point, St. Mary's Choptank, and the Yorktown-Eastover. The unconfined water table aquifer is known as the Columbia Aquifer. Most of the private water supply wells that supply individual homes are shallow bored wells that access the unconfined Columbia Aquifer. Because it is shallow and unconfined, this aquifer is vulnerable to pollutants and contamination and offers highly variable yields. It is becoming increasingly common for residential subdivisions outside of the County's Suburban Service Area (SSA) to use deep-drilled wells. Most of the public water supply wells are completed in the deeper and

confined or semi-confined aquifers, which are less vulnerable to contamination and offer better yields (40-400 gallons per minute) (Comprehensive Plan Amendment, Groundwater Resources in "Chesapeake Bay Program, "adopted by the Hanover County Board of Supervisors August 23, 2000)

Pollutants generally affect water quality through two different methods: run-off and leaching. Run-off refers to water that is not absorbed by the soil, but drains by overland flow to surface water. Run-off rapidly carries sediment and pollution to surface water bodies. Leaching, in contrast, refers to water that is absorbed through the soil and percolates downward to recharge ground water resources. Leaching typically does not transport sediment to a notable extent but can distribute pollution to groundwater which then discharges to surface water bodies.

The amount of run-off or leaching in a region is typically dependent upon the type of land cover. Areas with a higher percentage of development are more susceptible to higher rates of run-off pollution due to increased amounts of impervious land cover (e.g. parking lots, buildings, roads). In addition, if soils found in the developed areas are highly erodible, there is an increased susceptibility for sediment transport. Rural areas typically have more farm and forest land and may have increased susceptibility to pollutant leaching because of the extensive pervious ground water recharge areas.

Erodibility is a measure of how easily soil can be carried by storm run-off. Soils that have an Erodibility Index of 8.0 or higher are classified as "Highly Erodible Soils". Because of their relatively high erodibility, these soils have the potential to carry nutrients, pollutants, and sediments into waterways. The western third and eastern third of the County have significant areas of highly erodible soils (see Figure 2-5 for soil classifications found within Hanover County) Most areas with steep slopes occur along streams and rivers, especially where these watercourses traverse the Fall Line. At the Fall Line, the banks of several rivers, particularly the South Anna River, have relatively steep bluffs formed of exposed rock. In the eastern part of the County, steep slopes are concentrated along the tributaries that feed the Pamunkey River (Totopotomoy Creek, Mechumps Creek, Crump Creek and Parsleys Creek).

2.4. WATERSHEDS

Hanover County lies primarily within the York major watershed; however, the southernmost portion of the County lies within the James major watershed (Figure 2-6). The County is located within three primary sub-watersheds: the Pamunkey sub-watershed, the Middle James-Willis watershed, and the Lower James sub-watershed. There are a total of nine stream gauging and well monitoring stations in Hanover County. The eastern portion of the County, east of I-95, falls within the Eastern Virginia Groundwater Management Area. (Virginia Department of Conservation & Recreation (VDCR), 2010).

2.5. HYDROLOGY OF WATER SUPPLIES IN HANOVER COUNTY AND THE TOWN OF ASHLAND

Large diameter wells, generally larger than six inches, have been dug or drilled into the soil and weathered rock of the Piedmont and into the fluviomarine sediments of the Coastal Plain. These wells are commonly less than 60 feet deep. They yield small quantities of groundwater that is moderately soft, sometimes slightly turbid, and are susceptibale to contamination. Figure 2-7 shows the depth to the water table in Hanover County, Figure 2-8 shows the available water supply in Hanover County and Figure 2-9 shows the groundwater withdrawals by county in Virginia.

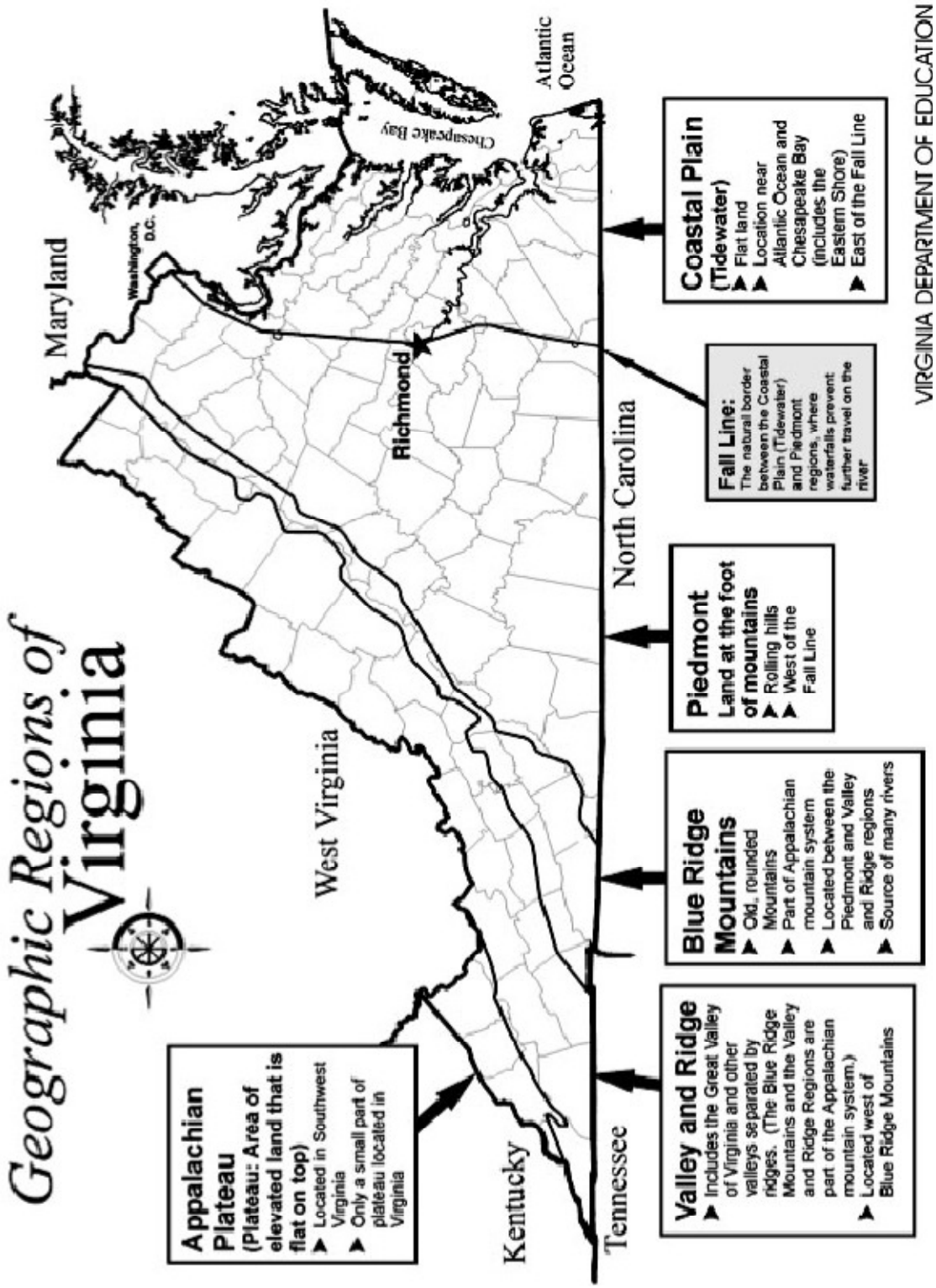
Small diameter wells have been drilled to a depth of as much as 200 feet into the Piedmont and as much as 350 feet into the Coastal Plain. Some of these wells yield as much as 50 gallons per minute. Several wells in the eastern part of the County yield more than 100 gallons per minute (Hanover County Soil Survey, 1980).

2.6. GENERAL DISCUSSION ON GROUNDWATER QUALITY IN HANOVER COUNTY AND THE TOWN OF ASHLAND

Hanover County has a diverse and complex mix of groundwater and surface waters, including tidal and non-tidal streams, wetlands, ponds, aquifer recharge areas and confined and unconfined groundwater aquifers. The County is divided into two major drainage areas, the Chickahominy River and the Pamunkey River Basin. The smaller Chickahominy Basin contains about 15 percent of Hanover's 473 square miles and drains southward into the Chickahominy River and eventually the James River. Although small by comparison to the Pamunkey River Basin, this southern drainage area contains a majority of the County's SSA. The larger Pamunkey River Basin is composed of the North Anna, South Anna and Pamunkey Rivers, all of which drain into the York River Basin. The northern drainage area, which is predominantly rural, includes about 85 percent of the County. The Town of Ashland straddles the two drainage areas.

Figure 2-1 Geographic Regions of Virginia

Source: http://www.chalk.richmond.edu (accessed June, 2010)



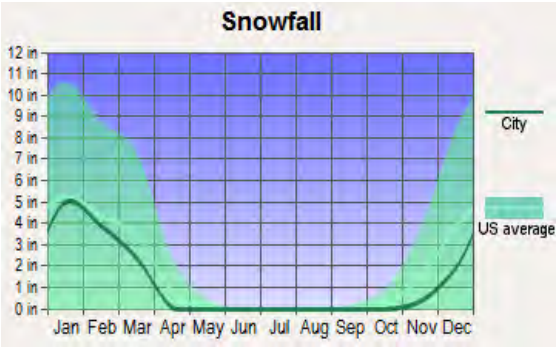


Figure 2-2 Monthly Average Temperature in the Town of Ashland

Source: http://www.city-data.com/city/Ashland-Virginia.html (accessed June 2010)

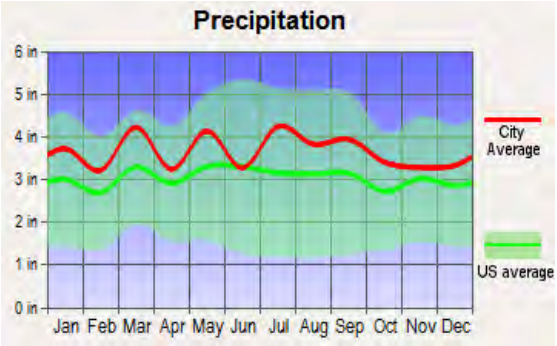


Figure 2-3 Monthly Average Precipitation in the Town of Ashland

Source: http://www.city-data.com/city/Ashland-Virginia.html (accessed June 2010)

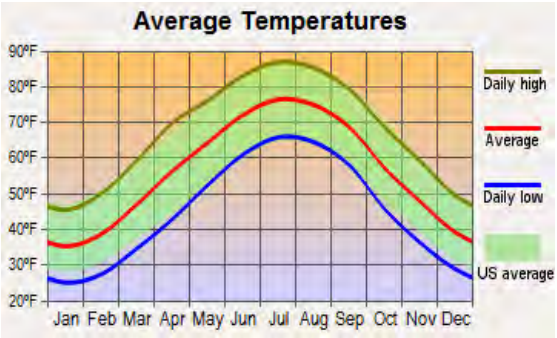


Figure 2-4 Monthly Average Snowfall in the Town of Ashland

Source: http://www.city-data.com/city/Ashland-Virginia.html (accessed June 2010)

Figure 2-5 Soil Classifications Found in Hanover County

Source: Hanover County GIS, 2010.

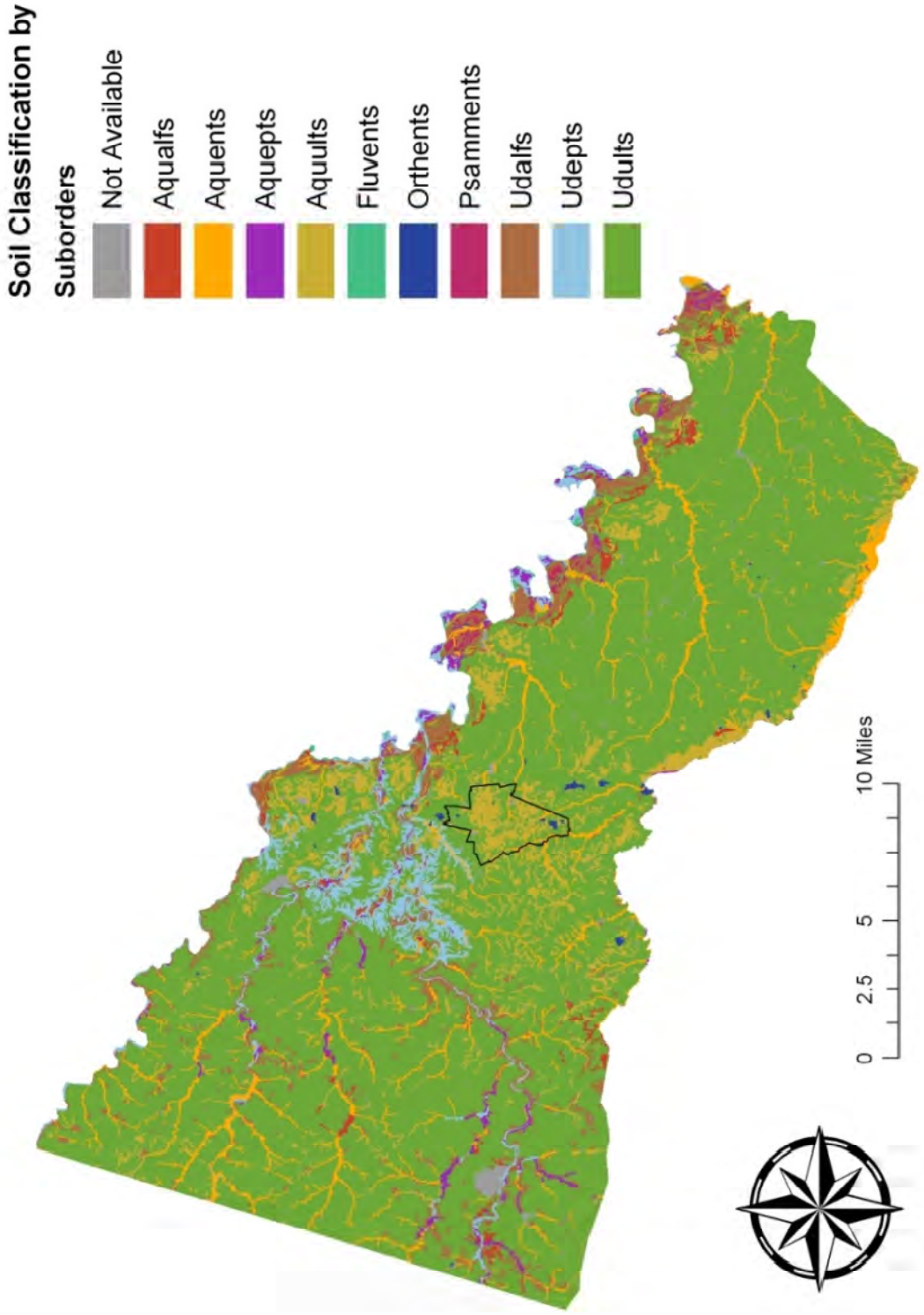


Figure 2-6 Major Watersheds in Virginia

Source: http://www.dcr.virginia.gov/soil_and_water/wsheds.shtml (accessed June, 2010)

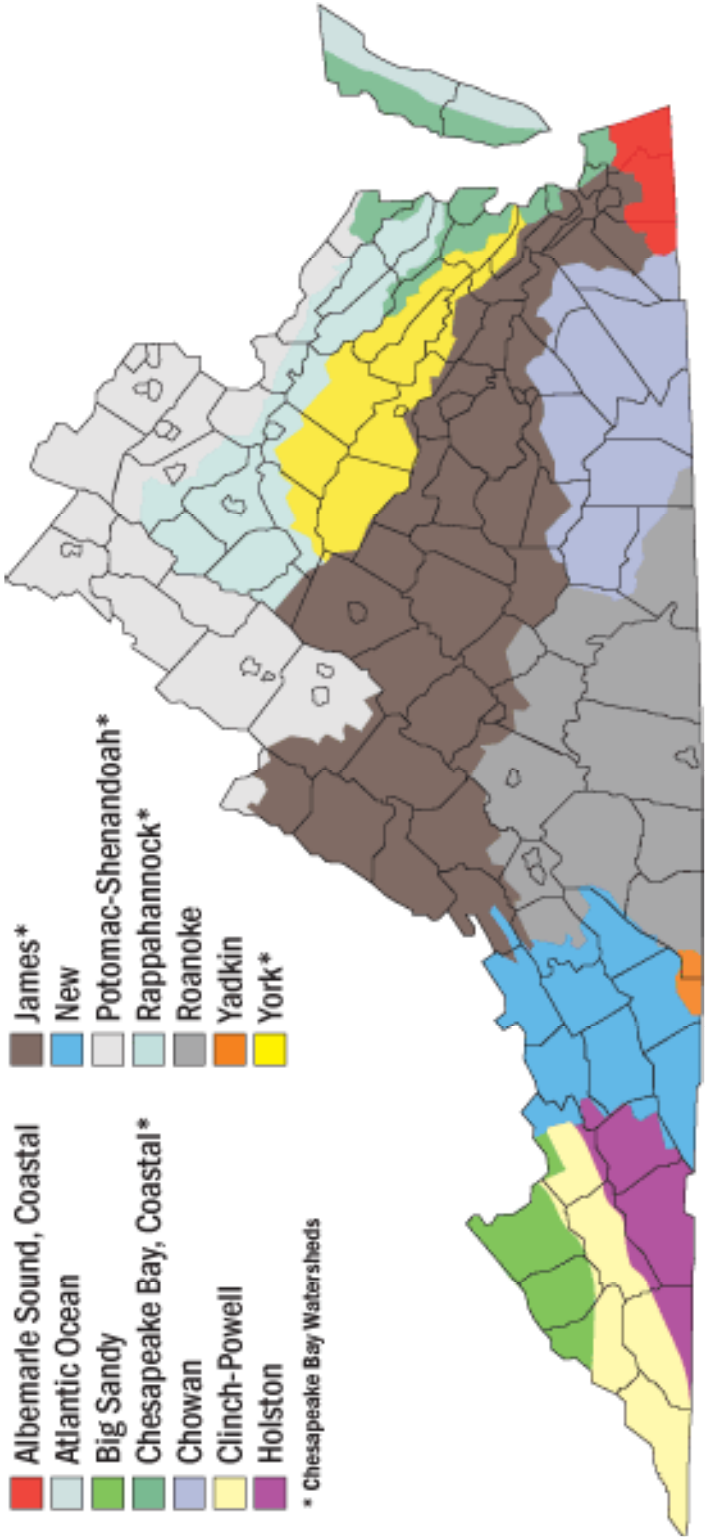


Figure 2-7 Depth to Water Table in Hanover County

Source: Hanover County GIS, 2009

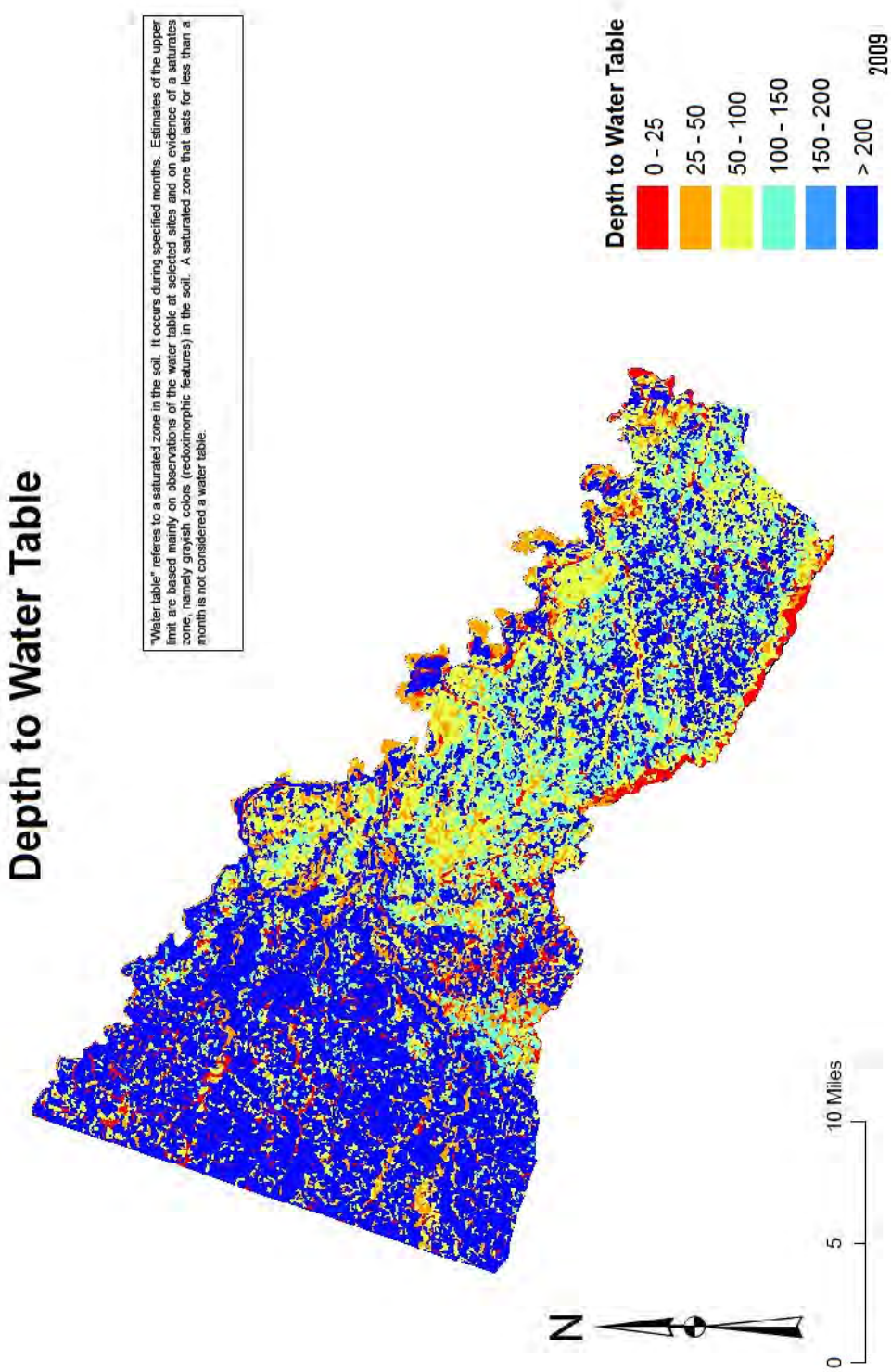


Figure 2-8 Available Water Supply in Hanover County

Source: Hanover County GIS, 2009

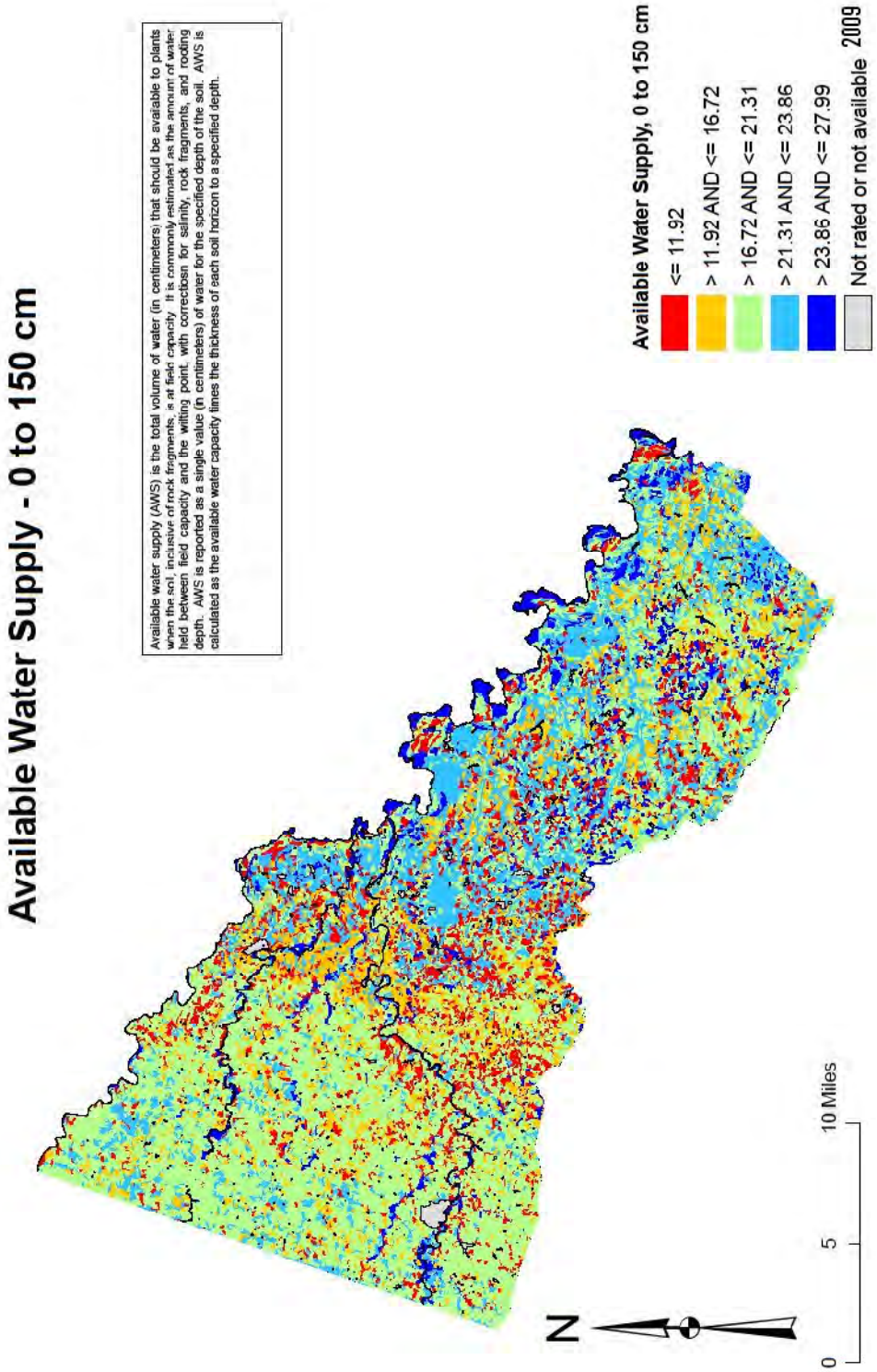
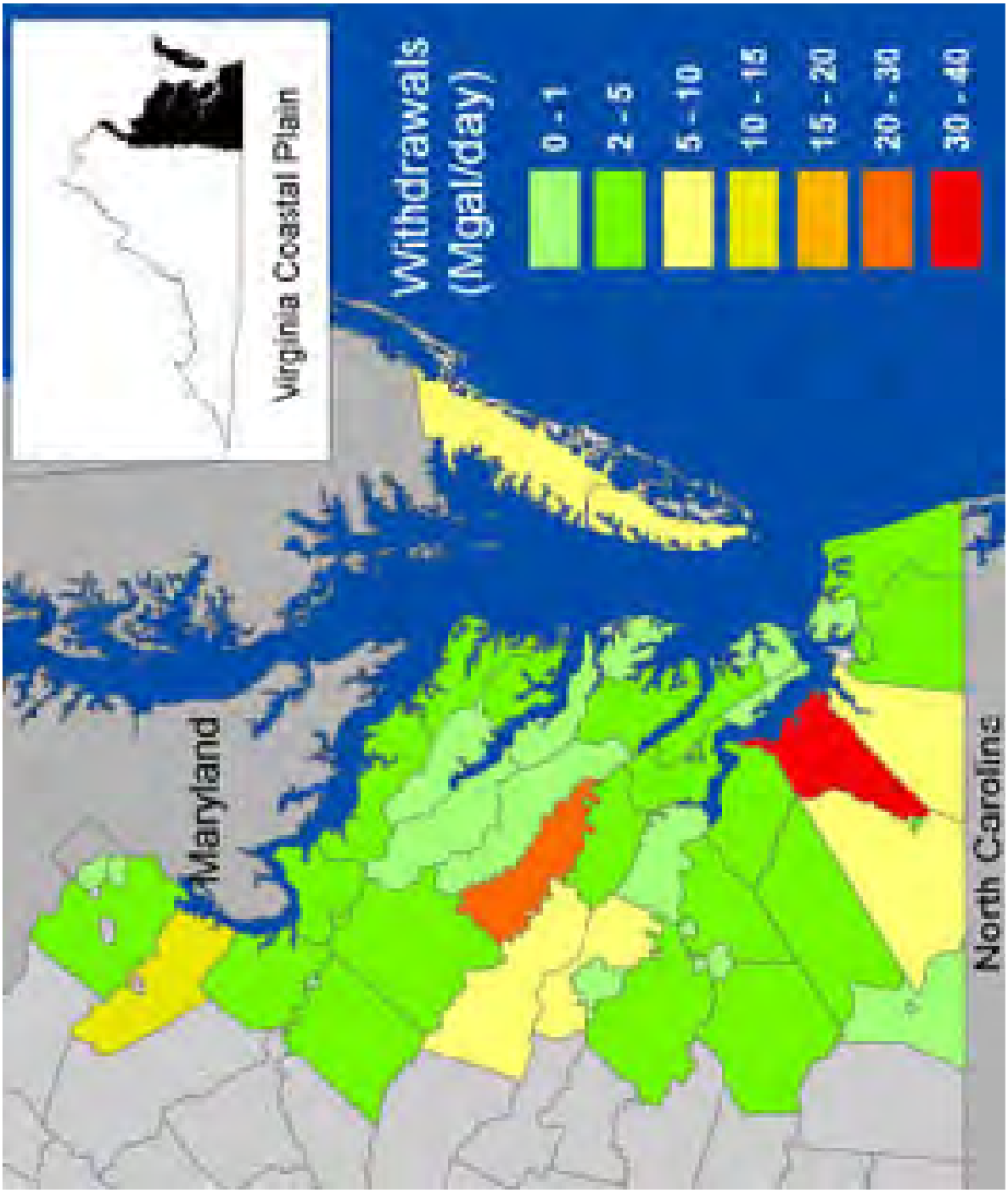


Figure 2-9 Ground Water Withdrawal by County in the Virginia Coastal Plain

Source: http://www.va.water.usgs.gov (accessed June, 2010)



3.0 APPROACH TO COLLECTING WATER SOURCE AND WATER USE INFORMATION

INTRO TO 9 VAC 25-780-70 AND 9 VAC 25-780-80

3.1. ELECTRONIC DATA FROM DEQ FOR WATER WITHDRAWAL REPORTING REGULATIONS

The Water Withdrawal Reporting Regulations apply to all water sources in Virginia which experience an average daily withdrawal of more than 10,000 gallons per day (gpd) or an average monthly withdrawal of more than 300,000 gallons per month (gpm). The withdrawals that must be reported include, but are not limited to, public water supplies, manufacturing, mining, commercial, institutional, livestock watering, artificial fish culture, and steam electric power generation sources. Farms withdrawing water from both ground and surface water sources for irrigation must also report their water use at 1.0 million gallons per month (mgm).

3.2. VIRGINIA DEPARTMENT OF HEALTH DATA AND RECORDS

Hanover County conducted a file review at the Virginia Department of Health (VDH), East Central Field Office in Richmond, Virginia in July 2009. The data collection process for the LRWRP includes data provided in the VDH Engineering Description Sheets (Appendix 1). VDH provided all Engineering Description Sheets for Hanover County water systems that are permitted.

Under Virginia's Private Well Regulations, all wells are required to have a written permit from VDH prior to construction, alteration, rehabilitation, abandonment or extension of a well. The Private Well Regulations require that an additional written inspection statement be complete prior to placing the new well into service. A Water Well Completion Report must be submitted by private well drillers for all new wells.

Under the Virginia Water Works Regulations, public water suppliers are required to obtain a permit from VDH prior to the construction or expansion of treatment works and distribution systems for both surface and ground water systems.

3.3. LOCAL GOVERNMENT DOCUMENTATION

Quantitative data regarding Hanover County's public community system is provided in the Hanover County Public Utilities Department (DPU) Facilities Master List (Appendix 2A) and in the "Community Water Systems: Groundwater Sources" document provided by DEQ (Appendix 2B).

3.4. DATA COLLECTION LIMITATIONS

The collected data described above provided the majority of needed information; however, there are still gaps in the LRWRP data. Certain water suppliers with the potential to withdraw over 300,000 gpm did not report their 2007 withdrawals; however, they may be below reporting requirement volume.

Hanover County and the Town of Ashland made all reasonable efforts to reconcile missing data; however, there are factors that inhibit full data collection. There is a lack of clear incentives for the water suppliers' participation in the LRWRP and there is an absence of a framework to enforce water suppliers' participation. These factors leave the decision of whether to participate and how much information to disclose in the water supplier's hands. Since the LRWRP is intended to be a "living document," this plan will be reviewed, revised and resubmitted to DEQ every ten (10) years (after the date of last approval) or when a major change in water issues has occurred within the planning region.

4.0 EXISTING WATER SOURCE INFORMATION (9 VAC 25-780-70)

Water Supply Planning Regulations require that the LRWRP for Hanover County and the Town of Ashland provide current information on existing water sources (Table 4-1 and 4-2). Figure 4-1 shows the location of all documented community systems in Hanover County that withdraw more than 300,000 gpm of ground or surface water.

Table 4-1 Public & Private Community Systems Withdrawing Over 300,000 Gallons Per Month
Ground (G) and Surface (S) Water Users

Avondale No. 1 (G)	Mountain Run Subdivision (G)
Cherrydale Subdivision (G)	Oak Hill Estates (G)
Colonial Forest (G)	Rainier Estates (G)
Courthouse Water System (G)	Rural Point Central Water System (G)
Dianne Ridge (G)	Scot's Landing (G)
Georgetown Water System (G)	Sinclair Manor (G)
Hanover Farms (G)	Spring Meadows - Meadow Gate (G)
Hanover Learning Center (G)	Strawhorn (G)
Mayfield Farms (G)	Taylor House Complex (G)
High Point Farms No. 1 (G)	Walnut Grove No. 1 (G)
Hanover Suburban Water System (G)(S)	Hanover Courthouse (G)

Source: Hanover County GIS, 2010, VDH, and DEQ, 2007

Table 4-2 Self-Supplied Users Withdrawing over 300,000 Gallons per Month
Ground (G) and Surface (S) Water Users

Atlee Square Shopping Center (G)	Horseshoe Farm (S)
Baptist Missionary Learning Center (G)	Keenbell Farms (S)
Barrett Learning Center (G)	Kirby Farms LLC (S)
Bear Island Paper Company LLC - Ashland Plant (S)	American Aggregates Corporation (S)
Berea Baptist (G)	Plain Dealing Farm (S)
Brookemeade Sod Farm, Inc (S)	Richfood Holdings, Inc (G)
Cabin Hill Farm (S)	Rural Point Elementary School (G)
CIRCAM / Rapsody LLC Waterworks (G)	Supervalu Inc - Mechanicsville Warehouse (G)
Colesville Nursery, Inc (S)	US Silica (S)
Concrete Pipes & Products Co - Hanover Plant (G)	Walnut Hill Farm (S)
Grainfield Farm (S)	West Nursery (S)
The Hollows Corporation Golf Course (G & S)	Westwood Farm (S)
Hanover Farms, Inc (S)	

Source: Hanover County GIS, 2010, VDH, and DEQ, 2007

4.1. COMMUNITY WATER SYSTEMS

All community water systems are supplied by ground water, stream intake or water purchased from the City of Richmond and Henrico County.

4.2. COMMUNITY WATER SYSTEMS USING GROUND WATER 9 VAC 25-780-70.B

Portions of Hanover County and the Town of Ashland are located in a Ground Water Management Area; these areas are East of Interstate 95, which runs through the center of Hanover County and the Town of Ashland. Wells dug in the Ground Water Management Area are required to have a water withdrawal permit, which increases the amount of data available for water supply planning decisions. There are 39 community wells in Hanover County and the Town of Ashland. Water supply planning data is available for each of these wells from Hanover County, the Town of Ashland, Aqua Virginia (a private water supplier) or VDH.

Table 4-3 shows the public and private community water systems categorized in descending order by their average annual withdrawals. The table also includes the percentage of total reported ground water withdrawal for public and private community systems as well as the cumulative percent of total withdrawal for these systems.

Table 4-3 Public & Private Community Water Systems In Hanover County

System	Well Name	Withdrawal (MGY)	% of Community Withdrawal	Cumulative % of Community Withdrawal
Hanover Suburban Water System	Harris Court Well #2	29.48	12.48	12.48
Spring Meadows - Meadow Gate	SM #2 (EP #4)	24.75	10.48	22.95
Avondale No. 1	Robin Ridge Well	17.10	7.24	30.19
Avondale No. 1	Avondale Well #1	14.06	5.95	36.14
Rural Point Central Water System	Hartford Oaks Well	12.61	5.34	41.48
Cherrydale Subdivision	Well #1	12.34	5.22	46.70
Spring Meadows - Meadow Gate	MG #2 (EP #2)	12.01	5.08	51.79
Courthouse Water System	Courthouse Well #3	11.14	4.72	56.50
Rural Point Central Water System	Breckenridge Well	9.08	3.84	60.34
Courthouse Water System	Courthouse Well #4	8.55	3.62	63.96
Cherrydale Subdivision	Well #2	7.91	3.35	67.31
Hanover Learning Center	Well No 3	6.12	2.59	69.90
High Point Farms No. 1	Well #1	5.81	2.46	72.36
Georgetown Subdivision	Georgetown Well	5.35	2.26	74.62
Strawhorn	Strawhorn Well	4.94	2.09	76.72
Hanover Farms	Well #2	4.91	2.08	78.79
Sinclair Manor	Sinclair Manor Well	4.71	1.99	80.79
Oak Hill Estates	Well #3	4.68	1.98	82.77
Walnut Grove	Well No 3 (1A)	4.46	1.89	84.66
Scot's Landing	Well No 1B	4.46	1.89	86.54
Colonial Forest	Well #1	4.42	1.87	88.41
Hanover Farms	Well #3	3.50	1.48	89.90
Spring Meadows - Meadow Gate	MG #1 (EP #1)	3.12	1.32	91.22
Mountain Run	Well #2	3.03	1.28	92.50
Spring Meadows - Meadow Gate	SM #1 (EP #3)	3.01	1.27	93.77
Rainier Estates	Well	2.12	0.90	94.67
Colonial Forest	Well #2	2.09	0.88	95.55
Courthouse Water System	Courthouse Well #2	2.07	0.88	96.43
Dianne Ridge	Dianne Ridge Well #2	1.73	0.73	97.16
Oak Hill Estates	Well #2	1.59	0.67	97.84
Hanover Learning Center	Well No 2	1.12	0.47	98.31
Mayfield Farm	Mayfield Farms #2	1.02	0.43	98.74
Scot's Landing	Well No 1	0.98	0.41	99.16
Scot's Landing	Well No 1A	0.77	0.33	99.48
Mayfield Farm	Burnside Farms #2	0.61	0.26	99.74
Taylor House Complex	Taylor House Well	0.33	0.14	99.88
Mountain Run	Well #1	0.21	0.09	99.97
Avondale No. 1	Avondale Well #2	0.04	0.02	99.99
Hanover Suburban Water System	Garthwright Well	0.03	0.01	100.00
	Total	**236.26**		

Source: VDH, 2007

4.3. COMMUNITY WATER SYSTEMS USING SURFACE WATER RESERVOIRS 9 VAC 25-780-70.C

The LRWRP is required to include data on community water systems using surface water reservoirs. This data element is not applicable to Hanover County or the Town of Ashland. After discussions with community water suppliers, there are no community water systems that rely on surface water reservoirs. As discussed in Section 10, future alternatives include surface water reservoirs to supplement the current water supplies.

4.4. COMMUNITY WATER SYSTEMS USING STREAM INTAKES 9 VAC 25-780-70.D

Hanover County and the Town of Ashland utilize two stream intakes (Appendix 3). The two intakes are located at the Doswell Water Treatment Plant and the South Anna Water Treatment Plant. Currently, the South Anna Water Treatment Plant is permitted, but inactive. The Doswell Water Treatment Plant is the only active community water system stream intake and has a maximum permitted daily withdrawal of 4.0 million gallons per day (mgd). In 2007, the system had an average daily withdrawal of 3.5 mgd from the North Anna River.

4.5. SELF-SUPPLIED USERS >300,000 GAL/MO SURFACE WATER FOR NON-AGRICULTURAL PURPOSES (OUTSIDE SSA) 9 VAC 25-780-70.E

The LRWRP includes information on all of the self-supplied users of more than 300,000 gpm of surface water for non-agricultural purposes (Appendix 4). Four self-supplied users were identified based on available data as potential users of more than 300,000 gpm of surface water for non-agricultural purposes.

- American Aggregates Corporation (also referred to as Martin Marietta Materials or Verdon Quarry), located on Verdon Road in northern Hanover, pulls an average of 1.009 mgd from an on-site quarry. Their estimated annual average usage is 368.46 mgd. The water from on-site ponds is used to wash aggregate via a sump system.
- Bear Island Paper Company, LLC, located on Old Ridge Road in northern Hanover, pulls an average of .821 mgd from the North Anna River. Their estimated annual average usage is 299.8 mgd.
- The Hollows Corporation, Inc, which operates a golf course on Greenwood Church Road in western Hanover, pulls an average of .185 mgd from an on-site 14-acre lake. The corporation also pulls from the South Anna River in two locations. In the two locations combined, it pulls an average of .138 mgd from the South Anna River. The estimated annual average usage from the 14-acre lake is 67.6 mgd and the estimated annual average usage from the two South Anna withdrawal points combined is 50.2 mgd.
- There was no report for US Silica, which is located on Taylors Creek Road in western Hanover.

4.6. SELF-SUPPLIED USERS >300,000 GAL/MO GROUND WATER FOR NON-AGRICULTURAL PURPOSES

9 VAC 25-780-70.F

The LRWRP documents the self-supplied users of more than 300,000 gpm of ground water for non-agricultural purposes (Appendix 5). There are no documented users within the community water system (public or private) service area that fall within this category. There are multiple documented users identified outside of the community water system (public or private) service area that fall within this category; however, information regarding average daily withdrawal is available only for Supervalue, Inc, which has an average daily withdrawal of .052 mgd.

Based on maximum daily withdrawals as listed on VDH's engineering description sheets for permitted wells, there may be many more groundwater users withdrawing more than 300,000 gpm. However, no daily withdrawal information is available for these users to determine their average daily and monthly withdrawals.

4.7. WATER PURCHASED FROM OUTSIDE THE GEOGRAPHIC BOUNDARIES OF PLANNING AREA

9 VAC 25-780-70.G

The LRWRP documents the amount of ground water or surface water that is purchased from water suppliers outside the geographic boundaries of the study area. This information includes the maximum daily and average annual withdrawals, the terms of the contract, the recipient area, the name of the supplier as well as any contractual limitations on the usage or withdrawal of the purchased water.

Hanover County and the Town of Ashland purchase water from Henrico County and the City of Richmond. Water purchased from Henrico County is pulled from the James River and is used to supply the Overhill development and the Tyson Factory located near U.S. Route 33 in Glen Allen. This water can also be used to supply the Hanover public community system in an emergency. The maximum daily withdrawal from the Henrico County Water System is .78 mgd. The water purchased from the City of Richmond is also pulled from the James River and is used to supply the Hanover public community system. The maximum daily withdrawal from the City of Richmond is 20.0 mgd (Appendix 6).

4.8. WATER AVAILABLE FOR PURCHASE FROM OUTSIDE THE PLANNING AREA (SOURCE >300,000 GAL/MO)

9 VAC 25-780-70.H

Based on the provided information, this data element is not applicable to Hanover County or the Town of Ashland. The agreements for water purchased from outside the planning area are detailed above.

4.9. AGRICULTURAL USERS OF >300,000 GAL/MO

9 VAC 25-780-70.I

4.9.1. GROUND WATER AGRICULTURAL USERS OF >300,000 GAL/MO

The LRWRP must identify all agricultural users identified by DEQ that use more than 300,000 gpm of surface or ground water. According to the available data, there are no agricultural users that withdraw more than 300,000 gpm of ground water.

4.9.2. SURFACE WATER AGRICULTURAL USERS OF >300,000 GAL/MO

According to the available data from DEQ, there are 10 self-supplied agricultural users withdrawing more than 300,000 gpm from surface water sources. All of this water is being used for irrigation purposes and is being pulled from either the South Anna River, North Anna River, Pamunkey River, Newfound River or farm ponds. These 10 users are discussed in detail in Section 5 and outlined in Appendix 7.

4.10. ESTIMATE OF SELF-SUPPLIED RESIDENCES/BUSINESSES WITHDRAWING <300,000 GAL/MO

9 VAC 25-780-70.J

A detailed analysis on the estimated number of residences and businesses that are self-supplied by individual wells withdrawing less than 300,000 gpm and the estimated water use by self-supplied users on individual wells is provided in Setion 7.3 of the LRWRP. Additional information is also available in Appendix 8.

In 2002, Hanover County was provided the results of a Source Water Assessment Plan (SWAP) prepared by VDH (Appendix 9). This plan, which was based on a windshield survey, assessed approximately 100 well sites within the County to determine their susceptibility (low, moderate, high). After reviewing the assessment, the County questions both the methodology and validity of the plan. However, the County will continue to rely on VDH for the review of individual wells and private community water systems.

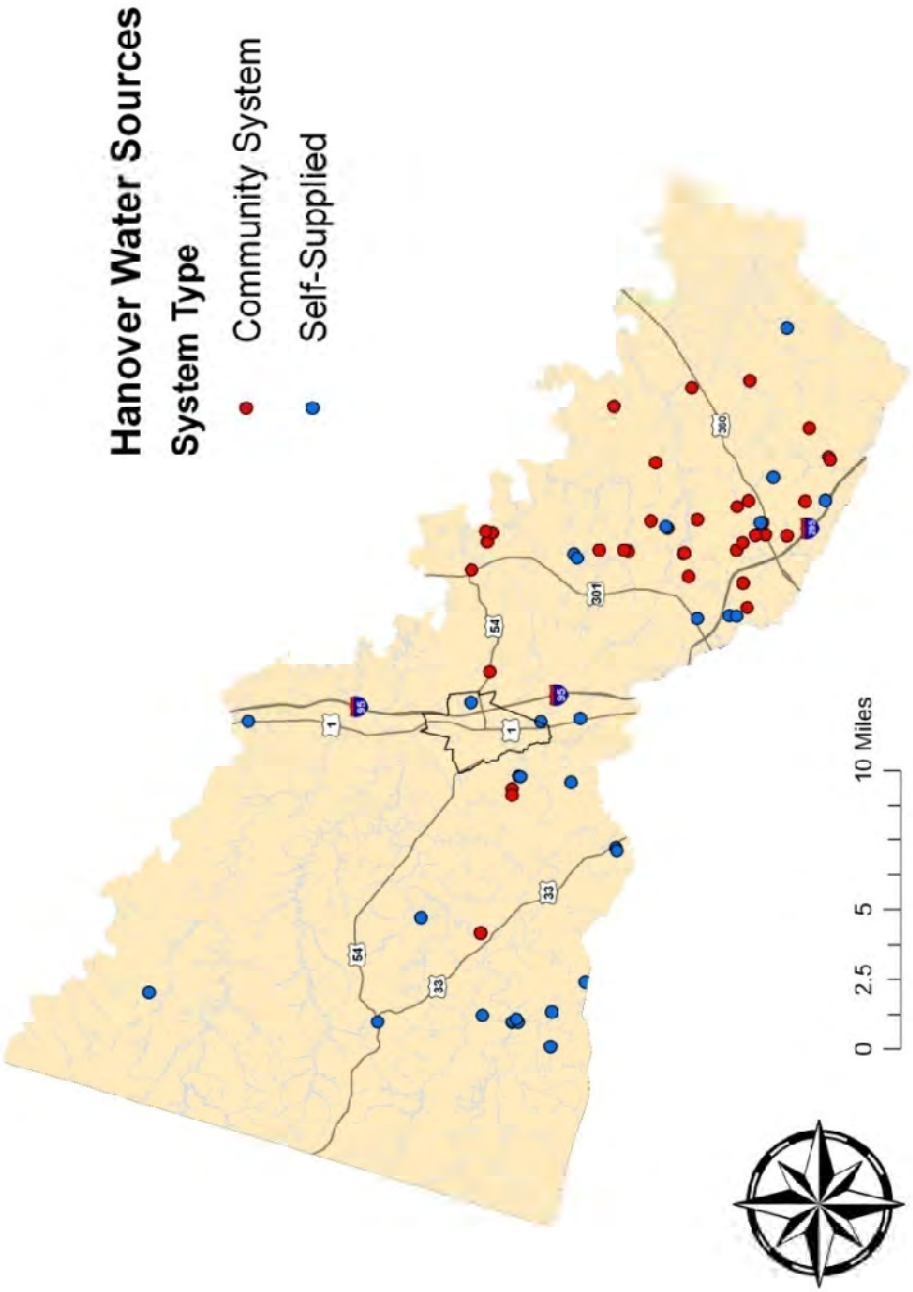
4.11. CONCLUSION

9 VAC 25-780-70.K

Based on long-term water supply needs, Hanover has determined that it may be necessary to secure an additional water source sometime after 2025. In 1994, the County entered into a contract with Richmond to allow a maximum daily withdrawal of 20 mgd from the James River. The combination of available and contracted sources should meet the County's water needs until 2025. In February 2008, the Hanover County Board of Supervisors approved a Conditional Use Permit (CUP-10-89, Am. 1-06) for American Aggregates (Martin Marietta Materials, Inc.) to expand a quarry located on Verdon Road. As part of the permit approval, the County negotiated a future water source at Verdon Quarry which, when permitted by DEQ, will address water needs beyond 2025.

Figure 4-1 Water Sources System Type in Hanover County

Source: Hanover County GIS, 2010.



5.0 EXISTING WATER USE INFORMATION (9 VAC 25-780-80)

5.1. COMMUNITY WATER SYSTEMS 9 VAC 25-780-80.B

The water use information for community systems withdrawing more than 300,000 gpm of ground or surface water must include the population served by each system and the number of connections for each system. According to Appendix 10, the population served by community water systems using ground or surface water is 82,305 and there are 22,760 connections used to serve this population.

5.1.1. POPULATION SERVED BY EACH COMMUNITY SYSTEM. 9 VAC 25-780-80.B.1

DEQ data indicates that the public and private community water systems in Hanover County and the Town of Ashland serve a population of 82,305. Public community water systems in Hanover County and the Town of Ashland serve approximately 72,000 people and private systems serve approximately 10,000 people. The population served by both public and private community water systems ranges from 49 people (Taylor House Complex) to 71,000 people (Hanover Suburban Water System) (Appendix 10).

5.1.2. CONNECTIONS SERVED BY EACH COMMUNITY SYSTEM 9 VAC 25-780-80.B.2

Public and private community water systems in Hanover County and the Town of Ashland have 22,760 connections. The public community water systems include 20,160 connections and the private community systems include 2,600 connections. The systems have a range between 3 connections (Courthouse Water System) to 19,850 connections (Hanover Suburban Water System).

5.1.3. AVERAGE AND MAXIMUM DAILY WITHDRAWAL BY EACH COMMUNITY SYSTEM 9 VAC 25-780-80.B.3

As discussed in Section 4.0, the majority of community water systems rely on ground water. Based on the available data, the average daily withdrawals of each community system ranges from .0058 mgd (Rainier Estates) to 3.6637 mgd (Hanover Suburban Water System). The maximum daily withdrawals of each community system ranges from .0080 mgd (Taylor House Complex) to 8.24 mgd (Hanover Suburban Water System). (Appendicies 8 and 9).

5.1.4. AVERAGE WATER USE FOR EACH COMMUNITY SYSTEM 9 VAC 25-780-80.B.4

The average monthly water use for public and private community systems using ground or surface water ranges from 0 mgm (Avondale Robin Ridge well and Walnut Grove well #1) to 106.42 mgm (Hanover Suburban

Water System – Doswell Water Treatment Plant). The total average monthly water use for all community systems, both public and private, using ground and surface water is 112.67 mgm and the total annual water use for all community systems, both public and private, using ground and surface water is 1351.98 mg (Appendix 11).

5.1.5. PEAK DAY WATER USE FOR EACH COMMUNITY SYSTEM 9 VAC 25-780-80.B.5

The peak day water use per month was determined by multiplying the average daily withdrawal in millions of gallons by a 1.5 peaking factor (Appendix 12). To provide a synopsis of the peak day averages, the data was averaged across all systems for each month. The annual peak day average is calculated from the monthly peak day averages. The annual peak day average for all community systems in the region is 155,501 gpd. The low peak day average for all community systems is 137,573 gpd and occurred in the month of March. The high peak day average for all community systems is 176,059 gpd and occurred in the month of August.

The data shows that water usage increased during the summer months when temperatures are high. March and April have the lowest peak day averages, possibly due to the increase of spring rainfall during this period.

5.1.6. AVERAGE ANNUAL USE BY SELF-SUPPLIED NON-AGRICULTURAL SOURCES >300,000 GAL/MO WITHIN A COMMUNITY SERVICE AREA 9 VAC 25-780-80.B.6

The available data did not identify any self-supplied water sources withdrawing more than 300,000 gpm for non-agricultural purposes within a community service area.

5.1.7. AVERAGE ANNUAL USE BY SELF-SUPPLIED AGRICULTURAL SOURCE >300,000 GAL/MO WITHIN A COMMUNITY SERVICE AREA 9 VAC 25-780-80.B.7

There are no agricultural water sources withdrawing more than 300,000 gpm within a community service area.

5.1.8. SELF-SUPPLIED USERS <300,000 GAL/MO WITHIN A COMMUNITY SERVICE AREA 9 VAC 25-780-80.B.8

The available data does not identify any self-supplied users withdrawing less than 300,000 gpm within a community service area. Community systems are designed to supply a limited number of users. Small, self-supplied users are likely to be located in the rural areas that are outside the economically and technically feasible area covered by the region's community systems.

5.1.9. DISAGGREGATED WATER USE FOR EACH COMMUNITY SYSTEM 9 VAC 25-780-80.B.9

The Hanover suburban water system provides the largest amount of water for non-residential users at 5.13 gpd. The service area for this water system corresponds to the the area identified as the SSA in the Hanover County Growth Management Conservation and Phased Suburban Development Plan, 2007. The Town of Ashland is located within this service area (See Appendix 13 for more information regarding disaggregated water use for community systems).

5.1.10. IN-STREAM BENEFICIAL USE – COMMUNITY SOURCE STREAM INTAKE 9 VAC 25-780-80.B.10

The withdrawal of surface water from community source stream intakes should not denegrate recreation, fish, wildlife resources and habitat. The existing environmental conditions related to fish and wildlife resources and habitat, recreation, and cultural and aesthetic values are described in Section 6. Consideration was given to the presence of endangered species, water quality, and special designations of water bodies in order to protect habitat, maintain waste assimilation, and provide recreational and cultural amenities. Population and economic growth may affect recreation, navigation, and waste assimilation activities. Typically, the most immediate actions to protect in-stream uses include limiting the amount of withdrawals, enhancing design criteria for intakes to reduce the capture of organisms, and selecting adequate timing for construction activities to prevent disruption of breeding activities. Furthermore, adequate wastewater treatment will ensure water quality, which is a key element for habitat protection and waste assimilation.

5.2. AVERAGE ANNUAL USE BY SELF-SUPPLIED NON-AGRICULTURAL SOURCES >300,000 GAL/MO OUTSIDE THE COMMUNITY SERVICE AREAS 9 VAC 25-780-80.C

As discussed in Section 4 and shown in Appendix 4, there are four self-supplied water users outside the community service area that use more than 300,000 gpm of surface water. The Bear Island Paper Co., L.L.C. Ashland Plant pulls an estimated annual average of 299.8 mgd from the North Anna River. American Aggregates Corporation pulls an estimated annual average of 368.46 mgd from a quarry. The Hollows Corporation, Inc. pulls an estimated annual average of 117.8 mgd from a 14-acre lake and two withdrawal points along the South Anna River. US Silica is included in the data because their water withdrawal and usage is close to the greater than 300,000 gpm reporting requirement; however, the only data provided is that their water is withdrawn from settling ponds.

As discussed in Section 4 and shown in Appendix 5, the available data only provides information on one self-supplied water user outside the community service area that uses more than 300,000 gpm of ground water;

Supervalue, Inc, has an average daily withdrawal of .052 mgd. There are other non-agricultural self-supplied users that are permitted by VDH, but they do not report their water withdrawal information to DEQ. It is unknown how many of these users meet the greater than 300,000 gpm threshold required for DEQ reporting.

5.3. SELF-SUPPLIED AGRICULTURAL USERS OF >300,000 GAL/MO OUTSIDE THE COMMUNITY SERVICE AREAS 9 VAC 25-780-80.D

DEQ data identifies 10 self-supplied agricultural users that withdraw more than 300,000 gpm of surface water; however, water use data is only provided for 8 of the users (data not provided for Liberty Springs Farm and Plain Dealing Farm). All of these users are located outside of the community water system service area. They include the following (Appendix 7):

- Ashland Berry Farm
- Brookmeade Sod Farm, Inc
- Cabin Hill Farm
- Colesville Nursery, Inc
- Enfield Sod - Enfield Farm
- Horseshoe Farm
- Kirby Farms, LLC
- Liberty Springs Farm
- Plain Dealing Farm
- Grainfield Farm

Each of these agricultural users withdraw surface water for irrigation purposes. Brookmeade Sod Farm is the largest water user, withdrawing .227 mgd from the South Anna River. Altogether, the 8 users pull a total of .378 mgd from the South Anna River, .072 mgd from the Newfound River, .587 mgd from the Pamunkey River and .118 mgd from the North Anna River. The total estimated agricultural usage by source for the above 8 users is 1.438 mgd.

5.4. ESTIMATED NUMBER AND TOTAL USE BY SELF-SUPPLIED SOURCES <300,000 GAL/MO OUTSIDE THE COMMUNITY SERVICE AREAS 9 VAC 25-780-80.E

It is difficult to identify and quantify the water usage of users outside of the community service areas; however, Section 7.3 provides a detailed analysis on water demand projections for self-supplied sources <300,000 gal/mo outside the community service area. Data for self-supplied users outside of community service areas is based on permits from VDH and DEQ.

6.0 EXISTING WATER RESOURCE CONDITIONS (9 VAC 25-780-90)

6.1. EXISTING ENVIRONMENTAL CONDITIONS 9 VAC 25-780-90.B

The LRWRP includes a description of natural resources and environmental conditions which are characteristic of the study area and may affect existing water resources or the development of new water resources. Additional information on the County's natural resources resources can be found in Section 2.0.

6.1.1. STATE OR FEDERAL LISTED THREATENED OR ENDANGERED SPECIES OR HABITATS OF CONCERN 9 VAC 25-780-90.B.1

The Endangered Species Act (ESA) of 1973 (7 USC 136; 16 USC 1535 et seq.) provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. The Fish and Wildlife Service, the U.S. Department of the Interior and the National Oceanic and Atmospheric Administration (NOAA) Fisheries Service in the U.S. Department of Commerce share responsibility for the administration of the ESA. The Fish and Wildlife Service maintains the list of 384 endangered and threatened species. Species include birds, insects, fish, reptiles, mammals, crustaceans, flowers, grasses and trees. The presence of listed threatened or endangered species, or species identified as rare or potential candidates for listing under the ESA must be considered in planning for future water supply needs. The ESA prohibits any action, administrative or real, that results in a "taking" of a listed species, or adversely affects their habitat.

Virginia law protecting threatened or endangered species also affects the ability to develop water supply resources. A Virginia Water Protection Permit (VWPP) is required for withdrawals from surface waters. In evaluating the VWPP application, the Virginia Department of Game and Inland Fisheries (VDGIF), the Virginia Department of Agriculture and Consumer Services (VDACS), and the Virginia Department of Conservation and Recreation, Division of Natural Heritage (VDCR-DNH) evaluate the effect of VWPP actions. VDGIF is responsible for protection of animal species; VDACS is responsible for the protection of plants and insects. Both agencies work with VDCR-DNH to maintain an inventory of known occurrences of species of concern. Tables 6-1 and 6-2 provide a list of threatened and endangered species in Hanover County.

As identified in the tables below, a number of species have been classified by either the VDGIF (Biota of Virginia (BOVA)) or VDCR-DNH as Threatened or Endangered or a species which merits special concern regarding the long term viability and health of the species. A Wildlife Action Plan has been prepared by the VDGIF for a number of these species. Those areas designated as protected habitat areas are shown on the map in Figure 6-1.

Table 6-1 Threatened or Endangered Species for Hanover County

Virginia Department of Game and Inland Fisheries

STATUS	COMMON NAME	SCIENTIFIC NAME
SE	Bat, Rafinesque's Eastern Big-Eared	Corynorhinus Rafinesquii Macrotis
SE	Rattlesnake, Canebrake	Crotalus Horridus
ST	Sandpiper, Upland	Bartramia Longicauda
ST	Shrike, Loggerhead	Lanius Ludovicianus
FSST	Eagle, Bald	Haliaeetus Leucocephalus
ST	Floater, Green	Lasmigona Subviridis
ST	Shrike, Migrant Loggerhead	Lanius Ludovicianus Migrans
FSSS	Lance, Yellow	Elliptio Lanceolata
SS	Heron, Little Blue	Egretta Caerulea Caerulea
SS	Wren, Winter	Troglodytes Troglodytes
SS	Frog, Carpenter	Lithobates Virgatipes
CC	Turtle, Spotted	Clemmys Guttata
SS	Harrier, Northern	Circus Cyaneus
SS	Night-Heron, Yellow-Crowned	Nyctanassa Violacea Violacea
SS	Owl, Barn	Tyto Alba Pratincola
SS	Lampmussel, Yellow	Lampsilis Cariosa
SS	Creeper, Brown	Certhia Americana
SS	Dickcissel	Spiza Americana
SS	Egret, Great	Ardea Alba Egretta
SS	Finch, Purple	Carpodacus Purpureus
SS	Kinglet, Golden-Crowned	Regulus Satrapa
SS	Moorhen, Common	Gallinula Chloropus Cachinnans
SS	Nuthatch, Red-Breasted	Sitta Canadensis
SS	Tern, Caspian	Sterna Caspia
SS	Thrush, Hermit	Catharus Guttatus
SS	Warbler, Magnolia	Dendroica Magnolia
SS	Otter, Northern River	Lontra Canadensis Lataxina

FE=Federal Endangered; FT=Federal Threatened; FC=Federal Candidate; FS=Federal Species of Concern (not a legal status; list maintained by USFWS Virginia Field Office);
SE=State Endangered; ST=State Threatened; SS=State Special Concern (not a legal status).

Source: Fish and Wildlife Information Service. 384 Species Booklet for Fish, Amphibians, Reptiles, Birds, Mammals, Mollusks, Other Aquatic Invertebrates, Terrestrial Invertebrates, Marine Mammals, Plants in (085) Hanover County. Virginia Department of Game and Inland Fisheries, 2009, http://www.vafwis.org/fwis (accessed July 12,.2010).

Table 6-2 Threatened or Endangered Species for Hanover County

Virginia Department of Conservation Resources

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	LAST YEAR OBSERVED
Amphibians				
Ambystoma Tigrinum	Tiger Salamander		LE	1973
Siren intermedia	Lesser Siren			2009
Birds				
Haliaeetus Leucocephalus	Bald Eagle		LT	2002
Bivalvia (Mussels)				
Alasmidonta Heterodon	Dwarf Wedgemussel	LE	LE	1972
Elliptio Lanceolata	Yellow Lance	SOC	SC	1995
Lampsilis Cariosa	Yellow Lampmussel		SC	1991
Lampsilis Radiata	Eastern Lampmussel		SC	1985
Lasmignona Subviridis	Green Floater		LT	1972
Communities				
Natural Community	Coastal Plain/Piedmont Acidic Seepage Swamp			2008
Natural Community	Coastal Plain/Piedmont Swamp Forest			2006
Natural Community	Mountain/Piedmont Basic Woodland			1995
Heteroptera (True Bugs)				
Sigara Depressa	Virginia Piedmont Water Boatman	SOC	LE	1969
Lepidoptera (Butterflies & Moths)				
Acronicta Albarufa	Barrens Dagger Moth			1998
Vascular Plants				
Asclepias Purpurascens	Purple Milkweed			2002
Desmodium Tenuifolium	Slim-leaf Tick-trefoil			1978
Helenium Brevifolium	Shortleaf Sneezeweed			2006
Mimosa Quadrivalvis Var. Angustata	Little-leaf Sensitive-briars			1986
Sarracenia Purpurea Ssp. Venosa	Sourthern Purple Pitcher-Plant			1987
Tetragonotheca Helianthoides	Pineland Squarehead			1972
Triadenum Tubulosum	Large Marsh St. John's Wart			2006

Federal Status: LE - Listed Endangered; SOC - Species of Concern species that merit special concern (not a regulatory category)

State Status: LE - Listed Endangered; LT - Listed Threatened; SC - Special Concern - animals that merit special concern according to VDGIF (not a regulatory category)

Source: Virginia Natural Heritage Program. Natural Heritage Resources by County: Hanover County. Virginia Department of Conservation and Recreation, 2002, http://www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml (accessed 07.12.2010).

6.1.2. ANADROMOUS, TROUT AND OTHER SIGNIFICANT FISHERIES 9 VAC 25-780-90.B.2

Anadromous, or migratory, fish are born in fresh water, but spend most of their lives in the ocean and return to fresh water to spawn. VDGIF's Fish Passage program works to "provide for fish passage at dams and remove stream blockages whenever necessary to restore natural passage for migratory and resident fish." A number of waterways and two dam sites have been identified in Hanover County as confirmed or potential migration pathways, spawning grounds, or nursery areas for anadromous fish.

Five rivers or streams are classified as anadromous fisheries in Hanover County and, as part of VDGIF's Fish Passage Program which committed jurisdictions to the completion of fish passage/dam removal projects, the following critical areas have been identified as part of the VDGIF 1989 Implementation Plan to remove impediments to migratory fish and restoring depleted migratory fish stocks in the Chesapeake Bay watershed:

- Little River near State Route 685
- North Anna River, approximately 4 kilometres upstream from U.S. Route 1
- Matatequin Creek at the crossing with State Route 606
- South Anna River at the Ashland Mill Dam

    1. Ashland Mill Dam - would reopen 9 miles. Provision of fish passage is needed at this 13' dam on the South Anna River near Rt. 1 to allow anadromous, catadromous (lives in fresh water and enters salt water to spawn) and resident fish species access to native spawning habitat. American shad, hickory shad, blueback herring, alewife herring, striped bass and American eel reach this dam each spring but cannot access historical upstream spawning habitat. Passage should be provided. One method would be through the construction of a fishway. Another less desirable method, and one which would have greater economic consequence to the region and industry, would be removal of the dam altogether.
    2. Ashland Water Supply Dam - would reopen 28 miles. A simple notch is needed at this low-head (3') water supply dam on the South Anna River near State Rt. 54 in Hanover County.

VDGIF is using a state-matched U.S. EPA Chesapeake Bay Program grant to fulfill the 1989 Implementation Plan initiatives for removing impediments to migratory fish and restoring depleted migratory fish stocks in the Chesapeake Bay watershed. Coordination involves a multi-faceted approach to address migratory fish restoration in Virginia's portion of the Chesapeake Bay. The Fish Passage Project and the Shad Restoration Project complement each other. There are no trout streams, wild or native, in Hanover County (Figure 6-2).

6.1.3. RIVER SEGMENTS - RECREATIONAL SIGNIFICANCE INCLUDING STATE SCENIC RIVER STATUS

9 VAC 25-780-90.B.3

The National Park Service has identified three rivers, the Chickahominy River, North Anna River and South Anna River, in its National Rivers Inventory. The Chickahominy River (from U.S. Route 360 to the borders of Henrico and New Kent Counties) has been designated as a Scenic River by VDCR (Figure 6-3).

Development or expansion of a water supply must include evaluation of impacts to the recreational, physical (including viewsheds and landscape), cultural, historical aspects of rivers and streams. A Scenic River designation may affect siting decisions or project design for development projects within the viewshed of the body of water. Measures should be undertaken early in the development process to ensure resources are not degraded or shorelines eroded as a consequence of development or water supply planning actions. Recreational fishing and boating depend on stable shorelines and streambanks, protected marshes, the maintenance of minimum flows in the affected waterways, and avoidance of excessive silt and sediment.

To receive a designation as a Scenic River, a river's hydrology, including any man-made alterations, and an inventory of its natural, cultural, and recreational resources, must be reviewed by an interdisciplinary study team and found to offer unique, rare or exemplary features that are valuable at a regional or national scale Those identified resources are detailed below (Table 6-3).

Table 6-3 Nationwide Rivers Inventory

National Park Service - National Center for Recreation and Conservation

RIVER	COUNTY	REACH	LENGTH (MILES)	YEAR LISTED/ UPDATED	POTENTIAL CLASSI-FICATION	*ORVS*	DESCRIPTION	OTHER STATES
Chickahominy River	James City, Charles City, New Kent	James River to Providence Forge	30	1982		G, O	Botanic-(An extensive, well developed cypress-gum swamp forest and bottomland hardwood forest which includes three rare, endemic and possibly endangered species of plants.)	
							Geologic-(Extreme topographic diversity including cliffs up to 100 feet high at Fish Hole Landing.)	
North Anna River	Caroline, Hanover, Spotsyl-vania	1.5 miles above Morris Bridge to Lake Anna	26	1982		R, H	Historic-(Numerous historic mill sites and ruins, Civil War Battlefields and breastworks, and Indian artifact sites are located within the corridor.)	
							Recreation-(One of the most popular whitewater canoe runs in Virginia.	

Table 6-3 Nationwide Rivers Inventory

National Park Service - National Center for Recreation and Conservation

RIVER	COUNTY	REACH	LENGTH (MILES)	YEAR LISTED/ UPDATED	POTENTIAL CLASSI-FICATION	*ORVS*	DESCRIPTION	OTHER STATES
							Segment includes a diversity of gradients including Fallsline Run, a Class 4 segment. Unique proximity to urban populations in Richmond and Fredericksburg. A noted smallmouth bass fishing river.)	
North Anna River	Caroline, Hanover	Pamunkey and South Anna River to Morris Bridge	6	1982		R, H	Historic-(Numerous historic mill sites and ruins, Civil War battlefields and breastworks, and Indian artifact sites are located within the corridor.)	
							Recreation-(Unique proximity to urban population in Richmond and Fredericksburg. A noted small-mouth bass fishing river.)	
South Anna River	Hanover	North Anna River to Gouldin	30	1982		R, H	See North Anna River (segment from Pamunkey and South Anna River to Morris Bridge) comments.	
South Anna River	Hanover, Louisa, Orange	Gouldin to Route 15 crossing	70	1982		R, H	Historic-(The corridor includes numerous still sites and ruins.)	
							Recreation-(The longest, least developed, free-flowing, canoeable river in the state, region and section.)	

ORV= Outstanding Remarkable Value. (S) Scenery, (R) Recreation, (G) Geology, (F) Fish, (W) Wildlife, (P) Prehistory, (H) History, (C) Cultural, (O) Other Values

Potential Classification. (W) Wild Rivers, (S) Scenic Rivers, (R) Recreational rivers

Source: National Park Service. National Center for Recreation and Conservation. National Rivers Inventory, accessed 07.12.2010 http://www.nps.gov/ncrc/programs/rtca/nri/states/va.html, (accessed July 12, 2010).

6.1.4. SITES OF HISTORIC OR ARCHAEOLOGICAL SIGNIFICANCE 9 VAC 25-780-90.B.4

Hanover County has a wealth of historic and archeological resources including historic buildings, Revolutionary War and Civil War battlefields, and pre-historic and Native American sites, cemeteries and archeological sites (Figure 6-4) . The County has policies in place to evaluate potential impact to the historic context of all identified resources from development proposals. None of the identified resources give rise to environmental conditions that may affect current water supply.

6.1.5. UNUSUAL GEOLOGIC FORMATIONS OR SPECIAL SOIL TYPES

9 VAC 25-780-90.B.5

There are two distinct geologic and hydrogeologic settings in Hanover County. The eastern portion of the County is located within the Coastal Plain Physiographic Province, which is composed of unconsolididated marine and non-marine sediments overlying a crystalline rock complex. A major fault zone, the Fall Line, separates the Coastal Plain Physiographic Province from the Piedmont Physiographic Province. The Piedmont Physiographic Province is composed of massive igneous and metamorphic rocks.

6.1.6. WETLANDS

9 VAC 25-780-90.B.6

Wetlands are transitional areas between dry uplands and bodies of water. Hanover's wetland complexes, whether tidal or non-tidal, consist of vegetated marshes, swamps, bogs, bottomlands, shallow open waters, non-vegetated beaches, sandflats and mudflats. Wetlands provide a multitude of benefits including, but not limited to, filtering pollutants and sediment, serving as a barrier to and a means to absorb floodwaters, buffering and stabilizing shorelines and stream banks from erosion, recharging groundwater resources, and serving as breeding and nesting grounds for plant and wildlife.

Most of Hanover County's wetlands exist along stream corridors. The majority of the wetlands are found along the middle and lower Pamunkey, Newfound River, Totopotomy Creek, Beaverdam Creek, and Mechumps Creek. Additional wetlands are found in the concentrated areas within the geographic center of the County. The lower part of the Chickahominy River has the greatest expanse of wetlands (Figure 6-5).

In addition to federal and state endangered species and wetlands regulations, the County's and the Town's respective Chesapeake Bay Preservation program regulates wetlands within Chesapeake Bay Preservation Areas (CBPAs), limits new development in wetlands and requires a 100' buffer around certain wetlands. VDCR's Natural Heritage Program has ranked watersheds according to the number of occurrences of natural heritage resources and their potential to be impacted by water quality changes (Table 6-4). The most significant watersheds in the County and their assigned ranking are listed below:

Table 6-4 Watershed Ranking – Impacts To Heritage Resources

Department Of Conservation And Recreation – Natural Heritage Program

WATERSHED	IMPACTS
Lower South Anna River	High
Chickahominy River/Beaverdam Creek	High
Lower Little River	Low
Upper Pamunkey River/Mechumps Creek	Low
Middle Pamunkey River/Topotomoy Creek	Low

Source: Department of Conservation and Recreation. Natural Heritage Program. Virginia Water Quality Report 305b, 1998.

6.1.7. CONSERVATION EASEMENTS AND RIPARIAN BUFFERS 9 VAC 25-780-90.B.7

Conservation easements, as defined by the State, "…excludes certain activities on private land, such as commercial development or residential subdivisions. Its main goal is to conserve natural or man-made resources on the land. The easement is usually described in terms of the resource it is designed to protect, such as agricultural, forest, historic or open space easements." (Virginia Department of Forestry, 2010). Conservation easements are a useful tool in protecting natural, historic and heritage resources; however, the intensity of such protections varies by individual easements and developments that may be permitted by some such agreements. While conservation easements provide some restriction on development options, the large rural expanses of Hanover County and the focus of growth in the Suburban Service Area have been the primary drivers for future water supply demand. There are a relatively small number of conservation easements in Hanover County, totaling 2,834 acres or 0.9% of land area (Figure 6-6). The locations of these easements will need to be factored into plans for additional community wells or any water reservoirs.

In addition to conservation easements, the County provides for the preservation of open space and sensitive lands through the descretionary zoning process The RC Rural Conservation District allows open space and sensitive lands to be preserved and maintained in conjunction with the development of clustered residential development. Hanover County has 5,466.43 acres in preservation areas within RC Districts.

The Chesapeake Bay Preservation Program, which was adopted by the Town and County in 1990 and 1992, respectively, requires the improvement of water quality of the Chesapeake Bay through proper land use management strategies. This Program has been revised a number of times, most recently in 2003. Resource Protection Areas (RPAs) and Resource Management Areas (RMAs) are defined in the Town and County Codes as tidal wetlands, nontidal wetlands connected by surface flow and contiguous to tidal wetlands or tributary streams, tidal shores, and a 100' wide buffer area located adjacent to and landward of other RPA components. RMAs are defined as highly erodible soils, highly permeable soils, floodplains and non-tidal wetlands not included in an RPA. If none of these features are contiguous to the RPA, or if the features are less than a total of 150' in width, then the RMAs consist of an area 150' contiguous to and landward of the RPA.

Development within RPAs is limited to water-dependant uses and redevelopment. Development within an RMA is allowed provided that certain development standards, as set forth in the Hanover County Code, are followed to ensure water quality is protected. Intensely Developed Areas (IDAs) are areas of concentrated development within an RPA where development has severely altered the natural state of the area. Hanover County has not identified any IDAs.

6.1.8. LAND USE AND LAND COVERAGE

9 VAC 25-780-90.B.8

Assessing land use and land cover is an important component of water supply planning because they affect the natural water systems' ability to be replenished and they help to predict where growth in water demand will occur (Figure 6-7). Where intense urban or suburban activity occurs, impervious land cover may occupy a significant percentage of the surface area. This absence of essential pervious surface area prevents rainfall and run-off from percolating in the soil and contributes to increases in run-off volume and pollutants. Because water is not available to recharge ground water, wells may perform less reliably and the velocity of point source water discharge may increase erosion and sediment control problems. Further, pollutant loads increase, thereby increasing the pollutant loads and decreasing water quality.

Development within the County is influenced by many factors including the Land Use Plan contained in the comprehensive plan, zoning, market conditions, physical and environmental constraints, road networks and the availability of utilities such as water and sewer. The County exerts a strong influence on the type, timing and location of development through zoning and the extension of public water and sewer services.

The comprehensive plan encourages suburban growth within a relatively small geographic area of the County identified and mapped as the SSA (Figure 6-8). A majority of growth (70%) is planned within the SSA, while the remaining 30% is planned for the rural areas of the County. The SSA is the area in which the County intends to invest a majority of its planned utility, drainage, and transportation infrastructure. The benefits to this strategy are many, and have served the County well since the County's growth management strategies were first adopted in 1982. This strategy allows for future growth to be concentrated in a relatively small, contiguous area which in turn minimizes impacts arsing from sprawl development to public infrastrutcure, specifially County-owned water and waste water transmission and treatment facilites, roads, and other public facilities. This strategy also helps to protect the rural charater of the County and the resources within the rural planning area such as wetlands, slopes, agricultural soils, and natural habitat.

The County also uses a number of zoning and performance-based tools to influence development and ensure environmental, historic and heritage resources are not adversely impacted by development. The County has enacted the Rural Conservation District (RC), Mixed Use District (MX), Single Family Residential District (RS) and Residential Multi-Family District (RM) to allow for discretionary rezoning which is designed to facilitate the preservation and efficient use of open space, protect natural features, focus development within the SSA and encourage cluster development within rural areas of the County. The rezoning process requires identification of sensitive environmental resources such as aquifer recharge areas, CBPA areas and historic structures.

Impervious cover in Hanover County is concentrated along Interstate 95 and 295 and within the SSA, primarily located in the Ashland, Chickahominy, Cold Harbor and Doswell areas of the County (Figure 6-9). Based on

data extrapolated from the 2002 LandSat images using areas with greater than 33% imperviousness, there is a total of 7.8 square miles of impervious surface (Figure 6-10).

6.1.9. IMPAIRED STREAMS

9 VAC 25-780-90.B.9

Information regarding impaired streams and rivers in Virginia is compiled by DEQ and presented to the EPA on a bi-annual basis (Figure 6-11). DEQ monitors rivers, lakes, streams and tidal waters for pollutants. Over 130 different pollutants are monitored annually to determine whether the waters can be used for swimming, fishing and drinking. Results are reported in the biennial 305(b) Water Quality Assessment Report; any waters that do not meet standards are reported in the 303(d) Impaired Waters Report. This information is crucial to water supply planning in order to develop surface waters to meet future water consumption needs.

6.1.10. POINT SOURCE DISCHARGES

9 VAC 25-780-90.B.10

Section 402 of the Clean Water Act established the National Pollutant Discharge Elimination System to limit pollutant discharges into streams, rivers, and bays. In the Commonwealth of Virginia, DEQ administers the program as the Virginia Pollutant Discharge Elimination System (VPDES). DEQ requires VPDES permits for all point source discharges to surface waters; however, the US Environmental Protection Agency (EPA) maintains authority to review applications and permits for "major" dischargers, a distinction based on discharge quantity and content.

DEQ and VDCR coordinate separate State programs that regulate the management of pollutants carried by storm water run-off. DEQ regulates storm water discharges associated with "industrial activities", while VDCR regulates storm water discharges from construction sites and from municipal separate storm sewer systems (MS4s). VPDES permit locations are shown on the map in Figure 6-12.

PETROLEUM STORAGE

DEQ implements the Underground Storage Tanks (UST) and Aboveground Storage Tanks (AST) programs in Virginia. When a release occurs from an aboveground or underground storage tank, the owner and operator of the tank are required to report the release to DEQ and other governmental agencies. Release reporting requirements are dependent upon the statutes and regulations governing the tank from which the release occurred, the contents of the tank, and the nature of the release.

Suspected and confirmed releases from USTs subject to the requirements of the UST Technical Regulation must be reported to DEQ within 24 hours of discovery of the release. Discharges of oil from sources other than tanks subject to the UST Technical Regulation (e.g. home heating oil tanks, above ground storage tanks, farm

tanks) must be reported to DEQ immediately upon discovery of the discharge. Petroleum storage and releases are shown on the map in Figure 6-13.

LANDFILLS

The known landfills in Hanover County include: an active, permitted construction /demolition and debris site; a closed construction /demolition and debris site; a closed industrial site; eight closed municipal waste sites, one closed Superfund site, and two closed private sites. Solid Waste Facilities are shown on Figure 6-14.

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT – SUPERFUND SITE

The EPA is overseeing the cleanup of the H&H Burn Pit Site, located off U.S. Route 33, where a system to pump and treat groundwater has been operating since May 2000. The system uses high vacuum extraction (HVE) to accelerate the removal of contamination from saturated soils and groundwater. Cleanup of contaminated sediments downstream of the former burn pit area was completed in late spring of 1999. The contaminated soil cleanup in the former burn pit area was completed in 1998.

Groundwater treatment is currently being evaluated by EPA, DEQ, and the parties potentially responsible ("PRPs") for the site contamination and will continue until cleanup goals have been reached. The Superfund Site is shown on the map in Figure 6-14.

6.1.11. OTHER POTENTIAL THREATS

9 VAC 25-780-90.B.11

Hazardous Waste Treatment, Storage and Disposal Facilities: There are no permitted facilities in the County that can store, treat and dispose of hazardous waste.

Failing Septic Systems: Septic systems represent a potential threat to shallow aquifers and shallow wells when they do not function properly. Fortunately, Hanover County does not have major areas with failing septic systems. The County's Chesapeake Bay Preservation Program requires pump-out at least once every five years and reserve drainfield areas; these two requirments reduce the likelihood of significant problems developing. On septic system siting and design, Hanover relies on the VDH, which is the lead agency regulating septic systems.

Biosolids Land Application: Hanover has adopted regulations for land application of biosolids. This regulation requires a permit from the Hanover County DPW, documentation of all federal and State permits, and allows application only on properties within the County zoned A-I, Agricultural District.

Mining Operations: Hanover has relatively few mining operations. The largest commercial operation is American Aggregates Corporation (also known as the Verdon Rock Quarry or Martin Marietta Materials) near

Doswell, which extracts granite rock for use in making crushed stone. Sand quarries exist along the Little River and the Pamunkey River as well.

Contaminant Source Inventory: A Contaminant Source Inventory has been completed for 18 wells operated by DPU. Four wells are screened in unconfined or semi-confined aquifers. The remaining 14 wells are screened in the confined Middle and Lower Potomac Aquifer.

Figure 6-1 Protected Habitat Areas in Hanover County

Source: Hanover County GIS, 2010.

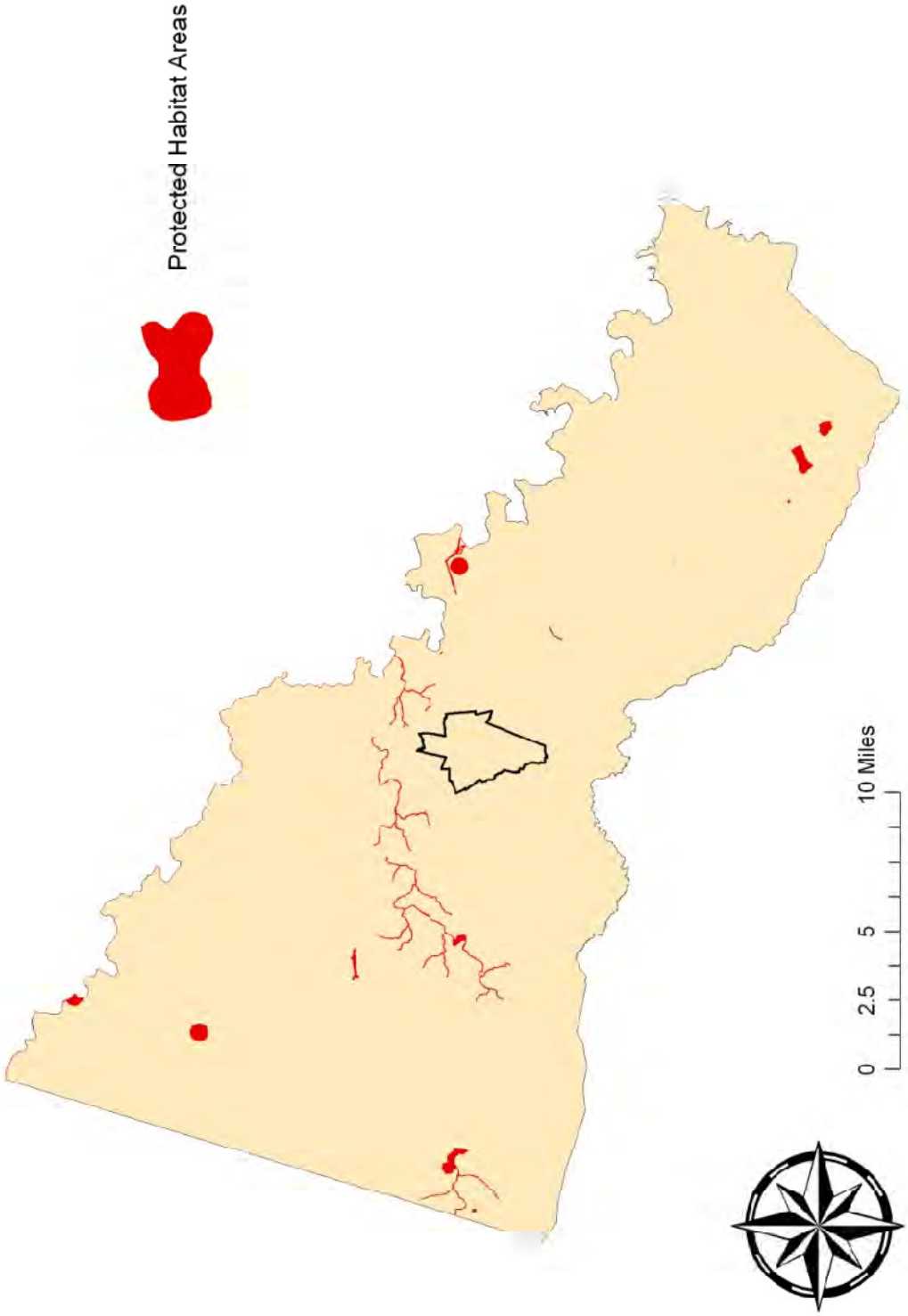


Figure 6-2 Virginia Department of Game and Inland Fisheries Trout Streams

Source: http://www.dgif.virginia.gov/fishing/trout/area-maps/, (accessed July 12, 2010).

Figure 6-3 Department of Conservation Resources Designated Scenic Rivers in Hanover County

Source: Hanover County GIS, 2010.

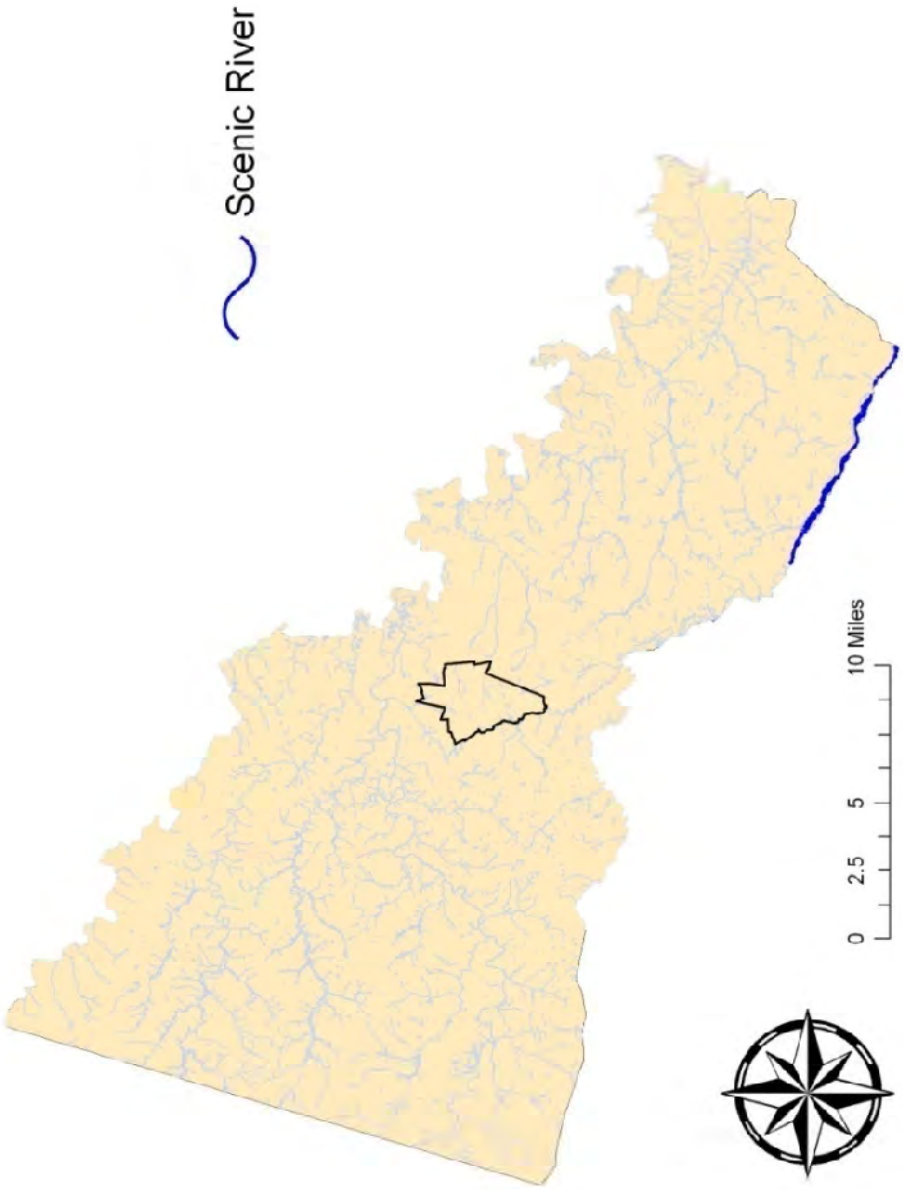


Figure 6-4 Historic & Archaeological Sites in Hanover County

Source: Hanover County GIS, 2010.

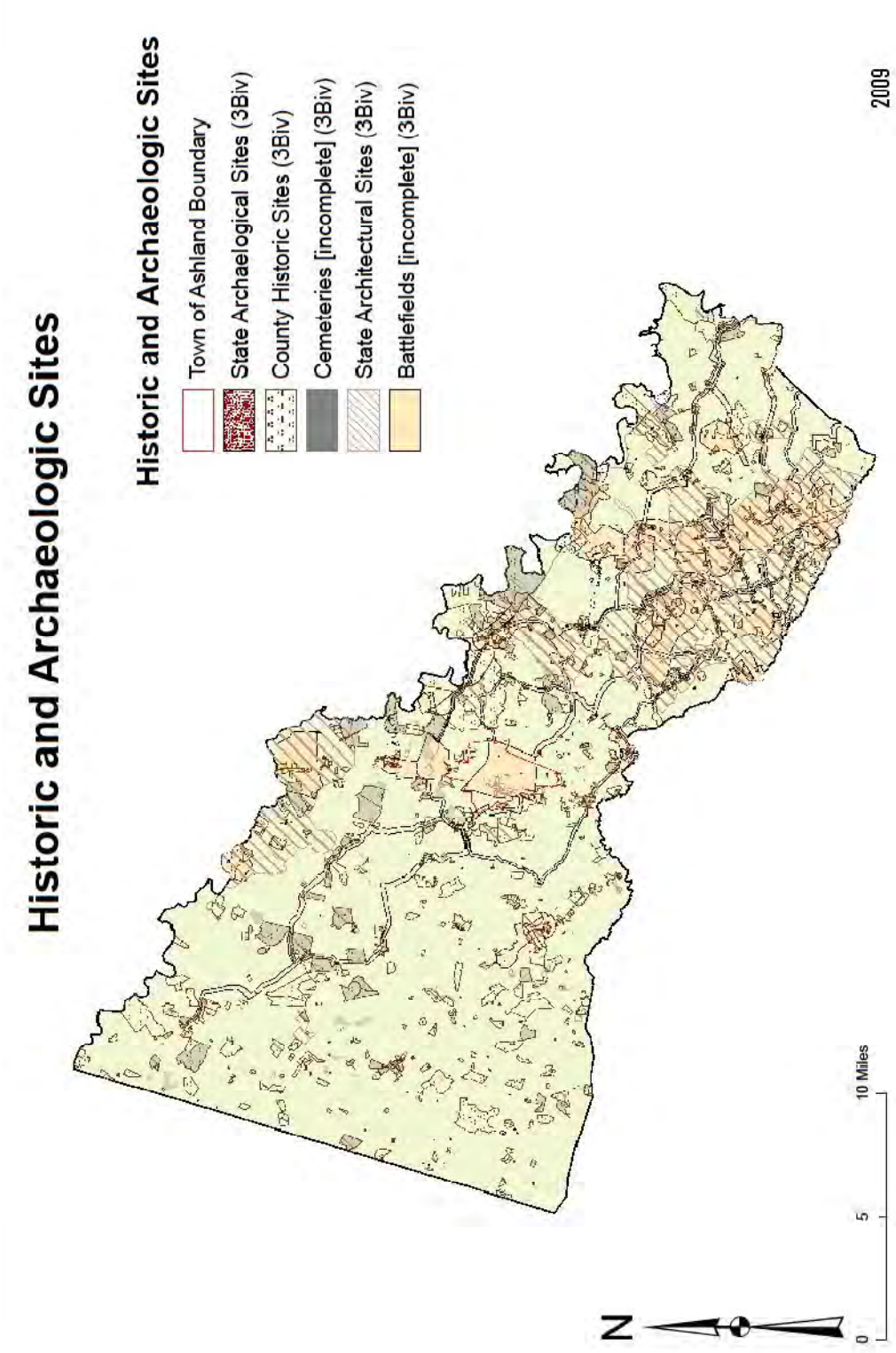


Figure 6-5 Wetlands in Hanover County

Source: Hanover County GIS, 2010.

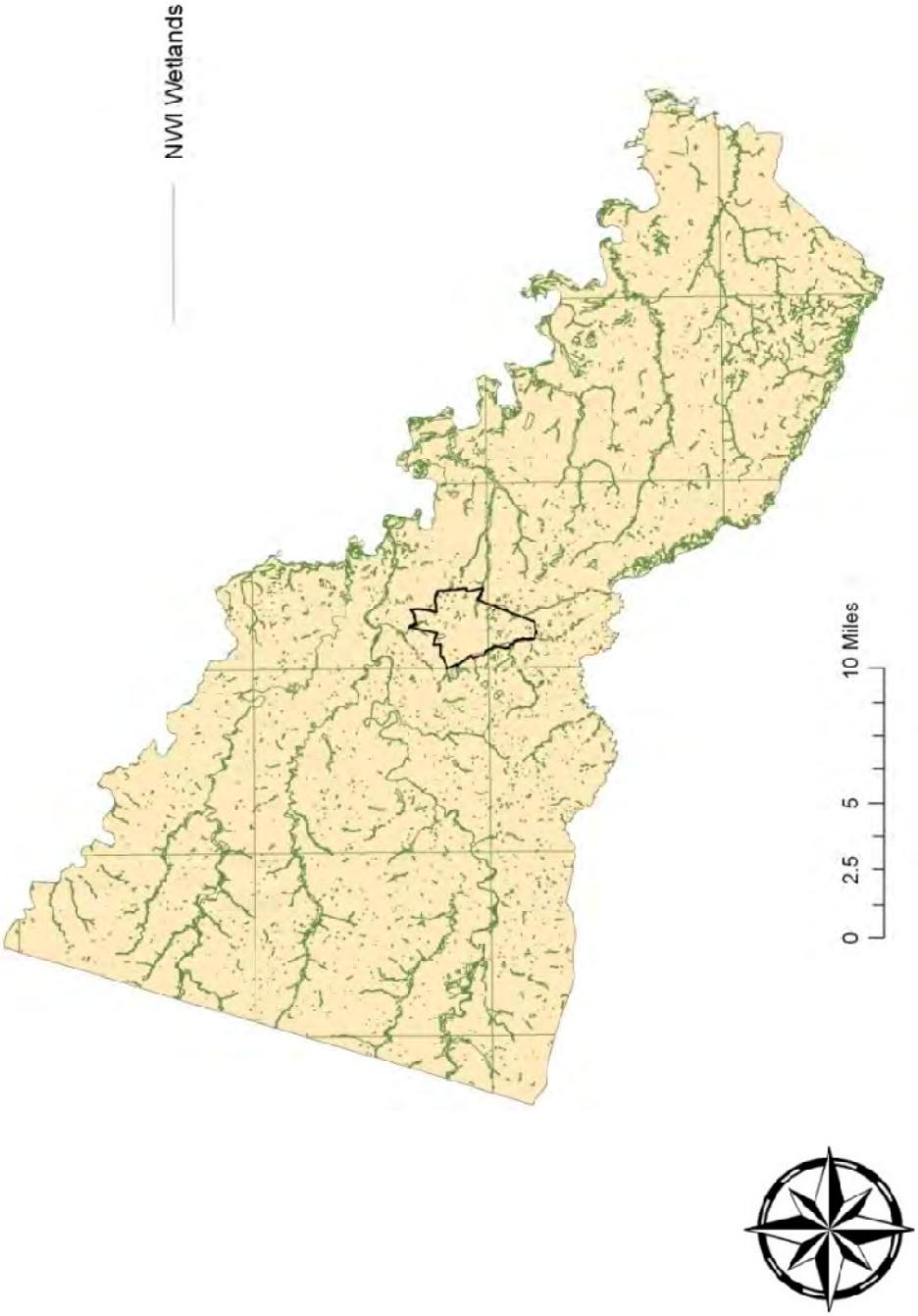


Figure 6-6 Conservation Easements & Watersheds in Hanover County

Source: Hanover County GIS, 2011.

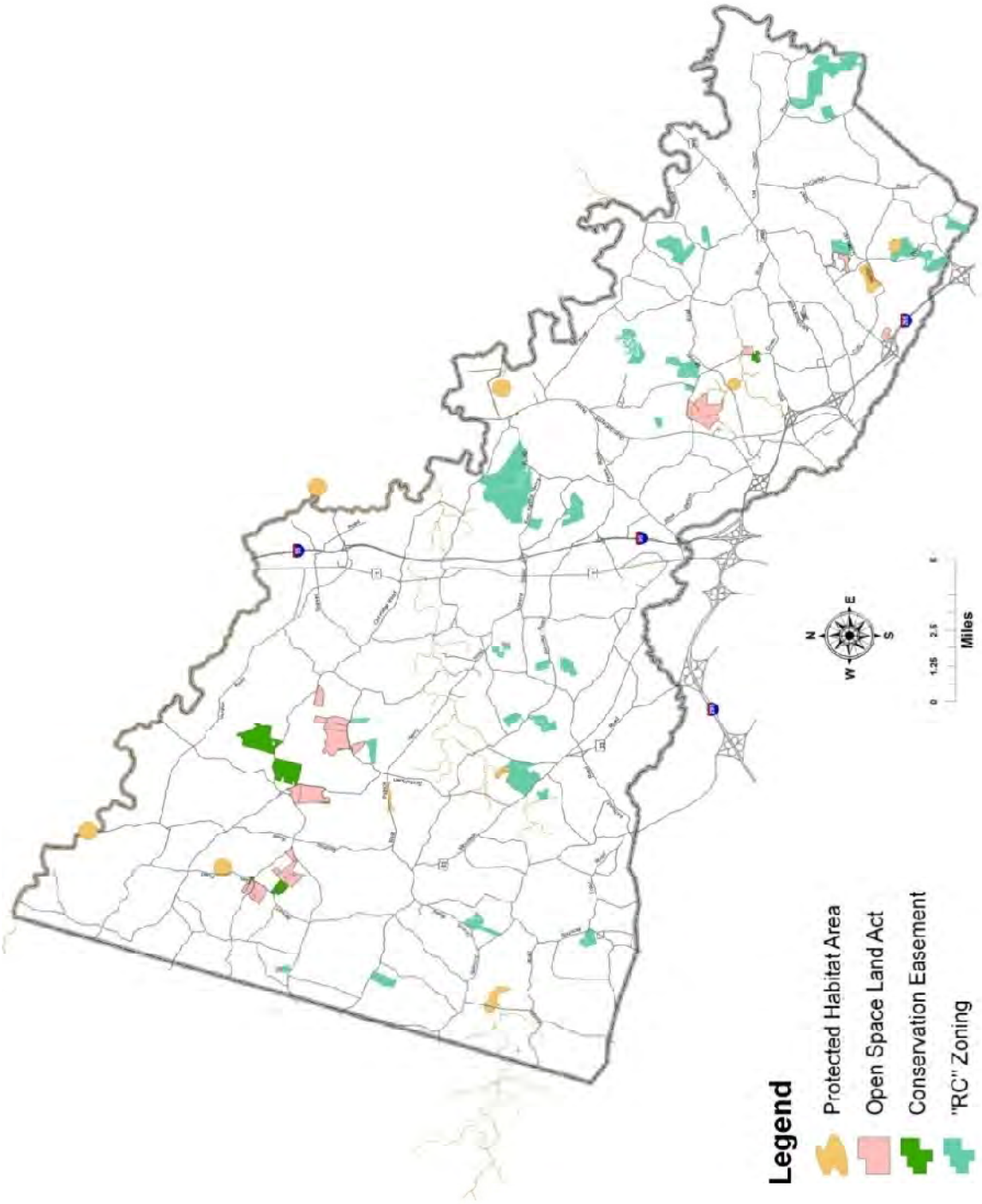


Figure 6-7 Land Cover in Hanover County

Source: Hanover County GIS, 2002.

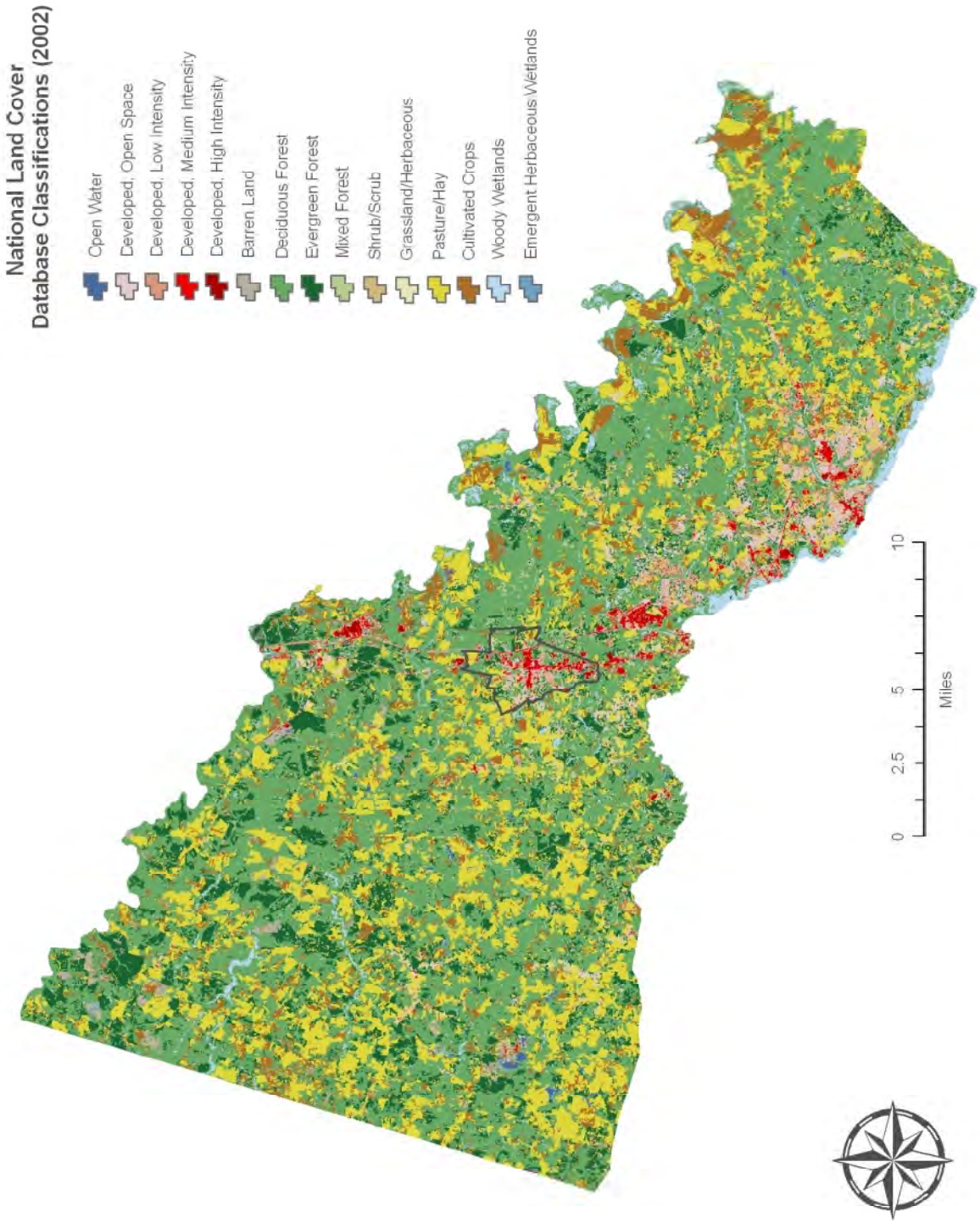


Figure 6-8 Phased Suburban Services Area & Conservation Development Plan

Source Hanover County Owner's Manual, 2027.

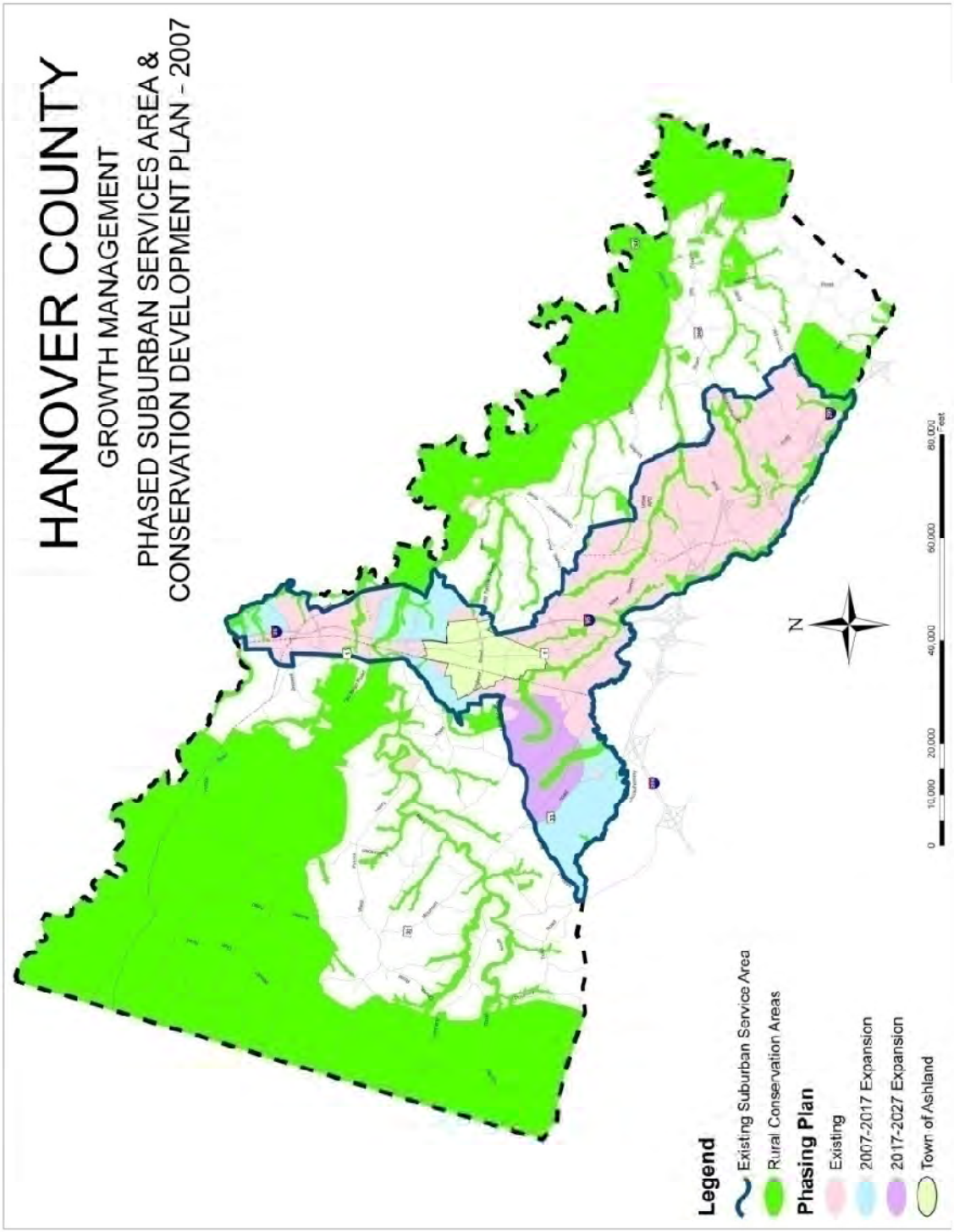


Figure 6-9 Impervious Surface Area in Hanover County

Source: LandSat Land Use Classification, 2002Hanover County GIS, 2010.

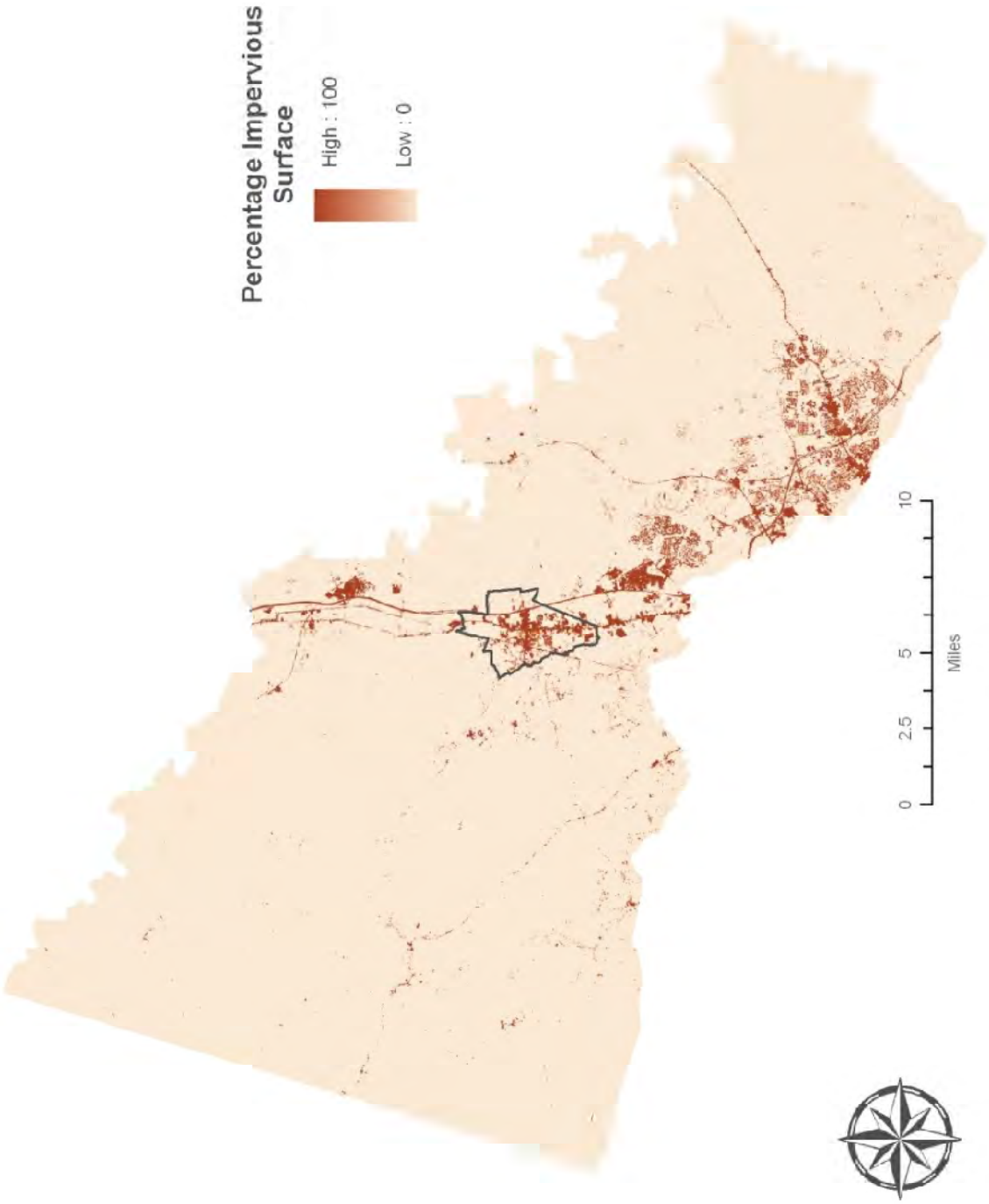


Figure 6-10 Impact of Development on Water Resources in Hanover County

Source: Hanover County GIS, 2010.

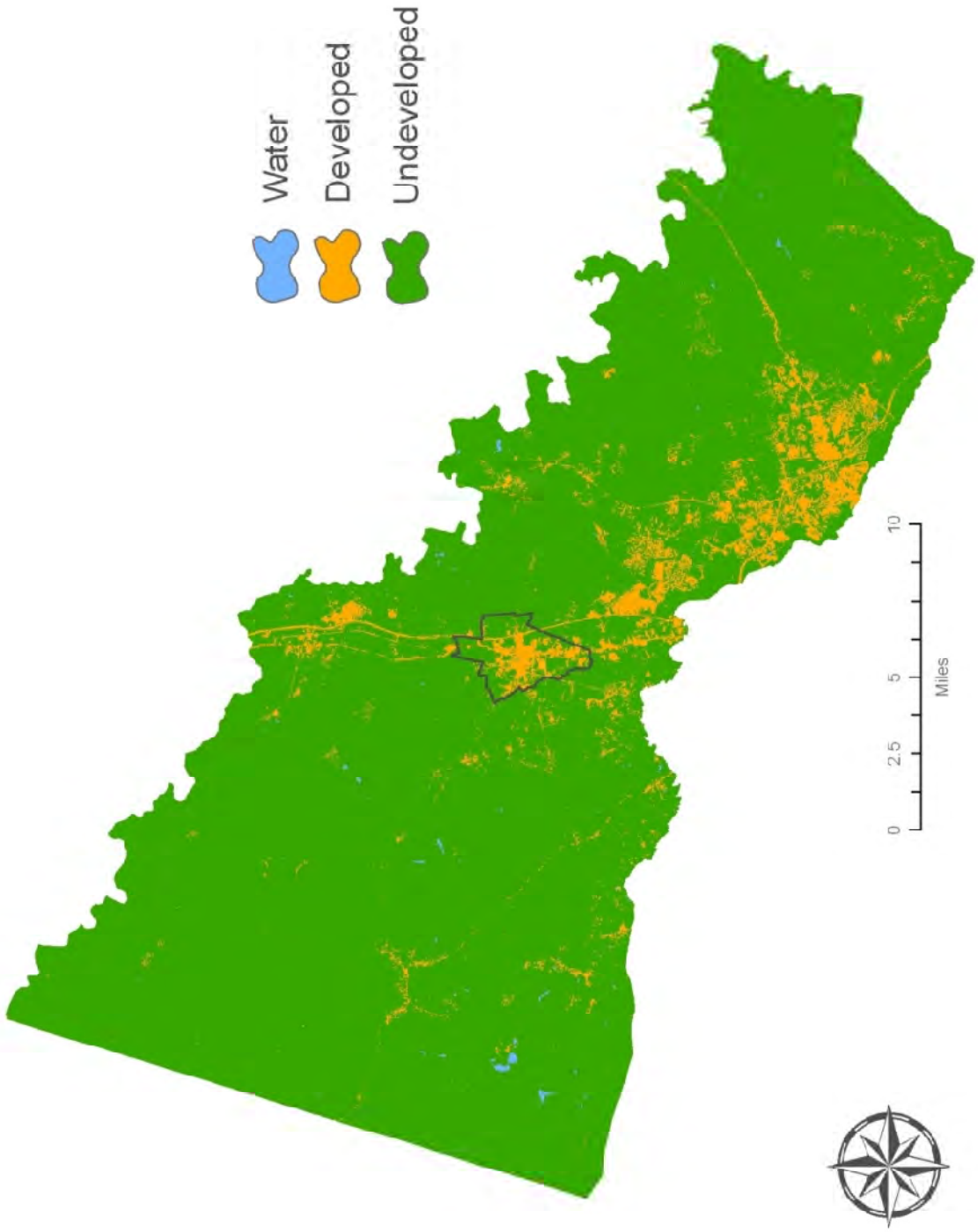


Figure 6-11 Impaired Streams in Hanover County

Source: Hanover County GIS, 2010.

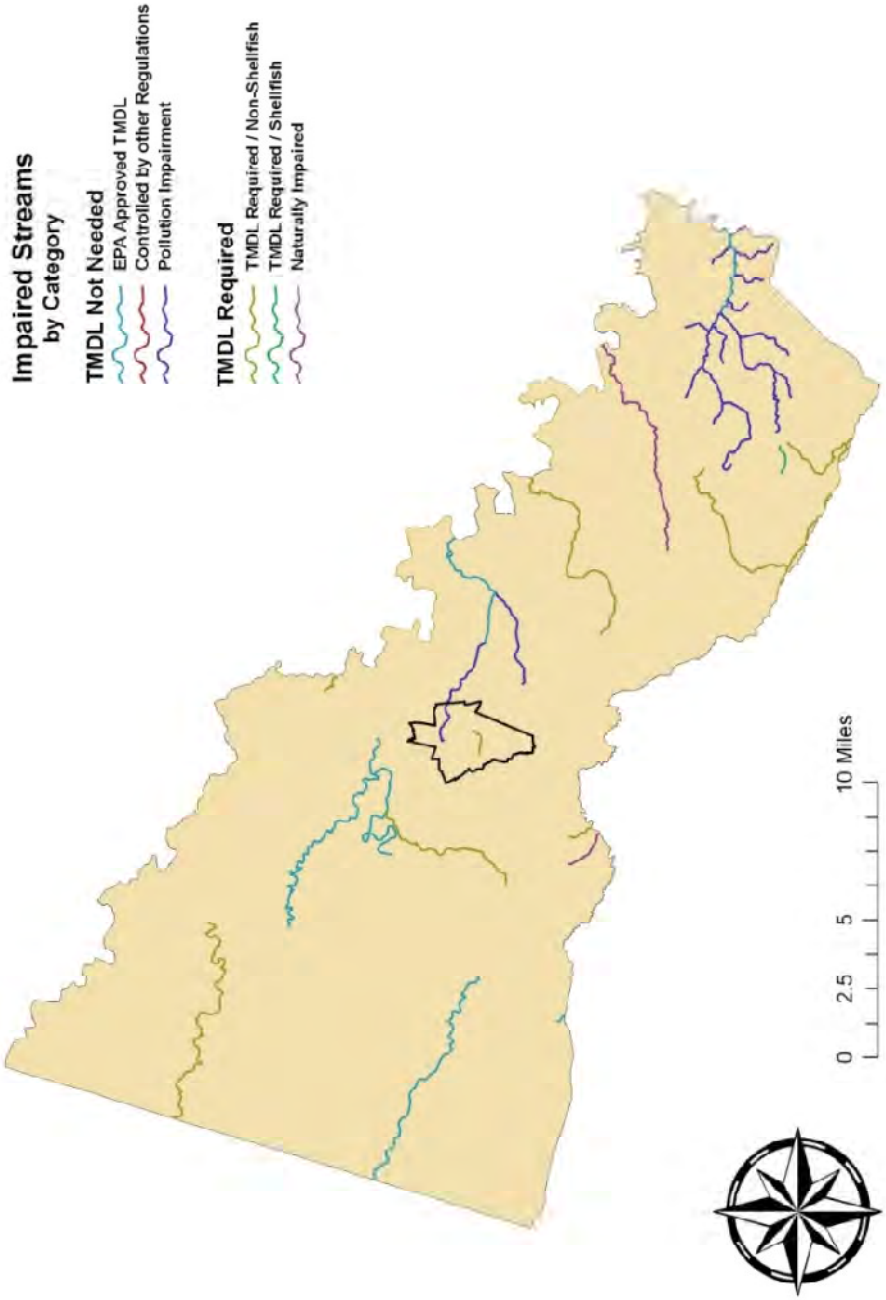


Figure 6-12 VPDES Permit Locations in Hanover County

Source: http://www.deq.virginia.gov/mapper_ext/ (accesed 2010).

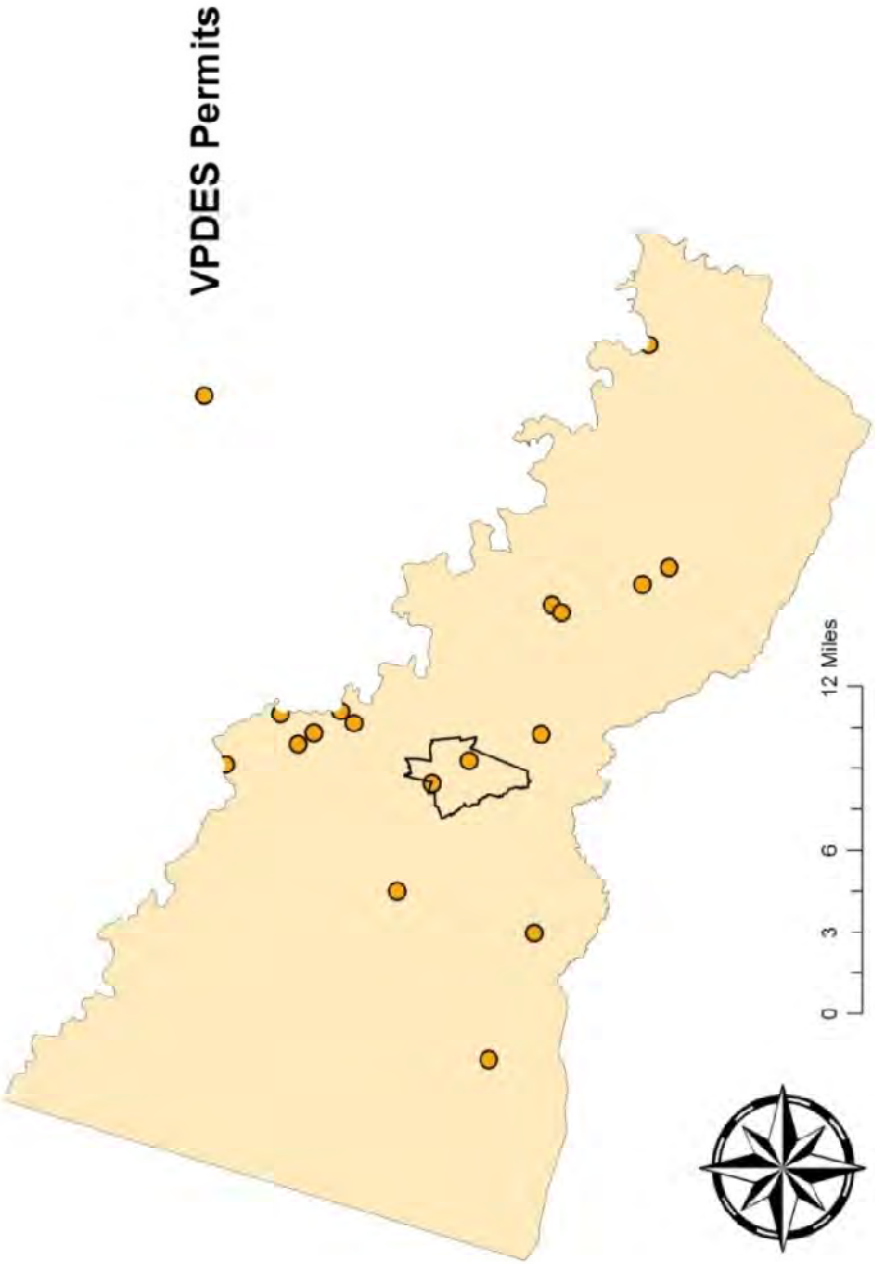


Figure 6-13 Petroleum Storage & Releases in Hanover County

Source: http://www.deq.state.va.us/tanks/stortnks.html/ (accesed 2010) .

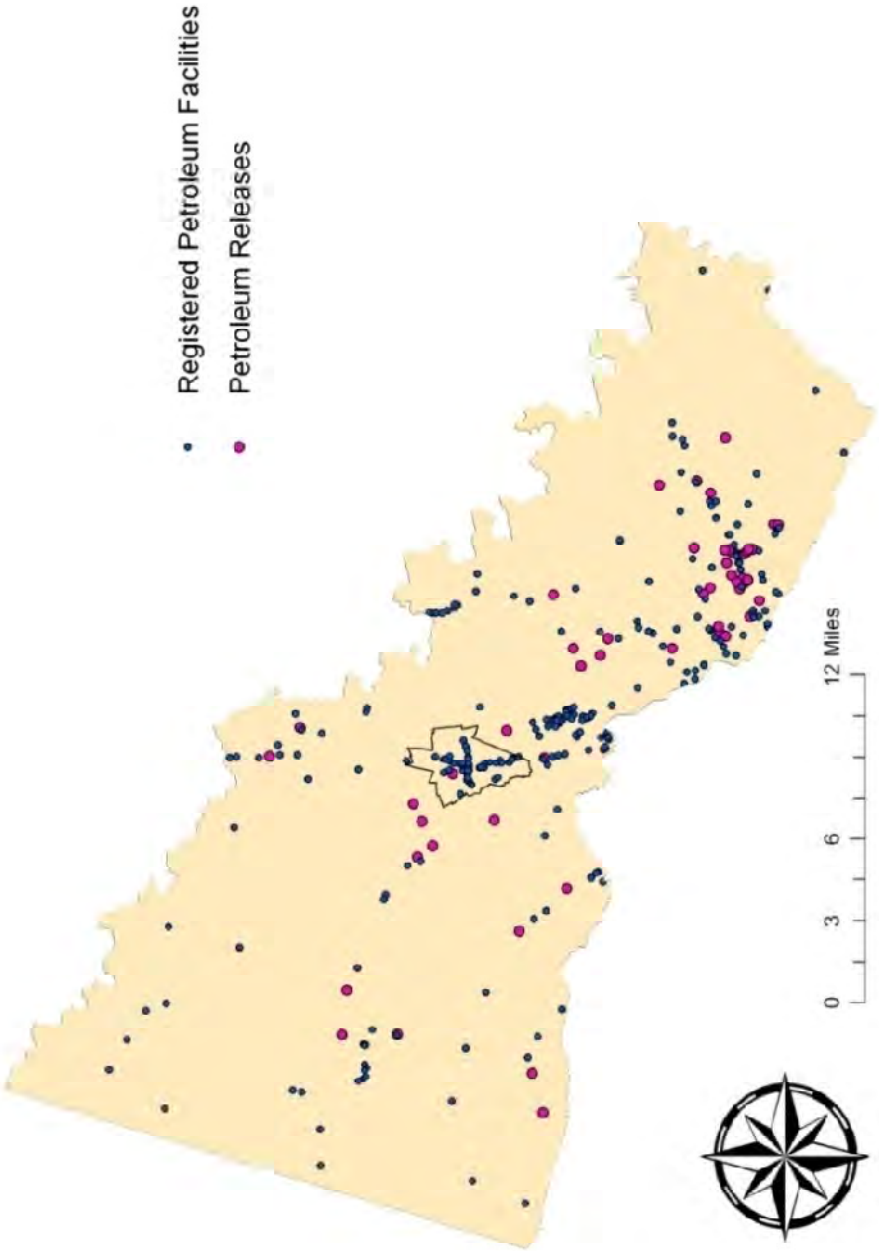
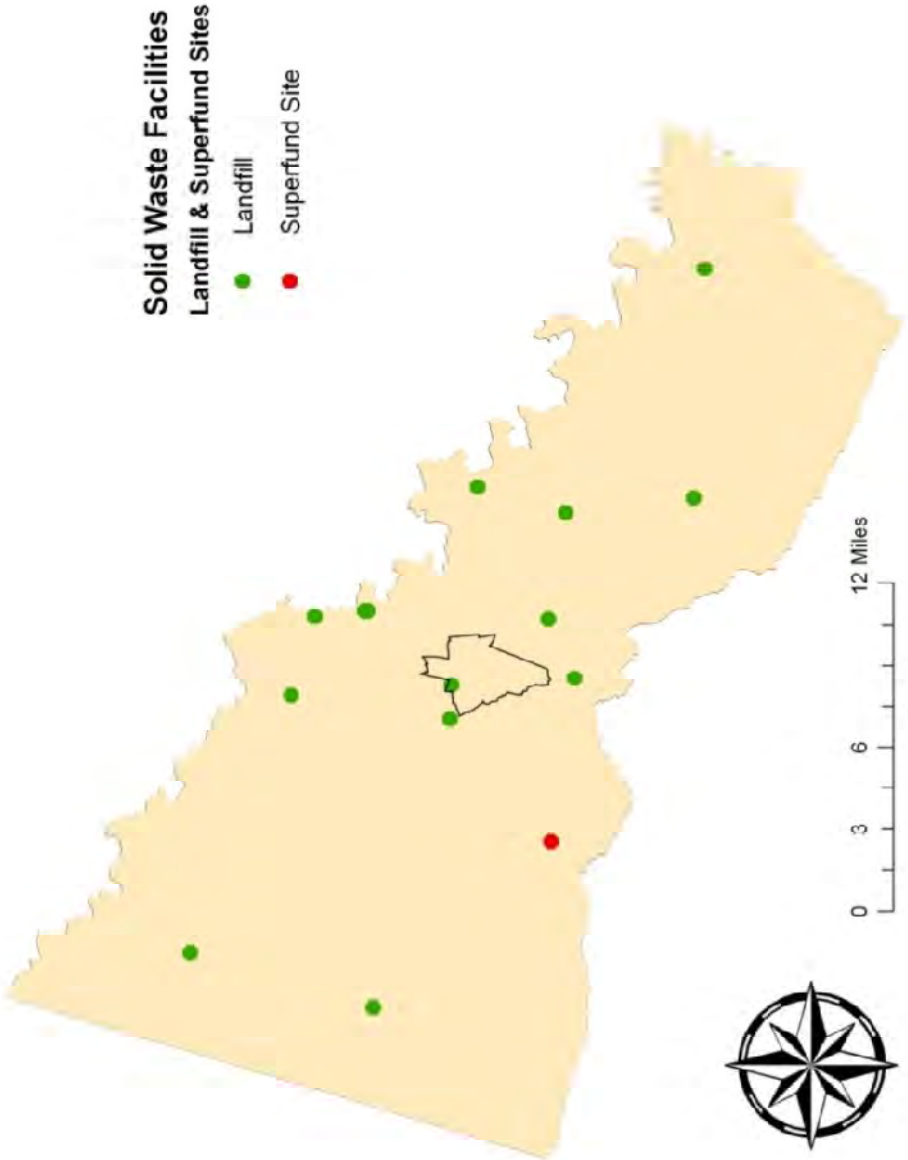


Figure 6-14 Solid Waster Facilities in Hanover County

Source: Hanover County Department of Public Works, 2010 and http://www.epa.gov/reg3hwmd/nppl/VAD980539878.htm (accessed



7.0 WATER DEMAND PROJECTION (9 VAC 25-780-100)

7.1. INTRODUCTION 9 VAC 25-780-100.A & 9 VAC 25-780-100.B

Future water demand projections were calculated using a per-capita method, including population forecasting, assumptions on customers served, and water use practices (AWWA 2001). Current population calculations were based on Traffic Analysis Zone (TAZ) population projections for the entire County. Water demand projections are included for each TAZ as well as the overall Planning Region. Calculations for water demand projection were based on all available data from survey responses, DEQ and VDH records, and County planning documents.

For the purposes of this LRWRP, a 31 year planning period was undertaken (2011 to 2042). This planning period was used to compliment the County's Water and Wastewater Facilities Master Plan (FMP) (Dewberry 2009) which also extends to 2042. Within the Planning Region, water is supplied by the public community systems, private community systems, individual wells, and self-supplied agricultural and non-agricultural users. Supplies are fed by ground water sources and water provided by Henrico County and the City of Richmond via contracts with Hanover County.

The agricultural and non-agricultural self-supplied users primarily rely on surface water withdrawals. Since some of the systems utilize ground water, any significant change in well yields could severely impact water supplies. Similarly, surface water supplies provided by other jurisdictions face potential impacts from droughts and increased demand by other uses. A long-term planning period is needed as a framework in which the new water supply planning efforts should be considered, given stresses placed on water sources in and around the Planning Region.

POPULATION PROJECTIONS

Water demand projections were based on an analysis of population trends and forecasts for the Planning Region. The per-capita method for demand projection was then applied following the AWWA's Water Resources Planning Manual. Population data for the Planning Region was obtained from the FMP on a TAZ level. This information included approved growth rates for the County, as well as rates for adding new connections to the publicly-owned community water system. More details about the assumptions used are provided in the following subsections.

The per-capita method is considered sufficient for the goal of forecasting the average annual water demand (AWWA 2001). This forecasting method also is recommended due to the long-term forecasting (more than 30 years) and the limited data on disaggregated uses. Per-capita models also produce satisfactory results as long as the distribution of consumer classes does not change substantially (AWWA 2001). This is the case of the

community water sources in the Planning Region, which serve a consistent mix of residential, commercial, industrial, and agricultural users.

POPULATION DATA

When previous documentation for a given region has not established reliable population data, the U.S. Census Bureau, Virginia Employment Commission, and the Weldon Cooper Center at the University of Virginia are some of the best sources for developing this data. In the case of the Planning Region, reliable population forecasts are published in the Hanover County Comprehensive Plan titled *Hanover County Owner's Manual 2027*. Therefore, data presented in the comprehensive plan, and data provided by Hanover County DPU were used to develop the TAZ population projections used in this portion of the LRWRP.

7.2. POPULATION TREND DATA AND EXTRAPOLATION 9 VAC 25-780-100.C

Table 7-1 shows the Hanover County Historic Population. Table 7-2 shows the projected growth for the County, which assumes 2% annual growth. The data presented in the comprehensive plan addresses population growth through 2027. In order to develop population projection for the life of this LRWRP, a rate of 2% growth was continued through 2042 (Hanover County 2007).

The County used this data to develop population projections for each TAZ. The TAZ population projections were used to develop the County's FMP and serve as the basis for the analysis in this LRWRP.

Table 7-1 Hanover County Historic Population

YEAR	POPULATION
1940	18,500
1950	21,985
1960	27,500
1970	37,479
1980	50,398
1990	63,306
2000	86,320
2006	99,174

Source: Hanover County Owner's Manual 2027

Table 7-2 Hanover County Population Projections	
Year	Population*
2012	112,273
2017	122,401
2022	134,641
2027	148,105
2032	165,960
2037	183,234
2042	202,305
*Extrapolated from comprehensive plan data using 2% population growth rate Source: Hanover County Comprehensive Plan 2007 - 2027	

SUMMARY AND DISCUSSION OF POPULATION TRENDS IN THE PLANNING REGION

Hanover County's Comprehensive Plan anticipates a County wide average annual population growth rate of 2% per year. The Town of Ashland's anticipated population growth is included in the County-wide growth forecasts. Although annual fluctuations in the growth rate above and below the 2% average annual rate are expected, historical data suggests that the long term 2% annual growth projection is valid.

7.3. WATER DEMAND PROJECTION

9 VAC 25-780-100.D

The following discussion presents water demand projections for community water systems and small, self-supplied users in the Planning Region. Projections for large, self-supplied agricultural and non-agricultural users (>300,000 gpm) also are included in the discussion below. Given the lack of data available for these self-supplied users, the projections were developed in a slightly different manner than for other users. A 31-year planning period was considered for these systems, as previously discussed.

Water demand projections were prepared using the per-capita method described above. The per-capita approach is considered sufficient for the goal of forecasting an average annual demand using simple linear regression, considering the long-term forecasting (more than 30 years), and the relatively limited data available on disaggregated uses (AWWA 2001). Per-capita models produce satisfactory results as long as the distribution of consumer classes does not change substantially (AWWA Manual 2001). This is the case for both public and private community water systems in the Planning Region, which primarily serve residential users.

Total population projected through the planning period was segregated into a population served by community water systems and a residential self-supplied population. Data included in the County's FMP provide a detailed analysis of current and projected populations served by publicly-owned community water systems. The analysis included in the FMP differentiated between public water system customers and private well users in TAZs that were divided by the boundary of the existing and proposed public water system. Data

for private community systems was developed using sources discussed above. The difference between total population and the population served by community water systems was assumed to represent the Planning Region population that is served by private wells.

Community system and self-supplied residential water demand projections were calculated from the service population projected to 2042. Projected community system demand was calculated using a per capita water use value of 81 gallons per day per person (gpd/p) for public and private community systems. The 81 gpd/p figure that applied to community systems was selected after discussion with and review by the representatives from the Planning Region and DEQ. Per-capita values of 94 gpd/p (Virginia Water Works Regulations), 75 gpd/p, and 59 gpd/p (other regional figures) also were considered. The 81 gpd/p figure was initially established by the County in its FMP (Hanover County 2009), and reflects aggregate demand by residential and non-residential users of the public community system. This figure is based on documentation and research of historic rates of water usage in the County. For small self-supplied (residential) users, a value of 75 gpd/p was applied based on data obtained from the U.S. Geological Survey (USGS 2005).

General assumptions were made in the water demand projections to overcome data gaps. First, it is assumed that water use practices would not vary significantly over the planning period. In other words, it is assumed that the per-capita use would not change significantly but that the population would increase. As discussed in Sections 8 and 10, this assumption was modified to reflect potential savings resulting from water demand management practices. The second assumption made in the planning process is that the growth in the Planning Region would be distributed evenly, with self-supplied users increasing at a rate similar to users of community water systems. The FMP provides data to address planned growth in different regions of the Planning Region. This means that in some TAZs the relative difference in population served by the community water systems and the population served by private wells would not change significantly over the planning period. However, in other TAZs, the County's growth plans suggest that the relative difference will shift more dramatically.

Over time, this development could result in a shift in the distribution of individuals supplied by public water systems and private wells, making the publicly-owned water system the more heavily used supply. The projected water demand will be reviewed at each 10-year water resource planning update, and the percentages of small, self-supplied users and public water system users will be updated, along with the projected water demand. This change will be accounted for in future updates to this LRWRP. The relative limitations and potential risk to long-term demand projections is addressed in the Statement of Need portion (Section 10) of this LRWRP.

PROJECTED COMMUNITY WATER SYSTEM (PUBLIC AND PRIVATE) DEMAND

Table 7-3 lists the estimated population served by public community water systems (calculated from data obtained in the FMP). These numbers are multiplied by an average per-capita water use factor of 81 gpd/p to estimate the corresponding public community water system demand.

The total projected water demand for publicly-owned water systems in the Planning Region by year 2042 is 10.07 mgd. This projected water demand for community systems was refined in the Demand Management discussion (Section 8) to take into account water savings derived from demand management measurements. The refined water projection results were then used to determine if alternative water sources must be evaluated and developed (Section 10). This analysis concludes with a statement of need based on refined water projections for community systems and small self-suppliers, discussion of general trends among large self-suppliers, and expected future growth in the region.

Table 7-3 Estimated Public Community System Population and Estimated Water Demand

YEAR	ESTIMATED POPULATION SERVED BY PUBLIC WATER SYSTEMS*	RESIDENTIAL WATER DEMAND (mgd)**
2012	57,790	4.68
2017	65,843	5.33
2022	74,895	6.07
2027	85,258	6.91
2032	96,648	7.83
2037	109,776	8.89
2042	124,312	10.07

* Based on analysis included in the FMP
** Results from multiplying estimated served population by the average per-capita water use factor of 81 gpd/p
Source: Hanover County, VA DPU Water and Wastewater Facilities Master Plan

There are 21 privately-owned community water systems within Hanover County (Appendix 10). These 21 systems serve a total population of 10,286. Given the wide range of data reported for the 21 systems, the per-capita water use factor of 81 gpd/p that was applied to public systems was also applied to these systems.

- Avondale No. 1
- Colonial Forest
- Georgetown Subdivision
- Hanover Learning Center
- Holly Ridge No. 1
- Mountain Run Subdivision
- Overhill Estates – Holly Farms
- Rural Point Central Water System
- Cherrydale Subdivision
- Dianne Ridge
- Hanover Farms
- High Point Farms No. 1
- Mayfield Farms
- Oak Hill Estates
- Rainier Estates
- Scot's Landing

- Sinclair Manor
- Strawhorn
- Walnut Grove No. 1
- Spring Meadows – Meadow Gate
- Taylor House Complex

Table 7-4 projects the DEQ data to the year 2042 using a 2 percent population growth factor, per the Hanover County Comprehensive Plan, and per-capita water use factor of 81 gpd/p. The total projected water demand for privately-owned community systems in year 2042 is 1.67 mgd.

Table 7-4 Estimated Private Community System Population and Estimated Water Demand

YEAR	ESTIMATED POPULATION SERVED BY PRIVATE SYSTEMS*	WATER DEMAND (mgd)**
2012	11,357	0.92
2017	12,539	1.02
2022	13,844	1.12
2027	15,284	1.24
2032	16,875	1.37
2037	18,632	1.54
2042	20,571	1.67

* Extrapolated from DEQ data (2007)
** Results from multiplying estimated served population by the average per-capita water use factor of 81 gpd/p
Source: DEQ Community Waters Systems Using Ground and Surface Water: Water Withdrawal Information (9 VAC 25-780-80B1-B3)

Table 7-5 illustrates the total population and water demand for public and privately-owned community systems.

Table 7-5 Estimated Public & Private Community System Population and Estimated Water Demand

YEAR	ESTIMATED POPULATION SERVED BY ALL COMMUNITY SYSTEMS	WATER DEMAND (mgd)
2012	69,147	5.60
2017	78,382	6.35
2022	88,739	7.19
2027	100,542	8.15
2032	113,523	9.20
2037	128,408	10.40
2042	144,883	11.74

Source: Hanover County Comprehensive Plan 2007 – 2027 and DEQ Community Water Systems Using Ground and Surface Water: Water Withdrawal Information (9 VAC 25-780-80B1-B3)

7.4. DEMAND PROJECTION FOR LARGE, SELF-SUPPLIED SOURCES OUTSIDE PUBLIC WATER SYSTEM SERVICE AREAS 9 VAC 25-780-100.E & 9 VAC 25-780-100.F

Large, self-supplied sources (withdrawing >300,000 gpm) did not reply to survey requests by the Planning Region. DEQ data, however, provides information on self-supplied agricultural users and non-agricultural users using more than 300,000 gallons per month of ground or surface water. The DEQ data identified 8 agricultural users of more than 300,000 gallons per month within the Planning Region, all of which are outside the existing service areas of public and privately-owned community systems. The 8 agricultural users with multiple intakes that have reported water use within the Planning Region are listed below and addressed in Appendix 7. All of these users withdraw water for irrigation from surface water sources (see Table 7-6).

- Ashland Berry Farm (2)
- Cabin Hill Farm (2)
- Enfield Farm (2)
- Horseshoe Farm (3)
- Brookemeade Sod Farm, Inc. (8)
- Colesville Nursery, Inc. (2)
- Grainfield Farm (4)
- Kirby Farms, LLC (3)

Table 7-6 lists these users, their water source, and estimated average annual usage. Because these users did not reply to the Planning Region's survey, there is no way to accurately project any increase in this usage. Therefore, the usage is projected as a constant to year 2042. The total projected water demand for agricultural users withdrawing more than 300,000 gallons per month in year 2042 is 1.44 mg or 0.004 mgd (average).

Table 7-6 Demand Projection for Large, Self-Supplied Agricultural Users

USER NAME	WATER SOURCE	ANNUAL WATER DEMAND (MG)*
Ashland Berry Farm	Newfound River	0.07
Ashland Berry Farm	Farm Pond	0.05
Brookemeade Sod Farm	South Anna River	0.23
Brookmeade Sod Farm	Route 54 Pond	0.13
Cabin Hill Farm	Pamunkey River	0.18
Colesville Nursery	Farm Pond	0.05
Colesville Nursery	South Anna River	0.02
Enfield Farm	North Anna River	0.12
Grainfield Farm	Pamunkey River	0.08
Horseshoe Farm	Pamunkey River	0.09
Kirby Farms	Pamunkey River	0.42
	TOTAL	1.44

* Based on DEQ water withdrawal reporting data (2007)
Source: DEQ Self-Supplied, Agricultural Users . 300,000 gal/month of Ground or Surface Water (9 VAC 25-780-70I, -80B7 and -80D)

DEQ also provided data for non-agricultural users of more than 300,000 gallons per month within the Planning Region, all of which are outside the service area of existing public and private community systems. The DEQ data identified 3 non-agricultural users of more than 300,000 gallons per month within the Planning Region, all of which are outside the service area of the existing public and private community systems. The 3 non-agricultural users (each with multiple intakes) that have reported water use within the Planning Region are listed below and addressed in Appendix 4:

- Bear Island Paper Co. LLC – Ashland Plant
- The Hollows Golf Course
- Martin Marietta Materials

Table 7-7 lists these users, their water source, and estimated average annual usage. Because these users did not reply to the Planning Region's survey, there is no way to accurately project any increase in this usage. Therefore, the usage is projected as a constant to year 2042. The total projected water demand for non-agricultural users withdrawing more than 300,000 gallons per month in year 2042 is 2.15 mgd.

Table 7-7 Demand Projection for Large, Self-Supplied Non-Agricultural Users

USER NAME	WATER SOURCE	AVERAGE DAILY WATER DEMAND (mgd)*
Bear Island Paper Co.	North Anna River	0.82
The Hollows Golf Course	14-acre Lake	0.19
The Hollows Golf Course	South Anna River	0.14
Martin Marietta Materials	Quarry	1.0
	TOTAL	2.15

* Based on DEQ water withdrawal reporting data (2007)
Source: DEQ Self-Supplied, Non-Agricultural Users Using More than 300,000 gal/month of Ground or Surface Water (9 VAC 25-780-70E, -80B6 and -80C)

The Hanover County Comprehensive Plan has recommended that all future industrial development be served by the County's public community water system. If this objective is attained, any increases in water withdrawal inside the Planning Region as a result of industrial development would occur as part of the public community water system and would not represent an unmonitored intake from the region's water resources. Based on the Comprehensive Plan recommendation, this LRWRP assumes that future increases in industrial use will be served by the County's public community water system.

7.5. DEMAND PROJECTION FOR SMALL, SELF-SUPPLIED SOURCES 9 VAC 25-780-100.G

An aggregate water demand projection for small, residential, self-supplied sources (withdrawing <300,000 gpm) was estimated based on methodology similar to that followed for the community systems. Self-supplied sources were identified using the FMP, which identified those TAZs that were not and would not be included

in the community system, as well as the portions of TAZs inside the community system service area that did not or would not have connections. Table 7-8 lists the estimated self-supplied residential population. These numbers are multiplied by the per-capita water use factor of 75 gpd/p (USGS 2005) to estimate the corresponding water demand. A factor of 75 gpd/p was used because there was not sufficient local data to determine a unique factor, as was done for the community system analysis presented above. The 75 gpd/p factor is based on a USGS national survey of self-supplied sources (USGS 2005). The smaller number reflects a general trend for self-supplied users to use less water, as they are more aware of the limits of their water source. The total projected water demand for residential, small, self-suppliers in year 2042 is 6.03 mgd.

Table 7-8 Estimated Self-Supplied Population and Estimated Water Demand

YEAR	ESTIMATED POPULATION SERVED BY PRIVATE WELLS*	WATER DEMAND (mgd)**
2012	44,383	3.33
2017	49,002	3.68
2022	54,102	4.06
2027	59,733	4.48
2032	65,951	4.95
2037	72,815	5.46
2042	80,393	6.03

* Estimated by subtracting population projections for community water systems from the overall Planning Region population projections
** Results from multiplying estimated served population by the average per-capita water use factor of 75 gpd/p
Source: Hanover County Comprehensive Plan 2007 – 2027 and Hanover County, VA DPU Water and Wastewater Facilities Master Plan

At the time of preparation of this LRWRP, no data was readily available to analyze and project water use in self-supplied businesses outside the service area of community water systems. A conservative estimate for water use by these types of businesses would be 5 percent of the water demand of residential well users (See Table 7-8). Using the 5 percent assumption, the total projected water demand for self-supplied businesses outside the service area of the community water system in year 2042 would be 0.30 mgd.

7.6. CUMULATIVE DEMAND AND CONFLICT 9 VAC 25-780-100.H

At the time this LRWRP was prepared, information on cumulative demand, use conflict, or in-stream flow information developed pursuant to 9 VAC 25-780-10.G was not available. The completion of the state-wide integrated LRWRP has not been prepared by DEQ and data from that plan is required to complete the necessary analysis in this section.

7.7. BALANCE OF DOMESTIC CONSUMPTION, IN-STREAM USES, AND ECONOMIC DEVELOPMENT

9 VAC 25-780-100.I

The following discussion addresses the balance among the diverse beneficial uses in the demand projection for the planning period. The term "beneficial use" refers to both in-stream and off-stream uses. In-stream beneficial uses include, but are not limited to the protection of fish and wildlife resources and habitat, maintenance of waste assimilation, recreation, navigation, and cultural and aesthetic values. Off-stream beneficial uses include, but are not limited to, domestic use, (including public water supply), agricultural uses, electric power generation, commercial, and industrial uses.

Meeting the Planning Region's needs for adequate and safe drinking water is the first purpose of the regulation referenced above. Encouraging, promoting, and protecting other beneficial uses constitutes the second purpose of the regulation, and reflects the interest in both continuous economic development and protection of in-stream uses. Detailed aspects of the community water systems and self-supplied users have been discussed in Sections 4 and 5, covering both domestic consumption and water use in economic activities. Environmental sources, description of the Planning Region, in-stream water uses, and environmental conditions in the Planning Region were discussed in Sections 2, 5 and 6. The following subsections focus on the balance of the three broad water uses as they were considered in the demand projection.

ECONOMIC ACTIVITY AND ECONOMIC TRENDS IN THE PLANNING REGION

To diversify Hanover's tax base, the comprehensive plan supports recruitment of business and industry in the fields of technology-based manufacturing, information technology, professional services, distribution, agricultural and forestry related industries, and tourism. As these recruiting efforts succeed, non-residential water demand and consumption are expected to increase.

A general assumption was applied in the demand projection of community water systems in order to address commercial users. Commercial water use inside the service area of community water systems was assumed to follow the same pattern as the population growth. Several commercial areas are located outside of the SSA; therefore, it is assumed that future business located in the rural areas of the County will be served by private wells. Thus, these assumptions and water projections take into consideration most small businesses in the region and their contribution to economic development.

Large, self-supplied sources (withdrawing >300,000 gpm) did not provide sufficient data to allow for detailed analysis of their future water demand. A coarse estimate of total current demand for large self-suppliers was calculated for agricultural and non-agricultural users (Table 7-6 and Table 7-7). Non-agricultural users typically comprise commercial or industrial users of water. As mentioned above, commercial users inside the service area of community water systems are generally accounted for in the water demand projections of community

water systems. The Hanover County Comprehensive Plan has laid the framework for all future industrial development to be located within the public community water system. Therefore, any increases in water withdrawal inside the Planning Region would occur as part of the community water system and would not represent an unmonitored intake from the region's groundwater or surface water resources.

Any new self-supplied industrial water user will have to be assessed on a case-by-case basis to get authorization for water withdrawals according to DEQ and VDH permitting processes. In addition, any future water use will be considered in the context of the latest update of this LRWRP. The Hanover County comprehensive plan and the Town of Ashland Comprehensive Plan (Town of Ashland 2004) provide additional information on the potential growth in the region that could result in future water use.

IN-STREAM USES

In-stream beneficial uses were described in Section 5 and the existing environmental conditions related to fish and wildlife resources and habitat, recreation, and cultural and aesthetic values are described in Section 6.

8.0 WATER DEMAND MANAGEMENT (9 VAC 25-780-110)

8.1. WATER CONSERVATION 9 VAC 25-780-110.A

DPU provides water service to the Town of Ashland and the County's SSA, which comprises approximately 106 square miles, or 22.5% of the 473 square miles of the County (GIS-calculated acreage). The remainder of the County is served by either private commercial water providers, such as Aqua Virginia, or from private wells that serve individual properties.

Water demand management is defined as any widely beneficial measure that reduces or reschedules average or peak withdrawals from surface or ground water sources while maintaining or mitigating the extent to which return flows are degraded. Demand management differs from traditional supply-oriented approaches that primarily attempt to meet increased demand by increasing supply; the primary objectives of demand management are to rationalize and control water use, reduce waste and increase efficiency and equity.

Demand management programs should be designed based on how water is used. Residential customers use the water supply for domestic uses such as drinking water, cooking, cleaning and sanitary uses. Commercial customers use the water supply in their operations for cooling, heating, and manufacturing processes. Water is used to irrigate residential properties, business properties, and parks and other governmental properties.

Water used for water supply system operation and water lost through leaks, evaporation and other causes is a factor of overall demand. DPU staff checks a sample of meters and water lines on a daily basis to ensure that there is no visual evidence of water leaks. During every billing cycle, exception reports are provided for any meter that shows a particularly high usage report. In both those instances, DPU will contact the customer to inform them that they may have a leak and lead them through the steps to check for leaks. DPU also provides dye tablets to test toilets to determine if a customer's toilet is leaking. Finally, DPU conducts annual macro-scale audits that balance production volumes with billed volumes to ensure that the numbers match within a 5% to 10% margin.

Demand management programs promote changes in consumer behavior and reduce waste from water loss. Educational campaigns or product pricing can promote behavior change in consumers to reduce water use and waste. Each gallon of water that is not used because of conservation efforts is one less gallon that needs to be stored, treated, pumped and distributed. The reduction in water usage may also result in energy savings if the water is heated or passed through a wastewater treatment system before returning to the environment.

Water conservation has reached a new level of awareness. Conservation may represent a practical alternative to developing or increasing the water supply or complement new water supply development projects until

technologies evolve to meet the needs of an ever-growing population. Clean water supplies, like other natural resources, are a limited resource and must be managed carefully so that they are preserved for future generations. Efforts to conserve existing supplies and to ensure the efficient allocation of water resources need to be made at each stage of the water supply planning process.

Increasing the efficiency of resource use remains the main strategy for water conservation. Efforts to increase efficiency should include replacing water consuming equipment with more efficient technologies, and finding and repairing leaks in the distribution system. DPU has a yearly budget for maintenance and repair of the County's water system. The County has developed a program with Fire/EMS where the Fire Department periodically tests fire hydrants and reports problems to DPU.

Water demand management practices in the Planning Region are used to refine the water demand forecast of both public community water systems and residential, small self-suppliers that were discussed in Section 7.0. Residential, small self-suppliers (<300,000 gpm) can also benefit from demand management practices; however, many demand management practices in community systems cannot be applied to residential, small self-suppliers. For self-suppliers, the use of water efficient technologies should be encouraged. Educational programs, metering systems, and financial incentives to promote the use of water efficient technologies are one potential course of action.

Water demand management practices can be applied to large self-supplied sources as well. As of August 23, 2000, DEQ records indicated that there were 58 wells owned by companies and public agencies that had withdrawals that exceed 300,000 gpm in the Planning Region. Outreach options to self-supplied sources and potable water demand management practices that are used in industry and agriculture are presented below.

8.1.1. PRACTICES TO PROMOTE MORE EFFICIENT WATER USE 9 VAC 25-780-110.A.1

The following discussion highlights practices used in the Hanover/Ashland Planning Region to address long-term water demand management for community water systems and provides examples of practices used in other jurisdictions that could be adopted by this Region. DPU owns, operates and maintains the Region's public central water systems and uses standard operating procedures for these systems to ensure that all manufactured potable water meets or exceeds all state and federal regulations.

The Planning Region's potable water comes from a combination of sources. The available capacity of each source used by the County system are set forth in Table 8-1.

Table 8-1 Planning Region's Potable Water Sources		
	AVAILABLE CAPACITY	STATUS
City of Richmond, James River – Lockwood Pump station	20 MGD	Active
City of Richmond WTP, James River – Henrico County	0.5 MGD	Emergency
Garthright Well	0.6 MGD	Emergency
Harris Court Well	0.2 MGD	Active
South Anna WTP, South Anna River	2.0 MGD	Inactive
Doswell WTP, North Anna River	4.0 MGD	Active
Source: VDH 2007		

8.1.2. WATER CONSERVATION MEASURES 9 VAC 25-780-110.A.2

The Hanover County Water Conservation and Management Plan was adopted in October 1992, and applies to all public central water systems operated by the County (Appendix 14). This Plan is the legal basis for current water conservation practices, such as water use monitoring, public awareness, recycling and reuse, plumbing codes, plumbing retrofit, submetering, leak detection and repair, unaccounted water loss identification, pressure reduction, billing incentives, rate structure, xeriscaping (landscaping and gardening in ways that reduce or eliminate the need for supplemental water from irrigation) and emergency use restrictions. Water conservation measures are used, when appropriate, to reduce the demand for water, improve the efficiency in water use and reduce water losses and waste.

DPU manages water use efficiency during periods of voluntary or mandatory conservation caused by drought conditions. Pursuant to the County's contract to purchase water from the City of Richmond, the County established certain conservation measures that reflected Richmond's conservation measures.

Infrastructure is reassessed when new technology that may result in water savings becomes available. Utility operators are provided continuing education for maintaining the water system and improving operating efficiencies to reduce water consumption.

Utility rates for public utilities are established annually by Hanover County Board of Supervisors as part of the County's budget adoption process. Utility rates are generally in accordance with recommendations contained in DPU's "rate study" as prepared by its professional rate consultant. DPU has a system-wide "conservation" rate structure that serves to reduce unnecessary water consumption and encourage conservation by residential, commercial and institutional customers. The bi-monthly rates for FY10 are in Appendix 15.

On utility bills, DPU provides regularly scheduled messages and bill inserts on water usage. These messages include tips on water conservation and frozen pipes. All of the information sent in bills is also available on the County's website. DPU has also periodically sponsored poster contests for County fourth graders in

conjunction with National Drinking Water Week. During this week, the department sends out daily e-mails to County employees and has an information desk set up in the County Administration Building. To reach the broad public during National Drinking Water Week, DPU puts a notice about water use and conservation in the local paper. DPU also maintains a webpage that includes tips on water conservation for both indoor and outdoor uses.

Both jurisdictions in the Planning Region have adopted the Virginia Uniform Statewide Building Code (VUSBC), which contains mandatory requirements for the construction, renovation and maintenance of all structures served by public utilities. The VUSBC requires (1) more efficient water use by specifying limits on flow rates for plumbing fixtures and public lavatories in new or renovated structures and (2) that all plumbing systems, fixtures and fittings, including but not limited to lavatories, showers, sinks, hose bibs, urinals and water closets, must be installed in a leak free condition, maintained in a leak free condition and operated as designed by the manufacturer without modification to any water conserving features. Additionally, VUSBC requires that replacement of existing fixtures or fittings be accomplished utilizing water conserving (i.e. "water saver") plumbing fixtures and fixture fittings. VUSBC requirements are enforced by Hanover County Building Inspectors Office (Building Inspector).

The Building Inspector provides homeowners and business owners with information regarding the requirements for using "water saver" fixtures at the time of permit application for additions, expansions and modifications to existing residences, buildings and structures. The County has low-flow and no-flow fixtures in new County buildings. In all other County buildings, all replaced fixtures are low-flow and when applicable, no flow fixtures are installed. In addition, flushing of the distribution pipelines is optimized to minimize the volume of water required to maintain water quality that meets or exceeds State and Federal standards and requirements.

8.1.3. PRACTICES TO ADDRESS WATER LOSS 9 VAC 25-780-110.A.3

DPU has a yearly budget for maintenance and repair of the County's water system. As noted above, the County has developed a program with Fire/EMS personnel where the Fire Department periodically tests fire hydrants and report to the DPU if they find problems. More importantly, the County has developed a water loss reduction program, as described below:

Hanover County's Water Loss Reduction Program includes the following elements:

- Annual Water Loss Audit: At the beginning of each calendar year, DPU conducts annual macro-scale audits that balance production volumes with billed volumes to ensure that the numbers match within a

5% to 10% margin. This determines the volume and nature of lost and unaccounted-for water, if any, within the public utilities system, and can initiate a search for the sources of water losses.

- Waterline Extensions: DPU enforces stringent construction and testing standards for all new waterline extensions to the public utilities system. Said standards meet all requirements of AWWA.

- Maintenance: Maintenance and the accurate recording of maintenance work provide the ability to ensure improvements are planned and undertaken, thereby maximizing system efficiency.

  - The proper maintenance of all meters is necessary to ensure an accurate water balance for comparing production and billed volumes. DPU provides proper maintenance for all meters. DPU purchases all meters that are installed on public water services. Meters are manufactured in compliance with AWWA standards. DPU maintains an aggressive meter replacement policy that ensures that water meters meet appropriate standards of AWWA for accuracy. Residential meters are replaced on a 15-20 year cycle in accordance with manufacturer's recommendations. Commercial meters that are 1.5" diameter and larger are subject to DPU's "Large Meter Replacement Program" which requires that each meter be evaluated every 3 to 5 years (Appendix 16).

  - The prompt repair of system faults (e.g., pipeline breaks or leaks) which result in water loss is provided by DPU. DPU operates a computerized work order system to track the initiation and completion of all repair orders. Work orders are initiated by either DPU staff (upon observing in the field the need for a repair) or contacts from customers (via telephone or web-based email) to DPU Customer Service.

  - Hanover County fire hydrants and other appurtenances are periodically checked for leakage and repaired or replaced when necessary.

- Leak Detection Program: DPU identifies leaks and repair needs in order to maintain optimum system efficiency. An active leak detection program integrates the benefits of an accurate water balance, maintenance records, operator knowledge, and continual system distribution evaluation. The leak detection program includes:

  - Operators are trained in distribution inspection procedures, including investigation of possible water losses. All operators are licensed by Commonwealth of Virginia.

  - Periodic inspections to identify leaks in the distribution system.

  - Periodic checks to monitor system output for comparison with historical averages.

  - A computer-based work order system that ensures completion of repairs in a timely manner.

- Customer field agents observe the integrity of the distribution system including meters during bi-monthly meter reading and report possible leaks and other problems to DPU for initiation of work orders.
- Leak detection – DPU periodically monitors water usage for loss following bi-monthly customer billing cycles when compared with well meter readings for a comparable period. An approximate 5% difference results in evaluation and analysis to satisfactorily resolve the discrepancy.
- Customer billing – DPU's computer-based billing system provides an automatic exception report of a customer account if the meter reading indicates bi-monthly usage outside of an acceptable tolerance. DPU Customer Service contacts the customer to report the abnormal consumption so that the customer may immediately repair the leak (e.g. malfunctioning toilet flap valve), if necessary.

DPU also provides customers with dye tablets to test toilets to determine if a toilet is leaking. DPU does annual macro-scale audits that balances production volumes with billed volumes to ensure that the numbers match within a 5% to 10% margin.

ENHANCING WATER LOSS CONTROL

DPU enforces stringent construction and testing standards for all new waterline extensions to the public utilities system. Said standards meet all requirements of the AWWA for allowable leakage.

8.2. DEMAND MANAGEMENT PLANNING OPTIONS 9 VAC 25-780-110.B

The responsibility for planning and delivering regional demand management programs currently resides with the jurisdictions that comprise the Planning Region, but involvement and support of all participants is critical. Demand management programs are customer driven; therefore, they must be tailored to the customer's wants and needs to be effective.

The demand management measures the Planning Region pursue can be grouped into the following demand Management strategies: (1) water rate structures, (2) codes and regulations, (3) customer incentives, and (4) public information and education.

RATE STRUCTURES

DPU operates all public central water systems. For these systems, there is an increasing water conservation rate structure for both residential and small commercial businesses. Residential and commercial user rates are structured to encourage conservation of water use. Residential rates have a base charge of $8.13 that is increased by $1.29 for every 1,000 gallons used up to 4,000 gallons. From 4,001 – 15,000 gallons used, the rate increases to $3.93 per every 1,000 gallons used and for water use over 15,000 gallons, the rate increases for $5.13 per every 1,000 gallons used.

For small commercial businesses, water conservation is reflected in the rate structure. The rate structure has a base charge depending on the size of the meter and then charges $3.49 per 1,000 gallons used up to 15,000 gallons of water. From 15,001 to 1,000,000 gallons used, the rate increases to $3.93 per 1,000 gallons used. For water usage over 1,000,000 gallons used, the rate actually decreases to $2.18 per gallons used. Otherwise, for the latter category, the rate would simply become punitive if they were charged even higher rates in order to operate their business.

CODES AND REGULATIONS

In addition to adopting the VUSBC and the Hanover County Water Conservation and Management Plan, the County has adopted a Water Code, which is located in Chapter 23-10 of the Hanover County Code (Appendix 17). The Water Code is discussed in detail in section 9.0.

CUSTOMER INCENTIVES

In this Planning Region, the customer incentives used are mostly in the form of the conservation rate structure. To promote water use efficiency, incentives can also be provided in many forms, including rebates, technical assistance, low interest loans or provision of demand management products to end users. Such programs should not be implemented until they have been analyzed for technical feasibility, market response and cost effectiveness.

PUBLIC INFORMATION AND EDUCATION

The objective of the Water Use Education Program is to inform DPU personnel and customers about prudent water use, reducing water waste, and available water conservation measures. DPU's Customer Operations Manager directs efforts undertaken by DPU for water use education. The Customer Operations Manager develops and maintains an education program to ensure continual water conservation education based on, but not limited to, the following criteria:

- Keeping abreast of water conservation methods and practices by identifying applicable water conservation guidance.
- Informing customers via inserts to bi-monthly bills and other methods consistent with the operational practices of DPU.
- Assisting with Hanover County public community water system water loss audits and reporting any and all misuse of water with recommendations to prevent future misuse.

A key factor in reducing excessive water use is the development of a cost-effective public information and education program. It is important to inform customers regarding the various aspects of the water industry. The information includes how drinking water is produced and why we need to conserve it. One outcome desired from the program is having the public develop a keener appreciation for water as a limited resource.

The primary goals of the education program are as follows:

- Create an awareness of local public water supply issues and problems.
- Inform customers of the benefits of water conservation that include:
  - Optimized use and efficiency of public water supplies
  - Cost savings by reducing, delaying, or eliminating utility system expansions
  - Reduced risk of public water supply shortages
  - Protection of economic viability of the area
- Inform customers regarding water-conserving techniques such as low water-use landscaping and low water-use fixtures.
- Inform customers regarding outdoor irrigation tips identifying the best management practices for irrigation and information on new water saving devices and water use practices as the information becomes available.

CONCLUSION

Effective demand management programs should provide equitable distribution of benefits to all customer classes, employ a targeted mix of methods to achieve desired results, and be continuously evaluated to optimize program performance. Hanover County adopted its Water Conservation Plan in October 1992, which contemplates the measures implemented by the DPU as the sole provider of public water utilities in the jurisdictions covered by the Hanover/Ashland Regional Plan. Those measures include:

(1) public information and education through mailings, newspaper advertisements and the Internet
(2) programs to aid customers in conservation of water
(3) continual reviews of customer usage to detect leaks
(4) annual audits of the DPU's records comparing production volumes with billed volumes

A five percent reduction in demand is assumed based on existing demand management programs. Five percent is a conservative estimate based on the potential savings that can be achieved through demand management by existing users and the implementation of new water conservation technology in future construction.

The County and the Town do not regulate the water usage for private water facilities located outside the County's SSA. The Health Department regulates the minimum standards for private individual wells. There is a recommended minimum well design standard of 150 gpd (actual wording is 5 gallons per minute per connection for 10 minutes or 500 gallons per hour with irrigation). The County and the Town rely on the State

Health Department to promote conservation measures which address minimum yield or voluntary water restrictions on private wells since that is the purview of the State Health Department. There are approximately 20,000 publicly served commericial water users/households within the County and the Town. The remainder of the population relies on some form of private system (mostly individual wells) for their daily water needs. The County and the Town has adopted the Virginia Uniform Statewide Building Code standards which address water consumption via low-flow fixtures during the building permit process and maintain a program to ensure continual water conservation education to the public at-large. However, the majority of the conservation measures are tied directly to the public utility system.

9.0 DROUGHT RESPONSE AND CONTINGENCY PLANS (9 VAC 25-780-120)

In general, drought is a period of unusually dry (i.e., a deficit in precipitation received) weather that persists long enough to cause serious problems such as crop damage or water supply shortages. In more specific terms, meteorological drought is a measure of departure of precipitation from normal. Due to climatic differences, what might be considered a drought in one location of the country may not be a drought in another location.

The Drought Response and Contingency Plan (DRCP), as a component of the LRWRP, is focused on identifying drought conditions and implementing appropriate response in order to maintain adequate water supplies in the Planning Region. The successful response to drought conditions in the Planning Region, the implementation of the DRCP, largely depends upon public education and involvement.

PURPOSE OF THE DRCP

- To provide a contingency plan to manage water supplies during drought conditions and emergency conditions (declared Drought Emergency, contamination event or equipment failure);
- To assist water suppliers to deliver a cost effective, adequate, safe and reliable supply of high quality water;
- To establish an enforceable programmed response for each drought stage (discussed below) that will reduce water consumption with the least adverse impact on the residents and businesses of the Planning Region; and,
- Non-climate related emergencies (contamination of water source, equipment failure) may result in the need to restrict water use until water service is restored.

REGULATIONS AND ENFORCEMENT MECHANISMS FOR WATER CONSERVATION

Hanover County and the Town of Ashland have adopted local ordinances supporting mandatory water restrictions within the boundaries of the Hanover public community system. The DRCP is enforceable through these local drought response ordinances, and through the Water Supply Planning Regulations (Section 9 VAC 25-780-120).

Section 15.2-923 of the Code of Virginia allows localities to restrict nonessential use of ground water during times of water shortages or water emergencies. Section 15.2-924 of the Code gives localities the power to restrict water use for the prevention of or the duration of a water supply emergency.

Based on the requirements of the regional James River Management Plan, there are three stages of response at the onset of drought; Alert Stage, Voluntary Stage and Mandatory Stage. The regional James River Management Plan provides that Hanover County can implement an Alert Stage to provide notice of and

prepare for an upcoming drought. The Voluntary Stage allows the County to use voluntary water consumption measures as indicated in the following table:

Table 9-1 Drought Response Measures

CATEGORY	CONSERVATION MEASURE
Established Landscape, Lawns and Gardens	Monday – no watering Odd property addresses water Tue, Thur and Sat Even property addresses water Wed, Fri and Sun (Odd/Even designation is determined by last digit of address number) Bucket watering (five gallon max. permitted anytime)
New Landscape	Unrestricted for first 10 days after planting, then limited to the "Established Landscape and Gardens" measures
Vegetable Gardens	Limited to any two days per week and between 8 p.m. and 10 a.m. on any day. Bucket watering is unrestricted
Paved Areas Washing (Streets, Drives, Patios, Walks, etc.)	Limited to two days per week. Unrestricted for immediate health and safety concerns
Vehicle Washing (Commercial Businesses Exempt)	Limited to two days per week using a hand-held hose with an automatic shut-off nozzle
Golf Courses (Greens Exempt)	Limited to 8 p.m. thru 10 a.m. on any day
Swimming Pools	Limited to filling required to maintain health and safety
Fountains	Limited to any two days per week and between 8 p.m. and 10 a.m. on any day
Businesses	Limited to essential uses
Restaurants	No restrictions
All Other Consumption Uses	Encourage conservation by any means

Source: Hanover County Department of Public Utilities Website, September 2010

Section 23-10 of the Hanover County Water Code (Appendix 16) authorizes the County Administrator, upon recommendation of the Director of Public Utilities and consultaion with the chairman of the Board of Supervisors, to impose mandatory water conservation measures.

The County Administrator shall impose the water conservation measures described below for well-supplied water systems when the County Administrator determines, based upon the rate of water usage in any given month, that the projected monthly water use by the customers of any one or more well-supplied water systems will exceed the permitted monthly withdrawal limit. The water use restrictions for any well-supplied water system shall be lifted if the County Administrator determines that the projected monthly water use by the customers of the well-supplied water system for which the restrictions have been imposed has decreased such that the permitted monthly withdrawal limit will not be exceeded for that month. In any event, the water use restrictions for a well-supplied water system shall be lifted automatically upon the first day of the next month.

The County Administrator shall impose mandatory water conservation measures for the Hanover Suburban Water System (including the Overhill Estates/Route 33 Water System and the Doswell Water System) whenever the flows in the James River drop to levels that require the limitation of withdrawals pursuant to the water protection permits issued by DEQ to the City of Richmond and County of Henrico or when the governor of the state or federal authority, pursuant to applicable law, declares an emergency, imposes mandatory water conservation measures and authorizes the County to enforce such measures. When mandatory conservation measures are so imposed upon the Suburban Water System, such measures are automatically imposed upon the well-supplied water systems. The water use restrictions for the Suburban Water System and well-supplied water systems (when imposed as a result of mandatory measures imposed upon the Suburban Water System) shall be lifted when the flows in the James River rise to normal levels or the governor of the state or federal authority lifts mandatory water conservation measures.

Notice of the implementation and termination of water conservation measures for one (1) or more of the well-supplied systems shall be publicly announced and delivered to each customer of the system or systems. The implementation or termination of the measures shall become effective immediately upon delivery of the notice.

Notice of the implementation and termination of water conservation measures for the Hanover Suburban System shall be publicly announced and published in a newspaper of general circulation for at least one (1) day. The implementation or termination of the measures shall become effective immediately upon publication of notice in a newspaper.

Water conservation measures for well-supplied water systems. Upon the implementation of water conservation measures in the Georgetown, Dianne Ridge, Sinclair Manor, Strawhorne, Oakhill Estates or Hanover Courthouse Water Systems, all of which are well-supplied water systems, the use of County provided water shall be restricted as follows:

- Fountains - water use is prohibited.
- Paved areas - washing or rinsing is prohibited except for health and safety requirements.
- Swimming pools - filling and replenishing is permitted only to the extent necessary to maintain health and safety. All other water use is prohibited.
- Vehicle washing - noncommercial washing is limited to one day per week using only hoses with an automatic shutoff nozzle.
- Landscaping and vegetable gardens - water use is limited to manual watering with buckets and is limited to ten (10) gpd.

- Lawns - watering is prohibited.
- Athletic fields - may be watered only between 8:00 p.m. and 10:00 a.m. and only at a rate not exceeding a total of one (1) inch during any ten-day period.

Water conservation measures for the Hanover Suburban Water System. Upon the implementation of water conservation measures by the County Administrator for the Hanover Suburban Water System, including the Overhill Estates/Route 33 water system and the Doswell system, use of the County provided water shall be limited as follows:

- Fountains - water use is prohibited.
- Paved areas - washing or rinsing is prohibited except for health or safety requirements.
- Swimming pools - filling and replenishing is permitted only to the extent necessary to maintain health and safety. All other uses are prohibited.
- Vegetable gardens and established landscape - watering is permitted only as follows:
  - Odd property addresses (by last digit of address number): water only on Tuesdays, Thursdays and Saturdays.
  - Even property addresses (by last digit of address number) and locations with no address number: water only on Wednesdays, Fridays and Sundays.
  - Watering is prohibited on Mondays.
  - Watering by bucket is unrestricted.
- Vehicle washing - noncommercial washing is limited to one day per week using only hoses with an automatic shutoff nozzle.
- Restaurants - serve water to customers only upon request.
- New landscape - watering is unrestricted during the first ten days after planting and shall conform to the provisions for established landscaping after the first ten days.
- Athletic fields - may be watered only between 8:00 p.m. and 10:00 a.m. and only at a rate not exceeding a total of one inch during any ten-day period.

It shall be a violation of this section for any person to use water or allow or cause the use of water in violation of the provisions of this section after the publication of notice as provided by paragraph (b) of this section.

- Penalty - Any customer account for which there has been a violation of any provision of this section after the publication of notice pursuant to paragraph (b) shall be subject to the following penalties:

- For the first offense, violators shall receive a written warning delivered in person or posted by a representative of the DPU.
- For the second offense, the account shall be billed a penalty of fifty dollars ($50.00), the fine to be imposed upon the next water bill for that account.
- For the third and each subsequent offense, the account shall be billed a penalty of one hundred dollars ($100.00) for each offense, the fine to be imposed upon the next water bill for that account.
- Customers shall have the right to challenge the assessment of a penalty. Such challenge shall be filed with the director of public utilities in writing within ten (10) days of the assessment of the penalty. If the administrative appeal is denied, customers shall have the right to file a challenge by notifying the County Attorney of such challenge within ten (10) days of such denial. Upon receipt of such challenge, the County Attorney shall file a civil warrant in the general district court seeking adjudication of the imposition of the fine.
- The director of public utilities may waive the penalty if he determines that the violation occurred due to no fault of the customer.

In December, 2009, DPU submitted a "Water Conservation and Management Plan" to VDEQ for a withdrawal permit associated with the Hanover Courthouse Water System. The submitted plan included mandatory water use restrictions establishing the following criteria:

- Drought Watch – increase awareness in public and private sector.
- Drought Warning – onset of drought is imminent.
- Drought Emergency – siginificant drought event, contamination, equipment failure.

Although the plan included drought indicators and voluntary/mandatory conservation measures, it is not part of the DRCP since VDEQ has not commented on the acceptibility of the document since its original submittal.

There are no specific ordinances requiring mandatory restrictions on water usage for private well owners. However, during drought situations, the County encourages these users to follow the same voluntary and mandatory conservation efforts.

PERIODIC REVIEW AND UPDATE OF THE DRCP

The LRWRP must be reviewed and updated by the participating jurisdictions periodically as specified in the planning regulations. The DRCP component of the LRWRP will also be reviewed and updated for conditions at the current time in the region. In particular, this review will focus on any required modifications in triggering criteria to reflect changed conditions. Population growth and increasing water demand may increase a water supplier's vulnerability to drought. Major additions of new water sources or improvements to water system

facilities may significantly reduce vulnerability. The update process also helps ensure that the County and the Town are familiar with the plan and encourages "post event" reviews of the plan to identify and correct any problems that may have arisen during an implementation.

10.0 STATEMENT OF NEED AND ALTERNATIVES (9 VAC 25-780-130)

Data and conclusions for the evaluation of adequacy and Statement of Need were compiled from previous sections of the LRWRP, including available public and private community system supply capacity (Sections 4 and 5), and projected water demand and demand management (Sections 7 and 8). The evaluation of adequacy and Statement of Need are based on water data available at the time this report was completed.

10.1. ADEQUACY OF EXISTING WATER SOURCES 9 VAC 25-780-130.A

Table 10-1 summarizes the analysis of adequacy of existing community water sources to meet projected water demand in the Planning Region throughout the planning period (2012-2042). The Planning Region's assessment of its existing water sources assumes that its Verdon Quarry water supply project will come on line by 2037. This alternative includes:

- 22 mgd water treatment plant adjacent to Verdon Quarry or in another location in the County;
- 50 mgd river intake and raw water pumping station at Little River;
- 30 mgd river intake and raw water pumping station at North Anna River;
- 22 mgd reservoir intake and raw water pumping station at Verdon Quarry;
- 22 mgd finished water pumping station at water treatment plant;
- 42-inch raw water main from Little River to Verdon Quarry;
- 42-inch raw water main from Verdon Quarry to North Anna River; and,
- 36-inch finished water main from water plant to the SSA

Table 10-1 provides information on water conservation from demand management (see also Section 8). This information is assessed as a percentage of water savings per decade. These savings were then used to refine the water demand projections presented earlier in Section 7. A five percent reduction in demand was assumed throughout the planning period. Five percent is a conservative estimate based on the potential savings that can be achieved through demand management by existing users and the implementation of new water conservation technology in future construction. The adjusted water demand is presented in Table 10-2.

Table 10-1 Projected Savings for Community Water Sources for the Planning Period of 2012 to 2042 Listed In Five-Year Increments

Column #1	2	3	4	5
Year	Original Projection of Public and Private Community System Demand *	Adjusted Water Demand of Public and Private Community Systems (mgd)**	Projected Savings in Community System Demand Due to Water Management Practices (mgd)**	Water Savings as % of Permitted Capacity (%)
2012	5.60	5.32	0.28	3.33
2017	6.35	6.03	0.32	3.81
2022	7.19	6.83	0.36	4.29
2027	8.15	7.74	0.41	4.88
2032	9.20	8.74	0.46	5.5
2037	10.40	9.88	0.52	6.19
2042	11.74	11.15	0.59	7.0

* Assumes 2 percent annual population growth rate

** Assumes 5 percent demand reduction

Source: Hanover County Comprehensive Plan 2007 – 2027, Hanover County, VA DPU Water and Wastewater Facilities Master Plan and USGS, 2005

Table 10-2 is structured to demonstrate the per-decade evaluation of adequacy, summarizing the results of per-capita demand forecasting discussed in Sections 7 and 8 (see Columns 1 through 3 of Table 10-2), and comparison of permit capacity (see Column 4 of Table 10-2). The total currently permitted withdrawal available for community systems in the Planning Region was estimated at 8.4 mgd.

Table 10-2 summarizes community water supply adequacy by comparing the available capacity to projected demand adjusted for potential savings from water demand management strategies, listing water demand as a percentage of available capacity (see Column 7 of Table 10-2). Column 8 of Table 10-2 specifically notes whether a water demand or surplus is anticipated for each decade of the Planning Period (community water source surplus is anticipated for the Planning Region throughout the Planning Period).

To summarize the results shown in Table 10-2, the total adjusted water demand for public and privately-owned community systems in the Planning Region by year 2042 is 11.15 mgd. The adjustment incorporates presumed water savings from application of water demand management strategies. The total demand represents approximately 24 percent of the projected water supply for the Planning Region in 2042. Based on

the assumptions and estimations for water demand and demand management (Sections 7 and 8), the overall conclusion is that water sources in the Region are adequate to meet projected demand(s) through the planning period. The adequacy of resources will be re-evaluated five years after compliance determination, according to 9 VAC 25-780.

Table 10-2 Adequacy of Community Water Sources for the Planning Period of 2012 to 2042

Listed In Five-Year Increments

Column # 1	2	3	4	5	6	7	8
Year	Estimated Population Served by Public and Privately-owned Community Systems*	Adjusted Water Demand of Public and Privately-owned Community Systems (mgd)**	Total Permitted Capacity of Community Systems (mgd)+	Adjusted Water Demand as % of Permitted Capacity (%)	Total Water Supply (mgd)++	Adjusted Water Demand as % of Total Water Supply (%)	Deficit (-) or Surplus (+) Relative to Total Water Supply
2012	69,147	5.32	8.4	63.3	25	21.28	+
2017	78,382	6.03	8.4	71.79	25	24.12	+
2022	88,739	6.83	8.4	81.31	25	27.32	+
2027	100,542	7.74	8.4	92.14	25	30.96	+
2032	113,523	8.74	8.4	104.05	25	34.96	+
2037	128,408	9.88	8.4	117.62	47^	21.02	+
2042	144,883	11.15	8.4	132.74	47^	23.72	+

* Assumes 2 percent annual population growth

**Adjusted to assume 5 percent demand reduction

+Assumes no change in permitted capacity

++ Based on analysis in FMP

^ Assumes Verdon Quarry Alternative is funded, permitted, and comes online in 2037 (Section 10.3.2.1 of this WSP)

Source: Source: Hanover County Comprehensive Plan 2007 – 2027, Hanover County, VA DPU Water and Wastewater Facilities Master Plan and USGS, 2005

There was not enough data available to determine the adjusted water demand of businesses or self-supplied users. In addition, Hanover County cannot control or monitor the types of water conservation measures employed by these users. Therefore, there are no projections presented for businesses or self-supplied users.

STATEMENT OF NEED

The discussion of adequacy of resources forms the basis for the Statement of Need for community water supplies. Under the assumptions and estimations for water demand and demand management used in Sections 7 and 8, water resources are evaluated to be adequate to meet projected demand in the Planning

Region. The evaluation of adequacy assumes that the Verdon Quarry reservoir project will be completed as scheduled in 2037, and further assumes that existing water contracts with the City of Richmond and Henrico County will be extended, if required, through the end of the planning period.

The Adequacy Assessment and Statement of Need were made in aggregate for all community systems in the Planning Region. This is based on the particular context of the Planning Region, reliance on surface water, ground water, and water purchased from other jurisdictions, and the potential for consolidation of private and community water systems. There are two (2) public community systems that supply approximately 53% of the Planning Region population (see Sections 4 and 5). There are 21 private community systems that serve less than 10% of the Planning Region population. The remaining 37% of the Planning Region population is self-supplied.

The ratio of population served by public and private community systems and individual wells may change in the future if development, climate and local aquifer conditions lead to a trend toward expansion of community water systems to serve existing self-supplied users. This is expected to occur with businesses, as the comprehensive plan highlights future growth corridors and nodes that occur within the existing or planned service area of the public community system (Hanover County 2007). In terms of residential users, this may occur as population growth in the Planning Region leads to consolidation of communities, and the aggregate replacement of individual private wells by community systems. Future residential development also may target areas highlighted for growth by the Comprehensive Plan. Consolidation into community systems may also occur if private water sources are abandoned (i.e., contamination, drought).

The adequacy of existing water sources to meet projected community water demand could change in the future given that the community systems rely on surface water, ground water or purchased supplies from outside the Planning Region. Continued or increased extra-regional withdrawals could affect the Planning Region's ground water supplies. Besides unforeseen economic and demographic changes in the neighboring regions, severe drought conditions can affect both surface and ground water sources in the Planning Region.

The evaluation of adequacy and the Statement of Need are based on all water data available at the time this report was completed. In order to achieve the goal of the LRWRP existing as a "living document", future updates of this LRWRP should consider the key changing variables that affect water demand in Hanover County. The adequacy of resources will be re-evaluated within five years from the LRWRP compliance determination, according to 9 VAC 25-780.

Any new water source will have to be assessed on a case-by-case basis to get authorization for surface or groundwater withdrawals according to DEQ and VDH permitting processes. Furthermore, any future water use will be considered in the context of the latest update of this Regional Water Supply Plan.

It is critical for the Planning Region that community water supplies maintain the capacity to respond to both domestic demands and economic development potential. The County recognizes that diversification of water supply is important.

CONDITIONS THAT MAY CHANGE THE ADEQUACY OF WATER SOURCES

The evaluation of adequacy is based on all water data available at the time this report was completed. Future updates of this LRWRP should consider the key changing variables that affect water demand in the Planning Region.

The South Anna and North Anna rivers have rural watersheds, no significant water quality problems, and are located primarily outside the planned growth areas of the County. Both the County and State agencies have taken proactive steps to protect water sources. DEQ has designated the eastern portion of Hanover County as a Groundwater Management Area. In 1999, Hanover completed a Wellhead Protection Area Delineation and Contaminant Source Inventory for 18 public water supply wells that are operated by DPU as a first step to protect the County's drinking water supply. Possible wellhead protection areas for these wells were mapped in accordance with Federal guidelines for wellhead protection contained in Part 1428 of the Safe Drinking Water Act Amendments of 1986. The County was involved in the Source Water Protection Program implemented by VDH, and will continue to coordinate with them to further ensure the protection of the public water supply.

The County also provides significant financial and coordination support of Soil and Water Conservation District Programs. Conservation assistance to landowners and farmers includes assistance for Chesapeake Bay Act plans, conservation education in schools, wildlife habitat management, assistance with the County Biosolids Program, and Agricultural Stewardship Program, all of which help to protect water quality. Furthermore, the zoning ordinances and land use control policies within the Planning Region allow for future development to be evaluated based on its potential to impact surface and ground water sources prior to approval. There are no known threats to these sources at this time. During each five year review, the Planning Region will reevaluate existing source protection to ensure that water sources are properly protected.

Another aspect to consider is the changing ratio of the population served by community water systems and private wells as ground water resources become scarce or less cost-effective. Integration of private well users into the community systems would be needed if quality or availability of ground water decreases. The possible integration of domestic self-suppliers into community water systems could create an additional stress to community systems. If new community sources need to be developed, every new project or the expansion of existing sources should be evaluated on a case-by-case basis, in the context of this LRWRP. The approval or extension of community water sources will follow the permitting process of DEQ and VDH. It is noted that a

locality's ability to expand publicly-owned community water systems is limited, and requires long-term planning, and consideration of water supplies when proposing/approving new developments.

In addition, any new industrial development or expansion of existing industrial suppliers may increase water withdrawals in the Planning Region. Any new large, self-supplied (industrial) water user proposing a withdrawal above the regulatory threshold will have to be assessed on a case-by-case basis to get authorization for surface or ground water withdrawals according to DEQ and VDH permitting processes. Furthermore, any future water use will be considered in the context of the latest update of this Regional Water Supply Plan.

Finally, special consideration should be given to ground water contamination, drought or other conditions that may cause reduction on well yields or closure of the well. Shallow wells (primary means of serving individual self-supplied residences and businesses) are at the greatest risk for drought, and contamination. Expansion of community water systems (ground water or surface water) may be required in the future to replace private sources (i.e., population density shifts, drought impacts, contamination), leading to more stress being placed on community water systems to meet demand. The Planning Region has emphasized water well protection, water quality monitoring, water purchase from neighboring localities, and reservoir alternatives in the latest updates of their Comprehensive Plans.

SUMMARY OF POTENTIAL WATER SUPPLY ALTERNATIVES

The Statement of Need indicates, according to available data, that water sources are considered adequate to meet current and projected demand(s) of the public and privately-owned community systems in the Planning Region throughout the Planning Period based on the future provision of a side-storage reservoir at the Verdon Quarry. Construction of the Verdon Quarry reservoir will require approval of appropriate water withdrawal permits and funding. Because supply is adequate and there is no deficit for the length of the Planning Period, an alternatives analysis of potential new water sources is not necessary. The adequacy of water supplies will be evaluated every five years. If, during one of these reviews, water supplies are no longer deemed adequate for the Planning Period, an alternatives analysis will be conducted.

11.0 CONCLUSION

The LRWRP relies on population forecasts and distribution assumptions contained within the Comprehensive plan and DPU's Facility Master Plan. Accordingly, the LRWRP anticipates approximately 70 percent of new residents will reside within the SSA (which includes the Town of Ashland) with the remainder residing within the rural areas of the County. A majority of households within the SSA will be connected to the County's public utility system, while a relatively few existing and new residences will rely on private community systems and individual wells. As for the rural areas of the County, it is assumed that new dwellings will continue to rely on individual wells or private community systems. Business and industry will rely on both the public utility system and individual wells to meet their future water needs.

To assure adequate demand conservation measures are in place, the LRWRP suggests the County will continue to implement existing water conservation and management practices, including implementation of conservation and management education programs for utility customers, leak detection programs and practices, implementation and enforcement of applicable building codes for reduced flow fixtures, and continued implementation of DPU's conservation billing rate practices. As noted in the LRWRP, although these practices may benefit both the operator of the private community system and the rate payer in such a system, Hanover County does not, nor is it expected to, have regulatory authority over these system operators. Additionally, the County relies on state permitting for private self supplied users, including residential users. The LRWRP also details the County's drought response program; no changes are anticipated for these policies.

The analysis indicates that Hanover County and the Town of Ashland will have an adequate public water supply through the 2042 planning period with the addition of the Verdon Quarry reservoir site (with necessary permitting and funding in place by 2037) and continued implementation of water conservation measures and drought response management procedures and policies. The LRWRP does not suggest or recommend the future local regulation of self-supplied users or private community systems.

VIRGINIA: At a regular meeting of the Board of Supervisors for Hanover County held in the Board Room of the Hanover County Administration Building on the 27th day of July, 2011, at 2:00 p.m.

Present:

Mr. Aubrey M. Stanley, Vice Chairman
Mr. John E. Gordon, Jr.
Mr. Robert R. Setliff
Mr. G.E. "Ed" Via, III
Mr. Elton J. Wade, Sr.
Mr. Cecil R. Harris, Jr., County Administrator
Mr. Sterling E. Rives, III County Attorney

Absent: Ms. Deborah B. Winans, Chairman
Mr. Charles D. McGhee

RESOLUTION

Adoption of the County of Hanover and Town of Ashland Water Supply Plan

WHEREAS Section 62.1-44.38:1 of the Code of Virginia provides that local and regional water supply programs shall be prepared throughout the Commonwealth; and

WHEREAS the State Water Control Board has developed regulations, found at 9 VAC 25-780 and titled Local and Regional Water Supply Planning, to implement this planning process; and

WHEREAS based upon these regulations, county, cities, and towns are required to complete a water supply program that fulfills the regulations by deadlines based on population; and

WHEREAS local governments may elect to join one or more other local governments to develop a regional water supply program for which a deadline of November 2, 2011, has been established; and

WHEREAS the State Water Control Board has determined that the following elements must be included in all local or regional water supply programs:

- A description of existing water sources;
- A description of existing water use;
- A description of existing water resource conditions;
- An assessment of projected water demand;
- A description of water management actions;
- A statement of need;
- An alternatives analysis that identifies potential alternatives to address projected deficits in water supplies;

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- A map or maps identifying important elements of the program that may include existing environmental resources, existing water sources, significant existing water uses, and proposed new sources;
- A copy of the adopted program documents including any local plans or ordinances or amendments that incorporate the local program elements required by this chapter;
- A resolution approving the plan from each local government that is party to the plan; and
- A record of the local public hearing, a copy of all written comments and the submitter's response to all written comments received, and

WHEREAS it is reasonable and prudent for the County of Hanover and Town of Ashland to coordinate and collaborate in the development of a regional long range water resources program; and

WHEREAS the County of Hanover is located within the County of Hanover and Town of Ashland regional water supply area; and

WHEREAS the County of Hanover and Town of Ashland Regional Long Range Water Resources Plan was developed in accordance with the provisions of the Virginia Administrative Code (9 VAC 25-780-70 through 9 VAC 25-780-130); and

WHEREAS on July 27, 2011, the County of Hanover held a public hearing to accept public comment on the County of Hanover and Town of Ashland Long Range Water Resources Plan and all written comments submitted have received a written response as required; and

WHEREAS the Hanover County Board of Supervisors has adopted policies to address drought mitigation and contingencies which include the following actions:

1. Authorization to develop water conservation measures on October 13, 1992; and
2. Adoption of Ordinance Number 07-22 on October 10, 2007, and Ordinance Number 08-09 on April 9, 2008, which establish voluntarily and mandatory water restrictions, establish procedures for implementation, enforcement, and penalties (as defined in Section 23-10 of the Hanover County Water Code);

NOW THEREFORE, BE IT RESOLVED that the Board of Supervisors of the County of Hanover hereby adopts the County of Hanover and Town of Ashland Long Range Water Resources Plan; and

BE IT FURTHER RESOLVED that the Board of Supervisors reaffirms its previous actions and states that those statutory and administrative actions constitute an integral part of the Regional Drought Response and Contingency Plan; and

BE IT FURTHER RESOLVED that the Board of Supervisors of the County of Hanover intends that the County of Hanover and Town of Ashland Long Range Water Resources Plan shall be revised to reflect changes in relevant data at least once every five years and shall be revised and resubmitted to DEQ every ten years in accordance with the regulations and sound planning practice.

On motion of Mr. Via, seconded by Mr. Wade, the members of the Board of Supervisors voted to approve this resolution as follows:

Vote:

Deborah B. Winans	Absent
Aubrey M. Stanley	Aye
John E. Gordon, Jr.	Aye
Charles D. McGhee	Absent
Robert R. Setliff	Aye
G. E. "Ed" Via, III	Aye
Elton J. Wade, Sr.	Aye

This is to certify that the above is a resolution adopted by the Hanover County Board of Supervisors on July 27, 2011.

Dated: August 4, 2011

Joseph P. Casey, Deputy County Administrator
Deputy Clerk, Hanover County Board of Supervisors

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PUBLIC NOTICE

Notice is hereby given that the Hanover County Board of Supervisors has set **Wednesday, July 27, 2011, at 7:00 P.M.,** in the Board Room of the Hanover County Government Building at Hanover Courthouse, Hanover, Virginia, as the day, date, time, and place for a public hearing to consider the following cases, at which public comments will be accepted:

COUNTY OF HANOVER AND TOWN OF ASHLAND LONG RANGE WATER RESOURCES PLAN

The Hanover County Board of Supervisors will consider the adoption of a Resolution to approve the County of Hanover and the Town of Ashland Long Range Water Resources Plan as mandated by the Virginia General Assembly and defined by regulation 9 VAC 25-780, Local and Regional Water Supply Planning, as developed by the State Water Control Board.

The County of Hanover and the Town of Ashland Long Range Water Resources Plan is a regional plan that describes existing water sources, existing water use, existing water resource conditions, projects water demands, provides for water management/conservation actions and establishes a Drought Response and Contingency Plan. (PUBLIC HEARING)

REZONINGS

C-10-99(c)
AM. 1-11

BELL CREEK CHILD DEVELOPMENT CENTER, L.L.C., Requests to rezone with conditions from M-1(c), Limited Industrial District with conditions to B-2(c), Community Business District, on GPIN 8715-37-5873, consisting of approximately 2.88 acres, located on the north line of Left Flank Road (Private Road) approximately 400 feet west of its intersection with Bell Creek Road (State Route 642) in the **CHICKAHOMINY MAGISTERIAL DISTRICT**. The subject property is designated on the General Land Use Plan Map as Office Services. The proposed rezoning amendment would permit the existing daycare facility to expand into a second structure for after school daycare. (PUBLIC HEARING)

C-34-02(c)
AM. 1-11

COMMONWEALTH LANDS, L.L.C., Requests an amendment to the conceptual plan approved with rezoning request C-34-02(c), AJA Land Company, Inc. and Estate of Robert L. Figg, Jr., on GPIN 7797-81-2205, consisting of approximately 62.5 acres, currently zoned RS(c), Single Family Residential District with conditions. The property is part of Honey Meadows Subdivision and is located on the north line of Honey Meadows Road (State Route 2380) approximately 1,700 feet north of its intersection with Atlee Station Road (State Route 637) in the **CHICKAHOMINY MAGISTERIAL DISTRICT.** The subject property is designated on the General Land Use Plan Map as Suburban General (2-4 dwelling units per acre). The proposed rezoning amendment would amend the conceptual plan to show a future phase of development. (PUBLIC HEARING)

C-3-11(c) **JEAN W. MAY**, Requests to rezone with conditions from A-1, Agricultural District, to AR-6(c), Agricultural Residential District, on GPIN 8727-07-6690, consisting of approximately 12.03 acres, located on the west line of Pollard Creek Road (State Route 742), approximately 800 feet north of its intersection with Fire Lane (State Route 724) in the **HENRY MAGISTERIAL DISTRICT**. The subject property is designated on the General Land Use Plan Map as Agricultural. The proposed zoning amendment would permit the creation of one (1) additional building lot for a gross density of one dwelling unit per 6.01 acres. (PUBLIC HEARING)

C-4-11(c) **STEPHEN R. MARKS**, Requests to rezone with conditions from A-1, Agricultural District, to AR-6(c), Agricultural Residential District, on GPIN 8708-64-7228, consisting of approximately 9.10 acres, located on the east line of Hanover Courthouse Road (U.S. Route 301), approximately 1,000 feet north of its intersection with Stumpy Road (State Route 654) in the **HENRY MAGISTERIAL DISTRICT**. The subject property is designated on the General Land Use Plan Map as Agricultural. The proposed zoning amendment would permit the creation of one (1) additional building lot for a gross density of one dwelling unit per 4.55 acres. (PUBLIC HEARING)

SPECIAL EXCEPTIONS

SE-22-03 AM. 1-11 **BELL CREEK CHILD DEVELOPMENT CENTER, L.L.C.**, Requests an amendment to a Special Exception Permit in accordance with Title I, Article 5, Section 13.7(a) of the Hanover County Zoning Ordinance to expand a daycare facility on GPIN 8715-37-5873, consisting of approximately 2.88 acres, zoned M-1(c), Limited Industrial District with conditions, and located on the north line of Left Flank Road (Private Road) approximately 400 feet west of its intersection with Bell Creek Road (State Route 642) in the **CHICKAHOMINY MAGISTERIAL DISTRICT**. (PUBLIC HEARING)

SE-10-11 **JULIA P. CLIME AND KATHERINE S. CLIME**, Request a Special Exception Permit in accordance with Title I, Article 5, Section 3A.6.2(g), of the Hanover County Zoning Ordinance to permit a home occupation in an accessory structure on GPIN 8707-54-0272, consisting of approximately 1.0 acre, zoned R-1, Single Family Residential District, and located on the north line of Patrick Henry Boulevard (State Route 753) approximately 800 feet west of its intersection with Old Lansdown Road (State Route 754) in the **BEAVERDAM MAGISTERIAL DISTRICT**. (PUBLIC HEARING)

Copies of the above cases may be reviewed in the Planning Office, Monday through Friday, between the hours of 8:30 a.m. and 5:00 p.m.

DO NOT PRINT BELOW THIS LINE

Received: _____

Advertised: July 14, 2011 and July 21, 2011

Date: July 11, 2011

Approved by: DP

RESOLUTION

Adoption of the County of Hanover and Town of Ashland Water Supply Plan

WHEREAS Section 62.1-44.38:1 of the Code of Virginia provides that local and regional water supply programs shall be prepared throughout the Commonwealth; and

WHEREAS the State Water Control Board has developed regulations, found at 9 VAC 25-780 and titled Local and Regional Water Supply Planning, to implement this planning process; and

WHEREAS based upon these regulations, county, cities, and towns are required to complete a water supply program that fulfills the regulations by deadlines based on population; and

WHEREAS local governments may elect to join one or more other local governments to develop a regional water supply program for which a deadline of November 2, 2011, has been established; and

WHEREAS the State Water Control Board has determined that the following elements must be included in all local or regional water supply programs:

- A description of existing water sources;
- A description of existing water use;
- A description of existing water resource conditions;
- An assessment of projected water demand;
- A description of water management actions;
- A statement of need;
- An alternatives analysis that identifies potential alternatives to address projected deficits in water supplies;
- A map or maps identifying important elements of the program that may include existing environmental resources, existing water sources, significant existing water uses, and proposed new sources;
- A copy of the adopted program documents including any local plans or ordinances or amendments that incorporate the local program elements required by this chapter;
- A resolution approving the plan from each local government that is party to the plan; and
- A record of the local public hearing, a copy of all written comments and the submitter's response to all written comments received, and

WHEREAS it is reasonable and prudent for the County of Hanover and Town of Ashland to coordinate and collaborate in the development of a regional long range water resources program; and

WHEREAS the Town of Ashland is located within the County of Hanover and Town of Ashland regional water supply area; and

WHEREAS the County of Hanover and Town of Ashland Regional Long Range Water Resources Plan was developed in accordance with the provisions of the Virginia Administrative Code (9 VAC 25-780-70 through 9 VAC 25-780-130); and

WHEREAS on July 19, 2011, the Town of Ashland held a public hearing to accept public comment on the County of Hanover and Town of Ashland Long Range Water Resources Plan and all written comments submitted have received a written response as required; and

WHEREAS the Hanover County Department of Public Utilities is responsible for the operation and maintenance of the Town of Ashland water and sewer systems.

WHEREAS the Hanover County Board of Supervisors has adopted policies to address drought mitigation and contingencies with full jurisdiction within the Town of Ashland, which include the following actions

1. Authorization to develop water conservation measures on October 13, 1992; and
2. Adoption of Ordinance Number 07-22 on October 10, 2007, and Ordinance Number 08-09 on April 9, 2008, which establish voluntarily and mandatory water restrictions, establish procedures for implementation, enforcement, and penalties (as defined in Section 23-10 of the Hanover County Water Code); and

NOW THEREFORE, BE IT RESOLVED that the Town Council of the Town of Ashland hereby adopts the County of Hanover and Town of Ashland Long Range Water Resources Plan; and

BE IT FURTHER RESOLVED that the Town Council reaffirms the previous actions of the Hanover County Board of Supervisors and states that those statutory and administrative actions constitute an integral part of the Regional Drought Response and Contingency Plan; and

BE IT FURTHER RESOLVED that the Town Council of the Town of Ashland intends that the County of Hanover and Town of Ashland Long Range Water Resources Plan shall be revised to reflect changes in relevant data at least once every five years and shall be revised and resubmitted to DEQ every ten years in accordance with the regulations and sound planning practice.

Faye O. Prichard, Mayor

Vote:

Mayor Prichard	aye
Vice Mayor Spagna	aye
Edward L. Henson III	aye
James R. Foley	aye
Terri Winston-Abri	aye

Resolution: Long Range Water Resources Plan
July 19, 2011

Public Hearing
Ashland Town Council

The Ashland Town Council has scheduled a public hearing for Tuesday, **July 19, 2011, at 7:00 p.m.** in the Council Chambers of the Town Hall located at 101 Thompson Street to accept comments from the public on the following:

ORD2011-04 an ordinance to vacate an unopened right-of-way for an alley extending +/- 265' south off of West Patrick Street, between N. Center Street and Park Street, and to transfer this real property to Randolph-Macon College, owners of the adjacent property identified as 7870-73-2227, 7870-73-5922, and 7870-73-6779.

ORD2011-05 an ordinance to vacate an unopened right-of-way, known as East Patrick Street, between Henry Street and N. Center Street and running parallel to and approximately 1,200 ft south of Smith Street, and to transfer this real property to Randolph-Macon College, owners of the adjacent property identified as 7870-82-0580, 7870-73-9372, 7870-83-0298, 7870-73-2227, 7870-83-6098, and 7870-82-8597.

COUNTY OF HANOVER AND THE TOWN OF ASHLAND LONG RANGE WATER RESOURCES PLAN

Consideration of the adoption of a Resolution to approve the County of Hanover and the Town of Ashland Long Range Water Resources Plan as mandated by the Virginia General Assembly and defined by regulation 9 VAC 25-780, Local and Regional Water Supply Planning as developed by the State Water Control Board.

The County of Hanover and the Town of Ashland Long Range Water Resources Plan is a regional plan that describes existing water sources, existing water use, existing water resource conditions, projects water demands, provides for water management/conservation actions and establishes a Drought Response and Contingency Plan.

Copies of the above requests may be obtained by contacting the Planning Office Administrative Assistant at 798-1073 or at Town Hall located at 101 Thompson Street, Ashland, Virginia 23005 Monday through Friday from 8:30 a.m. until 5:00 p.m.

Please run this legal ad on Thursday, June 30, 2011, and Thursday, July 7, 2011, for the public hearing on July 19, 2011.

Legal ad size appr. 3.25 wide x ? long

7516 County Complex Road Hanover, Virginia 23069